NOTICE OF PROPOSED AMENDMENT (NPA) NO 2009-07

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 for Large Aeroplanes (CS-25)

"Security related Design Standards"

TABLE OF CONTENTS

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 2009/010/R of 26 June 2009[2] (CS-25 Amendment 6). The scope of this rulemaking activity is outlined in Terms of Reference (ToR) 25-057 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)).

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

4. This rulemaking activity is included in the Agency's 4-year Rulemaking Programme for 2011. It implements the rulemaking task 25.057 Security Related Design Standards.

5. The text of this NPA has been developed by the Agency. It is submitted for consultation of all interested parties in accordance with Article 52 of the Basic Regulation and Articles 5(3) and 6 of the Rulemaking Procedure.

II. Consultation

6. 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 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/**

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

---

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. 2009/010/R of the Executive Director of the European Aviation Safety Agency of 26 June 2009 on Certification Specifications, Including Airworthiness Code and Acceptable Means of Compliance, for Large Aeroplanes (« CS-25 Amendment 6»).

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

Rulemaking Directorate
EASA
Postfach 10 12 53
D-50452 Cologne
Germany

Comments should be submitted by 16 October 2009. If received after this deadline they might not be taken into account.

III. Comment response document

7. 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 opinion / decision

Background: ICAO rulemaking

8. In response to a number of aeroplanes bombings and hijacking that occurred in the 1960s, 1970s and in the early 1980s, the International Civil Aviation Organisation (ICAO) in cooperation with the International Federation of Airline Pilots Association (IFALPA) considered several proposals to incorporate security* safeguards into ICAO Standards and Recommended Practices (SARPs) for the design of new aeroplanes.

On 21 December 1988, a terrorist bomb in a Boeing 747 aeroplane exploded over Lockerbie, Scotland. As a result, the efforts initiated by IFALPA to establish security design standards gained impetus, and ICAO formed the "Incorporation of Security into Aircraft Design" (ISAD) study group with representatives of the airworthiness authorities of different countries such as United states, France, Germany in order to consider the existing proposals and to recommend standards for security in design.

On March 12, 1997, the new standards for security were adopted by ICAO as amendment 97 to Annex 8 of the Chicago Convention (ICAO Annex 8), applicable to all aeroplanes carrying passengers, cargo or mail in international air navigation. Note that subsequent amendments (up to amendment 101 as of today) to Annex 8 were issued and modified the applicability of security standards.

* "security" is used in the sense of prevention of illicit acts against civil aviation.

Background: FAA rulemaking

9. In 1999, a task was assigned by the Federal Aviation Administration (FAA) to the Design for Security Harmonization Working Group (DSHWG) to propose harmonized regulations incorporating security measures into aeroplanes based on amendment 97 to ICAO Annex 8.

Following the September 11, 2001 terrorist acts, FAA published Amendment N°25-106 on January 15, 2002 adding new section 25.795 requiring strengthening the flight deck door to resist forcible intrusion by unauthorized persons and penetration by small arms fire and fragmentation devices.

Then on January 5, 2007, NPRM FAA-2006-26722 was published in order to adopt the ICAO standards related to security in the design and operation of transport category airplanes. Final rule 14 CFR 25 Amendment 25-127 was finally released on 28th of October 2008 and incorporates an amendment to section FAR 25.795. This amendment was supplemented by six new Advisory Circulars (AC[5]) and 2 amended ACs[5].

Subject of the proposed amendment

[5] ACs can be found on FAA website: www.faa.gov

10. This NPA proposes new and improved security provisions into the design of Large Aeroplanes considering the security threats by terrorist acts including hijacking and detonation of explosive devices. The 6 areas of security related standard improvements are described hereunder in the following points 12 to 17, as proposed amendments to current CS 25.795. This CS-25 amendment is only applicable to **new and amended Type Certificates and STCs as applicable under Part 21A.101**. This NPA does not cover any retroactive requirement.

11. Current CS-25 (amendment 6) already covers some security considerations coming from the terrorist acts that took place on 11th of September 2001. This includes strengthening the flight deck door to resist forcible intrusion by unauthorized persons or penetration by small arms fire and segmentation devices. Please refer to CS 25.795 (a) (1), (a) (2) (i) and (ii).

12. System survivability:

Proposed paragraph CS 25.795 (c) (2) will require a design to separate, shield or provide redundancy to the critical systems in order to maximize the ability of flight critical systems to survive damage caused by an explosive device or other event.

The proposed method is the “damage based” approach proposed by FAR 25.795 (c) (2). This consists in assuming an explosive device destroys the flight critical systems contained within a certain volume. Then the ability of the aeroplane to continue safe flight and landing is assessed based on the functionality of flight critical systems after the explosion and the effect of any resulting loss of functionality. A formula is proposed derived from the paragraph CS 25.365 (e) in order to generate a sphere and use it to determine the volume of the aeroplane within which one must assess loss of system function.

The proposed rule will provide compliance with ICAO annex 8 Amendment 101 in this respect.

13. Cargo Compartment fire suppression:

Proposed paragraph CS 25.795 (b) (3) will require fire suppression systems in cargo compartment to be designed to withstand and suppress a sudden and extensive fire, such as might result from an explosive or incendiary device.

This amendment will also provide compliance with ICAO annex 8 (Amendment 101) standards except for applicability (see paragraph 20. a. of A. IV. for details)

14. Smoke and fumes protection:

Two new paragraphs would be added to CS 25 in order to limit the effect of an explosive or incendiary device as follows:

a. In the flight deck: Proposed paragraph CS 25.795 (b) (1) will require the design of the flight deck to limit penetration of smoke, fumes and noxious gases generated by explosives or incendiary devices elsewhere on the aeroplane. This paragraph would complement paragraphs CS 25.831 and CS 25.857 which do not directly address penetration of smoke into the flight deck other than smoke originating in a cargo compartment.

   This proposal will provide compliance with ICAO Annex 8 (Amendment 101) standards in this respect.

b. In the cabin: Proposed paragraph of CS 25.795 (b) (2) will require the ability to remove smoke, fumes and noxious gases (such as might be produced by an explosive or incendiary devices) from the passenger cabin.

   The goal is to prevent smoke, fumes and noxious gases from reaching concentration levels that would be incapacitating to occupants in the cabin if an explosive or incendiary device is activated. There is currently no requirement for extracting cabin smoke, fumes and noxious gases. So this new paragraph can be considered as an improvement in cabin safety.

The model proposed for smoke, fumes and noxious gases is the one proposed in FAR 25.795 (b) (2) which defines minimum combined volumetric concentration of carbon monoxide and carbon dioxide for which the passengers need to be protected against.

This amendment will provide compliance with ICAO annex 8 (Amendment 101) standards in this respect, except that the requirement does not cover aeroplanes used solely to transport cargo.

15. Least Risk Bomb location:

Proposed paragraph CS 25.795 (c) (1) will require the applicant to establish a "Least Risk Bomb Location" (LRBL) as part of the design of aeroplanes, and then to identify it.

Presently, an aeroplane manufacturer is used to consider the LRBL only after completion of the design. This proposal would require the manufacturer to include the LRBL during the aeroplane initial design process.

This new requirement would allow compliance with ICAO annex 8 (Amendment 101), except that the requirement does not cover aeroplanes used solely to transport cargo.

16. Protection of the flight deck from intrusion and penetration by small arms fire or grenade shrapnel:

The proposed change to paragraphs CS 25.795 (a) (1) and (2) would extend the requirement for the design of a strengthened flight deck door to the bulkhead and any other accessible boundary separating occupied areas from the flight deck concerning both intrusion of unauthorized persons and penetration by projectiles.

Concerning the intrusion by unauthorized persons, even if the door is the most critical feature against intrusion, this amended requirement will require all boundaries (for example between galley areas and flight deck) with the same standard of design as the flight deck door.

Concerning the penetration of projectiles, even if the flight deck door already provides a high level of safety, the flight deck itself remains susceptible from discharge of weapons (for example in a multi-deck aeroplane, the ceiling and floor around the flight deck may be vulnerable).

This new requirement will allow compliance with ICAO Annex 8 (Amendment 101).

17. Interior design to deter hiding of dangerous articles and facilitate searches:

The proposed change of paragraph CS 25.795 (c) (3) will require that the interior design of aeroplanes deter the easy concealment of weapons, explosives or other objects and improve the likelihood of finding such items during a search.

As a matter of fact, under operational rules (Annex III to Regulation (EC) No 3922/91 as last amended by Regulation (EC) No 859/2008 - "EU OPS"), it may be necessary to search an aeroplane interior under certain conditions. Large aeroplanes contain many areas that are not readily visible but are relatively accessible. This proposal will then require applicants to consider, during the design phase of the interior, the need to search aeroplanes regularly and thus avoid designs that make it difficult to search.

This new requirement will allow compliance with ICAO annex 8 (Amendment 101), except that the requirement does not cover aeroplanes used solely to transport cargo.

18. Considerations on applicability: Weight and seating configuration.

The new requirements are proposed to be applicable to aeroplanes of a MTOW in excess of 45 500 Kg or with a maximum approved passenger seating configuration greater than 60. Note that the requirement on the Protection of the flight deck (CS 25.795 (a)) refers to operational rules to define its applicability, which **today** results in the same applicability for EU Member states that have implemented JAR-26 (more than 45 500 Kg/60 passengers).

This dividing line (45 500 Kg/60 passengers) was defined according to the security risks associated with size.

This proposal is based on following considerations and assumptions:

- Even if there are significant measures to limit the risks associated with boarding of passengers (screening systems, procedures), there is still a possibility for a device to be placed onboard the aeroplane. And this possibility increases with the number of passengers. This risk rationale is also valid for cargo carriers depending on the amount of cargo they can carry.
- Experience has shown that larger aeroplanes (passengers and cargo) are more attractive targets for terrorism.
- Large Cargo aeroplanes, even though less attractive than passengers aeroplanes, can also be a target for terrorism due to their capability to inflict third party fatalities and damage.
- Smaller sized aeroplanes can normally perform an emergency landing at an airport within 30 minutes or less, which can be quicker and safer than performing the Least Risk Bomb Location (LRBL) procedure. For larger aeroplanes that can be some hours away from a suitable airport, the LRBL procedure can be the only option.
- FAA (in FAR 25.795) as well as ICAO (in Annex 8, except for fire suppression system, see paragraph 19 a.) have elected to apply the same applicability criteria.

19. Considerations on applicability: aeroplanes used solely to transport cargo

The approach followed by EASA is the same as FAA: All the requirements are applicable to large aeroplanes intended for the carriage of passengers, cargo or mail, except that following provisions exclude aeroplanes used solely to transport cargo:

- Protection of the flight deck: the applicability is given in the operational rules.
  - Both EASA and FAA exclude aeroplanes used solely to transport cargo. This is in line with ICAO standards.
  - But it is to be noted that operational rules differ between EASA and FAA: under FAA regulation, this requirement is applicable to **all passenger-carrying** Transport Category aeroplanes operated under **Part 121 – Air Operating Certificate holders** (**whatever the MTOW or passenger numbers are) but not under Part 135 – commuters and on-demand operations.**
- Passenger cabin smoke protection: this requirement is proposed not to apply to aeroplanes used solely to transport cargo, as for FAA. This is not in line with ICAO standards. But the Agency considers that the cabin area in aeroplanes used to transport cargo is very limited (less than 20 occupants) and the access is restricted to specific occupants. Moreover operational procedures and emergency equipment installation can be in place to ensure protection of occupants in case of smoke or fume.
- Least Risk Bomb Location: this requirement is also proposed not to apply to aeroplanes used solely to transport cargo, as for FAA. This is not in line with ICAO standards. But first of all, the Agency considers that there is less risk of a device getting onboard for the aeroplanes carrying cargo only:
  - because the cargo aeroplanes are less targeted by terrorists ;
  - because the number of boarding occupants is smaller;
  - because there is less hidden areas: seats, life preserver stowages, overhead bins, armrests, footrests, cushions often provide cavities not practically accessible for search. Note that some of those areas are not directly targeted

by the rule. They are only recommended by AMC 25.795(a)(2) (referring itself to AC 25.795-8).

In addition and in practise, it seems really unlikely to discover a device during an all-cargo flight and if the potential bomb is known to be within any cargo container, it would be also unlikely for any personnel to reach it while in flight.

- Interior design to facilitate searches: Concerning the ease of search provision, same rational as for LRBL can be used to substantiate the non applicability of this requirement to aeroplanes used for cargo transportation: limited number of boarding occupants and less hidden areas. ICAO standards do not exclude all-cargo aeroplanes.

For those requirements where applicability differs between CS-25 and ICAO SARPs, a difference will be notified by the Agency to ICAO, as per article 38 of Convention on International Civil Aviation.

20. ICAO compliance - FAA/EASA harmonization

An important objective for the Agency is to comply with ICAO standards and recommended practices and, as far as possible to harmonize with FAR 25 regulations. After consideration of ICAO Annex 8 Amendment 101, as well as FAR 25.795 Amendment 127, it appears that there are some applicability differences between FAA and ICAO specifications. Please find hereafter the Agency considerations:

a. Applicability of cargo compartment fire suppression:

In ICAO Annex 8 Amendment 101, the specification requesting the cargo compartment fire suppression system to take into account fire caused by explosive or incendiary device is divided in 2 parts (PART IIIA 4.1.6 g) and PART IIIB D2 g) 3)) depending on the date of application for certification. Both parts are applicable to all aeroplanes with a MTOW of over 5700 Kg intended for carriage of passengers, cargo or mail in international air navigation. FAA final rule 25-127 text in section FAR 25.795 (b) (3) is only applicable for aeroplanes with a certificated passenger seating capacity of more than 60 persons or a MTOW of over 100,000 pounds (45 500 Kg).

However based on a recommendation from the ICAO Airworthiness panel (AIRP/2) and on the state letter AN 3/5-08/54 dated 25/08/2008 proposing amendment to the standards and recommended practices in Annex 8, the ICAO objective is to have the same applicability as FAA, that is to say 60 passengers/MTOW 45 500 Kg (see attachment B to state letter AN 3/5-08/54, Section III, chapter 4.2 g) 3)).

So,

- considering this 60 passengers/MTOW 45 500 Kg criteria more reasonable on the risk probability standpoint;
- considering that all the other security requirements are applicable with the same criteria;
- and based on the fact that applicability should be changed in the next Amendment to ICAO annex 8;

the Agency proposes to deviate from ICAO Annex 8 Amendment 101.

The proposal is then to make the cargo compartment fire suppression requirement applicable to all aeroplanes with a certificated passenger seating capacity of more than 60 persons or a MTOW of over 100,000 pounds (45 500 Kg).

b. Applicability of requirements on Passenger cabin smoke protection , Least Risk Bomb Location(LRBL) and Interior design to facilitate searches:

For these three requirements, The Agency proposes to get aligned with FAA and thus to exclude from the applicability the aeroplanes used solely to

transport cargo whereas such a discriminant does not exist in ICAO annex 8 (Amendment 101) for the corresponding paragraphs.

This results in a deviation with ICAO standards and recommended practices for the airworthiness of Aircraft (annex 8).

c. Applicability of requirement on protection of flight deck

Concerning the flight deck protection, the Agency proposes to keep aligned with ICAO annex 8 standards and thus, to keep the applicability criteria used in original CS 25.795: the rule would only be applicable to aeroplanes for which a *secure* flight deck door is required by operating rules. This clearly establishes a link with EU OPS1.1255 (and future IR OPS) and JAR 26.260.

OPS 1.1255 of EU OPS is applicable to all passenger-carrying aeroplanes with a MTOW in excess of 45 500 Kg or with a maximum approved passenger seating configuration greater than 60 (unless otherwise specified in national security programmes addressing onboard security). This requires the flight deck door design to meet the applicable retroactive airworthiness operational requirements Refer to A. V. 4.a.v and vi of this NPA.

In today's EASA system, there is no retroactive airworthiness operational requirement. So those additional airworthiness requirements are defined by Member States. Many of them have implemented JAR 26.
JAR 26.260 is applicable to all passenger-carrying aeroplanes of a MTOW in excess of 45 500 Kg or with a maximum approved passenger seating configuration greater than 60 having a lockable door between the flight deck and the passengers compartment.

Note 1: EU OPS concerning Flight deck Protection excludes aeroplanes solely used to transport Cargo, like for FAA.

Note 2: EU OPS requirements concerning Flight deck Protection is not fully in line with FAA requirement which is applicable to all passenger-carrying transport category aeroplanes operating in part 121, regardless of MTOW and number of passengers. So the FAA applicability excludes aeroplanes operating in part 135, which is not the case within EASA, but may include some transport category aeroplanes of less than 60 passengers/45 500 Kg.

d. Wording change concerning the Least Risk Bomb Location (LRBL) requirement

A different wording is proposed in CS 25.795 (c) (1) compared to FAR 25.795 (c) (1): the term "flight critical structure" is replaced by "integrity of the structure" . This minor change avoids the use of the term "flight-critical structure" which is not defined precisely. The intent of the rule is exactly the same (the structure lost as a result of a bomb should allow the aeroplane to safely continue safe flight and landing without it) and the Agency does not consider this change as a regulatory difference with FAA.

21. Additional Airworthiness Requirements for operations

Additional Airworthiness requirements for operations (formerly called JAR 26) will be treated separately: An A-NPA will be developed to determine whether or not CS-26 needs to include part of the provisions given in amended CS 25.795. As a result, and as described in TOR 25.057, a new rulemaking task 26.007 might need to be opened.

V. Regulatory Impact Assessment

22. Purpose and Intended Effect

a. Issue which the NPA is intended to address

The primary purpose of this rulemaking task is to address specific security threats in the large aeroplane designs which could have consequences on the safety of the flight while complying with ICAO standards and recommended practices, as specified in Amendment 101 to ICAO annex 8.

The proposed aeroplane design will provide greater protection of the cabin, flight deck and cargo compartments from the detonation of explosive or incendiary devices, penetration by projectiles and intrusion by unauthorized persons.

b. Scale of the issue

Security is a very significant issue in Aviation today. This rulemaking activity was initiated in the early 70s since the terrorist acts including hijacking and detonation of explosive devices have targeted aeroplanes. In the past 30 years, more than 60 explosives devices have detonated onboard aeroplanes worldwide. Two Major events accelerated the rulemaking process: the Lockerbie accident where a bomb exploded in the cargo hold of a Pan American Boeing 747 killing all 259 people; the terrorist act of September 11, 2001 where aeroplanes were commandeered and used as weapons.

c. Brief statement of the objectives of the NPA

The objective of this NPA is to incorporate in CS-25 the elements of Amendment 101 of ICAO annex 8 not yet incorporated concerning improved security provisions into the design of Large Aeroplanes.

CS-25 (Amendment 6) is not in line with ICAO standards and recommended practices, as specified in Amendment 101 to ICAO annex 8 in the following parts:

- Sub-part IIIB-D Design and Construction (system survivability ; Cargo compartment fire suppression; incapacitation of occupants; protection of the flight deck from smokes and fumes)
- Sub-part IIIB-G Operating Limitations and Information (LRBL identification)
- Sub-part IIIB-K Security (LRBL provision; protection of the flight deck)

In order to provide compliance with ICAO annex 8 Amendment 101, the objective of the NPA is to improve the resistance to illicit acts through enhanced aeroplane design in the 6 following areas:

- System survivability (for brief description, see paragraph 12 in chapter A. IV)
- Cargo Compartment fire suppression (for brief description, see paragraph 13 in Chapter A. IV)
- Smoke and fumes protection in the cabin and in the flight deck (for brief description, see paragraph 14 in Chapter A. IV)
- Least risk Bomb location and design (for brief description, see paragraph 15 in Chapter A. IV)
- Protection of the flight deck from intrusion and from penetration by small arms fire or grenade shrapnel (for brief description, see paragraph 16 in Chapter A. IV)
- Interior design to deter hiding of dangerous articles and improve searching (for brief description, see paragraph 17 in Chapter A. IV)

This would lead to a CS 25.795 amendment as well as to AMC to CS 25.795 amendment.

23. Options

a. The options identified

1. Do nothing
2. Modify CS-25

Modification of CS 25 would consist in amending CS paragraph 25.795 to cover all of the 6 areas:

- System survivability (see paragraph 12. of A. IV. for details);

- Cargo Compartment fire suppression (see paragraph 13. of A. IV. for details);
- Flight deck and passenger cabin smoke protection (see paragraph 14. of A. IV. for details);
- Least risk Bomb location (see paragraph 15. of A. IV. for details);
- Protection of the flight deck from intrusion and from penetration by small arms fire or grenade shrapnel (see paragraph 16. of A. IV. for details);
- Interior design to deter hiding of dangerous articles and improve searching (see paragraph 17. of A. IV. for details

Note that the options that would consider deviating from ICAO were not envisaged as it is the Agency's priority to comply with ICAO's standards.

The options with different applicability (for example, including the cargo aeroplanes) were not envisaged mainly for FAA harmonization purpose. In addition, as described in paragraph 19, the benefits to apply some of the paragraphs to cargo aeroplane are not substantial while adding additional costs.

b. The preferred option selected (if possible)

Modify CS 25. See paragraph 5c of this Regulatory Impact Assessment.

24. Sectors concerned

Those affected by this proposal in terms of safety, economic and security impacts are for Large aeroplanes with a MTOW in excess of 45.500kg or 60 passengers or more:

- Manufacturers and Design Organisations
- More than 150 Operators[6]
- Modifiers, part suppliers and maintenance organizations
- Security personnel
- Up to 700 million passengers and crew per year[7]

25. Impacts

a. All identified impacts

i. Safety

Option 1.

No impact. Doing nothing would not address present security and safety risk and would not improve compliance with ICAO standards and recommended practices as laid down in annex 8 for Airworthiness.

Option 2. This option would contribute to address security risk and increase safety and would improve compliance with ICAO standards and recommended practices as laid down in annex 8 for Airworthiness as well as improve harmonisation with FAA.

The reason of this rulemaking task is relevant to security and consequently to flight safety.

The overall proposal has positive safety impact. Each one of the 6 areas can be assessed separately:

- System survivability:

  The new proposed methodology for separation of critical systems would definitely increase the level of safety of applicable aeroplanes (maximum certificated passengers seating capacity of more than 60 persons or a MTOW of

[6] The AirClaims data base currently lists 166 operators of this type of aircraft

[7] According to EUROSTAT 792 million passengers were counted per air in 2007, most of them in large aircraft.

over 45 500 Kg) by increasing the ability of the aeroplane to survive damage caused by explosive or incendiary devices.

- Cargo Compartment fire suppression:

  The principal safety improvement here is to increase the capability of the fire suppression system itself to survive an explosive event and also the ability of extinguishing agent to suppress any subsequent fire.

- Flight deck and cabin smoke protection

  The general level of safety would be increased as only the removal of the smoke from the flight deck is addressed in current CS-25. The smoke penetration into the flight deck is not addressed in current CS (except the one originating from a cargo compartment).

  So the proposal would include smoke generated anywhere in the fuselage, such as in equipment or passenger compartments, which is a good safety step forward.

  Concerning the passenger cabin, there are no existing CS-25 requirement relating to extraction of cabin smoke or noxious gases, regardless of their source. So the proposed requirement can be also considered as having a great safety benefit.

- Least risk Bomb location:

  This new requirement is expected as an improvement in the level of safety since the LRBL will be a design consideration and applicants will need to incorporate provisions to enhance its effectiveness.

- Protection of the flight deck from intrusion and from penetration by small arms fire or grenade shrapnel:

  The overall level of Safety is increased due to the fact that the flight deck would be designed against the intrusion by unauthorized persons as well as the penetration of projectiles through **any boundary** separating the flight deck from the other occupant areas. In current CS-25, only the door is reinforced.

  So the proposed requirement will enhance safety by providing:

  - Resistance to intrusion into the flight deck through any access point other than the door;
  - better protection of the flight deck from ballistic penetration that could endanger the flight crew or disable critical flight instrumentation.

- Interior design to deter hiding of dangerous articles and facilitate searches:

  This new requirement provides safety improvement because it can avoid hiding dangerous device in the cabin.

  Note that in the Final Regulatory Evaluation done for amendment 25-127 (see appendix I reference 2), FAA estimates that over a period of 50 years, this rule will avoid around 114 fatalities and 1 lost aeroplane. The Agency concurs with this overall assessment.

  The agency expects thus the following safety benefits:

  - 114 lives saved over the analysis period;
  - One aeroplane loss avoided in the same period (average cost estimated at 49 millions Euros (see appendix III table 5);
  - No additional collateral damage is assumed.

  Note that some of the proposed provisions such as “flight deck smoke protection” and “cargo Compartment fire suppression” can improve safety in case of events not terrorism related.

ii. Economic

Option 1.

None

Option 2.

The proposed security related design standards for new Type Certificates will incur costs to the industry. The Agency identified three major costs positions: design and certification costs, manufacturing costs and additional fuel costs. In some rare cases of significant changes like passengers to freighter conversions, major cabin refurbishment, some requirements could become applicable for a major change to the TC and this would imply additional design costs.

- The design and certification costs as well as the manufacturing costs can be assessed separately for the 6 areas.:

- System survivability. The Agency recognizes that the design efforts that need to be done by applicants and suppliers to develop new designs fulfilling the survivability requirement are quite considerable. The design shall indeed be reviewed for each system and as appropriate, tested for reliability.

- Cargo compartment fire suppression. The economic impact for manufacturer or supplier can be considered quite high due to the design development and tests that will need to be done.

- Flight deck and cabin smoke protection. Costs would be linked to the design of new air distribution systems and associated tests to increase airflow in the cabin and to limit penetration of air in the flight deck. It is to be noted that some aeroplanes already have distribution system sufficient to limit penetration of smoke in the flight deck.

- Least risk Bomb location. Optimum design should be reviewed by the manufacturer in order to place a bomb. Most of the aeroplanes have today a specific location. Manufacturers would only have to check if additional design change could improve the protection.

- Protection of the flight deck. The economic impact for manufacturer or supplier can also be considered quite high due to needed redesign and installation of panels and monument as well as new intrusion resistant tests.

- Interior design to deter hiding of dangerous articles and facilitate searches. The cost would include possible redesign of the toilets, of the life preservers container and pouch, as well as overhead stowage bins, which is not expected to be high.

  It is to be noted that those impacts are limited by the fact that this requirement is only applicable for new TC.

  In the “Final Regulation Evaluation” (reference 2 in appendix I) prepared by FAA for this rule, the certification costs as well as the manufacturing costs are evaluated at 274 million dollars (around 196 million euros). Those costs include:

  - the additional man-hours for design, engineering, material and equipment expenses for tooling, performance and flight tests to certify the enhanced security features

  - as well as the equipment and installation to manufacture those enhanced security features

  EASA estimates (see appendices II and III table 1 for assumptions and hypothesis of calculations) that manufacturing and certification costs are 78 million Euros (see Appendix III tables 2 and 4).

- In addition to those design, certification and manufacturing costs, we can estimate an economic impact linked to the increased weight.

  According to FAA, following ATA calculation, the total weight increase due to this new regulation is estimated at 160 Kg (354 pounds) per aeroplane considering all sizes of Part 25 aeroplanes. This induces additional fuel consumption (19 000 litres per year per aeroplane), which is evaluated by FAA to be around 9 000 US Dollars per year per aeroplane (see reference 2 in appendix I).

  The Agency have reviewed FAA figures and based on EASA assumptions for the affected fleet concurs with the FAA conclusion: additional fuel consumption will lead to additional fuel costs of approximately 270 millions Euros (nominal) over a period of 50 years (please refer to Appendix II and Appendix III tables 1 and 2).

  Total costs are summarized in appendix III table 2.

- Positive economic impacts:

  The Agency identified two economic benefits in addition to the economic effect of the safety improvements: cost savings resulting from operational improvements and from avoiding security delays:

  Firstly, cost savings are expected due to the time savings for search purpose during operations. This time saved and associated cost saving is, however, very difficult to quantify due to the confidentiality of the subject: all security data pertaining to security are kept confidential to Security services and member states; Operators check-lists and associated procedures owned by the airlines are not dispatched outside the operator.

  Nevertheless it is known that

  - the search procedure is generally applied by Cabin Crew (in accordance with the airline's operating manual) before each flight and after disembarkation of passengers and after activities involving externals (cleaning, refuelling, catering)
  - Main areas subject to search are usually the toilets, overhead bins, seats and under seats.
  - after notification of bomb on board, pyrotechnics/security teams conduct search, with the help of Cabin crew from outside with appropriate communication means

  From this it can be concluded that this activity is very time consuming for an operator and an improved design could reduce the time required.

  As per FAA (reference 2 in Appendix I), potential benefit for operators is estimated at 1.68 man hours saving per search, which represents around 30% time saving.

  FAA estimates the associated cost benefit at 13.362 Euros per aeroplane, which would result in a total benefit for European market of 550 millions Euros (see appendix III table 5 "operational savings)).

  Note that the Agency could not validate this FAA data. Comments would be appreciated from European operators concerning the time spent for search as well as the time that could be saved.

  In addition, costs savings are expected in relation with the avoided loss of demand for air travel and possible revenue decrease for airlines as a consequence to any accident linked to terrorism. FAA estimated the cost saving at more than 200 millions EUR assuming an accident impact duration of 2 months (see Appendix III table 5)

In addition to those savings, we can estimate time and money savings due to the harmonization with FAA rules: no additional certification exercise will be needed for Type validation which will save time both for the Industry and for the Agency.

iii. Environmental

Option 1.

None

Option 2.

Due to the weight increase described above (ii economic impact) and the associated fuel burn, there is a related environmental impact caused by additional Greenhouse Gas Emissions (GHG).

The additional Greenhouse Gas Emissions (GHG emissions) are evaluated at 50 tons per year per aeroplane and for the total EASA fleet over the 50 years, additional 2 million tons of GHG emissions are predicted with this rule, which makes an increase of 0.02% relative to the total emissions by traffic in controlled air space (See tables 2 and 3 in Appendix III).

In addition, the proposed new requirements have an environmental impact concerning the fire suppression system in the cargo compartment which requires for an extinguishing agent being capable of suppressing a sudden and extensive fire and also capable of retaining its ability after an explosion.

For that purpose the Halon standard (Halon 1301) is recognized as being capable of satisfying the requirement from the standpoint of suppression but this product contributes to depletion of the ozone layer (EU 2037/2008).

However, this new proposed requirement will have a very low impact due to the fact that Halon is already used for suppression of fire in Cargo compartment and there is no additional use of Halon foreseen.

In addition, working groups are today working on equivalent agents meeting environmental requirement to further replace the Halon.

iv. Social

Option 1.

None

Option 2.

None

v. Other aviation requirements inside EASA scope

The new rule concerning the ease of search provision will assist compliance with:

- EU regulation 300/2008 on common rules in the field of civil aviation security (annex to article 4 about Aircraft security- paragraph 3)
- EU OPS 1.1250 Aeroplane search procedure checklist.

The new rule concerning the protection of the flight deck will complement:

- EU regulation 300/2008 on common rules in the field of civil aviation security (annex to article 4 and in-flight security measures-paragraph 10)
- EU OPS 1.1255 which specifies additional door design and procedures requirements so that pilots can monitor the entrance of the flight deck from their station. OPS 1.1255 also establishes the applicability of the mandatory flight deck door compliant with the applicable retroactive airworthiness operational requirements: “All **passenger**-carrying aeroplanes of a maximum certificated take-off mass in excess **of 45 500** Kg or with a Maximum

Approved Passenger Seating Configuration greater **than 60** shall be equipped with an approved flight deck door[…] and designed to meet the applicable retroactive airworthiness operational requirements".

- For the retroactive airworthiness operational requirements, refer to paragraph vi of this paragraph hereunder.

vi. Other aviation requirements outside EASA scope

JAR-26 requirements "Additional Airworthiness Requirements for Operations" is not yet integrated in EASA regulation structure but a new regulatory tool is under development: CS-26 and Safety Directives. It will ensure that the transfer of JAR-26 into EASA system can take place.

As of today, JAR 26.260 contains the provision of CS 25.795 amendment 5. A separate study will determine whether the proposed amendment to CS 25.795 will need to be included in CS-26 (see paragraph A. IV. 20. c.).

vii. ICAO Standards And Recommended Practices

ICAO Annex 8 of Chicago Convention (amendment 101) establishes the minimum security standards as described in this NPA. With the proposed CS 25.795, compliance with ICAO SARPs will be established from a design specification standpoint. The only deviation concerns **applicability** of the requirements concerning cargo compartment fire suppression, incapacitation of occupants, Least Risk Bomb Location and Interior search provision ((see paragraph 19. a. and b. of A. IV. for substantiation). This will be notified by the Agency to ICAO.

Note that a future amendment to ICAO Annex 8 should restore the compliance concerning the applicability of the requirement concerning cargo compartment fire suppression.

In addition, the new rule concerning the ease of search provision will assist compliance with ICAO Annex 17 of Chicago Convention about Security (Chapter 4 preventive security measures and Chapter 5 management of response to acts of unlawful interference)

The new rule concerning the protection of the flight deck will complement ICAO Annex 17 Security which requires that Commercial air transport operators ensure that during flight unauthorized persons are prevented from entering the flight deck.

The new rule concerning the LRBL will facilitate compliance with ICAO Annex 6 of Chicago Convention, chapter 13.3 Aeroplane search procedure checklist.

viii. Foreign comparable regulatory requirements

FAA:

- FAA Final rule 25-127 was released on October 28, 2008 for amendment of section 25.795 of FAR. Final CS 25.795 text is proposed to be fully harmonized with FAR 25.795 except:
- for the flight deck protection, the requirement refers to operational requirements which indirectly gives different applicability (see A. IV 20. c. Note 2).
- In addition, it can be noted that FAA conversion values, although similar to EASA ones, differs from EASA ones due to the selected round off. Anyway the Agency does not estimate the different values can be considered as regulatory differences. Note that EASA uses the same value as ICAO concerning the discriminant 45 500 Kg (FAA uses 45359 Kg).
- Another wording difference can be noted in CS 25.795 (c) (1) compared to FAR 25.795 (c) (1) : the term "flight critical structure" is replaced by "integrity of the structure" . This slight change avoids using the term "critical structure"

which is not defined. The intent of the rule is the same and the Agency does not consider this change as a regulatory difference.

b. Equity and fairness in terms of distribution of positive and negative impacts among concerned sectors.
No equity and fairness issues have been identified.

26. Summary and Final Assessment

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

Following the regulatory impact assessment above, we can conclude that despite the non negligible costs due to design, certification, manufacturing as well as additional fuel burn costs, the overall positive impacts in terms of safety (avoiding one fatal accident in the analysis period) and economy (operational savings) largely outweigh the negative impacts.

The rule expects to avoid 114 fatalities over the analysis period. The monetary benefits would thus be even more important if we considered those monetary benefits.

Furthermore, the harmonization between CS-25 with FAR 25 is strongly supported by both the Industry and the Agency as any regulatory difference between those specifications leads to a type validation exercise which may be very time consuming and may generate additional costs (additional Certification reports, certification tests ...).

The Agency considers that adopting those requirements would provide an overall increase in security resulting in an increased level of safety in European commercial aviation. This proposal would decrease the aeroplane vulnerability and increase aeroplane survivability in the event of bombing and hijacking.

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

The main actors economically impacted are the manufacturers of large aeroplanes due to the efforts in design development. Operators are expected to benefit from reduced labour costs for security searches.

In terms of security and safety impacts, aeroplane manufacturers, modifiers, operators, occupants and security personnel will be impacted.

No equity and fairness issues have been identified.

c. Final assessment and recommendation of a preferred option

Despite the negative economical impact in terms of design development, in particular for system survivability and cargo compartment fire suppression, the preferred option is option 2 for the two main following reasons:

- for the high positive impact in terms of security and safety.
- to be compliant with ICAO Annex 8 and FAR 25.

B. Draft Opinion(s) and/or Decision(s)

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

1. deleted text is shown with a strike through: ~~deleted~~
2. new text is highlighted with grey shading: new
3. ….

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

II Draft Decision CS-25

The envisaged change to Decision 2008/006/R Regulation 1702/2003 is:

In Book 1 „SUBPART D-DESIGN AND CONSTRUCTION“ amend the paragraph CS 25.795:

CS 25.795 Security considerations.

(see AMC 25.795)

(a) Protection of flight deck. If a secure flight deck door is required by operating rules, the bulkhead, door, and any other accessible boundary separating the flightcrew compartment from occupied areas ~~installation~~ must be designed to:

(1) Resist forcible intrusion by unauthorized persons and be capable of withstanding impacts of 300 Joules (221.3 footpounds) ~~at the critical locations on the door~~ , as well as a 1113 Newton (250 pound) ~~constant~~ tensile load on accessible handholds, including the doorknob or handle ~~(See AMC 25.795(a)(1))~~, and

(2) Resist penetration by small arms fire and fragmentation devices by meeting the following projectile definitions and projectile speeds ~~(See AMC 25.795(a)(2))~~.

(i) Demonstration Projectile #1. A 9 mm full metal jacket, round nose (FMJ RN) bullet with nominal mass of 8.0 g (124 grain) and reference velocity 436 m/s (1430 ft/s)

(ii) Demonstration Projectile #2. A .44 Magnum, jacketed hollow point (JHP) bullet with nominal mass of 15.6 g (240 grain) and reference velocity 436 m/s (1430 ft/s)

(b) Aeroplanes with a certificated passenger seating capacity of more than 60 persons or a maximum take-off weight of over 45 500 Kg (100 000 lb) must be designed to limit the effects of an explosive or incendiary device as follows:

(1) Flight deck smoke protection. Means must be provided to limit entry of smoke, fumes, and noxious gases into the flight deck.

(2) Passenger cabin smoke protection. Except for aeroplanes intended to be used solely for the transport of cargo, means must be provided to prevent passenger incapacitation in the cabin resulting from smoke, fumes, and noxious gases as represented by the initial combined volumetric concentrations of 0.59% carbon monoxide and 1.23% carbon dioxide.

(3) Cargo compartment fire suppression. An extinguishing agent must be capable of suppressing a fire. All cargo-compartment fire suppression-system components must be designed to withstand the following effects, including support structure displacements or adjacent materials displacing against the distribution system:

(i) Impact or damage from a 13 mm (0.5-inch) -diameter aluminium sphere travelling at 131 m/s (430 feet per second);

(ii) A 103 kPa (15 psi) pressure load if the projected surface area of the component is greater than 0,4 square meter (4 square feet). Any single dimension greater than 1,2 meters (4 feet) may be assumed to be 1,2 meters (4 feet) in length; and

(iii) A 15 cm (6-inch) displacement, except where limited by the fuselage contour, from a single point force applied anywhere along the distribution system where relative movement between the system and its attachment can occur.

(iv) Paragraphs (b)(3)(i) through (iii) of this paragraph do not apply to components that are redundant and separated in section or are installed remotely from the cargo compartment.

(c) An aeroplane with a certificated passenger seating capacity of more than 60 persons or a maximum take-off weight of over 45 500 Kg (100,000 lbs) must comply with the following:

(1) Least risk bomb location. Except for aeroplanes intended to be used solely for the transport of cargo, an aeroplane must be designed with a designated location where a bomb or other explosive device could be placed to best protect integrity of the structure and flight-critical systems from damage in the case of detonation.

(2) Survivability of systems.

(i) Except where impracticable, redundant aeroplane systems necessary for continued safe flight and landing must be physically separated, at a minimum, by an amount equal to a sphere of diameter

$$D = 2\sqrt{(H_0 / \pi)}$$

(where H0 is defined under paragraph 25.365(e)(2) and D need not exceed 1,54 meters (5.05 feet).

The sphere is applied everywhere within the fuselage-limited by the forward bulkhead and the aft bulkhead of the passenger cabin and cargo compartment beyond which only one-half the sphere is applied.

(ii) Where compliance with sub-paragraph (c)(2) (i) of this paragraph is impracticable, other design precautions must be taken to maximize the survivability of those systems.

(3) Interior design to facilitate searches. Except for aeroplanes intended to be used solely for the transport of cargo, design features must be incorporated that will deter concealment or promote discovery of weapons, explosives, or other objects from a simple inspection in the following areas of the aeroplane cabin:

(i) Areas above the overhead bins must be designed to prevent objects from being hidden from view in a simple search from the aisle. Designs that prevent concealment of objects with volumes 0.33 cubic decimetre (20 cubic inches) and greater satisfy this requirement.

(ii) Toilets must be designed to prevent the passage of solid objects greater than 5 cm (2.0 inches) in diameter.

(iii) Life preservers or their storage locations must be designed so that tampering is evident.

In Book 2 SUBPART D- “DESIGN AND CONSTRUCTION“ amend AMC 25.795 as follows:

AMC 25.795

Security considerations Referenced Documentation:

FAA memorandum, Subject Information: Certification of strengthened Flight Deck Doors on Transport Category Airplanes, Original release 6 November 2001.

AMC 25.795(a)(1)

Flight deck intrusion resistance. Referenced Documentation:

Federal Aviation Administration Advisory Circular (AC) 25.795-1A, Flight deck Intrusion Resistance, issue date ~~10 January 2002~~ 24 October 2008.

AMC 25.795(a)(2)

Flight deck penetration resistance

Referenced Documentation:

Federal Aviation Administration Advisory Circular (AC) 25.795-2A, Flight deck Penetration Resistance, issue date ~~10 January 2002~~ 24 October 2008.

Level IIIA of the (US) National Institute of Justice, Ballistic Resistance of Personal Body Armor, NIJ Standard 0101.04, Office of Science and Technology, Washington, D.C. 20531, September 2000.

Federal Aviation Administration Advisory Circular (AC) 25.795-3, Flight deck Protection (smoke and fumes), issue date 24 October 2008.

Federal Aviation Administration Advisory Circular (AC) 25.795-4, Passenger Cabin Smoke Protection, issue date 24 October 2008.

Federal Aviation Administration Advisory Circular (AC) 25.795-5, Cargo Compartment Fire Suppression, issue date 24 October 2008.

Federal Aviation Administration Advisory Circular (AC) 25.795-6, Least Risk Bomb Location, issue date 24 October 2008.

Federal Aviation Administration Advisory Circular (AC) 25.795-7, Survivability of Systems, issue date 24 October 2008.

Federal Aviation Administration Advisory Circular (AC) 25.795-8, Interior design to facilitate searches, issue date 24 October 2008.

C. Appendices

I Referenced Documents

Reference 1: FAA Final Rule Docket N°. FAA-2006-26722 Amendment N° 25-127

Reference 2: FAA Final Regulatory Evaluation "Security Related Considerations in the Design and Operation of Transport Category Airplanes", Office of Aviation Policy and Plans Aircraft Regulatory Analysis Branch, Michael D. Lukacs, September 15, 2008

II Ground rules and assumption for RIA costs and benefits calculations:

- Period of analysis: 50 years
- The first delivery will occur 1 year after the Type Certificate (TC) is granted
- Average Production period for large aeroplanes of more than 60 passengers or more than 45 500 Kg (called in this appendix “larger aeroplanes”): 28 years (source FAA Final Regulatory Evaluation – Appendix I, reference 2)
- 4 larger aeroplanes TC are granted every 10 years (source FAA Final Regulatory Evaluation – Appendix I, reference 2)
- An average of 60 newly Type certified larger aeroplanes are delivered each year (15 deliveries / Type Certification per year). Source FAA Final Regulatory Evaluation – Appendix I, reference 2
- Fuel price: 0.333 Euros/liter
- Annual flight hours per larger aeroplane (source FAA Final Regulatory Evaluation – Appendix I, reference 2) : 2920 hours
- All data coming directly from FAA report (Appendix I reference 2) are marked with a * in the tables in the appendix III.
- All data coming from FAA report (Appendix I reference 2) and compiled based on the European market and fleet are marked with *[1] in the tables in the appendix III.

III Costs and benefits tables:

Table 1. Input data

Input Data					
Analysis period				Years	50
Current Exchange rate (28/05/09)				EUR/$	1,39481
Liter/gallon					3,7854118
Fuel price (FAA assumption)				$ ct/gallon	176
Fuel price (current IATA)				$ ct/gallon	148
Fuel price applied				EUR/liter	0,333
Annual flight hrs (FAA)				hrs/aeroplane	2920
Annual flight hrs (Airclaims)				hrs/aeroplane	2605

Table 2. certification, manufacturing, Fuel and GHG emissions Costs

Costs					
Certification Costs					
Certification costs per TC (FAA estimate)				$/TC	1.490.460*
				EUR/TC	1.068.576*
Total certification costs				EUR	4.274.303*[1]
Manufacturing Costs					
Manufacturing Costs per aeroplane (FAA)				$/aeroplane	106.094*
				EUR/aeroplane	76.063*
Total manufacturing costs				EUR	73.870.297*[1]
Fuel costs					
Incremental fuelburn (FAA)				gallons/hrs/aeroplane	1,77
				ltr/hrs/aeroplane	6,7
Additional fuelburn per aeroplane per year (FAA)				liter	19.565*
Additional fuelburn per aeroplane per year (EASA)				liter	16.473
Additonal fuel costs per aeroplane				EUR	6.522
				$	9.096
Total additional fuel costs				EUR	271.559.158
Additional Greehouse Gas Emissions					
Additional GHG emissions per aeroplane				t/year/aeroplane	50
Total GHG emissions caused by rule				t	2.078.785
Total theoretical cost of buying ETS emission rights				EUR	31.472.806
Total					**381.176.563**

** and *[1]: refer to Appendix II*

Table 3. Input data for environmental cost impact

	Input Data		
1	Density JET-A1	kg/l	0,8075
2	CO2 emission factor (c)	kg CO2/kg fuel	3,16
4	CO2 offsetting cost	EUR/t	23
	Environmental Impact Estimate		**Average Aeroplanes >60seats**
5	Additional Fuelburn (volume)	l/hrs/aeroplane	6,700178886
6	Additional fuelburn (mass)	kg/hr/aeroplane	5,4
7	Additional CO2 created (CO2)	kg/hr/aeroplane	17
	Additional CO2 created (CO2)	t/aeroplane/year	50
10	Current ETS spot price	EUR/t	15,1
11	Current atmosfair compensation price	EUR/t	23,3
	Total Cost for offsetting ETS US fleet	EUR	81.829.295
	Total Cost for ofsetting atmosfair US fleet	EUR	125.932.798
	Total Cost for offsetting ETS EASA fleet	EUR	31.472.806
	Total Cost for offsetting atmosfair EASA fleet	EUR	48.435.692
	Total IFR traffic EASA countries per year	2007	8.850.824
	Average fuel burn per flight	t	4,304
	Total fuel burn EASA countries traffic		38.093.947
	Total CO2 released by EASA countries traffic per year		120.376.871
	Total GHG emmissions by EU-27 in 2005		151.400.000
	Share of this task in total fuel burn		0,02%

Table 4. Sum-up table of costs

EASA Estimate											
Deliveries TCs '08-'17	**Deliveries TCs '18-'27**	**Deliveries TCs '28-'37**	**Deliveries TCs '38-'47**	**Total Deliveries**	**Retirements**	**Netfleet**	**Certification costs**	**Manufacturing costs**	**Fuel costs**	**CO2 emissions**	
							EUR	**EUR**	**EUR**	**t**	**EUR**
							4.274.303	73.870.297	271.559.158	2.078.785	31.472.806
							4.274.303	-			
60				60		60		4.563.804	391.296	2.995	
60				60		120		3.879.234	782.591	5.991	
60				60		180		3.527.432	1.173.887	8.986	
60				60		240		3.297.349	1.565.182	11.981	
60				60		300		3.129.269	1.956.478	14.977	
60				60		360		2.998.317	2.347.774	17.972	
60				60		420		2.891.884	2.739.069	20.968	
60				60		480		2.802.746	3.130.365	23.963	
60				60		540		2.726.405	3.521.661	26.958	
60				60		600		2.659.878	3.912.956	29.954	
60				60		660		2.601.097	4.304.252	32.949	
60				60		720		2.548.570	4.695.547	35.944	
60				60		780		2.501.186	5.086.843	38.940	
60				60		840		2.458.102	5.478.139	41.935	
60				60		900		2.418.658	5.869.434	44.931	
60				60		960		2.382.334	6.260.730	47.926	
60				60		1.020		2.348.711	6.652.025	50.921	

EASA Estimate

Deliveries TCs '08-'17	Deliveries TCs '18-'27	Deliveries TCs '28-'37	Deliveries TCs '38-'47	Total Deliveries	Retirements	Netfleet	Certification costs	Manufacturing costs	Fuel costs	CO2 emissions	
60				60		1.080		2.317.444	7.043.321	53.917	
60				60		1.140		2.288.251	7.434.617	56.912	
60				60		1.200		2.260.897	7.825.912	59.907	
60				60		1.260		2.235.180	8.217.208	62.903	
60				60		1.320		2.210.933	8.608.504	65.898	
60				60		1.380		2.188.009	8.999.799	68.893	
60				60		1.440		2.166.284	9.391.095	71.889	
60				60		1.500		2.145.649	9.782.390	74.884	
60				60	60	1.500		2.126.008	9.782.390	74.884	
60				60	60	1.500		2.107.279	9.782.390	74.884	
60				60	60	1.500		2.089.386	9.782.390	74.884	
				-	60	1.440		-	9.391.095	71.889	
				-	60	1.380		-	8.999.799	68.893	
				-	60	1.320		-	8.608.504	65.898	
				-	60	1.260		-	8.217.208	62.903	
				-	60	1.200		-	7.825.912	59.907	
				-	60	1.140		-	7.434.617	56.912	
				-	60	1.080		-	7.043.321	53.917	
				-	60	1.020		-	6.652.025	50.921	
				-	60	960		-	6.260.730	47.926	
				-	60	900		-	5.869.434	44.931	
				-	60	840		-	5.478.139	41.935	
				-	60	780		-	5.086.843	38.940	

EASA Estimate

Deliveries TCs '08-'17	Deliveries TCs '18-'27	Deliveries TCs '28-'37	Deliveries TCs '38-'47	Total Deliveries	Retirements	Netfleet	Certification costs	Manufacturing costs	Fuel costs	CO2 emissions	
				-	60	720		-	4.695.547	35.944	
				-	60	660		-	4.304.252	32.949	
				-	60	600		-	3.912.956	29.954	
				-	60	540		-	3.521.661	26.958	
				-	60	480		-	3.130.365	23.963	
				-	60	420		-	2.739.069	20.968	
				-	60	360		-	2.347.774	17.972	
				-	60	300		-	1.956.478	14.977	
				-	60	240		-	1.565.182	11.981	
				-	60	180		-	1.173.887	8.986	
				-	60	120		-	782.591	5.991	
				-	60	60		-	391.296	2.995	
				-	60	-		-	-	-	

Table 5. Sum-up table of benefits

Benefits			
Operational savings			
Cost savings per aeroplane (FAA)		$	18.637*
Cost savings per aeroplane		EUR	*13.362**
Total operational savings		EUR	*556.380.209*[1]*
Replacement costs			
Value of average aeroplane		$	*49.000.000**
Total replacement costs		EUR	*35.130.233**
Lives saved			
Lives saved (50 years)			114*
Avoiding a demand reduction			
Loss of demand per month		$	*145.000.000**
		EUR	103.956.811
Total loss of demand		EUR for 2 months	207.913.623
Total			***1.061.624.065 **[1]***

** and *[1]: refer to Appendix II*