NOTICE OF PROPOSED AMENDMENT (NPA) NO 2008-04

DRAFT DECISION OF THE EXECUTIVE DIRECTOR OF THE EUROPEAN AVIATION SAFETY AGENCY

AMENDING
DECISION NO. 2003/2/RM OF THE EXECUTIVE DIRECTOR OF THE EUROPEAN AVIATION SAFETY AGENCY
of 17 October 2003
on

certification specifications, including airworthiness code and acceptable means of compliance, for large aeroplanes («CS-25»)

'Type III Emergency Exit Access and Ease of Operation'

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A. Explanatory Note

I. General

1. The purpose of this Notice of Proposed Amendment (NPA) is to envisage amending Certification Specifications for Large Aeroplanes (CS-25) as originally issued by Executive Director's Decision 2003/2/RM of 17 October 2003[1] and last amended by Executive Director's Decision 2007/020/R of 20 December 2007[2] (CS-25 Amendment 4). The scope of this rulemaking activity is outlined in Terms of Reference (ToR) 25.040 and is described in more detail below.

2. The European Aviation Safety Agency (hereinafter referred to as the Agency) is directly involved in the rule-shaping process. It assists the Commission in its executive tasks by preparing draft regulations, and amendments thereof, for the implementation of the Basic Regulation[3] which are adopted as Opinions (Article 19(1)). It also adopts Certification Specifications, including Airworthiness Codes and Acceptable Means of Compliance and Guidance Material to be used in the certification process (Article 19(2) Basic Regulations).

3. When developing rules, the Agency is bound to following a structured process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board[4] and is referred to as the Rulemaking Procedure.

4. This rulemaking activity is included in the Agency's 2008 Rulemaking Programme. It implements the rulemaking task 25.040 Type III exits.

5. The text of this NPA has been prepared by the Agency based on the draft text developed by the Rulemaking Group set up by the Agency for the 25.040 rulemaking task. It is submitted for consultation by all interested parties in accordance with Article 52 of the Basic Regulation and Articles 5(3) and 6 of the Rulemaking Procedure.

II. Consultation

To achieve optimal consultation, the Agency is publishing the draft decision of the Executive Director on its internet site. Comments should be provided within 3 months from the date of publication in accordance with Article 6(4) of the Rulemaking Procedure.

Comments on this proposal should be submitted by one of the following methods:

CRT: Send your comments using the Comment-Response Tool (CRT) available at **http://hub.easa.europa.eu/crt/**

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[1] Decision No 2003/2/RM of the Executive Director of the Agency of 17 October 2003 on certification specifications, including airworthiness code and acceptable means of compliance, for large aeroplanes (« CS-25»).

[2] Decision No. 2007/020/R of the Executive Director of the European Aviation Safety Agency of 20 December 2007 on Certification Specifications, Including Airworthiness Code and Acceptable Means of Compliance, for Large Aeroplanes («CS-25 Amendment 4»).

[3] Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC. OJ L 79, 19.03.2008, p.1.

[4] Management Board decision concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material (Rulemaking Procedure), EASA MB 08/2007, 13.6.2007

E-mail: In case the use of CRT is prevented by technical problems, these should be reported to the CRT webmaster and comments sent by email to NPA@easa.europa.eu.

Correspondence: If you do not have access to internet or e-mail you can send your comment by mail to:
Process Support
Rulemaking Directorate
EASA
Postfach 10 12 53
D-50452 Cologne
Germany

Comments should be received by the Agency before 10 July 2008. If received after this deadline they might not be taken into account.

III. Comment response document

6. All comments received in time will be responded to and incorporated in a comment response document (CRD). The CRD will be available on the Agency's website and in the Comment-Response Tool (CRT).

IV. Content of the draft decision

Envisaged changes to CS-25

7. The proposed change is to revise the Agency's Certification Specifications for Large Aeroplanes, to amend the title of paragraph CS 25.813 and to amend the content of sub-paragraph CS 25.813(c), to require design improvements and improved access to Type III passenger emergency exits typically located over the wings with a step-up inside the cabin and a step-down to the wings.

8. The improvements required for large aeroplanes with 20 or more passenger seats include the definition of minimum dimensions to ensure ease of operation of the exit and egress access.

9. For all Type III exits, rule changes are proposed to introduce a seat back break over restriction to discourage escaping passengers from climbing over the seat backs into the access path, and a proper design of the structures bounding the access path to avoid foot traps and protrusions.

10. In addition, instead of the conventional Type III exit design incorporating a removable hatch, an Automatically Disposable Hatch (ADH), is required for aeroplanes with a passenger seating configuration of 41 or more. The intention of the ADH is that it does not require manual intervention to ensure that its final location after opening is in a position that does not present an impediment in the exit access path, in the exit opening itself, or outside the aircraft.

11. It should be noted that Type IV exits are also covered by CS 25.813(c). This type of exit can normally only be utilised on an aircraft that has a passenger seating capacity of 9 or less (ref. CS 25.807(d)(1)). Although not the main focus of this NPA exercise, any revision to this paragraph must therefore also consider this smaller exit type. This has been achieved by treating them the same as Type III exits on aircraft with less than 20 passenger seats, i.e. as explained above, all of the proposed changes equally apply except those related to dimensionally defined unobstructed spaces for access and ease of operation.

12. The proposed rule changes are partially derived through the results of extensive testing conducted by the Cranfield Institute of Technology, UK and FAA's Civil Aeromedical Institute (CAMI) in the USA. The tests were performed to investigate possible enhancements regarding the evacuation capability of aeroplanes equipped with such exits.

13. In Book 2 „SUBPART D-DESIGN AND CONSTRUCTION" new AMC material (AMC 25.813(c)) is proposed, providing guidance in support of the proposed rule changes.

Dissenting views

14. At the fourth meeting of the Cabin Safety Rulemaking Group-25-040 (Type III Exits - Access to and Ease of Operation) it was concluded that a difference of opinion existed within the group that was most unlikely to be resolved by further discussion. Disagreement in the group related to acceptable method(s) for guaranteeing that deployable items will be moved out of the required passageway prior to the critical flight phases, and will remain so during a subsequent emergency evacuation.

15. Some members of the group proposed that a check for correct stowing of items under passenger control in the vicinity of Type III exits, performed by cabin crew before critical flight phases, would be acceptable. During this check, it was proposed a positive locking device, unable to be operated by the passenger, would be systematically engaged as part of the basic cabin crew procedure for cabin preparation before critical phases of flight.

16. The remainder of the group was of the opinion that maintenance of the passageway must be ensured by the design itself rather than by operational procedures. These group members did however consider that perhaps deployment of items into the passageway in flight may be acceptable by the provision of devices to automatically restore them to a safe condition should passengers fail to do this (e.g. powered devices automatically initiated by aircraft configuration changes such as flap deployment, landing gear extension).

17. The above two opposing positions were referred to as "Procedural Process" and "Design Solution" respectively. They are described in the paper "Dissenting Positions In Regards to Deployment of Items into the Minimum Required Type III Exit Passageway During Flight" of 05/01/2007, provided in Appendix II.

Agency Response

18. It was finally agreed that the Agency's Rulemaking procedure (Reference (1)) for resolving such differences must be followed in order to make further progress. After consultation of the relevant Agency experts, discussions with the FAA and Transport Canada, evaluation of advantages and disadvantages of both solutions and consideration of past experience and previous works conducted by the FAA and JAA, the Agency decided to give a direction to the 25.040 Rulemaking Group as follows (See Appendix III for the complete document).

Decision

19. The Agency concluded that it cannot give a credit to the "Procedural Process" solution involving Cabin Crew actions at this stage. The group was therefore requested to implement in the NPA proposal for CS-25 the "Design Solution" i.e. that the design alone without supporting actions by Cabin Crew must assure that the minimum required Type III exit unobstructed passageway is available in the critical phases of flight (i.e. taxi, takeoff and landing).

20. Acceptability of the "Procedural Process" solution involving Cabin Crew actions was however not ruled out forever and this option may be further explored in the future during individual aircraft type certification projects.

V. Regulatory Impact Assessment

1. Purpose and Intended Effect

a. Issue which the NPA is intended to address

The current CS-25 requirements regarding operation of and access to Type III exits are brief and are open to interpretation.

Accidents in which Type III equipped aeroplanes were involved (e.g. Manchester, 1985 and Los Angeles, 1991) have indicated a need to further improve the access to and operation of Type III exits in order to increase the number of occupants that can evacuate successfully through these exits in a post-crash fire scenario.

Studies have determined that in accidents to aircraft configured with Type III exits, 50% of passengers that evacuate through exits use the overwing exits. Whilst this proportion reduces to approximately 30% in high fire intensity accidents, it illustrates the importance of Type III exits to the evacuation system.

Of initial importance is of course that the person immediately adjacent to the exit can quickly make the exit available.

The operation of Type III removable hatches requires levels of strength and dexterity that cannot be easily reconciled with the fact that the task will most likely fall to naïve persons, i.e. passengers. In addition to the extended time taken to perform the initial opening of the exit, correct and quick disposal of a weighty hatch has been shown in many accidents and tests to be problematical. Typically, in service aircraft have hatches that weigh between 12kg and 25kg.

Furthermore, questions arise regarding the risk of a disposable hatch being placed in a position where it may impede evacuation or cause further evacuation delay due to confusion as to its correct disposal.

Automatically Disposable Hatches (ADH) have been proposed as a solution to these problems. An ADH is a hatch which, whilst still requiring effort from the operator, has the advantage that its correct disposal is assured by the design, i.e. mechanical features guide the hatch to the correct safe stowage location.

A further development of this approach is the Automatically Opening Exit (AOE). This takes the concept one stage further, having all the disposal qualities of an ADH and incorporating a stored power device to eliminate any effort required to open the exit. The Boeing 737 NG series overwing exits are an example of an in service AOE design.

Additionally, and of equal importance, is the maintenance of conditions conducive to high passenger flow out of a Type III exit after it has been opened.

Issues such as:

- minimum dimensions for an access passageway from the main aisle,
- position of access passageway in relation to exit opening,
- whether/to what extent deployable items (seat backs, foot/leg rests, video screens etc.) may encroach in flight into the access passageway and thus pose a risk of being or becoming deployed during an emergency evacuation,
- allowable post crash deformation of seats into the access passageway,

- the ease with which escapees might bypass the passageway by climbing over seat backs and cause congestion and potentially blockage of the access to the exit,
- the presence of "foot entrapment" risks,
- placarding to indicate the correct exit operation

are either inadequately or not at all covered in the current rule.

With all this in mind, the JAA, in co-operation with aviation authorities, industry and other interested parties, spent appreciable time (since the early 1990s) in attempting to agree revised requirements. Unfortunately, a balance between safety and economic impact, acceptable to all, was not found.

Furthermore, amendments made during this time period to the FAA regulations pertaining to Type III exit access are now agreed to be in need of further revision.

In 1999 the Aviation Rulemaking Advisory Committee (ARAC) was tasked with reviewing several Part 25 rules in the Cabin Safety area, including 25.813(c). The Cabin Safety Harmonization Working Group (CSHWG) was established for this work.

The CSHWG worked on the subject but their report (Reference (2)) unfortunately included dissenting positions. Attempts to resolve these differences of opinion within the JAA Cabin Safety Study Group (CSSG) and to propose an agreed NPA to Central JAA encountered similar problems. A draft NPA (25-270A) has been developed to an advanced level however. Appendix I provides the justification text for this as drafted at the time.

The Agency, in recognition of the continuing need to guarantee improved efficacy of Type III exits with an improved rule has continued this work and is now proposing revisions to CS-25.

b. Scale of the issue

Accident experience as well as evacuation test results and analyses have suggested that access to Type III exits and their operation are critical factors to evacuation.

Many new design aircraft types, from business jets and turbo-prop commuters to large airliners with seating capacities up to around 180 seats can be envisaged as normally utilising Type III exits. Furthermore, although less usual, aircraft with larger capacities, potentially up to around 300, and perhaps even more, might be designed with this exit type.

c. Brief statement of the objectives of the NPA

The purpose of this NPA is to amend CS 25.813(c) in order to provide a clearer definition and improved standard of the airworthiness requirements pertaining to access to and operation of Type III exits and to provide associated AMC material.

This would entail improvements to Type III exit access on aircraft with a passenger seating capacity in excess of 19 seats and the provision of an Automatically Disposable Hatch (ADH) on aircraft with a passenger seating capacity in excess of 40 seats.

The proposed regulatory change will address design improvements related to access to Type III exits and potential impediments to evacuation (e.g. minimum dimensions for an access passageway, allowable post-crash protrusions into the passageway, placards, etc.).

Some of the proposed changes are also applicable to Type IV exits.

2. Options

a. The options identified

Four options could be identified for Agency action:

Option 1 - Do nothing

Option 2 - Voluntary Implementation

Encouragement to industry to improve the configuration of the access beyond what is currently required by CS-25, with some published Agency guidance, along the lines outlined in JAA NPA 25-270A.

Option 3 - Rulemaking Action 1

Revise CS-25 broadly along the lines outlined in JAA NPA 25-270A but without the section requiring an AOE design for certain aircraft, with further enhancements aimed at resolving items found contentious in previous working groups, and issue associated guidance material.

Option 4 - Rulemaking Action 2

Revise CS-25 broadly along the lines outlined in JAA NPA 25-270A but replacing the requirements for an AOE design with the requirements for an ADH design, with further enhancements aimed at resolving items found contentious in previous working groups, and issue associated guidance material.

b. The preferred option selected

See paragraph 5. c. below.

3. Sectors concerned

Those directly affected by this proposal will include:

- Aircraft Manufacturers and their Design Organisations
- Aircraft Converters and their Design Organisations
- Aircraft Operators
- Aircraft crew
- Passengers

4. Impacts

a. All identified impacts

i. Safety

Accident experience as well as evacuation test results and analyses have suggested that access to Type III exits and their operation are critical factors to evacuation.

EASE OF ACCESS SAFETY IMPACT

Accident Experience

A review of accidents in the period 1967 to 2000 has been performed (Reference (3)). It was estimated that 22 fatal accidents had occurred in this period where life saving potential existed from the provision of improved Type III exits.

Figures provided in the Final Rule preamble for FAR Part 25 Amendment 76 (Reference (4)) which introduced the current FAA Type III Exit access requirements, were of a similar order. Here, it was noted that in the years 1982 to 1991, three US domestic accidents occurred *"…involving airplanes with Type III exits where passengers used those exits and where fire and/or smoke inhalation produced post-accident fatalities."* There was also an additional accident like the above involving a non-US registered aircraft.

In one of these accidents, it was further noted *"… 37 passengers escaped through a Type III exit on a Boeing 737. However, a deceased flight attendant and 10 deceased passengers were found lined up in the aisle within 8 feet of the exit. They died as a result of smoke and particulate inhalation. The NTSB reported "they most likely collapsed while waiting to climb out of the overwing exit."*

In 1985 a Boeing 737 suffered engine failure during takeoff in the UK, which resulted in a severe fire. During the emergency evacuation, 55 people lost their lives. The investigating body (AAIB) reported (Reference (5)):

"The failure of 10F seat-back baulk reflects the pressure of passengers struggling towards the right overwing exit, forcing the seat back forwards. Folded forwards it could only become a further significant obstacle to passengers attempting to escape.

Even had the 10F seat-back baulk not failed, the presence of a full row of seats at row 10, immediately inboard of the overwing Type III exit, with a pitch of 31 inches between rows 9 and 10 is considered likely to have obstructed access to and reduced the effectiveness of this exit."

It is to be noted that the technical contents of the requirements currently in CS-25 in regard to the required space adjacent to a Type III exit are not different to those according to which the aircraft in this accident had been approved.

Evacuation Tests

Many evacuation tests, utilising naïve subjects and high fidelity cabin simulators, have been performed in order to determine and justify improvements to evacuation under emergency conditions.

In 1987, the UK CAA commissioned Cranfield Institute of Technology to conduct research concerning passenger behaviour in aircraft emergencies in response to an AAIB recommendation from the UK Boeing 737 accident mentioned above.

The tests (Reference (6)) were conducted, with a specially configured out of service aircraft, under two circumstances, when passengers were competing to evacuate (generally known as "competitive" tests, achieved by offering a monetary bonus to the first half of the group to evacuate the test facility) and when passengers were evacuating in an orderly manner. The "Latin Square testing" principle was employed. This is a procedure used to factor out

differences in test subject groups and experience gained by the groups in succeeding test runs.

The effects of variations in two cabin features were tested, namely the width of a passageway in a bulkhead leading to a floor level exit and the seating configuration adjacent to a Type III exit. The latter tests are of interest to this rulemaking activity.

Unobstructed passageways between 3 and 34 inches (with the forward seat back just in front of the forward edge of the exit opening in each case) were tested and also a configuration with a seat row close to centred on the exit opening, with the outboard seat removed, and two unobstructed passageways of 6 inches leading to the exit.

The results led to conclusions that the optimum single unobstructed passageway is between 13 and 25 inches and that the "outboard seat removed" configuration also provided an acceptable evacuation rate with low propensity for blockage.

At about the same time, the FAA's Civil Aeromedical Institute (CAMI) performed tests (Reference (7)) with the same aims and published their first report in 1989. This work was also prompted by the questioning of the adequacy of existing regulations, highlighted by accident experience.

Several access configurations were tested on a cabin simulator, also consisting of an actual aircraft fuselage equipped with an interior representative of airline operations. The evacuation rates of several subject groups were measured, also using the principles of the "Latin Square Test".

Four access configurations were tested, ranging from the practicable minimum resulting from the then current and unquantified FAA regulation (approximately 6 inches, which remains the situation with CS-25), 10 and 20 inches of unobstructed passageway and a configuration which provided two passageways to the exit by centring a row on the exit, but with the outboard seat removed and two approximately 6 inch unobstructed passageways.

To this point all testing (both Cranfield and CAMI) had been performed with three seats between the aisle and exit.

The results from these tests were deemed by the FAA to provide justification for a rule change requiring a 20-inch passageway or two 6-inch passageways (outboard seat removed configuration).

However, a second series of testing (Reference (8)) was performed in order to investigate further seating configurations adjacent to Type III exits. The Final Rule text also included an allowance for a smaller unobstructed passageway of 10 inches, for layouts having only two seats between the aisle and exit.

Some commentators to the preceding FAA Notice of Proposed Rulemaking (NPRM) were of the opinion that insufficient testing had been performed but the FAA, in view of the safety benefits to be gained and limitations of time and resources for further work had moved to a final rule.

Later however, time and resources became available and a further series of tests (Reference (9)) was performed. Various configurations with three-seat rows were tested to obtain a more comprehensive understanding of effects of passageway widths and offsets from the exit opening. These tests were of

increasing size and scope and led to a final conclusion that in fact passageways between 13 and 25 inches provided for nearly identical evacuation performance.

This conclusion is compatible with that of the Cranfield tests.

EASE OF OPERATION SAFETY IMPACT

Accident Experience

The Boeing 737 accident in the UK mentioned above also experienced problems in regards to the initial opening of the Type III exit hatch. The AAIB reported:

"(…) which precipitated urgent action by the passengers in the centre cabin to open the right overwing escape hatch. This was only achieved with some difficulty, contributed to by the adjacent passengers' lack of knowledge of the hatch operating procedure and the practical difficulties in handling the hatch in the confined space available."

This highlights one critical aspect of Type III exit designs: the opening and stowage of the typical removable hatch design is in the majority of cases performed by a passenger. The provision of placards, located in prominent positions for those seated in the exit rows, providing instructions for opening and stowage/disposal of the hatch were required by the UK CAA after the Boeing 737 accident. This was also required by the introduction of Amendment 76 to FAR Part 25, with the additional requirement that a placard be provided indicating the weight of the hatch.

Such placards are an inexpensive way to reduce the risk of passengers failing to open the exit in a timely way and/or to dispose of it in an undesirable fashion.

Evacuation Tests

In the Cranfield tests, the subject adjacent to the exit was instructed to hand the hatch to a person stationed on the wing. This was a sensible precaution in view of the "competitive" nature of some of the tests.

In the CAMI testing however, disposal of the removable hatch was studied in detail. The exit preparation time, i.e. the time taken to open and dispose of the hatch was measured. In cases where test subjects were not given prior instructions of how to do this, as expected, they found a variety of solutions. These included laying the hatch horizontally or vertically against the back of the seat row forward of the exit or vertically in the seat position that the opener had previously occupied, throwing the hatch out the exit, and placing the hatch on a seat row forward of the exit. In some instances, the hatch was stowed in a position considered an impediment to efficient evacuation.

This further reinforces the advisability of requiring placards as described above but also illustrates that removable hatches present further significant issues.

In 1994, Cranfield University was commissioned by the UK CAA to consider ways of improving the ease of operation of Type III exits (Reference (10)).

The university designed and constructed an Automatically Disposable Hatch (ADH) to evaluate its influence on evacuation. This design employed a spring mechanism to provide assistance in lifting it up and along tracks to an overhead stowage location. The assisting force was slightly less than that needed to overcome the weight of the hatch assembly. Thus the effort required by the person opening the exit was minimal and a safe stowage location was ensured.

This hatch was not specifically designed for faster operating times, however it was evident that the exit became available to evacuees much faster than a conventional exit. The primary reason for the exit fitted with an ADH becoming available earlier is that time is not wasted in the disposal of the hatch.

Analyses

A benefit Analysis (Reference (3)) undertaken for Transport Canada and the UK CAA relating to the introduction of Automatic Hatches at overwing Type III exits suggested that the benefit applicable to western-world, transport category aircraft type certificated for 20 seats or more resulting from the introduction of Automatic Hatches is approximately 8 lives per year. Furthermore, the analysis suggested that the majority of the benefit afforded by an Automatic Hatch is attributable to the time saved in disposing of the hatch during the exit opening sequence and that there is minimal benefit to aircraft type certificated to 40 seats or less.

Another study (Reference (11)) concluded that the current operational and design requirements suggest that the need for further enhancements to evacuation capability decreases for aircraft type certificated for less than 40 passenger seats. These smaller aircraft tend to have a greater evacuation capability since the requirements of CS-25.807 and practical design considerations lead to a lower number of passengers per exit than is the case on larger aircraft.

Further gains in exit availability times are to be had with the AOE design . Such a design concept provides an assisting force sufficient to open the exit very swiftly (of the order of 2 seconds), without any passenger intervention after the initial handle operation. Although providing even earlier exit availability times, the additional gain over a well designed ADH would not be great. It is also to be noted that if a hatch opening time of, for instance 2 seconds, were to be mandated this would place a requirement on Type III exits not encountered on any other type of exit.

For this reason, it was concluded that there was no justification to consider going as far as requiring AOE designs rather than the ADH.

Option 1 - Do nothing

This option would mean that aircraft interiors would be designed such that access to and operation of Type III exits is not improved to achieve the rapid evacuation needs identified above.

The current CS-25 rule text has been used for the applicable European requirements for many years and resultant designs have shown widely varying interpretations of acceptable cabin arrangements adjacent to Type III exits. In the worst cases operation and/or adequate access to exits has been

compromised. There is no reason to suppose that this will improve markedly in the absence of intervention of the Agency.

Option 2 – Voluntary Compliance

This would, depending on the extent of Agency documentation, be at best rulemaking by guidance material and at worst be close to Option 1, i.e. limited guidance would still allow questionable designs. Neither alternative meets Agency's rulemaking standard.

Option 3 – Rulemaking Action 1

A clear rule and associated guidance would ensure that acceptable Type III exit operation and access will be provided in all future designs but would not realise the further safety improvements possible with ADH/AOE features.

Option 4 – Rulemaking Action 2

The full potential for improving the safety of Type III exits will be realised by this option. Care must be taken that the more complicated ADH designs do not have a higher probability of failure than a conventional hatch. It has been estimated (Reference (3)) that there is potential to save 8 lives per year by the introduction of ADHs, although this figure is eroded markedly if there is an increase in the probability of the hatch jamming to a point significantly higher than a conventional removable hatch.

Accident experience, experimental tests and analyses have demonstrated that lives will be saved by removing the risk of naïve passengers placing a removable hatch in a place where it will hinder efficient escapee flow and/or delaying the start of the flow due to indecision as to the correct opening method and/or difficulty in handling a large and heavy item.

ii. Economic

EASE OF ACCESS ECONOMIC IMPACT

During the deliberations for this rulemaking task, only one aspect caused discussions in regard to economic impacts and whether or not these impacts were in excess of the associated safety benefits. This aspect was whether or not seat recline should be allowed to encroach in flight into a prescribed minimum exit passageway.

It was agreed that all other elements of the proposed rule changes affecting ease of access fitted one or both of the following criteria:

- they had been shown to be defining a design standard below which a Type III exit could not be expected to perform its basic function (e.g. the 10 and 13 inch minimum unobstructed passageway dimensions). In other words, these minimum dimensions in the new rule text will be doing no more than quantifying the "access" that the rule has required for many years. Although arguably posing an economic penalty in comparison to designs accepted in the past, these dimensions have been shown to be the minima with which a Type III exit can perform its function and contribution to the allowable passenger seating capacity.
- they were of minimal cost (e.g. elimination of foot entrapment risk, prevention of escapees bypassing the provided passageway by folding seat backs, improved table latch designs, freedom from protrusions, definition of under-seat baggage restraint, and removal of impediments due to deployable features).

Economic justification of these rule changes has thus not been deemed necessary.

However, the question of allowing seat recline into minimum passageways during flight did cause much discussion. In fact, the Agency's rulemaking group failed to reach agreement on the direction of the balance between cost and benefit on this one issue. The Agency's dissenting position procedure (Reference (1)) was invoked. The dissenting position paper from the group and the Agency's Rulemaking Directorate response are provided in Appendices II and III.

As already explained, whilst industry members of the group were of the opinion that lower revenue would be a direct and obvious consequence of not allowing usage of the required passageways in flight for increased passenger comfort, other members were not convinced of this. The Agency's Rulemaking Directorate response concluded that seat loss, or any other negative economic effect, would be most unlikely for new aircraft designs. This is in line with the FAA's determination when passageway dimensions were introduced at Amendment 25-79. The associated analysis for this amendment concluded that no cost was attributable to the new improved access requirements.

EASE OF OPERATION ECONOMIC IMPACT

In regard to ease of Type III exit operation, two rule changes have been considered.

Firstly, it is proposed that placards illustrating the correct opening method and the weight of any removable hatch must be placed in prominent positions so that they may be read by all passengers seated adjacent to and facing an access passageway.

The costs of designing, producing, installing and maintaining such placards is considered to be extremely low in regards to their safety benefit and so no further benefit analysis has been performed.

Additionally, it is proposed to improve the ease of opening of Type III exits on aircraft with passenger seating configurations greater than 40 seats by requiring an ADH design.

Such designs may incur additional costs during design, production, operation and maintenance in comparison to the traditional removable hatch. However, it is expected that these additional costs should be reasonable in the context of a new type design and when contrasted with the benefits.

Unfortunately, industry was unable to provide quantified data for the additional costs for an ADH design.

In the case of smaller aircraft, it may be that the additional costs associated with an ADH Type III exit design are of a more significant nature than with larger aircraft. It is therefore fortunate that the associated safety benefits were found to be lower as well. The breakpoint found at 40 passenger seats is considered to fit well with the issue of costs to which manufacturers of smaller aircraft may be subject.

With larger aircraft (more than 40 passenger seats) Type III exits are likely to provide a larger absolute contribution to the overall evacuation capability. That is to say the rules controlling the number and type of required emergency exits (ref. CS 25.807) require a relatively high total exit rating, i.e. for up to 19 passenger seats a pair of Type III exits is the minimum accepted with a nominal total rating of 35 passengers and up to 39 seats a total nominal exit rating of 75 passengers results (1xType II and 1xType III). In the case of a larger aircraft however, the rules are constructed such that the nominal exit rating of a Type III exit is more likely to be utilised, i.e. the total number of installed seats can be equal to the total nominal exit rating of all the exits combined. This issue is addressed further in Reference (11).

It was therefore considered that emergency exit performance on larger aircraft deserves higher scrutiny. It has been a requirement for some time that all emergency exits have a means of opening that is "simple and obvious" and without requiring "exceptional effort" (Ref. CS 25.809(c)). The proposed requirement for ADH Type III exit designs on aircraft of over 40 passenger seats is considered to be providing for these basic characteristics, rather than providing a level of safety above that already expected. There is no justifiable reason why the only exits likely to be operated by naïve passengers should have the least obvious and most difficult operational characteristics.

Thus, the responsibility to justify this clarification to the expected design standard, in economic terms, is deemed satisfied without needing quantified data, which in any case has not been provided by industry.

Option 1 - Do nothing

This Option would have no immediate economic effect. However, in terms of the potential for loss of life in future accidents, there is possibility for adverse economic impacts.

Option 2 – Voluntary Compliance

This Option would be based on encouraging and guiding industry in adopting a more consistent approach to providing access to Type III exits. There would however, be varying potential economic disadvantages inherent with some cabin layout situations.

This would most likely result in less than even implementation with attendant confusion and disagreement within the industry and with the competent authorities.

Option 3 – Rulemaking Action 1

This Option will in certain cases lead to economic penalties. However, in the context of new type design, it should be possible to minimise these penalties by means of careful design of the various cabin features.

The only aspect of the proposed rule changes which caused doubt in terms of the cost/benefit balance was in regards to in-flight seat recline into the required passageway. It was concluded that whilst the safety risks were not of large magnitude, the economic costs were similarly small.

Option 4 – Rulemaking Action 2

This Option has, in addition to the costs outlined under Option 3, economic penalties for initial design, certification, production and operation of the ADH exits. Quantified data for these costs were not made available to the working group.

Notwithstanding this, the provision of a Type III exit design for larger aircraft where the operation is simple and obvious and doesn't require exceptional effort has been seen as simply bringing the design standard up to that provided on all other exit types and as required by an existing rule. With this in mind and the fact that only new type design will be affected, it was concluded that economic issues needed no further scrutiny.

iii. Environmental

No impacts on the environment have been identified.

iv. Social

No social impacts have been identified.

v. Other aviation requirements outside EASA scope

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

vi. Foreign comparable regulatory requirements

ICAO Annex 8 was reviewed and no text was found in conflict with the content or overall objectives of this NPA.

Previous regulatory activity under the auspices of ARAC involved the participation of both the FAA and Transport Canada, as did this NPA activity. This was carried out with the intention of working towards harmonised regulation although rulemaking activity in this area in North America is currently on hold. Whilst the outcome of future FAA and Transport Canada deliberations in regards to corresponding changes to their regulations cannot be fully predicted at this point, it is considered that their involvement in this Agency activity provides the best opportunity for future harmonisation.

b. Equity and fairness in terms of distribution of positive and negative impacts among concerned sectors

For aircraft with a seating capacity of less than 20 the proposed changes to CS-25 only change the requirements in the following areas - placarding, restricted seat back movement, deletion of protrusions, avoidance of foot entrapment, tray table latch design, and underseat baggage restraint.

The economic impacts for all these changes have been deemed small. Therefore, there is no reason to imagine that small entities will be affected, because aircraft with more than 20 passengers are not manufactured by such organisations.

5. Summary and Final Assessment

a. Comparison of the positive and negative impacts for each option evaluated

Option 1 - Do nothing

Whilst of some economic advantage to manufacturers and operators, the option of doing nothing would continue a long standing situation where the egress performance of Type III exits is not regulated to a consistent level.

Most interior layouts place seats in repetitive rows in the area of Type III exits and restrictions in passageway width, seat recline in flight, seat cushion position relative to the exit opening etc. are unwelcome to operators and their passengers.

However, whilst these exits have proved to be significant contributors to overall evacuation successes, the current state of CS-25 rules is such that this cannot be guaranteed for all aircraft. Variations in important layout details adjacent to Type III exits are to be found on the existing in service aircraft interiors that have been certificated to the current rule text (i.e. to JAR-25 and older FAR Part 25 amendment levels).

When designing new aircraft types, it should be possible to minimise effects on layout flexibility and passenger comfort/convenience.

Option 2 - Voluntary Compliance

The current rule merely requires "access" from the aisle to the exit and specifies that the projected opening of the exit be "unobstructed".

On the one hand it might be argued that these undefined aspects of the existing rule could be controlled by means of industry standards or perhaps more realistically by the issuance of Agency's guidance material.

Such an approach might possibly reduce the documentary changes needed.

However, the lack of clarity in the rule would probably oblige the necessary guidance to be extensive. It is difficult to see how such guidance could avoid becoming as prescriptive in practice as a rule change.

The rules for other exit types (Type II, I, A) allow for less interpretation (i.e. passageway dimensions are quoted) and it would seem sensible to bring Type III exits up to this standard rather than persist with an uneven approach.

In terms of the economic and safety impacts it is difficult to see why an approach relying on new guidance only would be less onerous than one incorporating rule changes (assuming the finally acceptable and implemented design solutions were the same).

Option 3 - Rulemaking Action 1

The provision of a clear rule will bring an assured level of Type III exit usability similar to other exit types. This will remove some long-standing differences in interpretation of acceptable cabin layouts in the vicinity of exits and will prevent future differences emerging as new features become widespread (e.g. foot/leg rests for exit row seats, Business Class seats at Type III exits).

It is inevitable that a rule change which ensures that Type III exits provide their assumed egress contribution will involve the prohibition of some configurations that have been accepted in the past.

This may result in reduced comfort (e.g. reduced recline for seats ahead of an exit passageway, prevent the use of certain foot/leg rests) for a small number of passengers. However, a reduction in passenger numbers (due to one less seat row being possible) is unlikely in the context of a new design aircraft.

Option 4 - Rulemaking Action 2

As with Option 3, this Option will bring the Type III exit into line with other exit types in regards to defining a justified and consistent usability standard. This will be taken one logical stage further though with the additional requirement for the exit to have ADH features.

When compared to other exit types it is inconsistent that the type of exit most likely to be operated by an untrained passenger (i.e. Type III exit) is potentially the most difficult to manipulate correctly. An ADH design will correct this situation and will ensure that future Type III exits realise their full contribution to evacuations.

Higher development and operational costs will result but these should not be excessive.

b. <u>A summary describing who would be affected by these impacts and analysing issues of equity and fairness</u>

In terms of safety impacts, aircraft crew and passengers will be affected.

In terms of both safety and economic impacts, manufacturers, converters and operators of aircraft configured with Type III exits will be affected.

Included in this will also be aircraft with larger exits that have been "de-rated" to Type III status.

Tightened rules may have negative economic and/or competitive impacts on these latter entities. However, in the context of new design aircraft, there should be ways to mitigate or even remove these negative impacts.

Solutions which may allow in-flight exit/passageway incursions, such as automated crew warnings of incorrect seat positioning (e.g. recline, foot/leg rest) and/or automated seat positioning "lock-out", although ambitious by today's standards, perhaps should not be ignored. Such solutions have the potential to eliminate the major part of any economic impacts.

c. Final assessment and recommendation of a preferred option

After due consideration the Agency believes that Option 4 is to be preferred.

The current CS-25 rule covering Type III exit operability and access allows unwarranted flexibility of interpretation and is thus out of balance with the rules for other exit types.

Type III exits form an important part of many aircraft emergency egress capabilities and all airworthiness aspects of their design (including allowable adjacent features) must be clearly prescribed. Associated guidance material will further improve safety and consistency of designs.

A passenger operated exit needs to be both simple and easy to operate. Current removable hatch designs are neither. The physical effort required is appreciable and correct disposal of the separated hatch would be an uncertain action for even a trained person.

The provision of ADH features does not constitute an unreasonable burden in the context of a new aircraft type.

However, the additional cost and weight of an AOE design has not been considered justifiable. An AOE design has the additional advantage of providing an even quicker opening of the exit (compared to an ADH design), i.e. the strength of the person operating the exit is not an issue. This feature, whilst of course advantageous, was not seen as being demanded by the overall set of concerns being addressed in this activity. That is to say, the concern is more that the removal hatch concept, whilst perhaps acceptable when handled as intended has in reality an appreciable risk of being mishandled by an untrained individual. The ADH design removes this risk.

Rulemaking as described under Option 4 above is therefore considered to be justified.

6. References

(1) Appendix 1 "Resolution Of Conflicts/Use Of Consensus" of the document "Rule Of Procedure For Rulemaking Groups" (EASA QMS document R.I028-02).
(2) Letter from Billy M. Glover (Assistant Chair ARAC) to Mr. Fazio (Executive Director ARAC) dated December 19, 2002, with attachments of CSHWG report on 25.813(c) and dissenting positions.
(3) A Benefit Analysis for the Installation of Automatic Hatches at Type III Exits (0942/R/000308/KK) February, 2008, RGW Cherry and Associates.
(4) FAA Final Rule, Amendment 25-76 Improved Access to Type III Exits (Federal Register: May 4, 1992 (Volume 57, Number 86).
(5) AAIB Report on the Accident to Boeing 737-236 series 1, G-BGJL at Manchester Airport on 22 August 1985 (Accident Report 8/88, ISBN 0 11 550892 9).
(6) Aircraft Evacuations: The Effect of Passenger Motivation and Cabin Configuration and Cabin Configuration Adjacent to the Exit (CAA Paper 98019) 1989, Cranfield Institute of Technology, published by UK Civil Aviation Authority.
(7) The Influence of Adjacent Seating Configurations on Egress Through a Type III Emergency Exit (DOT/FAA/AM-89/14) and Effects of Seating Configuration and

Number of Type III Exits on Emergency Aircraft Evacuation (DOT/FAA/AM-92/27), United States of America Federal Aviation Administration.

(8) Aeroplane Evacuations through Type-III Exits I: Effects of Seat Placement at the Exit (DOT/FAA/AM-95/22) and Aircraft Evacuations Through Type-III Exits II: Effects of Individual Subject Differences (DOT/FAA/AM-95/25), United States of America Federal Aviation Administration.

(9) Access-To-Egress I: Interactive Effects of Factors That Control the Emergency Evacuation of Naïve Passengers Through the Transport Airplane Type-III Overwing Exit (DOT/FAA/AM-02/16) and Access-To-Egress II: Repeated Measurement of Factors That Control the Emergency Evacuation of Passengers Through the Transport Airplane Type-III Overwing Exit (DOT/FAA/AM-04/2), United States of America Federal Aviation Administration.

(10) The Design and Evaluation of an Improvement to the Type III Exit Operating Mechanism (CAA Paper 97006) 1997, Cranfield College of Aeronautics, published by UK Civil Aviation Authority.

(11) A Review of Issues Related to the Fitment of Automatically Disposable Hatches at Type III Exits with Regard to the Number of Certificated Passenger Seats (0982/R/000422/KK) February, 2008, RGW Cherry and Associates.

B. DRAFT DECISION

The text of the amendment is arranged to show deleted text, new text or new paragraph as shown below:

- deleted text is shown with a strike through: ~~deleted~~
- new text is highlighted with grey shading: new
- ….

  Indicates that remaining text is unchanged in front of or following the reflected amendment.

Proposal 1: To amend CS 25.813 by revising the title and amending the existing text of paragraph (c) as follows:

Book 1
SUBPART D - DESIGN AND CONSTRUCTION

….

CS 25.813
Emergency exit access and ease of operation
(See AMC to 25.807 and 25.813 and AMC 25.813(c))

….

(c) ~~There must be access from each aisle to each Type III or Type IV exit, and –~~

The following must be provided for each Type III or Type IV exit -

(1) There must be access from the nearest aisle to each exit. In addition, for each Type III exit in an aeroplane that has a passenger-seating configuration of 20 or more and which has only seats installed immediately to the forward and aft of the access route(s) -

(i) Except as provided in sub-paragraph (c)(1)(ii) of this paragraph, the access must be provided by an unobstructed passageway that is at least 25.4 cm (10 inches) in width for interior arrangements in which the adjacent seat rows on the exit side of the aisle contain two seats, or 33 cm (13 inches) in width for interior arrangements in which those rows contain three seats. The width of the passageway must be measured with adjacent seats adjusted to their most adverse positions. At least 25.4 cm (10 inches) of the required passageway width must be within the required projected opening width of the exit. (See AMC 25.813 (c))

(ii) In lieu of one 25.4 or 33 cm (10 or 13 inches) passageway, there may be two unobstructed passageways, that must be at least 15.2 cm (6 inches) in width and lead to an unobstructed space adjacent to each exit. Adjacent exits must not share a common passageway. The width of the passageways must be measured with adjacent seats adjusted to their most adverse positions. The unobstructed space adjacent to the exit must extend vertically from the floor to the ceiling (or to the bottom of upper side wall stowage bins), inboard from the exit for a distance not less than the width of the narrowest passenger seat installed on the aeroplane (or 50.8cm (20 inches) whichever is the greatest), and from the forward edge of the forward passageway to the aft edge of the aft passageway. The exit opening must be totally within the fore and aft bounds of the unobstructed space. (See AMC 25.813 (c)).

(2) For each Type III exit which has an access route bounded by any item(s) other than only seats (e.g. bulkhead/wall, class divider, curtain) to its forward and/or aft side, must be provided with an unobstructed passageway that is at least 50.8 cm (20 inches) in width. The width of the passageway must be measured with any adjacent seats, or other movable features, adjusted to their most adverse positions.

(3) In addition to the access -

(i) For aeroplanes that have a passenger seating configuration~~, excluding pilot's seats,~~ of 20 or more, the projected opening of the exit provided must be unobstructed and there must be no interference in opening the exit by seats, berths, or other protrusions (including ~~seatbacks in any position~~ adjacent seats adjusted to their most adverse positions) for a distance from that exit not less than the width of the narrowest passenger seat installed on the aeroplane (or 50.6 cm (20 inches) whichever is the greatest).

(ii) For aeroplanes that have a passenger-seating configuration~~, excluding pilot's seats,~~ of 19 or fewer, there may be minor obstructions in this region, if there are compensating factors to maintain the effectiveness of the exit.

(4) For each Type III and Type IV exit there must be placards that –

(i) Are readable by each person seated adjacent to and facing a passageway to the exit, one in their normal field of view; and one adjacent to or on the exit;

(ii) Accurately state or illustrate the proper method of opening the exit, including the correct use of controls, handles, handholds etc.;

(iii) If the exit is a removable hatch, state the weight of the hatch and indicate an appropriate location to place the hatch after removal.

(5) For aeroplanes with a passenger seating configuration of 41 or more, each Type III exit must be designed such that when operated to the fully open position, the hatch/door is automatically disposed so that it can neither reduce the size of the exit opening, the passageway(s) leading to the exit, nor the unobstructed space specified in sub-paragraph (c)(1)(ii) of this paragraph, to below the required minimum dimensions. In the fully open position it must also not obstruct egress from the exit via the escape route specified in CS 25.810(c). (See AMC 25.813(c)).

(6) The design of each seat, or other feature, bounding the passageway leading to each Type III or Type IV exit must be such that evacuees are prevented from climbing over in the course of evacuating. (See AMC 25.813(c)).

(7) The design of all seats and bulkheads/partitions bounding the passageways leading to each Type III or Type IV exit must be free from protrusions (such as coat hooks) which could impede evacuation.

(8) The design and arrangement of all seats bordering and facing a passageway to each Type III or Type IV exit, both with and without the bottom cushion in place, must be free from any gap, which might entrap a foot or other part of a person standing or kneeling on a seat or moving on or along the seat row.

(9) The latch design of deployable features (such as tables, video monitors, telephones, leg/foot rest) mounted on seats or bulkheads/partitions bordering and facing a passageway to a Type III or Type IV exit, must be such that inadvertent release by evacuating passengers will not occur. The latch design of deployable features must also be such that

cabin crew can easily check that the items are fully latched in the stowed position. Placards indicating that each such item must be stowed for taxi, take-off and landing must be installed in the normal field of view of, and be readable by each person seated in each seat bordering and facing a passageway to a Type III or Type IV exit. (See AMC 25.813(c)).

(10) All seats bordering the passageway to a Type III or Type IV exit must be designed such that any baggage stowage provisions (such as under seat stowage) would prevent baggage items entering the passageway under the inertia forces of CS 25.561(b)(3).

(d) ….

Proposal 2: Introduce a new **AMC 25.813 (c)** as follows:

BOOK 2
AMC – SUBPART D

….

AMC 25.813(c)
Emergency Exit Access and Ease of Operation

1 Post Crash Seat Deformation

The requirement for an "unobstructed" passageway is not intended to preclude some deformation of seat structure into the required minimum passageway dimension due to emergency landing dynamic loading.

Seat permanent deformation of up to 3 inches (as recorded in the tests required by CS 25.562) into the minimum passageway dimensions defined in CS 25.813(c) is acceptable, provided no part of the seat intrudes into the minimum required projected opening of the exit and provided the exit operating characteristics are not compromised.

2 Deployable Features

Features mounted on seats, bulkheads or other cabin features, under passenger control and which deploy into the required minimum passageway, may be accepted as not contravening the "unobstructed passageway" requirements of CS 25.813(c) provided -

a. They are easily and instinctively pushed out of the passageway by escapees in the event that they remain deployed prior to, or become deployed during, an evacuation. This may include, but not be limited to, items such as handsets, tray tables, in-armrest video monitors. Items such as footrests which would not be within easy reach of escapees' hands and/or not easily visible during an evacuation will not be accepted as being easily and instinctively re-stowed; or

b. They can only be released by permanently pushing a button/control for several seconds. This may include, for instance, a situation such as a business/first class seat with an electrically actuated leg-rest/foot-rest extending across the minimum required passageway. Although at first sight this seems to be in direct contradiction to the text of CS 25.813(c)(1)(i), it is accepted that such a deliberate, flagrant and obvious action on the part of a passenger is unlikely. However, in such a case, the requirements of CS 25.813(c)(3) must still be met in full, i.e. the operation of the exit may not be compromised by the seat in any position.

Designs intending to use the principles of 2 a. or 2 b. above will be assessed on their individual merits.

It must be noted that none of the above reduces the requirement to design latching means that will prevent inadvertent release by evacuating passengers.

It is not accepted that Cabin Crew actions prior to taxi, take-off and landing are employed as the means to prevent later passenger actions to deploy features into the minimum required passageway.

Features (e.g. seat recline, footrests, video screens, tables) may still be unsafe, even if they do not deploy into a defined minimum 10 or 13 inch passageway (as applicable). Deployable items may create snagging/tripping hazards and in the case where a wider passageway than the minimum is provided, it cannot be assumed that escaping passengers will constrain themselves to passing along one side or the centre. Features which deploy into the actual passageway provided (in vertical projection from floor level to the upper ceiling/over head bin constraint) must be assessed in the same way as if they deployed into the minimum passageway, i.e. they must be accepted on one of the bases in 2 a. or 2 b. above.

3 Automatic Disposal of Hatch/Door

The intent, in CS 25.813(c)(5), of requiring "automatic" disposal of a Type III hatch/door on aircraft with passenger seating configurations of 41 or more is to remove the risk of passenger confusion, difficulty or error once the opening handle movement has been initiated.

In this context, "automatic" is intended to convey the requirement that this type of Type III exit should be by its design as simple, instinctive and easy to operate as any other type of exit.

Markings, controls and kinematics of the design should be so that with minimal instruction (i.e. from a study of the placards required by CS 25.813(c)(3)) a naïve subject, with the ranges of size and strength found in the 5th percentile female to the 95th percentile male, would be expected to be able to swiftly and correctly operate the exit to its fully open and secured position.

In this regard, the exit hatch/door must move from its closed to fully open position in one simple and continuous operator motion, e.g. avoiding discontinuities in required force/direction on the handle(s). The traditional practice of providing a removable hatch will not be accepted as meeting the requirements of CS 25.813(c)(5).

It is to be noted that the requirements of CS 25.809, which defines emergency exit operating characteristics, testing requirements etc. is applicable to all exit types, including Type III and IV.

4 Very Large Exit Access Provision

In most cases it is expected that the cabin arrangement adjacent to a Type III or IV exit will be such that access provision and unobstructed space for operation will be towards the minimum dimensions required. However, this might not always be the case.

Some of the testing performed to substantiate the required dimensions has revealed that competition between escaping passengers can reduce a Type III exit's evacuation performance in cases where a large unobstructed passageway or adjacent area is provided.

Dependent on the details of a specific cabin layout, additional substantiation may therefore be necessary for a design providing a substantially larger passageway and/or clear area adjacent to the exit than the minimum required. This will also apply to Type IV exits.

5 "De-Rated" and "Oversized" Exits

Two cases can be identified where some additional considerations may be needed when considering the provisions of CS 25.813(c)(3)(i), namely;

a. A larger exit type (e.g. Type II, I) which is declared as a Type III in order to, for instance, place a seat partially overlapping the exit opening (i.e. "de-rating" the exit).
b. The exit opening provided by the design is larger than the minimum required (i.e. an "oversize exit").

In such cases it may be acceptable that the exit opening provided is partially obstructed, at all times or perhaps when certain features are deployed, if the remaining exit aperture still provides the intended egress performance.

Each such case must be assessed on its own individual merits and if accepted would be so on the basis of Equivalent Safety.

6 Provisions to Prevent Escapees Bypassing the Intended Evacuation Route

CS 25.813(c)(6) is intended to prevent cabin installations which would permit escaping passengers bypassing the intended evacuation route to the exit by climbing over seat backs or any other feature that may bound the required access passageway.

In the case of seat backs, the surface over which an escapee may attempt to climb must remain essentially upright, i.e. not exceeding 20 degrees rearward and 10 degrees forward relative to a plane normal to the cabin floor, when a load of up to 668 N (150 lbf) is applied horizontally in a fore/aft direction at the structurally most critical point.

In the case of features other than seat backs, the obstacle to climbing over should be assessed with the aim that it be comparable to the seat back example above, i.e. the angle and height of the item/surface in question.

C. APPENDICES

Appendix I: ORIGINAL JAA NPA JUSTIFICTION

History:

Accidents in Europe (Manchester, 1985) and in the USA (Los Angeles, 1991 etc.) in which Type III equipped aeroplanes were involved indicated a need to further improve the access to and operation of Type III exits in order to increase the number of occupants that can evacuate successfully through these exits in a post crash fire scenario.

Whereas some European countries issued an Airworthiness Notice or similar directives on this subject prescribing a better access to Type III exits in their air carrier's fleets after the 1985 accident, the FAA amended FAR Part 25 as well as FAR Parts 121 and 135 (Amendments 25-76, 121-228 and 135-43), effective June 3, 1992, with the same intent, but being more onerous with respect to the exit access dimensions required. The Amendments were based upon a series of (non-competitive) tests conducted by CAMI on eight different access configurations to evaluate the ease of opening and the effect of passageway width on passenger flow through Type III exits. Amendment 25-76 mainly requires an unobstructed passageway of at least 10 inches in width for interior arrangements in which the seat rows bounding the access path to a Type III exit contain no more than two seats, or 20 inches respectively for interior arrangements in which the exit rows contain three seats. The centreline of the required passageway width is required not to be displaced more than 5 inches horizontally from that of the exit.

In lieu of a single passageway, two passageways at least 6 inches in width leading to an unobstructed space adjacent to each Type III exit are also permissible (outboard seat removed, OSR, configuration).

Instead of adopting the FAA rule changes, JAA Headquarters tasked the JAA Cabin Safety Study Group (JAA CSSG) in 1992 to also look into other areas where improvements could be made to enhance the evacuation through these exits without being too restrictive with respect to the passageway width and to develop a set of rule changes both for certification and in-service operation of large aeroplanes taking into account the results of the research which had been performed by the Cranfield Institute of Technology since 1985. The competitive and non-competitive evacuation tests performed up to that time with different seating arrangements indicated a significant difference between the 3- inch and the 13- inch vertical projections between the seat rows adjacent to the Type III exit and an optimum width between 13 inches and 25 inches for a single passageway of interior arrangements with exit seat rows containing three seats. Tests had also been conducted with different exit plug weights to evaluate the „ease of operation aspect". The exit opening and hatch removal had been evaluated with and without a 50 th percentile male dummy placed in the outboard seat adjacent to the Type III exit. Competitive tests with passageway widths that had not been tested before (6 inches and 10 inches respectively) funded by European aircraft manufacturers and operators followed in 1993. The results of these tests were added to the data base from the previous test series for the 3", 6", 13", 18", 25" and 36" vertical projections between the exit seat rows (see CAA Report No. 9408).

With support of Cranfield, a JAA Type III Exit Ad Hoc Working Group of the CSSG developed a set of rule changes and submitted their proposal to JAA HQ in 1995 on behalf of the CSSG. To improve the egress capability, a minimum passageway width of 10 inches with the front edge of the aft exit seat row not projecting more than 4 inches across the centreline of the exit and the seat backs of the seats bounding the passageway restricted in their movement to prevent evacuees from pushing down seat backs to climb over was considered to be acceptable by the WG for exit rows containing three seats or less. In addition, it was suggested to enhance the emergency exit operation by requiring that a sufficient number of naive subjects must demonstrate to be able to open the exit with and without a simulated incapacitated person

occupying the seat next to the exit, and make the exit usable for evacuation within certain time limits. In addition, revisions to JAR-OPS 1 were proposed concerning the seat allocation in Type III exit rows and the securing of the passenger cabin.

In October 1996, the proposals related to egress and to operational aspects were distributed as NPA 25D-270, NPA 26-2 and NPA-OPS 5, whereas the „ease of operation" proposals for JAR 25 and JAR 26 were distributed as ANPA Material linked to NPA 25D-270 & 26-2.

A Comment/Response Document on the NPAs was nearly finished by the CSSG Working Group in 1998, but was not sent to JAA HQ for various reasons.

Meanwhile, the FAA had issued NPRM 95-1 based on further CAMI tests performed in 1992 to „evaluate the effects of seat pitch and centreline offset on the total time for egress through Type III exits".

The NPRM adjusts the required single passageway width for interior arrangements containing three seats in a row from 20 inches to 13 inches with not more than 6.5 inches horizontal displacement between the exit centreline and the passageway centreline.

In an effort to harmonise FAR Part 25 and JAR 25 rulemaking, the FAA established a Cabin Safety Harmonisation Working Group (CSHWG) for the Aviation Rulemaking Advisory Committee's (ARAC) Emergency Evacuation Issues Group involving all interested parties from the USA as well as from Europe. In January 2000, the CSHWG was tasked to prepare a harmonised proposal with respect to § 25.813(c). The Group was assisted by CAMI who further evaluated the factors that could influence the egress through Type III exits to determine their relative contribution to the outcome of emergency evacuations (see Report DOT/FAA/AM-01/2: "*A Meta-Analysis of the Factors That Control Emergency Evacuation Through the Transport Airplane Type-III Overwing Exit*" dated January 2001).

In 2001, CAMI additionally developed a comprehensive test program, and conducted further 192 simulated emergency evacuations with a total of 2544 naive subjects participating (see DOT/FAA/AM-02/16: "*Access-To-Egress I: Interactive Effects of Factors That Control the Emergency Evacuation of Naive Passengers Through the Transport Airplane Type-III Overwing Exit*" dated August 2002).

The independent variables in these evacuation tests were passageway configuration, hatch disposal location (inside/outside), subject group size (low/medium/high density) and subject group motivation level (low/high). Additional variables of interest looked at were individual subject characteristics, such as gender, age, waist size, and height which had been shown in previous studies to significantly affect emergency egress.

Three single passageway configurations between triple seat assemblies were tested (20 inch passageway with 5 inch aft seat encroachment, 13 inch passageway with 10 inch aft seat encroachment and 10 inch passageway with 14 inch aft seat encroachment) as well as one dual passageway configuration (one 6 inch passageway fore and one 6 inch passageway aft of a seat assembly in which the outboard seat had been removed). All seat backs throughout the cabin were locked to prevent break over. The subjects selected to act as hatch operators did not get any other information regarding hatch operation than via graphics taken from a typical airline safety briefing card. Two cabin attendants, one at the front of the cabin, the other at the rear, assisted the evacuations only verbally.

The dependent variables of interest included hatch operation time and the time for individual subjects to egress. A complex research design was applied to determine the influence of the different independent variables and combinations thereof on "Exit Ready -to-Use Time", "First-Subject-Out Time", "Hatch-Operator-Out Time and "Individual Subject Egress Time". Outliers caused by improper positioning of the hatch, improper egress techniques used, design deficiencies causing foot traps, improper body shape (short legs) etc. were removed from the test data base.

The findings of these comprehensive tests replicated prior research showing that passageway configuration has only minimal effects on emergency evacuation (on egress as well as on hatch operation), *as long as* ergonomic minima are respected. In contrast, differences in the physical

characteristics of individual subjects, especially those characteristics related to ergonomic considerations, produced large differences in emergency evacuation performance, as did subject naiveté (lack of knowledge, experience, and skill). Of the single passageway configurations tested, again the 10 inch passageway configuration produced ergonomic restrictions significant with respect to egress performance, specifically for older, wider, and taller subjects. (Naive subjects aged 50 and above had not been included in the Cranfield tests.)

Having reviewed the CAMI reports as well as an NTSB Safety Study regarding "*Emergency Evacuation of Commercial Airplanes*" (NTSB/SS-00/01) issued in 2000, the CSHWG finalised their report on this issue late in 2002. The report contains a text proposal for the harmonised standard for JAR 25.813(c) and FAR 25.813(c) and some rationale for the proposal. It also includes two Attachments reflecting the dissenting positions of the Flight Attendant Unions in conjunction with SCISAFE (Survivor's Campain to Improve Safety In Flight Equipment) on one side and Aircraft Manufacturers and Airline Associations on the other side. The report was submitted to the FAA in December 2002. The rule text proposed by the CSHWG mainly requires an unobstructed 13 inch minimum passageway width for the single passageway configuration containing three seats in a row and a 10 inch minimum passageway width for the single passageway configuration containing two seats. At least 10 inches of the required passageway width have to be within the required projected opening width of the exit. Alternatively, in lieu of the single passageway, two passageways at least 6 inches in width which lead to an unobstructed space adjacent to each Type III exit are also permissible.

Requirements related to other cabin design features in the vicinity of Type III and/or Type IV exits, similar to those contained in JAA Draft NPA 25D-270, were included in the proposed rule in addition.

Also, a new Type III exit design, an Automatically Opening Exit (AOE), was intended to be required for all aeroplanes with a seating configuration larger than 40 *and Type III exits installed.* The new kind of Type III exits was proposed to prevent hatch-produced exit or access path obstructions as encountered in several of the simulated evacuations tests.

JAA Cabin Safety Steering Group's Considerations:
The draft CSHWG report including the dissenting opinions attached to it was submitted to all CSSG members by e-mail of 29 October 2002 and discussed during the CSSG meeting in Frankfurt on November 19 to 21, 2002. At the meeting, the chairman urgently requested the group to concentrate on the main dissenting views to see whether a compromise was possible to establish an NPA on this issue. At the end of the discussions, the CSSG seemed to have agreed to take the CSHWG rule text proposal as a basis for the NPA to be drafted, but to change the seat discriminant with respect to the AOE related requirement from 41 to 60 and to allow a reduction in passageway width between exit seat rows containing triple seats by a limited recline of the seat backs in front of the exit, but only for the en-route phase of a flight, and only for aeroplanes the Type III exits of which are automatically opening exits.

However, two weeks after the CSSG NPA had been drafted and mailed to the CSSG members for final agreement, a representative of AECMA as well as a representative of AEA objected against what was considered by the chairman and by at least the majority of participants as the CSSG agreed position, although the changes had been made in the interest of manufacturers and airlines and although there had been reservations from the Unions and authorities with regard to these alleviations. AECMA insisted on having all their dissenting views attached to the CSHWG report considered in the NPA.

Due to these lately submitted dissents, and in order to give all interested parties an equal chance, the first CSSG draft NPA has been revised by the authority members in charge of drafting the NPA, to bring it in line with the CSHWG rule text proposal, except for some more or less editorial changes to correct or improve the wording and make a requirement concerning class dividers more logic. The alleviations concerning the seat discriminant and the reduction of the passageway width by in-flight seat back recline, as intended during the

November 2002 CSSG meeting, have been removed. However, the original dissenting positions attached to the ARAC CSHWG report have been added in an Appendix to the NPA.

Note: The draft NPA does not contain any minimum passageway width requirement for access past a single seat because such configurations were not tested and not judged to be critical for egress by the majority of the CSHWG members.

It should be further noted that the CSSG intended to also propose a revised retroactive rule (Rev. NPA 26-2) considering elements of the proposed JAR 25 NPA as well as elements of the „ease of operation" proposals of the ANPA Material linked to NPA 26-2. A revision of NPA OPS-5 covering operational aspects was also envisaged.

There then followed the proposed rule changes and a three part Appendix, as follows;

Part 1: Unified Submission of the Dissenting Position to ARAC Cabin Safety Harmonisation Working Group on behalf of Members Representing AFA, APFA, ETF, ITM, IBT, and ITF in conjunction with SCISAFE.

Part 2: Unified Submission of the Dissenting Position of the Members Representing AEA, AECMA, AIA, Airbus, ATA, the Boeing Co and GAMA.

Part 3: A Table summarising the positions of the various groups.

Copies are not provided here but are available upon request to EASA.

Appendix II: Dissenting Positions In Regards to Deployment of Items into the Minimum Required Type III Exit Passageway during Flight

STATEMENT OF ISSUE

Introduction

At the fourth meeting of the Cabin Safety Rulemaking Group-25-040 (Type III Exits - Access to and Ease of Operation) it was concluded that a difference of opinion existed within the group that was most unlikely to be resolved by further discussion.

It was agreed at this meeting that the EASA Rulemaking procedure for resolving such differences must be followed in order to make further progress (Ref. "Appendix 1 - Resolution Of Conflicts/Use Of Consensus" of document "Rule Of Procedure For Rulemaking Groups").

This paper describes the issue over which agreement could not be reached and presents the two opposing positions.

This paper is presented to the Agency for consideration and with the request that direction be given to the group.

Area of Disagreement

Minimum required passageway dimensions from the aisle to a Type III exit have been unanimously agreed, and it is further agreed that these dimensions are only critical during an emergency evacuation.

At other times, the space reserved for an unobstructed passageway might be utilised, without compromising safety, for recline of seatbacks and/or the deployment of foot rests or other convenience items, under the control of passengers.

There is however, disagreement in the group regarding acceptable method(s) for guaranteeing that such items will be moved out of the required passageway prior to the critical flight phases, and will remain so during a subsequent emergency evacuation.

Some members of the group propose that a check for correct stowing of items under passenger control in the vicinity of Type III exits, performed by cabin crew before critical flight phases, would be acceptable. During this check, a positive locking device, unable to be operated by the passenger, would have to be systematically engaged as part of the basic cabin crew procedure for cabin preparation before critical phases of flight.

The remainder of the group is of the opinion that maintenance of the passageway must be ensured by the design itself rather than by operational procedures. Deployment of items into the passageway in flight may be acceptable by the provision of devices to automatically restore them to a safe condition should passengers fail to do this.

For ease of presentation, the above two opposing positions are hereafter referred to as "Procedural Process" and "Design Solution" respectively.

The group is split in roughly half between the two positions.

Each of the two sub-groups identified above have prepared a position paper. These are presented below for EASA Rulemaking Directorate consideration.

POSITION PAPER – "PROCEDURAL PROCESS"

History

The discussions on type III exits are long ongoing. In 1993 the JAA Cabin Safety Study Group (CSSG) drew attention to the fact that no significant differences were found between the evacuation rates for the vertical projections tested between 13" and 25". An association of European Aircraft Manufacturers and operators therefore funded Cranfield University in 1995 to conduct further tests involving also 6" and 10" vertical unobstructed projections between the seat rows adjacent to the exit involving three-seat row units. The results from these evacuation tests were then added to the data base from the previous test series for the 3", 6", 13", 18", 25" and 36" vertical projection.

The conclusion from this program was that reducing the minimum vertical projection between the seat rows adjacent to the type III exit from 13" to 10" would not affect the rate of evacuation significantly. Only when focusing on the effects of specific human subject characteristics such as age, height and waist size did the 13" wide passageway appear to be slightly superior to that of 10" width. This result can however be mainly put down to the fact that the 10" passageway configuration tested had a comparably large encroachment of 14" limiting the projected exit opening to actual 6" compared to 10" in the 13" passageway tested.

Based on these test results AEA proposed for both seating configurations (double- and triple-seat) an unobstructed minimum 10" passageway which, in consideration of the o.m. influence of human characteristics, should be within the provided projected opening width of the exit. In that combination it however should be allowed to recline the adjacent seat row into the passageway during flight. In the taxi, take-off and landing phases the seat row forward of the passageway would be restricted to the upright position. For further going restrictions regarding the size and location of the passageway, no substantiation was seen on behalf of the operators.

However, instead of attempting to improve the level of safety by increasing the passageway width on an "inch by inch" basis where the results remain questionable, the operators from the beginning rather preferred to see more radical changes to the type III exit for the benefit of true and substantial safety improvements. Tasked with the development of design criteria for such an improved type III exit for future aircraft a study group was established in 1996 by the JAA-CSSG. As major disadvantages of today's type III exits the difficult opening and handling of the hatch-type exits and the step-up/step-down motion during egress were identified. The study group therefore suggested to replace in general today's hatch-type exits by new enhanced type III exits in which these disadvantages are eliminated. At the same time however the advantages of today's type III exits should be maintained which are primarily the self-help opening characteristic and the minimum effect on the cabin arrangement.

The group met four times. In the discussions special attention was given to drafting design criteria applicable to an as large as possible range of aircraft and not to conflict with already existing rules.
In length the influence of size, position and way of opening of the exit on the egress rate was discussed. A difference in the opening time of a hinged type exit over hatches was identified. Although the egress rate through the aperture is not affected by the way the exit opens, quicker availability of the hinged type exit should allow for the egress of more passengers within the allocated time.

Furthermore increased size exits with lower thresholds, possible in aircraft with large fuselage diameters, would be preferred. For smaller aircraft this would lead to structural repercussions and possibly to unsolvable problems (ditching criteria, structural sizing requirements of the root joint interface, etc.) This argued in favour of at least maintaining the hatch option in the regulation for smaller aircraft.

Therefore, and in addition not to conflict with the type II exit definition, the group concluded to leave the criteria of size and position of type III exits unchanged as a minimum, but recommended to install larger exits with lower thresholds wherever possible.

With regard to improving the ease of operation of the exit the group concluded, that it is essential to replace the current plug-type hatch by a hinged or tracked door (ADH/AOE), which, due to the fact that it is attached to the fuselage and opens automatically when the handle is operated, eliminates the need to physically handle and discard the door. This technology is proven today as the canopy-style overwing exit of the 737 NG shows.

Based on these recommendations, the JAA published an NPA in Oct. 96 for the seat configuration around a type III exit on both current (NPA 26-2) and future NPA 25D-270) aircraft. Over time more and more operators already chose to implement this standard with new cabin configurations.

In the year 2000 the Cabin Safety Harmonisation Working Group was established to harmonize FAR/JAR 25.813 and FAR/JAR 25.810. In the interest of harmonization the airlines agreed to accept an increase of the min. passageway width to 13" in a triple-seat configuration. Dissenting opinions however remained on

a. restrictions in the utilisation of the passageway for the recline of backrests, the deployment of footrests or any other convenience devices outside the critical flight phases and
b. increasing the width of the passageway to compensate post-crash seat deformation.

a) Recline into the passageway

From the airlines perspective any solution leading to further loss of revenue cabin area is not acceptable, as not justifiable. A product development study from the Boeing Company reveals that every square meter in an aircraft cabin has today a revenue potential of up to 600€ per flight or up to 1100€ per day. Widening the passageway by 6" to allow a full recline of the seats lining the passageway without penetrating the same would equal a loss of approximately 0,7m² in a 737 or A320 aircraft or, for an airline of the size of DLH (155 single aisle a/c), would lead to an annual revenue potential loss of approximately 40 Mio €. For the worldwide aviation the annual loss would by far exceed a billion €, an amount which stands in no relation to a questionable safety benefit.

The solution can therefore only be operational. Before take-off and landing flight attendants make sure that passengers in the seats lining the passageways to the exits have put their seats into the upright position. This is already today's standard. As further compromise an additional mechanical lock, out of
reach of the passenger and when operated preventing operation of the items in question, could be considered. In that case the flight attendant would assure that the seat-functions are locked.

The proposal as discussed during the 4th meeting of the EASA Drafting Group for task 25.040 to operate the items in question automatically prior to the critical flight phases can not be accepted for the following reasons:

1. The technical complexity stands in no relation to the safety benefit.
2. Flight attendants are by regulation on board aircraft to guarantee passenger safety. As this is not questioned as such it can not be questioned for particular tasks such as locking the seat functions discussed.

b) Seat deformation

For the same reasons as above an additional loss of cabin space to compensate post-crash seat deformation can not be accepted. Here in particular the probability should also be taken into account with which an accident could occur where seat deformation could be hazardous. It would require that the following happens coincidentally:

a. the deceleration is close to 16g (if far below, there wouldn't be any deformation; if above the whole seat may detach.)
b. the crash must be survivable (crash-landing or overshoot)
c. a post-crash fire must develop.

Furthermore, as there are no pursuable data on the behaviour of cabin interior furnishings in a 16g crash scenario it is hypothetical to assume that seat deformation will be the crucial factor in an accident and not possibly the collapse of surrounding cabin furnishing (overhead bins, galleys, partitions etc.).

Summary

1. A 10" unobstructed passageway, which lies completely within the projected provided exit opening, allows an egress rate as required for a type III exit. For the benefit of harmonisation an increase to 13" has been accepted by the operators however under the condition that the backrest of the seat row lining the passageway may recline into the passageway during the uncritical flight phases. The flight attendant assures that the seats are in the upright position during take-off and landing.
2. Post-crash seat deformation shall not be considered in the passageway definition.
3. The replacement of disposable type III hatches by AOE or ADH receives the full support of the operators.
4. The proposed changes lead to a loss of cabin area and thereby to a loss of revenue potential. As the increase in costs stand in no relation to the assumed safety benefits aircraft operators oppose every change leading to further cabin area losses and suggest that solutions should be sought on the basis of keeping the passageway at a minimum and rather changing the size and position of the opening. Lowering the threshold and thereby reducing the step-up/ step-down would most certainly improve the egress rate and at the same time the effects of specific human characteristics such as age, height and waist would have been accounted for. The loss of revenue cabin area in the exit area would remain minimal.

POSITION PAPER - "DESIGN SOLUTION"

Requirements pertaining to access to exits have historically not relied on actions, by either the passengers or crew. Maintaining the proper access is considered important enough that the design itself must assure that minimum access is provided. That is, the consequences of failing to maintain the proper access can result in fatalities.

The Federal Aviation Administration and Transport Canada have already considered this issue and have a clear regulatory position. FAR and CAR 25.813(c) at the current amendments, in regards to the minimum required passageway for access to a Type III exit, state;

> *"The width of the passageway must be measured with adjacent seats adjusted to their most adverse position"*.

This is consistent with the requirements for other exit types.

This point was not an issue during the FAA harmonization activities under the Aviation Rulemaking Advisory Committee (ARAC). The ARAC group's difficulties were related to the type of 'automatic' exit that should be used, and the passenger number cut-off for such exits.

The desire by airlines to allow in-flight seat recline, footrest deployment etc. into the space required for effective evacuation performance of a Type III exit is however understood. Maximum flexibility in arranging cabin interior elements whilst maintaining an equal comfort level for all passengers is a situation with obvious commercial merit.
It must be noted though, that the proposals under discussion at this time will only affect new type designs. This should have a minimum disruption on cabin flexibility because cabin

designers and operators will know from the outset what the requirements are. A retrofit, on the other hand, may have more serious commercial implications and further consideration will be required when this is discussed.

There is in fact no disagreement in the group over the use of the passageway space in flight (and indeed, no disagreement over the dimensions of space required for the passageway). It is only the means to guarantee that this agreed minimum space will be clear again, should an evacuation be necessary, that is in question.

As already stated, this sub-group is firmly of the opinion that this must be achieved "by design". Although, a limitation to seat recline etc. or re-location of seats is the simplest route to achieving this, there are more imaginative technical solutions that would fully allow for the requested in-flight deployments whilst meeting this "by design" objective.

It would be feasible to install an actuator in the concerned seats to return an exit row seat with unauthorized recline etc. to the safe take-off/landing position, if this was detected at a critical point in the flight.

Although this would be a novel approach today, there is no reason to suppose that problematic design or certification issues would arise.

Alternatively, seat designs can be envisaged that would provide the desired level of comfort whilst not intruding into the exit passageway. For instance, seat designs that provide recline by sliding the seat pan forward and thinner seats backs are but two examples. These approaches don't need to intrude unacceptably into the space behind and would thus preserve configuration flexibility.

It is therefore difficult to see why there is such an objection to providing a robust guarantee of Type III exit access, in future new aircraft cabins, by the design of surrounding items.

Furthermore, this sub-group has severe misgivings in regards to the effectiveness of the "Procedural Process". This proposes that Cabin Crew oversight of passengers seated in the affected rows, before entering critical flight phases, will provide an acceptable level of safety.

Several significant flaws can be identified with the rationale of his approach;

1. The Procedural Process may not work because;

    - It prevents the seatback from interfering with the access to the Type III exit only when the procedures are followed and passenger behavior is reasonable.
    - Seat recline etc. may become inadvertently operated during an evacuation by passengers' uncoordinated panic behavior.
    - The very presence of features which can deploy into the exit access space introduces the possibility of unsafe failure modes in their mechanisms, with obvious negative effects on evacuation performance.
    - It can result in the seatback remaining in an unacceptable position if the flight attendant is pre-occupied performing extra-ordinary duties during an emergency.
    - In the case where the seat is equipped with a Cabin Crew operated "lock-out" device (one solution proposed by the "Procedural Process") it can still result in the seatback being in an unacceptable position if;
        - the flight attendant forgets (or is otherwise too occupied) to operate the device during normal take-off or landing operations, or
        - a passenger releases the recline lock mechanism (based on a review of seat supplier drawings, this is not an exceptionally difficult operation).

2. Some proponents of the Procedural Process argue that restricting recline through a flight attendant procedure is similar to other procedures currently allowed. For example, stowage of food carts, carry-on baggage and, in particular, food trays are all controlled by procedure, and could have egress implications. This is cited as justification for even more reliance on flight attendants assuring the correct configuration of safety critical cabin items.

   There are four principal counter arguments;

   Firstly, items such a food carts are such blatant impediments to evacuation that their being forgotten is most unlikely and they will therefore be tackled first, perhaps to the detriment of less conspicuous items.

   Secondly, many of the items are under total control of the crew, so there is no concern with passengers later defeating the procedure.

   Thirdly, the consequence of not following the procedure is a lesser safety risk for many items. Carry on baggage may be kicked out of the way and tray tables may be re-stowed.

   Lastly, the fact that there are some things that depend on procedure, and therefore have the potential to be overlooked is not justification for adding more procedural reliance and workload, especially when the consequences are more severe.

3. The space advantage requested by the "Procedural Process" is anyway only small.

   It is accepted by all members of the group that seats should not be allowed to recline (by design) to a point where the projected opening of the exit is encroached.

   In practice, this therefore means that only three inches of recline movement (at the top of the seat back) is at issue. This is the case because;

   - With a ten inch passageway (the minimum agreed by all for the case of two seats between the aisle and the exit) and a maximum encroachment of the rear seat to halfway across the minimum 20 inch wide Type III exit opening, no recline at all is possible without encroaching into the projected exit opening.
   - With a thirteen inch passageway (the minimum agreed by all for the case of three seats between the aisle and the exit) only three inches of recline is possible before encroaching into the projected exit opening.

4. Seats at Type III exits are not alone in facing a possible recline limitation.

   On the current world fleet it can be observed that seats immediately forward of galleys, closets, lavatories and other monuments often have restricted or no recline.

   It should be noted that these examples have been incorporated into cabin designs without any regulatory pressure.

<u>Summary</u>

The desire for in-flight deployment of seat features is understood and it is accepted that regulatory changes that would affect these possibilities must be well considered and justified.

In this regard it must be noted that the guarantee of exit access dimensions has been considered by other regulatory bodies and a clear position has been in place for some time

now. A consistent principle is followed for all exit types, namely that this important evacuation parameter must be ensured by basic design.

Further discussions and investigations in the current EASA rulemaking group have served to reinforce this view for those aligning with this "Design Solution" position.

It must be stressed that the proposals related to this paper are only applicable to amendments to CS25. In such a new aircraft design context, many solutions which would preserve operators' desires can be imagined. Proposals with retrofit implications will need further consideration.
In contrast, justification for reliance on Cabin Crew intervention and good passenger behavior just cannot be found. This is particularly highlighted by the fact that the dimensional gains sought are small and indeed many cabin interior designs have accepted restrictions on passenger comfort items already, for reasons unconnected with aviation regulations.

Appendix III: EASA Response to Dissenting Positions In Regards to Deployment of Items into the Minimum Required Type III Exit Passageway During Flight

The Agency has familiarized itself in detail with both the dissenting positions ("Design Solution" and "Procedural Process") as described in the paper "Dissenting Positions In Regards to Deployment of Items into the Minimum Required Type III Exit Passageway During Flight" of 05/01/2007.

The Agency has consulted internally the relevant EASA experts with both the Design and Operational/Cabin Crew backgrounds to get their views on pros and cons of both solutions proposed. Externally the Agency consulted the FAA and Transport Canada about their position and future intentions. The Agency also consulted a Cabin Safety expert apparently without a conflict of interests.

The Agency evaluated in general the advantages and disadvantages of solutions to the safety issues when taken:
- by design
- by operating procedures
- by training procedures

The Agency also took into consideration the experience with application of the above solution types gained in similar cases in the past.

The Agency took into consideration the regulatory approach and cost-benefit evaluation by the FAA taken on the subject issue in the past. The Agency noted also the results of the work done under the JAA.

After a thorough evaluation of the above information gathered the Agency has decided to give a direction to the 25.040 Rulemaking Group as follows:

Decision:

The Agency concluded that it cannot give a credit to the "Procedural Process solution" involving Cabin Crew actions at this stage. The group is therefore requested to implement in the NPA proposal for CS-25 the **"Design Solution"** i.e. that the design alone without supporting actions by Cabin Crew must assure that the minimum required Type III exit unobstructed passageway is available in the critical phases of flight.

Acceptability of **"**Procedural Process" solution involving Cabin Crew actions is however not ruled out forever and this option can be further explored in the future during individual aircraft type certification projects.

The above decision shall be considered as providing consensus for continuation of the group's work.

Justifications:

Safety considerations

1. It is recognized that the scale of the safety benefit of the new specifications for improved access to Type III exits in general can be evaluated as "moderate" or even "small" rather then "big". Small improvements in safety however should not be underestimated since they are applicable in one of the most critical situations – emergency evacuation. More radical safety measures are admitted to be outside the scope of the 25.040 task and are expected to be addressed by some future rulemaking tasks.

2. With satisfaction it was noted that the group was able to agree on such minimum passageway width (corresponding to 13 inches minimum for 3 abreast seating) that takes into account the effects of the growing average passenger weight and dimensions, a factor to be considered particularly in future designs.
3. "Design Solution" position is based on a well shared principle which traditionally favours (in particular for future aircraft designs) assurance of the acceptable level of safety by design solutions over solutions by operating and training procedures relying on the crew actions. In line with the above, new aircraft designs should in general reduce the (flight and cabin) crew workload and not the opposite.
4. "Design Solution" assures the acceptable level of safety fully within the scope of the current rulemaking for CS-25 and better reflects the current Agency's remit not covering yet the operations and licensing.
5. In principle however it is not ruled out that the recovery of the minimum unobstructed passageway width could be showed, with an acceptable level of safety, by a "Procedural Process" solution, particularly when supported by additional design features (like a mechanical lock of seat functions to prevent a counteraction by passengers). However, any new Cabin Crew action, as the return of the seat back to the upright position, locking the seat …, should not be looked at in isolation but as an addition to the already existing safety and non-safety (commercial) tasks currently performed and should consider "Human Factors". Therefore thorough analyses of Cabin Crew workload and Human Factors would need to be accomplished for each particular new type of aircraft to be certified in order to determine if there is a sufficient room for the Cabin Crew to accommodate these additional actions in the critical phases of flight[5] without reducing safety margins.
6. Any particular future conclusion about an acceptability of a "Procedural Process" solution as an alternative providing equivalent level of safety can only be made for each particular new aircraft type during its type certification when shown by positive results of the above mentioned analyses. In such case a Procedural Process solution could be proposed by a TC applicant during the type certification process e.g. as an equivalent safety finding or an alternative means of compliance (depending on the final wording and text division into CS paragraph(s) in Book 1 and AMC(s) in Book 2.
7. Any general conclusion about acceptability in general of "Procedural Process" can only be made when experience is gained from a sufficient number of certification cases in which Procedural Process solution was accepted as an acceptable alternative to the Design Solution.
8. Therefore, the Agency does not feel comfortable to give at this stage a credit in CS-25 to Cabin Crew actions since future results of the above requested analyses may or may not substantiate this credit.

Cost considerations

9. It is recognized that "Design Solution" will lead to a slight (approx. 8 cm i.e. 3 inches longitudinally seems to be at stake) loss of the available cabin revenue floor area. The methodology of the industry analysis of the cost attributed to the loss of revenue cabin area is not detailed but the figures (the revenue potential of one square meter, the annual revenue potential loss, the worldwide aviation annual loss) seem to be potential maximum losses understood to be calculated with certain assumptions not very likely to be materialised in practise:
    - Assumption 1: Any loss of cabin space area will inevitably result in a loss of seats and the corresponding loss of revenue.

[5] The definition itself of the critical phases of the flight may need to be reviewed since compared to the US, the EU regulation for operations exclude, up to now, taxiing and the first part of the descent from the phases of the flight defined as "critical".

- Assumption 2: There is a linear relation between a loss of cabin floor area and a loss in revenue.
- Assumption 3: 100% occupancy of all the flights

Provided the Agency's understanding is correct and the above assumptions were used for the calculations, the following comments can be made:

- Aircraft Cabin layouts will in practice rarely be those with the Maximum Approved Passenger Capacity (MAPC) configuration in which indeed any loss of floor area is expected to result in a loss of seats and corresponding loss of revenues.
- The relation between a loss of cabin area and loss of seats with corresponding loss of revenues is believed to be incremental i.e. growing in steps. Unless a cabin layout design is for MAPC it is expected there will be a room for a designer to accommodate a small loss of cabin space. Therefore most of cabin layout designs will be able to accommodate a relatively small loss of cabin floor area without any loss of seats. This expectation is in line with the FAA conclusion made when the FAA Amendment 25-79 was adopted (effective June 3, 1992) which introduced the requirement for a 10/20 inch minimum unobstructed passageway. The cost-benefit analysis concluded that no cost was attributable to the new improved access requirements under Part 25. The FAA determined that "the manufacturers can design the interior arrangements of aeroplanes that will receive future type certification so that there will be no fewer seats as a result of these improved access requirements".
- Even if we admit that a loss of seats in some rare cases can happen, the corresponding loss of revenues would need to be factored so that average flight occupancy is taken into account.

10. To conclude, unless otherwise provided by the group to the Agency in the RIA, it is believed that the cost of "Design Solution" in practice will be far lower than the "potential" cost figures suggested by the supporters of "Procedural Solution" in their position.

Harmonisation considerations

The "Design Solution" not relying on Cabin crew actions is consistent with the so far approach by the FAA and TC which is reported to be maintained in the future. "Design Solution" is therefore expected to assure harmonisation with the corresponding FAA and TC standards bringing all the advantages that harmonised rules have, a level playing field for the future TC applicants in particular.