COMMENT RESPONSE DOCUMENT (CRD) TO NOTICE OF PROPOSED AMENDMENT (NPA) 2008-01

for amending the Executive Director Decision No. 2003/12/RM of 5 November 2003 on general acceptable means of compliance for airworthiness of products, parts and appliances ("AMC-20")

And

Executive Director Decision No 2003/1/RM of 17 October 2003 on acceptable means of compliance and guidance material for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations ("AMC and GM to Part-21")

And

Executive Director Decision No 2003/11/RM of 5 November 2003 on definitions and abbreviations used in certification specifications for products, parts and appliances ("CS-Definitions")

And

Executive Director Decision No 2003/2/RM of 17 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for large aeroplanes ("CS-25")

And

Executive Director Decision No 2003/9/RM of 24 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for engines ("CS-E")

"Extended Range Operations with Two-Engined Aeroplanes ETOPS Certification and Operation ("AMC 20-6")

Explanatory Note

I. General

1. The purpose of the Notice of Proposed Amendment (NPA) 2008-01, dated 01 March 2008 was to propose an amendment to:

   - Decision 2003/12/RM[1] of 5 November 2003 ("AMC-20"),
   - Decision No 2003/1/RM[2] of 17 October 2003 ("AMC and GM to Part-21"),
   - Decision No 2003/11/RM[3] of 5 November 2003 ("CS-Definitions"),
   - Decision No 2003/2/RM[4] of 17 October 2003 ("CS-25")
   - Decision No 2003/9/RM[5] of 24 October 2003 ("CS-E"), and,
   - Decision No 2003/19/RM[6] of 28 November 2003 ("AMC to Part-M and Part-145")

   It proposes the introduction of a Revision 2 of AMC 20-6 giving an acceptable means of compliance and guidance material on "Extended Range Operations with Two-engined Aeroplanes ETOPS Certification and Operation".
   The corresponding rulemaking task was MDM.001. The objective of the task was to enhance and modernise the airworthiness, continuing airworthiness and operational considerations for applicants seeking approval for extended operations of two-engined aeroplanes and in particular it adds additional requirements for applicants seeking approval for diversion time beyond 180 minutes.

II. Consultation

2. The draft Executive Director Decision was published on the web site (http://www.easa.europa.eu) on 6 March 2008

   By the closing date of 6 June 2008, the European Aviation Safety Agency ("the Agency") had received 353 comments from 21 National Aviation Authorities, professional organisations and private companies.

III. Publication of the CRD

3. All comments received have been acknowledged and incorporated into this Comment Response Document (CRD) with the responses of the Agency.

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[1] Decision 2003/12/RM of 5 November 2003 on general acceptable means of compliance for airworthiness of products, parts and appliances (« AMC-20 »), as last amended by Decision 2010/003/R of 26/07/2010

[2] Decision No 2003/1/RM of 17 October 2003 on acceptable means of compliance and guidance material for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations ("AMC and GM to Part-21") as last amended by Decision 2010/001/R of 23 March 2003

[3] Decision No 2003/11/RM of 5 November 2003 on definitions and abbreviations used in certification specifications for products, parts and appliances («CS-Definitions»), as last amended by Decision 2007/16/R of 14 December 2007

[4] Decision No 2003/2/RM of 17 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for large aeroplanes («CS-25»), as last amended by Decision 2010/005/R of 12 August 2010

[5] Decision No 2003/9/RM of 24 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for engines («CS-E»), as last amended by Decision 2009/18/R of 18 December 2009

[6] Decision No 2003/19/RM of the Executive Director of the European Aviation Safety Agency of 28 November 2003 on acceptable means of compliance and guidance material to Commission Regulation (EC) No 2042/2003 of 20 November 2003 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organisations and personnel involved in these tasks, as last amended by Decision 2010/002/R of 28 April 2010.

4. In responding to comments, a standard terminology has been applied to attest the Agency's acceptance of the comment. This terminology is as follows:

   - **Accepted** – The comment is agreed by the Agency and any proposed amendment is wholly transferred to the revised text.
   - **Partially Accepted** – Either the comment is only agreed in part by the Agency, or the comment is agreed by the Agency but any proposed amendment is partially transferred to the revised text.
   - **Noted** – The comment is acknowledged by the Agency but no change to the existing text is considered necessary.
   - **Not Accepted** - The comment or proposed amendment is not shared by the Agency

   The resulting text has been included in Appendix A to this CRD and highlights the changes as compared to the current rule.

5. The Executive Director Decision will be issued at least two months after the publication of this CRD to allow for any possible reactions of stakeholders regarding possible misunderstandings of the comments received and answers provided.

6. Such reactions should be received by the Agency not later than **01 December 2010** and should be submitted using the Comment-Response Tool at http://hub.easa.europa.eu/crt.

IV. Main changes introduced after the NPA

7. The comments received through the external consultation of the NPA showed a significant concern from stakeholders about the structure proposed in the NPA. Those comments support to maintain a single document containing all ETOPS requirements both for type certificate holders and for operators seeking approval with clear responsibilities and applicability. As a result:

   - The structure of AMC 20-6 has been enhanced to better clarify applicability of each section.
   - Proposed amendments to AMC to Part-M and Part-145 have been consolidated as Appendix 8 to AMC 20-6.

8. The final proposed text for revision 2 to AMC 20-6 is included in Appendix A to this CRD.

9. To help readers a cross reference index between current AMC 20-6 and the proposed revision 2 of AMC 20-6 is included in Appendix B to this CRD.

V. CRD table of comments, responses and resulting text

(General Comments)	-

comment	*132* comment by: *UK CAA* It is recommended that AMC 20-6 is revision controlled, in view of the important advisory material it conveys. This would allow the national authorities to assess whether programmes have been developed in accordance with the correct version of this material.
response	*Accepted* Control of revision to be established

comment	*133* comment by: *UK CAA* There is no guidance to operators/TC holders on smoothing IFSD rate (e.g. by using 12 month moving average). Will the agency accept data presented by this method, (which requires some significant operating time before it is available), or does it seek data in some other form particularly early on in service? This material was in the earlier version of the AMC.
response	*Noted* 12 months moving average is an industry practise. In case this industry practise is not relevant the competent authority could accept other presentation of the data.

comment	*134* comment by: *UK CAA* Comment on various pages: justification: Reference should be to Competent Authority.
response	*Accepted*

comment	*135* comment by: *UK CAA* Various typographical errors: P.18 para 7, 5th line: "an acceptable level..." P.28 para (i) (A) last line " this NPA" P79 para (b), 5th line "A certification plan" P.86 para 6a "is considered as mature if" P.85 para f "the opportunity" should be re-inserted.
response	*Accepted*

comment	*157* comment by: *UK CAA* The board for tracking reliability seems to be variously referred to as the

Reliability Tracking Board (P86), the PSRAB (P87) and the reliability tracking board/PSRAB (P48). It is suggested that these references are made consistent.

justification:
Change to Reliability Tracking Board throughout.

response *Accepted*

Reliabilty tracking board will be used

comment *176* comment by: *Luftfahrt-Bundesamt*

The LBA has no comments on NPA 2008-01.

response *Noted*

comment *177* comment by: *AIRBUS*

Comments summary:

- The proposed rule and guidance material fail to meet the objective which is to "enhance and modernize" the ETOPS requirements (as quoted in the NPA's explanatory note). As such, the new EASA ETOPS rule material should not have been developed based on current AMC 20-6, which is 15 years old.
- The content, format and layout are not harmonized with FAA (contrary to current AMC 20-6 and previous FAA AC 120-42a).
- The status of already ETOPS approved aircraft is not clarified within this NPA.
- There are a lot of inconsistencies and unclear or misleading requirements and guidelines.
- This NPA fails to meet the objective of the certification rule which is to set safety objectives and not to drive aircraft design (e.g. prescriptive requirements for electrical architecture).
- Some key ETOPS concepts are outdated and not harmonized with FAA (e.g. consideration of Time Limited System, IFSD rate objectives vs diversion time...).

response *Partially accepted*

The structure of the AMC has been modified and the applicability of each chapter as well as the applicability of the entire AMC has been clarified. Inconsistencies have corrected.

CS25 text is objective and the AMC can be more specific as it is an aceptable means of compliance.
ETOPS concepts have been reviewed as required based on justifcation on the topics listed.
Harmonisation with the FAA regarding the technical content has been done where applicable.

comment *202* comment by: *AEA*

Comment: AEA observes that the NPA 2008-01 proposes amendments to AMC and GM to Part 21, CS-Definitions, CS-25, CS-E and AMC to part M, AMC to Part-145 and AMC20.
In principle justifiable however the ETOPS requirements will be rather scattered when the NPA is accepted. AEA considered the current situation where the AMC 20-6 contains in principle all ETOPS requirements for the operator very useful especially if an operator has to compile an ETOPS Manual. E.g the AMC 20-6 appendix 4 currently contains all the maintenance requirements for ETOPS. The NPA proposes deletion of this appendix and the maintenance requirements are added to Part M.

Proposal: Maintain a single EASA document containing all ETOPS Operational and Technical requirements/procedures relevant for the operator of an ETOPS aircraft.
Other regulatory material can refer to this single document.

response *Accepted*

One single document with clearly defined responsibilities is kept.

comment *255* comment by: *Embraer*

Operational Regulation

Currently JAR Ops 1.246(a) specifies that operators must have authority approval to operate beyond the threshold specified in JAR Ops 1.245. It does not specify an airworthiness standard or means of compliance other than a reference to AMC 20-6. Embraer suggests that this structure be retained in the operational regulation as it shifts to EASA's remit. FAR 121.162(b) published in January 2007 had the effect of requiring all ETOPS certification programs in process at the time to immediately change the basis of certification from AC 120-42A to the new FAR 25.3(b)(1). While this had only a minor technical impact because of the small differences between the two requirements, it necessitated a significant administrative effort to rewrite the compliance documentation to address the change in certification basis. Embraer believes this was an unnecessary burden that provided no benefit.

response *Accepted*

One single document with clearly defined responsabilities is kept.

comment *256* comment by: *Rolls-Royce*

The NPA only addresses extended range operations of **twin** engined aeroplanes (i.e.ETOPS). The extended range operation of Tris and Quads (LROPS) have been removed from this NPA (due to operators' concerns) and will be the subject of a future NPA. The published FAA rules are applicable to Twins, Tris and Quads This means that:

a. There is a lack of harmonisation between FAA and JAA rules until the LROPS NPA is published - When will this be?.
b. There is a difference in definitions. "ETOPS" under FAA rules means all multi-engined aircraft (except cargo) and "ETOPS" under EASA rules means only Twins. This could lead to confusion and should be harmonised with FAA to provide common definitions.

response

Noted

The proposal for regulating LROPS was not fully demonstrated by the Regulatory Impact Assessment done for EASA and JAA. This view was also confirmed by diversions statistic for 3 of more engined-aeroplanes European registered involved in commercial air transport.

Agency is participating in ICAO Special Operations Task Force (SOTF) on extended diversion time operations. Depending on the outcome of this activity the Agency may start a rulemaking task in 2012 (publication of an A-NPA).

comment

298 comment by: *CAA-NL, SCI*

General
- Appendix I to AMC M.A.302 and AMC M.B.301(b), 6.5.6.4 (page 20) suggests that ETOPS approval can only be applicable to aircraft that are managed by a CAMO.
- AMC 20-6, 7f.(3) (page 36) suggests that ETOPS approval would only be allowed for holders of some type of operator certificate.
- NPA 20-6, 10a (page 49) provides applicability details for ETOPS operations approvals.

For clarity, propose to clearly specify in AMC 20-6 under what conditions an ETOPS approval may be granted, and, if applicable at all, in which occasions flying with which diversion time without any specific authority approval is allowed (also when not holding an operations approval).

response

Accepted

The concept of ETOPS approval applies only to AOC holders involved in commercial air transportation.
Operators with aeroplanes with MTOM> 45 tons or maximum passenger seating configuration >19 above 60 minutes diversion time are required to have an ETOPS approval.
Operators with aeroplanes with MTOM< 45 tons and maximum passenger seating configuration <19 above 180 minutes diversion time are required to have an ETOPS approval.

comment

301 comment by: *Cessna Aircraft Company*

Cessna engineering greatly appreciates the efforts to achieve harmonization with EASA and the FAA. This NPA, while similar in general scope to the recently issued FAA rules and guidance, has significant differences in detail design requirements. The greater than 180 minute requirements (see comments following) are particularly different in the design requirements between the FAA and EASA. Given the need for ETOPS to do international extended range operations, we encourage EASA to continue considering, reviewing, and updating the NPA to align it with the FAA rules and guidance as much as possible.

response

Noted

Reply will be given to detailed comments

comment

310 comment by: *AIRBUS*

We recommend:

- To better structure the AMC to clearly identify what is (S)TC holders' relevant (21, 25, E) from what is operators' relevant (OPS),
- To better explain the grandfather clause for the ETOPS type design approval,
- To propose more generic design criteria that are applicable whatever the aircraft type, generation or manufacturer,
- To better structure the design requirements by ATA or by subject. For instance, the aircraft safety analysis requirement can be found at numerous locations in the AMC 20-6,
- To replace (or complement) the IFSD curves by numerical IFSD rates objectives.

response *Partially accepted*

The concept of grandfathering existing approval is accepted. It is explained in the explanatory notes as well as in the document.
The structure of the AMC has been modified and the applicability of each chapter as well as the applicability of the entire AMC has been clarified. Inconsistencies have corrected.
objectives: CS25 text is objective and the AMC can be more specfic as it is an aceptable means (e.g. electricity provisions in the AMC have been enhanced).
After considerations, referring to such ATA classification was not found to bring any benefit compare to existing organisation of the type design provisions.
IFSD curves provide better continuity within each curve.

TITLE PAGE p. 1

comment *359* comment by: *General Electric Company*

Attachment #1

Please see attached letter

response *Noted*

PMA is a more general issue that would need further considerations.
PMA which are ETOPS related would need ETOPS consideration for their approval.
For other PMA the ETOPS reliability system would ensure the correct functioning of the parts.

A. Explanatory Note - I. General p. 3

comment *161* comment by: *ECA - European Cockpit Association*

ECA thinks that the risk of a diversion not related to engine or group 1 system failure for flights operating beyond 180 minutes from an adequate airport shall be addressed in this document also for Tris and Quads.

response *Not accepted*

The proposal for regulating LROPS was not fully demonstrated by the

Regulatory Impact Assessment done for EASA and JAA. This view was also confirmed by diversions statistic for 3 of more engined-aeroplanes European registered involved in commercial air transport.

Agency is participating in ICAO Special Operations Task Force (SOTF) on extended diversion time operations. Depending on the outcome of this activity the Agency may start a rulemaking task in 2012 (publication of an A-NPA).

comment *178* comment by: *AIRBUS*

A.I.1:
General:
"Early ETOPS" and "Accelerated ETOPS" are not new concepts, as they are already included in current AMC 20-6.

response *Accepted*

comment *209* comment by: *AEA*

Comment: AEA is very satisfied that EASA decided (unlike the FAA) to issue an NPA related to ETOPS for two engined aeroplanes only.

AEA is very satisfied that EASA decided (unlike the FAA) to use the term ETOPS for extended operations of aeroplanes with two engines only and to use the term LROPS for tris and quads operating above 180 minutes.

response *Noted*

The proposal for regulating LROPS was not fully demonstrated by the Regulatory Impact Assessment done for EASA and JAA. This view was also confirmed by diversions statistic for 3 of more engined-aeroplanes European registered involved in commercial air transport.

Agency is participating in ICAO Special Operations Task Force (SOTF) on extended diversion time operations. Depending on the outcome of this activity the Agency may start a rulemaking task in 2012 (publication of an A-NPA).

A. Explanatory Note - IV. Content of the draft Decisions p. 4-8

comment *162* comment by: *ECA - European Cockpit Association*

ECA considers that the risk related to the use of alternate aerodromes located in severe climate and remote areas shall be addressed in this NPA. In particular, needs forAirplane equipment and Passenger recovery plans should be considered to preserve the health and safety of Passenger and Crews.

response *Noted*

The Basic Regulation, which only addresses the mitigation of safety risks, does not provide the legal basis for issues related to passenger health. The Agency will nevertheless continue studying the issue with the legislator. Therefore, the Agency can currently not regulate the passenger recovery plans.

comment	*163* comment by: *ECA - European Cockpit Association* ECA thinks that the Authority shall verify that the cleared operation,including the use of particular alternate aerodromes, doesn't pose health or safety risks to Passengers and Crews. It is Regulatory matter issue rules that safeguard Passengers.
response	*Noted* The Basic Regulation, which only addresses the mitigation of safety risks, does not provide the legal basis for issues related to passenger health. The Agency will nevertheless continue studying the issue with the legislator. Therefore, the Agency can currently not regulate the passenger recovery plans.

comment	*179* comment by: *AIRBUS* A.IV.3: Development process: Consider replacing "extension of the ETOPS threshold diversion time" by "extension of the maximum ETOPS diversion time". Indeed, the ETOPS threshold diversion time (for twins) is 60 min and 180min is the maximum ETOPS diversion time in the current AMC 20-6. This maximum ETOPS diversion time is proposed for extension in this NPA.
response	*Accepted* Text amended.

comment	*225* comment by: *Walter Gessky* **1) NPA IV. 2.** As noted in IV. 2. the NPA does not contain all requirements which are proposed by ICAO state letter SP 59/4-07/47 dated 28.9.2007. EASA should provide the Ms with a proposal to inform ICAO about any deviations from ICAO SARPS before 20.11.2008. Justification: Deviation from ICAO SARPS has to be notified to ICAO.
response	*Noted* This is not yet an ICAO standard, subject to the task force where the Agency participates and the final ICAO standard, the Agency will take the appropriate action.

comment	*226* comment by: *Walter Gessky* EU-OPS gives some advice with regard to ETOPS . The following paragraphs might require to be updated to be in line with the new requirements. 1) **EU- OPS1.245(a)(1) und (2)** should be adapted to fit to the new AMC for ETOPS design approval. 2) **JAA AMC OPS 1.245(a)(2)** which give guidance for the ETOPS approval for aircraft with max 19 PAX and less 45 360 kg is not in force. Equivalent guidance for EU-OPS might be required.
response	*Noted*

The suggested amemdment to EU-OPS has already been adopted as second amemdment published as Regulation EC No. 859/2008.

comment 236 comment by: *AIRBUS*

A.IV.5:
Harmonization wiith ICAO:
ICAO ANC has decided that the EDTO provisions are to be re-examined by a group, to be formed by the Secretariat, which will be called the Special Operations Task Force (SOTF). Its objective will be to examine the proposed EDTO provisions considering the comments received from States and organizations via the State Letter, and to additionally take into account the views of stakeholders. Some of the elements retained in this NPA and considered by the Agency to be in line with ICAO State Letter may be not in line with the final EDTO provisions that will be implemented by ICAO.

response *Noted*

This is not yet an ICAO standard, subject to the outcome of task force in which the Agency participates and the final ICAO standard, the Agency will take the appropriate action.

comment 237 comment by: *AIRBUS*

A.IV.6:
Harmonization with FAA:
One of the main issues of harmonization of this NPA with FAA material is the totally different structure of the rule material. The annex 7 to the RIA (page 159 to 165 of this NPA) does not support the fact that although the EASA and FAA rules structure are totally different, most of the ETOPS requirements are actually very close. As a minimum, this RIA annex should list the identified items of differences between the two regulations and indicates that the other requirements, although presented and/or worded differently, are actually consistent.

response *Partially accepted*

The list of technical differences has been established, however, it is considered that it is not a significant difference in design.

comment 273 comment by: *Austro Control GmbH*

IV. 2.
As noted in IV. 2. the NPA does not contain all requirements which are proposed by ICAO state letter SP 59/4-07/47 dated 28.9.2007. EASA should provide the Ms with a proposal to inform ICAO about any deviations from ICAO SARPS before 20.11.2008.

Justification:
Deviation from ICAO SARPS has to be notified to ICAO.

response *Noted*

This is not yet an ICAO standard, subject to the outcome of task force in which the Agency participates and the final ICAO standard, the Agency will take the appropriate action.

comment 274 comment by: *Austro Control GmbH*

EU-OPS gives some advice with regard to ETOPS .
The following paragraphs might require to be updated to be in line with the new requirements.

1) **EU- OPS1.245(a)(1) und (2)** should be adapted to fit to the new AMC for ETOPS design approval.

2) **JAA AMC OPS 1.245(a)(2)** which give guidance for the ETOPS approval for aircraft with max 19 PAX and less 45 360 kg is not in force. Equivalent guidance for EU-OPS might be required.

response *Noted*

The suggested amendment to EU-OPS has already been adopted as second amendment published as Regulation EC No. 859/2008.

comment 299 comment by: *FAA*

1. Affected Text (Please *specify clearly the location (e.g., page number, paragraph/section number) of the proposed text affected by your comment*): Page 4 paragraph IV. 1. 5) "Harmonize with FAA and ICAO" Page 7 paragraph 6 "Harmonization with other authorities or organizations", and Annex 7 "Differences between EASA and FAA proposals relative to Design".

• 2. Comment (Please state your comment clearly and in plain language):
According to the stated paragraphs above, the EASA ETOPS NPA is harmonized with the FAA rules and associated AC's, with a few exceptions. None of those exceptions listed any ETOPS Maintenance Program requirement differences. Therefore, I expected the EASA ETOPS Maintenance Program requirements to be harmonized with the FAA ETOPS requirements. In my opinion the EASA ETOPS Maintenance Program requirements contain significant differences and are not harmonized with the FAA requirements. Additionally, the ETOPS Maintenance Program requirements as described in the EASA document are not structured in a manner that can be easily followed, or understood. For one thing, throughout this NPA it seems that an operator's normal maintenance program requirements for non - ETOPS and the specific ETOPS supplemental requirements are combined, at least in some areas, making it impossible to distinguish one from the other. When the FAA ETOPS AC 120-42A was codified into a rule package, the FAA articulated all the required ETOPS Maintenance Program supplemental requirements into one specific section of the new rule package. Additionally, we followed up the rule requirements with an amended AC (120-42B) that articulates in specific sections not only the rule requirements, but what each facet or element is needed to constitute a viable program for each and every ETOPS supplemental requirement. Furthermore, in my opinion, there is no clear distinction between regulatory requirements versus advisory recommendations within the EASA NPA, nor do I believe the European operators will be able to understand and follow this NPA. Furthermore it appears to me there are significant technical differences between FAA requirements versus EASA requirements. Much of the specific NPA verbiage seems to have been extracted from the original ETOPS 120-42A AC, and has not embellished our current requirements and guidance. It is my recommendation that EASA delay issuance of this NPA, proceed with harmonization meetings to promote harmonization, and consider rewriting this

document to coincide with the FAA ETOPS Maintenance Program requirements. Note: The following six comment sheets articulate only **some** of the specific areas that I believe EASA should consider revising, either because they are confusing, or they contain technically incorrect information. Due to a limited comment time period, and other commitments, my comments are limited in number, and do not include justification, or alternative text.

3. Justification (Please provide support for your comment):

4. Proposed Alternative Text (If any):

•5. Person Providing Comment (Include routing symbol):
Mario L. Giordano , FAA Safety Inspector (AFS-303)

response

Noted

The structure of the AMC has been modified and the applicability of each chapter as well as the applicability of the entire AMC has been clarified. Inconsistencies have corrected.

comment

335 comment by: *FAA*

1. Affected text: Page 4, A. IV. 2. IV. Content of the draft Decisions 1. Regulatory Background
The following main directions were followed by the working group:

2) Assess the impact of the increase of range of modern two-, three- and four-engined aeroplanes on new long haul routes, in particular in severe climate areas;

2. Comment: Thank you for the opportunity to comment The FAA acknowledges the differences between the FAA rules and that of EASA. Specifically the EASA rule does not address three and four-engine aircraft and that it does not address severe climate airports, and therefore passenger recovery plans

3. Justification:

4. Proposed Alternative Text:

5. Person Providing Comment: Robert Reich, Assistant Manager, Operations Seattle Aircraft Evaluation Group

response

Noted

The proposal for regulating LROPS was not fully demonstrated by the Regulatory Impact Assessment done for EASA and JAA. This view was also confirmed by diversions statistic for 3 of more engined-aeroplanes European registered involved in commercial air transport.

Agency is participating in ICAO Special Operations Task Force (SOTF) on extended diversion time operations. Depending on the outcome of this activity the Agency may start a rulemaking task in 2012 (publication of an A-

NPA).

comment

338 comment by: *FAA*

1. Affected text: Page 5. Note A. IV.2. 2) and 3) The origination of the proposal included in this NPA.

After several discussions between European air transport industry, EASA and CJAA, the JAA ETOPS/LROPS Ad Hoc Working Group was recommended to split the initial proposal (included in JAA NPA-OPS 40 ETOPS/LROPS) into three separate subjects:
1) The extension of the ETOPS diversion time for two-engined aeroplanes (twins) beyond 180 minutes.
2) The extension of the provisions of the ETOPS NPA to three-engined aeroplanes (tris) and four-engined aeroplanes (quads) (LROPS) to be progressed in a separate A-NPA.

2. Comment: The FAA is pleased to see that although the regulatory schemes within the FAA and the Proposed NPA are not completely harmonized, the issues alternate Aerodromes located in severe climate areas and provisions for three-engine and four-engine LROPS has not been dropped, but rather are to be "progressed in a separate NPA". The FAA looks forward with interest on this process of "progress" on the LROPS and passenger recovery issues.

3. Justification:

4. Proposed Alternative Text:

5. Person Providing Comment: Robert Reich, Assistant Manager, Operations Seattle Aircraft Evaluation Group

response

Partially accepted

The proposal for regulating LROPS was not fully demonstrated by the Regulatory Impact Assessment done for EASA and JAA. This view was also confirmed by diversions statistic for 3 of more engined-aeroplanes European registered involved in commercial air transport.

Agency is participating in ICAO Special Operations Task Force (SOTF) on extended diversion time operations. Depending on the outcome of this activity the Agency may start a rulemaking task in 2012 (publication of an A-NPA).

Related to the passenger recovery plan, the Basic Regulation, which only addresses the mitigation of safety risks, does not provide the legal basis for

issues related to passenger health. The Agency will nevertheless continue studying the issue with the legislator. Therefore, the Agency can currently not regulate the passenger recovery plans.

A. Explanatory Note - V. Regulatory Impact Assessment p. 8-9

comment *181* comment by: *AIRBUS*

A.V.2:
Regulatory Impact Assessment:

- What is the additional flexibility on one-engine-out speed introduced by this NPA?
- Consider replacing "180 min threshold diversion time" by "180 min maximum diversion time"

response *Noted*

The one-engine-out speed flexibility was introduced in the 2nd amendment of EU-OPS (OPS 1.245(b)). The RIA was initally developed to asses the impact of the whole package (Proposed amendment to regulation as well as associated AMCs).

Your comment regarding the minor change to RIA is noted. However, the proposed change does not affect the intend of the RIA.

B. DRAFT DECISIONS p. 10

comment *1* comment by: *Francis Fagegaltier Services*

General comment on the whole NPA.

The word "propeller" is used (only) once (table 1 of annex 6 of RIA being, of course, excluded) : this seems to show that the concept of ETOPS would also be relevant to "turbo-propeller" aircraft. But, nowhere in these proposals we find inputs provided by the propeller type certificate holder. And there is no proposed changes to CS-P in a manner similar to what is being proposed for CS-E.

This was a comment made by the JAA Engine Study Group to JAA Headquarters by letter ESG 01/29 dated 22 August 2001 in relation to the ETOPS/LROPS package (quote *We also noted that the proposal did not address JAR-P (does ETOPS/LROPS preclude the use of turbo-prop aircraft ?).* unquote).

Some propeller may be very large and complex, as ilustrated by the propeller installed on Airbus A400M aircraft. And, contrary to JAR-21, Part 21 mandates the issuance of a separate type certificate for the propellers.

Can this proposal be clarified with regard to the role of the propeller type certificate holder ?

response *Noted*

The AMC does not prevent any propeller-driven aeroplane, as turbo-propeller, as an application for ETOPS certification. The concerned manufacturers have not commented on this NPA.

comment *10* comment by: *Francis Fagegaltier Services*

In 2001, the JAA Engine Study Group (ESG) made the below copied comment to JAA Headquarters. This comment would also be valid against this NPA (JAR-APU being of course replaced by CS-APU).
quote
We noted that the proposal did not address JAR-APU (are not APUs important for such operations ?).
Unquote
Indeed, there are texts involving the APU designer, for example the mandatory 3000 cycles tests on the APU.
Can this proposal be clarified with regard to the role of the APU ETSO holder ? (note : although APUs are granted an ETSO authorisation, all actions are done "as if" the APU had a TC : see 21A.604.

It is believed that at least the 3000 cycles tests should be part of CS-APU.

response *Not accepted*

The Agency considers that the AMC is already appropiate with regards to APU installation as part of the type design approval.

comment *32* comment by: *Francis Fagegaltier Services*

General comment on use of the word "authority".

The whole NPA lacks consistency in this use.

We find "Authority", "competent Authority", "certification authority", "certification authority / agency", "appropriate authority", "verifying authority", "Authority / Agency", etc.

Agency is (of course!) defined as well as competent authority (Part 21 paragraph 21.1). The others are not.

Clarification would be appropriate.

response *Accepted*

The term 'competent authority' will be used.

B. Draft Decisions - I. Draft Decision amending AMC and GM to Part 217 p. 11

comment *2* comment by: *Francis Fagegaltier Services*

AMC 21A.3 (a), paragraph (a)

The wording "which includes extended range operation with two-engined aeroplane (ETOPS) capability" is not adequate in relation to engine TC holders. Furthermore, they cannot "ensure the initial and continued fleet compliance

with the applicable ETOPS reliability objectives" : this task is under the aircraft TC holder's responsibility.

This AMC material should be further developped to clearly separate obligations of the engine TC holder, of the propeller TC holder (if relevant), of the APU ETSO authorisation holder and of the aircraft TC holder. The relationship between these four players should also be addressed with regard to surveillance of the ETOPS fleet.

May be, some words as follows would clarify the subject :
Holders of engine type certificates having certified an engine model in compliance with the specifications of CS-E 1040 ETOPS should specifically track the in-service occurrences which would affect the continued compliance of this engine model with CS-E 1040, as part of the system for collection, investigation and analysis of data required by 21A.3 (a).
Engine TC holder should then inform the aircraft TC holder of any event affecting such compliance with CS-E 1040.
+
Similar words for propeller TC holders (but ... what is the equivalent of CS-E 1040 ?)
+
Similar words for APU ETSO authorisation holders (but ... what is the equivalent of CS-E 1040 ?)

+
Holders of aircraft type certificates having aircraft models operating under ETOPS rules should implement a specific tracking, reporting and resolution system for ETOPS significant occurrences, suitable to ensure the initial and continued fleet compliance with the applicable ETOPS reliability objectives. This system should be part of the system for collection, investigation and analysis of data required by 21.A.3(a). These aircraft TC holders should take account of the information on engine, APU and propellers installed in the ETOPS fleet provided by engine, APU and propeller certificate holders.

response *Partially accepted*

The AMC is amended to include the need for cooperation between the aircraft TC holder, the engine TC holder and when relevant the propeller TC holder and APU ETSO authorisation holder.

comment *3* comment by: *Francis Fagegaltier Services*

AMC 21A.3 (a), paragraph (b)
As far as "reporting" is concerned, the reference to AMC 20-6 seems to be insufficient in relation to the timing of this reporting. Indeed, the "96 hours" reaction time has been deleted from AMC 20-6 but appears in Appendix I to AMC M.A.302 and AMC M.B.301 (b). How does this fit with the "72 hours" specified in 21A.3 ?

This should be clarified in this AMC 21A.3 (a).

response *Accepted*

Reporting requirements are amended to read 72 hours.
Regarding the proposal for cross refer to the AMC to Part-M, it is not relevant

anymore because the proposed amendments to AMCs and GMs to Part-M and Part-145 have been included in the Operations chapter of the new structure.

comment

182 comment by: *AIRBUS*

I:
AMC & GM to Part 21:

- There is no reference to the approval of documentary changes to the CMP. Airbus considers that there should be guidelines to allow a DOA applicant to develop its own internal procedure, in order to obtain the associated privilege under 21A.263(c)(4).
- Numbering of sub-paragraphs (a) and (b) seems incorrect - Shouldn't it be (1) and (2) instead?

response

Partially accepted

Agreed with numbering comment sub-paragraphs should be (1) and (2)

Privilege 21A.263(c)(4) is associated with the approval of documentary changes to the aircraft flight manual and is therefore not applicable to the CMP. It should be noted that AMC 20-6 Appendix 1 para 6.c defines minors changes to and permits minor changes to a CMP to be authorised by a DOA which is then permitted under privileges 21A.263(c)(3) when included in the DOA terms of approval.

resulting text

AMC 21A.3(a) Collection, investigation and analysis of data related to ETOPS significant occurrences

(1) (1)Holders of a type-certificate, restricted type-certificate, supplemental type-certificate or any other relevant approval deemed to have been issued under Part 21 and which includes extended range operation with two-engined aeroplane (ETOPS) capability should implement a specific tracking, reporting and resolution system for ETOPS significant occurrences, suitable to ensure the initial and continued fleet compliance with the applicable ETOPS reliability objectives. This system should be part of the system for collection, investigation and analysis of data required by 21.A.3(a).
Appropriate coordination should exist between Engine TC holder, propeller TC holder and APU ETSO approval holder with the aircraft TC holder to ensure compliance with the ETOPS reliability objectives.

(2) (2) For tracking, reporting and resolution of ETOPS significant occurrences refer to EASA AMC 20-6

B. Draft Decisions - II. Draft Decision amending CS-Definitions p. 12

comment

4 comment by: *Francis Fagegaltier Services*

Definition of 'ETOPS Configuration, Maintenance and Procedures (CMP) Standard'

This "wording" is never used in this NPA except in this proposed definition in CS-definitions and in paragraph 4 terminology of AMC 20-6. Note that these two definitions are not 100% identical.

Why is there is need to define a "wording" which is never used ?

response *Partially accepted*

The definition of CMP document has been removed from CS-DEF and only appears in AMC 20-6. Therefore, the inconsistencies have been corrected.

comment *5* comment by: *Francis Fagegaltier Services*

Definition of 'ETOPS Configuration, Maintenance and Procedures (CMP) Standard'

Beside the other comment on need for such an unused definition, it must be noted that the proposed wording is really unclear.

In relation to grammar, what is the meaning of "the particular aeroplane or engine configuration minimum requirements" ?

In relation to the technical aspects, what are these "minimum requirements", in particular in the EU legal framework where CS-25, CS-E ..., AMC to Part 21 / 145 ... are not binding ?

It is noted that this definition does not address propellers or APUs. This seems to be wrong.

response *Not accepted*

The wording is correct in that in accordance with the proposed amendment to CS-E an engine may be declared capable with an ETOPS rating and recorded in the TCDS.

Within the EU legal framework the minium requirements are those to comply with regulation (EC) 216/2008 Article 20.1(a), that is the applicable airworthiness codes and any special detailed technical specification necessary

Definition has been amended to replace aeroplane or engine by airframe-engine combination..

comment *6* comment by: *Francis Fagegaltier Services*

'ETOPS (Extended Range Operations for Two-Engined Aeroplanes)'

What is the "Authority" which is referenced in this definition ? See general comment on use of the word "authority".

response *Accepted*

The term 'competent authority' will be used.

comment *7* comment by: *Francis Fagegaltier Services*

'Adequate Aerodrome'

The last part of this definition ("at the expected time of use, ...emergency services") is not relevant to a definition. It seems to be advisory material for

	the word "satisfactory". This sentence should be deleted from the definition and located elsewhere in this package, as appropriate. What are these "applicable performance requirements" ? Performance of the operator ? Performance of the aerodrome ? Performance of the aircraft ? Else ? Meaning of "requirements" in the EU legal framework ? All this should be clarified. In addition, it is noted that the adequate aerodrome is not consistently written with capital letters throughout these proposals.
response	*Accepted* The definition for Adequate Aerodrome will be deleted from CS-DEF and AMC 20-6.

comment	*136* comment by: *UK CAA* There are no definitions of 'Early' or 'Accelerated ETOPS' There needs to be clear definitions of what are "Early" and "Accelerated" ETOPS in this draft decision
response	*Not accepted* There is not need for definitions in CS-DEF as Early and Accelerated ETOPS are concepts which are well explained in the AMC 20-6.

comment	*137* comment by: *UK CAA* Approved by the Authority (ETOPS approval) is incorrect justification: This should refer to the Competent Authority Proposed text: N/A however there are multiple similar incorrect references to "the authority" throughout the document, which should be referred to as the competent authority.
response	*Accepted* should read Competent Authority. See response to Comment 32.

comment	*164* comment by: *ECA - European Cockpit Association* ECA thinks that this definition of adequate aerodrome is not suitable: there sould be a minimum ICAO category for RFFS depending on the type of aircraft, a maximum time of notice in case it is not located on the airport, etc.
response	*Accepted* The definition for Adequate Aerodrome is deleted from CS-DEF and AMC 20-6. Appendix 4 section 8 diversion decision making contains a reference to minimum RFFS category.

comment	*183* comment by: *AIRBUS* II: CS-Definitions: Definition of "ETOPS CMP standards" is incorrect and incomplete. Indeed, "CMP standard" does not mean only the configuration minimum requirements. The CMP contains particular aircraft or engine minimum requirements, including the configuration, maintenance, flight crew procedures and dispatch restrictions found necessary by the Agency to establish the suitability of an airframe/engine combination for ETOPS. Another definition should be added: "Adequate ETOPS (en-route alternate) aerodrome". This term is used at numerous places in this NPA but is not clearly defined in this NPA. Harmonization with JAR-OPS 1.192 should also be targeted. See also comment made on AMC 20-6 § 4 (Terminology).
response	*Partially accepted* ETOPS CMP text to be amended to include operating and maintenance procedures The definition of CMP will not be added to CS-DEF as it is already defined in AMC 20-6. Definition of adequate aerodrome is removed from AMC 20-6

comment	*228* comment by: *Walter Gessky* **1) CS-DEF** Add a definition for Accelerated ETOPS. Justification: For a better understanding and clarification.
response	*Not accepted* There is not need for definitions in CS-DEF as Early and Accelerated ETOPS are concepts which are well explained in the AMC 20-6.

comment	*229* comment by: *Walter Gessky* ~~**1) CS-DEF**~~ ~~Add a definition for Accelerated ETOPS.~~ ~~Justification:~~ ~~For a better understanding and clarification.~~ Added twice by error.
response	*Noted*

comment	*275* comment by: *Austro Control GmbH* Add a definition for Accelerated ETOPS. Justification: For a better understanding and clarification.
response	*Not accepted* There is not need for definitions in CS-DEF as Early and Accelerated ETOPS are concepts which are well explained in the AMC 20-6.

resulting text

'ETOPS (Extended Range Operations for Two-Engined Aeroplanes)' means those operations of two-engined aeroplanes that are approved by the Competent Authority (ETOPS approval), to operate beyond the threshold distance determined in accordance with operational requirements from an "Adequate Aerodrome".

B. Draft Decisions - III. Draft Decision amending CS-25 p. 13

comment *8* comment by: *Francis Fagegaltier Services*

This proposal is not adequate for CS-25. Indeed it seems to be applicable to the applicant for an ETOPS approval : such an applicant is usually an airline. Operators are not subject to CS-25.

Was the intent to say something like this :

CS 25.1535
To determine an aircraft configuration capable of ETOPS, the following must be complied with :
(a) The aircraft type design must comply with all of the CS-25 specifications while considering the maximum mission time and the longest diversion time considered for ETOPS.
(b) An analysis of the crew workload and operational implications of continued operations with failure effects must be performed for the longest diversion time which is considered for ETOPS.
(c) The aircraft on-board facilities must be capable of fulfilling the flight crew's and passengers' physiological needs for the whole duration of the flight including the longest diversion time.
(d) Appropriate limitations must be established.

response *Partially accepted*

The text proposed by the commentator is more appropriate for CS material. CS material is addressing products not applicants. Text will be amended accordingly . However reference will be made to suitability for ETOPS to keep consistency with AMC-20.

comment *184* comment by: *AIRBUS*

III:
CS 25.1535:

- The definition of "maximum mission time" is not given in the AMC 20-6. This definition should be added with consideration (for the sake of harmonization) to the definition proposed by the FAA in the draft AC 25.1535.
- The NPA does not provide explanations on how to consider this new CS 25.1535 vs. current ETOPS type design approval granted against the current AMC 20-6 (formally named IL 20). It is our understanding that the new EASA ETOPS regulation does not affect the current ETOPS approval hold by (S)TC holders. Yet, it is not clear whether current ETOPS approval hold by (S)TC holder are implicitly considered as compliant with CS 25.1535. For instance, the paragraph 10 of the AMC (Operational Approval Consideration) will be applicable to any new ETOPS operational approval program, for airplane-engine combinations

that were approved either against the old AMC 20-6 or the new §25.1535. Yet, many reference are made to CS 25.1535 in this paragraph, which will probably bring confusion for airplane-engine combination, which have never been certified, against this paragraph. The EASA mechanisms should be explained as it was done by the FAA in the § 25.3 and the draft AC 25.1535.

response *Accepted*

The words "maximum mission time" have been replaced by the "maximum flight duration" time which is consistent with wording used in AMC 25.1309.
The applicability of 25.1535 is defined by Part-21. It is not the intention to invalidate existing approvals.

comment *185* comment by: *AIRBUS*

IV:
CS E.1040:

- Additional information should be provided (e.g. in the AMC 20-6) to explain the applicability of this paragraph. In these explanations, consideration can be given to the equivalent FAA §33.201 and the associated draft AC 33.201, which require an ETOPS certification of the engine only for aircraft following the Early ETOPS method.
- It may be confusing to indicate in this paragraph that the IFSD rate is function of the maximum mission time: the IFSD rate is mainly function of the diversion time as it is indicated in the curves given in the Appendix 1 of the AMC. We acknowledge that the formula uses in this Appendix 1 are also dependant of the maximum flight time, but in a less extent than the diversion time. For sake of simplification and also consistency with the FAA, a simple relation to the diversion time would be beneficial.
- As for CS 25.1535, can EASA explain what are the grand-father processes for this new CS E.1040?

response *Noted*

Applicability is defined in Part-21. There is no intention to invalidate existing approvals.
Concerning the calculation of the IFSD we keep the reference to both maximum duration and longest diversion time as both are parameters of the IFSD curve.

comment *232* comment by: *Walter Gessky*

1) CS 25.1535 ETOPS Approval
Wording should be changed to ETOPS **Design** Approval.

Justification:
In AMC20-6 this is refered to as ETOPS Type Design Approval. To avoid confusion because design approval does not automatically include approval for ETOPS operation.

2) CS25 25.1535 ETOPS Approval

Add the following:
(d) ETOPS capability and limitation should be published in the Aircraft Flight Manual
Justification:
CS 25 or its guidance material should require that the ETOPS capablity and limitations be specified in the Aircraft Flight Manual.

response *Partially accepted*

Text to be modified accordingly.
Limitations must be established, it seems implicit that they need to go in the AFM. AMC 20-6 does clarify this.

comment *276* comment by: *Austro Control GmbH*

1) CS 25.1535 ETOPS Approval
Wording should be changed to ETOPS **Design** Approval.

Justification:
In AMC20-6 this is refered to as ETOPS Type Design Approval. To avoid confusion because design approval does not automatically include approval for ETOPS operation.

2) CS25 25.1535 ETOPS Approval
Add the following:
(d) ETOPS capability and limitation should be published in the Aircraft Flight Manual

Justification:
CS 25 or its guidance material should require that the ETOPS capablity and limitations be specified in the Aircraft Flight Manual.

response *Partially accepted*

Text to be modified accordingly
Limitations must be established, it seems implicit that they need to go in the AFM. AMC 20-6 does clarify this.

resulting text

CS 25.1535 ETOPS Design approval

To determine an aircraft configuration capable of ETOPS, the following must be complied with :

(a) Comply with the requirements of CS-25 considering the maximum flight duration and the longest diversion time for which approval is being sought.

(b) Consider crew workload and operational implications and the flight crew's and passengers' physiological needs of continued operations with failure effects for the longest diversion time for which approval is being sought.

(c) Establish appropriate capability and limitations.

(See AMC 20-6)

B. Draft Decisions - IV. Draft Decision amending CS-E p. 14

comment 9 comment by: *Francis Fagegaltier Services*

In 2001 the JAA Engine Study Group (ESG) made the below copied comment to JAA Headquarters. This comment is still valid against the proposed CS-E 1040.
quote
The ESG support the principle and would be ready to study any proposal for inclusion of text into JAR-E. However, it should be noted that JAR-E covers only the engine type design and not the aircraft parts which make up the powerplant installation. Some engine in-flight shut-downs are caused by aircraft parts or systems (including the crew); such cases cannot be addressed by JAR-E and this proposal needs to be developed accordingly.
Unquote
Indeed, the proposed CS-E 1040 imposes that "each applicant .. must show that the engine **will achieve** an IFSD rate ...". If this "applicant" is the operator, then CS-E is not applicable to him. If this "applicant" is the aircraft TC holder, then CS-E 1040 is not applicable to him. If this "applicant" is the engine TC holder, then it is impossible for him to comply because many IFSD are not engine related : the engine TC holder cannot take responsibility for aircraft parts or for crew actions.

This proposal must be entirely re-written.

Proposals will be made in relation to other comments.

response *Partially accepted*

Text has been amended to reflect the present CS style. However the commentator did not propose any revised text.

resulting text

CS-E 1040 ETOPS

In order to be approved for ETOPS capability, the engine shall achieve an IFSD rate that is compatible with the safety target associated to the maximum flight duration and the longest diversion time for which approval is being sought.

(See AMC 20-6)

B. Draft Decisions - V. Draft Decision amending AMC to Part M p. 15

comment 186 comment by: *AIRBUS*

AMC to Part M:
General:
Some key elements of the ETOPS maintenance requirements seem to be missing or are not sufficiently explicit in the AMC to Part M: ETOPS service check (although mentioned in the ETOPS training program, Annex 6 to the AMC 20-6), IFSD rates objectives (Appendix 1 to the AMC 20-6 does not clearly distinguishes the manufacturer's relevant requirements from the operators' ones).

response *Accepted*

Text amended.

comment *218* comment by: *AEA*

Section: "V. Draft Decision amending AMC to Part M" "AMC 20-6"

Comment: Along the proposed "V. Draft Decision amending AMC to Part M", is used the term: ETOPS Maintenance Significant System, but there is no definition at all of the concept of "Maintenance" Significant System; except for paragraph 6.5.6.4 (ref page 20/165), where is written: "an ETOPS maintenance Significant System is (see also AMC 20-6)" ... and a very synthetic definition is provided.
The problem is that the proposed amended AMC 20-6 never recall the terminology and definition of ETOPS "Maintenance" Significant System.

Proposal: (AMC 20-6 Terminology)
Add reference and description of ETOPS Maintenance Significant System (or better to the "Minimum ETOPS Maintenance Significant Item List").

response *Accepted*

The term Maintenance Significant System does appear in AMC 20-6, however the term Significant system is used. The word "maintenance" to be removed. Note the proposed amendments to AMCs and GMs to Part-M and Part-145 have been included in the Operations chapter of the new structure

comment *302* comment by: *FAA*

1. Affected Text (Please *specify clearly the location (e.g., page number, paragraph/section number) of the proposed text affected by your comment*):
Page 15, AMC M.A.302(c) Maintenance programme compliance

a) contain the standards, guidance and direction necessary to support the intended
operations. Specific ETOPS tasks identified by the (Supplemental) Type Certificate
Holder in the Configuration, Maintenance and Procedures document (CMP) or equivalent, should be included in the programme and identified as ETOPS tasks as
applicable;

2. Comment (Please state your comment clearly and in plain language):
The paragraph's wording is confusing. I don't understand why "Supplemental" is included. Furthermore, the sentence is not clear. I believe you mean the **operator's** program should contain the guidance and direction necessary to support the **operator's** intended operations. Furthermore, the statement that the CMP tasks or equivalent should be included in the program is confusing. First of all, I believe you mean the CMP task, or equivalent should be incorporated into the **operator's** program. Secondly, there is no equivalent to a CMP task. An ETOPS operator must incorporate all applicable CMP items/tasks.

3. Justification (Please provide support for your comment):

4. Proposed Alternative Text (If any):

•5. Person Providing Comment (Include routing symbol):
Mario L. Giordano, FAA Safety Inspector (AFS-303)

response

Noted

The word Supplemental is used to allow for the possibility that an aeroplance has been modified to an ETOPS airworthiness standard by an organisation other than the TC holder.
The term maintenace programme within the AMC refers to the operators maintenance programme. Note the proposed amendments to AMCs and GMs to Part-M and Part-145 have been included in the Operations chapter of the new structure

resulting text

See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC to Part M - AMC M.A.302(c) Maintenance programme compliance p. 15

comment

11 comment by: *Francis Fagegaltier Services*

In 7 (a), what is this "direction" on first line ? If this word is used with the dictionnary meaning of "explicit instruction, order", would that be appropriate for an AMC ? Should not that become part of a text of higher level in the hierarchy of EU texts?

response

Accepted

Agreed the term direction could be miss leading, text to read
.. contains the standards, guidance and instructions necessary.....

comment

12 comment by: *Francis Fagegaltier Services*

In 7 (a), the words Configuration, Maintenance and Procedures have capital initial letters which could be understood as refering to a defined "wording". But nowhere these "Configuration, Maintenance and Procedures" are defined.

This "Configuration, Maintenance and Procedures document" is unknown and this should be made clear to the reader.

Note : there are 8 occurrences of "Configuration, Maintenance and Procedures" in this NPA. 2 associated with "standard" , 3 alone, 2 associated with "document" and 1 deleted.

response

Accepted

Agreed, when written in full the term ETOPS Configuration, Maintenance and Procedures should be used. Referring to the document CMP is well known in the ETOPS context

comment

83 comment by: *Boeing*

Page 15. REQUEST FOR CHANGE #1:

Boeing suggests changing paragraph 7.(b) to read as follows:

(b) preclude identical errors being applied to multiple similar elements ~~**in any**~~ **where applicable in systems identified as** ETOPS maintenance significant system, for example staggering of identical tasks; and;...

We also suggest adding a NOTE after paragraph 7.(c) to read:

NOTE: An ETOPS Maintenance Significant System is:
1) A system for which the redundancy characteristics are directly linked to the number of engines. OR
2) A system that may affect the proper functioning of the engines to the extent that it could result in an in-flight shutdown or uncommanded loss of thrust. OR
3) A system, which contributes significantly to the safety of a diversion.

JUSTIFICATION: Operators should look at the task and determine if they are susceptible to human factor error, and use a practical approach to protecting against these concerns. Also, an *ETOPS Maintenance Significant System* is not defined elsewhere in the AMC.

Page 15. REQUEST FOR CHANGE #2:
Boeing suggests deleting paragraph 7.(c) altogether.

JUSTIFICATION: Maintenance procedures for pressurisation sealing features are analyzed in the MSG-3 process for maintenance intervals and listed in the Maintenance Planning Data (MPD). Operators perform inspections based on their approved maintenance program as tailored to their experiences. Procedures that make sense for one operator may not for another. There are no similar requirements under any other ETOPS regulation.

In the highly unlikely event that a revision to the inspection interval was somehow based on ETOPS operation, that revision would be identified in supporting ETOPS documentation. These tasks are not specific or unique to ETOPS.

response

Partially accepted

Change #1 partially accepted.
The text of the paragraph has been deleted as a result of the comment no. 187
Change #2
Agreed to delete paragraph (based MSG, it is normally considered as ETOPS significant system and it is normally part of the CMP)

comment *187* comment by: *AIRBUS*

M.A.302(c)7:
Maintenance Program Compliance:
§7.(a) Maintenance Program - task identification

- It is required that « specific ETOPS tasks identified in the CMP » should

	be identified as ETOPS tasks. Do we have to consider any task listed in the CMP, or tasks which are solely listed in the CMP? As per AMC 145.A.30(e), the ETOPS Maintenance tasks have to be identified in order to ensure that these tasks are performed by ETOPS qualified personnel. This paragraph §7(a) seems to indicate that only specific ETOPS tasks (i.e. in addition to the basic maintenance program developed for TC) listed in the CMP are to be identified as ETOPS tasks in the maintenance program. This sentence is confusing, and further clarification on the identification process of these tasks is required. An ETOPS Maintenance task could be an ETOPS specific task or/and a maintenance task affecting an ETOPS significant system. An ETOPS specific task could be either an existing task with a different interval for ETOPS, a task unique to ETOPS operations, or a task mandated by the CMP further to the in-service experience review (note that in the case ETOPS is considered as baseline in the development of a maintenance program, no "ETOPS specific" task may be identified in the MRB). Guidelines are also needed to clarify how the list of ETOPS significant systems should be considered in the identification of those tasks. §7.(b) Maintenance Program - ETOPS Maintenance Significant System • The added value of this paragraph is questionable, as it is already a requirement for all operations as per 145.A.65: "With regard to aircraft line and base maintenance, the organisation shall establish procedures to minimise the risk of multiple errors and capture errors on critical systems, and to ensure that no person is required to carry out and inspect in relation to a maintenance task involving some element of disassembly/reassembly of several components of the same type fitted to more than one system on the same aircraft during a particular maintenance check. However, when only one person is available to carry out these tasks then the organisation's work card or worksheet shall include an additional stage for re-inspection of the work by this person after completion of all the same tasks." • Consider the addition of a cross reference to App I (to AMC M.A.302 and M.B.301(b)) for a definition of an "ETOPS Maintenance Significant System". What is an "ETOPS Maintenance Significant System" (Part M) vs. an "ETOPS significant Systems" (Part 25)? Further explanation should be given. What is the added value of introducing a new term? Up to now, manufacturers provide the operators with a "recommended" list of ETOPS significant systems, that the operator uses as baseline to develop its own list of ETOPS significant systems based on its own experience. This principle has been kept by the FAA as explained in the draft AC 120-42B. We do not recommend creating a new term for a concept that should not be changed by the publication of the new ETOPS regulation. §7.(c) Maintenance Program - Cargo compartment inspection • Airbus does not support the introduction of this paragraph, as it is not an ETOPS specific requirement. Integrity of cargo compartment liners is a basic airworthiness issue, which should be addressed by the aircraft maintenance program for both ETOPS and non-ETOPS.
response	*Partially accepted*

§7.(a) agreed, text amended.
An ETOPS Maintenance task could be an ETOPS specific task or/and a maintenance task affecting an ETOPS significant system. An ETOPS specific task could be either an existing task with a different interval for ETOPS, a task unique to ETOPS operations, or a task mandated by the CMP further to the in-service experience review (note that in the case ETOPS is considered as baseline in the development of a maintenance program, no "ETOPS specific" task may be identified in the MRB).

§7.(b) agreed to delete paragraph.

§7.(c) agreed to delete paragraph.

comment *212* comment by: *AEA*

Comment: we fully understand the importance of this required. However it is not unique for ETOPS. The fire suppression capability of all long range aeroplanes regardless the number of engines is affected if the cargo compartment integrity is degraded beyond certain limits.

Note: we assume that the future release of the LROPS NPA for tris and quads will contain this requirement as well.

Proposal: Include such requirement in a section applicable for all aeroplanes regardless the number of engines**.**

response *Partially accepted*

Paragraph 7(c) deleted, any specific requirements to maintain cargo holds, pressurisation systems etc will be included in the CMP and operator/CAMO is not required to develop specific tasks.
The 2nd comment is out of the scope of this NPA.

comment *216* comment by: *AEA*

This comment applies to several sections:
- AMC M.A. 302 (c), par. 7;
- AMC M:B. 301 (b), par. 7;
- Appendix I to AMC M.A. 302 and AMC M.B. 301 (b), par 6.5.6.4:

Comment: Both current and proposed ETOPS rules require operators to establish their own list. This may cause to include many items or, worse, to have a very short list. Therefore the definition of the ETOPS system list is crucial to enhance the level of safety of the ETOPS operation.
Since it is evident that most of the items in the ETOPS list *must be* the same for any operator of a particular aircraft/engine combination, it is our opinion that a "*minimum ETOPS Maintenance Significant Item list***"**, should be established by the manufacturer and approved by the Authority during the certification process, in order to provide with minimum+clear requirement, common through the industry.

Also it is our opinion that the list should not address a generic system (ATA, Sub-ATA), but it should include only those components which effectively may lead a system to be non-operative in flight. This will permit to focus on the component effectively significant to ETOPS operation.
For example: components which may be handled by applying the MEL with no

ETOPS restriction should not be reported, therefore should not be included in the ETOPS system list, (just as an example: for B777 MEL 21-61-03 Cabin Zone Temp. Control System; 21-62-02 TRIM Air PRSOV; ecc.).

Furthermore, it is important to remember that the list is required for several different scopes, which may be another source of potential error:

- A) Task identification (Maintenance programme)
- B) Dual Maintenance procedure
- C) Verification Programme *(Resolution of Airplane Discrepancy)*
- D) ETOPS Reliability Program (reporting to Authority)

Proposed minimum list will have many positive consequences like:

- - provide operators with common criteria and base line;
- - avoid any possible reporting and investigation omission (or excess);
- - avoid any possible dual maintenance task omission (or excess);
- - avoid any possible verification programme task omission (or excess);
- - facilitate operators new for a specific aircraft/engine combination when considering of introducing new ETOPS aircraft into their fleet;
- - enhance the general safety by reducing misunderstanding, omission, ecc.

Proposal: Minimum ETOPS Maintenance Significant Item List established by the manufacturer and approved by the AA. To be included into the CMP

response *Partially accepted*

The intent of the AMC material is to achieve the condition as described by the commentator.
The list of ETOPS significant system is not included in the CMP however, the (S)TC holder should produce a list as specified by this AMC 20-6

comment *291* comment by: *CAA-NL, SCI*

AMC M.A.302(c), 7(c)
Page: 15
If the aircraft design is certified for ETOPS, then there must be instructions for continuing airworthiness recommended by the TC-holder to ensure continued compliance with the requirements for ETOPS. M.A.302(c)1 then already mandates the incorporation of such recommendations into the aircraft maintenance program. If such instructions do not include any specific tasks to maintain e.g. the integrity of cargo compartment and pressurisation features, then there should be no need for the CAMO/owner to 'design' its own instructions. This proposed AMC suggests otherwise.
This NPA, as well as AMC 20-6, seems to be written such that also an operator can apply for ETOPS approval, even without an ETOPS type design approval. The burden of proof then lies with the operator also for the ETOPS type design requirements. The (lack of) segregation of the two types of requirements is sometimes confusing however. One would think that the requirement in above AMC is included to cover the specific case for an operator ETOPS approval without an ETOPS type design approval. Propose to clarify this in the text.

response *Accepted*

Paragraph 7(c) deleted, any specific requirements to maintain cargo holds, pressurisation systems etc will be included in the CMP and operator/CAMO is not required to develop specific tasks.

resulting text: See resulting text in Appendix A

B. Draft Decisions - Draft Decision amending AMC to Part M - AMC M.A.302(d) Maintenance programme-reliability programmes p. 15-16

comment 13 comment by: *Francis Fagegaltier Services*

In opening paragraph of §6, for the understanding of the average reader, what are "RVSM", "MNPS" and "RNP" which do not appear in CS-Definitions ?

response *Noted*

The terms Reduced Vertical Separation Minimum, Minimum Navigation Performance Specification, Required Navigation Performance are examples of specific type of operations where an approval by the competent authority is required in order to carry out such operation. It is assumed that those organisations maintaining aeroplanes for which an ETOPS approval is sought, will be familiar with these terms and other that require competent authority approval prior to commencing operations.

comment 14 comment by: *Francis Fagegaltier Services*

In paragraph 6 (a), the grammar of "engine oil consumption and condition monitoring programmes" is not clear enough for the understanding of the intent. In particular it is difficulty to determine which "condition" is to be considered : oil condition ? Engine condition ? Aircraft condition ?

Should the reader understand that the intent is to say the following :
"an engine oil consumption monitoring programme should be implemented as part of an aircraft condition monitoring programme" ? or "an engine oil consumption monitoring programme should be implemented as part of an engine condition monitoring programme" ? Or something else ?

response *Accepted*

Text amended.
Engine oil consumption and engine condition monitoring programmes should be implemented

comment 15 comment by: *Francis Fagegaltier Services*

In 6 (b), it is supposed that the intent is not to refer to an "oil consumption programme" because the oil consumption cannot be directly controlled. Should this be "oil consumption monitoring programme" ?

response *Accepted*

Accepted change, text amended to "oil consumption monitoring programme".

comment	*16* comment by: *Francis Fagegaltier Services* In 6 (b), What is the meaning of "oil consumption programme ... sensitive to oil consumption trend" ? Was the intent to say the following : the oil consumption monitoring programme should track the oil consumption trend ?
response	*Accepted* Text amended.

comment	*17* comment by: *Francis Fagegaltier Services* The second sentence of 6 (b) is too much complex for a good understanding. Was the intent to say the following : In the case of ETOPS operations, this monitoring must be continuous and take account of oil added at the ETOPS departure station.
response	*Partially accepted* Text amended.

comment	*18* comment by: *Francis Fagegaltier Services* In 6 (c), one could say that oil analysis is always meaningful because all known engines use oil (*) ! This paragraph is of no use, unless there is a hidden thinking which cannot be simply identified. Can this be clarified ? (*) of course, engines used for commercial operations.
response	*Noted* The intent of this paragraph is to ensure that if the engine condition can be determined from analysis of engine oil samples, then this should be included in the engine reliability programme.

comment	*19* comment by: *Francis Fagegaltier Services* In 6 (d) there is ambiguity : the APU cannot be added to the (is it the engine ?) oil comsumption programme because the APU is not the engine. It would be better to ask for an "APU oil consumption monitoring programme". This is found in § 1.14 in appendix V to AMC M.A.704.
response	*Accepted* Accepted APU oil consumption monitoring programme to be requested.

comment	*20* comment by: *Francis Fagegaltier Services* In paragraph 6 (e), what is this "engine monitoring programme" ? Is this

	related in some manner to paragraph 6 (a) ?
response	*Accepted* Applicability of these requirements has been clarified in the new structure

comment	*21* comment by: *Francis Fagegaltier Services* The paragraph 6 (e) shows a lack of understanding of engines. It should be entirely re-written. It must be realised that the most likely limit to be exceeded would be the gas temperature limit (usually called EGT). Increase in EGT is most of the time the result of the "normal" deterioration of the engine over time and the most likely cause of engine removal from the aircraft. But such EGT exceedence may occur during the flight for many reason, other than the normal engine deterioration. It must also be noted that no engine margin is determined during engine certification. First of all, an objective should be defined. It seems that the objective, of course to be confirmed by EASA, is the following : "*after one engine in flight shut down, the remaining engine must not be voluntarily operated to exceed the certified limits during the diversion flight, in all weather conditions and for all engine loading demands.* *Furthermore, before the flight, the engine trend monitoring of EGT (exhaust gas temperature) must not predict an EGT exceedence during the flight in the worst conditions of a diversion after one engine IFSD."* Once an objective in defined, the paragraph might be written. The trend monitoring is an operator's task as well as piloting technics : the above proposed objective may be a basis for such re-writing. However, there might be a need to impose in CS-E 1040 some analysis by the engine TC holder to determine if additional limits or criteria must be determined to cover the worst case scenario during an ETOPS diversion. But this sub-paragraph (e) is not related to ETOPS : in this paragraph 6, only sub-paragraphs (a), (b), (d), (g) and (h) specifically refer to ETOPS. May be the commenter has not understood the intent. Clarification would be necessary.
response	*Partially accepted* Agreed the meaning of the paragraph is unclear. The text has been amended in order clarify the meaning of the paragraph. Regarding the recommendation to "impose in CS-E 1040 some analysis by the engine TC holder to determine if additional limits or criteria must be determined to cover the worst case scenario during an ETOPS diversion" we see no clear need for this to be established.

comment	*22* comment by: *Francis Fagegaltier Services* In paragraph 6 (f), there is reference to "safe operation". Is this "safe engine operation" ? Is this "safe aircraft operation" ? is this "safe ETOPS operation" ?

This is significant because, for example, an engine IFSD is safe for the engine, but a dual IFSD is not safe for a two-engined aircraft !

This paragraph calls for an operator-designed engine condition monitoring. It would be more appropriate to request it from the engine TC holder (note : the manufacturer is not in all cases the TC holder. This has been corrected in some places in this NPA but not everywhere). Something could be added to CS-E 1040 for this purpose.

However, this sub-paragraph (f) is not related to ETOPS : in this paragraph 6, only sub-paragraphs (a), (b), (d), (g) and (h) specifically refer to ETOPS. May be the commenter has not understood the intent of the sub-paragraph. Clarification would be necessary.

response *Accepted*

The intent of this paragraph is to ensure that the safe operation of the aircraft is ensured. The text has been amended to clarify this intent.

comment *23* comment by: *Francis Fagegaltier Services*

In paragraph 6 (g), the first sentence is particularly obscure. For example, what is a "prescribed event" ?

The last sentence seems to interfere in commercial and/or contractual arrangements between a provider (engine TC holder for example) and a customer (operator). This is inappropriate in such AMC.

A complete re-writing would be necessary.

response *Accepted*

see amended text

comment *84* comment by: *Boeing*

Page 16. **Part B, V. Draft Decision amending AMC to Part M**:
AMC M.A.302(d) Maintenance programme-reliability programmes, 6.(g):

Boeing suggests that paragraph 6.(g) be revised as follows:

(g) In the case of aircraft operated in accordance with an ETOPS approval the operator should develop a verification programme or procedures should be established, to ensure corrective action following an engine shutdown, ~~**primary**~~ **ETOPS Maintenance Significant** system failure or adverse trends or any prescribed event which require a verification flight or other action and establish means to assure their accomplishment. A clear description of who must initiate verification actions and the section or group responsible for the determination of what action is necessary should be identified in this verification programme. ~~**Primary**~~ **ETOPS Maintenance Significant** systems or conditions requiring verification actions should be described in the M.A Subpart G organisation's ETOPS procedures. ...

JUSTIFICATION: ***ETOPS significant system*** (or *ETOPS maintenance significant system)* are defined terms. **"*Primary system*"** is not a defined term in the EASA proposal and its use could lead to operator confusion.

response

Partially accepted

The term "ETOPS significant system" will be used throughout the document.

comment

188 comment by: *AIRBUS*

M.A.302(d):
Maintenance Program - Reliability:
6.(d) Maintenance Program - Reliability - APU

- The sentence "If the APU is required for ETOPS operation" is unclear. Should it be understood as "If the APU is required to be running throughout the ETOPS portion of the flight", or "If the APU is part of the Type Design assessment for ETOPS", or "If the APU is required for ETOPS MMEL dispatch", or all?

6.(g) Maintenance Program - Reliability - Verification

- What is EASA interpretation of "an aircraft operated in accordance with an ETOPS approval"? Is it only "when the aircraft is dispatched on an ETOPS flight"? In this case, it seems not consistent with the wording in AMC paragraph M.A.706 Personnel Requirements, i.e. when the aircraft is "involved in ETOPS operations". We propose to change it to read: "an ETOPS maintained aircraft".
- Add "action" after the word "verification" in the 1st sentence: "[...] event which require a verification flight or other verification action [...]"

response

Partially accepted

6(g) Comments accepted, text amended.
6(d) "If an APU is needed" is a clear statement and would imply that an aircraft can not be dispatched unless the APU is operational, as it will have been assessed during the Type Design that an APU is a requirement for ETOPS operations.

comment

300 comment by: *FAA*

1. Affected Text (Please *specify clearly the location (e.g., page number, paragraph/section number) of the proposed text affected by your comment*):
...
Page 15 and 16 AMC M.A.302(c) Maintenance programme compliance
AMC M.A.302(d) Maintenance programme-reliability programmes

2. Comment (Please state your comment clearly and in plain language):

This entire section is confusing. Is the intended audience the manufacturer, or the operator??? If the section is intended for the operator, shouldn't all the required operator's ETOPS Maintenance Program supplemental requirements be detailed in this section?? I simply can't readily locate in this section, or any other section a clear listing and definition of all the requirements.

3. Justification (Please provide support for your comment):

	4. Proposed Alternative Text (If any): **•5. Person Providing Comment (Include routing symbol):** Mario L. Giordano, FAA Safety Inspector (AFS-303)
response	*Noted* The part M regulation is intended to define the reponsibilities and actions of the operator/maintenance organisation with respect to ensuring the continuing airwothiness of the aircraft. Note that the proposed amendments to AMCs and GMs to Part-M and Part-145 have been included in the Operations chapter of the new structure.

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC to Part M - AMC M.A.501 (b) – Installation p. 16

comment	*24* comment by: *Francis Fagegaltier Services* (1) Grammar correction. "a ... components" seems to be inappropriate. Suggestion : to delete the "a". (2) "Required standard" : what are they ? How can a maintenance organisation be satisfied of meeting something which is not defined ?
response	*Partially accepted* (1) This wording has not been introduce as part of this NPA, however, the comment is accepted (2) The wording "required standard" has not been introduced by this NPA

comment	*138* comment by: *UK CAA* Remove references to ETOPS within the context of Subpart F organisations justification: Regulation (EC) No. 216/2008, article 3 (j) defines a 'Complex' aircraft as being one equipped with a turbojet or more than one turboprop engine. Therefore ETOPS would not be applicable to Subpart F and must be maintained to Part 145.
response	*Accepted* The reference to ETOPS has been deleted to avoid confusion

comment	*189* comment by: *AIRBUS* M.A.501(b)2: Installation: The meaning of an "operational approval configuration" should be clarified.
response	*Accepted*

Text amended.

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC to Part M - AMC M.A.704 Continuing airworthiness management exposition p. 16-18

comment: *25* comment by: *Francis Fagegaltier Services*

In paragraph 6, "... all people involved in" : in what ? Some words are apparently missing.

response: *Accepted*

Text amended

comment: *190* comment by: *AIRBUS*

M.A.704.6:
Continuing Airworthiness Management Exposition:
The EASA interpretation of "an aircraft operated in accordance with an ETOPS approval" should be clarified. Is it only "when the aircraft is dispatched on an ETOPS flight"? In this case, it seems not consistent with the wording in AMC paragraph M.A.706 Personnel Requirements, i.e. when the aircraft is "involved in ETOPS operations". We propose to change it to read: "an ETOPS maintained aircraft".

response: *Accepted*

Text to be adapted.

comment: *292* comment by: *CAA-NL, SCI*

AMC M.A.704, 6
Page 16
'Personnel involved in' not specified.
Proposed text: '... personnel involved, including supportive...'

response: *Accepted*

text amended

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC to Part M - AMC M.A.706 Personnel requirements p. 18

comment: *26* comment by: *Francis Fagegaltier Services*

Consistency of vocabulary.
In AMC M.A.704 we find

6. In the case of aircraft operated in accordance with an ETOPS approval,
In AMC M.A.706 we find
4.9 in case of aircraft involved in ETOPS operations,
In AMC M.B.301 (b) we find again
7. In the case of aircraft operated in accordance with an ETOPS approval,

It is suggested harmonising. Note : the entire NPA has not been checked with regard to this specific wording.

response *Accepted*

Text amended.
The new structure of the AMC 20-6 avoids such confusions

comment *191* comment by: *AIRBUS*

AMC M.A.706:
Personnel Requirements:
For the consistency with AMC paragraphs M.A.302(d)6(g), M.A.704.6 and M.B.301(b)7, we propose to change the first sentence to read "in case of ETOPS maintained aircraft".

response *Accepted*

The new structure of the AMC20-6 avoids such confusions.

comment *203* comment by: *AEA*

Comment: ETOPS concept and procedures are almost never identical for every operator.

Proposal: 4.9 in case of aircraft involved in ETOPS operations, knowledge of the ETOPS concept and specific ETOPS procedures of the operator.

response *Accepted*

Text amended

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC to Part M - AMC M.B.301 (b) Maintenance programme p. 18

comment *27* comment by: *Francis Fagegaltier Services*

In paragraph 7, the wording "ETOPS Maintenance Significant Systems" has capital letters as if it was a defined wording. This is not defined. Where can we find the definition of these systems ?

The same comment would apply to "Configuration, Maintenance and Procedures (CMP)". This comment has already been made against another proposal in this NPA.

response *Partially accepted*

The term to be amended to ETOPS significant system and is defined in AMC 20-6
The comment regarding Configuration, Maintenance and Procedures (CMP) is noted and has been addressed

comment *139* comment by: *UK CAA*

No reference to any definition of "Maintenance Significant Systems"

justification:
Maintenance significant systems need to be clearly identified

response *Accepted*

The term "Maintenance Significant Systems" is misleading and should read "significant system" and is defined in AMC 20-6

comment *192* comment by: *AIRBUS*

M.B.301(b)7:
Maintenance Program:
The EASA interpretation of "an aircraft operated in accordance with an ETOPS approval" should be clarified. Is it only "when the aircraft is dispatched on an ETOPS flight"? In this case, it would not be consistent with the wording in AMC paragraph M.A.706 Personnel Requirements, i.e. when the aircraft is "involved in ETOPS operations". We propose to change it to read: "an ETOPS maintained aircraft".

response *Accepted*

text amended

comment *303* comment by: *FAA*

1. Affected Text (Please *specify clearly the location (e.g., page number, paragraph/section number) of the proposed text affected by your comment*):
Page 19 paragraph 6.5.6.4 (e) "problems with ETOPS Maintenance Significant Systems
...
2. Comment (Please state your comment clearly and in plain language):
The word "Maintenance" should be removed from this section as well as other areas in the document. They are not ETOPS Maintenance Significant Systems, they are ETOPS Significant Systems.

3. Justification (Please provide support for your comment):
4. Proposed Alternative Text (If any):

•5. Person Providing Comment (Include routing symbol):
Mario L. Giordano, FAA Safety Inspector (AFS-303)

response *Accepted*

text amended.

comment *307* comment by: *FAA*

1. Affected Text (Please *specify clearly the location (e.g., page number, paragraph/section number) of the proposed text affected by your comment*):
Page 18,AMC M.B.301 (b) Maintenance programme
...
7. In the case of aircraft operated in accordance with an ETOPS approval, the quality of
maintenance and reliability programmes can have an appreciable effect on the reliability of
the propulsion system and the ETOPS Maintenance Significant Systems. An assessment
should be made of the proposed maintenance and reliability programme's ability to maintain
a acceptable level of safety for the propulsion system and the ETOPS Maintenance
Significant Systems of the particular airframe/engine combination. Type specific ETOPS
requirements may be summarised in a single document, frequently referred to as
Configuration, Maintenance and Procedures (CMP).

78. The competent authority may approve an incomplete maintenance programme at the
start of operation of an aircraft or an operator, subject to limiting the approval of the
maintenance programme to a period that does not exceed any required maintenance not yet
approved.

2. Comment (Please state your comment clearly and in plain language):
Don't understand the highlighted comments. Specifically, an operator's maintenance program is not summarized in a single document referred to as a CMP. The CMP is the manufacturer's document that an ETOPS operator must comply with, and it is one small portion of an operator's program. If an operator's ETOPS maintenance program is contained in a single document, it should be contained in the operator's ETOPS Maintenance Document

Additionally, the FAA disagrees with paragraph 78. An operator's ETOPS Maintenance Program must be complete before an operator is authorized for ETOPS operations

3. Justification (Please provide support for your comment):
4. Proposed Alternative Text (If any):

•5. Person Providing Comment (Include routing symbol):
Mario L. Giordano, FAA Safety Inspector (AFS-303)

response *Partially accepted*

Accepted last sentence of paragraph 7 to be deleted.

The paragraph 8 has not been amended by this NPA, and it is considered also

to be acceptable for the start of operations in a controlled manner.

resulting text | See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC to Part M - 7. Amend Appendix I to AMC. M.A.302 and AMC M.B.301(b) to read as follows: Appendix I to AMC M.A.302 and AMC M.B.301 (b) … p. 18-21

comment *28* comment by: *Francis Fagegaltier Services*

In 6.5.6.4, it is suggested clarifying this ETOPS reliability programme by adding a reference to read "The ETOPS reliability programme requested in § 6.1.1 (e) should be designed ..."

response *Accepted*

Accepted. AMC 20-6 has been amended in order to clarify the applicability of each requirement.

comment *29* comment by: *Francis Fagegaltier Services*

In 6.5.6.4 opening paragraph. What are these "ETOPS related problems" ? How is a "problem" defined ?

Similarly, what are these "significant events detrimental to ETOPS flights" ? How is "significant" defined ? How is "detrimental" defined ?

To define a reliability programme in so vaguely defined conditions is likely to be highly difficult.

Clarification is necessary.

response *Accepted*

Text improved.

comment *30* comment by: *Francis Fagegaltier Services*

In 6.5.6.4 opening paragraph.
What is this "Authority" ? See general comment on use of the word "authority".

response *Accepted*

text amended

comment *31* comment by: *Francis Fagegaltier Services*

In 6.5.6.4 opening paragraph.
The question of consistency of these 96 hours with the 72 hours in 21A.3 has already been raised in another comment. Clarification is necessary.

response *Accepted*

	Agreed to read 72 hours
comment	*33* comment by: *Francis Fagegaltier Services* In paragraph 6.5.6.4, in second alinea, the wording "item geberally required to be reported" is not clear enough. Which items ? Required by whom or what ?
response	*Partially accepted* In accordance with AMC 20-8 to be added.
comment	*34* comment by: *Francis Fagegaltier Services* In paragraph 6.5.6.4, in second alinea, in (a), are APU in-flight shutdowns included under this item ? Or is this limited to engine IFSD ?
response	*Noted* It is not included in this item of the list but it is included in the failures of ETOPS significant systems, if APU is included in the list of ETOPS significant systems.
comment	*35* comment by: *Francis Fagegaltier Services* In paragraph 6.5.6.4, in second alinea, under item (e), how are "problems" defined ? Similarly, "ETOPS Maintenance Significant Systems" are not defined. This item should be clarified.
response	*Partially accepted* Text improved. The term ETOPS maintenance significant systems has been deleted and AMC 20-6 only refers to ETOPS significant systems
comment	*36* comment by: *Francis Fagegaltier Services* In paragraph 6.5.6.4, in third alinea, APUs and propellers are not identified. This seems to be incorrect. Item (c), time, cycles etc. : are they related to the aircraft ?To the engine ? To the APU ? To the propeller ? Or all pieces of equipment onboard ? This should be clarified.
response	*Partially accepted* Text amended. regarding item (c) comment , this will be dependent upon the product part or appliance

comment	*37* comment by: *Francis Fagegaltier Services* In paragraph 6.5.6.4, in fourth alinea, first line, we find an "aircraft reliability programme". Is this related by any means to the "ETOPS reliability programme" found in first sentence of §6.5.6.4 ? By the way, we find here a sort of definition of "ETOPS Maintenance Significant System" (singular this time when other occurrences refer to "systems" (plural)). To hide a definition (?) at the fourth appearance of the so "defined" wording is totally inappropriate. Why is it not placed in CS-Definitions ? There is a cross-reference to AMC 20-6 ("see also AMC 20-6") where this "defined" wording is not used. Could the relevance of this cross-reference be clarified ?
response	*Accepted* Text amended to clarify reliability programme Text amended to plural. Note that the proposed amendments to AMCs and GMs to Part-M and Part-145 have been included in the Operations chapter of the new structure.

comment	*38* comment by: *Francis Fagegaltier Services* In paragraph 6.5.12, we find one (the only one in these proposals) reference to LROPS. Should it be deleted according to explanatory note ?
response	*Accepted* reference to LROPS to be deleted.

comment	*39* comment by: *Francis Fagegaltier Services* In paragraph 6.5.12 (b), how can "data from the operator's total fleet" be relevant ? It is a very small part of the aircraft fleet. Should the word "operator's" be deleted to be consistent with the apparent intent ?
response	*Accepted* text amended.

comment	*40* comment by: *Francis Fagegaltier Services* In paragraph 6.5.12 (e), the first sentence is highly questionable. On a legal basis, only a law court could decide on responsibilities when an event occurs. On a technical basis, a design related event can be created by an operator. For example, with regrad to engine critical parts, a disc burst would likely be considered as a design related event. But "responsibilities" are shared by the engine designer (Engineering Plan and Manufacturing Plan) and by the

operator (Service Management Plan) (for definition of these terms see CS-E 515).

This sub-paragraph (e) should be entirely and carefully re-written.

response *Accepted*

Other comments have questioned the validity of this paragraph and hence it has been deleted.

comment *41* comment by: *Francis Fagegaltier Services*

In paragraph 6.5.13 (a), the operator is in charge of defining the means for checking the start reliability of the APU when in (b) it seems that the operator must follow what is defined by the APU OEM.

The respective roles of the operator and of the APU ETSO authorisation holder (supposed to be referenced here as "OEM") are not clear. This should be better described.

response *Not accepted*

This paragraph identifies the requirements for an operator APU in-flight start programme. Thus, the operator is required to establish such programme. The reference to the OEM implies that the operator should use information provided by the APU supplier.

comment *81* comment by: *Roberto Ravignani - Blue Panorama airline*

Blue Panorama agrees to the spirit of this NPA and its purpose to enhance and modernise the continuing airworthiness, involving all applicants to this rulemaking process.
We think this is a valuable mean to achieve a complete comprehension of some ETOPS requirements and to have a guideline to develop a list of ETOPS Significant systems that truly mirrors operator's fleet and meets the requirements of EASA rule as AMC 20-6 and also a comprehensive definitions list related to ETOPS Operations, a sort of common criteria wordwidely accepted and not misleading.

Below BPA proposals applicable to NPA par. 6.5.6.4.

1. ETOPS Maintenance Significant System List

ETOPS Rules always require the operator to draw its own list of ETOPS significant systems; this could easily lead to a list that includes all items or, worse not include those items that could affect ETOPS operations.
A longer list could be unmanageable and difficult to track, while a short list could be unsatisfactory and potentially unsafe.

- **A. BPA Proposal 1.1**

- It should be developed a sort of Minimum "*ETOPS Significant items*" list, (as an appendix of AMC 20-6) common to the industry; this list could avoid excesses or omissions of information and above all misunderstandings that

could bring to an unsafety condition.
- A Minimum "*ETOPS Significant items*" list should be included in Operator's ETOPS Manual.

- **B. BPA Proposal 1.2**

- BPA feels the need of better addressing the "*ETOPS Significant items*" list to specific components (six_digit ATA code), rather than the complete system/subsystem (e.g. refuelling station indicators belong to ATA 28-41 Fuel qty indicating system, a possible failure of this component during flight could not affect diversion time nor ETOPS operations).

2. Event oriented reliability programme
Each ETOPS operator has to develop an ETOPS reliability program in order to be respondant to ETOPS Rules requirements, despite fleet size.
Which "event" has to be classified as ETOPS significant/critical event, and then reportable?

Should

- status messages,
- transient failures,
- blinking messages,
- messages tested satisfactorily on ground not duplicating the failure

be reported?

- **A. BPA Proposal 2.1**

- Assign specific codes to reportable events, in order to better standardize the flow of data being forwarded to the competent Authority.

- **A. BPA Proposal 2.2**

- BPA proposes the use of an unambiguous, worldwidely accepted terminology, to avoid misunderstanding, potentially unsafe.

As stated in *NPA page 19 of 165 AMC M.A. 302 and AMC M.B. 301 (b) paragraph 6.5.6.4.*:

- " ...The ETOPS reliability programme should be event oriented and incorporate reporting procedures for *significant events detrimental to ETOPS Flights*. "
- Subparagraph (e) : "problems with ETOPS Maintenance Significant Systems"

For example a RH EICAS computer failure is detrimental to ETOPS, an aircraft has to be dispatched with a "*NO ETOPS operations allowed* " statement,

Is this a *significant event detrimental to ETOPS* and so reportable or is it an

event detrimental to ETOPS but not significant?

- **B. BPA Proposal 2.3**

- BPA proposes to change *NPA page 19 of 165 AMC M.A. 302 and AMC M.B. 301 (b) paragraph 6.5.6.4.*: as follows:
"*Any failure or malfunction of an ETOPS Maintenance System, which caused a repair, substitution, MEL application should be reported to the competent authority*", within 96 hours, as stated in NPA.
Thus avoiding reporting of transient failures, blinking messages etc...

response *Partially accepted*

proposal 1.1
Not accepted - The list of significant systems may differ between manufacturers. The manufacturer should provide such a list as defined in this AMC 20-6
proposal 1.2
Noted - The method of defining the applicable systems and equipment will be manufacturer dependant

Point 2 - The comment is partially accepted. The following note has been added:
Note: status messages, transient failures, blinking messages, messages tested satisfactory on ground not duplicating the failure should only be reported after an assessment by the operator that an unacceptable trend has occurred on the system.

Proposal 2.1
Not accepted, it would be impractical to issue a series of code for reporting purposes to account for all possible occurrences.

Proposal 2.2
The amended text clarifies this comment

Proposal 2.3
Not accepted, all failures or malfunctions of ETOPS significant systems are reportable occurrence. They may result in repair, substitution of a part, or operation within the MEL, thus, these events will be reported as part of the failure report procedures.

comment *85* comment by: *Boeing*

Page 20: **Part B, V. Draft Decision amending AMC to Part M**:
Appendix I to AMC M.A.302 and AMC M.B.301(b), 6.5.6.4.

The three sub-paragraphs under ETOPS Maintenance Significant System should be (A), ~~**(A)**~~**(B)**, & ~~**(A)**~~**(C).**

JUSTIFICATION: This appears to be a typographical error.

response *Accepted*

comment	*86* comment by: *Boeing* Page 20: **Part B, V. Draft Decision amending AMC to Part M**: Appendix I to AMC M.A.302 and AMC M.B.301(b), 6.5.12.(a): Boeing suggests that paragraph 6.5.12.(a) be revised to read as follows: (a) The operator's assessment of propulsion systems reliability for the ETOPS~~/LROPS~~ fleet should be made available to... **JUSTIFICATION**: Deletion of the term "LROPS" is appropriate because LROPS is not part of the current EASA AMC. It has no official definition yet.
response	*Accepted*

comment	*87* comment by: *Boeing* Page 20: **Part B, V. Draft Decision amending AMC to Part M**: Appendix I to AMC M.A.302 and AMC M.B.301(b), 6. Reliability Programmes, 6.5.12 Reporting to the competent Authority, (c): Boeing suggests deleting paragrpah 6.5.12.(c) altogether. **JUSTIFICATION:** Paragraph (c) should be deleted because it is too broad and undefined. Among the unanswered questions that would require excessive explanation: 1. As currently written, this subparagraph could be interpreted to apply to any and every part or system on the airplane. If retained, it should restrict coverage to ETOPS-significant systems. 2. *"Any adverse sustained trend"* is a highly subjective element. It would have to be defined and examples provided for each affected ETOPS-significant system to clarify intent and applicability. An adverse trend is expected in about half the operators at any given time. 3. If this was intended to refer to an adverse trend in the engine IFSD rate, then a revision would need to require a specified rate to be broken in order to trigger action by an authority (See AMC-20: Appendix 1 - Propulsion System Reliability Assessment, 3 Risk Management and Risk Model).
response	*Partially accepted* The trend should be applicable to ETOPS significant items, the trigger point adverse will be highly dependent on the system and all possibilities could not be defined in the AMC.

comment	*88* comment by: *Boeing* Page 21: **Part B, V. Draft Decision amending AMC to Part M**: Appendix I to AMC M.A.302 and AMC M.B.301(b), 6.5.13(a) Boeing suggests revising paragraph 6.5.13.(a) as follows: (a) Where an APU is required for ETOPS and the aircraft is not operated with

	this APU running prior to the ETOPS entry point, the operator should initially implement a cold soak in-flight starting programme to verify that start reliability at cruise altitude is above 95%. Once the APU in-flight start reliability is proven, the periodic APU in-flight start monitoring programme may be minimised ~~**or even discontinued**~~. The APU in-flight start monitoring programme should be acceptable to the competent authority. **JUSTIFICATION**: An APU in-flight start monitoring program may be minimised but should not be discontinued. It should be maintained at some level in order to ensure that the airline APU start reliability continues to meet the required rate. The monitoring program is the only way to discover degradations in the start rate due to causes such as high APU hours or changes in maintenance procedures.
response	*Partially accepted* Text amended to reflect the intent.

comment	*140* comment by: *UK CAA* There is an incorrect timescale of 96 hours indicated here justification: This statement is contradictory to AMC 20-8 proposed text: The Competent Authority should be notified within 72 hours of events reportable through this programme.
response	*Accepted*

comment	*141* comment by: *UK CAA* Any diversion / turn back due to hydraulic or other system failure, if the engine was not the cause justification: There is no need to record the engine details if the engine was not the cause of the turn back proposed text: The report should identify - add **as applicable**
response	*Accepted*

comment	*142* comment by: *UK CAA* Second line refers to ETOPS/LROPS, but LROPS is not part of the NPA justification: Preamble indicates that LROPS will be covered by separate A-NPA

proposed text:
"ETOPS fleet should...."

response *Accepted*

comment *193* comment by: *AIRBUS*

App I to AMC M.A.301 & M.B.301(b) - 6.1.1(e):
Reliability Programs:
the EASA interpretation of "an aircraft operated in accordance with an ETOPS approval" should be clarified. Is it only "when the aircraft is dispatched on an ETOPS flight"? In this case, it seems not consistent with the wording in paragraph AMC M.A.706 Personnel Requirements, i.e. when the aircraft is "involved in ETOPS operations". We propose to change it to read: "an ETOPS maintained aircraft".

response *Accepted*

Text amended.

comment *194* comment by: *AIRBUS*

App I to AMC M.A.301 & M.B.301(b) - 6.5.6.4:
Reliability Programs:

- See comments related to AMC M.A.302(c)7. We do not recommend creating a new term "ETOPS Maintenance Significant System" as it does not bring added value to a concept that exists today and that will not change with the new ETOPS regulation. This would also help to remain consistent with the new FAA ETOPS regulation.
- In addition, a reference is made to the AMC 20-6 although this new term "ETOPS Maintenance Significant System" is not defined in the AMC 20-6.

response *Accepted*

Term changed to "ETOPS Significant Systems".

comment *195* comment by: *AIRBUS*

App I to AMC M.A.301 & M.B.301(b) - 6.5.12(e):
Reporting to the Authority:

- This paragraph should provide the IFSD rates objectives or at least an indication of the place where to find them. The Appendix 1 to the AMC 20-6 provides the IFSD rates for the certification exercise. Yet, this appendix is not clear enough to indicate what are the objectives for the operators.
- Last sentence implies that in-flight shutdown rate caused by operator's maintenance or flight ops practices are acceptable until the IFSD rate exceeds the applicable limit. In case of large fleet, it means that several

IFSD could occur until appropriate enforcement action is considered.

response

Partially accepted

Point 1
Operators IFSD rate is evaluated in acordance with paragraphs 6.3 and 13.
Point 2
Accepted, text deleted.

comment

196 comment by: *AIRBUS*

App I to AMC M.A.301 & M.B.301(b) - 6.5.13:
APU in-flight start:
What is EASA policy regarding the maximum number of start attempts for a start to be qualified as successful?

response

Noted

Each attempt to start an APU is classified as a start.

comment

217 comment by: *AEA*

Section: - Appendix I to AMC M.A. 302 and AMC M.B. 301 (b), par. 6.5.6.4

Comment: "ETOPS related problems", "significant Event detrimental to ETOPS"
A clear definition of what it is considered "ETOPS Event", "significant Event" and "problem" with ETOPS maintenance significant system is crucial.
It's our opinion that above mentioned definition could induce Operators to apply different criteria or worse, they could miss to report an ETOPS Event.
Still now, industry wide, above definition causes lots of questions and different interpretations.

Just as an example, following are few possible matters of confusion about interpretation of ETOPS Event, ETOPS problem, significant EVENT:
a) Is ETOPS Event considered only what happens during the ETOPS portion of flight?
b) Event occurring on flight non dispatched as ETOPS (short/medium leg), have to be reported for the ETOPS programme?
c) Is ETOPS Event considered whatever occurs to an ETOPS Significant system regardless the phase of flight? (i.e. IDG Goes Off on ground, IDG goes Off during flight; IDG goes Off at descent);
d) Could the failure of an ETOPS significant system alone NOT be considered ETOPS event ? (i.e. IDG Off, relevant special procedure successfully applied: APU On).
e) In general: status messages, blinking messages, messages tested on ground successfully (positively verified as per FIM, AMM), should not be reported as they should not be considered "critical/significant" event. Clear confirmation should be shared along the industry.

Proposal1: (ETOPS Significant Event)
Use only one terminology to avoid any confusion. We propose the term "ETOPS Event" as the most clear and representative of a critical situation related to ETOPS Operation.
Proposal2: (ETOPS Significant Event reporting criteria

We propose to change as follow: "report any failure or malfunction (instead of problem), of an ETOPS Maintenance Significant System which required its substitution, repair or MEL application during ETOPS leg".
Proposal3: (ETOPS Significant Event reporting definition)
Add a dedicated paragraph in AMC 20-6, to clearly describe what should be considered ETOPS Event, providing clear criteria (we suggest to include extended examples like those reported above: a) through e).

response *Partially accepted*

Proposal 1 & 2 accepted. The text has been amended to clarify the commenter's concerns.

Proposal 3 Not Accepted. The text is considered sufficient to define the reported events.

comment *238* comment by: *Walter Gessky*

Appendix 1 zu AMC M.A.320 und AMC M.B. 301(b) 6.5.6.4
Add and change the following:
The ETOPS reliability programme should be designed with early identification and
prevention of ETOPS related problems as the primary goal. The programme should be event-orientated and incorporate reporting procedures for significant event detrimental to ETOPS flights. The Authority **and the TC holder** should be notified within ~~96~~ **72** hours of reportable through this programme.

Justification:
The time to notify significant events should be in line with EU-OPS 1.420(b)(3). The operator should be obliged to report ETOPS related problems not only to the authority but also to the TC holder.

response *Accepted*

comment *239* comment by: *Walter Gessky*

Appendix I to AMC M.A.302 and AMC M.A.301 (b)
in 6.5.12, delete the term LROPS.
This term is not defined.

response *Accepted*

comment *240* comment by: *Walter Gessky*

Appendix 1 zu AMC M.A.320 und AMC M.B. 301(b),
Add a new 6.5.14
Reporting to the (S)TC holder
"(a) The operator should report any design related failure, malfunction and defect on ETOPS significant systems
(b) 'The operator should report the aircraft and engine hours flown periodically. Where the combined ETOPS fleet is part of a larger fleet of

the same aircraft/engine combination, data from the operator's total fleet will be acceptable.
(c) the (S)TC holder should be notified within 72 hours.

Justification.
This reporting is important to keep valid ETOPS Design Approval and should support EU-OPS 1.420(b)(5)), which requires that incidents are reported to the organisation responsible for design which might cause adverse effect on the continued airworthiness of the aeroplane.

response *Partially accepted*

Text amended, (S)TC holder added.

comment *277* comment by: *Austro Control GmbH*

Appendix 1 zu AMC M.A.320 und AMC M.B. 301(b) 6.5.6.4
Add and change the following:
The ETOPS reliability programme should be designed with early identification and prevention of ETOPS related problems as the primary goal. The programme should be event-orientated and incorporate reporting procedures for significant event detrimental to ETOPS flights. The Authority **and the TC holder** should be notified within ~~96~~ **72** hours of reportable through this programme.

Justification:
The time to notify significant events should be in line with EU-OPS 1.420(b)(3). The operator should be obliged to report ETOPS related problems not only to the authority but also to the TC holder.

response *Accepted*

comment *278* comment by: *Austro Control GmbH*

Appendix I to AMC M.A.302 and AMC M.A.301 (b)
in 6.5.12, delete the term LROPS.
This term is not defined.

response *Accepted*

comment *279* comment by: *Austro Control GmbH*

Appendix 1 zu AMC M.A.320 und AMC M.B. 301(b),

Add a new 6.5.14
Reporting to the (S)TC holder
"(a) The operator should report any design related failure, malfunction and defect on ETOPS significant systems
(b) 'The operator should report the aircraft and engine hours flown periodically. Where the combined ETOPS fleet is part of a larger fleet of the same aircraft/engine combination, data from the operator's total fleet will be acceptable.
(c) the (S)TC holder should be notified within 72 hours.

Justification.
This reporting is important to keep valid ETOPS Design Approval and should support EU-OPS 1.420(b)(5)), which requires that incidents are reported to the organisation responsible for design which might cause adverse effect on the continued airworthiness of the aeroplane.

response *Accepted*

comment *293* comment by: *CAA-NL, SCI*

Appendix I to AMC M.A.302 and AMC M.B.301(b), 6.5.12(e)
Page: 20
The text seems to indicate that an unacceptable engine in-flight shutdown rate should not cause the operator's ETOPS approval to be revoked or limited, if it is not the operator's fault. This is unacceptable, for obvious safety reasons. Moreover, the reason for locating this text in this appendix is unclear. Propose to remove 6.5.12(e).

response *Partially accepted*

Text amended to clarify the intent of the paragraph

comment *305* comment by: *FAA*

1. Affected Text (Please *specify clearly the location (e.g., page number, paragraph/section number) of the proposed text affected by your comment*):
Page 21, paragraph 6.5.13 APU in-flight start program.

2. Comment (Please state your comment clearly and in plain language):

The program as stated doesn't define all of the program requirements that the FAA requires.

Additionally the EASA program states the APU starts can "even be discontinued" The FAA totally disagrees with this provision.

3. Justification (Please provide support for your comment):
4. Proposed Alternative Text (If any):

•5. Person Providing Comment (Include routing symbol):
Mario L. Giordano, FAA Safety Inspector (AFS-303)

response *Partially accepted*

An APU in flight start programme should not be discontinued but adapted.

resulting text: See resulting text in Appendix A to CRD

B. Draft Decisions - Draft Decision amending AMC to Part M - Appendix V to AMC M.A.704 Continuing airworthiness management organisation exposition p. 21-23

comment	*42* comment by: *Francis Fagegaltier Services* The opening sentences of paragraph 1.14 (which are in brackets) look like comments. The relevance to this document is not obvious and should be explained or these sentences should be deleted.
response	*Partially accepted* The brackets are deleted.

comment	*43* comment by: *Francis Fagegaltier Services* In paragraph 1.14, the item (j), Parts and configuration control, leads to a fundamental question : what about PMA parts and /or STCs ? It is possible to impose something to the engine TC holder by means of CS-E 1040 but it must be made very clear that the reliability analysis cannot be performed by the TC holder for engines which have "unknown" parts in them. How is this serious concern taken into account in all this process ?
response	*Noted* PMA is a more general issue that would need further considerations. PMA which are ETOPS related would need ETOPS consideration for their approval. For other PMA the ETOPS reliability system would ensure the correct functioning of the parts. With respect to STC that effect ETOPS the applicable issue will be addressed during the certification process.

comment	*143* comment by: *UK CAA* There is no reference to RVSM and MNPS in the CAME index list justification: These issues are related and need to be covered in the CAME proposed text: Add additional sub paragraphs or title headings to 1.14.
response	*Not accepted* The requested change is not in accordance with the TOR

comment	*144* comment by: *UK CAA* Associated procedures need to be added to the list to address the added topics in the previous comment justification:

Additional procedures needed to address RVSM MNPS etc

proposed text:
N/A

response *Not accepted*

The requested change is not in accordance with the TOR.

comment *197* comment by: *AIRBUS*

App V to AMC M.A.704 - 1.14:
ETOPS Procedures:

- Important ETOPS maintenance procedures are missing in this list such as the ETOPS task identification and the limitations on dual maintenance (AMC M.A 302.c) or the ETOPS service check.
- It should be clarified that an "ETOPS Maintenance Significant System" is an "ETOPS significant System"? (see above comments related to AMC M.A.302(c)7)

response *Partially accepted*

The ETOPS task identification should be defined in the maintenance programme and are not related to a CAMO exposition requirements.
Text amended to refer to ETOPS significant systems.

comment *241* comment by: *Walter Gessky*

Appendix V to AMC M.A. 704
Part 1, 1.8 should be changed to
1.8 failures, malfunction and defect reports
Justification:
The CAME should report all failure, malfunction and defect to the authority and the (S)TC holder

response *Not accepted*

This paragraph has not been changed by the NPA. However, the difference with the requirement of para 1.14(g) is noted and this will be forwarded to the persons responsible for the development of the continued airworthiness rules for further review.

comment *242* comment by: *Walter Gessky*

Appendix V to AMC M.A. 704, 1.14 g)
change the text
g) **failures, malfunction and** defect reporting

Justification:
Not only defects should be reported.

response *Accepted*

comment	*280* comment by: *Austro Control GmbH* **Appendix V to AMC M.A. 704** Part 1, 1.8 should be changed to **1.8 failures, malfunction and defect reports** Justification: The CAME should report all failure, malfunction and defect to the authority and the (S)TC holder
response	*Not accepted* This paragraph has not been changed by the NPA. However, the difference with the requirement of para 1.14(g) is noted and this will be forwarded to the persons responsible for the development of the continued airworthiness rules for further review.

comment	*281* comment by: *Austro Control GmbH* **Appendix V to AMC M.A. 704, 1.14 g)** change the text g) **failures, malfunction and** defect reporting Justification: Not only defects should be reported.
response	*Accepted*

comment	*294* comment by: *CAA-NL, SCI* Appendix V to AMC M.A.704, 1.14 Page: 23 Propose to add the following specific subject: m) Control procedure to preclude an aircraft being released for extended range operation after in-flight propulsion system shutdown or primary system failure on a previous flight, or significant adverse trends in system performance (ref. current AMC 20-6, 10c(5) and Appendix 4, item 6).
response	*Not accepted* This is included in the Verification programme.

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC to Part M - Appendix XI to AMC to M.A.708(c) p. 23-25

comment	*44* comment by: *Francis Fagegaltier Services* In paragraph 2.23, there seems to be a requirement for a Part 145 organisation to implement the APU "in-flight start programme".

	This does not seem appropriate. Can this be clarified ?
response	*Partially accepted* The program should be the responsibility of the operator/CAMO. The new structure of AMC20-6 clarifies this.

comment	*45* comment by: *Francis Fagegaltier Services* In paragraph 3.22, which is part of §3 titled "engine maintenance", we find a reference to the APU. The APU is not an engine, at least according to Part 21. Then, such reference to APU in §3 seems to be out of place. Can this be clarified ?
response	*Noted* The commentator is correct, however if an APU is required for ETOPS OPS, it will be part of the overall oil consumption monitoring programme

comment	*46* comment by: *Francis Fagegaltier Services* In paragraph 4.13, again a reference to APU in-flight start programme in relation to a Part 145 organisation. See comment on §2.23.
response	*Partially accepted* The program should be the responsibility of the operator/CAMO, the new structure of AMC20-6 clarifies this.

comment	*145* comment by: *UK CAA* Add maintenance significant systems to the list in this section justification: It is important to have procedures related to maintenance significant items.
response	*Accepted* Text to be amended to include reference to maintenance of ETOPS significant systems

comment	*146* comment by: *UK CAA* Add maintenance significant systems to the list in this section justification: It is important to have procedures related to maintenance significant items.
response	*Accepted* Text to be amended to include reference to maintenance of ETOPS significant systems

comment 198 comment by: AIRBUS

M.A.708(c) - 2.23:
ETOPS Procedures:

- This list should be consistent with the one given in App V to AMC M.A.704 - 1.14.
- Should the identification and handling of "ETOPS Significant System" be added in the list of procedures related to ETOPS?

response *Accepted*

This text has been amended to address the need of interface procedures between the CAMO and the contracted part-145 organisation.

comment 199 comment by: AIRBUS

M.A.708(c) - 3.22:
ETOPS Procedures:

- This list should be consistent with the one given in App V to AMC M.A.704 - 1.14.
- Should the identification and handling of "ETOPS Significant System" be added in the list of procedures related to ETOPS?

response *Accepted*

This text has been amended to address the need of interface procedures between the CAMO and the contracted part-145 organisation.

comment 200 comment by: AIRBUS

M.A.708(c) - 4.13:
ETOPS Procedures:
This list should be consistent with the one given in App V to AMC M.A.704 - 1.14.

- Should the identification and handling of "ETOPS Significant System" be added in the list of procedures related to ETOPS?

response *Accepted*

This text has been amended to address the need of interface procedures between the CAMO and the contracted part-145 organisation.

comment 204 comment by: AEA

Section: 9. Amend appendix XI to AMC to M.A.708(c) to read as follows:
Contracted Maintenance
2. Aircraft Maintenance
2.23 ETOPS Procedures

Comment: Procedures to preclude identical errors being applied to multiple similar elements in any ETOPS maintenance significant system are important enough to mention in the contract involving the part-145 organisation.

Proposal:

Add following bullet:

- Procedures to preclude identical errors being applied to multiple similar elements in any ETOPS maintenance significant system.

response *Accepted*

The additional requirement for procedures to preclude identical errors being applied to multiple similar elements in any ETOPS significant system has been added

comment *243* comment by: *Walter Gessky*

Appendix XI to AMC M.A. 708(c)2.23
ETOPS Procedures Add the following:

- Defect reporting

Justification:
The part 145 organisation has to report all defects found during maintenance.

response *Accepted*

This text has been amended to address the need of interface procedures between the CAMO and the contracted part-145 organisation.

comment *244* comment by: *Walter Gessky*

•1) Appendix XI to AMC M.A. 708(c) 3.22 and 4.13
ETOPS Procedures Add the following:

- Defect reporting

Justification:
The part 145 organisation has to report all defects found during maintenance.

response *Accepted*

This text has been amended to address the need of interface procedures between the CAMO and the contracted part-145 organisation

comment *282* comment by: *Austro Control GmbH*

Appendix XI to AMC M.A. 708(c)2.23
ETOPS Procedures Add the following:

- Defect reporting

Justification:
The part 145 organisation has to report all defects found during maintenance.

response *Accepted*

This text has been amended to address the need of interface procedures between the CAMO and the contracted part-145 organisation.

comment *308* comment by: *FAA*

1. Affected Text (Please *specify clearly the location (e.g., page number, paragraph/section number) of the proposed text affected by your comment*):
Pages 23 -25 Appendix XI to AMC to M.A.708(c)
CONTRACTED MAINTENANCE

2. Comment (Please state your comment clearly and in plain language):
The FAA believes this section is very confusing, and in some areas is technically incorrect.
If EASA wants to speak to contract maintenance in the NPA , we believe a short paragraph that makes it clear the operator is ultimately responsible for their entire ETOPS Maintenance Program, however if all , or part of that program is contracted out, then it must be clear what is contracted out.

Furthermore, it must be clear between parties specifically what is contracted out, and it must be to only those entities that are duly authorized, qualified, and trained .

3. Justification (Please provide support for your comment):
4. Proposed Alternative Text (If any):

•5. Person Providing Comment (Include routing symbol):
Mario L. Giordano, FAA Safety Inspector (AFS-303)

response *Noted*

This text has been amended to address the need of interface procedures between the CAMO and the contracted part-145 organisation.

B. Draft Decisions - Draft Decision amending AMC to Part-145 - AMC 145.A.30(e) Personnel requirements p. 26-27

comment *201* comment by: *AIRBUS*

AMC 145.A.30(e):
Personnel Requirements:
The only reference to personnel ETOPS qualification in AMC 20-6 relates to Flight Crews and Dispatchers. EASA expectations and/or guidelines regarding qualification process and content of ETOPS qualification course should be provided.

response *Accepted*

The structure of the AMC has been modified and the applicability of each chapter as well as the applicability of the entire AMC has been clarified. The maintenance requirements are included in the new structure.

comment *205* comment by: *AEA*

Reference
6. Maintenance personnel that are involved in ETOPS maintenance tasks should complete an ETOPS training programme and should have satisfactorily performed ETOPS tasks under supervision, within the framework of the Part-145 approved procedures for Personnel Authorisation.

Comment: ETOPS concept and procedures are almost never identical for every operator.

Proposal:
Add following bullet:

6. Maintenance personnel that are involved in ETOPS maintenance tasks should complete an ETOPS training programme reflecting the relevant ETOPS procedures of the operator and should have satisfactorily performed ETOPS tasks under supervision, within the framework of the Part-145 approved procedures for Personnel Authorisation.

response *Accepted*

Text amended

resulting text See resulting text in Appendix A.

B. Draft Decisions - VII. Draft Decision amending AMC-20 p. 28

comment *47* comment by: *Francis Fagegaltier Services*

"AMC" stands for "acceptable means of compliance". This is supposed to be compliance with something.

It is not easy (if possible at all) to find in this NPA to which text this is supposed to be related (in compliance with). Could this be clarified ?

response *Noted*

The proposed AMC is acceptable means of compliance to obtain an ETOPS approval in accordance with the applicable requirements of Part 21, Part M, Part 145, CS-25(ETOPS type design approval) and CS-E(ETOPS type design approval).

comment *147* comment by: *UK CAA*

The terminology is inconsistent

justification:
Clarity needed

proposed text:
By having four sets of operational criteria: greater than 60 but less than or equal to 90 minutes, greater than 90 minutes but less than or equal to 120 minutes, greater than 120 minutes **but less than or equal to 180 minutes, greater than 180 minutes.**

response *Partially accepted*

In the new structure of AMC 20-6 this text has been deleted.

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation p. 28

comment *227* comment by: *Walter Gessky*

A list of abbreviations should be added to the AMC 20-6.
Justification:
A lot of abbreviations are used in the AMC. For clarification the should be listed in the AMC

response *Accepted*

The list of abbreviations is proposed.

comment *283* comment by: *Austro Control GmbH*

A list of abbreviations should be added to the AMC 20-6.

Justification:
A lot of abbreviations are used in the AMC. For clarification the should be listed in the AMC

response *Accepted*

See comment above.

comment *311* comment by: *AIRBUS*

AMC 20-6 - §1:
Purpose:
A single concept "Accelerated ETOPS" is defined in this introduction (as it was in the current AMC-6). Accelerated is one ETOPS concept among others: there is no reason to define it in the introduction but rather in the paragraph 7. In addition:

- This paragraph refers to the Appendix 7, that does not contain any more the Accelerated ETOPS guidance material as in the current AMC-6,
- This paragraph uses the same term for type design and operations: "Early ETOPS" is appropriate to type design as explained in paragraph 7 of this AMC. The term "Accelerated ETOPS" only applies to the ETOPS

operational approval,
- We would recommend to introduce the definition of Early ETOPS and Accelerated ETOPS in the paragraph 4, to review these concepts in the paragraph 7, and then to detail them respectively in paragraph 8 and 10,
- §1a refers to 3 sets of design criteria. It is a bit confusing as the criteria for ETOPS beyond 180 min can be considered as a 4th set,
- In §(ii), the link between the Approval Plan and the CRI needs to be clarified. Is it considered that a CRI will systematically needed for any ETOPS approval plan?
- In §(ii)(C), the wording used to describe the problem resolution plan is not consistent with § 8.b.3. Furthermore, it is not clear whether the expectation is to have the problem identified within 30 days, or whether a resolution should be proposed within 30 days.

response *Partially accepted*

Agreed for the comments related to 'accelerated ETOPS' and 'early ETOPS'.

Not agreed for the proposal to add a fourth set to type design (greater than 180 minutes) as this is included in the statement that for greater diversion times than 90 minutes the diversion time may be a parameter for the assessment of certain systems.

The abbreviation CRI has been deleted.

The resolution plan in chapter 3 is addressing the 'accelerated ETOPS' approval granted to operators, and the resolution plan in chapter 2 is addressing the 'early ETOPS' approval granted to (S)TC holders. However, in both cases it is requested to have a plan for resolution and not the solution to the problem. Wording can be aligned taking into account the different approval contexts.

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation - 1 Purpose p. 28-29

comment *48* comment by: *Francis Fagegaltier Services*

In paragraph 1 Purpose there is some text titled "accelerated ETOPS" which seems to be totally out of place. The commenter has been unable to find its right place in this NPA.

Can this be clarified ?

response *Accepted*

Text deleted.

comment *89* comment by: *Boeing*

Page 28: **Part B, VII. Draft Decision amending AMC-20:**

AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation

Boeing recommends that AMC 20-6 be separated into two AMCs: one for type design and another for operations.

JUSTIFICATION: Making this change would avoid much of the confusion that has existed by having type design and operational information in a single AMC, e.g., misapplying the world fleet in-flight shutdown criteria to an individual airline. Separating the AMC into two parts would also better harmonize this guidance with the FAA.

response *Noted*

The structure of the AMC has been modified and the applicability of each chapter as well as the applicability of the entire AMC has been clarified

comment *90* comment by: *Boeing*

Pages 28 and 29: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 1 Purpose, Accelerated ETOPS,

Boeing suggests the following changes be made to this section:

2. ~~*Accelerated*~~ *ETOPS Approvals*:
a. Types of ETOPS Approvals
(i) Operational Approval
Factors to allow reduction or substitution of operator's in-service experience when applying for Accelerated ETOPS, are contained in ~~**Appendix 7**~~ **Section 10.c.(1)** of this AMC. Each application will be dealt with by the Authority on a case by case basis and will be based on a specific approved plan (see ~~**Appendix 7**~~ **Section 10.c.(1)**).

(ii) Type Design Approval (TDA)
(A) 180 minutes or above **Early** ETOPS Approval is considered feasible at the introduction to service of an airframe/engine combination, as long as the Agency is totally satisfied that all aspects of the Approval Plan (CRI) have been completed. The Agency must be satisfied that an approval plan achieves an equivalent level of safety to that intended in that AMC. (**See Section 8 of this AMC, and Appendices 1 & 2).**

(B) Any deficiency in compliance with the Approved Plan can result in some lesser approval than that sought.

~~**(C)**~~ **b.** Operators and (S)TC holders will be required to respond to any incident or occurrence in the most expeditious manner. A serious single event or series of related events could result in immediate revocation of ETOPS approval. Any isolated problem not justifying immediate withdrawal of approval, must be included in a Certification Authority approved plan within 30 days.

~~**2**~~ **3.** RELATED REFERENCES
CS-Definitions,
Part 21,
Part 145,
Part M,

CS 25.901, 25.903, 25.1309, 25.1351 (d), 25.1419, 25.1535, CS-25 Subpart J, CS-E 510, CS-E 515, CS-E 520, operational requirements.

~~**3. RESERVED**~~

JUSTIFICATION: Revise for clarity, re-number, and incorporate correct references. Paragraph (B) applies specifically to type design approvals. Former paragraph (C) applies to both operational and type design approvals.

response *Partially accepted*

The term has been deleted from that section
It is also reworded and references are clarified.
Section 3 is going to be used for the list of abbreviations.

comment *257* comment by: *Rolls-Royce*

The proposed AMC 20-6, Paragraph 1.b.(ii) (A) states that for Type Design, "*180 minutes or above ETOPS approval is considered feasible at the introduction to service ....."* It is unclear why the 180 minutes distinction has been introduced in this sentence. It should say "*ETOPS approval for any diversion time is considered feasible at the introduction to service...."*

response *Accepted*

Text amended.

resulting text: See the resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation - 2 Related references p. 29

comment *49* comment by: *Francis Fagegaltier Services*

The only reference to CS-E 515 in this NPA is found ... in this paragraph.

Therefore, the relevance of this specific reference is questionable !

response *Accepted*

The reference has been removed.

comment *50* comment by: *Francis Fagegaltier Services*

The relevance of the reference to CS-E 520 will be questioned in another comment relative to the paragraph where the unique use of this reference is made.

response *Noted*

The comment will be addressed in the relevant paragraph.

comment	*149* comment by: *UK CAA* para 2 CS-E 1040 is now also a related reference, introduced by this NPA justification: CS-E 1040 addresses ETOPS clearance, and references this AMC material.
response	*Noted* Text amended.

resulting text	See resulting text in the appendix to the CRD.

B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation - 4 Terminology p. 29-33

comment	*51* comment by: *Francis Fagegaltier Services* There is no need for a definition of an APU because such definition already exist in CS-definition. Furthermore, this definition in AMC 20-6 is not consistent with the official definition of an APU !
response	*Accepted* Definition deleted as the definition in CS-Definitions covers the intent of this definition.

comment	*52* comment by: *Francis Fagegaltier Services* Why is there a need to duplicate here the definition of "ETOPS configuration, Maintenance and Procedures (CMP) Standard" which is proposed for incorporation into CS-definitions by this NPA ? The fact that the two definitions are not 100% identical is even more confusing.
response	*Accepted* Definition has been removed from CS-DEF. The AMC definition has been amended as a result of other comments.

comment	*53* comment by: *Francis Fagegaltier Services* The proposed "definition" of an "engine" is very peculiar. 21A.41 is clear : the TCDS is part of the type certificate. 21A.21 is clear : an engine has a type certificate. Suggested alternate wording engine = The basic engine type design as defined in the Engine Type

	Certificate. However, there is a fundamental need for clarification : what is meant by "basic" ? Does this definition excludes PMA parts ?
response	*Partially accepted* The definition has been deleted.

comment	*54* comment by: *Francis Fagegaltier Services* The spelling should be frozen : "despatch" or "dispatch" but not both ! In this "definition" the first sentence is quite obscure. Can this clarified ? Is it really part of "definition" of "despatch" ?
response	*Accepted* The term to be used is 'dispatch'. First sentence removed from the definition.

comment	*56* comment by: *Francis Fagegaltier Services* The examples provided in brackets do not help clarifying the concept. Even worse they are confusing, especially the last example (inability to obtain ...). Furthermore, to provide an "internal failure" as an example of "external influence" is surprising. Suggested alternate wording : deletion of the text in brackets. In-flight shutdown (IFSD) When an engine ceases to function in flight and is shutdown, whether self-induced, crew initiated or caused by some other external influence. Of course, it is assumed that the "flight" includes periods on ground where the engine is running (the "flight'" for the engine should be from engine start at the gate to engine shutdown at the gate).
response	*Partially accepted* The examples in brakets are not only applicable to the last part of the definition. However, for clarification the examples have been moved to separate sentences.

comment	*57* comment by: *Francis Fagegaltier Services* In many places the wording "an engine inoperative" is used. It might be useful to remind that in CS-defintion an abbreviation is defined as 'OEI' means one engine inoperative. Why is it not used here ?
response	*Noted* The text has been checked and the benefit of change to the OEI abbreviation is not obvious.

comment	*58* comment by: *Francis Fagegaltier Services* in definition j (2) propulsion system, does the word "component" in "the engine and each component" include the propeller ?
response	*Accepted* The definition also includes propeller.

comment	*76* comment by: *KLM* **page 29 of 165** **Section: AMC 20** 4 Terminology (2) Suitable. For the purpose of this AMC a suitable aerodrome is an adequate aerodrome with weather reports, or forecasts, or any combination thereof, indicating that the weather conditions are at or above operating minima and the field condition reports indicate that a safe landing can be accomplished at the time of the intended operation. **Comment:** The term suitable is no longer to be used as it is creating confusion with other required adequate airports for contingency purposes. **Proposal:** The agreed term for this is Adequate ETOPS en-route alternate. Therefore replace suitable with adequate ETOPS en-route alternate
response	*Accepted* Text amended

comment	*77* comment by: *KLM* **page 32 of 165** **Section: AMC 20** 4 Terminology (iv) A system specifically installed to enhance the safety of ETOPS operations and an ETOPS diversion regardless of the applicability of paragraphs (2)(i), (2)(ii) and (2)(iii) above (e.g., SATCOM, GPS). **Comment:** Here are SATCOM and GPS defined as ETOPS significant systems, which implies that when these systems when installed are u/s the aircraft can not operate an ETOPS flight. This is far too restrictive. These systems are not required for ETOPS as primary system, but only to be promoted to enhance these operations. When not primary required for ETOPS they cannot be ETOPS significant and have to be taken out of this list.
response	*Partially accepted*

Although SATCOM and GPS are not specifically required, a reliable communication and navigation means shall be installed as per EU-OPS, article OPS 1.865. As such they became 'Group 2 System'.

comment

82 comment by: *Roberto Ravignani - Blue Panorama airline*

Par 4, subpar i:
ETOPS Significant System (Type Design Approval).

Proposed amendment AMC 20-6 introduces a new item: "ETOPS significant system (Type Design Approval)".

BPA proposes to delete "Hydraulic System" from point 1)(i): this system is designed with an intrinsic redundancy and the event of a multiple failure in concurrency with an Engine failure is really unlikely; if a system with an intrinsic redundancy hasn't shown any relevant defect so far, we belive it should not be considered "ETOPS significant system": we just think it should be tracked as part of the operator's traditional reliability program.

response

Not accepted

The Agency considers that 'hydraulic system' is a ETOPS group 1 system because the availability of hydraulic power is directly related to the number of operating engines. Hydraulic power is necessary to control the aeroplane and the effect of an engine failure on the loss of the hydraulic power shall be analysed by the applicant.

comment

91 comment by: *Boeing*

Page 29: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 4 Terminology, a. Aerodrome, (2)

Boeing suggests revising paragraph 4.a.(2) to read as follows:

(2) ~~**Suitable**~~ **ETOPS En-route Alternate Aerodrome**. For the purpose of this AMC ~~**a suitable**~~ **an ETOPS En-route Alternate** aerodrome is an adequate aerodrome with weather reports, or forecasts, or any combination thereof, indicating that the weather conditions are at or above operating minima and the field condition reports indicate that a safe landing can be accomplished at the time of the intended operation (see Appendix ~~**3**~~ **5**).

JUSTIFICATION: The term *"suitable aerodrome"* has been replaced by *"ETOPS En-route Alternate Aerodrome,"* which is now explained in Appendix 5, not Appendix 3, where "suitable" used to be explained.

response

Partially accepted

Text amended, as a result of other comments and after a review of the definition included in EU-OPS, the definitions of suitable and adequate aerodrome have been deleted.

comment

93 comment by: *Boeing*

Page 32: **Part B, VII. Draft Decision amending AMC-20:**

AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 4 Terminology, k. Approved One-Engine-Inoperative Cruise Speed, (2) (iii)

Boeing suggests revising paragraph 4.k.(2)(iii) to read as follows:

2) The operator must use this speed in ...
(iii) establishing the level off altitude (net performance) data. This level off altitude (net performance) must clear any obstacle en route by margins as specified in the operational requirements. **A speed other than the approved one-engine-inoperative-speed may be used as the basis for compliance with enroute obstacle requirements, provided fuel consumption is shown not to exceed the critical fuel scenario associated with the applicable ETOPS equal-time point, and the Maximum Diversion Time associated with time limited systems is not exceeded.**

JUSTIFICATION: Although the Explanatory Note at the beginning of the NPA states that there is additional flexibility on one-engine-out speed, the text as written is unchanged from the original AMC 20-6 definition which offered no flexibility. Adding the suggested text (excerpted from FAA AC 120-42B) will allow European operators the same flexibility as US operators without compromising safety when operating ETOPS routes over high terrain.

response *Partially accepted*

Text amended.

comment *131* comment by: *DGAC France*

VII, AMC 20-6, §4.a.(1)(i), (page 29/165)

F-DGAC believes there is a typo error in the definition of the ETOPS alternate aerodrome where it is requested according to the NPA definition that the aerodrome is equipped with an ATC. It should be ATS, for information the EU-OPS amdt 2 §1.192 uses this word "ATS" for the definition of alternate ETOPS aerodrome.
If this error was not corrected, it would induce some constraints to flights within remote areas where ATC aerodrome might not be available while ATS is available.
An aerodrome with ATS only could be "acceptable" as a destination aerodrome but not as an alternate aerodrome, which would be "strange".

The ETOPS alternate aerodrome should be equipped at a minimum with Air Traffic Services, an AFIS, providing necessary information, seems sufficient .

response *Partially accepted*

Definition of adequate aerodrome has been deleted from AMC 20-6

comment *150* comment by: *UK CAA*

AMC 20-6 Para 4(a)(2)
Definition of 'Suitable' ETOPS En Route Alternate is given but it appears not to be used in this context anywhere else in the document.

response *Accepted*

Text amended, as a result of other comments and after a review of EU-OPS the definitions of suitable and adequate aerodrome have been deleted.

comment 151 comment by: *UK CAA*

First para on page

Makes reference to the "relationship to the number of engines" but the material is only applicable to twin engined aircraft.

response *Noted*

The comment is correct; the material is for two engine only but the intent of the wording is considered to be generic enough to cover ETOPS case and possible use for future developments.

comment 213 comment by: *AEA*

Comment: It is helpful that the definitions of Adequate and Suitable ETOPS airfields have been retained. The distinction was somewhat blurred in EU Ops by the definition in Ops 1.192 (c) of an Adequate ETOPS en-route alternate aerodrome, without the corresponding definition of a Suitable alternate.

Proposal:
n/a

response *Noted*

However, as a result of other comments the definitions of suitable and adequate aerodrome have been deleted

comment 219 comment by: *AEA*

Section: AMC 20-6 4. Terminology, par. i

Comment: Proposed amendment AMC 20-6 introduces a brand new item: "ETOPS significant system (Type Design Approval)".
The introduction of an exclusive list for Type design approval scope will definitely distinguish between the system which should be addressed at Type design stage and the system considered at "operations+maintenance" stage.
For instance, typical matter of confusion is the Hydraulic system: this is never considered as an ETOPS Significant System in operation and maintenance, due to the redundancy of power supply and the number of independent sources introduced at design stage.

Proposal: As per above, we agree to keep proposed new wording, but we reinforce the need of previous Proposal of comment 217 on ETOPS Significant Event reporting definition, to distinguish between the two lists.

response *Partially accepted*

Consistency approach to what is an ETOPS significant system has been ensured by amending the text. However, the Agency consider that the hydraulic power is an ETOPS significant system and therefore additional criteria is provided.

comment 220 comment by: AEA

Section: AMC 20 - 4 Terminology
(2) Suitable.

Comment:
The term suitable is no longer to be used as it is creating confusion with other required adequate airports for contingency purposes.

Proposal:
The agreed term for this is Adequate ETOPS en-route alternate.
Therefore replace suitable with adequate ETOPS en-route alternate

response *Accepted*

Text amended, as a result of other comments the definitions of Suitable and adequate aerodrome have been deleted.

comment 221 comment by: AEA

Section: AMC 20
4 Terminology
(2) ETOPS Group 2 Systems
(iv) A system specifically installed to enhance the safety of ETOPS operations and an ETOPS diversion regardless of the applicability of paragraphs (2)(i), (2)(ii) and (2)(iii) above (e.g., SATCOM, GPS).

Comment:
Here are SATCOM and GPS defined as ETOPS significant systems, which implies that when these systems when installed are u/s the aircraft can not operate an ETOPS flight. This is far too restrictive. These systems are not required for ETOPS as primary system, but only to be promoted to enhance these operations.
When not primary required for ETOPS they cannot be ETOPS significant and have to be taken out of this list.

Proposal: Take SATCOM and GPS out of this list

response *Partially accepted*

Although SATCOM and GPS are not specifically required, a reliable communication and navigation means shall be installed as per EU-OPS, article OPS 1.865. As such they became 'Group 2 System'.

comment 245 comment by: Walter Gessky

AMC 20-6, 4.d. engine
d. *Engine*
Change the text
The basic engine assembly as supplied by the engine manufacturer as defined in the Engine Supplemental Type Certificate ~~and~~ **or** Engine Type Certificate Data Sheet.

Justification:
This requires clarification. For STC`s the basic engine assembly data are is notified in the STC, for engine certified under a TC the data are contained in the TCDS. No 'TCDS issued for STC approvals.

response

Partially accepted

Definition has been deleted because 'engine' is already defined in CS-DEF.

comment

246 comment by: *Walter Gessky*

AMC 20-6, 4.m. *Maximum Approved Diversion Time*
First bullet, second sentence,
Add the following:
This Maximum Approved Diversion Time is reflected in the aeroplane and engine Type Certificate Data Sheets **or STC**. The Maximum Approved Diversion Times for the aeroplane should not be exceeded and are reflected in the AFM or AFM-supplement.

Justification:
The maximum approved diversion time should be notified in the STC when ETOPS is approved under a STC? STC approval data are not reflected in the TCDS.

response

Accepted

Text amended.

comment

258 comment by: *AEA*

Section:
B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation
4 TERMINOLOGY
g) Despatch
~~**g. Despatch**~~
~~**ETOPS planning minima applies until dispatch. Despatch is when the aircraft first moves under its own power for the purpose of is taking off.**~~

Proposal: Suggest to delete the term "Despatch" and "Dispatch" as we propose not to use despatch for the ETOPS planning minima limit.
In Appendix 5 "SELELECTION OF ENROUTE ALTERNATE AERODROMES", suggest to use "take off" to be consistent with EU OPS 1.340.

response

Not accepted

For the time being, the definition is kept because it is aligned with EU-OPS definition and it is aligned with ICAO definition of 'flight time' (refer to ICAO Annex 6 Part I).

comment

284 comment by: *Austro Control GmbH*

AMC 20-6, 4.d. engine
d. *Engine*
Change the text
The basic engine assembly as supplied by the engine manufacturer as defined in the Engine Supplemental Type Certificate ~~and~~ **or** Engine Type Certificate Data Sheet.

Justification:
This requires clarification. For STC`s the basic engine assembly data are is notified in the STC, for engine certified under a TC the data are contained in the TCDS. No 'TCDS issued for STC approvals.

response *Partially accepted*

Definition has been deleted because 'engine' is already defined in CS-DEF.

comment *285* comment by: *Austro Control GmbH*

AMC 20-6, 4.m. *Maximum Approved Diversion Time*
First bullet, second sentence,
Add the following:
This Maximum Approved Diversion Time is reflected in the aeroplane and engine Type Certificate Data Sheets **or STC**. The Maximum Approved Diversion Times for the aeroplane should not be exceeded and are reflected in the AFM or AFM-supplement.

Justification:
The maximum approved diversion time should be notified in the STC when ETOPS is approved under a STC? STC approval data are not reflected in the TCDS.

response *Accepted*

Text amended.

comment *312* comment by: *AIRBUS*

AMC 20-6 - §4:
Terminology:

- §a. Adequate aerodrome: Current JAR-OPS 1.192 defines a notion of "Adequate aerodrome" and a notion of "Adequate ETOPS en-route Alternate aerodrome", where an "Adequate ETOPS en-route Alternate aerodrome" is an "adequate aerodrome" with an ATC facility and at least one instrument approach procedure. We understand that the concept of "Adequate aerodrome" is used for basic (non-ETOPS) operations as well as to defined the ETOPS threshold i.e. when a given ETOPS operations becomes ETOPS or not. Then, the concept of "Adequate ETOPS en-route Alternate aerodrome" is used for aerodromes selected to support the ETOPS mission i.e. the aerodromes nominated at dispatch along the ETOPS sector. We recommend that these two definitions appear in the AMC 20-6 and in CS-Definition as there are available in JAR-OPS 1.192. With respect to the definition given in this paragraph (in accordance with the proposal made in the NPA-OPS 40A and as per JAR-OPS 1.192), an adequate aerodrome requires only an ATS. For an "Adequate ETOPS en-route Alternate aerodrome", one instrument approach procedure is sufficient (instead of one let-down aid)
- §a.1.(i) RFFS category 4: the new FAA ETOPS rule has different requirement for ETOPS beyond 180 min, where the aircraft must remain within the ETOPS authorized diversion time from an adequate airport with RFFS 7 or higher.
- §a.2 Suitable airport: The adjective "suitable" is no more used in the

new FAA ETOPS regulation and was not used as well in the NPA-OPS 40A in this context (i.e. at flight preparation). The use of this adjective is only restricted to its normal meaning, when the crew selects in flight a "suitable" diversion aerodrome. The term used in the NPA-OPS 40A was "ETOPS En-route alternate".

- §c - Definition of "ETOPS CMP standards" is incorrect and incomplete. Indeed, "CMP standard" does not mean only the configuration minimum requirements. The CMP contains particular aircraft or engine minimum requirements, including the configuration, maintenance, flight crew procedures and dispatch restrictions found necessary by the Agency to establish the suitability of an airframe/engine combination for ETOPS. (see also comments on CS-Definition)
- §f Extended Range Entry point: Consider calling this term "ETOPS entry point" as proposed in the NPA-OPS 40A. Add also "first" in the first sentence (The ETOPS entry point is the "first" point...) as this precision is very important for defining the ETOPS sector.
- §h IFSD: Consider new IFSD definition for ETOPS as proposed by the FAA. The IFSD is a primary parameter for ETOPS and an harmonization between the two regulations is strongly recommended.
- §i ETOPS significant system: consider removing "Type Design Approval" in the title, as ETOPS Significant System is also an important item for ETOPS maintenance processes to be put in place by the Operator.
- §i ETOPS significant system, ETOPS group 2 systems. We do not understand why GPS is listed as an ETOPS group 2 system enhancing the ETOPS operations and diversions. The GPS based navigation means (en-route or approach) are as important for a normal flight than for an ETOPS flight.
- §j.(2) Propulsion System: what is the definition of a "major" propulsion unit? Furthermore, is it the intent of this definition to include the fuel system in this sub-group?
- §k Approved One-Engine-Inoperative Cruise Speed.
    - Correct the reference: the in-flight procedure is not explained in § 10.f.3 (It may be part of the Appendix 4 but it is not further detailed in this appendix).
    - We recommend considering the wording proposed in the NPA-OPS 40A as well as the proposed AMC OPS 1.192, which clarifies that variation of the TAS can be considered in the determination of the diversion distance.
    - We recommend to consider the FAA policy that allows the operators to select a speed other than the approved one-engine inoperative speed for the obstacles clearance constraints provided fuel consumption is shown not to exceed the critical fuel scenario and the time-limited systems requirements are not exceeded. This policy will be very important for Himalayans operations with twins. This policy provides an equivalent safety level as current JAR-OPS 1.192 (12) as fuel planning and time-limited systems must be verified.
- §m Maximum Approved Diversion Time: This paragraph may be confusing as the name "time" is used both in the singular and in the plural. We recommend clarification to be made in this paragraph by writing "time(s)" in order to capture the current ETOPS 180 min principles as well as the new ETOPS beyond 180min principles. We also recommend adding a specific paragraph with this respect in the chapter 7 "Concepts". We also recommend EASA to consider the guidance provided by the FAA in its draft AC 25.1535 (§9.i) (See also comments on chapter 7 "concepts)

- §n Operator's Approved Diversion Time: Typing error: replace operation by operator in the second line. The concept of "ETOPS adequate aerodrome" is used in this paragraph although it is not defined in this NPA.

response *Partially accepted*

§a. Accepted. Definition of adequate aerodrome deleted.

§a.1(i). The RFFS category 4 has been historically allowed for ETOPS en-route alternates and this is based on the capability of category 4 RFFS to completely contain a fire such as the size of a wheel fire, possibly caused by a brake over heat on landing. A larger fire could be suppressed, but for a shorter period of time. ETOPS has additional system reliability, which reduces the likelihood of a diversion.

§a.2 Accepted. Reference to suitable deleted.

§c. Accepted. Text amended to add reference to crew procedure. CS-Definitions also amended to reflect this and will refer to extended range operations instead of ETOPS

§f. Partially accepted: extended range is kept to remain in line with definition (e). Accept to add "first".

§h. Partially accepted. The Agency considers that although the definitions do not have exactly the same wording they are aligned except of the last sentence of the FAA definition. The Agency has also accepted the FAA exclusions but has requested that such events be reported in the frame of continued airworthiness for ETOPS.
§i. Accepted. Text amended.
§j.(2) Partially accepted. The words 'major' have been deleted. Yes, this defintion include the fuel system.
§k. Accepted. Text amended.
§m. The addition of '(s)' to the word 'time' is accepted. Adding the proposed guidance coming from the FAA will not be done at this stage.
§n. Accepted. Text amended.

comment *361* comment by: *General Electric Company*

para 4 h
In the interest of harmonization and consistency, the definition of IFSD should be the same as the FAA definition, including exclusion of "automatic relight" and "less than desired thrust" events. (Reference: 14 CFR Section 1.1 General Definitions)

response *Partially accepted*

The Agency considers that although the definitions do not have exactly the same wording they are aligned except of the last sentence of the FAA definition. The Agency has also accepted the FAA exclusions but has requested that such events be reported in the frame of continued airworthiness for ETOPS.

resulting See resulting text in Appendix A.

text	

B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation - 5 General Eligibility Considerations p. 33

comment	*152* comment by: *UK CAA* (m) Para 1 Remove "or the engine" justification: Not needed as Engine TCDS does not refer to ETOPS certification proposed text: A maximum approved diversion time for the airframe/engine combination established in accordance with the type design criteria in this AMC and Appendices 1 and 2 of this AMC.
response	*Not accepted* The amendments of CS-E and AMC 20 envisage a specific Engine ETOPS Type Design approval that will be reflected in the engine TCDS.

comment	*313* comment by: *AIRBUS* AMC 20-6 - §5: General Eligibility Considerations: This paragraph does not provide clear guidance regarding the eligibility for ETOPS of a candidate aircraft/engine combination. The fact that this paragraph specifically refers to "Early" ETOPS seems to indicate that it does not apply to in-service ETOPS type design approval. Is it the intent of EASA to restrict the concept of "eligibility" only to early ETOPS approval? In this case, the requirements for eligibility of an aircraft/engine combination in the frame of an in-service approval should also be provided. Note that §8.d seems not in line with this paragraph (see also related comment). Furthermore, the link between the Approval Plan and the CRI needs to be clarified.
response	*Accepted* Text amended. Paragraph deleted on the bases that the word 'elegibility' is understood in other regulation as 'who can apply' and the paragrah mixes both requirements for type design and requirements for air operations.

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation - 6 Applicability and Grandfather Clauses p. 34

comment	*314* comment by: *AIRBUS* AMC 20-6 - §6: Applicability and Grandfather clauses: This paragraph should be further developed in order to clarify which part of EU-OPS contains (or will contain) the grand father clauses applicable to the current ETOPS operational approval. Furthermore, this paragraph should also provide EASA expectations regarding the status of aircraft with existing EASA ETOPS 180min type design approval. For sake of consistency, consideration could be given of the FAA principles given in §25.3 and §121.162.
response	*Accepted* Text amended.

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation - 7 Concepts p. 34-36

comment	*59* comment by: *Francis Fagegaltier Services* In paragraph 7 (f)(4) (which is not modified by these proposals), we find some wording which is not defined. This terminology is close to but different from some terms used with the same acronym CMP. This is : "type design CMP standard" and "CMP standard". Consistency of the terminology used throughout this NPA should be checked.
response	*Accepted* Text amended

comment	*94* comment by: *Boeing* Page 34: **Part B, VII. Draft Decision amending AMC-20:** **AMC 20-6** Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 7. Concepts Boeing suggests that the last sentence in the 3rd paragraph be deleted as follows: "The following is provided to define the concepts for evaluating extended range operation with two-engined aeroplanes. ~~**This approach ensures that two-engined aeroplanes are consistent with the level of safety required for current extended range operation with three and four-engine turbine powered aeroplanes without unnecessarily restricting operation**~~**."** **JUSTIFICATION:** Statistics for all of commercial jet aviation, as well as over 23 years of Twin-Engine airplanes in ETOPS service conclusively show twins to

	be the target for safe operation, not the three & four-engine airplanes. *(Twinjets have generally had less than half the: accident rate, hull loss rate and fatality rate of three- and four-engined airplanes.)*
response	*Not accepted* This sentence was not modified by this NPA, it is providing an historic rational for the provisions within AMC 20-6

comment	*95* comment by: *Boeing* Page 35: **Part B, VII. Draft Decision amending AMC-20:** AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 7. Concepts, f. Approval Basis, (2) In-service experience, Boeing suggests that paragraph 7.f.(2) be revised as follows: ~~(2) *In-service experience*~~ ~~It is also necessary for each operator desiring approval for extended range operation to show that it has obtained sufficient maintenance and operations experience with that particular airframe/engine combination to conduct safely these operations (see paragraph 10).~~ (~~3~~ **2**) *Operations Approval ...* (~~4~~ **3**) *Continuing Airworthiness ...* **JUSTIFICATION:** Delete the section on "*In-service Experience*" as it contradicts both Accelerated ETOPS and Early ETOPS; then re-number the sub-sections.
response	*Partially accepted* Text improved to better reflect the ETOPS approval types as appropriate.

comment	*248* comment by: *Walter Gessky* **AMC 20-6, 7.f.(1)(ii)** Add the following: (ii) Evidence that the type design of the aeroplane is approved for extended range operation is normally reflected by a statement in the Agency approved Aeroplane Aircraft Flight Manual (AFM) or AFMSupplement and Type Certificate Data sheet **or STC** which references the CMP standard requirements for extended range operations. Justification: A reference to the CMP standard should also be notified in the STC. TCDS does not reflect STC approval data
response	*Accepted* Text amended.

comment	*286* comment by: *Austro Control GmbH* **AMC 20-6, 7.f.(1)(ii)** Add the following:

(ii) Evidence that the type design of the aeroplane is approved for extended range operation is normally reflected by a statement in the Agency approved Aeroplane Aircraft Flight Manual (AFM) or AFMSupplement and Type Certificate Data sheet **or STC** which references the CMP standard requirements for extended range operations.

Justification:
A reference to the CMP standard should also be notified in the STC. TCDS does not reflect STC approval data

response *Accepted*

Text amended.

comment *315* comment by: *AIRBUS*

AMC 20-6 - §7:
Concepts:

- Consider adding a paragraph to detail the concepts of maximum diversion time(s). For that, we recommend EASA to consider the guidance provided by the FAA in its draft AC 25.1535 (§9.i). In particular, it shall be highlighted the difference between the current ETOPS up to 180 min concept and the new ETOPS beyond 180 min for the time-limited systems (as given in §10.d.3.i). Indeed, as per the current ETOPS 180 min concept, one maximum diversion time (One Engine Inoperative (OEI) speed, ISA, still air) is considered; this maximum diversion time is mainly driven by the IFSD rate; the time-limited system (only the cargo fire suppression system is identified in the current AMC 20-6) must be above this maximum diversion time + 15 min. For ETOPS beyond 180 min, the maximum diversion time (OEI speed, ISA, still air) continues to be driven by the IFSD rate but the maximum diversion distance capability is also limited by the time limited systems which are either checked at the All Engines Operative (AEO) speed or the OEI speed considering the wind and temperature effect and a 15min margin. See also comments made against Appendix 1.
- §c.&§d.: These paragraph are related to continuing airworthiness. Consider adding reference to Part145 and AMC to Part M.
- §e Human Factors. This paragraph could be completed in order to provide EASA expectations for the aircraft occupants' physiological needs as per CS 25.1535.
- §f(1)(ii): consider to add a statement regarding the evidence that the type design is approved for ETOPS is reflected by the issuance of an Agency approved ETOPS CMP document, in addition to the statement in the Agency approved AFM and TCDS, which both refer the applicable ETOPS CMP standard requirements.
- §f(2): consider replacing "It is necessary" by "it may be necessary", as this statement does not apply to accelerated ETOPS approval.
- §f(4): replace the term "Continuing Airworthiness" by "Continued Airworthiness", as this paragraph clearly refers to review of the in-service experience.

response *Partially accepted*

first point not accepted.

Adding the proposed guidance coming from the FAA will not be done at this stage.

§c&§d : this is not necessary as the maintenance AMC have been now incorporated into AMC 20-6

§e not accepted. CS 25.1535 is considered sufficient.

§f(1)(ii) not accepted. The wording is considered clear.

§f(2) accepted. Text amended.

§f(4) accepted. Text amended.

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation - 8 Type Design Approval Consideration for Eligibility p. 36-48

comment 60 comment by: *Francis Fagegaltier Services*

In 8 (a), the sentence "should have been certificated according to the airworthiness standards of commercial air transport of large aeroplanes and Engines" is particularly obscure. Can it be clarified ?

response *Accepted*

Propose to delete the words commercial air transport

comment 61 comment by: *Francis Fagegaltier Services*

In 8 (a), it seems that only turbofan engines are considered because there is no reference to the propeller. See general comment on the subject.

If this AMC 20-6 is limited to aircraft equipped with turbofan engines, this should be so declared at the beginning.

If ETOPS is limited to aircraft equipped with turbofan engines, this should also be declared at the beginning.

response *Noted*

The turbo-propeller case is not excluded from this NPA. However, to date the Agency has only certified two airframe-engine combination of this type using the JAA information leaflet 20 that was the predecessor of AMC 20-6.
Moreover, the concerned manufacturers have not commented on this NPA.

comment 62 comment by: *Francis Fagegaltier Services*

The sentence added to 8 (d) is obscure : "Excluding failures of the engine, any system or equipment failure condition that affects the aeroplane or engine, or combination of failures that would result in a need for a diversion, should be

considered a Major event (CS 25.1309) and therefore the probability of such should be compatible with that safety objective."

Failure of an engine equipment which affects the engine is an engine failure, is not it ? What is really meant here ?

"the probability of such should" : such what ?

response

Noted

The Agency considers that the proposed wording is considered to be clear. The engine failure is treated in an specific manner in the context of ETOPS. The failure of other systems and equipments that could affect the aeroplane or engine and that would lead to a diversion are upgraded to Major in the context of ETOPS (when normally is classified as Minor). That is the meaning of this paragraph.

comment

63 comment by: *Francis Fagegaltier Services*

in paragraph 8 d (2)(iii) (which is not modified by this NPA), there are requests which have little technical meaning.

Indeed, the sentence "It should be shown during type design evaluation that adequate engine limit margins exist (i.e., rotor speed, exhaust gas temperatures)" imposes margins on rotor speeds. What could this be for all engines which are regulated by N1 speed ? Note : these engines are likely to represent the vast majority of commercial engines.

Note that in AMC M.A.302(d) (proposal 2 of this NPA) the bracket uses "e.g." contrary to this AMC 20-6 which uses "i.e.".

It is interesting to note here a cross-reference to AMC to Part M where the wording is significantly different. Therefore, there is no consistency between this text of AMC 20-6 and text in AMC to Part M.

In both cases such engine type design evaluation should not be part of any AMC but placed in CS-E 1040.

Suggestion : to delete paragraph 8 d (2)(iii) and associated note. To transfer inCS-E 1040,the appropriate text.

response

Partially accepted

The text has been amended to clarify that the engine limits should not be exceeded during a one-engine operation taking due consideration of the additional loads imposed.

comment

64 comment by: *Francis Fagegaltier Services*

In paragraph 8 d (3), the references to CS-E 510 (safety analysis) and to CS-E 520 (Strength) are not understood in relation to uncontained engine failure.

Eventually uncontained engine failures are taken into account as part of the normal aircraft certification process. The intent of this specific paragraph in AMC 20-6 in relation to ETOPS cannot be determined at all. The intent should be clearly explained.

response

Accepted

Text amended.

comment

65 comment by: *Francis Fagegaltier Services*

In paragraph 8 d (4), the added text ("The APU should demonstrate ...") should be placed in CS-APU. This is another case where the respective responsibilities of operator, aircraft TC holder and APU ETSO authorisation holder must be clearly determined : who is doing what ?

Proposal

to change AMC 20-6 to read as follows :
(4) The APU installation, if required for extended range operations, should meet the applicable CS 25 provisions (Subpart J, APU) and any additional requirements necessary to demonstrate its ability to perform the intended function as specified by the Agency following a review of the applicant's data. If a certain extended range operation may necessitate in-flight start and run of the APU, it must be substantiated that the APU complies with CS-APU 600. If this reliability cannot be demonstrated, it may be necessary to require continuous operation of the APU.

In CS-APU to create a new sub-part E (similar in principle to subpart F of CS-E) and a new paragraph to read as follows :

SUBPART E - OPERATIONAL DESIGN REQUIREMENTS

CS-APU 600 In-flight start reliability
When requested for aircraft ETOPS approval, it must be demonstrated that the APU has an in-flight start reliability throughout the flight envelope of the aircraft which is compatible with the overall safety objective for ETOPS approval of this aircraft but not less than 95%. This demonstration must take account of all approved fuel types and temperatures.

response

Not accepted

Not accepted. The Agency do not consider that there is a need for an APU ETOPS certification as it is covered as part of the aeroplane ETOPS type design approval.

comment

66 comment by: *Francis Fagegaltier Services*

In paragraph 8 d (15), most of the NPA proposed wording is relevant tto CS-E 1040. This is another case where the respective responsibilities of operator, aircraft TC holder and engine TC holder must be clearly determined : who is doing what ?

Proposal

AMC 20-6 to read as follows
(15) Engine condition monitoring
The operator should implement an engine condition monitoring programme in compliance with CS-E 1040.

Text to be embodied in CS-E 1040 as follows:
Procedures for an engine condition monitoring process must be defined and validated for ETOPS. This engine condition monitoring process must be able to determine, pre-flight, if an engine is no longer capable of providing, within certified engine operating limits, the maximum thrust required for a single engine aircraft diversion. The effects of additional engine loading demands (e.g., anti-ice, electrical), which may be required during an engine inoperative diversion, must be accounted for.

response *Noted*

With the new structure adopted for AMC-20, the responsibilities of the various actors are better defined.

comment *67* comment by: *Francis Fagegaltier Services*

In paragraph 8 f (3), the text "A flight test should be conducted by the (S)TC holders and witnessed by the Agency " seems to be in contradiction with 21A.263 which forbids verification by the Agency. The current 21A.33 (d) which would allow the Agency to witness such tests has been proposed for deletion by EASA NPA 16-2006.

Could EASA clarify the legal status of such sentence in AMC 20-6 ?

response *Not accepted*

the referenced paragraph does not prevent the Agency to witness a flight test. This will be still the case in the future.

comment *68* comment by: *Francis Fagegaltier Services*

Paragraph 8 h ETOPS type design approval

This paragraph imposes changes to the engine TCDS. Per 21A.41, the TCDS is part of the engine type certificate. Therefore, adding things into the TCDS is a change to the type certificate to be managed under sub-part D of Part 21. Consequently, this is managed not under AMC 20-6 but under CS-E which is the certification basis for approving changes to engine TC.

Conclusion : the text of sub-paragraph (2) should be transfered to CS-E 1040.

response *Not accepted*

This paragraph is providing additional information as to the location of the data defining the engine limitations. These should be established in accordance with CS-E 40

comment *69* comment by: *Francis Fagegaltier Services*

Paragraph 8 i (2)

Considering the limits the Agency has imposed to itself in relation to issuance of airworthiness directives (*), how would it be possible to issue an AD to restaure a reliability level which is not a type design certification criteria but simply a criteria for allowing some special operations ?

(*) EASA does not issue ADs when some parts incorporated in the flying aircraft are unsafe (i.e. a faulty design) because of an error in maintenance or in production.

response *Accepted*

The comment is valid. The paragraph will be reworded to reflect also the new Agency's AD policy.

comment *70* comment by: *Francis Fagegaltier Services*

paragraph 8 i (5)

If the flying type design is safe according to CS-25/CS-E, EASA would have no legal basis for imposing an airworthiness directive because of insufficient reliability for ETOPS. This should be reviewed by lawyers.

response *Partially accepted*

Paragraph deleted

comment *96* comment by: *Boeing*

Page 37: **Part B, VII. Draft Decision amending AMC-20: AMC 20-6** Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 8. Type Design Approval Consideration for Eligibility, c. Request for Approval

Boeing suggest the following be added to paragraph 8.c.:

c. Request for Approval
An applicant for, and holders of a (S)TC aeroplane manufacturer or other civil airworthiness Authorities, requesting a determination that a particular airframe/engine combination is a suitable type design for extended range operation, should apply to the Agency. The Agency will then initiate an assessment of the engine and airframe/engine combination in accordance with paragraphs 8, 9 and Appendix 1 & 2 of this AMC.

Because the EASA ETOPS type-design safety standard objectives are the same as the FAA ETOPS type-design safety standards, an approval in accordance with 14 CFR 25.1535 satisfies the type-design requirements of paragraphs 8, 9 and Appendix 1 & 2 of the AMC.
JUSTIFICATION: The JAA/EASA ETOPS Working Group intended that EASA ETOPS type-design standards be technically equivalent to FAA ETOPS type-design standards. However, procedurally, EASA elected to put the means of compliance in an AMC, in contrast to the FAA's choice to place them in Appendix K to 14 CFR Part 25.

response *Not accepted*

The Agency considers that this is handled by Bilateral Agreements.

comment *97* comment by: *Boeing*

Page 37: **Part B, VII. Draft Decision amending AMC-20: AMC 20-6**

Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 8. Type Design Approval Consideration for Eligibility, b. Early ETOPS, (3)

Boeing suggests that the following changes be made to paragraph 8.b.(3):

...Any isolated problem not justifying immediate withdrawal of approval should be **promptly** addressed in a ~~**(by the Agency approved)**~~ resolution plan **approved by the Agency**. ~~**within 30 days.**~~

JUSTIFICATION: As written, this paragraph does not adequately define reporting and timing responsibilities such that the (S)TC holder and Agency can properly assess and approve the resolution plan within 30 days.

response *Partially accepted*

Text will be enhanced.

comment *98* comment by: *Boeing*

Page 38: **Part B, VII. Draft Decision amending AMC-20: AMC 20-6** Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 8. Type Design Approval Consideration for Eligibility, d. Criteria, (4)

Boeing suggests that the following change be made to paragraph 8.d.(4):

"(4) The APU installation, if required for extended range operations, should meet the applicable CS 25 provisions (Subpart J, APU) and any additional requirements necessary to demonstrate its ability to perform the intended function as specified by the Agency following a review of the applicant's data. If a certain extended range operation may necessitate in-flight start and run of the APU, it must be substantiated that the APU has adequate capability and reliability for that operation. The APU should demonstrate the required in-flight start reliability throughout the flight envelope (compatible with overall safety objective but not less than 95%)**,** or an acceptable procedure demonstrated for starting and running the APU, (e.g. descent to allow start). ~~**; taking account of all approved fuel types and temperatures.**~~ If this reliability cannot be demonstrated, it may be necessary to require continuous operation of the APU."

JUSTIFICATION: CS-APU 250 (a) already requires the APU *supplier* to provide fuel specification, rate, pressure and temperature range of fuel flow to the inlet of the APU fuel system, and the degree of filtration necessary for satisfactory APU operation.

response *Partially accepted*

Text amended but not as proposed by the commentator.

comment *99* comment by: *Boeing*

Page 39: **Part B, VII. Draft Decision amending AMC-20: AMC 20-6** Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 8. Type Design Approval Consideration for Eligibility, d. Criteria, (5), second paragraph, top of page 39

Boeing suggests that the following changes be made to this section:

"Consideration should also be given to the effects on the flight crew's and passengers' physiological needs (e.g., cabin temperature control), when continuing the flight with an ~~**or more**~~ **inoperative** engine ~~**and/**~~or airframe system ~~**inoperative**~~.

The provision of essential services to ensure the continued safety of the aeroplane and safety of the passengers and crew, particularly during very long diversion times with ~~**depleted**~~ **degraded** systems, should be assessed. The assessments of ETOPS significant systems should be carried out to give particular attention to ensure, for example: ... "

JUSTIFICATION:
1st paragraph - Correct typo, and reword for clarity.

2nd paragraph - A "depleted" system connotes one that is somehow used up or exhausted, thus it must be considered inoperative. But not all inoperative systems would be considered "depleted". E.g. A hydraulic system with an inoperative pump would not be considered depleted unless the hydraulic fluid had all leaked out. Replacing "depleted" with "degraded" makes more sense and is more conservative because it includes systems that may not be inoperative.

response *Accepted*

Text amended. 'depleted or degraded' added.

comment *100* comment by: *Boeing*

Page 39: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 8. Type Design Approval Consideration for Eligibility, d. Criteria, (6)

Boeing suggests that the following change be made to paragraph 8.d.(6):

"(6) It should be demonstrated for extended duration single-engine operation, that the remaining power (electrical, hydraulic, pneumatic) will continue to be available at levels necessary to permit continued safe flight and landing, and to provide those services necessary for the overall safety of the passengers and crew.
~~**Unless it can be shown that cabin pressure can be maintained on single-engine operation at the altitude necessary for continued flight to a suitable aerodrome, oxygen should be available to sustain the passengers and crew for the maximum diversion time.**~~ "

JUSTIFICATION: As written, the (deleted) sentence could be interpreted to mean that supplemental oxygen is required for the duration of a single-engine diversion regardless of the altitude flown.

response *Not accepted*

The text is not changed by the proposed amendment. The paragraph does not seem to be a issue for previous applications. The text was intended to measure the performance of the pressurisation system rather than providing a safety objective.

comment *101* comment by: *Boeing*

Page 41: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 8. Type Design Approval Consideration for Eligibility, d. Criteria, (9)

Boeing recommends that paragraph 8.d.(9) be deleted in its entirety.

JUSTIFICATION: Paragraph 8.d.(9) is redundant to paragraph 8.d.(8), except that it introduces specific design configuration requirements. It should be sufficient that the electrical power system be designed such that for any failure or combination of failures not shown to be Extremely Improbable, all essential functions for continued safe flight and landing on an ETOPS flight are preserved. Subparagraph (i) to 8.d.(9) is the same as 8.d.(8) except that it introduces new terms, e.g., "technical loads" which are undefined and confusing as to how they differ from the loads called out in paragraph 8.d.(7). Subparagraph (ii) is a prescriptive design configuration requirement which is inappropriate for AMC material. An AMC generally describes an acceptable means of compliance rather than requiring a specific design configuration solution.

response *Partially accepted*

The paragraphs have been reworded for clarification.

comment *102* comment by: *Boeing*

Page 41: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 8. Type Design Approval Consideration for Eligibility, d. Criteria, (10)

Boeing suggests the following change to paragraph 8.d.(10):

"(10) It should be shown that adequate status monitoring information and procedures on all ~~**critical**~~ **ETOPS Significant** systems are available ..."

JUSTIFICATION: Clarity and consistency with the defined term, *ETOPS Significant System*.

response *Accepted*

text amended.

comment *103* comment by: *Boeing*

Page 42: **Part B, VII. Draft Decision amending AMC-20:**

AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 8. Type Design Approval Consideration for Eligibility, d. Criteria, (11) Fuel System, (i)

Boeing suggests that the following change be made to paragraph 8.d.(11)(i):

(11) Fuel System
(i) The aeroplane fuel system should provide fuel pressure and flow to the engine(s) in accordance with CS ~~**25.951 and**~~ 25.955 for any fuel pump power supply failure condition not shown to be Extremely Improbable.

JUSTIFICATION: CS 25.951 is not really applicable to the issue being addressed by paragraph 8.d.(11). CS 25.951 deals with air in the fuel and fuel venting requirements, whereas the intent of paragraph 8.d.(11) is to ensure there is always power to fuel system components. Removal of the reference to CS 25.951 will make the EASA AMC more closely harmonized with FAA requirements in 14 CFR 25, Appendix K, paragraph K25.1.4.(a).

response *Not accepted*

CS 25.951 is a general requirement that should be considered as well.

comment *104* comment by: *Boeing*

Page 46: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 8. Type Design Approval Consideration for Eligibility, f. Assessment of Failure Conditions, (4)

Boeing suggests that the following change be made to paragraph 8.f.(4):

"(4) Safety assessments should consider the flight consequences of single or multiple system failures leading to a diversion, and the probability and consequences of subsequent failures or exhaustion of the capacity of time limited systems that might occur during the diversion.

~~**Safety assessments should determine whether a diversion should be conducted to the nearest airport or to an airport presenting better operating conditions, considering:**~~
~~**(i) The effect of the initial failure condition on the capability of the aeroplane to cope with adverse conditions at the diversion airport, and**~~
~~**(ii) The means available to the crew to assess the extent and evolution of the situation during a prolonged diversion.**~~

The aeroplane flight manual and the flight crew warning and alerting and display systems should provide clear information to enable the flight crew to determine when failure conditions are such that a diversion is necessary."

JUSTIFICATION: The industry recognized term for a diversion aerodrome is "nearest suitable."

The type design failure assessment process may result in a recommendation to divert to the nearest suitable aerodrome. A decision to proceed to "the nearest airport or to an airport presenting better operating conditions" is the responsibility of the flight crew, considering conditions specific to their situation. Options available to the crew are considered during the failure assessment phase of design, but the assessment does not determine the choice the crew makes. As currently written, this paragraph implies otherwise.

response *Partially accepted*

Text enhanced to better clarify what the flight consequences are.

comment *153* comment by: *UK CAA*

b(3)

Makes ref to a "(by the agency approved)_resolution plan"

justification:
Confusing use of English

proposed text:
"should be addressed within 30 days in a manner defined in a resolution plan approved by the agency"

response *Accepted*

Text amended.

comment *165* comment by: *ECA - European Cockpit Association*

ECA wonders what is the definition of Extremely Improbable: 10-9? (mentioned in '(12) Time-limited system')

response *Noted*

Yes, the commenter is right. For further information, the comenter can refer to CS 25.1309 and associated AMC.

comment *206* comment by: *AEA*

Section: 8. Type Design Approval consideration for eligibility
(9) For ETOPS approvals above 180 minutes, and in order to meet the safety objective (i.e. Extremely Improbable) associated.....

Comment: The regulatory impact assessment (RIA) does not provide information if existing ETOPS aircraft such as the A330 and 777-200/-300 already comply with the additional criteria to operate ETOPS above 180 minutes.

Proposal:
Add an appendix to the NPA with regard to the capabilities of the existing ETOPS aircraft.

response *Not accepted*

The comment is out of the scope of the NPA. This comment should be

addressed to TC's holders. There is not intend to include a list of approved aircraft in the AMC.

comment *249* comment by: *Walter Gessky*

AMC 20-6, 8 a.
a. Eligibility
As discussed in paragraph 5 above, to be eligible for extended range operations (ETOPS), the specified airframe/engine combination and engine, should have been certificated according to the **airworthiness standards of commercial air transport of large aeroplanes and Engines.** They should be evaluated considering the concepts and the type design considerations in this AMC, and Appendices 1 and 2. The required reliability of the airframe/engine combination, and of the engine, can be validated by:

Question:
What is the airworthiness standards of commercial air transport of large aeroplanes and Engines? (CS 25 plus JAR 26?) This wording should be clarified.

response *Accepted*

Text amended.

comment *288* comment by: *Austro Control GmbH*

AMC 20-6, 8 a.
a. Eligibility
As discussed in paragraph 5 above, to be eligible for extended range operations (ETOPS), the specified airframe/engine combination and engine, should have been certificated according to the **airworthiness standards of commercial air transport of large aeroplanes and Engines.** They should be evaluated considering the concepts and the type design considerations in this AMC, and Appendices 1 and 2. The required reliability of the airframe/engine combination, and of the engine, can be validated by:

Question:
What is the airworthiness standards of commercial air transport of large aeroplanes and Engines? (CS 25 plus JAR 26?) This wording should be clarified.

response *Accepted*

Text amended.

comment *304* comment by: *Cessna Aircraft Company*

Electrical power sources: 8(d)(9):

a. (i): this appears to be a significant increase in power source requirements (size of load carrying ability) for the sources used for the greater than 180 minute case. Considerations listed in 8(d)(5)(6) and (7) as well as use of maximum flight duration and/or maximum diversion time in the SSA (App. 2, Item 2) should provide for adequate addressing of long diversion time concerns with regard to electrical supplies and other aircraft systems. Load shedding and other active load management schemes can minimize the crew workload and risk

associated with power source failures. It is difficult to see how extra large generators alone will contribute to increased safety for longer than 180 minute diversion times.

b. (ii): this appears to require a fourth (or more) power source(s) that can power the listed services in 8(d)(7). If a 4th supply is required, is some lower level of independence from the other three required sources accepted (since the AMC does not require 4 independent sources, rather it requires a fourth to be considered after the three fail)?

response *Partially accepted*

The paragraph has been reworded.

comment *306* comment by: *Cessna Aircraft Company*

Operation in icing conditions in 8 (d) (13): Cessna Engineering recommends further consideration and harmonization of the icing requirements between FAA and draft EASA NPA requirements. The stated intent of the icing requirements appears similar; however, the language differences could lead to different interpretations of the requirements. In addition, further consideration is recommended for the requirement that the combined probability of a longer than assumed icing episode along with the probability of the aircraft having to operate in icing conditions should be shown to be "Extremely Improbable". This requirement would appear to be a reasonable objective, but the use of the term "Extremely Improbable" implies a quantitative analysis using the CS 25.1309 definition of extremely improbable (less than 1E-9). Horizontal extents are published as part of the icing envelopes in CS-25 Appendix C. However, there are no defined probabilities associated with exceedance of these horizontal extents within the regulatory or guidance materials. Establishing the quantitative probability of the combined event without an accepted exceedance probability for the horizontal extents may not be possible. If this approach is pursued, accepted probabilities for exceedance of the defined horizontal extents should be defined within the regulatory materials.

response *Noted*

The Agency acknowledges the situation. The issue is also common to normal airworthiness certification. It is up to the TC's applicants to propose the methodology.

comment *316* comment by: *AIRBUS*

AMC 20-6 - §8.a:
Eligibility:

- The content of this paragraph seems to contradict the definition given in §5 (see also related comments).
- This paragraph refers to QUOTE: "reliability of the airframe/engine combination, and of the engine" UNQUOTE. This seems redundant.

§(3): is this last paragraph really needed? Is it considered that an "Early ETOPS approval plan" applies only when the candidate airframe/engine combination has no prior in-service experience?

response

Noted

Text amended.

comment

317 comment by: *AIRBUS*

AMC 20-6 - §8.d:
Type Design Criteria:

- What is the added value to indicate in this paragraph that the airplane/engine should comply with CS 25.1309, CS 25.901, CS 25.903, CS E-510, CS E-520? These certification requirements are applicable to type certification. It is recalled in §8.a that the aircraft/engine must be certified against the airworthiness standards before applying to an ETOPS certification. As a matter of fact, compliance with the above mentioned paragraphs is implicitly required by this eligibility criterion. We recommend the AMC 20-6 to only present the additional requirements associated with ETOPS (e.g. the specific ETOPS safety criteria to comply with CS 25.1309).
- We recommend to better structure this paragraph by subject. For instance the specific ETOPS safety criteria can be found at various places in this paragraph (d) as well as in paragraph (e) and Appendix 2. A more structured certification part would greatly simplify the certification compliance documents.

response

Partially accepted

References have been amended.
The suggestion on structure improvement will be considered for a future revision of the AMC.

comment

318 comment by: *AIRBUS*

AMC 20-6 - §8.d:
Type Design Criteria - ETOPS significant systems:

- We recommend the list of ETOPS significant systems (even given for example) to be simplified in order to be more generic. Indeed, as per the definition given in chapter 4, an ETOPS significant system is a system unique to ETOPS in the sense that it has a unique role to prevent the diversion or protect it, should it occurs. We consider certain systems listed as being as important for a normal flight than for an ETOPS flight. Furthermore, different aircraft have different system design and architecture, as such, one system may be ETOPS significant on a given aircraft model, and not significant on another model. As such, we would not list them as ETOPS significant.
- Consider revising the sentence on top of page 39, which currently reads: QUOTE "[...] when continuing the flight with one or more engine and/or airframe system inoperative." UNQUOTE. This sentence seems not applicable to twin-engine aircraft, as it refers to more than one engine failure. Furthermore, it seems to exclude the effect on flight crew and passengers during a diversion.

response

Partially accepted

First bullet point: Not accepted, the systems are listed as example.
Second bullet point: Accepted. Text amended.

comment 319 comment by: *AIRBUS*

Attachment #2

AMC 20-6 - §8.d(8) & (9):
Type Design Criteria - Electrical system requirements:

- We consider that the electrical requirements given in these two paragraphs are too much design-oriented and as such are too much prescriptive. These requirements may be acceptable for current twins but they are not for the next generation of twins. We strongly ask to modify the wording of these two paragraphs in the manner that they only set safety objectives so that they are adequate whatever the aircraft type or generation is. We favor a simplification of the EASA ETOPS ATA 24 requirements in order to harmonize them with the FAA Part 25 requirements: 3 independent power source are required for ETOPS; a 4th independent power source is required for ETOPS>180min; ETOPS ATA 24 Safety aspects are treated through the standard §25.1309 process. If this solution is not acceptable, we propose in the attached document the minimum changes that we deem necessary to make the propose NPA wording acceptable whatever the aircraft type. These proposals are based on original changes proposed by and discussed with EASA certification team.

- The detailed statement regarding time-limited power source should be be removed, as it should be covered by §8(d)12.

response *Partially accepted*

The paragraph has been reworded.

comment 320 comment by: *AIRBUS*

AMC 20-6 - §8.d(12):
Type Design Criteria - Time-Limited system:

- We recommend EASA to clarify in this paragraph its expectation in term of number of time-limited systems value to be provided in the AFM as a function of the ETOPS operational requirements presented in chapter 10 of this AMC (ETOPS <=180min and ETOPS>180min). Current guidelines are not in line with FAA.
- Time limited system capability should also be listed in the ETOPS CMP document. This document is reviewed by the airline's flight ops and engineering staff, while the AFM may be reviewed only by flight ops staff. A statement in the CMP will ensure that any maintenance work that could affect the time limited system capability of the aircraft will be adequately communicated by the engineering organization to flight-ops organization.

response *Noted*

This number should be the physical limitation. The way to use the limitation is defined in chapter 3 Operational approval.
2nd Accepted. Text amended.

comment *321* comment by: *AIRBUS*

AMC 20-6 - §8.d(13):
Type Design Criteria - Operations in icing conditions:
The first paragraph, which deals with demonstration of adequate handling qualities in case of icing conditions, only focus on the one-engine inoperative diversion scenario. The second paragraph requires considering this case as well as the depressurization one. Could EASA clarify the reason of the difference between the two paragraphs?

response *Noted*

The icing requirement (section 7 paragraph (13)(i)) is only applicable for aircraft not yet certified for operating in icing conditions.

comment *322* comment by: *AIRBUS*

AMC 20-6 - §8.d(14):
Type Design Criteria - Solutions to achieve required reliability:
We do not agree with the statement regarding the fact that maintenance actions should be introduced in the CMP only as temporary solutions. This may be true in the case of interim maintenance action pending availability of design improvement; however there may be maintenance tasks in the CMP as a result of a review of the SSA. These tasks may be either existing tasks with a reduced interval specific to ETOPS, or a task that is additional to the basic maintenance program. The text of this paragraph should therefore be updated accordingly.

response *Accepted*

Text amended.

comment *323* comment by: *AIRBUS*

AMC 20-6 - §8.d(15):
Type Design Criteria - Engine Condition Monitoring:
It should be clarified that ECM program outputs do not need to be produced and reviewed as part of pre-departure service check, but at an adequate interval.

response *Accepted*

Text amended.

comment *324* comment by: *AIRBUS*

AMC 20-6 - §8.e(1):
Reliability - General:

- This introduction is confusing as it only refers to in-service experience and does not clarify that the demonstration of reliability necessary for obtaining an ETOPS type design approval can be either made through

the "In-service experience" method or the "Early" ETOPS method. See also comments made on paragraph 9 of this AMC 20-6.
- The reference to time-limited systems is also confusing. Time-limitations are identified during the design process as per §8.d.(12). They can be verified during an ETOPS reliability demonstration (e.g. flight test). This ETOPS reliability process may even identify new time-limited systems (not found during the design exercise). But the global approach of time-limited systems identification will be made during the aircraft/engine design phases and not the reliability demonstrations.

response *Accepted*

1st comment agreed. Text amended.
2nd comment: the purpose of the paragraphs to define the flight time to be taken into account in the analysis, not to define what the maximum diversion time is. The reference to maximum diversion time will be deleted to clarify this point.

comment *325* comment by: *AIRBUS*

AMC 20-6 - § 8.e(3):
Reliability - Airframe systems:

- Is it the intent of the notes related to " 75 minutes or less" to exclude the time limited system assessment from the scope of this ETOPS approval?
- §(i) Hydraulic power. The background of this requirement is not clear. What is specific to ETOPS vs. type certification with respect to the hydraulic system or flight control system? In addition, the wording may appear too much design-oriented. For instance, how are considered aircraft equipped with only two hydraulic systems (pressurized by engine-driven pumps) but also with independent hydraulic sources for flight control actuation (pressurized by engine-driven pumps and/or electrical pumps)?
- § (iv) Cargo compartment. (A) Design. The new ETOPS regulation can take the opportunity to ban Class D cargo compartment from ETOPS operations (after a certain date defined by the agency). (B) Fire protection. This paragraph is very confusing. It may be useless for the certification part. Indeed, the ETOPS certification requirement (§8) only ask to identify the cargo fire suppression time and insert this value in the AFM. Then, this is the ETOPS operational requirements (§10) that will detail how this limitation is applied depending on the ETOPS operations (beyond 180 min or not, the criteria change).
- § (v) Cabin pressurisation. The background of this requirement is not clear. Can EASA further explain the origin of this requirement (that is not present in the FAA ETOPS regulation)?

response *Partially accepted*

1st comment. Yes, the intention is to exclude it.
2nd comment. Partially accepted, text amended.
3rd comment. Not accepted. It is already covered by another activity, but text is improved.
4th comment. Partially accepted, text amended.

comment *326* comment by: *AIRBUS*

AMC 20-6 - §8.h:
ETOPS Type Design Approval:

- §(1) We recommend EASA to clarify in this paragraph its expectation in term of number of time-limited systems value to be provided in the AFM as a function of the ETOPS operational requirements presented in chapter 10 of this AMC (ETOPS <=180min and ETOPS>180min). Current guidelines are not in line with FAA. See also comments related to 8.d.(12)
- §(1)(vi): Proposed statement in not clear. Furthermore, there is usually only one CMP document (and one statement of approval) for different aircraft models of the same family, while the approved (maximum) diversion time may not be the same for all models. Therefore, consider replacing proposed statement with the following: "The Type design, systems reliability and performance of the considered airplane/engine models combinations have been evaluated by the EASA in accordance with CS25, CS-E and AMC 20-6 and found suitable for ETOPS operations when configured, maintained and operated in accordance with this document. This finding does not constitute an EASA approval to conduct ETOPS operations. ETOPS Operational approval must be obtained from the responsible authority". Furthermore, this paragraph should also recommend that the relevant approved diversion time should also be included in the ETOPS CMP document, e.g. in a separate table.
- §(2): applicability of this paragraph should be clarified (see also comment related to CS-E).

response *Partially accepted*

1st comment: the value that should be included here is the physical limitation for time limited systems. How to use this number is described in chapter 3 operational considerations.
2st partially accepted. Text amended. But the last sentence is not adding anything.
3rd comment. Partially accepted. The applicability is going to be clarified. It is not a prerequisite for an ETOPS type design approval of the aeroplane that the engine obtains an ETOPS type design approval. However, there is no opportunity for the engine manufacturers to obtain this approval.

comment *327* comment by: *AIRBUS*

AMC 20-6 - §8.i:
Type Design Change process:

- §3 Reliability Tracking Board. This paragraph explains that the RTB should be run every two years but it does not include the fact that the RTB can be suspended for mature product, as explained in Appendix 1 §6 or Appendix 2 §5.
- §3 Reliability Tracking Board. This board is named "ETOPS RTB" in most of recent JAA/EASA certification documents. The acronym PSRAB was used only in the old FAA AC 120-42a.

- §5 Airworthiness Directives: is it EASA intent to mandate CMP revisions through AD? If yes, the process should be further clarified (e.g. EASA to issue only one AD, which would mandate the first applicable CMP issue and any applicable subsequent revisions).

response *Accepted*

1st comment: The reference to the process to monitor mature ETOPS products has been added.
2nd comment: RTB is now used
3rd comment: Deleted.

comment *328* comment by: *AIRBUS*

AMC 20-6 - §9:
In-service Experience for ETOPS Type Design Approval:
The chapter is only referring to the in-service experience method whereas the AMC presents also another method: Early ETOPS. We recommend this chapter to be more generic in order to capture the two methods made available to the manufacturers for obtaining an ETOPS type design approval.

response *Accepted*

Text amended and moved to chapter II section 6

resulting text See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation - 10 Operational Approval Considerations p. 49-75

comment *75* comment by: *Modification and Replacement Parts Association*

Within the draft AMC, there are several references to use of manufacturer manuals, such as the references to 'manufacturer-validated Training and Maintenance and Operations Manual procedures."

For the reasons that follow, we recommend that this AMC be amended with a note that explains:

NOTE: PMA parts that are accepted under bilateral agreements are considered to be acceptable for installation in ETOPS-qualified engines, so long as the competent authority does not find that inclusion of such a part would adversely affect the airworthiness of the product.

In the United States, language similar to the language found in the Draft AMC had lead to some aviation industry questions about whether one could use PMA parts in ETOPS engines.

The FAA ended this debate in the United States when the FAA responded in the Federal Register to such concerns. In the Federal Register, the FAA explained that:

The FAA does not agree that additional rulemaking is necessary to specifically address PMA or repaired parts usage in ETOPS operations. PMA parts comply with the applicable airworthiness standards and are approved as replacements for corresponding TC holder parts. Extended Operations (ETOPS) of Multi-Engine Airplanes; Final Rule, 72 Fed. Reg. 1807 (January 16, 2007).
In response to concerns about safety of ETOPS-qualified engines with PMA parts installed in them, the FAA further explained:
With respect to service difficulty reporting, the FAA monitors service data to identify unsafe conditions and other situations affecting ETOPS operations. This data is collected from TC holders, operators, repair stations, PMA holders, and other sources as applicable. The FAA will take appropriate corrective action to eliminate identified unsafe conditions or other situations negatively affecting ETOPS operations. Id.
In July 2007, EASA published Decision No. 2007/003/C (16 July 2007), which explained the circumstances under which US-FAA approval findings concerning PMAs would be reciprocally accepted within the European Community.

In light of the EASA reciprocal acceptance of PMAs, and in light of the FAA determination that PMA parts are safe for use in ETOPS engines, EASA should also conclude that PMA parts accepted under the EASA regulations and decisions should be acceptable for use in ETOPS-qualified engines. In order to allay confusion over this subject, we recommend publishing an explicit note in the the AMC.

response

Noted

As the commenter has proposed, these parts will be accepted under the bilateral agreements and they do not need to be mentioned in an AMC.

comment

78 comment by: *KLM*

Page: 73 of 165

Section: AMC 20
(3) Approval for ETOPS above 180 minutes

In view of the long diversion time involved (above 180 minutes), the operator is
responsible to ensure that on any given day in the forecast conditions, such as prevailing winds and temperature and applicable diversion and approach* procedures,
a diversion to an ETOPS en-route Alternate will not exceed the:
(A) Engine-related time-limited systems capability at the approved one-engine inoperative cruise speed; and
(B) Non engine-related time-limited system capability, such as cargo fire suppression, or other non engine-related system capability at the all engine operative cruise speed.

Comment:
This means that dynamic time/distance circles will have to be calculated by flightplanning systems. This is an irrealistic requirement as no system is capable of this calculation and still produce a flightplan. Wind is too much a changing issue and that would require many re-iterations in the calculations which is not possible.
The requirement as above is impossible.

Proposal:

The manner to handle ETOPS above 180 should not be different from below 180 with defining the area of operations based on the still air situation to find where the operation can occur. If there is doubt on the capability of the systems a larger margin might be applied e.g 30 minutes instead of 15.

response *Partially accepted*

The calculation should be added for any given forecast condition. For the time being, there is not requirement of recalculating and replanning during flight.
The words at flight planning stage have been added.

comment *79* comment by: *KLM*

Page: 74 of 165

Section: AMC 20
(ii) Communications Equipment (VHF/HF, Data Link and Satellite based communications)
Operators are required to use any or all of these forms of communications to ensure
communications capability when operating ETOPS in excess of 180 minutes. For all
routes where voice communication facilities are available, voice communications
should be provided in the aeroplane.

Comment:
See comment on SATCOM and GPS as well. Data link is not specified as an ETOPS significant system for operations beyond 180 mins and is only mentioned here.
SATCOM is not an ETOPS required system for operations below 180 mins and is not in the MEL as such and should not be as it is an additional system only.
When specified as required for ETOPS beyond 180 mins than it has to be specified in particular.

Proposal:

There is inconsistent mention of these systems

response *Partially accepted*

This proposal shall be read together with the 2 amendment to EU-OPS which is being published. The requirement in particular read:

'OPS 1.865
Communication and Navigation equipment for operations under IFR,
or under VFR over routes not navigated by reference to visual landmarks
...

(g) An operator shall ensure that aeroplanes conducting ETOPS have a communication means capable of communicating with an appropriate ground station at normal and planned contingency altitudes. For ETOPS routes where voice communication facilities are available, voice communications shall be provided. For all ETOPS operations beyond 180 minutes, reliable

communication technology, either voice based or data link, must be installed. Where voice communication facilities are not available and where voice communication is not possible or is of poor quality, communications using alternative systems must be ensured.'

It is therefore considered that the requirement make sense.

comment 105 comment by: *Boeing*

Page 51: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations, c. ETOPS Approval, (1) Accelerated ETOPS Approval, (i) Requesting Approval, (C)

Boeing suggests the following changes be made to this paragraph:

"The operator seeking Accelerated ETOPS Operations Approval should also demonstrate to the Authority that it has an ETOPS programme in place that addresses ~~**The**~~ **the** following ~~**are the**~~ ETOPS process elements:"

JUSTIFICATION: This appears to be a typographical error in the sentence.

response *Accepted*

Text amended.

comment 106 comment by: *Boeing*

Page 52: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations, c. ETOPS Approval, (1) Accelerated ETOPS Approval, (i) Requesting Approval, (D) 2.

Boeing suggests that the text of this paragraph be revised as follows:

"2. The plan to train the flight and ~~**continuing airworthiness**~~ **maintenance** personnel to the different ETOPS process elements."

JUSTIFICATION: "*Continuing airworthiness personnel"* is an undefined term and may lead to confusion.

response *Not accepted*

The Agency considers that "maintenance personnel" could be misunderstood. Continuing airworthiness personnel is broader.

comment 107 comment by: *Boeing*

Page 53: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations, c. ETOPS Approval, (1) Accelerated ETOPS Approval, (ii) Validation of the Operators

ETOPS Processes (last sentence on page 53)

Boeing suggests that the text of this paragraph be changed as follows:

" ... The following elements will be useful or beneficial in justifying a reduction in the **validation** requirements of ETOPS processes: ... "

JUSTIFICATION: Adding the word "validation" clarifies that less process validation work is required if an operator possesses the experience elements which follow. As currently written, the statement erroneously implies that *ETOPS requirements* may be reduced.

response *Accepted*

Text amended.

comment *108* comment by: *Boeing*

Pages 54 & 55: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations c. ETOPS Approval, (1) Accelerated ETOPS Approval, (ii) Validation of the Operators ETOPS Processes

Boeing notes that there are three separate lists of (A), (B), (C), & (D) items under paragraph (ii) with no intervening outline. We suggest that this be either re-structured or re-numbered.

JUSTIFICATION: For clarity, and to facilitate specific references.

response *Partially accepted*

Although the three different list are under the same bullet point (ii) 'Validation of the Operator ETOPS Processes', they are addressing different aspects of the validation procedure.
However, it is considered that the text can be enhanced to better reflect this.

comment *109* comment by: *Boeing*

Page 58: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations, c. ETOPS Approval, (2) In-service ETOPS Approval, (iv) Validation of Operator ETOPS Continued Airworthiness and Operations Capability

Boeing suggests the following changes be made to the text of this paragraph:

"The operator should demonstrate competence to safely conduct and adequately support the intended operation. Prior to ETOPS approval, the operator should demonstrate that the ETOPS continuing airworthiness processes required by Part M are being properly conducted ~~**their usual departure and destination aerodromes**~~.

"The operator should also demonstrate that ETOPS flight dispatch release

practices, policies, and procedures are established for operations ~~**to and from their usual departure and destination aerodromes**~~. "

JUSTIFICATION: Operator Validation of ETOPS processes and procedures do not have to be accomplished on actual flights and/or they may only be conducted on selected routes of the operators choosing, not on all "usual" destinations and/or departure airports.

response *Accepted*

Text amended.

comment *110* comment by: *Boeing*

Page 69: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations, d. Types of ETOPS Approval, (1) Approval for 90 Minutes or less ETOPS

Boeing recommends the following changes to the text of the first portion of this paragraph:

"The Operators Approved Diversion Time is an operational limit that should not exceed the Maximum Approved Diversion Time and time-limited system capability minus 15 minutes ~~**(unless already included in manufacturer data)**~~ **as explained in AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations, d. Types of ETOPS Approval, (2) Approval for 90 to 180 minute ETOPS. ... "**
JUSTIFICATION: Our suggested change is intended to reduce the likelihood of misinterpretation of the time-limited system requirement (the possibility of erroneously counting the 15 minutes twice) by referring instead to a definition later in this section of the AMC.

response *Not accepted*

Compliance with theses limitations by the operator is explained in paragraph 7.1

comment *111* comment by: *Boeing*

Page 69: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations d. Types of ETOPS Approval, (1) Approval for 90 Minutes or less ETOPS, (i) Operations Approval

Boeing suggests the following changes to this section:

"If the airframe/engine combination does not yet have a Type Design approval for at least 90 minutes diversion time in accordance with the criteria in CS 25.1535, the aircraft should satisfy the following relevant ETOPS design requirements.
~~**(i) Operations Approval**~~

Consideration may be given to the approval of ETOPS up to 90 minutes for operators with minimal or no in-service experience with the airframe/engine combination. This determination considers such factors as the proposed area of operations, the operator's demonstrated ability to successfully introduce aeroplanes into operations and the quality of the proposed continued airworthiness and operations programmes.
~~**(ii)**~~ **(i)** Continued Airworthiness
Maintenance and reliability programmes should be instituted which follow the guidance in EASA Part M and in this AMC.
~~**(iii)**~~ **(ii)** Release Considerations ..."

[*Continue renumbering through paragraphs ~~(iv)~~ (iii) and ~~(v)~~ (iv****)]***
JUSTIFICATION: The subject of original paragraph (i) is the opportunity for an operator to be granted an ETOPS Operational Approval for 90 minutes with an airframe/engine combination that has not been approved for 90 minutes diversion time and without in-service experience on that airframe/engine combination. It does not describe a normal Operations Approval as the original title seems to suggest. This change would make section (1) consistent with section (2).

response *Accepted*

Text amended.

comment *112* comment by: *Boeing*

Page 73: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations, d. Types of ETOPS Approval, (3) Approval for ETOPS above 180 minutes, (i) Operating limitations

Boeing suggests the following revisions be made to this section:

(3)(i) Operating Limitations
The Operator's Approved Diversion Time is an operational limit that should not exceed the Maximum Approved Diversion Time.
In view of the long diversion time involved (above 180 minutes), the operator is responsible to ensure that on any given day in the forecast conditions, such as prevailing winds**,** ~~**and**~~ temperature**,** and applicable diversion ~~**and approach***~~ procedures, a diversion to an ETOPS en-route Alternate will not exceed the:

(A) Engine-related time-limited systems capability at the approved one-engine-inoperative cruise speed; and
(B) Non engine-related time-limited system capability, such as cargo fire suppression, or other non engine-related system capability at the all engine operative cruise speed.

~~*** Approach procedure needs not to be considered if the 15 minutes margin is already included in the time-limited systems capability.**~~

JUSTIFICATION: The time-limiting system capability, if any, is required by AMC 20-6 Paragraph 8.(d)(12) to be specified by the manufacturer in the AFM or CMP for the specific airframe/engine combination. By definition, the system

	capability of a time-limited system should be stated as that system's "time limit" without the addition or subtraction of any margin. The "inclusion" of a 15 minute "margin" in the asterisk statement is not appropriate. The 15 minute "margin" is to be applied by the operator in determining the limiting diversion time for a given flight in accordance with the Operational Considerations of AMC 20-6(10)(d). There should be no question in the mind of the operator as to whether they need to reduce the stated system capability by 15 minutes.
response	*Partially accepted* Text has been clarified

comment	*113* comment by: *Boeing* Page 74: **Part B, VII. Draft Decision amending AMC-20:** **AMC 20-6** Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations, d. Types of ETOPS Approval, (4) *(fewer than 20 seats),* (ii) Operations Approval Boeing suggests the following change be made to paragraph 10.d.(4)(ii): "(ii) Operations Approval Approval to conduct operations with diversion times exceeding 180 minutes may be granted to operators with experience on the particular airframe/engine combination or existing ETOPS approval on a different airframe/engine combination, or equivalent experience. Operators should minimise diversion time along the preferred track ~~and minimise operations where **diversion times are in excess of**~~ **to** 180 minutes or less whenever possible. ..." **JUSTIFICATION:** Revised for clarity and consistency, and to harmonize as much as possible with FAA guidance.
response	*Accepted* Text amended.

comment	*114* comment by: *Boeing* Page 75: **Part B, VII. Draft Decision amending AMC-20:** **AMC 20-6** Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations e. Operations Manual Boeing suggests that the first sentence on page 75 be revised to read as follows: "An example **outline** of ~~**an**~~ ETOPS Operations Manual Supplement **content** is provided in Appendix 7 to this AMC." **JUSTIFICATION:** Appendix 7 contains an outline of the material that could/should be in an operations manual supplement. It is not a sample supplement.
response	*Accepted*

Text amended.

comment *115* comment by: *Boeing*

Page 75: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations, f. Flight Preparation and In-Flight procedures, (1)

Boeing suggests that paragraph 10.f.(1) be revised as follows:

"(1) An operator should establish pre-flight planning and dispatch procedures for ETOPS and they should be listed in the Operations Manual. These procedures should include, but not be limited to, the ~~**provision**~~ **gathering and dissemination** of forecast and actual weather **information**, **both along the route and at the proposed ETOPS Alternate Airports**. ~~**and en-route and**~~ **Procedures should also be established to ensure that the requirements of** ~~**fuel planning, taking account of**~~ the critical fuel scenario **are included in the fuel planning for the flight**."

JUSTIFICATION: Reworded for clarity.

response *Accepted*

Text amended.

comment *116* comment by: *Boeing*

Page 75: **Part B, VII. Draft Decision amending AMC-20:**
AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation, 10 Operational Approval Considerations, f. Flight Preparation and In-Flight procedures

Boeing suggests that the last sentence of paragaph 10.f. be revised to read as follows:

~~**"**An example~~ **Additional guidance on the expected content of the "Flight Preparation and Inflight Procedures" section of the operations manual** is provided in ~~the appendix~~ **Appendix** 4 to this AMC. ~~– "Flight Preparation and In-Flight procedures.~~**"**

JUSTIFICATION: Appendix 4 provides guidance to the operator. It is not an example of an operations manual.

response *Accepted*

Text amended

comment *154* comment by: *UK CAA*

49 a(1)
Suggest change to "operational approval" in first line

response | *Partially accepted*

Text has been clarified.

comment | *167* comment by: *ECA - European Cockpit Association*

ECA thinks that only one single-engine diversion speed for each type operated shall be used and clearly stated in the Aircraft Flight Manual to avoid Flight Crews and Dispatchers confusion.

response | *Not accepted*

comment | *168* comment by: *ECA - European Cockpit Association*

ECA thinks that only one single-engine diversion speed for each type operated shall be used and clearly stated in the Aircraft Flight Manual to avoid Flight Crews and Dispatchers confusion.

response | *Not accepted*

comment | *169* comment by: *ECA - European Cockpit Association*

ECA wonders why is "satellite based comm." not mentioned here (up to 180 minute diversion time)?
It is forecast page 74 in paragraph 3 (ii) for ETOPS above 180 mn.
ECA considers that VHF/HF and data link only is not satisfactory from a safety point of view in case of real diversion.

response | *Not accepted*

The same situation was in the previous AMC and the Agency did not have any reason for changing this. In Europe, operators will have to comply with the amendment 2 to EU-OPS:
'

OPS 1.865
Communication and Navigation equipment for operations under IFR, or under VFR over routes not navigated by reference to visual landmarks

...

(g) An operator shall ensure that aeroplanes conducting ETOPS have a communication means capable of communicating with an appropriate ground station at normal and planned contingency altitudes. For ETOPS routes where voice communication facilities are available, voice communications shall be provided. For all ETOPS operations beyond 180 minutes, reliable communication technology, either voice based or data link, must be installed. Where voice communication facilities are not available and where voice communication is not possible or is of poor quality, communications using alternative systems must be ensured'

comment | *170* comment by: *ECA - European Cockpit Association*

ECA thinks that 15 minute margin is for unforeseen wind changes, so approach procedure shall always be considered.

response

Not accepted

The 15 minutes is for the approach procedures as the actual wind conditions are considered for operations beyond 180 minutes.

comment

214 comment by: *AEA*

Reference 10 Operational Approval Considerations. Para (d)(2)
Comment: "The Operator's Approved Diversion Time is an operational limit that should not exceed the Maximum Approved Diversion Time specified in the Aeroplane Flight Manual, minus 15 minutes for cargo fire suppression systems." It is not clear what does this mean

Proposal:
clarification

response

Noted

The 15 minutes should apply to time limited systems and not only to fire protection systems. The text should be modified. The rationale for the 15 minutes is the time to perform an approach procedure.

comment

222 comment by: *AEA*

Section: (3) Approval for ETOPS above 180 minutes (i) Operating limitations *(In view of the long diversion time involved.....)*

Comment:
This means that dynamic time/distance circles will have to be calculated by flightplanning systems. This is an irrealistic requirement as no system is capable of this calculation and still produce a flightplan. Wind is too much a changing issue and that would require many re-iterations in the calculations which is not possible.
The requirement as above is impossible.

Proposal:

The manner to handle ETOPS above 180 should not be different from below 180 with defining the area of operations based on the still air situation to find where the operation can occur. If there is doubt on the capability of the systems a larger margin might be applied e.g 30 minutes instead of 15.

response

Partially accepted

The calculation should be added for any given forecast condition. For the time being, there is not requirement of recalculating and replanning during flight.
The words at flight planning stage have been added

comment

223 comment by: *AEA*

Section: AMC 20
(3) Approval for ETOPS above 180 minutes
(ii) Communications Equipment (VHF/HF, Data Link and Satellite based communications)
("Operators are required to use any or all of these forms of communications ....")

Comment:
(See comment on SATCOM and GPS as well -222). Data link is not specified as an ETOPS significant system for operations beyond 180 mins and is only mentioned here.
SATCOM is not an ETOPS required system for operations below 180 mins and is not in the MEL as such and should not be as it is an additional system only.
When specified as required for ETOPS beyond 180 mins than it has to be specified in particular.

Proposal:

There is inconsistent mention of these systems

response *Partially accepted*

This proposal shall be read together with the 2 amendment to EU-OPS which is being published. The requirement in particular read:

'OPS 1.865
Communication and Navigation equipment for operations under IFR,
or under VFR over routes not navigated by reference to visual landmarks
...

(g) An operator shall ensure that aeroplanes conducting ETOPS have a communication means capable of communicating with an appropriate ground station at normal and planned contingency altitudes. For ETOPS routes where voice communication facilities are available, voice communications shall be provided. For all ETOPS operations beyond 180 minutes, reliable communication technology, either voice based or data link, must be installed.
Where voice communication facilities are not available and where voice communication is not possible or is of poor quality, communications using alternative systems must be ensured.'

It is therefore considered that the requirement make sense.

comment *250* comment by: *Walter Gessky*

AMC 20-6, 10. (1)(i) (C), page 52
Add a new 17.
"Failure, malfunction and defect reporting on ETOPS critical systems"

Justification: ETOPS type design approval holder requires to fulfill the obligation of item 7.f.(4) Continuing Airworthiness in service experience, accident and incident information and information with regard to malfunctions, failures and defects from the operator with regard to ETOPS critical systems.

response *Not accepted*

The reporting scheme for ETOPS significant system is already covered under the proposed amendment to Part M. The Agency is going to bring the maintenance section back to a separate chapter of the AMC and therefore this will be more visible.

comment *260* comment by: *AEA*

Section:
B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation
10 OPERATIONAL APPROVAL CONSIDERATIONS
c. ETOPS Approval
(1) (i) (C) 4. ETOPS Manual in place
(page 52)

Comment: Operators may prefer adding an ETOPS chapter to their approved Operations Manual.

Proposal: write paragraph as follows:
(1) (i) (C) 4. ETOPS Manual in place, **or its equivalent in the Operations Manual.**

response *Accepted*

Text amended.

comment *261* comment by: *AEA*

Section:
B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation
10 OPERATIONAL APPROVAL CONSIDERATIONS
c. ETOPS Approval
(2) In service operational approval
(iv) Validation of Operator ETOPS Continued Airworthiness and Operations Capability.
(page 58)

Comment: editorial

Proposal: write the paragraph as follows:
... the Operator should demonstrate that the continuing airworthiness processes required by Part M being properly conducted **at** their usual departure and destinations aerodromes

response *Accepted*

Text amended. The last part of the sentence has been removed.

comment *262* comment by: *AEA*

Section:
B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation

10 OPERATIONAL APPROVAL CONSIDERATIONS
c. ETOPS Approval
(2) In service operational approval
(v) ETOPS Operations Approval issued by the Authority.
(Page 59)

Comment:
Point (H) and (I) should be deleted. Both points should rather be assessed by the Operator, and the procedures approved by the Authority and outlined in the Operations Manual.

Proposal: Delete the following points
~~(H) Define proposed routes and the diversion time necessary to support those routes;~~

- ~~(I) The proposed one-engine-inoperative cruise speed [...] associated with the planned procedures.~~

response *Not accepted*

The Agency considers that although the 2 points are to be considered by the operator and approved by the competent authority, they should be at least kept in the AMC.

comment *263* comment by: *AEA*

Section:
B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation
10 OPERATIONAL APPROVAL CONSIDERATIONS
c. ETOPS Approval
(2) In service operational approval
(v) ETOPS Operations Approval issued by the Authority.
(i) Initial/Recurrent training
(page 75)

Comment: "Area specific", as opposed to "route specific", offers greater flexibility and leeway to fulfil the training syllabus.

Proposal: Replace route by AREA, as follows:
"The qualification will be type and ~~route~~ **area** specific in accordance with the applicable operational requirements"

response *Accepted*

Text amended.

comment *289* comment by: *Austro Control GmbH*

AMC 20-6, 10. (1)(i) (C), page 52
Add a new 17.
"Failure, malfunction and defect reporting on ETOPS critical systems"

Justification: ETOPS type design approval holder requires to fulfill the obligation of item 7.f.(4) Continuing Airworthiness in service experience, accident and incident information and information with regard to malfunctions, failures and defects from the operator with regard to ETOPS critical systems.

response *Not accepted*

The reporting scheme for ETOPS significant system is already covered under the proposed amendment to Part-M. The Agency is going to bring the maintenance section back to a separate chapter of the AMC and therefore this will be more visible.

comment *295* comment by: *CAA-NL, SCI*

AMC 20-6, 10d(1)(iii)(C)
Page: 70
Reference is made to AMC to Part M for critical fuel scenario. Which AMC is meant specifically?

response *Accepted*

There is a typographical error as this paragraph should read:
'Fuel should be sufficient to comply with the critical fuel scenario as described in appendix 4 to this AMC.'
Text amended.

comment *297* comment by: *CAA-NL, SCI*

AMC 20-6, 10a(2)
Page: 49
According to this NPA, the Two-Engined aeroplanes mentioned are allowed to use a 180 minutes diversion time, without ETOPS approval. Current regulations are more strict, with a recommended maximum of 120 hours without authority approval. The substantiation to extend only seems to address the reliability of modern two-engined aeroplanes (Annex C.II, 1a, page 134), where "modern" is not further specified. The proposed extension, however, would also apply to less modern aircraft. Moreover, the influence of operational and continuing airworthiness factors rightfully addressed in AMC 20-6 for ETOPS approval, is not considered in substantiating the extension to 180 minutes in AMC 20-6, 10a(2).

response *Not accepted*

It should be read in conjunction with EU-OPS requirements.

comment *329* comment by: *AIRBUS*

AMC 20-6 - §10.c(1)(c):
ETOPS approval:

- There is a typo in the first sentence: either some words are missing, or it should read: "[...] an ETOPS Programme in place that addresses the following ETOPS process elements:"
- The list of processes refers to "a proven ECM and reporting system as indicated in this AMC". This AMC describes what is a proven process, but guidelines regarding ECM and reporting are in AMC to Part M and Part 145.

response *Accepted*

Text amended and references added.

comment	*330* comment by: *AIRBUS* AMC 20-6 - §10.c(1)(D): ETOPS approval: §1 refers to « primary and secondary power system ». We think that this paragraph should refer to "ETOPS Significant System" instead. Otherwise, additional guidelines regarding the identification of primary and secondary power system should be provided.
response	*Accepted* Text amended.

comment	*331* comment by: *AIRBUS* AMC 20-6 - §10.c: ETOPS approval: • It is surprising that an operational validation flight is optional for the accelerated ETOPS method (...flight can be required...) whereas it appears to be mandatory for the in-service ETOPS method (...flight will be required...). • The provisions to be included in the ETOPS operational approval (e.g. §10.c.(1).D.(iv) and §10.c.(2)(iv)) makes a reference to CS 25.1535. This reference should be removed, as these provisions will also be applicable to aircraft that have never been certified against CS 25.1535. • §(iii) page 55 and §(iv) page 58 refer to "Operator ETOPS Continued Airworthiness and Operations Capability". It should be replaced by "Operator ETOPS Continuing Airworthiness and Operations Capability".
response	*Accepted* 1st comment. Accepted. 2nd comment. Accepted. 3rd comment. Accepted.

comment	*332* comment by: *AIRBUS* AMC 20-6 - §10.d: Types of ETOPS approval: • The reference made to CS 25.1535 for ETOPS up to and including 180 min should be clarified as an operator may apply for such approval with aircraft that have never been certified against CS 25.1535. We concur that ETOPS beyond 180 min approval can refer to CS 25.1535. • §10.d.1.(i). What is the purpose of the statement "unless already included in manufacturer data"? • §10.d.1.(ii). Title should be changed to read "Continuing Airworthiness" • §10.d.1.(iii). There is a mistake for the reference to the fuel planning (replace AMC to Part M by Appendix 4 to this AMC) • §10.d.2.(i). Title should be changed to read "Continuing Airworthiness" • §10.d.2.(vi)(A): additional guidelines should be added, to clarify whether the 15 min margin is considered in this case, and if the time capability of the cargo fire protection system can be assessed versus the all-engine operative speed.

- §10.d.2.(vii)(A): additional guidelines should be added, to clarify whether the 15 min margin is considered in this case, and if the time capability of the cargo fire protection system can be assessed versus the all-engine operative speed.
- § 10.d.3.(i) Review this paragraph, which can appear confusing. See also comments made on time-limited systems (chapter 7, concepts). For ETOPS beyond 180min, the operator's diversion time is not limited by the maximum approved diversion time: the time-limited systems as given in the AFM will limit the diversion distance capability of the airplane. The IFSD rate requirement are likely to be the same for any ETOPS beyond 180 min operations (0.01/1000 E.H)
- § 10.d.3.(ii) This paragraph is not clear enough to indicate whether or not satellite based voice communication is required for ETOPS > 180 min (it is required by FAA).

response *Partially accepted*

1st comment accepted.
2nd accepted
3rd accepted
4th accepted.
5th accepted.
6th accepted
7th accepted
8th partially accepted. See answer to comment 223

comment *333* comment by: *AIRBUS*

AMC 20-6 - §10.e:
Operations Manual:

- The second sentence indicates that the authority will review the in-service ETOPS experience. This consideration does not necessarily fit with the Accelerated ETOPS method;
- Consider changing "Manufacturer" by "(S)TC holder" to be consistent with the AMC wording.

response *Partially accepted*

1st comment: the mention of service experience in this paragraph is related to amendments to the operations manual when ETOPS approval has been granted. It is not related to "accelerated ETOPS". The text has been amended to clarify the intent.
2nd comment: accepted.

comment *360* comment by: *General Aviation Manufacturers Association / Hennig*

The General Aviation Manufacturers Association (GAMA) endorses the proposed applicability of ETOPS in a.(1) and (2) which limits requirements for smaller airplanes for ETOPS to: "Two-Engined aeroplanes with a maximum approved passenger seating configuration of 19 or less and a maximum take-off mass less than 45360 kg, with a diversion time greater than 180 minutes at the approved one-engine-inoperative speed (under standard conditions in still air) from an adequate aerodrome."

	This applicability aligns with the agreements developed during the development of JAA NPA OPS-40 and its supporting analysis and also provides for a harmonized approach to ETOPS for small turbine airplanes which aligns with FAA's Part 121 and 135 differences. GAMA would support EASA publishing the applicability for ETOPS as proposed in EASA NPA 08-01. (Reference GAMA08-23.)
response	*Noted*

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - AMC 20-6 Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation - 11 Continuing Surveillance p. 75-76

comment	*334* comment by: *AIRBUS* AMC 20-6 - §11: Continuing surveillance: There is a typo mistake in the reference made to the appendices.
response	*Accepted* Text amended.

resulting text	See resulting text in AMC 20-6

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 1 - Propulsion System Reliability Assessment p. 77

comment	*336* comment by: *AIRBUS* AMC 20-6 - Appendix 1: General: This appendix 1 appears to be only applicable to airframe and engine manufacturers. Yet, it is the only place in the NPA where the numerical IFSD objectives are provided. The NPA presently does not provide the IFSD objectives for the operators as a function of the diversion time. It should be clarified that this appendix 1 is only applicable to (S)TC holders and the IFSD objectives for the operators should be added in the Part M.
response	*Accepted* Text amended.

resulting	See resulting text in Appendix A

text	

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 1 - Propulsion System Reliability Assessment - 1 Assessment Process p. 77

comment	*251* comment by: *Walter Gessky* **Appendix 1, 1.last bullet (page 77)** Add the following If an approved engine CMP is maintained by the responsible engine Authority and is duly referenced on the engine Type Certificate Data Sheet **or STC**, then this shall be made available to the ~~Authority~~ Agency conducting the aeroplane propulsion system reliability assessment. Such a CMP shall be produced taking into account all the requirements of paragraphs 8 and 9 and should be incorporated or referenced in the aeroplane CMP. Justification: When CMP is approved under a STC, than it could not be referenced in the TCDS.
response	*Accepted* Text amended

comment	*290* comment by: *Austro Control GmbH* **Appendix 1, 1.last bullet (page 77)** Add the following If an approved engine CMP is maintained by the responsible engine Authority and is duly referenced on the engine Type Certificate Data Sheet **or STC**, then this shall be made available to the ~~Authority~~ Agency conducting the aeroplane propulsion system reliability assessment. Such a CMP shall be produced taking into account all the requirements of paragraphs 8 and 9 and should be incorporated or referenced in the aeroplane CMP. Justification: When CMP is approved under a STC, than it could not be referenced in the TCDS.
response	*Accepted* Text amended

comment	*337* comment by: *AIRBUS* AMC 20-6 - Appendix 1, §1: Assessment process: A reference to CS-E 1040 should be made in this paragraph to explain the relation between this appendix and this new CS-E paragraph. EASA should clarify when an ETOPS certification of the engine as per CS-E 1040 is required. Consideration should be given to the FAA ETOPS regulation principles with this respect (as presented in the Annex 7 to the RIA).
response	*Accepted* Text amended to include reference to CS-E 1040

comment	*339* comment by: *FAA*
response	*Noted that there was no text.*

comment	*341* comment by: *FAA* 1. Affected text: Page 77. Appendix 1 and Annex 5 PROPULSION SYSTEM RELIABILITY ASSESSMENT ASSESSMENT PROCESS**:** To establish by utilizing service experience whether a particular airframe/engine combination has satisfied the propulsion systems reliability requirements for ETOPS, an engineering assessment will be made by the Agency, using all pertinent propulsion system data. 2. Comment: The FAA accepts and agrees with the desire of EASA to fully quantify the risks inherent in three-engine and four-engine LROPS before proceeding with a final NPA on this subject. We acknowledge that during the development of the final US ETOPS rules the FAA did, in fact, quantify such risks based on industry projections and historical data as referenced in the IFALPA input to the EASA NPA on page 154. 3. Justification: 4. Proposed Alternative Text: 5. Person Providing Comment: Robert Reich, Assistant Manager, Operations
response	*Noted*

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 1 - Propulsion System Reliability Assessment - 2 Reliability Validation Methods p. 77-81

comment	*71* comment by: *Francis Fagegaltier Services* Appendix 1, paragraph 2 The assessment will be made by the Agency (first sentence of paragraph 1 of appendix 1). How will the Agency be made aware of all modifications made to the power-unit (paragraph 2 a (3) (i) (D)) ? This imposes to search for all PMA parts incorporated in the engine as well as all STCs. This information cannot be

	provided by aircraft or engine TC holders.
response	*Not accepted* The OEM will not routinely track the data requested, however, as it is requested as a result of a IFSD the aircraft records will contain the data mentioned in the referenced paragraph, which can be made available

comment	*72* comment by: *Francis Fagegaltier Services* appendix 1, paragraph 2 a (3)(i) It must be made clear that an engine in-flight shutdown may occur when the aircraft is on ground. This is because of the defintion of the flight which, for an engine, is from engine start at the gate of departure to engine shutdown at the gate of arrival.
response	*Partially accepted* The definition of IFSD is given in paragraph 4 Terminology. The text amended to align with the definition.

comment	*73* comment by: *Francis Fagegaltier Services* paragraph 2 b (ii) (note : numbering is inconsistent between paragraphs 2 a and 2 b) The propulsion system validation test should be placed either in CS-25 or in CS-E. An AMC is not the appropriate place for such "requirements". It is suggested to place it in CS-E 1040 even if the test article would be composed of the engine and of aircraft parts making up the nacelle.
response	*Partially accepted* With regards to paragraph numbering - the numbering system used will be reviewed an amended as appropriate on production of a consolidated AMC. These paragraphs are maintained here as they refer to the propulsion system and the early ETOPS approval of the aircraft.

comment	*340* comment by: *AIRBUS* AMC 20-6 Appendix 1, §2: Reliability Validation Methods: • The term "ETOPS-rated propulsion system" is used several times in this paragraph. What is an "ETOPS-rated propulsion system"? Is it a propulsion system that is fitted on an ETOPS approved airframe-engine combination (against the current AMC 20-6) or is it only referring to an engine certified against the new CS-E 1040? In this case, some wording should be added to address the case of a propulsion system derived from a non-ETOPS certified engine fitted on an ETOPS approved airplane/engine combination. • Consider replacing "[...] by a design, analyses and test programmes"

with "a programme of design, test and analyses".

response *Accepted*

Point 1: the text amended to clarify the intent.
Point 2: proposed text accepted.

comment *342* comment by: *AIRBUS*

AMC 20-6 Appendix 1, §2(b):
Early ETOPS:
Typo : Replace « An certification plan » with « A certification plan ».

response *Accepted*

Text amended

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 1 - Propulsion System Reliability Assessment - 3 Risk Management and Risk Model p. 81-83

comment *117* comment by: *Boeing*

Page 83: **Part B, VII. Draft Decision amending AMC-20:**
Appendix 1 - Propulsion System Reliability Assessment, 3 Risk Management and Risk Model, a. Figure 1, Page 82; and b.(5), Figure 2

Boeing notes that the target IFSD rate for 180-minute diversion time in Figure 1 conflicts with the target IFSD rate for 3-hour diversion time in Figure 2. We suggest that the graph line in Figure 2 start just after 3 hours to avoid the conflict.

JUSTIFICATION: This change is intended to resolve the conflicting 180-minute IFSD rate requirements in these two figures.

response *Noted*

There are different IFSD objectives (diversion times up to and including 180, and diversion times>180) and therefore there is a discontinuity.
The discontinuity also exists in the FAA rules.

These are objectives but what is important is the analysis of the root cause and take the appropriate corrective actions.

comment *211* comment by: *AEA*

Reference
Figure 1 - Target IFSD rates vs Diversion Times 2-engine aeroplane. Diversion Times 180 minutes or less.

Figure 2 - Target IFSD rates vs Diversion Times 2-engine aeroplane. Diversion Times above 180 minutes.

Comment: Discrepancy between figure 1 and figure with regard to the target IFSD rate for diversion times of 180 minutes.

Figure 1 shows for 180 minutes a target IFSD rate of ± 0.022.
Figure 2 shows for 180 minutes a target IFSD rate of ± 0.014.

We fail to understand the significant difference of the target IFSD rate between figure 1 and 2.

Proposal:
Include in NPA a single graph showing the target IFSD rates for diversions times that vary from 60 minutes to 10 hrs.

response *Noted*

There are different IFSD objectives (diversion times up to and including 180, and diversion times>180) and therefore there is a discontinuity.
The discontinuity also exists in the FAA rules.

These are objectives but what is important is the analysis of the root cause and take the appropiate corrective actions.

comment *296* comment by: *CAA-NL, SCI*

Appendix 1, 3
Pages: 82, 83
There is a discontinuity at 180 minutes diversion times when comparing Figures 1 and 2:
According to Figure 1, the IFSD Rate must be < 0.0225 at 180 minutes, while according to Figure 2, the IFSD Rate must be < 0.014 at 180 minutes.

response *Noted*

There are different IFSD objectives (diversion times up to and including 180 and diversion times>180) and therefore there is a discontinuity.
The discontinuity also exists in the FAA rules.

These are objectives but what is important is the analysis of the root cause and take the appropriate corrective actions.

comment *345* comment by: *AIRBUS*

AMC 20-6 Appendix 1, §3:
Risk Model:
We acknowledge that EASA provides the IFSD rate objective as curves function of the diversion time rather than rounded IFSD rate values valid for a certain diversion time range (as proposed by the FAA). We would like EASA to clarify:

- How ETOPS 120 min approvals are considered. An IFSD rate of 0.05/1000E.H is required (in plain text) in the current AMC 20-6, as well as in current FAA ETOPS rule (Appendix K to Part 25). This plain text value is no more available in this NPA. The curve provided in figure 1 reads an IFSD rate objective in the order of 0.027/1000 EH.

- What are the IFSD rates objectives for the operators as a function of the ETOPS diversion time?
- How are considered the FAA proposed IFSD rates objectives for the (S)TC holder on one side and for the operators on the other side?
- For the sake of consistency (in term of concept and figures), can it be indicated that an IFSD rate objective of 0.01/1000EH permits to operate any ETOPS beyond 180 min operations (as proposed by the FAA). As such, the EASA ETOPS beyond 180min concept would become consistent with the FAA proposed one: " With ETOPS type design approval for greater than 180 minutes, there are no propulsion system reliability restrictions on the routes an operator may fly. The only remaining restrictions on maximum diversion time are due to the most limiting time capability of the airplane's ETOPS significant systems."

response *Not accepted*

The figures below 180 minutes were in the AMC before. The value of 0.05 mentioned in the previous version was the IFSD rate that the engine should achieve without applying the ETOPS requirements. In other words this value was the one giving a reasonable chance to achieve the value mentioned by the graph for 120 minutes (0.027)

Operators IFSD rates are evaluated in accordance to paragraph 6.3 and 13

Operator's maximum diversion time takes into account both engine reliability and time limited systems (See paragraphs 7.1; 7.2 and 7.3)

resulting text: See resulting text in Appendix A

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 1 - Propulsion System Reliability Assessment - 4 Engineering Assessment p. 84-85

comment *346* comment by: *AIRBUS*

AMC 20-6 Appendix 1, §4(g):
Propulsion System Reliability Assessment Board:
Consider replacing "Propulsion System Reliability Assessment Board" with "ETOPS Reliability Tracking Board (RTB)", for consistency with AMC 20-6 - §8.i.

response *Accepted*

Text amended.

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 1 - Propulsion System Reliability Assessment - 5 Early ETOPS Occurrences Reporting & Tracking p. 85-86

comment	*74* comment by: *Francis Fagegaltier Services* Reliability tracking board The title of paragraph 6 "continuing airworthiness" should be "continued airworthiness". As far as engine continued airworthiness is concerned, respective tasks must be made clear : is the analysis of engine events done by the engine TC holder in relation with the engine certificating authority or by this tracking board ?
response	*Accepted* Text Amended

comment	*155* comment by: *UK CAA* 5 c Amend" the first 250000 hours" to "at least the first 250000 hours" justification: As currently written, the material would permit the holder to stop tracking once they have achieved a stable IFSD rate, and this could be before 250000 hours have elapsed. This should not be the intent of the material. Experience has shown that certain engines problems do not become evident in early operation.
response	*Accepted* In conjunction with the Airbus comment 347, which highlighted an inconsistency between the hours required for early ETOPS and that used for in-service experience. The text has been amended to "....at least the first 100,000...." . These ensure that the additional process required via the early ETOPS route is not in excess of that which would be required for in service experience route.

comment	*156* comment by: *UK CAA* 5 d Engine related Abandoned Take Offs and Air Turn Backs also provide useful evidence for tracking justification: Such events do not necessarily lead to the other scenarios in operation, but may do in other cases, and so they should be tracked. proposed text: Add: (6) Abandoned Take-Offs due to engine related causes. (7) Air Turn backs due to engine related causes. And renumber current (6) as (8).
response	*Partially accepted* The text has been amended to align the operators maintenance program tracking requirements to that of the S(TC) holders for early ETOPS. This included the introduction of items that meet the intent of this comment.

comment *347* comment by: *AIRBUS*

AMC 20-6 Appendix 1, §5:
Early ETOPS reporting and tracking:
What is the rationale for disconnecting the in-service experience requirement for reporting (250,000 engine hours) from the criteria for stable reliability levels given in Appendix 1 §2 (i.e. 100,000 engine hours for new propulsion systems or 50,000 engine hours for derivative)?

response *Accepted*

The highlighted inconsistency between that hours required for early ETOPS and the hours used for in-service experience is agreed. The text has been amended to "....at least the first 100,000...." . These ensure that the additional process required via the early ETOPS route is not in excess if that which would be required for in service experience route.

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 1 - Propulsion System Reliability Assessment - 6 Continuing Airworthiness p. 86-87

comment *348* comment by: *AIRBUS*

AMC 20-6 Appendix 1, §6(c):
Minor revision of the ETOPS CMP document:
These guidelines should also be reflected in AMC and GM to Part 21 (see also related comments).

response *Not accepted*

A DOA which is permitted under priviliges 21A.263(c)(3) when included in the DOA terms of approval may approve documentary changes to the CMP.

resulting text: See resulting text in Appendix A

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 1 - Propulsion System Reliability Assessment - 7 Design Organisation Approvals p. 87-88

comment *233* comment by: *Boeing*

Page 88: **Part B, VII. Draft Decision amending AMC-20:**
Appendix 1 - Propulsion System Reliability Assessment, Section 7, DESIGN ORGANISATION APPROVALS

Boeing suggests that the following paragraph be deleted as indicated:

7. DESIGN ORGANISATION APPROVALS

...

~~Third country (S)TC holders, not holding an EASA DOA must present proof of at least an equivalent organisation and a hand book containing procedures that satisfies the intent of EASA Part 21 and this EASA AMC 20-6.~~

JUSTIFICATION: The intent of this paragraph is unclear and it conflicts with existing validation practices. It is recommended that this paragraph be deleted and existing certification and validation policies and procedures be used.

response *Accepted*

Text deleted. The validation of ETOPS approval from foreign (S)TC is handled via the normal bilateral verification/validation procedures

comment *252* comment by: *Embraer*

DOA equivalence

Section 7 (page 88) specifies that third country holders of ETOPS design approvals that are not DOAs must show that they have an equivalent organization, and a hand book defining the procedures that are equivalent to that of IR 21 and AMC 20-6. This requirement would effectively require that third country applicants have some sort of organization delegation. There are some countries that have no provisions for organizational delegation in their aeronautical code, and they work in other ways (for example, individual designees, direct authority involvement, etc.).

Article 3 of Commission Regulation 1702/2003 says that the requirement for demonstration of organizational capability of applicants in non-member states can be satisfied by the issuance of the applicable approval from the State of Design if the system of the state has been found to have the same level of independent checking as required by the regulation. There is no requirement for an equivalent organization or a handbook. The proposed AMC is beyond the requirement of the applicable regulation, so the second paragraph in Section 7 should be removed.

response *Noted*

Text deleted. The validation of ETOPS approval from foreign (S)TC is handled via the normal bilateral verification/validation procedures.

comment *362* comment by: *General Electric Company*

paragraph 7 DESIGN ORGANISATION APPROVALS
The requirement for a third country TC (STC) holder to present proof of an equivalent organization and a handbook to satisfy the intent of Part 21 and AMC 20-6 should be deleted. It is an unnecessary burden on non-European industry and is contrary to the validation principles in current and future bilateral agreements with the US and other countries. The state of design is responsible for regulating the organizational structure of its certificate holders.

response *Noted*

Text deleted. The validation of ETOPS approval from foreign (S)TC is handled via the normal bilateral verification/validation procedures.

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 2 - Aircraft Systems Reliability Assessment - 2 System Safety Assessment "SSA" p. 89-92

comment	*253* comment by: *Embraer* Safety Assessment Requirements Paragraph 2.f on page 92 says that safety assessments should consider the need to divert to the nearest suitable aerodrome, or alternatively, to a more distant aerodrome with better operating conditions. Embraer believes that this type assessment is so complex and so driven by external environment rather than failure effects that to do such an evaluation during certification will have add little value. In addition, the possibility of actual conditions being worse than forecast is equally applicable to non-ETOPS operations yet consideration of whether it is more advisable to divert to a more distant aerodrome offering better conditions has not been necessary. Given the additional margin for ceiling and visibility required by Appendix 6, the probability of an unanticipated loss of availability of a suitable aerodrome is probably less likely for an ETOPS scenario, notwithstanding the longer diversion time. Embraer believes that this requirement should be deleted.
response	*Not accepted* The text is maintained. The intent of this paragraph is to provide general guidance to the flight crew to enable them to take the appropriate decisions.

comment	*349* comment by: *AIRBUS* AMC 20-6 Appendix 2, §2(c): SSA methodology: This paragraph presents a specific methodology for the system safety analysis based on the ETOPS significant systems Group 1/ Group 2 sorting. This methodology may be specific to certain applicant(s) but is not in any case a standard practice of the global aviation industry. For instance, this principle has not been used for the ETOPS 180min approval of Airbus twin engine airplanes against AMC 20-6 or AC 120-42A. We ask to remove this specific utilization of the Group 1/ Group 2 systems in the SSA from the AMC.
response	*Not accepted* For consistency with the FAA the text will be maintained.

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 2 - Aircraft Systems Reliability Assessment - 3 Reliability Validation Methods p. 92-95

comment	*118* comment by: *Boeing*

Page 94: **Part B, VII. Draft Decision amending AMC-20:**
Appendix 2 - Aircraft Systems Reliability Assessment, 3 Reliability Validation Methods, b. Early ETOPS, (1) Acceptable Early ETOPS Plan, (J)

Boeing suggests the following changes to paragraph 3.b.(1)(J):

(J) At the completion of the aeroplane(s) demonstration testing, the ETOPS significant systems must undergo an ~~aeroplane visual inspection~~ **operational or functional check** per the Instructions for Continued Airworthiness of CS 25.1529. The engines must also undergo a gas path inspection. These inspections are intended to identify any abnormal conditions that could result in an in-flight shutdown or diversion. Any abnormal conditions must be identified, tracked and resolved in accordance with subpart (2) below. **This inspection requirement can be relaxed** ~~Consideration~~ **for ETOPS-significant systems not changing on derivative aircraft and/or systems similar in design to proven models.**
JUSTIFICATION: Consideration should be given for established ETOPS Significant Systems. Efforts should concentrate on new systems that need validation. Practical application of system validation and consideration of existing reliable systems allows more time for consideration of new systems.

response *Accepted*

Text amended.

comment *158* comment by: *UK CAA*

2 (iii)

Amend " the first 250000 hours" to "at least the first 250000 hours"

justification:
See comment to Paragraph 5c, Page 85

response *Partially accepted*

In conjunction with the Airbus comment 347, which highlighted an inconsistency between the hours required for early ETOPS and the hours used for in-service experience. The text has been amended to "....at least the first 100,000...." . These ensure that the additional process required via the early ETOPS route is not in excess of that which would be required for in service experience route.

comment *159* comment by: *UK CAA*

(2)(v)

Abandoned Take Offs should also be tracked.

justification:
Add (J) Abandoned Take Offs

response *Partially accepted*

The text has been amended to align the operators maintenance program tracking requirements to that of the S(TC) holders for early ETOPS. This

included the introduction of items that meet the intent of this comment

comment 350 comment by: *AIRBUS*

AMC 20-6 Appendix 2, §3:
Reliability Validation method:
This paragraph presents two methods (In-service Experience and Early ETOPS) aiming at demonstrating that relevant ETOPS problem are limited in compliance with the specified safety objective. We ask EASA to clarify what an ETOPS relevant problem is, in particular considering the FAA definition for this concept: "an ETOPS relevant problem is a problem with an ETOPS group 1 significant system that has, or could result in, an IFSD or diversion." Completing this definition would be in line with the ETOPS occurrence reporting and tracking events detailed in Appendix 2 §3.(b).(2) and the continuing surveillance as detailed in Appendix 2 §4 of this draft AMC 20-6.

response *Noted*

Comment not understood, can the commentator clarify?

comment 351 comment by: *AIRBUS*

AMC 20-6 Appendix 2, §3.b.(2):
Early ETOPS reporting and tracking:
What is the rationale for disconnecting the in-service experience requirement for reporting (250,000 flight hours) from the criteria for stable reliability levels given in Appendix 1 - §2 (i.e. 100,000 engine hours for new propulsion systems or 50,000 engine hours for derivative)? Furthermore, the value given in this paragraph (250,000 flight hours) represents 500,000 engine hours, i.e. twice the value given in Appendix 1 §5 for the early ETOPS reporting and tracking guidelines for the engine.

response *Accepted*

The highlighted inconsistency between the hours required for early ETOPS and the hours used for in-service experience is agreed. The text has been amended to "....at least the first 100,000...." . These ensure that the additional process required via the early ETOPS route is not in excess if that which would be required for in service experience route.

comment 352 comment by: *AIRBUS*

AMC 20-6 Appendix 2, §5.d:
Minor revision of the ETOPS CMP document:
These guidelines should also be reflected in AMC and GM to Part 21 (see also related comments).

response *Not accepted*

A DOA which is permitted under privileges 21A.263(c)(3) when included in the DOA terms of approval may approve documentary changes to the CMP

resulting text See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 2 - Aircraft Systems Reliability Assessment - 6 Design Organisation Approval p. 97

comment	*234* comment by: *Boeing*
response	*Noted* No comment introduced

comment	*235* comment by: *Boeing* Page 97: **Part B, VII. Draft Decision amending AMC-20:** APPENDIX 2 - AIRCRAFT SYSTEMS RELIABILITY ASSESSMENT, Section 6, DESIGN ORGANISATION APPROVAL: Boeing requests the deletion of the following text in paragraph 6: *6. DESIGN ORGANISATION APPROVAL* *...* ***~~Third country (S)TC holders, not holding an EASA DOA must present proof of at least an equivalent organisation and a hand book containing procedures that satisfies the intent of EASA Part 21 and this EASA AMC 20-6.~~*** **JUSTIFICATION:** The intent of this paragraph is unclear and it conflicts with existing validation practices. It is recommended that this paragraph be deleted and existing certification and validation policies and procedures be used.
response	*Accepted* Text deleted. The validation of ETOPS approval from foreign (S)TC is handled via the normal bilateral verification/validation procedures.

comment	*363* comment by: *General Electric Company* paragraph 6 DESIGN ORGANISATION APPROVAL The requirement for a third country TC (STC) holder to present proof of an equivalent organization and a handbook to satisfy the intent of Part 21 and AMC 20-6 should be deleted. It is an unnecessary burden on non-European industry and is contrary to the validation principles in current and future bilateral agreements with the US and other countries. The state of design is responsible for regulating the organizational structure of its certificate holders.
response	*Accepted* Text deleted. The validation of ETOPS approval from foreign (S)TC is handled via the normal bilateral verification/validation procedures.

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 3 - Aerodromes Operational Limitations - 1 General p. 98

comment	*119* comment by: *Boeing* Page 98: **Part B, VII. Draft Decision amending AMC-20:** Appendix 3 - Operational Limitations Boeing suggests the following change to the title of Appendix 3: **"APPENDIX 3 -** ~~AERODROMES~~ **OPERATIONAL LIMITATIONS"** **JUSTIFICATION:** This appears to be a typographical error. As written, the title is incorrect. The word "Aerodromes" should be deleted as it appears to have been a word accidentally carried over from the old title of Appendix 3.
response	*Accepted* Text amended.

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 3 - Aerodromes Operational Limitations - 3 Standard en Route Alternate Aerodrome pre Departure Weather Minima p. 98-100

comment	*353* comment by: *AIRBUS* AMC 20-6 Appendix 3: Operational Limitations: • Remove "Aerodromes" from the title of this appendix. • The concept of "Adequate ETOPS en-route Alternate aerodrome" is used in this appendix although it is not defined in this NPA. • The two paragraphs dealing with the operator's approved diversion time and the use of maximum diversion time are confusing. They may be applicable for the current ETOPS concept, that remain unchanged for ETOPS up to 180 min operations. These explanations become non-appropriate when dealing with the new ETOPS beyond 180 min concepts. • There is a typo in the last sentence of §2 : "[...] is normally be the limiting factor". Consider removing "be".
response	*Accepted* 1st accepted. 2nd accepted. 3rd accepted 4th accepted.

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 4 - Flight Preparation and In-Flight Procedures - 2 ETOPS Maintenance Programme p. 102

comment	*80* comment by: *KLM* AMC 20 appendix 4 The ETOPS Maintenance requirements are deleted from this appendix and scattered into other documentation for the parts 21, 25 CS and 145. This creates a difficult picture for a starting ETOPS operator or operators having to review the total requirements. The ETOPS working group has always justified the requirement for one document containing all the required information on ETOPS and this should be maintained. Therefor re-instate appendix 4 and all other relevant maintenance information required for ETOPS with reference to 145 and 21 and 25 if applicable, but keep all the information together. This is also justified by the requirement for an ETOPS manual which will be the working document in an airline. In order to prevent overlooking any required part, the relevant info has to be kept together.
response	*Accepted* Text amended as the Agency is going to prepare one single document with three clearly identified chapters.

resulting text: See resulting text in Appendix A

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 4 - Flight Preparation and In-Flight Procedures - 10 ETOPS Parts Control - 2. Minimum Equipment List (MEL) p. 104-105

comment	*120* comment by: *Boeing* Page 104: **Part B, VII. Draft Decision amending AMC-20:** Appendix 4 - Flight Preparation and In-flight Procedures, 2. Minimum Equipment List (MEL), a. Boeing suggests that paragraph 2.a. be revised as follows: " 2. Minimum Equipment List (MEL) The system redundancy levels appropriate to ETOPS should be reflected in the Master Minimum Equipment List (MMEL). An operator's MEL may be more restrictive than the MMEL considering the kind of ETOPS operation proposed, equipment and in-service problems unique to the operator. Systems considered to have a fundamental influence on flight safety may include, but are not limited to, the following: a. electrical~~, including battery~~; ... " **JUSTIFICATION:** Although the battery has been included in previous ETOPS MEL guidance, it is only one component of the electrical system. Since

components are not specified for other systems on the list, and the battery does not have any special ETOPS significance, it should not be included here.

response *Accepted*

Text amended.

comment *121* comment by: *Boeing*

Page 105: **Part B, VII. Draft Decision amending AMC-20:**
Appendix 4 - Flight Preparation and In-flight Procedures, 2. Minimum Equipment List (MEL)

Boeing suggests that the items required for diversion times greater than 180 minutes should be re-numbered in such a way that they can be distinguished from the MEL safety systems earlier in the paragraph. In its present configuration, paragraph 2 has two sub-paragraphs (a), (b), (c), and (d).

JUSTIFICATION: Suggested change is needed for clarity and the ability to reference a specific requirement by paragraph number.

response *Noted*

Text amended.

comment *122* comment by: *Boeing*

Page 105: **Part B, VII. Draft Decision amending AMC-20:**
Appendix 4 - Flight Preparation and In-flight Procedures, 2. Minimum Equipment List (MEL), b. (the second one under paragraph 2)

Boeing suggests that this paragraph be revised as follows:

"In addition, the following systems are required to be operative for dispatch for ETOPS with diversion times above 180 minutes:

a. Fuel Quantity Indicating System (FQIS);

b. APU (including electrical and pneumatic supply to its designed capability) **if necessary to comply with ETOPS requirements; ..."**

JUSTIFICATION: Depending on the electrical system architecture, not all airplanes require an APU to meet ETOPS type design standards.

response *Accepted*

Text amended.

comment *123* comment by: *Boeing*

Page 105: **Part B, VII. Draft Decision amending AMC-20:**
Appendix 4 - Flight Preparation and In-flight Procedures, 2. Minimum Equipment List (MEL), c. (the second one under paragraph 2)

Boeing suggests that this paragraph be revised as follows:

"In addition, the following systems are required to be operative for dispatch for

ETOPS with diversion times above 180 minutes:
...
c. ~~Automatic engine or propeller control~~ **Autothrottle** system; ..."

JUSTIFICATION: The intent was to address automatic thrust control systems for ETOPS with diversion times above 180 minutes.

response *Not accepted*

Present wording is kept as it seems more generic. For example CS 25.1329 uses autothrust and not autothrottle

comment *171* comment by: *ECA - European Cockpit Association*

ECA thinks that the risk would be better assessed requiring a Low Fuel Quantity alert to advise Crew when Safe Diversion could be at risk. There should be a "Fuel used / FOB discrepancy" alarm for this kind of operations.

response *Noted*

The concern is already covered by the proposed text.

comment *207* comment by: *AEA*

Comment: Engine Conditioning Monitoring procedures at many operators depend heavily on recording systems such as ACMS. The current MMEL (and consequently also most operator MEL's) do not reflect the ACMS system reduncy levels appropriate to the Engine Condition Monitoring aspects.

Proposal:
Add to the example MEL list:

q. all system(s) and equipment required for engine condition monitoring.

response *Accepted*

Text modified accordingly.

comment *208* comment by: *AEA*

Reference
2. Minimum equipment list (MEL)
In addition, the following systems are required to be operative for dispatch for ETOPS with diversion times above 180 minutes...

Comment: No rational why all additional MEL requirements are needed above 180 minutes.
Note: Additional items seems to be added solely to satisfy the pilot community and not based on risk analysis normally performed for MEL restrictions.
Unclear what communication system(s) are meant? SATCOM?

Proposal:

Remove additional requirements or

	Add appendix to RIA with risk analysis/clarification per system why it is required for dispatch for ETOPS with diversion times above 180 minutes.
response	*Not accepted* It is an operational requirement in EU-OPS.

comment	*309* comment by: *Cessna Aircraft Company* Appendix 4, MEL: the additional requirements for equipment for greater than 180 minutes includes the APU. We suggest, for clarification, that this should include "if required for ETOPS" to cover the case where a design may meet the ETOPS requirements without the use of the APU.
response	*Accepted* Text amended.

comment	*354* comment by: *AIRBUS* AMC 20-6 Appendix 4: MEL: • Consider changing the sentence introducing the MEL list "Systems considered to have a fundamental influence on flight safety may include..." by "Systems considered to have a fundamental influence on safety of an ETOPS flight may include..." • Remove the bullet (p) (that is not given in the current AMC 20-6): "all systems and equipment supplied from the standby/emergency electrical power source". Indeed, this is not in line with the MMEL development process that must consider the effect of the next critical failure: the emergency electrical power configuration is not considered as a next critical failure as it is the result of a combination of several failures. In addition, a manufacturer may add systems on the emergency generator power bar for pilot's comfort reasons rather than for safety reasons. Such ETOPS MMEL principle would penalize airplane with more equipments supplied from the emergency power source and could therefore encourage to limit the list of equipments to those required by the safety analysis. Airbus asks to remove this bullet, which is contrary to the MMEL basic principles and goes against manufacturer's design improvement initiatives. • The APU and associated power sources should not be explicitly a NO GO item for ETOPS beyond 180 min. Indeed, a (S)TC holder may either install additional or increase the reliability of the power sources (electric or pneumatic), which would make that the APU is not required to achieve the safely objectives for instance. We recommend adding a clarification such as "when it is required by the manufacturer's MMEL analysis" to clarify that the APU and associated power supply are NO GO for ETOPS beyond 180 min only if prescribed by the MMEL analysis for a certain airframe-engine combination.
response	*Noted* 1st comment. Not accepted. The AMC is only for ETOPS and there is no need to specify. 2nd comment. Accepted.

3rd comment accepted.

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 4 - Flight Preparation and In-Flight Procedures - 10 ETOPS Parts Control - 3. Communication and Navigation Facilities p. 105

comment *124* comment by: *Boeing*

Page 105: **Part B, VII. Draft Decision amending AMC-20:**
Appendix 4 - Flight Preparation and In-flight Procedures, 3. Communications and Navigation Facilities, b. and c.

Boeing suggests the following changes in this section:

"b. ~~Non-visual ground navigation aids are available and located so as to provide, taking account of the navigation equipment installed in the aeroplane, the navigation accuracy necessary for the planned route and altitude to be flown, and the routes to any alternate and altitudes to be flown in the event of engine shutdown; and~~
~~c.~~ Visual and non-visual aids are available at the specified alternates for the anticipated types of approaches and operating minima."

JUSTIFICATION: No ground-based navigation aid is receivable along oceanic ETOPS routes. The only ground-based navigation requirement for ETOPS occurs at alternate aerodromes, as stated in original paragraph c.

response *Accepted*

Text amended.

comment *264* comment by: *AEA*

Section: B. Draft Decisions - Draft Decision amending AMC-20
APPENDIX 4 FLIGHT PREPARATION AND IN-FLIGHT PROCEDURES
10. ETOPS PARTS CONTROL
3. COMMUNICATION AND NAVIGATION FACILITIES.
(a)
(page 105)

Comment:
Communication is more important before the diversion than once the decision to divert has been taken. The principle of ETOPS is based on a flight follow-up by the operator's dispatch. Therefore communication with the operator's dispatch is as important as communication with ATC.
General comment: it seems difficult for an operator to guarantee that availability especially for the communication with ATC.

Proposal: Rewrite the paragraph as follows
Communications facilities are available to provide under normal conditions of propagation at all planned ~~**contingency**~~ altitudes **of the intended normal**

	flight and the diversion scenarios reliable two-way voice and /or data link communications.
response	*Accepted* Text amended.

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 4 - Flight Preparation and In-Flight Procedures - 10 ETOPS Parts Control - 4. Fuel Supply p. 105-107

comment	*125* comment by: *Boeing* Page 106: **Part B, VII. Draft Decision amending AMC-20:** Appendix 4 - Flight Preparation and In-flight Procedures, 4. Fuel Supply, c. Critical Fuel Scenario Boeing suggests the following changes in paragraph 4.c.: "c. Critical Fuel Scenario. The following describes a scenario for a diversion at the most critical point. The applicant should confirm ~~the~~ **compliance with this** scenario ~~to be used~~ when calculating the critical fuel reserve necessary. ..." **JUSTIFICATION:** The operators should confirm that their flight planning system is correctly calculating and properly displaying the elements of the ETOPS Critical Fuel Scenario.
response	*Accepted* Text amended.

comment	*126* comment by: *Boeing* Page 107: **Part B, VII. Draft Decision amending AMC-20:** Appendix 4 - Flight Preparation and In-flight Procedures, 4. Fuel Supply, d. Icing Boeing notes that the critical fuel scenario does not appear to be harmonized with the FAA in the area of fuel mileage degradation penalties (penalties imposed for cruise portion vs. entire diversion). It should be changed to be parallel with the FAA's document. **JUSTIFICATION:** Different approaches may require different logic in industry flight planning programs.
response	*Not accepted* The Agency considers that the critical fuel criteria laid down in the AMC is compatible with the applicable fuel requirements in Europe for the operations

of aeroplanes involved in commercial operations.

resulting text | See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 4 - Flight Preparation and In-Flight Procedures - 10 ETOPS Parts Control - 5. Alternate Aerodromes p. 107

comment *127* comment by: *Boeing*

Page 107: **Part B, VII. Draft Decision amending AMC-20:**
Appendix 4 - Flight Preparation and In-flight Procedures, 5. Alternate Aerodromes

Boeing suggests that the following change be made to paragraph 5:

"To conduct an ETOPS flight, the required ~~take-off, destination alternate aerodromes, including~~ ETOPS en-route Alternate aerodromes~~,~~ should meet the weather requirements of planning minima for IFR flights for an ETOPS en-route alternate contained in the applicable operational requirements. The planned en-route alternates for using in the event of propulsion system failure or aeroplane system failure(s) which require a diversion should be listed in the cockpit documentation (e.g. computerised flight plan). ..."

JUSTIFICATION: Origin aerodromes, destination aerodromes, and their alternates, when required, only need to meet ETOPS weather minima if they are declared to be ETOPS Enroute Alternate Aerodromes for that flight. This requirement is stated in the second paragraph. On many ETOPS flights, the origin and/or destination aerodromes and their associated alternates are well outside the ETOPS portion of the flight.

response *Accepted*

Text amended.

comment *128* comment by: *Boeing*

Page 107: **Part B, VII. Draft Decision amending AMC-20:**
Appendix 4 - Flight Preparation and In-flight Procedures, 5. Alternate Aerodromes

Boeing suggests deleting the last paragraph in paragraph 5:

"**~~ETOPS en-route alternates should also be identified and listed in operational flight plan for all cases where the planned route to be flown contains a point more than the applicable (ETOPS) threshold time at the one-engine-inoperative speed from an adequate aerodrome~~.**

JUSTIICATION: Delete for clarity. This last paragraph is a restatement of the last sentence in the first paragraph, and is therefore not required.

response

Partially accepted

Both paragraphs have been merged, as the conditions for the planned en-route alternates list was not included in the same paragraph.

comment

172 comment by: *ECA - European Cockpit Association*

ECA thinks that the phrase "applicable(ETOPS) threshold" shall be better clarified.

response

Accepted

Text amended.

comment

215 comment by: *AEA*

Comment: What does the following mean? "To conduct an ETOPS flight, the required take-off, destination alternate aerodromes, including ETOPS en-route Alternate aerodromes, should meet the weather requirements of planning minima for IFR flights for an ETOPS en-route alternate contained in the applicable operational requirements."
If it means that, for ETOPS flights, takeoff alternate and destination alternate aerodrome planning requirements must meet ETOPS requirements, that are certainly not the case.
If it means that ETOPS flights may use takeoff or destination alternate aerodromes which are more than one hour's flying time from the departure or destination aerodrome respectively, but aerodromes used in those cases must meet ETOPS alternate planning requirements, that needs to be made clearer.

Proposal:
clarification

response

Accepted

Text amended.

comment

355 comment by: *AIRBUS*

AMC 20-6 Appendix 4, §5:
Alternate Aerodromes:

- Remove from the first sentence the reference to the takeoff and destination alternate. As explained in the second paragraph of this chapter, the takeoff and destination aerodromes must comply with the ETOPS weather minima only if these are selected as ETOPS en-route alternate aerodromes.
- Add in the last sentence of the last paragraph "under standard conditions in still air".

response

Accepted

Text amended.

resulting text	See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 4 - Flight Preparation and In-Flight Procedures - 10 ETOPS Parts Control - 6. In-Flight Re-Planning and Post-Dispatch Weather Minima p. 107-108

comment	*160* comment by: *UK CAA* Appendix 4 Para 6 'Post-Dispatch, weather conditions at en route alternates should be equal to or better than the minima for the available instrument approach' justification: Needs confirmation that the minima refers to the normal - ie Non Etops minima for the available instrument approach proposed text: Post-Dispatch, weather conditions at en route alternates should be equal to or better than the normal non-ETOPS minima for the available instrument approach.
response	*Accepted* Text amended.

resulting text	See resulting text in Appendix A

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 4 - Flight Preparation and In-Flight Procedures - 10 ETOPS Parts Control - 7. Delayed Dispatch p. 108

comment	*265* comment by: *AEA* **Section:** B. Draft Decisions - Draft Decision amending AMC-20- APPENDIX 4 FLIGHT PREPARATION AND IN-FLIGHT PROCEDURES 10. ETOPS PARTS CONTROL 7. DELAYED DISPATCH **Comment:** Flight Operations Staff/Dispatchers ought to be used in lieu of "operations support personnel" to be consistent with Appendix 6. Both airport weather and conditions (NOTAMs) should be cross checked simultaneously to corroborate airport availability and operating minima. **Proposal:** Rewrite the paragraph as follows**:** *If the dispatch of the flight is delayed by more than an hour, after the operating crew have left the briefing facility,* ***~~operations support personnel~~ flight operations staff/Dispatchers*** *should monitor weather forecasts* ***~~f~~or and airport status a****t the nominated en-route alternates*
response	*Partially accepted*

The term dispatcher has been replaced by the general term operation personnel other than flight crew to align with EU-OPS. This term has also been used in appendix 6.
The proposal to add 'and airport status at' has been accepted

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 4 - Flight Preparation and In-Flight Procedures - 10 ETOPS Parts Control - 8. Diversion Decision Making p. 108

comment *129* comment by: *Boeing*

Page 108: **Part B, VII. Draft Decision amending AMC-20:**
Appendix 4 - Flight Preparation and In-flight Procedures, 8. Diversion Decision Making

Boeing suggests the following changes be made to the first paragraph under paragraph 8:

8. Diversion Decision Making

"Operators shall establish procedures for flight crew, outlining the criteria that indicate **when** a diversion or change of routing **is recommended** whilst conducting an ETOPS flight. For an ETOPS flight, **in the event of the shutdown of an engine,** these procedures should include ~~the shutdown of an engine~~, fly to and land at the nearest ~~(in terms of the least flying time)~~ **suitable** aerodrome appropriate for landing."

JUSTIFICATION: the suggested change is needed for clarity , since the section deals with factors to be considered in determining the suitability of an aerodrome.

response *Accepted*

Text amended.

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 4 - Flight Preparation and In-Flight Procedures - 10 ETOPS Parts Control - 9. In-Flight Monitoring p. 108-109

comment *224* comment by: *British Midland Airways Ltd, t/a 'bmi'*

BMA believes that it is impractical for the flight crew to remain informed of field conditions and aerodrome services at the designated ETOPS en-route alternate(s) beyond forecast and actual meteorological conditions. Such other

field and aerodrome services conditions are published by NOTAM and most ACARS AOC systems do not have a facility to obtain NOTAMs, and is not provided by any other radio broadcast facility such as VOLMET or HIWAS.

There would be a dis-proportionate burden placed upon the Dispatch service to continually monitor NOTAM updates for all the selected ETOPS en-route alternates for the applicable flights. It is not necessarily possible for Dispatch service to be aware of a flight's proximity to the ETOPS Entry Point. Such alternate aerodrome monitoring is not conducted for any other type of flight beyond flight crew pre-flight briefing.

Furthermore, for those aircraft not ACARS equipped, communications with their Dispatch service may not be easily assured once airborne to receive such information, reliant upon HF communications often via third-party exchange providers.

BMA believes that In-Flight Monitoring requirement under this paragraph should be confined only to forecast weather, which is readily available to those aircraft with ACARS, or alternatively via VOLMET services to non-ACARS equipped aircraft, and that this paragraph be re-worded accordingly.

response *Partially accepted*

This in-flight monitoring is considered to be quite an important safety issue for ETOPS. The difficulties of such provisions are well understood and the paragraph has been therefore reworded to highlight that the field conditions, aerodrome services and facilities should be monitored where possible.

resulting text See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 4 - Flight Preparation and In-Flight Procedures - 10 ETOPS Parts Control - 10. Aeroplane Performance Data p. 109

comment *254* comment by: *Embraer*

Fuel flow data in AFM

Section 10 of Appendix 4 refers to operations manual and the need for data sufficient to determine fuel reserves. It specifies the AFM as the source for fuel flow data, as well as data for all-engine cruise and holding. There is no requirement in CS 25 to provide these data as part of the authority required AFM, and there are no established means of compliance for determining these data. This information is normally conveyed as part of the operational information in an AOM or FCOM that may be reviewed and accepted by the authority, but it is not part of the CS 25 approved AFM. Section 10 should be revised to delete reference to the AFM as the source of the operations data.

response *Accepted*

The text refers now to data provided by the (S)TC holder.

comment *356* comment by: *AIRBUS*

AMC 20-6 Appendix 4, §10:
Aeroplane Performance Data:
Remove the reference to CS 25.1535. This paragraph is applicable to any ETOPS approved aircraft under the current AMC 20-6 or the new CS 25.1535, which is not retroactive.

response *Accepted*

The text refers now to data provided by the (S)TC holder.

resulting text See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 4 - Flight Preparation and In-Flight Procedures - 10 ETOPS Parts Control - 11. Operational Flight Plan p. 109

comment *130* comment by: *Boeing*

Page 109: **Part B, VII. Draft Decision amending AMC-20:**
Appendix 4 - Flight Preparation and In-flight Procedures, 11. Operational Flight Plan

Boeing recommends the following changes to paragraph 11:

"11. OPERATIONAL FLIGHT PLAN

The type of operation (i.e. ETOPS**, <u>including the diversion time used to establish the plan</u>**) should be listed on the operational flight plan as required by the applicable operational requirements."

<u>JUSTIFICATION:</u> Stating the ETOPS time used to generate a flight plan is an industry standard intended to (1) notify the flight crew that the flight plan is an ETOPS plan, and (2) assist the crew in the correct circle selection on their plotting chart. This is especially important if an MEL item reduces the "normal" diversion time used by the operator.

response *Accepted*

Text amended.

resulting text See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 5 - ETOPS en-Route Alternate Aerodromes - 3. Criteria for Approval to Operate up to 90 Minutes - 1. Selection of en-Route Alternate Aerodromes p. 110-111

comment *266* comment by: *AEA*

Section:
B. Draft Decisions - Draft Decision amending AMC-20 -

Appendix 5 - ETOPS en-Route Alternate Aerodromes -
3. Criteria for Approval to Operate up to 90 Minutes -
1. Selection of en-Route Alternate Aerodromes
a. "The landing distances required as specified in the AFM..."
(page 111)

Comment:
How can a landing distance available be computed?

Concerns about the term "known" :Weather related Runway Surface Conditions can not be predicted.

response *Noted*

The word computed is applicable to landing distance required. The comment about "known" is not understood as the paragraph refers to anticipated conditions at the expected arrival times.

resulting text: See resulting text in Appendix A

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 5 - ETOPS en-Route Alternate Aerodromes - 3. Criteria for Approval to Operate up to 90 Minutes - 2. Dispatch Minima - en-Route Alternate Aerodromes p. 111-112

comment *173* comment by: *ECA - European Cockpit Association*

ECA thinks that the risk of unforeseen Weather and/or wind changes shall be better addressed. This rule shall also be coordinated with other Authorities all over the world at the maximum possible extent; taking into account that the type of approach is a good step.

response *Noted*

The Agency thank the commenter for the comment. The text of this NPA is based on the technical material prepared by the Joint Aviation Authorites ETOPS/LROPS Ad Hoc Working Group. One part of this group terms of reference was to harmonise with FAA and ICAO. Therefore as such this material has been harmonised with other regulators to the extent possible within the European regulatory system.

comment *267* comment by: *AEA*

Section:
B. Draft Decisions - Draft Decision amending AMC-20 -
Appendix 5 - ETOPS en-Route Alternate Aerodromes -
3. Criteria for Approval to Operate up to 90 Minutes -
1. Selection of en-Route Alternate Aerodromes
c. plus any reduced visibility limits
2. Dispatch Minima - En-Route Alternate Aerodromes
Table 1. Planning minima
plus any reduced visibility limits

Comment:

The term "*plus any reduced visibility limits*" might need clarification.

Proposal:
Clarify the term "*plus any reduced visibility limits*"

response

Noted

The use of plus any reduced visibility limits means that the crew must account of the forecast visibility of the alternative and any possible reduction that may be anticipated.

comment

268 comment by: *AEA*

Section:
B. Draft Decisions - Draft Decision amending AMC-20 -
Appendix 5 - ETOPS en-Route Alternate Aerodromes -
3. Criteria for Approval to Operate up to 90 Minutes -
2. Dispatch Minima -En-Route Alternate Aerodromes

Comment:
For harmonization sake, ETOPS planning minima rules should be applied as for the non-ETOPS flights in EU-OPS 1.340.

EU- OPS 1.340
Meteorological Conditions
(a) On an IFR flight a commander shall only:
(1) Commence take-off; or
(2) ...
when information is available indicating that the expected weather conditions, at the time of arrival, at the destination and / or required alternate aerodrome(s) prescribed in OPS 1.295 are at or above the planning minima, prescribed in OPS 1.297.

response

Not accepted

The text is an AMC providing guidance on the items to be addressed and it is not proposed to structure this as regulation text.

comment

269 comment by: *AEA*

Section:
B. Draft Decisions - Draft Decision amending AMC-20 -
Appendix 5 - ETOPS en-Route Alternate Aerodromes -
3. Criteria for Approval to Operate up to 90 Minutes -
2. Dispatch Minima -En-Route Alternate Aerodromes

Proposal: Add : the following sentence as « Despatch » has been cancelled from Terminology.

ETOPS planning minima applies until take off. By take off one shall understand brake release for take off.

response

Not accepted

In accordance with EU OPS 1.192 ETOPS planning minima applies until dispatch. Dispatch is when the aircraft first moves under its own power for the purpose of taking off.

resulting text	See resulting text in Appendix A

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 6 - ETOPS Training Programme p. 113

comment	*357* comment by: *AIRBUS* AMC 20-6 Appendix 6: ETOPS Training Programme: • Add in bullet (f) details on the Time-limited systems concepts. Indeed, these are used to determine the diversion distance limitations for the ETOPS beyond 180 min operations and as such should be part of the training syllabus. • Similar guidelines should also be added for the training programme of flight dispatchers (as well and Maintenance & Engineering personnel in AMC to Part M and Part 145). • For what reason is "Fuel Management with degraded systems such as loss of primary FMS" listed as an ETOPS diversion case?
response	*Partially accepted* 1st bullet: Accepted 2nd bullet: Accepted for maintenance engineers 3rd bullet: The reference to loss of primary FMS has been deleted.

resulting text	See resulting text in Appendix A

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 6 - ETOPS Training Programme - 5 ETOPS Line Flying Under Supervision (LFUS) p. 114

comment	*174* comment by: *ECA - European Cockpit Association* ECA thinks that a higher number of ETOPS sectors shall be considered to Train Flight Crews not ETOPS Qualified on other types. The minimum is too low: 2 sectors is OK for pilots who have already ETOPS qualified. 4 should be the standard.
response	*Not accepted* The Agency considered that the stated minimum ETOPS sectors will sufficient as part of the ETOPS training programme.

comment	*270* comment by: *AEA* **Section:** . Draft Decisions - Draft Decision amending AMC-20 - APPENDIX 6 ETOPS TRAINING PROGRAMME. **Comment:** editorial

Proposal: chapter 4 is missing

response *Accepted*

chapter numbering amended

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 7 - Typical ETOPS Operations Manual Supplement - Part A General/Basic p. 119-120

comment *271* comment by: *AEA*

Section: Draft Decisions - Draft Decision amending AMC-20 -
APPENDIX 7 TYPICAL ETOPS OPERATIONS MANUAL SUPPLEMENT.
PART A/ General/ Basic
• **i.** introduction

Comment:
editorial, use of i) instead of a)

Proposal: ~~**i.**~~ **a. Introduction**

response *Accepted*

text amended.

resulting text: See resulting text in Appendix A.

B. Draft Decisions - Draft Decision amending AMC-20 - Appendix 7 - Typical ETOPS Operations Manual Supplement - Part C Route and Aerodrome Instructions p. 121

comment *259* comment by: *AEA*

Section:
B. Draft Decisions - Draft Decision amending AMC-20 -
Appendix 7 - Typical ETOPS Operations Manual Supplement -
Part C Route and Aerodrome Instructions
f)

Comment: The term "requirements" should be added to remain consistent with this AMC.

Proposal: Rewrite the paragraph as follows:
f. Performance **requirements** and weather minima for aerodromes that are designated as possible alternates.

response *Accepted*

Text amended.

comment 272 comment by: *AEA*

Section:
B. Draft Decisions - Draft Decision amending AMC-20 -
Appendix 7 - Typical ETOPS Operations Manual Supplement -
Part C Route and Aerodrome Instructions
f)

Comment: The term "requirements" should be added to remain consistent with this AMC.

Proposal: Rewrite the paragraph as follows:
f. Performance **requirements** and weather minima for aerodromes that are designated as possible alternates.

response *Accepted*

Text amended.

resulting text: See resulting text in Appendix A.

C. Appendices - Appendix 2 RIA Two-engined Aeroplane with a Maximum Approved Passenger Seating Configuration of 20 or More or a Maximum Takeoff Mass of Less Than 45360 kg Used in Commercial Air Transportation and with a Maximum Diversion Time Greater than 180 Minutes at the Approved One-Engine Inoperative Speed from an Adequate Aerodrome p. 134-137

comment 175 comment by: *ECA - European Cockpit Association*

ECA thinks that diversions to Airports located in severe climate and/or remote areas affect Passenger and Crews safety and shall be addressed in this NPA.

response *Not accepted*

The regulation of passenger and crew recovery plans for severe climate areas is the subject of a planned EASA study to determine the boundaries between issues of passenger health and flight safety, also addressing the operator responsibility as part of the passenger air transport contract.

comment 343 comment by: *FAA*

1. Affected text: Page 137, C.II 1. i. (1) *i. Summary and Final Assessment:*

(1) Comparison of the positive and negative impacts for each option evaluated

- Do nothing: Safety: possibility of diversion to inadequate aerodromes. Economic impact: prevent operations beyond 180 minutes. Not in line with ICAO proposals. No harmonized with FAA new rule;
- The previous package: Some provisions were highly criticised by

Operators;

- FAA new rule: harmonization with the FAA has been considered as part of the

Terms of Reference;

2. Comment: Although the FAA is pleased that the EASA NPA for twins is similar in its application and scope, the FAA acknowledges that the format and organization of the EASA regulations are dissimilar to the US regulations. As such an opportunity for harmonization and to ease the burden on operators has been lost.

3. Justification:

4. Proposed Alternative Text:

5. Person Providing Comment: Robert Reich, Assistant Manager, Operations Seattle Aircraft Evaluation Group

response *Noted*

The Agency thanks the FAA for the comment and notes the differences in the regulation structure leading to current proposed text.

C. Appendices - Annex 7 to RIAs: Differences between EASA and FAA proposals relative to Design p. 159-165

comment *344* comment by: *FAA*

1. Affected text: Page 159. Annex 7 to RIA, Differences between EASA and FAA proposals relative to Design:
In principle technical harmonization has been achieved in the majority of the aspects. However, in the FAA the technical requirements related to design are rules (FAR-25) where in this proposal they are acceptable means of compliance. Main differences between this NPA and the recently published FAA rule for ETOPS are summarized below:

2. Comment: The FAA stands ready to lend its expertise and experience that was gained during the development and drafting of our final rules, to EASA if they feel we may be of assistance.

3 Justification:

4. Proposed Alternative Text:

5. Person Providing Comment: Comment: Robert Reich, Assistant Manager, Operations, Seattle Aircraft Evaluation Group

response *Noted*

The Agency thanks the FAA for the offer of assistance.

comment *358* comment by: *AIRBUS*

AMC 20-6 - Annex 7 to RIA:
Differenced between EASA and FAA proposals relative to design:

- §1 This first paragraph dealing with Part 21 provides a comprehensive rationale on the difference between EASA and FAA approaches.
- §2 The table in this paragraph, which compares the draft EASA NPA to the FAR 25, is useless and a source of great confusion. Indeed, EASA has decided not to codify the ETOPS requirements as much as the FAA did in the Part 25 Amendment 120. The EASA AMC 20-6 is therefore structured as a guidance material and not as a regulation. The table in this paragraph simply provides the corresponding paragraph in each regulation. To bring added value, this table should identify the similarities in term of design (of course not in term of wording as the two regulations are structured and written in a very different way). This table should also highlight the items of difference between the two regulations. Presented as such, this table gives the impression that the EASA and FAA ETOPS design criteria are really different, which we believe (and hope) this is not the case.
- §3 As per the comment made before, we ask EASA to clarify if the certification of the engines against CS-E 1040 is only required for the Early ETOPS method (as the FAA asks compliance with §33.201 only for Early ETOPS) or not. We also recommend EASA to replace (or complement) the IFSD curves by numerical IFSD rates objectives.
- §4 This paragraph is very confusing. It is not exhaustive and it is a source of errors. For instance, we do not see any difference between EASA and FAA for the cargo fire protection time: first, this limitation should be given by the manufacturer in the AFM, second it becomes an operational limitation for the operator as per the principles explained in the §10 of the AMC 20-6.

response

Noted

§1. The Agency thank the commenter for the comment.

§2.The text of this NPA is based on the technical material prepared by the Joint Aviation Authorities ETOPS/LROPS Ad Hoc Working Group. One part of this group terms of reference was to harmonise with FAA and ICAO. Therefore as such, this material has been harmonised with other regulators to the extent possible within the European regulatory system

§3. If an ETOPS approval is being sought via the Early ETOPS route the engine will need comply with the requirements as specified in CS-E 1040. This does not preclude the use of an engine complying with CS-E 1040 on an aeroplane for which ETOPS approval is sought via the in-service route.

§4. The Agency notes that this list may not be exhaustive an the intent was to highlight the main differences between proposed text and the FAA and not all differences. With respect to cargo fire protection, while both require a cargo fire protection system, the proposed text allows the distance to be flown to be calculated using the all engine operating speed in all cases.

Appendix A – Resulting text after CRD

AMC 20-6
Extended Range Operation with Two-Engined Aeroplanes ETOPS Certification and Operation

Table of Contents

Appendix 2- Aircraft systems reliability assessment

1. Assessment process
2. System safety assessment “SSA”
3. Reliability validation methods
4. Continuing Surveillance
5. Continued airworthiness
6. Design Organisation Approval

Appendix 3- Operational limitations

1. Area of Operation
2. Operator’s approved diversion time
3. Issue of the ETOPS operational approval by the Competent Authority

Appendix 4- Flight preparation and in-flight procedures

1. General
2. Minimum equipment list (MEL)
3. Communication and navigation facilities
4. Fuel supply
5. Alternate aerodromes
6. In-flight re-planning and post-dispatch weather minima
7. Delayed dispatch
8. Diversion decision making
9. In-flight monitoring
10. Aeroplane performance data
11. Operational flight plan

Appendix 5- ETOPS en-route alternate aerodromes

1. Selection of en-route alternate aerodromes
2. Dispatch minima- en-route alternate aerodromes
3. En-route alternate aerodrome planning minima- Advanced landing systems

Appendix 6- ETOPS training programme

1. Introduction to ETOPS regulations
2. Normal Operations
3. Abnormal and contingency procedures
4. ETOPS line flying under supervision (LFUS)
5. Flight Operations personnel other than flight crew

Appendix 7- Typical ETOPS operations manual supplement

Part A: General/ basic
Part B: Aeroplane Operating Matters
Part C: Route and aerodrome instructions
Part D: Training

Appendix 8: Continuing Airworthiness Considerations

1. Applicability
2. Occurrence reporting
3. Maintenance programme and reliability programme
4. Continuing Airworthiness Management Exposition
5. Competence of continuing airworthiness and maintenance personnel

Chapter I GENERAL CONSIDERATIONS

SECTION 1: PURPOSE

This AMC states an acceptable means but not the only means for obtaining approval for two-engined aeroplanes intended to be used in extended range operations and for the performance of such operations. This AMC is structured in 3 chapters which contain the following information:

- Chapter I of this AMC provides general guidance and definitions related with extended range operations.
- Chapter II of this AMC provides guidance to (S)TC holders seeking ETOPS type design approval of an engine or a particular airplane-engine combination. These airplanes may be used in extended range operations.
- Chapter III of this AMC provides guidance to operators seeking ETOPS operational approval to conduct extended range operations under the requirements of the applicable operational regulations[7].

The purpose of this revision no 2 of AMC20-6 is to develop guidance for obtaining approval for diversion times exceeding 180 minutes.

ETOPS type design approvals and operational approvals obtained before the issue of this revision remain valid. Extension of existing ETOPS type design approvals or operational approvals beyond 180 min will have to be issued in accordance with this revision.

New ETOPS type design approvals and operational approvals will have to be issued in accordance with this revision

SECTION 2: RELATED REFERENCES

CS-Definitions: ED Decision No. 2003/011/RM as last amended
CS-E: ED decision No. 2003/9/RM, as last amended (CS-E 1040)
CS-25: ED Decision No. 2003/2/RM, as last amended, (CS 25.901, 25.903, 25.1309, 25.1351 (d), 25.1419, 25.1535, CS-25 Subpart J)
EU-OPS: Council Regulation (EEC) No 3922/91, as last amended
Part 21: Annex to Commission Regulation (EC) No 1702/2003, as last amended
Part M: Annex I to Commission Regulation (EC) No 2042/2003, as last amended
Part 145: Annex II to Commission Regulation (EC) No 2042/2003, as last amended

SECTION 3: ABBREVIATIONS

AFM: Airplane Flight Manual
ATS: Air Traffic Services
CAME: Continuing Airworthiness Management Exposition
CAMO: Continuing Airworthiness Management Organisation approved pursuant to Part-M Subpart-G
CG: Centre of Gravity
IFSD: In-flight shut-down
MCT: Maximum Continuous Thrust
MMEL: Master Minimum Equipment List
MEL: Minimum Equipment List

[7] EU-OPS until operational requirements Part-SPA Subpart-ETOPS are in force

RFFS Rescue and Fire Fighting Services
(S)TC: Supplemental Type Certificate

SECTION 4 TERMINOLOGY

~~a. Aerodrome~~

~~(1) Adequate~~

~~For the purpose of this AMC, an *adequate aerodrome* is an aerodrome, which the operator and the Competent Authority consider to be adequate, having regard to the performance requirements applicable at the expected landing weight or mass. In particular, it should be anticipated that at the expected time of use:~~

~~(i) The aerodrome will be available, and equipped with necessary ancillary services, such as ATCS, sufficient lighting, communications, weather reporting, navaids and emergency services. Rescue and Fire Fighting Services (RFFS) equivalent to ICAO category 4 (for RFFS not located on the aerodrome; capable of meeting the aeroplane with 30 minutes notice) or the relevant aeroplane category if lower, is acceptable for planning purposes only, when being considered as an ETOPS en-route alternate; and~~

~~(ii) At least one letdown aid (ground radar would so qualify) will be available for an instrument approach.~~

~~(2) Suitable. For the purpose of this AMC a suitable aerodrome is an adequate aerodrome with weather reports, or forecasts, or any combination thereof, indicating that the weather conditions are at or above operating minima and the field condition reports indicate that a safe landing can be accomplished at the time of the intended operation (see Appendix 3).~~

~~b. Auxiliary Power Unit (APU)~~
~~A gas turbine engine intended for use as a power source for driving generators, hydraulic pumps and other aeroplane accessories and equipment and/or to provide compressed air for aeroplane pneumatic systems.~~

a. Approved One-Engine-Inoperative Cruise Speed

(1) The approved one-engine-inoperative cruise speed for the intended area of operation must be a speed, within the certificated limits of the aeroplane, selected by the operator and approved by the competent authority.

(2) The operator must use this speed in

(i) establishing the outer limit of the area of operation and any dispatch limitation,

(ii) calculation of single-engine fuel requirements under Appendix 4 section 4 of this AMC ~~paragraph 10.d.(4) Fuel and Oil Supply~~, and,

(iii) establishing the level off altitude (net performance) data. This level off altitude (net performance) must clear any obstacle en route by margins as specified in the operational requirements.

A speed other than the approved one-engine-inoperative-speed may be used as the basis for compliance with en-route obstacle requirements.

The fuel required with that speed or the critical fuel scenario associated with the applicable ETOPS equal-time point, whichever is higher has to be

uplifted. The Maximum Diversion Time associated with time limited systems should not be exceeded.

(3) As permitted in Appendix 4 of this AMC, based on evaluation of the actual situation, the pilot in command ~~has the authority~~ may to deviate from the planned one-engine-inoperative cruise speed.

Note: The diversion distance based on the approved one-engine-inoperative cruise speed may take into account the variation of the True Air Speed.

b. Dispatch

~~ETOPS planning minima applies until dispatch~~. Dispatch is when the aircraft first moves under its own power for the purpose of taking-off.

~~d. Engine~~
~~The basic engine assembly as supplied by the engine manufacturer as defined in the Engine (Supplemental) Type Certificate and Engine Type Certificate Data Sheet~~

c.ETOPS Configuration, Maintenance and Procedures (CMP) ~~*Standard*~~

The ETOPS CMP document contains the particular ~~aeroplane~~ airframe-engine combination configuration minimum requirements, including any special inspection, hardware life limits, Master Minimum Equipment List (MMEL) constraints, operating and maintenance procedures ~~practices~~ found necessary by the ~~Authority~~ Agency to establish the suitability of an airframe/engine combination for extended range operation.

~~e. Extended Range Operations~~

~~For the purpose of this AMC, extended range operations are those flights conducted over a route that contains a point further than one hour flying time at the approved one-engine-inoperative cruise speed (under standard conditions in still air) from an adequate aerodrome.~~

d. ETOPS significant system

ETOPS Significant System means the aeroplane propulsion system and any other aeroplane systems whose failure could adversely affect the safety of an ETOPS flight, or whose functioning is important to continued safe flight and landing during an aeroplane diversion.

Each ETOPS significant system is either a Group 1 or Group 2 system based on the following criteria:

(1) ETOPS Group 1 Systems:

Group 1 Systems are ETOPS significant systems that, related to the number of engines on the aeroplane or the consequences of an engine failure, make the systems' capability important for an ETOPS flight. The following provides additional discriminating definitions of an ETOPS Group 1 Significant System:

(i) A system for which the fail-safe redundancy characteristics are directly linked to the number of engines (e.g., hydraulic system, pneumatic system, electrical system).

(ii) A system that may affect the proper functioning of the engines to the extent that it could result in an in-flight shutdown or uncommanded loss of thrust (e.g.,

fuel system, thrust reverser or engine control or indicating system, engine fire detection system).

(iii) A system which contributes significantly to the safety of an engine inoperative ETOPS diversion and is intended to provide additional redundancy to accommodate the system(s) lost by the inoperative engine. These include back-up systems such as an emergency generator, APU, etc.

(iv) A system essential for prolonged operation at engine inoperative altitudes such as anti-icing systems for a two-engined aeroplane if single engine performance results in the aeroplane operating in the icing envelope.

(2) ETOPS Group 2 Systems:

Group 2 Systems are ETOPS significant systems that do not relate to the number of engines on the aeroplane, but are important to the safe operation of the aeroplane on an ETOPS flight. The following provides additional discriminating definitions of an ETOPS Group 2 Significant System:

(i) A system for which certain failure conditions would reduce the capability of the aeroplane or the ability of the crew to cope with an ETOPS diversion (e.g., long range navigation or communication, equipment cooling, or systems important to safe operation on a ETOPS diversion after a decompression such as anti-icing systems).

(ii) Time-limited systems including cargo fire suppression and oxygen if the ETOPS diversion is oxygen system duration dependent.

(iii) Systems whose failure would result in excessive crew workload or have operational implications or significant detrimental impact on the flight crew's or passengers' physiological well being for an ETOPS diversion (e.g., flight control forces that would be exhausting for a maximum ETOPS diversion, or system failures that would require continuous fuel balancing to ensure proper CG, or a cabin environmental control failure that could cause extreme heat or cold to the extent it could incapacitate the crew or cause physical harm to the passengers).

(iv) A system specifically installed to enhance the safety of ETOPS operations and an ETOPS diversion regardless of the applicability of paragraphs (2)(i), (2)(ii) and (2)(iii) above (e.g. communication means).

e. Extended Range Entry Point

The extended range entry point is the first point on the aeroplane's outbound route which is:
~~one hour flying time at the approved one-engine-inoperative cruise speed (under standard conditions in still air) from an adequate aerodrome:~~

- For two-engined aeroplanes with a maximum approved passenger seating configuration of 20 or more, or with a maximum take-off mass of 45360 kg or more, at 60 minutes flying time at the approved one-engine-inoperative cruise speed (under standard conditions in still air) from an adequate aerodrome.

- For two-engined aeroplanes with a maximum approved passenger seating configuration of 19 or less and a maximum take-off mass of less than 45360 kg, at 180 minutes flying time at the approved one-engine-inoperative speed (in still air) from an adequate aerodrome

~~g. *Maintenance Personnel*~~

~~Mechanics, Licensed Ground Engineers, Maintenance Support Personnel~~

f. In-flight Shutdown (IFSD)

In-flight shutdown (IFSD) means when an engine ceases to function and is shutdown, whether self induced, flight crew initiated or caused by an external influence. For ETOPS, all IFSDs occurring from take-off decision speed until touch-down shall be counted.
The Agency considers IFSD for all causes, for example: flameout, internal failure, flight crew initiated shutdown, foreign object ingestion, icing, inability to obtain or control desired thrust or power, and cycling of the start control, however briefly, even if the engine operates normally for the remainder of the flight.
This definition excludes the cessation of the functioning of an engine when immediately followed by an automatic engine relight and when an engine does not achieve desired thrust or power but is not shutdown. These events as well as engine failures occurring before take-off decision speed or after touch-down, although not counted as IFSD, shall be reported to the competent authority in the frame of continued airworthiness for ETOPS.

~~h. In-flight Shutdown (IFSD)~~

~~When an engine ceases to function in flight and is shutdown, whether self-induced,crew initiated or caused by some other external influence (i.e., In Flight Shutdown (IFSD) for all causes; for example: due to flameout, internal failure, crew-initiated shutoff, foreign object ingestion, icing, inability to obtain and/or control desired thrust).~~

g. Maximum Approved Diversion Time

A maximum approved diversion time(s) for the airframe/engine combination or the engine, established in accordance with the type design criteria in this AMC and Appendices 1 and 2 of this AMC. This Maximum Approved Diversion Time(s) is reflected in the aeroplane and engine Type Certificate Data Sheets or (S)TC. The maximum approved diversion time(s) for the aeroplane should not be exceeded and are reflected in the AFM or AFM-supplement.

Any proposed increase in the Maximum Approved Diversion Time(s), or changes to the aircraft or engine, should be re-assessed by the (S)TC holder in accordance with Part 21A.101, to establish if any of the Type Design criteria in this AMC should be applied.

h. Operator's Approved Diversion Time

Operator's Approved Diversion Time is the maximum time authorised by the Competent Authority that the operator can operate a type of aeroplane at the approved one-engine-inoperative cruise speed (in still air) from an adequate aerodrome for the area of operation.

i. System:

A system includes all elements of equipment necessary for the control and performance of a particular function. It includes both the equipment specifically provided for the function in question and other basic equipment such as that necessary to supply power for the equipment operation.

(1) Airframe System. Any system on the aeroplane that is not part of the propulsion system.

(2) Propulsion System. The aeroplane propulsion system includes the engine and each component that is necessary for propulsion; components that affect the control of the propulsion units; and components that affect the safe operation of the propulsion units.

SECTION 5: CONCEPTS

Although it is self-evident that the overall safety of an extended range operation cannot be better than that provided by the reliability of the propulsion systems, some of the factors related to extended range operation are not necessarily obvious.

For example, cargo compartment fire suppression/containment capability could be a significant factor, or operational/maintenance practices may invalidate certain determinations made during the aeroplane type design certification or the probability of system failures could be a more significant problem than the probability of propulsion system failures. Although propulsion system reliability is a critical factor, it is not the only factor which should be seriously considered in evaluating extended range operation. Any decision relating to extended range operation with two-engined aeroplanes should also consider the probability of occurrence of any conditions which would reduce the capability of the aeroplane or the ability of the crew to cope with adverse operating conditions.

The following is provided to define the concepts for evaluating extended range operation with two-engined aeroplanes. This approach ensures that two-engined aeroplanes are consistent with the level of safety required for current extended range operation with three and four-engine turbine powered aeroplanes without unnecessarily restricting operation.

a. *Airframe Systems*

A number of airframe systems have an effect on the safety of extended range operation; therefore, the type design certification of the aeroplane should be reviewed to ensure that the design of these systems is acceptable for the safe conduct of the intended operation.

b. *Propulsion Systems*

In order to maintain a level of safety consistent with the overall safety level achieved by modern aeroplanes, it is necessary for two-engined aeroplanes used in extended range operation to have an acceptably low risk of significant loss of power/thrust for all design and operation related causes (see Appendix 1).

c. *Maintenance and Reliability Programme Definition*

Since the quality of maintenance and reliability programmes can have an appreciable effect on the reliability of the propulsion system and the airframe systems required for extended range operation, an assessment should be made of the proposed maintenance and reliability programme's ability to maintain a satisfactory level of propulsion and airframe system reliability for the particular airframe/engine combination.

d. *Maintenance and Reliability Programme Implementation*

Following a determination that the airframe systems and propulsion systems are designed to be suitable for extended range operation, an in-depth review of the applicant's training programmes, operations and maintenance and reliability programmes should be accomplished to show ability to achieve and maintain an acceptable level of systems reliability to safely conduct these operations.

e. *Human Factors*

System failures or malfunctions occurring during extended range operation could affect flight crew workload and procedures. Since the demands on the flight crew may increase, an assessment should be made to ensure that more than average piloting skills or crew co-ordination is not required.

Chapter II TYPE DESIGN APPROVAL CONSIDERATIONS

SECTION 1: APPLICABILITY

This chapter is applicable to (S)TC applicants or holders seeking ETOPS type design approval for an engine or a particular airplane-engine combination.

SECTION 2: COMPETENT AUTHORITY

The Competent Authority for the issue of an ETOPS type design approval is the Agency.

SECTION 3: GENERAL

When a two-engined aeroplane is intended to be used in extended range operations, a determination should be made that the design features are suitable for the intended operation. The ~~essential airframe systems and the propulsion system~~ ETOPS significant system for the particular airframe/engine combination should be shown to be designed to fail-safe criteria and ~~through service experience~~ it ~~must~~ should be determined that it can achieve a level of reliability suitable for the intended operation. In some cases modifications to systems may be necessary to achieve the desired reliability.

SECTION 4: ELEGIBILITY

To be eligible for extended range operations (ETOPS), the specified airframe/engine combination, should have been certificated according to the airworthiness standards of large aeroplanes and engines.

The process to obtain a type design ETOPS approval requires the applicant to show that in accordance with the criteria established in this chapter II and Appendices 1 and 2:

- the design features of the particular airframe/engine combination are suitable for the intended operations; and,
- the particular airframe/engine combination, having been recognised eligible for ETOPS, can achieve a sufficiently high level of reliability.

The required level of reliability of the airframe/engine combination, can be validated by the following methods:

(1) METHOD 1: in-service experience for ETOPS Type Design Approval defined in section 6.1 and Appendices 1 and 2 of this AMC, or

(2) METHOD 2: a programme of design, test and analyses agreed between the applicant and the Agency, (i.e. Approval Plan) for Early ETOPS Type Design Approval defined in Appendices 1 and 2 of this AMC.

~~(3) for the aeroplane, a combination of (1) and (2).~~

SECTION 5: REQUEST FOR APPROVAL

An applicant for, and holders of a (S)TC ~~aeroplane manufacturer or other civil airworthiness Authorities~~, requesting a determination that a particular airframe/engine combination is a suitable type design for extended range operation, should apply to the Agency. The Agency will then initiate an assessment of the engine and airframe/engine combination in accordance with the criteria laid down in this chapter II and Appendix 1 & 2 of this AMC

SECTION 6: VALIDATION METHODS OF THE LEVEL OF RELIABLITY

This ~~section~~ chapter together with Appendix 1 and 2 to this AMC should be followed to assess the reliability level of the propulsion system and airframe systems for which ETOPS type design approval is sought. Appendix 1 and 2 describe both the in-service experience method and the early ETOPS method.

6.1 METHOD 1: IN-SERVICE EXPERIENCE FOR ETOPS TYPE DESIGN APPROVAL

~~In establishing the suitability of a type design in accordance with paragraph 8 of this AMC and as a pre-requisite to obtaining any operational approval in accordance with the criteria of paragraph 10 of this AMC, it should be shown that an acceptable level of propulsion system and airframe systems reliability can be or has been achieved in service by the world fleet for the particular airframe/engine combination.~~

~~For this purpose,~~ Prior to the ETOPS type design approval, ~~paragraph 8~~, it should be shown that the world fleet of the particular airframe/engine combination for which approval is sought can achieve or has achieved, as determined by the Agency (see Appendix 1 and 2), an acceptable and reasonably stable level of ~~single~~ propulsion system in-flight shutdown (IFSD) rate and airframe system reliability.

Engineering and operational judgement applied in accordance with the guidance outlined in Appendix 1 will then be used to determine that the *IFSD rate objective* for all independent causes can be or has been achieved. This assessment is an integral part of the determination in ~~paragraph 8.b.d.(2)~~ section 7 paragraph (2) for type design approval. This determination of propulsion system reliability is derived from a world fleet data base containing, in accordance with requirements of Appendix 1, all in-flight shutdown events, all significant engine reliability problems, design and test data and available data on cases of significant loss of thrust, including those where the propulsion system failed or the engine was throttled back or shut down by the pilot. This determination will take due account of the approved maximum diversion time, proposed rectification of all identified propulsion and ETOPS significant systems problems, as well as events where in-flight starting capability may be degraded.

6.2 METHOD 2: EARLY ETOPS

ETOPS approval is considered feasible at the introduction to service of an airframe/engine combination as long as the Agency is totally satisfied that all aspects of the approval plan have been completed. The Agency must be satisfied that the approval plan achieves the level of safety intended in this AMC and in the aeroplane and engine certification bases. Any non-compliance with the approval plan can result in a lesser approval than sought for.

(S)TC holders will be required to respond to any incident or occurrence in the most expeditious manner. A serious single event or series of related events could result in immediate revocation of ETOPS type design approval. Any isolated problem not justifying immediate withdrawal of approval, should be addressed within 30 days in a resolution plan approved by the Agency. (S)TC holders will be reliant on operators to supply incident and occurrence data.

SECTION 7: EVALUATION CRITERIA OF THE ETOPS TYPE DESIGN

The applicant should conduct an evaluation of failures and failure combinations based on engineering and operational consideration as well as acceptable fail-safe methodology. The ~~analysis~~ evaluation should consider effects of operations with a single engine, including allowance for additional stress that could result from failure of the first propulsion system. Unless it can be shown that equivalent safety levels are provided or the effects of failure are minor, failure and reliability analysis should be used as guidance in verifying that the proper level of fail-safe design has been provided. Excluding failures of the engine, any system or equipment failure condition, or combination of failures that affects the aeroplane or engine and that would result in a need for a diversion, should be considered a Major event (CS 25.1309) and therefore the probability of such should be compatible with that safety objective. The following criteria are applicable to the extended range operation of aeroplanes with two engines:

(1) Airframe systems should be shown to comply with CS 25.1309 in accordance with section 7 and 8 of chapter II and Appendix 2 to this AMC.

(2) The propulsion systems should be shown to comply with CS 25.901.

(i) Engineering and operational judgement applied in accordance with the guidance outlined in ~~paragraph 9~~ section 6 and Appendix 1 should be used to show that the propulsion system can achieve the desired level of reliability.

(ii) Contained engine failure, cascading failures, consequential damage or failure of remaining systems or equipment should be assessed in accordance with CS 25.901.

(iii) It should be shown during the type design evaluation that the approved engine limits at all approved power settings will not be exceeded when conducting an extended duration single-engine operation during the diversion in all expected environmental conditions. The assessment should account for the effects of additional engine loading demands (e.g., anti-icing, electrical, etc.) which may be required during the single-engine flight phase associated with the diversion

(3) The safety impact of an uncontained engine failure should be assessed in accordance with CS 25.903, ~~CS-E 510 and CS-E 520~~.

(4) The APU installation, if required for extended range operations, should meet the applicable CS 25 provisions (Subpart J, APU) and any additional requirements necessary to demonstrate its ability to perform the intended function as specified by the ~~Authority~~ Agency following a review of the applicant's data. If certain extended range operation may necessitate in-flight start and run of the APU, it must be substantiated that the APU has adequate capability and reliability for that operation.
The APU should demonstrate the required in-flight start reliability throughout the flight envelope (compatible with overall safety objective but not less than 95%) taking account of all approved fuel types and temperatures. An acceptable procedure for starting and running the APU (e.g. descent to allow start) may be defined in order to demonstrate compliance to the required in-flight start reliability. If this reliability cannot be demonstrated, it may be necessary to require continuous operation of the APU.

(5) Extended duration, single-engine operations should not require exceptional piloting skills and/or crew co-ordination. Considering the degradation of the performance of the aeroplane type with an engine inoperative, the increased flight crew workload, and the malfunction of remaining systems and equipment, the impact on flight crew procedures should be minimised.

~~Consideration should also be given to the effects of continued flight with an engine and/or airframe system inoperative on the flight crew's and passengers' physiological needs (e.g., cabin temperature control).~~

Consideration should also be given to the effects on the ~~flight~~ crew's and passengers' physiological needs (e.g., cabin temperature control), when continuing the flight with an inoperative ~~or more~~ engine ~~and/~~or one or more inoperative airframe system(s) ~~inoperative~~.

The provision of essential services to ensure the continued safety of the aeroplane and safety of the passengers and crew, particularly during very long diversion times with depleted/degraded systems, should be assessed. The applicant should provide a list of aircraft system functions considered as necessary to perform a safe ETOPS flight. The applicants should consider the following examples:

(i) Flight deck and cabin environmental systems integrity and reliability

(ii) The avionics/cooling and consequent integrity of the avionic systems

(iii) Cargo hold fire suppression capacity and integrity of any smoke/fire alerting system

(iv) Brake accumulator or emergency braking system capacity/integrity

(v) Adequate capacity of all time dependent functions

(vi) Pressurisation System integrity/reliability

(vii) Oxygen System integrity/reliability/capacity, if the Maximum Approved Diversion Time is based on the oxygen system capability

(viii) Integrity/reliability/capacity of back-up systems (e.g. electrical, hydraulic)

(ix) Fuel system integrity and fuel accessibility. Fuel consumption with engine failure and/or other system failures (see paragraph (11))

(x) Fuel quantity and fuel used, indications and alerts (see paragraph (10)).

(6) It should be demonstrated for extended duration single-engine operation, that the remaining power (electrical, hydraulic, pneumatic) will continue to be available at levels necessary to permit continued safe flight and landing, and to provide those services necessary for the overall safety of the passengers and crew.

Unless it can be shown that cabin pressure can be maintained on single-engine operation at the altitude necessary for continued flight to an ~~suitable~~ ETOPS en-route alternate aerodrome, oxygen should be available to sustain the passengers and crew for the maximum diversion time.

(7) In the event of any single failure, or any combination of failures not shown to be Extremely Improbable, it should be shown that electrical power is provided for essential flight instruments, warning systems, avionics, communications, navigation,

required route or destination guidance equipment, supportive systems and/or hardware and any other equipment deemed necessary for extended range operation to continue safe flight and landing at an ~~suitable~~ ETOPS en-route alternate aerodrome. Information provided to the flight crew should be of sufficient accuracy for the intended operation.

Functions to be provided may differ between aeroplanes and should be agreed with the ~~Authority/~~Agency. These should normally include:

(i) attitude information;

(ii) adequate radio communication (including the route specific long range communication equipment as required by the applicable operational regulations) and intercommunication capability;

(iii) adequate navigation capability (including route specific long range navigation equipment as required by the applicable operational regulations and weather radar);

(iv) adequate cockpit and instrument lighting, emergency lighting and landing lights;

(v) sufficient captain and first officer instruments, provided cross-reading has been evaluated;

(vi) heading, airspeed and altitude including appropriate pitot/static heating;

(vii) adequate flight controls including auto-pilot;

(viii) adequate engine controls, and restart capability with critical type fuel (from the stand-point of flame out and restart capability) and with the aeroplane initially at the maximum relight altitude;

(ix) adequate fuel supply system capability including such fuel boost and fuel transfer functions that may be necessary;

(x) adequate engine instrumentation;

(xi) such warning, cautions, and indications as are required for continued safe flight and landing;

(xii) fire protection (cargo, APU and engines);

(xiii) adequate ice protection including windshield de-icing;

(xiv) adequate control of cockpit and cabin environment including heating and pressurisation; and,

(xv) ATC Transponder.

Note: For 90 minutes or less ETOPS operations, the functions to be provided must satisfy the requirements of CS 25.1351(d)(2) as interpreted by AMC 25.1351(d)(4) and (5).

(8) Three or more reliable and independent electrical power sources should be available. As a minimum, following failure of any two sources, the remaining source should be capable of powering the items specified in paragraph (7) ~~8.b~~. If one or more of the required electrical power sources are provided by an APU, hydraulic system, or ram air turbine, the following criteria apply as appropriate:

(i) The APU, when installed, should meet the criteria in paragraph (4) ~~8. b~~.

(ii) The hydraulic power source should be reliable. To achieve this reliability, it may be necessary to provide two or more independent energy sources (e.g., bleed air from two or more pneumatic sources).

(iii) The Ram Air Turbine (RAT) should be demonstrated to be sufficiently reliable in deployment and use. The RAT should not require engine dependent power for deployment.

~~Note: For 75 minutes or less ETOPS operations, if one of the required electrical power sources is provided by batteries, the following criteria apply:~~

~~Where one of the 3 independent electrical power sources is time-limited (e.g. batteries), such power source should have a capability to enable the items required by the verifying authority in paragraph 8 bd to be powered for the maximum certificated diversion time in still air conditions, plus an allowance for holding, approach and landing, and the likely prevailing weather conditions for the planned routes ,(e.g. an allowance for headwinds).~~

If one of the required electrical power sources is provided by batteries, the following criteria apply:

(iv) When one of the 3 independent electrical power sources is time-limited (e.g. batteries), such power source should have a capability to enable the items required in paragraph (7) to be powered for continued flight and landing to an ETOPS en-route alternate aerodrome and it will be considered as a time-limited system in accordance with paragraph (12)~~.~~

(9) For ETOPS approvals above 180 minutes, in addition to the criteria for electrical power sources specified in paragraph (8) above, the following criteria should also be applied:

(i) Unless it can be shown that the failure of all 3 independent power sources required by paragraph (8) above is extremely improbable, following failure of these 3 independent power sources, a fourth independent power source should be available that is capable of providing power to the essential functions referred to in paragraph (7) for continued safe flight and landing to an adequate ETOPS en-route alternate aerodrome

(ii) If the additional power source is provided by an APU, it should meet the criteria in paragraph (4).

(iii) If the additional power source is provided by a hydraulic system or ram air turbine the provisions of paragraph (8) apply.

~~(9)~~(10) It should be shown that adequate status monitoring information and procedures on all ETOPS significant systems are available for the flight crew to make pre-flight, in-flight go/no-go and diversion decisions.

Adequate fuel quantity information should be available to the flight crew, including alerts, and advisories, that consider the fuel required to complete the flight, abnormal fuel management or transfer between tanks, and possible fuel leaks in the tanks, the fuel lines and other fuel system components and the engines.

~~(10) Extended range operations are not permitted with time-related cargo fire limitations less than the approved maximum diversion time in still air conditions (plus an allowance for 15 minutes holding an approach and landing, and the likely prevailing weather conditions for the planned route, e.g. allowance for headwinds) determined by considering other relevant failures, such as an engine inoperative, and combinations of failures not shown to be Extremely Improbable~~.

(11) Fuel system

(i) The aeroplane fuel system should provide fuel pressure and flow to the engine(s) in accordance with CS 25.951 and 25.955 for any fuel pump power supply failure condition not shown to be extremely improbable.

(ii) The fuel necessary to complete the ETOPS mission or during a diversion should be available to the operating engine(s) under any failure condition, other then fuel boost pump failures, not shown to be extremely improbable[8]. (e.g. crossfeed valve failures, automatic fuel management system failures)

(12) Time-limited system

In addition to the Maximum Approved Diversion Time, diversion time may also be limited by the capacity of the cargo hold fire suppression system or other time-limited systems determined by considering other relevant failures, such as an engine inoperative, and combinations of failures not shown to be extremely improbable.

Time-limited system capability, if any, must be defined and stated in the Aeroplane Flight Manual or AFM-supplement and CMP document.

~~(11)~~(13) Operation in icing conditions

Airframe and propulsion ice protection should be shown to provide adequate capability (aeroplane controllability, etc.) for the intended operation. This should account for prolonged exposure to lower altitudes associated with the single engine diversion, cruise, holding, approach and landing.

(i) The aeroplane should be certified for operation in icing conditions in accordance with CS 25.1419.

(ii) The aeroplane should be capable of continued safe flight and landing in icing conditions at depressurisation altitudes with one engine inoperative.

The extent of ice accumulation on unprotected surfaces should consider the maximum super cooled liquid water catch at one-engine inoperative and depressurisation cruise altitudes. Substantiated icing scenario(s) should be assumed to occur during the period of time when icing conditions are forecast. The icing episode(s) assumed should be agreed with the Agency. The probability of icing longer than that assumed, and agreed for the icing episode(s), in combination with the probability of the

[8] Extremely improbable is defined in CS25.1309 and AMC to CS 25.1309.

aeroplane having to operate in icing conditions (e.g. engine in-flight shut down or decompression) should be shown to be extremely improbable.

~~(12)~~(14) Solutions to achieve required reliability

The permanent solution to a problem should be, as far as possible, a hardware/design solution. However, if scheduled maintenance, replacement, and/or inspection are utilised to obtain type design approval for extended range operation, and therefore are required in the CMP standard document, ~~this type of solution should normally be temporary and~~ the specific maintenance information should be easily retrievable and clearly referenced and identified in an appropriate maintenance document.

(15) Engine Condition Monitoring.

Procedures for an engine condition monitoring process should be defined and validated for ETOPS. The engine condition monitoring process should be able to determine, if an engine is no longer capable of providing, within certified engine operating limits, the maximum thrust required for a single engine diversion. The effects of additional engine loading demands (e.g., anti-ice, electrical), which may be required during an engine inoperative diversion, should be accounted for.

SECTION 8: ANALYSIS OF FAILURE EFFECTS AND RELIABILITY

8.1 General

~~The analysis and demonstration of airframe and propulsion system failure effects and reliability provided by the applicant as required by paragraph 8.b. should be based on in-service experience as required by paragraph 9, and the expected longest diversion time for extended range routes likely to be flown with the aeroplane. If it is necessary in certain failure scenarios to consider less time due to time-limited systems, the latter will be established as the maximum diversion time.~~

The analysis and demonstrations of airframe and propulsion system level of reliability and failure effects required by section 6 and section 7 should be based on the expected longest diversion time for extended range routes likely to be flown with the aeroplane. However, in certain failure scenarios, it may be necessary to consider a shorter diversion time due to the time-limited systems.

8.2 Propulsion systems

(i) An assessment of the propulsion system's reliability for particular airframe/engine combinations should be made in accordance with ~~paragraph 9~~ section 6 and Appendix 1.

(ii) The analysis should consider:

(A) Effects of operation with a single-propulsion system (i.e., high-power demands including extended use of MCT and bleed requirements, etc.) and include possible damage that could result from failure of the first propulsion system.

(B) Effects of the availability and management of fuel for propulsion system operation (i.e., cross-feed valve failures, fuel mismanagement, ability to detect and isolate leaks, etc.).

(C) Effects of other failures, external conditions, maintenance and crew errors, that could jeopardise the operation of the remaining propulsion system, should be examined.

(D) Effect of inadvertent thrust reverser deployment, if not shown to be extremely improbable (includes design and maintenance).

8.3 Airframe systems

An assessment of the airframe system's reliability for particular airframe/engine combinations should be made in accordance with section7 and Appendix 2.

The analysis should consider:

~~(3)~~(i) Hydraulic Power and Flight Control

An analysis should be carried out taking into account the criteria detailed in paragraph ~~8.b (6).~~ section 7 paragraph (6)

Consideration of these systems may be combined, since many commercial aeroplanes have full hydraulically powered controls. For aeroplanes with all flight controls being hydraulically powered, evaluation of hydraulic system redundancy should show that single failures or failure combinations, not shown to be extremely improbable, do not preclude continued safe flight and landing at an ~~suitable~~ ETOPS en-route alternate aerodrome. As part of this evaluation, the loss of any ~~two~~ parts of the hydraulic systems and any engine should be assumed to occur unless it is established during failure evaluation that there are no sources of damage or the location of the damage sources are such that this failure condition will not occur.

Note: For 75 minutes or less ETOPS approval, additional analysis to show compliance with ~~paragraph 8 b~~ section 7 will not be required for airframe systems, where for basic (non ETOPS) Type Design Approval compliance with CS 25.1309, or its equivalent, has already been shown.

~~(4)~~(ii)Services Provided by Electrical Power

An analysis should show that the criteria detailed in ~~paragraphs 8. b~~ section 7 paragraphs (6), (7) and (8) are satisfied taking into account the exposure times established in paragraph ~~8. c~~ (1).

Note1: For 75 minutes or less ETOPS approval, additional analysis to show compliance with section 7 ~~paragraph 8.b~~. will not be required for airframe systems, where for basic (non ETOPS) Type Design Approval (TDA), compliance with CS 25.1309, or its equivalent, has already been shown.

Note 2: For ETOPS approval above 180 minutes, the analysis should also show that the criteria detailed in section 7 paragraph (9) are satisfied.

~~(5)~~(iii) Equipment Cooling

An analysis should establish that the equipment (including avionics) necessary for extended range operation has the ability to operate acceptably following failure modes in the cooling system not shown to be extremely improbable. Adequate indication of the proper functioning of the cooling system should be demonstrated to ensure system operation prior to dispatch and during flight.

Note: For 75 minutes or less ETOPS approval, additional analysis to show compliance with paragraph section 7 ~~8.b~~ will not be required for airframe systems, where for basic (non ETOPS) Type Design Approval (TDA), compliance with CS 25.1309, or its equivalent, has already been shown.

~~(6)~~(iv) Cargo Compartment

It should be shown that the cargo compartment design and fire protection system capability (where applicable) is consistent with the following:

~~(i)~~(A) Design

The cargo compartment fire protection system integrity and reliability should be suitable for the intended operation considering fire detection sensors, liner materials, etc.

~~(ii)~~(B) Fire Protection

~~An analysis or test should be conducted to show, considering approved maximum diversion in still air (including an allowance for 15-minute holding and/or approach and land), that the ability of the system to suppress or extinguish fires is adequate to ensure safe flight and landing at a suitable aerodrome.~~ The capacity/endurance of the cargo compartment fire suppression system should be established.

~~(7) Reserved~~

~~(8)~~(v) Cabin Pressurisation

~~A review of fail-safe and redundancy features should show that the loss of cabin pressure is Improbable under single-engine operating conditions~~. Authority/Agency approved aeroplane performance data should be available to verify the ability to continue safe flight and landing after loss of pressure and subsequent operation at a lower altitude (see also section 7 paragraph (6)) ~~paragraph 8. b.(6)).~~

~~(9)~~(vi) Cockpit and Cabin Environment

The analysis should show that an adequate cockpit and cabin environment is preserved following all combinations of propulsion and electrical system failures which are not shown to be extremely improbable e.g. when the aeroplane is operating on standby electrical power only.

Note: For 75 minutes or less ETOPS approval, additional analysis to show compliance with section 7 ~~paragraph 8.b~~. will not be required for airframe systems, where for basic (non ETOPS) Type Design Approval (TDA), compliance with CS 25.1309, or its equivalent, has already been shown.

SECTION 9: ASSESSMENT OF FAILURE CONDITIONS

In assessing the fail-safe features and effects of failure conditions, account should be taken of:

(1) The variations in the performance of the system, the probability of the failure(s), the complexity of the crew action.

(2) Factors alleviating or aggravating the direct effects of the initial failure condition, including consequential or related conditions existing within the aeroplane which may affect the ability of the crew to deal with direct effects, such as the presence of smoke, aeroplane accelerations, interruption of air-to-ground communication, cabin pressurisation problems, etc.

(3) A flight test should be conducted by the (S)TC holders and witnessed by the Agency to validate expected aeroplane flying qualities and performance considering propulsion system failure, electrical power losses, etc. The adequacy of remaining aeroplane systems and performance and flight crew ability to deal with the emergency, considering remaining flight deck information, will be assessed in all phases of flight and anticipated operating conditions. Depending on the scope, content, and review by the Agency of the (S)TC holders ~~manufacturer's~~ data base, this flight test could also be used as a means for approving the basic aerodynamic and engine performance data used to establish the aeroplane performance identified in chapter III ~~paragraph 10.d.(6).~~

(4) Safety assessments should consider the flight consequences of single or multiple system failures leading to a diversion, and the probability and consequences of subsequent failures or exhaustion of the capacity of time-limited systems that might occur during the diversion.

Safety assessments should determine:

(i) The effect of the initial failure condition on the capability of the aeroplane to cope with adverse conditions at the diversion airport, and
(ii) The means available to the crew to assess the extent and evolution of the situation during a prolonged diversion.

The aeroplane flight manual and the flight crew warning and alerting and display systems should provide clear information to enable the flight crew to determine when failure conditions are such that a diversion is necessary.

~~e. Authority Aeroplane Assessment Report~~

The assessment of the reliability of propulsion and airframe systems for a particular airframe/engine combination will be contained in the Agency ~~an Authority~~ approved Aeroplane Assessment Report. ~~This report will be approved by the Certification Authority after review and concurrence by the Authority responsible for Operations~~. In the case the Agency is validating the approval issued by a third country certification authority the report may incorporate the assessment report established by the latter.

~~of a subsequent Certification Authority, the report may incorporate partly or totally the report established by the original Authority~~.

Following approval of the report, the propulsion and airframe system recommendations will be included in an ~~Authority~~ Agency-approved CMP document that establishes the CMP standard requirements for the candidate ~~aeroplane~~ engine or airframe/engine combination. This document will then be referenced in the Operation Specification and the Aircraft Flight Manual or AFM-Supplement.

SECTION 10: ISSUE OF THE ETOPS TYPE DESIGN APPROVAL

Upon satisfactory completion of the aeroplane evaluation through an engineering inspection and test programme consistent with the type certification procedures of the Agency and sufficient in-service experience data (see Appendix 1 & 2):

(1) The type design approval, the Maximum Approved Diversion Time and demonstrated capability of any time-limited systems will be reflected in the approved AFM or AFM-Supplement, and the aeroplane and engine Type Certification Data Sheet or Supplemental Type Certificate which contain directly or by reference the following pertinent information, as applicable:

(i) special limitations (if necessary), including any limitations associated with a maximum diversion time established in accordance with ~~paragraph 8.c.~~ section 8 paragraph (1) and time-limited systems (for example, the endurance of cargo hold fire suppression systems);

(ii) additional markings or placards (if required);

(iii) revision to the performance section of the AFM to include the data required by Appendix 4 paragraph 10 ~~in accordance with paragraph 10.d.(6);~~

(iv) the airborne equipment, installation, and flight crew procedures required for extended range operations;

(v) description or reference to the CMP document containing the approved aeroplane standards for extended range operations;

(vi) a statement to the effect that:

~~"The type design reliability and performance of this airframe/engine combination has been evaluated in accordance with in accordance with AMC 20-6 and found suitable for (state maximum diversion time) extended range operations with the incorporation of the approved aeroplane configuration CMP standard. This finding does not constitute approval to conduct extended range operations".~~

"The Type design, systems reliability and performance of the considered airplane/engine models combinations have been evaluated by the Agency in accordance with CS-25, CS-E and AMC 20-6 and found suitable for ETOPS operations when configured, maintained and operated in accordance with this document. This finding does not constitute an approval to conduct ETOPS operations."

(2) The Engine ETOPS Type Design approval and Maximum Approved Diversion Time will be reflected in the engine Type Certification Data Sheet or Supplemental Type Certificate which contain directly or by referencing the following pertinent information, as applicable:

(i) special limitations (if necessary), including any limitations associated with the Maximum Approved Diversion Time should be established;

(ii) additional markings or placards (if required);

(iii) description or reference to a document containing the approved engine configuration.

SECTION 11: CONTINUED AIRWORTHINESS OF THE ETOPS TYPE DESIGN APPROVAL

~~8.g type design change process~~

(1) The Agency will include the consideration of extended range operation in its normal ~~monitoring~~ surveillance and design change approval functions.

(2) The (S)TC holders whose approval includes a type design ETOPS approval, as well as the Agency should periodically and individually review the in-service reliability of the airframe/engine combination and of the engine. Further to these reviews and each time that an urgent problem makes it necessary, in order to achieve and maintain the desired level of reliability and therefore the safety of ETOPS, the Agency may:

- o require that the type design standard be revised, for example by the issuance of an Airworthiness Directive, or,
- o issue an Emergency Conformity Information[9]

~~(2)~~(3)The Reliability Tracking Board ~~/Propulsion System Reliability Assessment Board (PSRAB)~~ will periodically check that the airframe/propulsion system reliability requirements for extended range operation ~~(see Appendix 1)~~ are achieved or maintained. For mature ETOPS products the RTB may be replaced by the process to monitor their reliability as defined in Appendix 1, section 6.b and Appendix 2, section 5.c.

Note: Periodically means in this context two years.

~~(3)~~(4)Any significant problems which adversely affect extended range operation will be corrected. Modifications or maintenance actions to achieve or maintain the reliability objective of extended range operations for the airframe/engine combination will be incorporated into the ~~design~~ CMP document. The Agency/~~Authority~~ will co-ordinate this action with the affected (S)TC holder ~~manufacturer and operator.~~

~~(4)The Airworthiness Directive process may be utilised as necessary to implement a CMP standard change~~.

~~*h. Continued Airworthiness*~~

(5) The ~~type design~~ CMP document which establishes the suitability of an ~~aeroplane~~ engine or airframe/engine combination for extended range operation defines the minimum standards for the operation.

[9] See EASA Airworthiness Directive Policy reference C.Y001-01 (28.07.08)

Chapter III OPERATIONAL APPROVAL CONSIDERATIONS

SECTION 1: APPLICABILITY

This acceptable means of compliance is for operators seeking an ETOPS operational approval to operate:

(1) Two-engined aeroplanes with a maximum passenger seating configuration of 20 or more, or with a maximum take-off mass of 45 360 kg or more, in excess of 60 minutes at the approved one-engine-inoperative speed (under standard conditions in still air) from an adequate aerodrome;

(2) or Two-engined aeroplanes with a maximum passenger seating configuration of 19 or less and a maximum take-off mass of less than 45 360 kg, in excess of 180 minutes at the approved one-engine-inoperative speed (in still air) from an adequate aerodrome.

SECTION 2: COMPETENT AUTHORITY

The Competent Authority for the issue of an ETOPS operational approval to an operator is the authority that has issued its Air Operator Certificate.

Nevertheless, as the operational approval requires the operator to comply with the continuing airworthiness requirements of Annex 8 of this AMC, the operator has to ensure that the specific ETOPS elements related to continuing airworthiness are approved by the Competent Authority designated in Annex I (Part-M) to Regulation (EC) 2042/2003.

SECTION 3: APPLICABLE OPERATIONAL REQUIREMENTS

This chapter details the approval process required for ETOPS in accordance with the operational requirements.[10]

SECTION 4: METHODS FOR OBTAINING ETOPS OPERATIONS APPROVAL

There are two methods for obtaining an ETOPS approval, depending on the availability and amount of prior experience with the candidate airframe/engine combination:

- "Accelerated ETOPS approval", does not require prior in-service experience with the candidate airframe/engine combination;
- "In-service ETOPS Approval", based on a pre-requisite amount of prior in-service experience with the candidate airframe/engine combination. Elements from the "accelerated ETOPS approval" method may be used to reduce the amount of prior in-service experience.

SECTION 5: ACCELERATED ETOPS APPROVAL

The criteria defined in this section permit approval of ETOPS operations up to 180 minutes, when the operator has established that those processes necessary for successful ETOPS are in place and are proven to be reliable. The basis of the accelerated approval is that the operator will meet equivalent levels of safety and satisfy the objectives of this AMC.

[10] EU-OPS until operational requirements Part-SPA Subpart-ETOPS are in force.

The Accelerated ETOPS approval process includes the following phases:

- Application phase
- Validation of the operator's ETOPS processes
- Validation of Operator ETOPS Continuing Airworthiness and Operations Capability
- Issue of ETOPS Operations Approval by the competent authority

5.1 Application phase

The operator should submit an Accelerated ETOPS Operations Approval Plan to the Authority six (6) months before the proposed start of ETOPS. This time will permit the competent authority to review the documented plans and ensure adequate ETOPS processes are in place.

(A) Accelerated ETOPS Operations approval plan:
The Accelerated ETOPS Operations approval plan should define:

1. the proposed routes and the ETOPS diversion time necessary to support those routes;

2. The proposed one-engine-inoperative cruise speed, which may be area specific depending upon anticipated aeroplane loading and likely fuel penalties associated with the planned procedures;

3. How to comply with the ETOPS Processes listed in paragraph (B)

4. The resources allocated to each ETOPS process to initiate and sustain ETOPS operations in a manner that demonstrates commitment by management and all personnel involved in ETOPS continuing airworthiness and operational support;

5. How to establish compliance with the build standard required for Type Design Approval, e.g. CMP document compliance;

6. Review Gates: A review gate is a milestone- tracking plan to allow for the orderly tracking and documentation of specific provisions of this section. Normally, the review gate process will start six months before the proposed start of ETOPS and should continue until at least six months after the start of ETOPS. The review gate process will help ensure that the proven processes comply with the provisions of this AMC and are capable of continued ETOPS operations

(B) Operator ETOPS process elements
The operator seeking Accelerated ETOPS Operations Approval should also demonstrate to the competent authority that it has established an ETOPS process that includes the following ETOPS elements:

1. Airframe/engine combination and engine compliance to ETOPS Type Design Build Standard (CMP);

2. Compliance with the continuing airworthiness requirements as defined in Appendix 8, which should include:

   a. Fully developed Maintenance Programmes,

   b. A tracking and a proven ETOPS Reliability Programme

   c. A proven Oil Consumption Monitoring Programme;

   d. A proven Engine Condition Monitoring and Reporting system;

e. A propulsion system monitoring programme;

f. An ETOPS parts control programme;

g. A proven Plan for Resolution of Aeroplane Discrepancies

3. ETOPS operations manual supplement or its equivalent in the Operations Manual;

4. The operator should establish a programme that results in a high degree of confidence that the propulsion system reliability appropriate to the ETOPS diversion time would be maintained;

5. Initial and recurrent training and qualification programmes in place for ETOPS related personnel, including flight crew and all other operations personnel

6. Compliance with the Flight Operations Programme as defined in this AMC;

7. Proven flight planning and dispatch programmes appropriate to ETOPS;

8. Procedures to ensure the availability of meteorological information and MEL appropriate to ETOPS; and

9. Flight crew and dispatch personnel familiar with the ETOPS routes to be flown; in particular the requirements for, and selection of ETOPS en-route alternate aerodromes.

(C) Process elements Documentation:
Documentation should be provided for the following elements:

1. Technology new to the operator and significant differences in ETOPS significant systems (engines, electrical, hydraulic and pneumatic), compared to the aeroplanes currently operated and the aeroplane for which the operator is seeking Accelerated ETOPS Operations Approval;

2. The plan to train the flight and continuing airworthiness personnel to the different ETOPS process elements;

3. The plan to use proven or manufacturer validated Training and Maintenance and Operations Manual procedures relevant to ETOPS for the aeroplane for which the operator is seeking Accelerated ETOPS Operations Approval;

4. Changes to any previously proven or manufacturer validated Training, Maintenance or Operations Manual procedures described above. Depending on the nature of any changes, the operator may be required to provide a plan for validating such changes;

5. The validation plan for any additional operator unique training and procedures relevant to ETOPS, if any;

6. Details of any ETOPS support programme from the airframe/engine combination or engine (S)TC holder, other operators or any third country authority or other competent authority; and

7. The control procedures when a contracted maintenance organisation or flight dispatch organisation is used.

5.2 Validation of the Operator's ETOPS Processes

This section identifies process elements that need to be validated and approved prior to the start of Accelerated ETOPS. For a process to be considered proven, the process should first be described, including a flow chart of process elements. The roles and responsibilities of the personnel managing the process should be defined including any training requirement. The operator should demonstrate that the process is in place and functions as intended. This may be accomplished by providing data, documentation and analysis' results and/or by demonstrating in practise that the process works and consistently provides the intended results. The operator should also demonstrate that a feedback loop exists to facilitate the surveillance of the process, based on in-service experience.

If any operator is currently approved for conducting ETOPS with a different engine and/or airframe/engine combination it may be able to document proven ETOPS processes. In this case only minimal further validation may be necessary. It will be necessary to demonstrate that processes are in place to assure equivalent results on the engine and/or airframe/engine combination being proposed for Accelerated ETOPS Operations Approval.

(A) Reduction in the validation requirements:
The following elements will be useful or beneficial in justifying a reduction by the competent authority in the validation requirements of ETOPS processes:

1. Experience with other airframes and/or engines;
2. Previous ETOPS experience;
3. Experience with long range, over-water operations with two, three or four engine aeroplanes;
4. Any experience gained by flight crews, continuing airworthiness personnel and flight dispatch personnel, while working with other ETOPS approved operators, particularly when such experience is with the same airframe or airframe/engine combination.

Process validation may be done on the airframe/engine combination, which will be used in Accelerated ETOPS operation or on a different aeroplane type than that for which approval is being sought.

(B) Validation programme:

A process could be validated by demonstrating that it produces equivalent results on a different aeroplane type or airframe/engine combination. In this case, the validation programme should address the following:

1. The operator should show that the ETOPS validation programme can be excuted in a safe manner;

2. The operator should state in its application any policy guidance to personnel involved in the ETOPS process validation programme. Such guidance should clearly state that ETOPS process validation exercises should not be allowed to adversely impact the safety of actual operations especially during periods of abnormal, emergency, or high cockpit workload operations. It should emphasise that during periods of abnormal or emergency operation or high cockpit workload ETOPS process validation exercises may be terminated;

3. The validation scenario should be of sufficient frequency and operational exposure to validate maintenance and operational support systems not validated by other means;

4. A means should be established to monitor and report performance with respect to accomplishment of tasks associated with ETOPS process elements. Any recommended changes resulting from the validation programme to ETOPS continuing airworthiness and/or operational process elements should be defined.

(C) Documentation requirements for the process validation

The operator should:

1. Document how each element of the ETOPS process was utilised during the validation;
2. Document any shortcomings with the process elements and measures in place to correct such shortcomings;
3. Document any changes to ETOPS processes, which were required after an in-flight shut down (IFSD), unscheduled engine removals, or any other significant operational events;
4. Provide periodic Process Validation reports to the competent authority (This may be addressed during Review Gates).

(D) Validation programme information

Prior to the start of the validation process, the following information should be submitted to the competent authority:

1. Validation periods, including start dates and proposed completion dates;
2. Definition of aeroplane to be used in the validation (List should include registration numbers, manufacturer and serial number and model of the airframe and engines);
3. Description of the areas of operation (if relevant to validation) proposed for validation and actual operations;
4. Definition of designated ETOPS validation routes. The routes should be of duration required to ensure necessary process validation occurs;
5. Process validation reporting. The operator should compile results of ETOPS process validation.

5.3 Validation of Operator ETOPS Continuing Airworthiness and Operations Capability

The operator should demonstrate competence to safely conduct and adequately support the intended operation. Prior to ETOPS approval, the operator should demonstrate that the ETOPS continuing airworthiness processes are being properly conducted.

The operator should also demonstrate that ETOPS flight dispatch and release practices, policies, and procedures are established for operations.

An operational validation flight may be required so that the operator can demonstrate dispatch and normal in-flight procedures. The content of this validation flight will be determined by the Competent Authority based on the previous experience of the operator.

Upon successful completion of the validation flight, when required, the operator should modify the operational manuals to include approval for ETOPS as applicable

5.4 ETOPS Operations Approval issued by the Competent Authority

Operations approvals granted with reduced in-service experience may be limited to those areas determined by the competent authority at time of issue. An application for a change is required for new areas to be added.

The approval issued by the Competent Authority for ETOPS up to 180 minutes should be based on the information required in Appendix 3 section 3.

SECTION 6: IN-SERVICE ETOPS APPROVAL

Approval based on in-service experience on the particular airframe/engine combination.

6.1 Application

Any operator applying for ETOPS approval should submit a request, with the required supporting data, to the competent authority at least 3 months prior to the proposed start of ETOPS with the specific airframe/engine combination.

6.2 Operator Experience

Each operator ~~requesting Approval will be required to have appropriate experience. A summary must be provided to~~ seeking approval via the in-service route should provide a report to the competent authority, indicating the operator's capability to maintain and operate the specific airframe/engine combination for the intended extended range operation. This report should include experience with the engine type or related engine types, experience with the aeroplane systems or related aeroplane systems, or experience with the particular airframe/engine combination on non-extended range routes. Approval would be based on a review of this information.
Each operator requesting Approval to conduct ETOPS beyond 180 minutes should already have ETOPS experience and hold a 180 minute ETOPS approval.

~~Note 1: Additional information regarding Reduction of Operator's in-service experience is contained in Appendix 7.~~

Note ~~2~~1: The operator's authorised maximum diversion time may be progressively increased by the competent authority as the operator gains experience on the particular airframe/engine combination.Not less than 12 consecutive months experience will normally be required before authorisation of ETOPS up to ~~120~~ 180 minutes maximum diversion time, unless the operator can demonstrate compensating factors. The factors to consider may include duration of experience, total number of flights, operator's diversion events, record of the airframe/engine combination with other operators, quality of operator's programmes and route structure. However, the operator will still need, in the latter case, to demonstrate his capability to maintain and operate the new airframe/engine combination at a similar level of reliability.

~~(2)~~ In considering an application from an operator to conduct extended range operations, an assessment should be made of the operator's overall safety record, past performance, flight crew training and experience, and maintenance programme. The data provided with the request should substantiate the operator's ability and competence to safely conduct and support these operations and should include the means used to satisfy the considerations outlined in this paragraph. (Any reliability assessment obtained, either through analysis or service experience, should be used as guidance in support of operational judgements regarding the suitability of the intended operation.)

6.3 Assessment of the Operator's Propulsion System Reliability

Following the accumulation of adequate operating experience by the world fleet of the specified airframe/engine combination and the establishment of an IFSD rate objective in accordance with Appendix 1 for use in ensuring the propulsion system reliability necessary for extended range operations, an assessment should be made of the applicant's ability to achieve and maintain this level of propulsion system reliability.

This assessment should include trend comparisons of the operator's data with other operators as well as the world fleet average values, and the application of a qualitative judgement that considers all of the relevant factors. The operator's past record of propulsion system reliability with related types of power units should also be reviewed, as well as its record of achieved systems reliability with the airframe/engine combination for which authorisation is sought to conduct extended range operations.

Note: Where statistical assessment alone may not be applicable, e.g., when the fleet size is small, the applicant's experience will be reviewed on a case-by-case basis.

6.4 Validation of Operator ETOPS Continuing Airworthiness and Operations Capability

The operator should demonstrate competence to safely conduct and adequately support the intended operation. Prior to ETOPS approval, the operator should demonstrate that the ETOPS continuing airworthiness processes are being properly conducted.

The operator should also demonstrate that ETOPS flight dispatch and release practices, policies, and procedures are established for operations.

An operational validation flight may be required so that the operator can demonstrate dispatch and normal in-flight procedures. The content of this validation flight will be determined by the Authority based on the previous experience of the operator.

Upon successful completion of a validation flight, where required, the operational specifications and manuals should be modified accordingly to include approval for ETOPS as applicable.

6.5 ETOPS Operations Approval issued by the Competent Authority

Operations approvals based on in-service experience are limited to those areas agreed by the Competent Authority at time of issue. Additional approval is required for new areas to be added.

The approval issued by the Competent Authority for ETOPS should specifically include provisions as described in Appendix 3 section 4

SECTION 7: ETOPS APPROVAL CATEGORIES

There are 4 approval categories:

- Approval for 90 minutes or less diversion time
- Approval for diversion time above 90 minutes up to 180 minutes
- Approval for diversion time above 180 minutes

- Approval for diversion times above 180 minutes of operators of two-engined aeroplanes with a maximum passenger seating configuration of 19 or less and a maximum take-off mass less than 45 360 kg

An operator seeking ETOPS approval in one of the above categories should comply with the requirements common to all categories and the specific requirements of the particular category for which approval is sought.

7.1 REQUIREMENTS COMMON TO ALL ETOPS APPROVAL CATEGORIES:

(i) Continuing Airworthiness

The operator should comply with the continuing airworthiness considerations of Appendix 8.

(ii) Release Considerations

(A) Minimum Equipment List (MEL)

Aeroplanes should only be operated in accordance with the provisions of the approved Minimum Equipment List (MEL).

(B) Weather

To forecast terminal and enroute weather, an operator should only use weather information systems that are sufficient reliable and accurate in the proposed area of operation

(C) Fuel

Fuel should be sufficient to comply with the critical fuel scenario as described in Appendix 4 to this AMC.

(iii) Flight Planning

The effects of wind and temperature at the one-engine-inoperative cruise altitude should be accounted for in the calculation of equal-time point. In addition to the nominated ETOPS en-route alternates, the operator should provide flight crews with information on adequate aerodromes on the route to be flown which are not forecast to meet the ETOPS en-route alternate weather minima. Aerodrome facility information and other appropriate planning data concerning these aerodromes should be provided before commencement of the flight to flight crews for use when executing a diversion.

(iv) Flight Crew Training

The operator's ETOPS training programme should provide initial and recurrent training for flight crew in accordance with Appendix 6.

(v) En-route Alternate

Appendix 5 to this AMC should be implemented when establishing the company operational procedures for ETOPS

(vi) Communications Equipment (VHF/HF, Data Link)

For all routes where voice communication facilities are available, the communication equipment required by operational requirements should include at least one voice-based system.

7.2 SPECIFIC REQUIREMENTS:

7.2.1 APPROVAL FOR 90 MINUTES OR LESS DIVERSION TIME

The Operator's Approved Diversion Time is an operational limit that should not exceed neither:

- the Maximum Approved Diversion Time nor,
- the time-limited system capability minus 15 minutes

If the airframe/engine combination does not yet have a Type Design approval for at least 90 minutes diversion time, the aircraft should satisfy the relevant ETOPS design requirements.

Consideration may be given to the approval of ETOPS up to 90 minutes for operators with minimal or no in-service experience with the airframe/engine combination. This determination considers such factors as the proposed area of operations, the operator's demonstrated ability to successfully introduce aeroplanes into operations and the quality of the proposed continuing airworthiness and operations programmes.

Minimum Equipment List (MEL) restrictions for 120 minutes ETOPS should be used unless there are specific restrictions for 90 minutes or less.

7.2.2 APPROVAL FOR DIVERSION TIME ABOVE 90 MINUTES UP TO 180 MINUTES

Prior to approval, the operator's capability to conduct operations and implement effective ETOPS programmes, in accordance with the criteria detailed in this AMC and the relevant appendices, will be examined.

The Operator's Approved Diversion Time is an operational limit that should not exceed either:

- the Maximum Approved Diversion Time, nor,
- the time-limited system capability minus 15 minutes

<u>i) Additional Considerations for aircraft with 120 minutes Maximum Approved Diversion Time</u>

In the case of an aircraft approved for 120 minutes Maximum Approved Diversion Time, an operator may request an increase in the operator's approved diversion time for specific routes provided:

1. The requested Operator's Approved Diversion Time does not exceed neither:
   - 115% of the Maximum Approved Diversion Time nor,
   - the time-limited system capability minus 15 minutes

2. The aeroplane fuel carriage supports the requested Operator's Approved Diversion Time diversion time

3. It can be shown that the resulting routing will not reduce the overall safety of the operation.

Such increases will require:

(A) the Agency to assess overall type design including time-limited systems, demonstrated reliability; and

(B) the development of an appropriate MEL related to the diversion time required.

ii) Additional Considerations for aircraft with 180 minutes Maximum Approved Diversion Time

In the case of an aircraft certified for 180 minutes Maximum Approved Diversion Time, an operator may request an increase in the operator's approved diversion time for specific routes provided:

1. The requested Operator's Approved Diversion Time does not exceed neither:

   o 115% of the Maximum Approved Diversion Time nor,

   o the time-limited system capability minus 15 minutes

2. The aeroplane fuel carriage supports the requested Operator's Approved Diversion Time diversion time

3. It can be shown that the resulting routing will not reduce the overall safety of the operation.

Such increases will require:

(A) the Agency to assess overall type design including time-limited systems, demonstrated reliability; and

(B) the development of an appropriate MEL related to the diversion time required.

7.2.3 APPROVAL FOR DIVERSION TIME ABOVE 180 MINUTES

Approval to conduct operations with diversion times exceeding 180 minutes may be granted to operators with previous ETOPS experience on the particular engine/airframe combination and an existing 180 minute ETOPS approval on the airframe/engine combination listed in their application.

Operators should minimise diversion time along the preferred track. Increases in diversion time by disregarding ETOPS adequate aerodromes along the route, should only be planned in the interest of the overall safety of the operation.

The approval to operate more than 180 minutes from an adequate aerodrome shall be area specific, based on the availability of adequate ETOPS en-route alternate aerodromes.

(i) Operating limitations

In view of the long diversion time involved (above 180 minutes), the operator is responsible to ensure at flight planning stage, that on any given day in the forecast

conditions, such as prevailing winds, temperature and applicable diversion procedures, a diversion to an ETOPS en-route alternate aerodrome will not exceed the:

(A) Engine-related time-limited systems capability minus 15 minutes (for the approach procedure) at the approved one-engine-inoperative cruise speed; and

(B) Non engine-related time-limited system capability minus 15 minutes (for the approach procedure), such as cargo fire suppression, or other non engine-related system capability at the all engine operative cruise speed.

(ii) Communications Equipment (VHF/HF, Data Link and Satellite based communications)

Operators should use any or all of these forms of communications to ensure communications capability when operating ETOPS in excess of 180 minutes.

7.2.4 APPROVAL FOR DIVERSION TIMES ABOVE 180 MINUTES OF OPERATORS OF TWO-ENGINED AEROPLANES WITH A MAXIMUM PASSENGER SEATING CONFIGURATION OF 19 OR LESS AND A MAXIMUM TAKE-OFF MASS LESS THAN 45 360 KG

(i) Type Design

The airframe/engine combination should have the appropriate Type Design approval for the requested maximum diversion times in accordance with the criteria in CS 25.1535 and chapter II 'Type Design Approval Considerations' of this AMC.

(ii) Operations Approval

Approval to conduct operations with diversion times exceeding 180 minutes may be granted to operators with experience on the particular airframe/engine combination or existing ETOPS approval on a different airframe/engine combination, or equivalent experience. Operators should minimise diversion time along the preferred track to 180 minutes or less whenever possible. The approval to operate more than 180 minutes from an adequate aerodrome shall be area specific, based on the availability of alternate aerodromes, the diversion to which would not compromise safety.

Note: Exceptionally for this type of aeroplanes, operators may use the accelerated ETOPS approval method to gain ETOPS approval. This method is described in section 5.

SECTION 8: ETOPS OPERATIONS MANUAL SUPPLEMENT

The ETOPS operations manual supplement or its equivalent material in the operations manual, and any subsequent amendments, are subject to approval by the Competent Authority.

The Authority will review the actual ETOPS in-service operation. Amendments to the Operations Manual may be required as a result. Operators should provide information for and participate in such reviews, with reference to the (S)TC holder where necessary. The information resulting from these reviews should be used to modify or update flight crew training programmes, operations manuals and checklists, as necessary.
An example outline of ETOPS Operations Manual Supplement content is provided in Appendix 7 to this AMC.

SECTION 9: FLIGHT PREPARATION AND IN-FLIGHT PROCEDURES

The operator should establish pre-flight planning and dispatch procedures for ETOPS and they should be listed in the Operations Manual. These procedures should include, but not be limited to, the gathering and dissemination of forecast and actual weather information, both along the route and at the proposed ETOPS alternate aerodromes**.** Procedures should also be established to ensure that the requirements of the critical fuel scenario are included in the fuel planning for the flight.

The procedures and manual should require that sufficient information is available for the aeroplane pilot in command, to satisfy him that the status of the aeroplane and relevant airborne systems is appropriate for the intended operation. The manual should also include guidance on diversion decision-making and en-route weather monitoring.

Additional guidance on the content of the "Flight Preparation and In Flight Procedures" section of the operations manual is provided in Appendix 4 to this AMC

SECTION 10: OPERATIONAL LIMITATIONS

The operational limitations to the area of operations and the Operator's Approved Diversion Time, are detailed in Appendix 3 to this AMC – "Operational Limitations".

SECTION 11: ETOPS EN-ROUTE ALTERNATE AERODROMES

An operator should select ETOPS en-route alternates aerodromes in accordance with the applicable operational requirements and Appendix 5 to this AMC - Route Alternate.

SECTION 12: INITIAL/RECURRENT TRAINING

An operator should ensure that prior to conducting ETOPS, each crew member has completed successfully ETOPS training and checking in accordance with a syllabus compliant with Appendix 7 to this AMC, approved by the Competent Authority and detailed in the Operations Manual.

This training should be type and area specific in accordance with the applicable operational requirements.

The operator should ensure that crew members are not assigned to operate ETOPS routes which they have not successfully passed the training.

SECTION 13: CONTINUING SURVEILLANCE

The fleet-average IFSD rate for the specified airframe/engine combination will continue to be monitored in accordance with Appendices 1, ~~and~~ 2 and 8. As with all other operations, the Competent Authority should also monitor all aspects of the extended range operations that it has authorised to ensure that the levels of reliability achieved in extended range operations remain at the necessary levels as provided in Appendix 1, and that the operation continues to be conducted safely. In the event that an acceptable level of reliability is not maintained, if significant adverse trends exist, or if significant deficiencies are detected in the type design or the conduct of the ETOPS operation, then the appropriate Competent Authority should initiate a special evaluation, impose operational restrictions if necessary, and stipulate corrective action for the operator to adopt in order to resolve the problems in a timely manner. The appropriate Authority should alert the Certification Authority when a special evaluation is initiated and make provisions for ~~provide for~~ their participation.

APPENDIX 1 - PROPULSION SYSTEM RELIABILITY ASSESSMENT

1. ASSESSMENT PROCESS

To establish by utilising service experience whether a particular airframe/engine combination has satisfied the propulsion systems reliability requirements for ETOPS, an engineering assessment will be made by the Agency, using all pertinent propulsion system data. To accomplish the assessment, the Agency will need world fleet data (where available), and data from various sources (the operator, the engine ~~manufacturer~~ and ~~the~~ aeroplane ~~manufacturer~~ (S)TC holder) which should be extensive enough and of sufficient maturity to enable the Agency to assess with a high level of confidence, using engineering and operational judgement and standard statistical methods where appropriate, that the risk of total power loss from independent causes is sufficiently low. The Agency will state whether or not the current propulsion system reliability of a particular airframe/engine combination satisfies the relevant criteria. Included in the statement, if the operation is approved, will be the engine build standard, propulsion system configuration, operating condition and limitations required to qualify the propulsion system as suitable for ETOPS.

Alternatively, where type design approval for Early ETOPS is sought at entry into service, the engineering assessment can be based on substantiation by analysis, test, in service experience, CS-E 1040 compliance or other means, to show that the propulsion system will minimise failures and malfunctions and will achieve an IFSD rate that is compatible with the specified safety target associated with total loss of thrust.

If an approved engine CMP is maintained by the responsible engine Authority and is duly referenced on the engine Type Certificate Data Sheet or STC, then this shall be made available to the ~~Authority~~ Agency conducting the aeroplane propulsion system reliability assessment. Such a CMP shall be produced taking into account all the requirements of chapter II ~~paragraphs 8 and 9~~ and should be incorporated or referenced in the aeroplane CMP.

2. RELIABILITY VALIDATION METHODS

There are two extremes in the ETOPS process with respect to maturity; one is the demonstration of stable reliability by the accumulation of in-service experience and the other is by a programme of design, test and analyses, agreed between the (S)TC holders and the Agency. The extent to which a propulsion system is a derivative of previous propulsion systems used on an ETOPS approved airplane is also a factor of the level of maturity. When considering the acceptability of a propulsion system, maturity should be assessed not only in terms of total fleet hours but also taking account of fleet leader time over a calendar time and the extent to which test data and design experience can be used as an alternative.

a. *Service Experience*

~~When considering the acceptability of a propulsion system for extended range operation, maturity should be assessed not only in terms of total fleet hours but also take account of fleet leader time over a calendar time but, also to the extent to which test data and design experience can be used as an alternative.~~

~~There are two extremes in the ETOPS process with respect to maturity; one is the demonstration of stable reliability by the accumulation of service experience and the other is by an agreed design and test program between the manufacturers and authorities. The extent to which a propulsion system is a derivative of previous ETOPS-rated systems is also a factor of the level of maturity.~~

There is justification for the view that modern propulsion systems achieve a stable reliability level by 100,000 engine hours for new types and 50,000 engine hours for

derivatives. 3,000 to 4,000 engine hours is considered to be the necessary time in service for a specific unit to indicate problem areas.

Normally, the in-service experience will be:

(1) For new propulsion systems: 100,000 engine hours and 12 months service. Where experience on another aeroplane is applicable, a significant portion of the 100,000 engine hours should normally be obtained on the candidate aeroplane;

On a case-by-case basis, relevant test and design experience, and maximum diversion time requested, could be taken into account when arriving at the in-service experience required;

(2) For derivative propulsion systems: 50,000 engine hours and 12 months service. These values may vary according to the degree of commonality. To this end in determining the derivative status of a propulsion system, consideration should be given to technical criteria referring to the commonality with previous ~~ETOPS rated engines~~ propulsion system used on an ETOPS approved aeroplane. Prime areas of concern include:

(i) Turbomachinery;
(ii) Controls and accessories and control logic;
(iii) Configuration hardware (piping, cables etc.);
(iv) Aeroplane to engine interfaces and interaction:
  (A) Fire;
  (B) Thrust reverser;
  (C) Avionics;
  (D) etc.

The extent to which the in-service experience might be reduced would depend upon the degree of commonality with previous ~~ETOPS rated engines~~ propulsion system used on an ETOPS approved aeroplane. using the above criteria and would be decided on a case-by-case basis.

Also on a case-by-case basis, relevant test and design experience and maximum diversion time requested, could be taken into account when arriving at the in-service experience required.

Thus, the required experience to demonstrate propulsion system reliability should be determined by:

(i) The extent to which previous service experience of common ~~ETOPS rated engines~~ propulsion system used on an ETOPS approved aeroplane. systems can be considered;

(ii) To what extent compensating factors, such as design similarity and test evidence, can be used;

(iii) The two preceding considerations would then determine the amount of service experience needed for a particular propulsion system proposed for ETOPS.

These considerations would be made on a case-by-case basis and would need to provide a demonstrated level of propulsion system reliability in terms of ~~in-flight shut down~~ IFSD rate ~~of the order of 0·05 per 1 000 hours, as is necessary also for new propulsion systems~~. See paragraph 3 ‘Risk Management and Risk Model’.

(3) Data Required for the Assessment

(i) A list of all engine shutdown events~~, both ground and in-flight~~, for all causes (excluding normal training events) ~~including flameout~~. The list should provide the following for each event:

(A) date;

(B) airline;

(C) aeroplane and engine identification (model and serial number);

(D) power-unit configuration and modification history;

(E) engine position;

(F) symptoms leading up to the event, phase of flight or ground operation;

(G) weather/environmental conditions and reason for shutdown and any comment regarding engine restart potential;

(ii) All occurrences where the intended thrust level was not achieved, or where crew action was taken to reduce thrust below the normal level (for whatever reason):

(iii) Unscheduled engine removals/shop visit rates;

(iv) Total engine hours and aeroplane cycles;

(v) All events should be considered to determine their effects on ETOPS operations;

(vi) Additional data as required;

(vii) The Agency will also consider relevant design and test data.

b. *Early ETOPS*

(1) Acceptable Early ETOPS certification plan;

Where type design approval for Early ETOPS is sought at first entry into service the engineering assessment can be based on substantiation by analysis, test, in service experience, CS-E 1040 compliance or other means to show that the propulsion system will minimise failures and malfunctions, and will achieve an IFSD rate that is compatible with the specified safety target associated with catastrophic loss of thrust. An approval plan, defining the early ETOPS reliability validation tests and processes, must be submitted by the applicant to the Agency for agreement. This plan must be implemented and completed to the satisfaction of the Agency before an ETOPS type design approval will be granted for a propulsion system.

(2) Propulsion System Validation Test.

The propulsion system for which approval is being sought should be tested in accordance with the following schedule. The propulsion system for this test should be configured with the aeroplane installation nacelle and engine build-up hardware representative of the type certificate standards.
Tests of simulated ETOPS service operation and vibration endurance should consist of 3,000 representative service start-stop cycles (take-off, climb, cruise, descent, approach, landing and thrust reverse), plus three simulated diversions at maximum continuous thrust for the Maximum Approved Diversion Time for which ETOPS eligibility is sought. These diversions are to be approximately evenly distributed over the cyclic duration of the test, with the last diversion to be conducted within 100 cycles of the completion of the test.

This test must be run with the high speed and low speed main engine rotors unbalanced to generate at least 90 percent of the applicant's recommended maintenance vibration

levels. Additionally, for engines with three main engine rotors, the intermediate speed rotor must be unbalanced to generate at least 90 percent of the applicant's recommended acceptance vibration level. The vibration level shall be defined as the peak level seen during a slow acceleration/deceleration of the engine across the operating speed range. Conduct the vibration survey at periodic intervals throughout the 3000 cycle test. The average value of the peak vibration level observed in the vibration surveys must meet the 90% minimum requirement. Minor adjustments in the rotor unbalance (up or down) may be necessary as the test progresses, in order to meet the required average vibration level requirement. Alternatively, to a method acceptable to the Agency, an applicant may modify their test to accommodate a vibration level marginally less than 90% or greater than 100% of the vibration level required in lieu of adjusting rotor unbalance as the test progresses.

Each one hertz (60 rpm) bandwidth of the high speed rotor service start-stop cycle speed range (take-off, climb, cruise, descent, approach, landing and thrust reverse) must be subjected to $3x10^6$ vibration cycles. An applicant may conduct the test in any rotor speed step increment up to 200 rpm as long as the service start-stop cycle speed range is covered. For a 200 rpm step the corresponding vibration cycle count is to be 10 million cycles. In addition, each one hertz bandwidth of the high speed rotor transient operational speed range between flight idle and cruise must be subjected to $3x10^5$ vibration cycles. An applicant may conduct the test in any rotor speed step increment up to 200 rpm as long as the transient service speed range is covered. For a 200 rpm step the corresponding vibration cycle count is to be 1 million cycles.

At the conclusion of the test, the propulsion system must be:

(i) Visually inspected according to the applicant's on-wing inspection recommendations and limits.

(ii) Completely disassembled and the propulsion system hardware must be inspected in accordance with the service limits submitted in compliance with relevant instructions for continued airworthiness. Any potential sources of in-flight shutdown, loss of thrust control, or other power loss encountered during this inspection must be tracked and resolved in accordance with paragraph 5 of this Appendix 1.

~~C.~~3. RISK MANAGEMENT AND RISK MODEL

Propulsion systems approved for ETOPS must be sufficiently reliable to assure that defined safety targets are achieved.

a. For ETOPS with a Maximum Approved Diversion Time of 180 minutes or less

An early review of information for modern fixed wing jet powered aircraft shows that the rate of fatal accidents for all causes is in the order of $0{\cdot}3 \times 10^{-6}$ per flying hour. The reliability of aeroplane types approved for extended range operation should be such that they achieve at least as good an accident record as equivalent technology equipment. The overall target of $0{\cdot}3 \times 10^{-6}$ per flying hour has therefore been chosen ~~as the all-causes safety target~~ as the safety target for ETOPS approvals up to 180 minutes.

When considering safety targets, an accepted practice is to allocate appropriate portions of the total to the various potential contributing factors. By applying this practice to the overall target of $0{\cdot}3 \times 10^{-6}$ per flying hour, in the proportions previously considered appropriate, the probability of a catastrophic accident due to complete loss of thrust from independent causes must be no worse than $0{\cdot}3 \times 10^{-8}$ per flying hour.

Propulsion system related accidents may result from independent cause events but, based on historical evidence, result primarily from events such as uncontained engine failure events,

common cause events, engine failure plus crew error events, human error related events and other. The majority of these factors are not specifically exclusive to ETOPS.

Using an expression developed by ICAO, (ref. AN-WP/5593 dated 15/2/84) for the calculation of engine in-flight shutdown rate, together with the above safety objective and accident statistics, a relationship between target engine in-flight shutdown rate for all independent causes and maximum diversion time has been derived. This is shown in Figure 1.

In order that type design approval may be granted for extended operation range, it will be necessary to satisfy the Agency that after application of the corrective actions identified during the engineering assessment (see Appendix 1, ~~paragraph~~ ~~1.d.~~ section 4: ENGINEERING ASSESSMENT. CRITERIA FOR ACCEPTABLE RELIABILITY VALIDATION METHODS), the target engine in-flight shutdown rates will be achieved. This will provide assurance that the probability objective for loss of all thrust due to independent causes will be met.

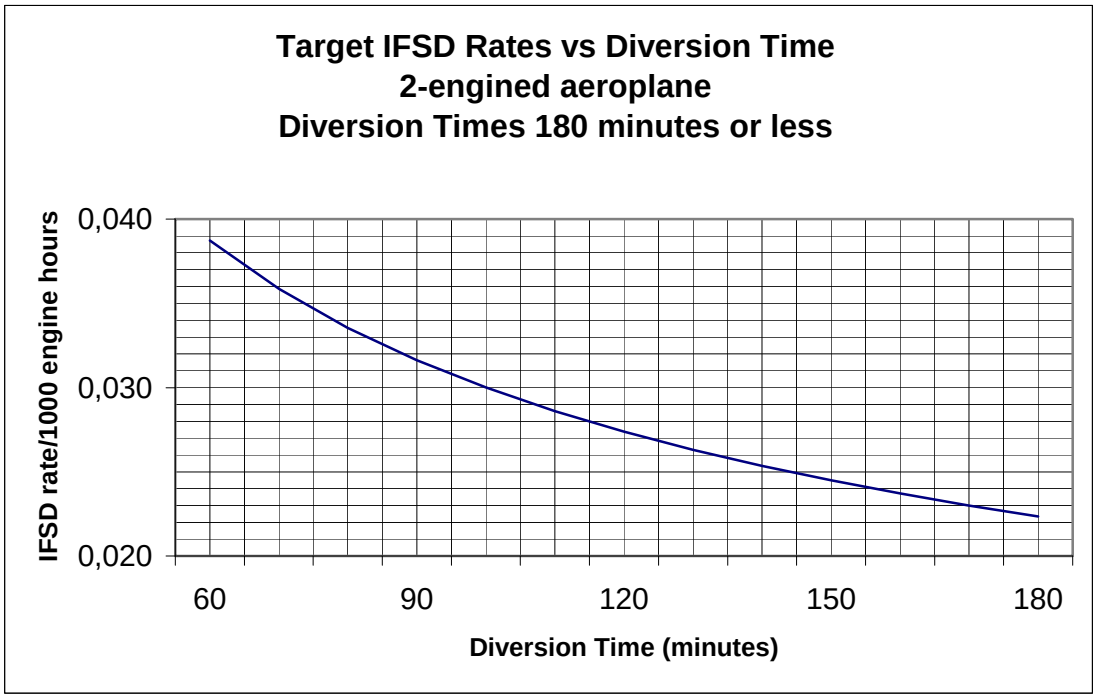

Figure 1

b. For ETOPS with a Maximum Approved Diversion Time of greater than 180 minutes

The propulsion systems IFSD rate target should be compatible with the objective that the catastrophic loss of thrust from independent causes is no worse than extremely improbable, based on maximum ETOPS flight duration and maximum ETOPS rule time.

For ETOPS with Maximum Approved Diversion Times longer than 180 minutes, to meet this objective that the powerplant installations must comply with the safety objectives of CS 25.1309, the goal should be that the catastrophic loss of thrust from independent causes should be extremely improbable (see AMC 25.1309). The defined target for ETOPS approvals with diversion times of 180 minutes or less, for catastrophic loss of thrust from independent causes, is 0.3×10^{-8}/hr. (see paragraph 3 of this Appendix). This target was based on engine IFSD rates that were higher than can be and are being achieved by modern ETOPS airframes/engines. To achieve the same level of safety for ETOPS approvals beyond 180 minutes as has been achieved for ETOPS approvals of 180 minutes or less, the propulsion system reliability IFSD rate target needs to be set and maintained at a level that is compatible with an Extremely Improbable safety objective (i.e. 1.0×10^{-9} /flight hr).

For example, a target overall IFSD rate of 0.01/1000 hr. (engine hours) that is maintained, would result in the loss of all thrust on two engine aeroplanes being extremely improbable even assuming the longest time envisaged. The risk model formula summarised for a two engine aeroplane is:

p/flight hour = [2(Cr x{T-t}) x Mr(t)] divided by T

(1) p is the probability of a dual independent propulsion unit failure on a twin,

(2) 2 is the number of opportunities for an engine failure on a twin (2),

(3) Cr is cruise IFSD rate (0.5x overall rate), Mr is max continuous IFSD rate (2x overall rate), T is planned max flight duration in hours (departure to planned arrival airport), and t is the diversion or flight time in hours to a safe landing. IFSD rates, based on engine manufacturers' historical data from the last ten years of modern large turbofan engines, presented to the JAA/EASA and ARAC ETOPS working groups have shown cruise IFSD rates to be of the order of 0.5x overall rate, and the max continuous IFSD rate (estimated from engine fleet analysis) to be 2x overall rate. Then, for an IFSD goal of .010/1000EFH overall, the cruise IFSD rate is .005/1000EFH, and the max continuous rate is .020/1000EFH.

(4) Sample calculation (max flight case scenario): assume T = 20 hour max flight duration, an engine failure after 10 hours, then continued flight time required is t = 10 hours, using the ETOPS IFSD goal of .010/1000EFH or less, results in a probability of p=1 E-9/hour (i.e. meets extremely improbable safety objective from independent causes).

(5) A relationship between target IFSD rate and diversion times for two engine aeroplanes is shown in Figure 2.

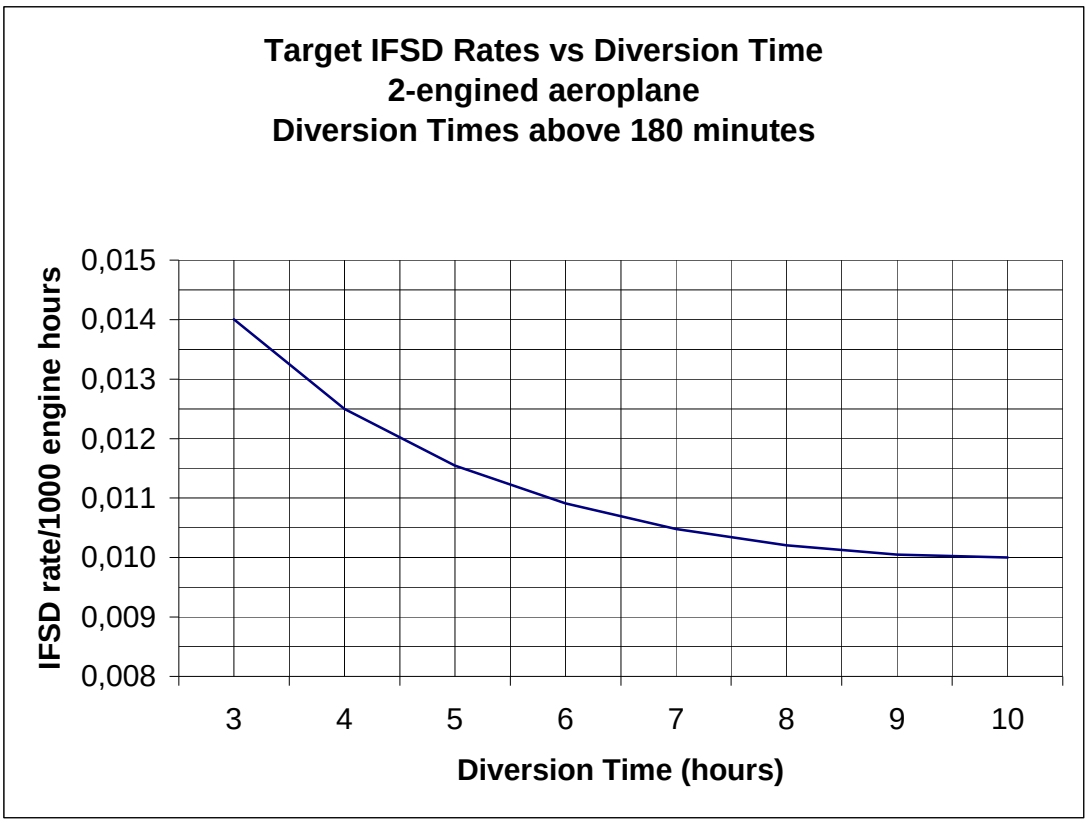

Figure 2

~~D.~~4. ENGINEERING ASSESSMENT.CRITERIA FOR ACCEPTABLE RELIABILITY VALIDATION METHODS

The following criteria identify some areas to be considered during the engineering assessment required for either reliability validation method.

a. There are maintenance programmes, engine on-wing health monitoring programmes, and the promptness and completeness in incorporating engine service bulletins, etc., that influence an operator's ability to maintain a level of reliability. The data and information required will form a basis from which a world-fleet engine shut down rate will be established, for use in determining whether a particular airframe/engine combination complies with criteria for extended range operation.

b. An analysis will be made on a case-by-case basis, of all significant failures, defects and malfunctions experienced in service or during testing, including reliability validation testing, for the particular airframe/engine combination. Significant failures are principally those causing or resulting in in-flight shut down or flameout of the engine(s), but may also include unusual ground failures and/or unscheduled removal of engines. In making the assessment, consideration should be given to the following:

(1) The type of propulsion system, previous experience, whether the power-unit is new or a derivative of an existing model, and the operating thrust level to be used after one engine shutdown;

(2) The trends in the cumulative twelve month rolling average, updated quarterly, of in-flight shutdown rates versus propulsion system flight hours and cycles;

(3) The demonstrated effect of corrective modifications, maintenance, etc. on the possible future reliability of the propulsion system.;

(4) Maintenance actions recommended and performance and their effect on propulsion system and APU failure rates;

(5) The accumulation of operational experience which covers the range of environmental conditions likely to be encountered;

(6) Intended maximum flight duration and maximum diversion in the ETOPS segment, used in the extended range operation under consideration.

c. Engineering judgement will be used in the analysis of paragraph ~~1.d.(2)~~ b. above, such that the potential improvement in reliability, following the introduction of corrective actions identified during the analysis, can be quantified.

d. The resultant predicted reliability level and the criteria developed in accordance with ~~paragraph 1.c~~ section 3 (RISK MANAGEMENT AND RISK MODEL) should be used together to determine the maximum diversion time for which the particular airframe/engine combination qualifies.

e. The type design standard for type approval of the airframe/engine combination, and the engine, for ~~extended range operations~~ ETOPS will include all modifications and maintenance actions for which full or partial credit is taken ~~in paragraph 5.3~~ by the (S)TC holder and other ~~such~~ actions required by the Agency to enhance reliability. The schedule for incorporation of type design standard items should normally be established in the Configuration, Maintenance and Procedures (CMP) document for example in terms of calendar time, hours or cycles.

f. When ~~a foreign manufacturer's~~ third country (S)TC holders' and/or third country operator's data are evaluated, the respective foreign ~~Airworthiness~~ Authorities will be offered ~~the opportunity~~ to participate in the assessment.

g. ~~Propulsion System Reliability Assessment Board (PSRAB)~~ ETOPS Reliability Tracking Board (RTB)'s Findings.

Once an assessment has been completed and the ~~(PSRAB)~~ RTB has documented its findings, he Agency will declare whether or not the particular airframe/engine combination and engine satisfy the relevant considerations of this AMC. Items recommended qualifying the propulsion system, such as maintenance requirements and limitations will be included in the Assessment Report (chapter II section 10 of this AMC ~~paragraph 8 e. of this AMC~~).

h. In order to establish that the predicted propulsion system reliability level is achieved and subsequently maintained, the (S) TC holder should submit to the Agency an assessment of the reliability of the propulsion system on a quarterly basis. The assessment should concentrate on the ETOPS configured fleet and should include ETOPS related events from the non-configured fleet of the subject airframe/engine combination and from other combinations utilising a related engine model.

5. EARLY ETOPS OCCURRENCES REPORTING & TRACKING

a. The holder of a (supplemental) type certificate of an engine, which has been approved for ETOPS without service experience in accordance with this AMC, should establish a system to address problems and occurrences encountered on the engine that could affect the safety of operations and timely resolution.

b. The system should contain a means for: the prompt identification of ETOPS related events, the timely notification of the event to the Agency, proposing a resolution of the event and obtaining Agency's approval. The implementation of the problem resolution can be accomplished by way of Agency approved change(s) to the type design, the manufacturing process, or an operating or maintenance procedure.

c. The reporting system should be in place for at least the first 100,000 fleet engine hours. The reporting requirement remains in place until the fleet has demonstrated a stable in-flight shut down rate in accordance with the targets defined in this Appendix 1.

d. For the early ETOPS service period, an applicant must define the sources and content of the service data that will be made available to them in support of their occurrence reporting and tracking system. The content of this data should be adequate to evaluate the specific cause of all service incidents reportable under Part 21A.3(c), in addition to the occurrences that could affect the safety of operations, and should be reported, including:

(1) In-flight shut down events and rates;

(2) Inability to control the engine or obtain desired power;

(3) Precautionary thrust reductions (except for normal troubleshooting as allowed in the aircraft flight manual);

(4) Degraded propulsion in-flight start capability;

(5) un-commanded power changes or surges.

(6) diversion or turn-back

(7) failures or malfunctions of ETOPS significant systems

(8) Unscheduled engine removals for conditions that could result in one of the reportable items listed above.

~~E.~~6. ~~CONTINUING~~ CONTINUED AIRWORTHINESS OF TYPE DESIGN

For ETOPS, the Agency will periodically review its original findings by means of a Reliability Tracking Board. In addition, the Agency document containing the CMP standard will be revised as necessary.

Note: The Reliability Tracking Board will usually comprise specialists from aeroplane and engine disciplines. (See also Appendix 2)

Periodic meetings of the ETOPS Reliability Tracking Board are normally frequent at the start of the assessment of a new product. The periodicity is adjusted by the Agency upon accumulation of substantial service experience if there is evidence that the reliability of the product is sufficiently stable. The periodic meetings of the board are discontinued once an ETOPS product, or family of products, has been declared mature by the Agency.

Note: The overall engine IFSD rate should be viewed as a world-fleet average target figure of engine reliability (representative of the airframe/engine combination being considered) and if exceeded, may not, in itself, trigger action in the form of a change to the ETOPS design standard or a reduction in the ETOPS approval status of the engine. The actual IFSD rate and its causes should be assessed with considerable engineering judgement. For example, a high IFSD rate early after the commencement of the operation may be due to the limited number of hours contributing to the high rate. There may have been only one shut down. The underlying causes have to be considered carefully. Conversely, a particular single event may warrant corrective action implementation, even though the overall IFSD rate objective is being achieved.

~~*(1)*~~*a. Mature ETOPS products*

A family of ETOPS products with a high degree of similarity is considered as mature ones if:

(~~i~~1) The product family has accumulated at least 250,000 flight hours for an aeroplane family or 500,000 operating hours for an engine family;

(~~ii~~2) The product family has accumulated service experience covering a comprehensive spectrum of operating conditions (e.g. cold, hot, high, and humid);

(~~iii~~3) Each ETOPS approved model or variant in the family has achieved the reliability objectives for ETOPS and has remained stable at or below the objectives fleet-wide for at least two years;

New models or significant design changes may not be considered mature until they have individually satisfied the condition of paragraph ~~a here-before~~ above 6.a.

The ~~Reliability Tracking Board Chairman and the Project Certification Manager~~ Agency makes the determination of when a product or a product family is considered mature.

~~*(2)*~~*b. Surveillance of mature ETOPS products*

The ~~Manufacturer~~ (S)TC holder of an ETOPS product which the Agency has found mature, should institute a process to monitor the reliability of the product in accordance with the objectives defined in this Appendix 1. In case of occurrence of an event or series of events or a statistical trend that implies a deviation of the reliability of the ETOPS fleet, or a portion of the ETOPS fleet (e.g. one model or a range of serial numbers), above the limits specified for ETOPS in this AMC, the ~~Manufacturer~~ (S)TC holder should:

(~~i~~1) Inform the Agency and define a means to restore the reliability through a Minor Revision of the CMP document, with a compliance schedule to be agreed with the Agency if the situation has no immediate safety impact;

(~~ii~~2) Inform the Agency and propose an ad-hoc follow-up by the Agency until the concern has been alleviated or confirmed if the situation requires further assessment;

(~~iii~~3) Inform the Agency and propose the necessary corrective action(s) to be mandated by the Agency through an AD if a direct safety concern exists.

In the absence of a specific event or trend requiring action, the ~~Manufacturer~~ (S)TC holder should provide the Agency with the basic statistical indicators prescribed in this Appendix 1 on a yearly basis.

~~(3)~~c. Minor Revision of the ETOPS CMP Document

A Minor Revision of the ETOPS CMP document is one that contains only editorial adjustments, configurations, maintenance and procedures equivalent to those already approved by the Agency, or new reliability improvements which have no immediate impact on the safety of ETOPS flights and which are introduced as a means to control the continued compliance with the reliability objectives of ETOPS.
Minor revisions of the ETOPS CMP document ~~may~~ should be approved by ~~designated~~ authorised signatories personnel of the ~~Manufacturer~~ (S)TC holder under the provisions of its approved Design Organisation Handbook.

7. DESIGN ORGANISATION APPROVALS

~~Manufacturers of products approved for ETOPS should hold a Design Organisation Approval (DOA) conforming to PART 21. Their approved Design Organisation Handbook (DOH) must contain appropriate organisation and procedures covering the tasks and responsibilities of this AMC.~~
~~Foreign manufacturers not approved as a EASA DOA must present an equivalent organisation and procedures that satisfies the intent of this paragraph. For example, the equivalent FAA FAR 21 approval process is considered acceptable.~~

(S)TC holders of products approved for ETOPS should hold a Design Organisation Approval (DOA) conforming to EASA Part-21, with the appropriate terms of approval and privileges. Their approved Design Organisation Handbook (DOH) must contain an appropriate description of the organisation and procedures covering all applicable tasks and responsibilities of EASA Part-21 and this AMC.

APPENDIX 2 - AIRCRAFT SYSTEMS RELIABILITY ASSESSMENT

1. ASSESSMENT PROCESS

The intent of this Appendix is to provide additional clarification to ~~paragraphs 8b, 8c,(1) and 7.f.(4)~~ sections 7 and 8 of chapter II of this AMC. Airframe systems are required to show compliance with CS 25.1309. To establish whether a particular airframe/engine combination has satisfied the reliability requirements concerning the aircraft systems for extended range operations, an assessment will be made by the Agency, using all pertinent systems data provided by the applicant. To accomplish this assessment, the Agency will need world-fleet data (where available) and data from various sources (~~the~~ operators, ~~aeroplane manufacturer~~ (S)TC holder the ~~equipment~~ and ~~equipment manufacturers~~ original equipment manufacturers (OEM)). This data should be extensive enough and of sufficient maturity to enable the Agency to assess with a high level of confidence, using engineering and operational judgement, that the risk of systems failures during a normal ETOPS flight or a diversion, is sufficiently low in direct relationship with the consequence of such failure conditions, under the operational environment of ETOPS missions.

The Agency will declare whether or not the current system reliability of a particular airframe/engine combination satisfies the relevant criteria.

Included in the declaration, if the airframe/engine combination satisfy the relevant criteria, will be the airframe build standard, systems configuration, operating conditions and limitations, required to qualify the ETOPS significant systems as suitable for extended range operations.

Alternatively, where type design approval for Early ETOPS is sought at first entry into service, the engineering assessment can be based on substantiation by analysis, test, in-service experience or other means to show that the airframe significant systems will minimise failures and malfunctions, and will achieve a failure rate that is compatible with the specified safety target

2. SYSTEM SAFETY ASSESSMENT 'SSA' (INCLUDING RELIABILITY ANALYSIS)

~~a. *ETOPS Significant Systems*~~

~~(1) An ETOPS significant system is:~~

~~(i) A system for which the fail-safe redundancy characteristics are directly linked to the number of engines, e.g. hydraulic system, pneumatic system, electrical system.~~

~~(ii) A system that may affect the proper functioning of the engines to the extent that it could result in an inflight shutdown or uncommanded loss of thrust, e.g. fuel system, thrust reverser or engine control or indicating system, engine fire detection system.~~

~~(iii) A system which contributes significantly to the safety of flight and a diversion with one-engine-inoperative, such as back-up systems used in case of additional failure during the diversion. These include back-up or emergency generator, APU or systems essential for maintaining the ability to cope with prolonged operation at single engine altitudes, such as anti-icing systems.~~

~~(iv) A system for which certain failure conditions may reduce the safety of a diversion, e.g. navigation, communication, equipment cooling, time limited cargo fire suppression, oxygen system.~~

~~(2) The list of ETOPS significant systems should be agreed with the Agency.~~

~~b. *Reliability Assessment for Systems*~~

~~The reliability assessment for systems must determine which systems are significant to ETOPS and assure that the reliability of such systems is sufficient in direct relationship with the consequences of their potential malfunctions during ETOPS missions.~~

~~The assessment also requires a review of the Systems Safety Assessment (SSA) established in compliance with AMC 25.1309-1 and specific ETOPS requirements in this AMC (e.g., loss of cabin pressurisation during Single Engine Operation), to take into account the particular conditions and requirements applicable to ETOPS missions.~~

~~In order to achieve the level of confidence intended for ETOPS, the analytical assessment in the SSA must be confirmed by statistical data from a sufficient data base of directly applicable service experience and by an engineering assessment of the service experience of the airframe systems under review.~~

~~Statistical indicators (MTBF/MTBUR) and engineering judgement applied to the individual events must be used to evaluate the maturity and the reliability of all ETOPS significant systems.~~

~~c. *Analytical Assessment*~~

~~The SSA conducted in accordance with CS 25.1309 of all ETOPS significant systems must be reviewed as follows:~~

~~(1) Conduct a (supplemental) Functional Hazard Assessment (FHA) considering the ETOPS missions. In determining the effect of a failure condition during an ETOPS mission, the following should also be reviewed:~~

~~(i) Crew workload over a prolonged period of time~~

~~(ii) Operating conditions at single engine altitude~~

~~(iii) Lesser crew familiarity with the procedures and conditions to fly to and land at diversion airfields.~~

~~(2) Introduce any additional failure scenario/objectives necessary to comply with this AMC.~~

~~(3) Consider maximum ETOPS flight duration and maximum ETOPS diversion time for all probability calculations. (The probability calculations for those systems that cannot affect the proper functioning of the engines or systems where fail safe/redundancy is not affected by the number of engines, but which could cause a diversion or contribute to the safety of a diversion, may be based on average fleet risk mission time for ETOPS operated aircraft, assuming a maximum diversion time.~~

~~(Note - not average risk mission time for whole fleet.)~~

~~(4) Consider effects of prolonged time and single engine altitude in terms of continued operation of remaining systems following failures.~~

~~(5) Specific ETOPS maintenance tasks and/or intervals or specific ETOPS flight procedures necessary to attain the safety objectives must be included in the appropriate approved document (e.g. CMP document, MMEL).~~

~~d. *Service Experience/Systems Safety Assessment (SSA)*~~

~~When considering the acceptability of airframe systems for extended range operations, maturity should be assessed in terms of the maturity of the technology being used and the maturity of the particular design under review.~~

~~In performing the SSA's particular account will be taken of the following:~~

~~(1) For equipment identical or close to equipment used on other aircraft, the SSA failure rates will be validated by in-service experience.~~

~~The amount of service experience (either direct or related) must be indicated for each equipment of an ETOPS significant system.~~

~~Where related service experience is used to validate failure modes and rates, an analysis must be produced to show the validity of the service experience.~~

~~In particular, if the same equipment is used on a different aircraft type, it must be shown that there is no difference in operating conditions (vibrations, pressure, temperature) or that these differences do not adversely affect the failure modes and rates.~~

~~If service experience on similar equipment on other aircraft is claimed to be applicable an analysis must be produced substantiating the reliability figures used on the quantitative analysis. This substantiation analysis should include details of the differences between the similar and new equipment, details of the service experience of the similar equipment and details of any "lessons learnt" modifications introduced and included in the new equipment.~~

~~For certain equipment, (e.g., IDGs, TRUs, bleeds, emergency generator) this analysis may have to be backed up by tests. This must be agreed with the Agency.~~

~~(2) For new or substantially modified equipment, account will be taken in the SSA for the lack of validation of the failure rates by service experience.~~

~~A study should be conducted to determine the sensitivity of the assumed SSA failure condition probabilities to the failure rates of that equipment.~~

~~Should a failure case probability be sensitive to this equipment failure rate and close to the required safety objective, particular provision precautions may be applied (e.g. temporary dispatch restrictions, inspections, maintenance procedures, crew procedures ...) to account for the uncertainty until the failure rate has been appropriately validated by service experience.~~

~~(3) In order to confirm that the predicted system reliability level is achieved and maintained, the (S) TC holder should monitor the reliability of airframe (ETOPS significant) systems after entry into service. The manufacturer should submit a report to the Agency initially on a quarterly basis (for the first year of operation) and thereafter on a periodic basis and for a time to be agreed with the Agency (see 7.f.(4) and 8.g.(3)). The monitoring task should include ETOPS significant events from both the ETOPS and non-ETOPS fleet of the subject family of airframes. This additional reliability monitoring is required only for those systems that could effect the proper functioning of the engines or systems where the fail-safe/redundancy is affected by the number of engines and back-up systems used in the case of additional failure during the diversion.~~

~~Note: See also Appendix 1 paragraph e Continuing Airworthiness for aircraft systems.~~

The System Safety Assessment (SSA) which should be conducted in accordance with CS 25.1309 for all ETOPS significant systems should follow the steps below:

a. Conduct a (supplemental) Functional Hazard Assessment (FHA) considering the ETOPS missions. In determining the effect of a failure condition during an ETOPS mission, the following should also be reviewed:

   (1) Crew workload over a prolonged period of time;

   (2) Operating conditions at single engine altitude;

   (3) Lesser crew familiarity with the procedures and conditions to fly to and land at diversion aerodromes.

b. Introduce any additional failure scenario/objectives necessary to comply with this AMC.

c. For compliance demonstration of ETOPS significant system reliability to CS 25.1309 there will be no distinction made between ETOPS group 1 and group 2 systems. For qualitative analysis (FHA) the maximum flight time and the maximum ETOPS diversion time should be considered. For quantitative analysis (SSA) the average ETOPS mission time and maximum ETOPS diversion time should be considered. Consideration should be given to how the particular airframe/engine combination is to be utilised, and analyse the potential route structure and city pairs available, based upon the range of the aeroplane

d. Consider effects of prolonged time and at single engine altitude in terms of continued operation of remaining systems following failures.

e. Specific ETOPS maintenance tasks, intervals and specific ETOPS flight procedures necessary to attain the safety objectives, shall be included in the appropriate approved documents (e.g. CMP document, MMEL).

f. Safety assessments should consider the flight consequences of single or multiple system failures leading to a diversion and the probability and consequences of subsequent failures or exhaustion of the capacity of time critical systems, which might occur during the diversion.

Safety assessments should determine whether a diversion should be conducted to the nearest aerodrome or to an aerodrome presenting better operating conditions, considering:

(1) The effect of the initial failure condition on the capability of the aeroplane to cope with adverse conditions at the diversion aerodrome, and

(2) The means available to the crew to assess the extent and evolution of the situation during a prolonged diversion.

The aircraft flight manual and the flight crew warning and alerting and display systems should provide clear information to enable the flight crew to determine when failure conditions are such that a diversion is necessary.

3. RELIABILITY VALIDATION METHODS

There are two extremes in the ETOPS process with respect to maturity; one is the demonstration of stable reliability by the accumulation of in-service experience and the other is by a design, analyses and test programmes, agreed between the (S)TC holders and the Agency/Authority.

a. In-s*ervice Experience/Systems Safety Assessment (SSA)*

In-service experience should generally be in accordance with that identified in Appendix 1 for each airframe/engine combination. When considering the acceptability of airframe systems for ETOPS, maturity should be assessed in terms of used technology and the particular design under review.

In performing the SSA's, defined in paragraph 2 of this Appendix 2, particular account will be taken of the following:

(1) For identical or similar equipment to those used on other aeroplanes, the SSA failure rates should be validated by in-service experience:

(i) The amount of in-service experience (either direct or related) should be indicated for each equipment of an ETOPS significant system.

(ii) Where related experience is used to validate failure modes and rates, an analysis should be produced to show the validity of the in-service experience.

(iii) In particular, if the same equipment is used on a different airframe/engine combination, it should be shown that there is no difference in operating conditions (e.g., vibrations, pressure, temperature) or that these differences do not adversely affect the failure modes and rates.

(iv) If in-service experience with similar equipment on other aeroplanes is claimed to be applicable, an analysis should be produced substantiating the reliability figures used on the quantitative analysis. This substantiation analysis should include details of the differences between the similar and new equipment, details of the in-service experience of the similar equipment and details of any "lessons learnt" from modifications introduced and included in the new equipment.

(v) For certain equipment, (e.g., IDGs, TRUs, bleeds and emergency generators) this analysis may have to be backed up by tests. This should be agreed with the Agency.

(2) For new or substantially modified equipment, account should be taken in the SSA for the lack of validation of the failure rates by service experience.

A study should be conducted to determine the sensitivity of the assumed SSA failure condition probabilities to the failure rates of the subject equipment.

Should a failure case probability be sensitive to this equipment failure rate and close to the required safety objective, particular provision precautions should be applied (e.g. temporary dispatch restrictions, inspections, maintenance procedures, crew procedures) to account for the uncertainty, until the failure rate has been appropriately validated by in-service experience.

b. Early ETOPS

Where type design approval for Early ETOPS is sought at first entry into service of the airframe/engine combination, the engineering assessment can be based on substantiation by analysis, test, in-service experience (the same engine or airframe with different engines) or other means, to show that the ETOPS significant systems will achieve a failure rate that is compatible with the specified safety objective. An approval plan, defining the early ETOPS reliability validation tests and processes, should be submitted by the (S)TC's holders to the Agency for agreement. This certification plan should be completed and implemented to the satisfaction of the Agency before an ETOPS type design approval will be granted.

(1) Acceptable Early ETOPS approval plan

In addition to the above considerations, the following should be complied with for an Early ETOPS approval:

(i) Aeroplane Testing

For each airframe/engine combination that has not yet accumulated at least 15,000 engine hours in service, to be approved for ETOPS, one or more aeroplanes should conduct flight testing which demonstrates that the airframe/engine combination, its components and equipment are capable for, and function properly, during ETOPS flights and ETOPS diversions. These flight tests may be coordinated with, but they are not in place of flight testing required in Part 21.35(b)(2).

The flight test programme should include:

(A) Flights simulating actual ETOPS operation, including normal cruise altitude, step climbs and APU operation if required for ETOPS;

(B) Demonstration of the maximum normal flight duration with the maximum diversion time for which eligibility is sought;

(C) Engine inoperative maximum time diversions to demonstrate the aeroplane and propulsion system's capability to safely conduct an ETOPS diversion, including a repeat of a MCT diversion on the same engine;

(D) Non-normal conditions to demonstrate the aeroplane's capability to safely conduct an ETOPS diversion under worst case probable system failure conditions;

(E) Diversions into representative operational diversionary airports;

(F) Repeated exposure to humid and inclement weather on the ground followed by long range operations at normal cruise altitude;

(G) The flight testing should validate the adequacy of the aeroplane's flying qualities, performance and flight crew's ability to deal with the conditions of paragraphs (C)/(D)&(E) above.

(H) The engine-inoperative diversions must be evenly distributed among the number of engines in the applicant's flight test programme except as required by paragraph (C) above.

(I) The test aeroplane(s) must be operated and maintained using the recommended operations and maintenance manual procedures during the aeroplane demonstration test.

(J) At the completion of the aeroplane(s) demonstration testing, the ETOPS significant systems must undergo an operation or functional check per the Instructions for Continued Airworthiness of CS 25.1529. The engines must also undergo a gas path inspection. These inspections are intended to identify any abnormal conditions that could result in an in-flight shutdown or diversion. Any abnormal conditions must be identified, tracked and resolved in accordance with subpart (2) below. This inspection requirement can be relaxed for ETOPS significant systems similar in design to proven models.

(K) Maintenance and Operational Procedures. The applicant must validate all ETOPS significant systems maintenance and operational procedures. Any problems found as a result of the validation must be identified, tracked and resolved in accordance with paragraph subpart (2) below.

(ii) APU Testing.

If an APU is required for ETOPS, one APU of the type to be certificated with the aeroplane should complete a test consisting of 3000 equivalent aeroplane operational cycles. Following completion of the demonstration test, the APU must be disassembled and inspected. Any potential sources of in-flight start and/or run events should be identified, tracked and resolved in accordance with paragraph subpart (2) below.

(2) Early ETOPS Occurrence Reporting & Tracking

(i) The holder of a (S)TC of an aeroplane which has been approved for ETOPS without service experience in accordance with this AMC, should establish a system to address problems and occurrences encountered on the airframe and propulsion systems that could affect the safety of ETOPS operations and timely resolution for these events;

(ii) The system should contain a means for the prompt identification of ETOPS related events, the timely notification of the event to the Agency and proposing to, and obtaining Agency's approval for the resolution of this event. The implementation of the problem resolution can be accomplished by way of an Agency approved change(s) to the type design, the manufacturing process, or an operating or maintenance procedure.

(iii) The reporting system should be in place for at least the first 100,000 flight hours. The reporting requirement remains in place until the airframe and propulsion systems have demonstrated stable reliability in accordance with the required safety objectives

(iv) If the airframe/engine combination certified is a derivative of a previously certificated aeroplane, these criteria may be amended by the Agency, to require reporting on only those changed systems.

(v) For the early ETOPS service period, an applicant must define the sources and content of in-service data that will be made available to them in support of their occurrence reporting and tracking system. The content of this data

should be adequate to evaluate the specific cause of all service incidents reportable under Part 21.A.3(c), in addition to the occurrences that could affect the safety of ETOPS operations and should be reported, including:

(A) In-flight shutdown events;

(B) Inability to control the engine or obtain desired power;

(C) Precautionary thrust reductions (except for normal troubleshooting as allowed in the Aircraft Flight Manual);

(D) Degraded propulsion in-flight start capability;

(E) Inadvertent fuel loss or availability, or uncorrectable fuel imbalance in flight;

(F) Technical air turn-backs or diversions associated with an ETOPS Group 1 system;

(G) Inability of an ETOPS Group 1 system, designed to provide backup capability after failure of a primary system, to provide the required backup capability in-flight;

(H) Any loss of electrical power or hydraulic power system, during a given operation of the aeroplane;

(I) Any event that would jeopardise the safe flight and landing of the aeroplane during an ETOPS flight.

4. CONTINUING SURVEILLANCE

In order to confirm that the predicted system reliability level is achieved and maintained, the (S)TC holder should monitor the reliability of airframe ETOPS significant systems after entry into service. The (S)TC's holder should submit a report to the Agency, initially on a quarterly basis (for the first year of operation) and thereafter on a periodic basis and for a time to be agreed with the Agency. The monitoring task should include all events on ETOPS significant systems, from both the ETOPS and non-ETOPS fleet of the subject family of airframes. This additional reliability monitoring is required only for ETOPS Group 1 systems.

5. CONTINUED AIRWORTHINESS

a. Reliability Tracking Board

The Agency will periodically review its original findings by means of a Reliability Tracking Board. In addition, the Agency document containing the CMP standard will be revised as necessary.

Note: The Reliability Tracking Board will usually comprise specialists from aeroplane and engine disciplines. (See also Appendix 1).

Periodic meetings of the ETOPS Reliability Tracking Board are normally frequent at the start of the assessment of a new product. The periodicity is adjusted by the Agency upon accumulation of substantial in-service experience if there is evidence that the reliability of the product is sufficiently stable. The periodic meetings of the board are discontinued once an ETOPS product, or family of products, has been declared mature by the Agency.

b. Mature ETOPS products

A family of ETOPS products with a high degree of similarity is considered as mature when:

(1) The product family has accumulated at least 250,000 flight hours for an aeroplane family;

(2) The product family has accumulated service experience covering a comprehensive spectrum of operating conditions (e.g. cold, hot, high, humid);

(3) Each ETOPS approved model or variant in the family has achieved the reliability objectives for ETOPS and has remained stable at or below the objectives fleet-wide for at least two years;

New models or significant design changes may not be considered mature until they have individually satisfied the conditions specified above.

The Agency makes the determination of when a product or a product family is considered mature.

c. Surveillance of mature ETOPS products

The (S)TC holder of an ETOPS product which the Agency has found mature, should institute a process to monitor the reliability of the product in accordance with the objectives defined in this Appendix. In case of occurrence of an event, a series of events or a statistical trend that implies a deviation of the reliability of the ETOPS fleet, or a portion of the ETOPS fleet (e.g. one model or a range of serial numbers), above the limits specified for ETOPS, the (S)TC should:

(1) Inform the Agency and define a means to restore the reliability through a Minor Revision of the CMP document, with a compliance schedule to be agreed with the Agency if the situation has no immediate safety impact;

(2) Inform the Agency and propose an ad-hoc follow-up by the Agency until the concern has been alleviated, or confirmed if the situation requires further assessment;

(3) Inform the Agency and propose the necessary corrective action(s) to be mandated by the Agency through an AD if a direct safety concern exists.

In the absence of a specific event or trend requiring action, the (S)TC holder should provide the Agency with the basic statistical indicators prescribed in this Appendix 2 on a yearly basis.

d. Minor Revision of the ETOPS CMP Document

A Minor Revision of the ETOPS CMP document is one that contains only editorial adjustments, configurations, maintenance and procedures equivalent to those already approved by the Agency, or new reliability improvements which have no immediate impact on the safety of ETOPS flights and which are introduced as a means to control the continued compliance with the reliability objectives of ETOPS.

Minor revisions of the ETOPS CMP document should be approved by authorised signatories of the Design Organisation and under the provisions of its approved Design Organisation Handbook.

6. DESIGN ORGANISATION APPROVAL

(S)TC holders of products approved for ETOPS should hold a Design Organisation Approval (DOA) conforming to EASA Part-21, with the appropriate terms of approval and privileges. Their approved Design Organisation Handbook (DOH) must contain an appropriate description of the organisation and procedures covering all applicable tasks and responsibilities of EASA Part-21 and this AMC.

APPENDIX 3 - OPERATIONAL LIMITATIONS

~~1 GENERAL~~

~~a. One of the distinguishing features of two-engine extended range operations is the concept of a suitable en-route alternate aerodrome being available to which an aeroplane can divert after a single failure or failure combinations which require a diversion. Whereas most two-engine aeroplanes operate in an environment where there is usually a choice of diversion aerodromes available, the extended range aeroplane may have only one alternate within a range dictated by the endurance of a particular airframe system (e.g., cargo fire suppressant), or by the approved maximum diversion time for that route.~~

~~b. It is, therefore, important that any aerodrome designated as an en-route alternate has the capabilities, services and facilities to support safely that particular aeroplane, and that the weather conditions at the time of arrival provide a high assurance that adequate visual references are available upon arrival at decision height (DH) or minimum descent altitude (MDA), and that the surface conditions are within acceptable limits to permit the approach and landing to be completed safely with one propulsion system and/or airframe systems inoperative.~~

~~c. As well as satisfying the ICAO Annex 6 requirements in relation to crew qualification for operations on such routes, operators should show that these facilities and services specified are available for the proposed operations.~~

~~2 SUITABLE AERODROME SELECTION~~

~~For an aerodrome to be suitable for the purpose of this AMC, it should have the capabilities, services, a minimum of ICAO category 4, or the relevant aeroplane category if lower, Rescue and Fire Fighting Services (RFFS) and facilities necessary to designate it as an adequate aerodrome, (for RFFS not located on the aerodrome; capability of meeting the aeroplane within 30 minutes notice) and have weather and field conditions at the time of that particular operation which provide a high assurance that an approach and landing can be safely completed with one propulsion system and/or airframe systems inoperative, in the event that a diversion to the en-route alternate becomes necessary. Due to the natural variability of weather conditions with time, as well as the need to determine the suitability of a particular en-route aerodrome prior to departure, the en-route alternate weather minima for planning purposes are generally higher than the weather minima necessary to initiate an instrument approach. This is necessary to assure that the instrument approach can be conducted safely if the flight has to divert to the alternate aerodrome. Additionally, since the visual reference necessary to safely complete an approach and landing is determined, among other things, by the accuracy with which the aeroplane can be controlled along the approach path by reference to instrument aids, as well as by the tasks the pilot is required to accomplish to manoeuvre the aeroplane so as to complete the landing, the weather minima for non-precision approaches are generally higher than for precision approaches.~~

~~3 STANDARD EN-ROUTE ALTERNATE AERODROME PRE-DEPARTURE WEATHER MINIMA~~

~~The following are established for flight planning and release purposes with two-engine aeroplanes in extended range operations.~~

~~A particular aerodrome may be considered a suitable aerodrome for flight planning and release purposes for extended range operation if it meets the criteria of paragraph 3 of this Appendix and has one of the following combinations of instrument approach capabilities and en-route alternate aerodrome weather minima at the time of the particular operation. An operator should include in his Operations Manual either Table 1 or Table 2, but not a combination of both, for use in determining the operating minima at the planned en-route alternate aerodrome.~~

~~Table 1 Planning minima – ETOPS~~

~~Approach Facility Configuration~~	~~Alternate Airfield Ceiling~~	~~Weather Minima Visibility/RVR~~
~~For aerodromes with at least one operational navigation facility, providing a precision or non-precision runway approach procedure or a circling manoeuvre from an instrument approach procedure~~	~~A ceiling derived by adding 122 m (400 feet) to the authorised DH, MDH (DA/MDA) or circling minima~~	~~A visibility derived by adding 1 500 meters to the authorised landing minima.~~
~~The weather minima below apply at aerodromes which are equipped with precision or non-precision approaches on at least two separate runways (two separate landing surfaces)~~		
~~For aerodromes with at least two operational navigation facilities providing a precision or non-precision runway approach procedure to separate suitable runways~~	~~A ceiling derived by adding 61 m (200 feet) to the higher of the authorised DH/MDH (DA/MDA) for the approaches~~	~~A visibility derived by adding 800 meters to the higher of the two authorised landing minima~~

~~Table 2 Planning minima – ETOPS~~

~~Type of Approach~~	~~Planning Minima (RVR visibility required & ceiling if applicable)~~			
	~~Aerodrome with~~			
	~~at least 2 separate approach procedures based on 2 separate aids serving 2 separate runways~~	~~at least 2 separate approach procedures based on 2 separate aids serving 1 runway~~	~~or~~	~~at least 1 approach procedure based on 1 aid serving 1 runway~~
~~Precision Approach Cat II, III (ILS, MLS)~~	~~Precision Approach Cat I Minima~~	~~Non-Precision Approach Minima~~		
~~Precision Approach Cat I (ILS, MLS)~~	~~Non-Precision Approach Minima~~	~~Circling minima or, if not available, non-precision approach minima plus 200 ft / 1 000 m~~		
~~Non- Precision Approach~~	~~The lower of non-precision approach minima plus 200 ft / 1 000 m or circling minima~~	~~The higher of circling minima or non-precision approach minima plus 200 ft / 1 000 m~~		
~~Circling Approach~~	~~Circling minima~~			

~~4 EN-ROUTE ALTERNATE AERODROME PRE-DEPARTURE WEATHER MINIMA TAKING ADVANTAGE OF ADVANCED LANDING SYSTEMS~~

~~It is recognised that the development of advanced landing systems may lead to certified capability for planned single engine Category II and/or Category III approach and landings.~~

~~Before advantage of any such capability can be used in the pre-flight selection of an en-route alternate aerodrome the appropriate Authority must be satisfied that the operator has demonstrated that when an ETOPS aircraft has encountered any failure condition in the~~

~~airframe and/or propulsion system that would result in a diversion to an en-route alternate aerodrome, subsequent failures during the diversion, that would result in the loss of the capability to safely conduct and complete the Category II/III approach and landing are Improbable. The certificated capability of the airframe/engine combination should be evaluated considering the approved maximum diversion time.~~

~~Approval of the planned use of these advanced systems to nominate en-route alternate aerodromes will be on a case-by-case basis and will use the table of paragraph 4 of this Appendix.~~

~~5 EN-ROUTE ALTERNATE SUITABILITY IN FLIGHT~~

~~See paragraphs 10.d.(5)(iv) and 10.j.(2)(iv).~~

1. AREA OF OPERATION

An operator is, when specifically approved, authorised to conduct ETOPS flights within an area where the diversion time, at any point along the proposed route of flight, to an adequate ETOPS en-route alternate aerodrome, is less than the operator's approved diversion time (under standard conditions in still air) at the approved one-engine-inoperative cruise speed.

2. OPERATOR'S APPROVED DIVERSION TIME

The procedures established by the operator should ensure that ETOPS is only planned on routes where the Operator's Approved Diversion Time to an Adequate ETOPS en-route alternate Aerodrome can be met.

3. ISSUE OF THE ETOPS OPERATIONS APPROVAL BY THE COMPETENT AUTHORITY

The approval issued by the Competent Authority for ETOPS operations should be based on the following information provided by the operator:

a. Specification of the particular airframe/engine combinations, including the current approved CMP document required for ETOPS as normally identified in the AFM.

b. Authorised area of operation;

c. Minimum altitudes to be flown along planned and diversionary routes;

d. Operator's Approved Diversion Time.

e. Aerodromes identified to be used,, including alternates, and associated instrument approaches and operating minima;

f. The approved maintenance and reliability programme for ETOPS;

g. Identification of those aeroplanes designated for ETOPS by make and model as well as serial number and registration

h. Specification of routes and the ETOPS diversion time necessary to support those routes;

i. The one-engine-inoperative cruise speed, which may be area specific, depending upon anticipated aeroplane loading and likely fuel penalties associated with the planned procedures;

j. Processes and related resources allocated to initiate and sustain ETOPS operations in a manner that demonstrates commitment by management and all personnel involved in ETOPS continued airworthiness and operational support;

k. The plan for establishing compliance with the build standard required for Type Design Approval, e.g. CMP document compliance.

APPENDIX 4 - FLIGHT PREPARATION AND IN-FLIGHT PROCEDURES

~~1 GENERAL~~

~~The maintenance programme should contain the standards, guidance and direction necessary to support the intended operations. Maintenance personnel and other personnel involved should be made aware of the special nature of ETOPS and have the knowledge, skills and ability to accomplish the requirements of the programme.~~

~~2 ETOPS MAINTENANCE PROGRAMME~~

~~The basic maintenance programme for the aeroplane being considered for ETOPS is the continuous airworthiness maintenance schedule currently approved for that operator, for the make and model airframe/engine combination. This schedule should be reviewed to ensure that it provides an adequate basis for development of ETOPS maintenance requirements. These should include maintenance procedures to preclude identical action being applied to multiple similar elements in any ETOPS significant system (e.g., fuel control change on both engines).~~

~~a. ETOPS related tasks should be identified on the operator's routine work forms and related instructions.~~

~~b. ETOPS related procedures, such as involvement of centralised maintenance control, should be clearly defined in the operator's programme.~~

~~c. An ETOPS service check should be developed to verify that the status of the aeroplane and certain critical items are acceptable. This check should be accomplished by an authorised and trained person prior to an ETOPS flight. Such a person may be a member of the flight crew.~~

~~d. Log books should be reviewed and documented, as appropriate, to ensure proper MEL procedures, deferred items and maintenance checks, and that system verification procedures have been properly performed.~~

~~3 ETOPS MANUAL~~

~~The operator should develop a manual for use by personnel involved in ETOPS. This manual need not include, but should at least reference, the maintenance programme and other requirements described by this Appendix, and clearly indicate where they are located in the operator's manual system.~~

~~All ETOPS requirements, including supportive programmes, procedures, duties, and responsibilities, should be identified and be subject to revision control. This manual should be submitted to the Authority 30 days before implementation of ETOPS flights.~~

~~Alternatively, the operator may include this information in existing manuals used by personnel involved in ETOPS.~~

~~4 OIL CONSUMPTION PROGRAMME~~

~~The operator's oil consumption programme should reflect the manufacturer's recommendations and be sensitive to oil consumption trends. It should consider the amount of oil added at the departing ETOPS stations with reference to the running average consumption; i.e., the monitoring must be continuous up to, and including, oil added at the ETOPS departure station. If oil analysis is meaningful to this make and model, it should be included in the programme. If the APU is required for ETOPS operation, it should be added to the oil consumption programme.~~

~~5 ENGINE CONDITION MONITORING~~

~~This programme should describe the parameters to be monitored, method of data collection and corrective action process. The programme should reflect manufacturer's instructions and industry practice. This monitoring will be used to detect deterioration at an early stage to allow for corrective action before safe operation is affected. The programme should ensure that engine limit margins are maintained so that a prolonged single-engine diversion may be conducted without exceeding approved engine limits (i.e., rotor speeds, exhaust gas temperature) at all approved power levels and expected environmental conditions. Engine margins preserved through this programme should account for the effects of additional engine loading demands (e.g., anti-icing, electrical, etc.) which may be required during the single-engine flight phase associated with the diversion.~~

~~6 VERIFICATION PROGRAMME AFTER MAINTENANCE~~

~~The operator should develop a verification programme or procedures should be established to ensure corrective action following an engine shutdown, primary system failure or adverse trends or any prescribed events which require a verification flight or other action and establish means to assure their accomplishment. A clear description of who must initiate verification actions and the section or group responsible for the determination of what action is necessary should be identified in the programme. Primary systems or conditions requiring verification actions should be described in the operator's ETOPS manual.~~

~~7 RELIABILITY PROGRAMME~~

~~An ETOPS reliability programme should be developed or the existing reliability programme supplemented. This programme should be designed with early identification and prevention of ETOPS related problems as the primary goal. The programme should be event-orientated and incorporate reporting procedures for significant events detrimental to ETOPS flights. This information should be readily available for use by the operator and Authority to help establish that the reliability level is adequate, and to assess the operator's competence and capability to safely continue ETOPS. The Authority should be notified within 96 hours of events reportable through this programme.~~

~~a. In addition to the items required to be reported by other regulations, the following items should be included:~~

~~(i) in-flight shutdowns;~~

~~(ii) diversion or turnback;~~

~~(iii) uncommanded power changes or surges;~~

~~(iv) inability to control the engine or obtain desired power; and~~

~~(v) problems with systems critical to ETOPS.~~

~~b. The report should identify the following:~~

~~(i) aeroplane identification;~~

~~(ii) engine identification (make and serial number);~~

~~(iii) total time, cycles and time since last shop visit;~~

~~(iv) for systems, time since overhaul or last inspection of the defective unit;~~

~~(v) phase of flight; and~~

~~(vi) corrective action.~~

~~8 PROPULSION SYSTEM MONITORING~~

~~The operator's assessment of propulsion systems reliability for the extended range fleet should be made available to the Authority (with the supporting data) on at least a monthly basis, to ensure that the approved maintenance programme continues to maintain a level of reliability necessary for extended range operation.~~

~~The assessment should include, as a minimum, engine hours flown in the period, in flight shut-down rate for all causes and engine removal rate, both on a 12 month moving average basis. Where the combined extended range fleet is part of a larger fleet of the same airframe/engine combination, data from the operator's total fleet will be acceptable. However, the reporting requirements of paragraph 7 of this Appendix must still be observed for the extended range fleet.~~

~~Any adverse sustained trend would require an immediate evaluation to be accomplished by the operator in consultation with the Authority. The evaluation may result in corrective action or operational restrictions being applied.~~

~~Note: Where statistical assessment alone may not be applicable, e.g., when the fleet size is small, the operator's performance will be reviewed on a case-by-case basis.~~

~~9 MAINTENANCE TRAINING~~

~~The Maintenance training should focus on the special nature of ETOPS. This programme should be included in the normal maintenance training. The goal of this programme is to ensure that all personnel involved in ETOPS are provided with the necessary training so that the ETOPS maintenance tasks are properly accomplished and to emphasise the special nature of ETOPS maintenance requirements. Qualified maintenance personnel are those that have completed the operator's extended range training programme and have satisfactorily performed extended range tasks under supervision, within the framework of the operator's approved procedures for Personnel Authorisation.~~

~~10 ETOPS PARTS CONTROL~~

~~The operator should develop a parts control programme with support from the manufacturer, that ensures the proper parts and configuration are maintained for ETOPS. The programme includes verification that parts placed on an ETOPS aeroplane during parts borrowing or pooling arrangements, as well as those parts used after repair or overhaul, maintain the necessary ETOPS configuration for that aeroplane.~~

1. GENERAL

The flight release considerations specified in this paragraph are in addition to the applicable operational requirements. They specifically apply to ETOPS. Although many of the considerations in this AMC are currently incorporated into approved programmes for other aeroplanes or route structures, the unique nature of ETOPS necessitates a re-examination of these operations to ensure that the approved programmes are adequate for this purpose.

2. MINIMUM EQUIPMENT LIST (MEL)

The system redundancy levels appropriate to ETOPS should be reflected in the Master Minimum Equipment List (MMEL). An operator's MEL may be more restrictive than the MMEL considering the kind of ETOPS operation proposed, equipment and in-service problems unique to the operator. Systems and equipment considered to have a fundamental influence on safety may include, but are not limited to, the following:

a. electrical;

b. hydraulic;

c. pneumatic;

d. flight instrumentation, including warning and caution systems;

e. fuel;

f. flight control;

g. ice protection;

h. engine start and ignition;

i. propulsion system instruments;

j. navigation and communications, including any route specific long range navigation and communication equipment;

k. auxiliary power-unit;

l. air conditioning and pressurisation;

m. cargo fire suppression;

n. engine fire protection;

o. emergency equipment;

p. systems and equipment required for engine condition monitoring

In addition, the following systems are required to be operative for dispatch for ETOPS with diversion times above 180 minutes:

q. Fuel Quantity Indicating System (FQIS);

r. APU (including electrical and pneumatic supply to its designed capability), if necessary to comply with ETOPS requirements;

s. Automatic engine or propeller control system;

t. Communication system(s) relied on by the flight crew to comply with the requirement for communication capability.

3. COMMUNICATION AND NAVIGATION FACILITIES

For releasing an aeroplane on an ETOPS flight, the operators should ensure that:

a. Communications facilities are available to provide under normal conditions of propagation at all planned altitudes of the intended flight and the diversion scenarios, reliable two-way voice and/or data link communications;

b. Visual and non-visual aids are available at the specified alternates for the anticipated types of approaches and operating minima.

4. FUEL SUPPLY

a. General

For releasing an aeroplane on an ETOPS flight, the operators should ensure that it carries sufficient fuel and oil to meet the applicable operational requirements and any additional fuel that may be determined in accordance with this Appendix.

b. Critical Fuel Reserve

In establishing the critical fuel reserves, the applicant is to determine the fuel necessary to fly to the most critical point (at normal cruise speed and altitude, taking into account the anticipated meteorological conditions for the flight) and execute a diversion to an ETOPS en-route alternate under the conditions outlined in this Appendix, the 'Critical Fuel Scenario' (paragraph c. below).

These critical fuel reserves should be compared to the normal applicable operational requirements for the flight. If it is determined by this comparison that the fuel to

complete the critical fuel scenario exceeds the fuel that would be on board at the most critical point, as determined by applicable operational requirements, additional fuel should be included to the extent necessary to safely complete the Critical Fuel Scenario. When considering the potential diversion distance flown account should be taken of the anticipated routing and approach procedures, in particular any constraints caused by airspace restrictions or terrain.

c. Critical Fuel Scenario.

The following describes a scenario for a diversion at the most critical point. The applicant should confirm compliance with this scenario when calculating the critical fuel reserve necessary.

Note1: If an APU is one of the required power sources, then its fuel consumption should be accounted for during the appropriate phases of flight.

Note2: Additional fuel consumptions due to any MEL or CDL items should be accounted for during the appropriate phases of flight, when applicable.

The aeroplane is required to carry sufficient fuel taking into account the forecast wind and weather to fly to an ETOPS route alternate assuming the greater of:

(1) A rapid decompression at the most critical point followed by descent to a 10,000ft or a higher altitude if sufficient oxygen is provided in accordance with the applicable operational requirements.

(2) Flight at the approved one-engine-inoperative cruise speed assuming a rapid decompression and a simultaneous engine failure at the most critical point followed by descent to a 10,000ft or a higher altitude if sufficient oxygen is provided in accordance with the applicable operational requirements.

(3) Flight at the approved one-engine-inoperative cruise speed assuming an engine failure at the most critical point followed by descent to the one-engine-inoperative cruise altitude.

Upon reaching the alternate, hold at 1500 ft above field elevation for 15 minutes and then conduct an instrument approach and landing.

Add a 5% wind speed factor (i.e., an increment to headwind or a decrement to tailwind) on the actual forecast wind used to calculate fuel in the greater of (1), (2) or (3) above to account for any potential errors in wind forecasting. If an operator is not using the actual forecast wind based on wind model acceptable to the competent authority, allow 5% of the fuel required for (1), (2) or (3) above, as reserve fuel to allow for errors in wind data. A wind aloft forecasting distributed worldwide by the World Area Forecast System (WAFS) is an example of a wind model acceptable to the competent authority.

d. Icing

Correct the amount of fuel obtained in paragraph c. above taking into account the greater of:

(1) the effect of airframe icing during 10 percent of the time during which icing is forecast (including ice accumulation on unprotected surfaces, and the fuel used by engine and wing anti-ice during this period).

(2) fuel for engine anti-ice, and if appropriate wing anti-ice for the entire time during which icing is forecast.

Note: Unless a reliable icing forecast is available, icing may be presumed to occur when the total air temperature (TAT) at the approved one-engine-inoperative cruise speed is less than +10ºC, or if the outside air temperature is between 0ºC and -20ºC with a relative humidity (RH) of 55% or greater.

The operator should have a programme established to monitor aeroplane in-service deterioration in cruise fuel burn performance and including in the fuel supply calculations

sufficient fuel to compensate for any such deterioration. If there is no data available for such a programme the fuel supply should be increased by 5% to account for deterioration in cruise fuel burn performance.

5. ALTERNATE AERODROMES

To conduct an ETOPS flight, the ETOPS en-route alternate aerodromes, should meet the weather requirements of planning minima for an ETOPS en-route alternate aerodromes contained in the applicable operational requirements. ETOPS planning minima apply until dispatch. The planned en-route alternates for using in the event of propulsion system failure or aeroplane system failure(s) which require a diversion should be identified and listed in the cockpit documentation (e.g. computerised flight plan) for all cases where the planned route to be flown contains a point more than the operator's approved diversion time at the one-engine-inoperative speed, under standard conditions in still air, from an adequate aerodrome.

Where departure or destination aerodromes are selected as ETOPS en-route alternate, they should meet the weather requirements of planning minima for IFR flights for an ETOPS en-route alternate contained in the applicable operational requirements, unless the critical fuel scenario includes additional fuel to continue the diversion from the departure or destination aerodrome to an alternate aerodrome meeting the weather requirements of planning minima for destination and destination alternate aerodromes for the available instrument approach which is contained in the applicable operational requirements.

See also Appendix 5 to this AMC 'ETOPS En-route Alternate Aerodromes'.

6. IN-FLIGHT RE-PLANNING AND POST-DISPATCH WEATHER MINIMA

An aeroplane whether or not dispatched as an ETOPS flight may not re-route post dispatch without meeting the applicable operational requirements and satisfy by a procedure that dispatch criteria have been met. The operator should have a system in place to facilitate such re-routes.

Post-dispatch, weather conditions at the ETOPS en-route alternates should be equal to or better than the normal landing minima for the available instrument approach.

7. DELAYED DISPATCH

If the dispatch of a flight is delayed by more than one hour, after the operating crew have left the briefing facility, operations personnel should monitor weather forecasts and airport status at the nominated en-route alternates to ensure that they stay within the specified planning minima requirements until dispatch.

8. DIVERSION DECISION MAKING

Operators shall establish procedures for flight crew, outlining the criteria that indicate when a diversion or change of routing is recommended whilst conducting an ETOPS flight. For an ETOPS flight, in the event of the shutdown of an engine, these procedures should include the shutdown of an engine, fly to and land at the nearest aerodrome appropriate for landing.

Factors to be considered when deciding upon the appropriate course of action and suitability of an aerodrome for diversion may include but are not limited to:

a. Aircraft configuration / weight / systems status;

b. Wind and weather conditions en route at the diversion altitude;

c. Minimum altitudes en route to the diversion aerodrome;

d. Fuel required for the diversion;

e. Aerodrome condition, terrain, weather and wind;

f. Runways available and runway surface condition;

g. Approach aids and lighting;

h. RFFS* capability at the diversion aerodrome;

i. Facilities for aircraft occupants - disembarkation & shelter;

j. Medical facilities;

k. Pilot's familiarity with the aerodrome;

l. Information about the aerodrome available to the flight crew.

Contingency procedures should not be interpreted in any way that prejudices the final authority and responsibility of the pilot in command for the safe operation of the aeroplane.

Note: for an ETOPS en-route alternate aerodrome, a published RFFS category equivalent to ICAO category 4, available at 30 minutes notice, is acceptable.

9. IN-FLIGHT MONITORING

During the flight, the flight crew should remain informed of any significant changes in conditions at designated ETOPS en-route alternate aerodromes. Prior to the ETOPS Entry Point, the forecast weather, established aeroplane status, fuel remaining, and where possible field conditions and aerodrome services and facilities at designated ETOPS en-route alternates are to be evaluated. If any conditions are identified which could preclude safe approach and landing on a designated en-route alternate aerodrome, then the flight crew should take appropriate action, such as re-routing as necessary, to remain within the operator's approved diversion time of an en-route alternate aerodrome with forecast weather to be at or above landing minima. In the event this is not possible, the next nearest en-route alternate aerodrome should be selected provided the diversion time does not exceed the maximum approved diversion time. This does not override the pilot in command's authority to select the safest course of action.

10. AEROPLANE PERFORMANCE DATA

The operator should ensure that the Operations Manual contains sufficient data to support the critical fuel reserve and area of operations calculation.

The following data should be based on the information provided by the (S)TC holder. The requirements for one-engine-inoperative performance en-route can be found in the applicable operational requirements.

Detailed one-engine-inoperative performance data including fuel flow for standard and non-standard atmospheric conditions and as a function of airspeed and power setting, where appropriate, covering:

a. drift down (includes net performance);

b. cruise altitude coverage including 10,000 feet;

c. holding;

d. d altitude capability (includes net performance);

e. missed approach.

Detailed all-engine-operating performance data, including nominal fuel flow data, for standard and non-standard atmospheric conditions and as a function of airspeed and power setting, where appropriate, covering:

a. Cruise (altitude coverage including 10,000 feet); and

b. Holding.

It should also contain details of any other conditions relevant to extended range operations which can cause significant deterioration of performance, such as ice accumulation on the unprotected surfaces of the aeroplane, Ram Air Turbine (RAT) deployment, thrust reverser deployment, etc.

The altitudes, airspeeds, thrust settings, and fuel flow used in establishing the ETOPS area of operations for each airframe/engine combination should be used in showing the corresponding terrain and obstruction clearances in accordance with the applicable operational requirements.

11. OPERATIONAL FLIGHT PLAN

The type of operation (i.e. ETOPS, including the diversion time used to establish the plan) should be listed on the operational flight plan as required by the applicable operational requirements.

APPENDIX 5 - ETOPS EN-ROUTE ALTERNATE AERODROMES

~~(Note: 180 min provisions are included in the main text)~~

~~1. GENERAL~~

~~Paragraphs 10.a. through 10.i. of this AMC detail the criteria for operational approval of extended range operations with a maximum diversion time between 60 and 120 minutes to an en route alternate (at approved single-engine inoperative cruise speed). This appendix serves the function of differentiating the criteria for approval of operations up to 90 minutes diversion time.~~

~~2. 90 - MINUTE OPERATION~~

~~Since 1976, two-engine aeroplane operations up to 90 minutes diversion time (two engine speed) were approved over Africa, the Indian Ocean, the Bay of Bengal and the North Atlantic using ICAO recommendations of the time and the applicable operational rule. The aeroplanes performing these missions were not designed to meet all the design and reliability criteria now in Paragraphs 8, 9 and Appendix 1&2 of this AMC and were not subjected to the operational approval criteria detailed in Paragraph 10, Appendices 3, 4 and 7 of this AMC. However, these operations have proven to be safe and successful due to the short duration of the concerned ETOPS sectors, the short diversion time, the favourable operating characteristics of the route and the built-in reliability of the initial product. This experience, along with the ETOPS operational experience gathered since 1985, has led to the development of the 90 minute criteria detailed below. This criteria bridges the gap between the 60 min, non-ETOPS, requirements and the current requirements defined in this AMC. It defines specifically what needs to be accomplished in order to obtain an operational approval with a maximum diversion time of 90 minutes or less.~~

~~3. CRITERIA FOR APPROVAL TO OPERATE UP TO 90 MINUTES~~

~~a. Type Design~~

~~Compliance must be shown to all applicable paragraphs. Where relevant, specific 90 min, or less, criteria is denoted directly in the text of paragraphs 8 and Appendix 1.~~

~~b. Operational Approval~~

~~Consideration may be given to the approval of extended range operations up to 90-minutes for operators with minimal or no in-service experience with the airframe/engine combination. This determination considers such factors as the proposed area of operations, the operator's demonstrated ability to successfully introduce aeroplanes into operations, the quality of the proposed maintenance and operations programs.~~

~~(1) Maintenance~~

~~Maintenance programs should be instituted which follow the guidance in Appendix 4.~~

~~(2) Operations~~

~~(i) Operation programs should be instituted which follow the guidance in paragraphs 10.d., 10.e. and 10.f. and Appendix 3.~~
~~(ii) Minimum Equipment List (MEL): Provision of the JAA Master Minimum Equipment List (MMEL), including 90 minute or less "Extended Range" provisos.~~

1. SELECTION OF EN-ROUTE ALTERNATE AERODROMES

For an aerodrome to be nominated as an ETOPS en-route alternate for the purpose of this AMC, it should be anticipated that at the expected times of possible use it is an adequate

ETOPS aerodrome that meets the weather and field conditions defined in the paragraph below titled 'Dispatch Minima – En-Route Alternate Aerodromes' or the applicable operational requirements.

To list an aerodrome as an ETOPS en-route alternate the following criteria should be met:

a. The landing distances required as specified in the AFM for the altitude of the aerodrome, for the runway expected to be used, taking into account wind conditions, runway surface conditions, and aeroplane handling characteristics, permit the aeroplane to be stopped within the landing distance available as declared by the aerodrome authorities and computed in accordance with the applicable operational requirements.

b. The aerodrome services and facilities are adequate to permit an instrument approach procedure to the runway expected to be used while complying with the applicable aerodrome operating minima.

c. The latest available forecast weather conditions for a period commencing at the earliest potential time of landing and ending one hour after the latest nominated time of use of that aerodrome, equals or exceeds the authorised weather minima for en-route alternate aerodromes as provided for by the increments listed in Table 1 of this Appendix. In addition, for the same period, the forecast crosswind component plus any gusts should be within operating limits and within the operators maximum crosswind limitations taking into account the runway condition (dry, wet or contaminated) plus any reduced visibility limits.

d. In addition, the operator's programme should provide flight crews with information on adequate aerodromes appropriate to the route to be flown which are not forecast to meet en-route alternate weather minima. Aerodrome facility information and other appropriate planning data concerning these aerodromes should be provided to flight crews for use when executing a diversion.

2. DISPATCH MINIMA – EN-ROUTE ALTERNATE AERODROMES.

An aerodrome may be nominated as an ETOPS en-route alternate for flight planning and release purposes if the available forecast weather conditions for a period commencing at the earliest potential time of landing and ending one hour after the latest nominated time of use of that aerodrome, equal or exceed the criteria required by Table 1 below.

In addition, for the same period, the forecast wind component, including gusts, should be within limits for the landing runway expected to be used and should not exceed the maximum wind values, as detailed in the Operations Manual for engine inoperative landing taking into account the runway condition (dry, wet or contaminated).

Table 1. Planning Minima

Approach Facility	Ceiling	Visibility
Precision Approach	Authorised DH/DA plus an increment of 200 ft	Authorised visibility plus an increment of 800 metres
Non-Precision Approach or Circling approach	Authorised MDH/MDA plus an increment of 400 ft	Authorised visibility plus an increment of 1500 metres

The above criteria for precision approaches are only to be applied to Category 1 approaches. When determining the usability of an Instrument Approach (IAP), forecast wind plus any gusts should be within operating limits, and within the operators maximum crosswind limitations taking into account the runway condition (dry, wet or contaminated) plus any reduced visibility limits. Conditional forecast elements need not be considered, except that a PROB 40 or TEMPO condition below the lowest applicable operating minima should be taken into account.

When dispatching under the provisions of the MEL, those MEL limitations affecting instrument approach minima should be considered in determining ETOPS alternate minima.

3. EN-ROUTE ALTERNATE AERODROME PLANNING MINIMA – ADVANCED LANDING SYSTEMS

The increments required by Table 1 are normally not applicable to Category II or III minima unless specifically approved by the Authority.
Approval will be based on the following criteria:

a. Aircraft is capable of engine-inoperative Cat II/III landing; and

b. Operator is approved for normal Cat II/III operations.

The competent authority may require additional data (such as safety assessment or in-service records) to support such an application. For example, it should be shown that the specific aeroplane type can maintain the capability to safely conduct and complete the Category II/III approach and landing, in accordance with EASA CS-AWO, having encountered failure conditions in the airframe and/or propulsion systems associated with an inoperative engine that would result in the need for a diversion to the route alternate aerodrome.

Systems to support one-engine inoperative Category II or III capability should be serviceable if required to take advantage of Category II or III landing minima at the planning stage.

APPENDIX 6 -ETOPS TRAINING PROGRAMME

The operator's ETOPS training programme should provide initial and recurrent training for flight crew as follows:

1. INTRODUCTION TO ETOPS REGULATIONS

a. Brief overview of the history of ETOPS;

b. ETOPS regulations;

c. Definitions;

d. Approved One-Engine-Inoperative Cruise Speed;

e. ETOPS Type Design Approval – a brief synopsis;

f. Maximum approved diversion times and time-limited systems capability.

g. Operator's Approved Diversion Time;

h. Routes and aerodromes intended to be used in the ETOPS area of operations;

i. ETOPS Operations Approval;

j. ETOPS Area and Routes;

k. ETOPS en-route alternates aerodromes including all available let-down aids;

l. Navigation systems accuracy, limitations and operating procedures;

m. Meteorological facilities and availability of information;

n. In-flight monitoring procedures;

o. Computerised Flight Plan;

p. Orientation charts, including low level planning charts and flight progress charts usage (including position plotting);

q. Equal Time Point;

r. Critical fuel.

2. NORMAL OPERATIONS

a. Flight planning and Dispatch

(1) ETOPS Fuel requirements

(2) Route Alternate selection - weather minima

(3) Minimum Equipment List – ETOPS specific

(4) ETOPS service check and Tech log

(5) Pre-flight FMS Set up

b. Flight performance progress monitoring

(1) Flight management, navigation and communication systems.

(2) Aeroplane system monitoring

(3) Weather monitoring

(4) In-flight fuel management – to include independent cross checking of fuel quantity

3. ABNORMAL AND CONTINGENCY PROCEDURES:

a. Diversion Procedures and Diversion 'decision making'.

Initial and recurrent training to prepare flight crews to evaluate potential significant system failures. The goal of this training should be to establish crew competency in dealing with the most probable contingencies. The discussion should include the factors that may require medical, passenger related or non-technical diversions.

b. Navigation and communication systems, including appropriate flight management devices in degraded modes.

c. Fuel Management with degraded systems

d. Initial and recurrent training which emphasises abnormal and emergency procedures to be followed in the event of foreseeable failures for each area of operation, including:

(1) Procedures for single and multiple failures in flight affecting ETOPS sector entry and diversion decisions. If standby sources of electrical power significantly degrade the cockpit instrumentation to the pilots, then training for approaches with the standby generator as the sole power source should be conducted during initial and recurrent training.

(2) Operational restrictions associated with these system failures including any applicable MEL considerations.

4. ETOPS LINE FLYING UNDER SUPERVISION (LFUS)

During the introduction into service of a new ETOPS type, or conversion of pilots not previously ETOPS qualified where ETOPS approval is sought, a minimum of two ETOPS sectors should be completed including an ETOPS line check.

ETOPS subjects should also be included in annual refresher training as part of the normal process.

5. FLIGHT OPERATIONS PERSONNEL OTHER THAN FLIGHT CREW

The operator's training programme in respect to ETOPS should provide training where applicable for operations personnel other than flight crew (e.g. dispatchers), in addition to refresher training in the following areas:

a. ETOPS Regulations / Operations Approval

b. Aeroplane performance / Diversion procedures

c. Area of Operation

d. Fuel Requirements

e. Dispatch Considerations MEL, CDL, weather minima, and alternate airports

f. Documentation

APPENDIX 7 -TYPICAL ETOPS OPERATIONS MANUAL SUPPLEMENT

~~A General~~

~~The purpose of this appendix is to establish the factors which the Authority may consider in exercising its authority to allow reduction or substitution of operator's in-service experience requirement in granting ETOPS Operational Approval.~~

~~Paragraph 7 of this AMC states that "....the concepts for evaluating extended range operations with two-engine aeroplanes....ensures that two-engine aeroplanes are consistent with the level of safety required for current extended range operations with three and four-engine turbine powered aeroplanes without unnecessarily restricting operation".~~

~~It is apparent that the excellent propulsion related safety record of two-engine aeroplanes has not only been maintained, but potentially enhanced, by the process related provisions associated with ETOPS Type Design and Operational Approvals. Further, currently available data shows that these process related benefits are achievable without extensive in-service experience. Therefore, reduction or elimination of in-service experience requirements may be possible when the operator shows to the Authority that adequate and validated ETOPS processes are in place.~~

~~The Accelerated ETOPS Operational Approval Programme with reduced in-service experience does not imply that any reduction of existing levels of safety should be tolerated but rather acknowledges that an operator may be able to satisfy the objectives of this AMC by a variety of means of demonstrating that operator's capability.~~

~~This Appendix permits an operator to start ETOPS operations when the operator has established that those processes necessary for successful ETOPS operations are in place and are considered to be reliable. This may be achieved by thorough documentation of processes, demonstration on another aeroplane/validation (as described in Paragraph G of this Appendix) or a combination of these.~~

~~B Background~~

~~When ETOPS requirements were first released in 1985 ETOPS was a new concept, requiring extensive in-service verification of capability to assure the concept was a logical approach. At the time, the Authorities recognised that a reduction in the in-service requirements or substitution of in-service experience, on another aeroplane, would be possible.~~

~~The ETOPS concept has been successfully applied for close to a decade; ETOPS is now widely employed. The number of ETOPS operators has increased dramatically, and in the North Atlantic US airlines have more twin operations than the number of operations accomplished by three and four engine aeroplanes. ETOPS is now well established.~~

~~Under the AMC, an operator is generally required to operate an airframe/engine combination for one (1) year, before being eligible for 120 minute ETOPS; and another one (1) year, at 120 minute ETOPS, before being granted 180 minute ETOPS approval. For example, an operator who currently has 180 minute ETOPS approval on one type of airframe/engine or who is currently operating that route with an older generation three or four engine aeroplane could be required to wait for up to two (2) years for such an approval. Such a requirement creates undue economic burden on operators and may not contribute to safety. Data indicates that compliance with processes has resulted in successful ETOPS operation at earlier than the standard time provided for in the AMC.~~

~~ETOPS operational data indicates that twins have maintained a high degree of reliability due to heightened awareness of specific maintenance, engineering and flight operation process related requirements. Compliance with ETOPS processes is crucial in assuring high levels of reliability of twins. Data shows that previous experience on an airframe/engine combination prior to operating ETOPS, does not necessarily make a significant difference in the safety of such operations. Commitment to establishment of reliable ETOPS processes has been found to~~

be a much more significant factor. Such commitment, by operators, to ETOPS processes has, from the outset, resulted in operation of twins at a mature level of reliability.

ETOPS experience of the past decade shows that a firm commitment by the operator to establish proven ETOPS processes prior to the start of actual ETOPS operations and to maintain that commitment throughout the life of the programme is paramount to ensuring safe and reliable ETOPS operations.

C Terminology

Process:

A process is a series of steps or activities that are accomplished, in a consistent manner, to ensure that a desired result is attained on an ongoing basis. Paragraph D documents ETOPS processes that should be in place to ensure a successful Accelerated ETOPS programme.

Proven Process:

A process is considered to be 'proven' when the following elements are developed and implemented:

(1) Definition and documentation of process elements

(2) Definition of process related roles and responsibilities

(3) Procedure for validation of process elements

- Indications of process stability/reliability

- Parameters to validate process and monitor (measure) success

- Duration of necessary evaluation to validate process

(4) Procedure for follow-up in-service monitoring to assure process remains reliable/stable.

Methods of process validation are provided in paragraph G.

D ETOPS Processes

The two-engine airframe/engine combination for which the operator is seeking Accelerated ETOPS Operational Approval must be ETOPS Type Design approved prior to commencing ETOPS. The operator seeking Accelerated ETOPS Operational Approval must demonstrate to the Authority that it has an ETOPS programme in place that addresses the process elements identified in this paragraph

The following are the ETOPS process elements:

(1) Aeroplane/engine compliance to Type Design Build Standard (CMP)

(2) Compliance with the Maintenance Requirements as defined in Paragraph 10 and Appendix 4 of this AMC:

Fully developed Maintenance Programme (Appendix 4, paragraph 2) which includes a tracking and control programme.

ETOPS manual (Appendix 4, paragraph 3) in place.

A proven Oil Consumption Monitoring Programme. (Appendix 4, paragraph 4)

A proven Engine Condition Monitoring and Reporting system. (Appendix 4, paragraph 5)

A proven Plan for Resolution of Aeroplane Discrepancies. (Appendix 4, paragraph 6)

A proven ETOPS Reliability Programme. (Appendix 4, paragraph 7)

Propulsion system monitoring programme (Appendix 4, paragraph 8) in place. The operator should establish a programme that results in a high degree of confidence that the propulsion system reliability appropriate to the ETOPS diversion time would be maintained.

Training and qualifications programme in place for ETOPS maintenance personnel. (Appendix 4, paragraph 9).

Established ETOPS parts control programme (Appendix 4, paragraph 10)

(3) Compliance with the Flight Operations Programme as defined in Paragraph 10 of this AMC.

Proven flight planning and dispatch programmes appropriate to ETOPS.

Availability of meteorological information and MEL appropriate to ETOPS.

Initial and recurrent training and checking programme in place for ETOPS flight operations personnel.

Flight crew and dispatch personnel familiarity assured with the ETOPS routes to be flown; in particular the requirements for, and selection of, en-route alternates.

(4) Documentation of the following elements:

Technology new to the operator and significant difference in primary and secondary power (engines, electrical, hydraulic and pneumatic) systems between the aeroplanes currently operated and the two-engine aeroplane for which the operator is seeking Accelerated ETOPS Operational Approval.

The plan to train the flight and maintenance personnel to the differences identified in 1 above.

The plan to use proven or manufacturer validated Training and Maintenance and Operations Manual procedures relevant to ETOPS for the two-engine aeroplane for which the operator is seeking Accelerated ETOPS Operational Approval.

Changes to any previously proven or manufacturer validated Training, Maintenance or Operations Manual procedures described above. Depending on the nature of any changes, the operator may be required to provide a plan for validating such changes.

The validation plan for any additional operator unique training and procedures relevant to ETOPS, if any.

Details of any ETOPS programme support from the airframe manufacturer, engine manufacturer, other operators or any other outside agency.

The control procedures when maintenance or flight dispatch support is provided by an outside party as described above.

E Application

Paragraph 10a of this AMC requires that requests for extended range operations be submitted at least 3 months prior to the start of extended range operations. Normally, the operator should submit an 'Accelerated ETOPS Operational Approval Plan' to the Authority six (6) months before the proposed start of extended range operations. This additional time will permit the Authority to review the documented plans and assure adequate ETOPS processes are in place.

The operator's application for Accelerated ETOPS should:

Define proposed routes and the ETOPS diversion time necessary to support those routes.

Define processes and related resources being allocated to initiate and sustain ETOPS operations in a manner which demonstrates commitment by management and all personnel involved in ETOPS maintenance and operational support.

Identify, where required, the plan for establishing compliance with the build standard required for Type Design Approval, e.g. CMP (Configuration, Maintenance and Procedures Document) compliance.

Document plan for compliance with requirements in Paragraph D.

5. Define Review Gates. A Review Gate is a milestone tracking plan to allow for the orderly tracking and documentation of specific requirements of this Appendix. Each Review

~~Gate should be defined in terms of the tasks to be satisfactorily accomplished in order for it to be successfully passed. Items for which the Authority visibility is required or the Authority approval is sought should be included in the Review Gates. Normally, the Review Gate process will start six (6) months before the proposed start of extended range operations and should continue at least six (6) months after the start of extended range operations. Assure that the proven processes comply with the provisions of Paragraph C of this Appendix.~~

~~F Operational Approvals~~

~~Operational approvals which are granted with reduced in-service experience should be limited to those areas agreed by the Authority at approval of the Accelerated ETOPS Operational Approval Plan. When an operator wishes to add new areas to the approved list, Authority concurrence is required.~~

~~Operators will be eligible for ETOPS Operational Approval up to the Type Design Approval limit, provided the operator complies with all the requirements in Paragraph D.~~

~~G Process Validation.~~

~~Paragraph D identifies those process elements that are needed to be proven prior to the start of Accelerated ETOPS. For a process to be considered proven, the process must first be defined. Typically this will include a flow chart showing elements of the process. Roles and responsibilities of the personnel who will be managing this process should be defined including any training requirement. The operator should demonstrate that the process is in place and functions as intended. The operator may accomplish this by thorough documentation and analysis, or by demonstrating on an aeroplane that the process works and consistently provides the intended results. The operator should also show that the feedback loop exists to illustrate need for revision of the process, if required, based on in-service experience.~~

~~Normally the choice to use, or not to use, demonstration on an aeroplane as a means of validating the process should be left up to the operator. With sufficient preparation and dedication of resources such validation may not be necessary to assure processes should produce acceptable results. However, in any case where the proposed plan to prove the processes is determined by the Authority to be inadequate or the plan does not produce acceptable results, validation of the process in an aeroplane may be required.~~

~~If any operator is currently operating ETOPS with a different airframe and/or engine combination it may be able to document that it has proven ETOPS processes in place and only minimal further validation may be necessary. It will, however, be necessary to demonstrate that means are in place to assure equivalent results will occur on the aeroplane being proposed for Accelerated ETOPS Operational Approval.~~

~~The following elements which, while not required, may be useful or beneficial in justifying a reduction in the requirements of ETOPS processes:~~

~~Experience with other airframes and/or engines.~~

~~2. Previous ETOPS experience.~~

~~3. Experience with long range, overwater operations with two, three or four engine aeroplanes.~~

~~Any experience gained by flight crews, maintenance personnel and flight dispatch personnel while working with other ETOPS approved operators.~~

~~Process validation may be done in the airframe/engine combination which will be used in Accelerated ETOPS operation or in a different aeroplane type than that for which approval is being sought, including those with three and four engines.~~

~~A process may be validated by first demonstrating the process produces acceptable results on a different aeroplane type or airframe/engine combination. It should then be necessary to~~

~~demonstrate that means are in place to assure equivalent results should occur on the aeroplane being proposed for Accelerated ETOPS Operational Approval.~~

~~Any validation programme should address the following:~~

~~The operator should show that it has considered the impact of the ETOPS validation programme with regard to safety of flight operations. The operator should state in its application any policy guidance to personnel involved in the ETOPS process validation programme. Such guidance should clearly state that ETOPS process validation exercises should not be allowed to adversely impact the safety of actual operations especially during periods of abnormal, emergency, or high cockpit workload operations. It should emphasise that during periods of abnormal or emergency operation or high cockpit workload ETOPS process validation exercises may be terminated.~~

~~The validation scenario should be of sufficient frequency and operational exposure to validate maintenance and operational support systems not validated by other means.~~

~~A means must be established to monitor and report performance with respect to accomplishment of tasks associated with ETOPS process elements. Any recommended changes to ETOPS maintenance and operational process elements should be defined.~~

~~Prior to the start of the process validation programme, the following information should be submitted to the Authority:~~

~~- Validation periods, including start dates and proposed completion dates.~~

~~- Definition of aeroplane to be used in the validation. List should include registration numbers, manufacturer and serial number and model of the airframe and engines.~~

~~- Description of the areas of operation (if relevant to validation objectives) proposed for validation and actual operations.~~

~~- Definition of designated ETOPS validation routes. The routes should be of duration required to ensure necessary process validation occurs.~~

~~Process validation reporting. The operator should compile results of ETOPS process validation. The operator should:~~

~~- Document how each element of the ETOPS process was utilised during the validation.~~

~~- Document any shortcomings with the process elements and measures in place to correct such shortcomings.~~

~~- Document any changes to ETOPS processes which were required after an in-flight shut down (IFSD), unscheduled engine removals, or any other significant operational events.~~

~~- Provide periodic Process Validation reports to the Authority. This may be addressed during Review Gates.~~

The ETOPS operations manual supplement can be divided under these headings as follows:

PART A. GENERAL/BASIC

a. Introduction

(1) Brief description of ETOPS

(2) Definitions

b. Operations approval

(1) Criteria

(2) Assessment

(3) Approved diversion time

c. Training and Checking

d. Operating procedures

e. ETOPS operational procedures

f. ETOPS Flight Preparation and Planning

(1) Aeroplane serviceability

(2) ETOPS Orientation charts

(3) ETOPS alternate aerodrome selection

(4) En-route alternate weather requirements for planning

(5) ETOPS computerised Flight Plans

g. Flight Crew Procedures

(1) Dispatch

(2) Re-routing or diversion decision-making

(3) ETOPS verification (following maintenance) flight requirements

(4) En-route Monitoring

PART B. AEROPLANE OPERATING MATTERS

This part should include type-related instructions and procedures needed for ETOPS.

a. Specific type-related ETOPS operations

(1) ETOPS specific limitations

(2) Types of ETOPS operations that are approved

(3) Placards and limitations

(4) OEI speed(s)

(5) Identification of ETOPS aeroplanes

b. Dispatch and flight planning, plus in-flight planning

(1) Type-specific flight planning instructions for use during dispatch and post dispatch

(2) Procedures for engine(s)-out operations, ETOPS (particularly the one-engine-inoperative cruise speed and maximum distance to an adequate aerodrome should be included)

c. ETOPS Fuel Planning

d. Critical Fuel Scenario

e. MEL/CDL considerations

f. ETOPS specific Minimum Equipment List items

g. Aeroplane Systems

(1) Aeroplane performance data including speed schedules and power settings

(2) Aeroplane technical differences, special equipment (e.g. satellite communications) and modifications required for ETOPS

PART C. ROUTE AND AERODROME INSTRUCTIONS

This part should comprise all instructions and information needed for the area of operation, to include the following as necessary:

a. ETOPS area and routes, approved area(s) of operations and associated limiting distances

b. ETOPS an-route alternates

c. Meteorological facilities and availability of information for in-flight monitoring

d. Specific ETOPS computerised Flight Plan information

e. Low altitude cruise information, minimum diversion altitude, minimum oxygen requirements and any additional oxygen required on specified routes if MSA restrictions apply

f. Performance requirements and weather minima for aerodromes that are designated as possible alternates

PART D. TRAINING

This part should contain the route and aerodrome training for ETOPS operations. This training should have twelve-months of validity or as required by the applicable operational requirements. Flight crew training records for ETOPS should be retained for 3 years or as required by the applicable requirements.

The operator's training programme in respect to ETOPS should include initial and recurrent training/checking as specified in this AMC.

Appendix 8 CONTINUING AIRWORTHINESS CONSIDERATIONS

1. APPLICABILITY

The requirements of this Appendix apply to the continuing airworthiness management organisations (CAMO) managing the aircraft for which an ETOPS operational approval is sought, and they are to be complied with in addition to the applicable continuing airworthiness requirements of part-M. They specifically affect:

a. Occurrence reporting

b. Aircraft maintenance programme and reliability programme

c. Continuing airworthiness management exposition

d. Competence of continuing airworthiness and maintenance personnel

2. OCURRENCE REPORTING.

In addition to the items generally required to be reported in accordance with AMC 20-8, the following items concerning ETOPS should be included:

a. in-flight shutdowns;

b. diversion or turn-back;

c. un-commanded power changes or surges;

d. inability to control the engine or obtain desired power; and

e. failures or malfunctions of ETOPS significant systems.

Note: status messages, transient failures, blinking messages, messages tested satisfactorily on ground not duplicating the failure should only be reported after an assessment by the operator that an unacceptable trend has occurred on the system

The report should identify as applicable the following:

a. aircraft identification;

b. engine, propeller or APU identification (make and serial number);

c. total time, cycles and time since last shop visit;

d. for systems, time since overhaul or last inspection of the defective unit;

e. phase of flight; and

f. corrective action.

The Competent Authority and the (S)TC holder should be notified within 72 hours of events reportable through this programme.

3. MAINTENANCE PROGRAMME AND RELIABILITY PROGRAMME.

The quality of maintenance and reliability programmes can have an appreciable effect on the reliability of the propulsion system and the ETOPS Significant Systems. The Competent Authority should assess the proposed maintenance and reliability programme's ability to maintain an acceptable level of safety for the propulsion system and the ETOPS Significant Systems of the particular airframe/engine combination.

3.1 MAINTENANCE PROGRAMME:

The maintenance programme of an aircraft for which ETOPS operational approval is sought, should contain the standards, guidance and instructions necessary to support the intended operation. The specific ETOPS maintenance tasks identified by the (S)TC holder in the Configuration, Maintenance and Procedures document (CMP) or equivalent should be included in the maintenance programme and identified as ETOPS tasks.

An ETOPS Maintenance task could be an ETOPS specific task or/and a maintenance task affecting an ETOPS significant system. An ETOPS specific task could be either an existing task with a different interval for ETOPS, a task unique to ETOPS operations, or a task mandated by the CMP further to the in-service experience review (note that in the case ETOPS is considered as baseline in the development of a maintenance program, no "ETOPS specific" task may be identified in the MRB).

3.1.1 PRE-DEPARTURE SERVICE CHECK

An ETOPS service check should be developed to verify the status of the aeroplane and the ETOPS significant systems. This check should be accomplished by an authorised and trained person prior to an ETOPS flight. Such a person may be a member of the flight crew.

3.2 RELIABILITY PROGRAMME:

3.2.1 GENERAL

The reliability programme of an ETOPS operated aircraft should be designed with early identification and prevention of failures or malfunctions of ETOPS significant systems as the primary goal. Therefore the reliability programme should include assessment of ETOPS Significant Systems performance during scheduled inspection/testing, to detect system failure trends in order to implement appropriate corrective action such as scheduled task adjustment.

The reliability programme should be event-orientated and incorporate:

a. reporting procedures in accordance with section 2: Occurrence reporting

b. operator's assessment of propulsion systems reliability

c. APU in-flight start programme

d. Oil consumption programme

e. Engine Condition Monitoring programme

f. Verification programme

3.2.2 ASSESSMENT OF PROPULSION SYSTEMS RELIABILITY

a. The operator's assessment of propulsion systems reliability for the ETOPS fleet should be made available to the competent Authority (with the supporting data) on at least a monthly basis, to ensure that the approved maintenance programme continues to maintain a level of reliability necessary for ETOPS operations as established in chapter II section 6.3.

b. The assessment should include, as a minimum, engine hours flown in the period, in-flight shutdown rate for all causes and engine removal rate, both on a 12-months moving average basis. Where the combined ETOPS fleet is part of a larger fleet of the same aircraft/engine combination, data from the total fleet will be acceptable.

c. Any adverse sustained trend to propulsion systems would require an immediate evaluation to be accomplished by the operator in consultation with the competent authority. The evaluation may result in corrective action or operational restrictions being applied.

d. A high engine in-flight shutdown rate for a small fleet may be due to the limited number of engine operating hours and may not be indicative for an unacceptable trend. The underlying causes for such an increase in the rate will have to be reviewed on a case-by-case basis in order to identify the root cause of events so that the appropriate corrective action is implemented.

e. If an operator has an unacceptable engine in-flight shutdown rate caused by maintenance or operational practices, then the appropriated corrective actions should be taken.

3.2.3 APU IN-FLIGHT START PROGRAMME

a. Where an APU is required for ETOPS and the aircraft is not operated with this APU running prior to the ETOPS entry point, the operator should initially implement a cold soak in-flight starting programme to verify that start reliability at cruise altitude is above 95%.
Once the APU in-flight start reliability is proven, the APU in-flight start monitoring programme may be alleviated. The APU in-flight start monitoring programme should be acceptable to the competent authority.

b. The Maintenance procedures should include the verification of in-flight start reliability following maintenance of the APU and APU components, as defined by the OEM, where start reliability at altitude may have been affected.

3.2.4 OIL CONSUMPTION MONITORING PROGRAMME:

The oil consumption monitoring programme should reflect the (S)TC holder's recommendations and track oil consumption trends. The monitoring programme must be continuous and include all oil added at the departure station.
If oil analysis is recommended to the type of engine installed, it should be included in the programme.
If the APU is required for ETOPS dispatch, an APU oil consumption monitoring programme should be added to the oil consumption monitoring programme.

3.2.5 ENGINE CONDITION MONITORING PROGRAMME:

The engine condition monitoring programme should ensure that a one-engine-inoperative diversion may be conducted without exceeding approved engine limits (e.g. rotor speeds, exhaust gas temperature) at all approved power levels and expected environmental conditions. Engine limits established in the monitoring programme should account for the effects of additional engine loading demands (e.g. anti-icing, electrical, etc.), which may be required during the one-engine-inoperative flight phase associated with the diversion.

The engine condition monitoring programme should describe the parameters to be monitored, method of data collection and corrective action process. The programme should reflect manufacturer's instructions and industry practice. This monitoring will be used to detect deterioration at an early stage to allow for corrective action before safe operation of the aircraft is affected.

3.2.6 VERIFICATION PROGRAMME

The operator should develop a verification programme to ensure that the corrective action required to be accomplished following an engine shutdown, any ETOPS significant system failure or adverse trends or any event which require a verification flight or other verification action are established. A clear description of who must initiate verification actions and the section or group responsible for the determination of what action is necessary should be identified in this verification programme. ETOPS significant systems or conditions requiring verification actions should be described in the Continuing Airworthiness Management

Exposition (CAME). The CAMO may request the support of (S)TC holder to identify when these actions are necessary. Nevertheless the CAMO may propose alternative operational procedures to ensure system integrity. This may be based on system monitoring in the period of flight prior to entering an ETOPS area

4. CONTINUING AIRWORTHINESS MANAGEMENT EXPOSITION.

The CAMO should develop appropriate procedures to be used by all personnel involved in the continuing airworthiness and maintenance of the aircraft, including supportive training programmes, duties, and responsibilities.

The CAMO should specify the procedures necessary to ensure the continuing airworthiness of the aircraft particularly related to ETOPS operations. It should address the following subjects as applicable:

a. General description of ETOPS procedures

b. ETOPS maintenance programme development and amendment

c. ETOPS reliability programme procedures

(1) Engine/ APU oil consumption monitoring

(2) Engine/APU Oil analysis

(3) Engine conditioning monitoring

(4) APU in-flight start programme

(5) Verification programme after maintenance

(6) Failures, malfunctions and defect reporting

(7) Propulsion System Monitoring/Reporting

(8) ETOPS significant systems reliability

d. Parts and configuration control programme

e. Maintenance procedures that include procedures to preclude identical errors being applied to multiple similar elements in any ETOPS significant system

f. Interface procedures with the ETOPS maintenance contractor, including the operator ETOPS procedures that involve the maintenance organisation and the specific requirements of the contract

g. Procedures to establish and control the competence of the personnel involved in the continuing airworthiness and maintenance of the ETOPS fleet.

5. COMPETENCE OF CONTINUING AIRWORTHINESS AND MAINTENANCE PERSONNEL

The CAMO organisation should ensure that the personnel involved in the continuing airworthiness management of the aircraft have knowledge of the ETOPS procedures of the operator.

The CAMO should ensure that maintenance personnel that are involved in ETOPS maintenance tasks:

a. Have completed an ETOPS training programme reflecting the relevant ETOPS procedures of the operator, and,

b. Have satisfactorily performed ETOPS tasks under supervision, within the framework of the Part-145 approved procedures for Personnel Authorisation.

5.1. PROPOSED TRAINING PROGRAMME FOR PERSONNEL INVOLVED IN THE CONTINUING AIRWORTHINESS AND MAINTENANCE OF THE ETOPS FLEET

The operator's ETOPS training programme should provide initial and recurrent training for as follows:

1. INTRODUCTION TO ETOPS REGULATIONS

a. Contents of AMC 20-6

b. ETOPS Type Design Approval – a brief synopsis

2. ETOPS OPERATIONS APPROVAL

a. Maximum approved diversion times and time-limited systems capability.

b. Operator's Approved Diversion Time

c. ETOPS Area and Routes;

d. ETOPS MEL

3. ETOPS CONTINUING AIRWORTHINESS CONSIDERATIONS

a. ETOPS significant systems

b. CMP and ETOPS aircraft maintenance programme

c. ETOPS pre-departure service check

d. ETOPS reliability programme procedures

(1) Engine/ APU oil consumption monitoring

(2) Engine/APU Oil analysis

(3) Engine conditioning monitoring

(4) APU in-flight start programme

(5) Verification programme after maintenance

(6) Failures, malfunctions and defect reporting

(7) Propulsion System Monitoring/Reporting

(8) ETOPS significant systems reliability

e. Parts and configuration control programme

f. CAMO additional procedures for ETOPS

g. Interface procedures between Part-145 organisation and CAMO

Appendix B - Cross-reference index

AMC 20-6	**AMC 20-6 revision 2**
1. PURPOSE	Chapter I- Section 1: Purpose
2. RELATED REFERENCES	Chapter I- Section 2: Related References
3. RESERVED	N/A
4. TERMINOLOGY	Chapter I- Section 4: Terminology
5. DISCUSSION	Deleted
6. APPLICABILITY AND GRANDFATHER CLAUSES	Deleted
7. CONCEPTS	Chapter I: section 5
8. TYPE DESIGN APPROVAL CONSIDERATION FOR ELIGIBILITY	Chapter II Type design approval considerations
9. IN-SERVICE EXPERIENCE FOR ETOPS TYPE DESIGN APPROVAL	Chapter II: Section 6.1: In-Service Experience For ETOPS Type Design Approval
10. OPERATIONAL APPROVAL CONSIDERATIONS	Chapter III Operational Approval Considerations
Appendix 1-Propulsion system reliability assessment	Appendix 1-Propulsion system reliability assessment
Appendix 2- Aircraft systems reliability assessment	Appendix 2- Aircraft systems reliability assessment
Appendix 3- Suitable en-route alternate aerodromes	Appendix 5- ETOPS en-route alternate aerodromes
Appendix 4- ETOPS maintenance requirements	Appendix 8- Continuing Airworthiness Considerations
Appendix 5- 90 minutes or less ETOPS operational program criteria	Chapter III Section 7.1 Approval for ETOPS up to 90 Minutes
Appendix 6- Not used	N/A
Appendix 7- Reduction of operator's in-service experience requirement prior to the granting of an ETOPS operational approval ("Accelerated ETOPS operational approval")	Chapter III Section 5 Accelerated ETOPS approval

Appendix C - Attachments

08alm008 comments NPA 2008-01.pdf
Attachment #1 to comment #359

Extract of Draft EASA NPA on ETOPS Chapter B VI "Draft Decision AMC-20, Sub-Chapter 8d. "Criteria"

(EASA A350 CERT Additional/new text proposed is highlighted in red)
(Airbus proposed modifications are highlighted in blue)

(8) Three or more reliable and independent electrical power sources should be available. In this context and with special regard to the ETOPS relevant failure case of one engine inoperative, if there are more than 1 electrical power source normally (mechanically or hydraulically) driven by the failed engine, these power sources can not be considered to be "independent" electrical power sources in the sense of this paragraph. As a minimum, following failure of any two sources, ~~the remaining source(s)~~ a third power source should be capable of powering the items specified in paragraph 8.~~b~~d.(7). If one or more of the three required electrical power sources are provided by an APU, hydraulic system, or ram air turbine, the following criteria apply as appropriate:

(i) The APU, when installed, should meet the criteria in paragraph 8.~~b~~d. (4).

(ii) The hydraulic power source should be reliable. To achieve this reliability, it may be necessary to provide two or more independent energy sources (e.g., bleed air from two or more pneumatic sources).

(iii) The Ram Air Turbine (RAT) should be demonstrated to be sufficiently reliable in deployment and use. The RAT should not require engine dependent power for deployment.

Note: For 75 minutes or less ETOPS operations, if one of the required electrical power sources is provided by batteries, the following criteria apply:

The electrical power and distribution system including the standby or alternate power system, should comply with the requirements of CS 25.1351 and associated AMC's. Where the alternate power source provided to comply with CS 25.1351(d) is time limited (e.g. batteries), such a power source should have a capability to enable the items required by the verifying authority in paragraph 8~~b~~d. (7) to be powered for the maximum certificated diversion time in still air conditions, plus an allowance for holding, approach and landing, and the likely prevailing weather conditions for the planned routes ,(e.g. an allowance for headwinds).

(9) For ETOPS approvals of greater than 180 minutes, ~~and in order to meet the safety objective (i.e. Extremely Improbable) associated with the total loss of electrical power, including in combination with an engine failure~~ , in addition to the criteria for electrical power sources specified in paragraph 8d.(8) above, the following criteria should also be applied:

(i) Any one of the three ~~or more~~ independent electrical power sources (used for showing compliance to ETOPS requirements) as mentioned in paragraph 8d.(8) above should be capable of, and available to supply power to all ~~technical~~ essential ~~loads/~~functions/systems (typically all main, essential, standby and emergency bus bars, but excluding galleys, IFE systems etc).

(ii) ~~To meet CS 25.1351(d), f~~Following the failure of any power source combined with the loss or failure of the other two sources, ~~further~~ a fourth *independent* power source~~(s)~~ should be available that is ~~(are)~~ capable of providing power to the essential functions for continuous safe flight and landing.

~~This paragraph (ii) to be replaced in the following way:~~

~~(ii) To meet CS 25.1351(d), after the loss of electrical power sources following any combination of failure not shown to be extremely improbable, remaining (normal) and/or further (clarify applicability to APU and RAT) power source(s) should be available that is (are) capable of providing power to the essential functions for continuous safe flight and landing.~~

(iii) Where one of the above power sources is an APU, it should meet the criteria in paragraph 8 d.(4).

(iv) If the additional power source is provided by a hydraulic system or ram air turbine the provisions of paragraph 8 d.(8) apply.

(v) The list of essential functions to be powered ~~from the standby~~ by the fourth *independent* power source for ETOPS for continuous safe flight and landing, is as defined in paragraph 8 d.(7).

Attachment #2 to comment #319