Operational Evaluation Board Report

Boeing 747-400 / -400F / -8 / -8F
Flight Crew Qualifications

Report, Rev 2
27 Nov 2013

European Aviation Safety Agency
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Boeing 747-400 / -400F / -8 / -8F

Operational Evaluation Board – Flight Crew Qualifications

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Revision Record

<table>
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<th>Date</th>
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Acronyms

AFM..........................Airplane Flight Manual
AMC..........................Acceptable Means of Compliance
AP..........................Autopilot
AT .........................Auto Throttle
ATO .........................Approved Training Organisation
ATQP .......................Alternative Training and Qualification Programme
AWO .......................All Weather Operations
CBT .........................Computer Based Training
CCOM .......................Cabin Crew Operations Manual
CPD .........................Common Procedure Document for conducting Operational Evaluation Boards dated June 10, 2004 signed jointly by JAA, FAA and TCCA
CRM .........................Crew Resource Management
CTLC .......................Common Takeoff and Landing Credit
Difference Level...........a designated level of difference as defined in the CPD for the evaluation of pilot training, checking and currency
EASA .......................European Aviation Safety Agency
ECL .........................Electronic Check List
EFB .........................Electronic Flight Bag
EFIS .........................Electronic Flight Instrument System
EGPWS ......................Enhanced Ground Proximity Warning System
ERF .........................Extended Range Freighter
EVS .........................Enhanced Vision System
FAA .........................Federal Aviation Administration
FAR .........................Federal Aviation Regulation
FBW .........................Fly By Wire
FCL .........................Flight Crew Licensing
FCTM .......................Flight Crew Training Manual
FCOM .......................Flight Crew Operations Manual
FSTD .......................Flight Simulation Training Device
FMA .........................Flight Mode Annunciator
FMS .........................Flight Management System
FSB .........................Flight Standardization Board
FPT .........................Flat Panel Trainer
GPWS .......................Ground Proximity Warning System
IAN......................Integrated Approach Navigation
JAA......................Joint Aviation Authorities
JAR......................Joint Aviation Requirements
LIFUS....................Line Flying Under Supervision
LNAV......................Lateral Navigation
LPC......................Licence Proficiency check
LOFT.....................Line Orientated Flying Training
MDR......................Master Differences Requirements
MFF......................Mixed Fleet Flying
MMEL.....................Master Minimum Equipment List
MTOM....................Maximum Take-Off Mass
NAA......................National Aviation Authority
ND.......................Navigation Display
OEB......................Operational Evaluation Board
ODR......................Operator Differences Requirements
OTD......................Other Training Device


PFD .......................... Primary Flight Display
PDU .......................... Primary Display Unit
PIC .......................... Pilot In Command
PM .......................... Pilot Monitoring
QRH .......................... Quick Reference Handbook
TCAS .......................... Traffic Alert and Collision Avoidance System
TAWS .......................... Terrain Awareness and Warning System
TCCA .......................... Transport Canada Civil Aviation
TRI .......................... Type Rating Instructor
TRTO .......................... Type Rating Training Organization
VNAV .......................... Vertical Navigation
ZFTT .......................... Zero Flight Time Training
3EFF .......................... Three-Engine Ferry Flight

Note on references and reference texts:
Where references are made to requirements and where extracts of reference texts are provided, these are at
the amendment state at the date of evaluation or publication of the report. Readers should take note that it is
impractical to update these references to take account of subsequent amendments to the source documents.
Preamble

This report combines the EASA operational evaluations of the B747-400, the B747-400F, B747-8 and the B747-8F.

The initial operational evaluation of the B747-400 and -400F was performed in a “catch-up” process. This review was based on the applicable FAA FSB reports, EASA flight test data, the relevant FCTMs, and applicable approved EU operator training courses.

Subsequent operational evaluations of the B747-8 and -8F were performed by an integrated team composed of EASA, FAA and TCCA members. However this OEB report is only applicable to operations under the framework of EASA.

Emanating from these evaluations, this report specifies the EASA recommendations for training checking and currency requirements on the B747-400, -400F, -8 and -8F, as specified in the relevant EU regulations for civil aviation aircrew and air operations. This report also contains finding of operational acceptability.

The OEB recommends the approval of:

- Boeing referenced ODR tables;
- Boeing proposed type rating courses for the B747-400, -400F, -8 and -8F as addressed in this report;
- Boeing proposed differences courses from the B747-400/-400F to B747-8/-8F; and
- Boeing proposed familiarization course from the B747-8 to B747-8F and vice versa.


The OEB further recommends the included conditions for operations on more than one type or variant, common take-off and landing credit from the B747 towards the B787, and the One-Engine Inoperative Ferry Flight (3EFF) recommendations.

The evaluations were conducted in compliance with the applicable EASA OEB Handbook and Common Procedure Document (CPD) for conducting Operational Evaluation Boards. Determinations made in this report are based on the evaluations of specific B747 aircraft models equipped in a given configuration and in accordance with current regulations and guidance. Modifications and upgrades made to the models described herein, or introduction of other variants may require amendment of the contents of this report.
1. **OEB B747-400/-400F FCL/OPS Subgroup Composition (Catch-up Process)**

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<thead>
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<tr>
<td>Graham Pass</td>
<td>EASA</td>
<td>OEB Chairman</td>
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<tr>
<td>Graham Stokes</td>
<td>EASA</td>
<td>OEB Team Member</td>
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<tr>
<td>Philip Adrian</td>
<td>Boeing</td>
<td>Advisor</td>
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2. **OEB B747-8/-8F Flight Crew Qualifications Group Composition**

<table>
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<tr>
<td>Andrea Boiardi</td>
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<td>Jo Geodert</td>
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<td>Axel Herbst</td>
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<td>Herbert Meyer</td>
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<td>Udo Schauss</td>
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<td>Joerg Steible</td>
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<td>Klaus Walkner</td>
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<td>Mikal Campanello</td>
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<td>Bill Jackson</td>
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<td>Stacey L. Klein</td>
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<td>John LaBrow</td>
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1) T2 flight test (21-24 January 2011)
2) T3 B747-400 to B7474-8 differences course (7-10 March 2011)
3) T3 B747-8 aircraft flight test (28-29 March 2011)
4) T5 B747-8 initial pilot type rating training course (11 February - 28 March 2013)
5) B747-400/-400F One-Engine Inoperative Ferry Flight Evaluation (July 2011)
7) B747-8/-8F One-Engine Inoperative Ferry Flight Evaluation (19 November 2011)
Executive Summary

1. Scope of the evaluations

This report specifies the EASA aircraft type designation and pilot license endorsement, and identifies the Training, Checking and Currency minimum requirements. The OEB did not evaluate Cabin Crew Training, Maintenance Training, operational suitability, or the use of equipment or functions such as the Electronic Flight Bag (EFB), Enhanced / Synthetic Vision Systems (E/SVS), RNP (AR) or Steep Approaches, wake vortex categorization, etc.

The evaluation of the Boeing Electronic Flight Bags has been performed by a separate OEB in a dedicated report. All relevant reports are available on the EASA OEB website at http://www.easa.europa.eu/certification/experts/OEB-reports.php.

2. Initial Operational Evaluation B747-400/-400F

The initial operational evaluation of the B747-400 and -400F was performed in a “catch-up” process. This review was based on the applicable FAA FSB reports, EASA flight test data, the relevant FCTMs, Boeing training courses, and applicable approved EU operator training courses.

Since the introduction of the B747-400, the aircraft has seen changes such as weight increases, the B747-400F Boeing Converted Freighter, Extended Range Freighter (ERF) and FMS upgrades. None of these changes affect the handling characteristics of the aircraft.

The OEB reviewed the Boeing B747-400 Standard Transition Course for initial Pilot Type Rating (Revision 13, dated 1 December 2009) and found it to be compliant with JAR-FCL 1. The OEB recommends this course as a baseline for the B747-400 type rating training and checking. Operators may add additional elements as required by their operation, and these will vary. Since numerous training courses for specific B747-400/-400F variants have already been approved, examples of acceptable training courses are not provided in this report. While handling qualities aspects of the B747-400/-400F variants are common, display format differences may require additional training emphasis.

The OEB reviewed the differences between the B747-400 and B747-400F (and vice versa) and concluded that Level A Familiarization Training is sufficient.

The B747-100/300 (‘classic’) variants are considered to be a separate type from the B747-400, B747-400F, B747-8 and B747-8F variants. However, common handling qualities and other common characteristics permit certain credits for training, checking, and currency. The OEB endorsed the recommendations for pilots converting from the B747-100/300 (‘classic’) to the B747-400/-400F as contained in the FAA FSB report (“B747-100, -200, -SP, -300, 400 & 400LCF”, Revision 2, dated 14 June 2007).
3. **Operational Evaluations of the B747-8/-8F**

Subsequent operational evaluations of the B747-8 and -8F were conducted jointly by integrated teams composed of EASA, FAA and TCCA members, to simultaneously meet the EASA OEB, FAA FSB, and TCCA OE requirements. Each Authority uses the results of the evaluation process to produce a report specific to its particular requirements that, while similar in intent, may differ somewhat in detail. This OEB report is applicable to operations under the framework of EASA.

Boeing requested that the following be evaluated:

- B747-8/-8F aircraft type designation and pilot license endorsement;
- Initial Type Rating Training B747-8/-8F;
- Differences Training B747-400/-400F to B747-8/-8F;
- Familiarization Training B747-8 to B747-8F and vice versa;
- common take-off and landing credit from the B747 towards the B787; and
- One-Engine Inoperative Ferry Flight Recommendations for the B747-400/-400F and the B747-8/-8F.

The evaluation process commenced with a series of meetings during which Boeing presented the operating philosophy and general system arrangements of the B747-8.

Operator Differences Requirement (ODR) tables B747-8 to B747-400, B747-8F to B747-400, and B747-8 to B747-8F were proposed by Boeing as a basis for the evaluation. These ODR tables and associated differences were assessed and found acceptable by the OEB.

Following a flight evaluation of handling qualities and comparison of systems differences, the OEB determined that differences training between the B747-400/-400F and the B747-8/-8F was acceptable.

Familiarization training between the B747-8 and B747-8F (and vice versa), differences training from the B747-400/-400F to the B747-8/-8F, and a full type rating course for the B747-8/-8F have been evaluated.

Difference courses from the B747-8/-8F to the B747-400/-400F have not been assessed for the time being.

A syllabus for reduced type rating training based on credit for commonality is available, but has not been evaluated by EASA.

4. **Three-Engine Ferry Flight Operations (3EFF)**

In July 2011, an OEB process was performed to evaluate additional specific items which are related to B747 3EFF operations. This included a review of FAA and JAR-OPS TGL material, EU-
OPS, and Boeing documentation and training material. Additionally the 3EFF ferry programmes of two EU-OPS AOC holders were evaluated.

Various simulator scenarios, including both short and long haul flights were used to evaluate the 3EFF training and procedures. Additionally over the service life of the B747-400 actual 3EFF flights have been flown using the above referenced 3EFF manuals, and have been found to be acceptable. A B747-8 T2 Flight test performed in January 2011 has demonstrated satisfactory handling characteristics with respect to critical engine failure at V1, engine out approach and go-around, and two-engine out approach and landing.

The evaluation of the flight crew qualifications and procedures for the B747-8/8F 3EFF operations was completed on 19 November 2013 with the successful B747-8/8F 3EFF evaluation in the FFS.

5. Conclusions

Emanating from these evaluations, this report specifies the EASA recommendations for training checking and currency requirements for the B747-400, B747-400F, B747-8 and B747-8F, in accordance with applicable EU regulations for civil aviation aircrew and air operations. This report also contains findings of operational suitability.

In particular, the EASA OEB recommends:

- a single licence endorsement “B747-400” for the B747-400, B747-400F, B747-8 and B747-8F aircraft;
- approval of the Boeing B747-400/-400F to B747-8/-8F Differences Course;
- approval of the Boeing B747-8/-8F initial type rating course;
- familiarization training between the B747-8 and B747-8F (and vice versa);
- acceptance of the enclosed recommendations for operations on more than one type or variant;
- common take-off and landing credit from the B747 towards the B787; and
- Three-Engine Ferry Flight Recommendations for the B747-400/-400F/-8/-8F.

The Operational Evaluations were conducted in accordance with the EASA OEB terms of reference, the OEB Handbook, the CPD, and applicable EU regulations for civil aviation aircrew and air operations.
Operational Evaluation Report – Flight Crew Qualifications

1. **Purpose and Applicability**

This report addresses:

- Licence endorsement for the B747-400, B747-400F, B747-8 and B747-8F aircraft;
- Master Differences Requirements (MDR) for flight crews requiring familiarization or differences training;
- Acceptable Operator Differences Requirement (ODR) tables;
- Recommendations for the type rating training courses
  - for the initial B747-400 type rating course;
  - for the B747-'classic' to the B747-400/-400F type rating course (and reverse);
  - for the initial B747-8/-8F type rating course;
- Recommendations for differences training courses:
  - for the B747-400/-400F to the B747-8/-8F;
- Recommendations for familiarization courses:
  - for the B747-400 to the B747-400F (and vice versa);
  - for the B747-8 to the B747-8F (and vice versa);
- recommendations for operations on more than one type or variant;
- recommendations for checking, currency/recent experience;
- recommendations for instructor training;
- common take-off and landing credit from the B747 towards the B787; and
- recommendations for One-Engine Inoperative ferry flights.

This evaluation does not include requirements and training for the use of equipment or functions such as the Electronic Flight Bag (EFB), Enhanced / Synthetic Vision Systems (E/SVS), RNP (AR) or Steep Approaches, etc.

The evaluation of the Boeing Electronic Flight Bags has been performed by a separate OEB in a dedicated report. All relevant reports are available on the EASA OEB website at [http://easa.europa.eu/certification/flight-standards/fs-overview.php](http://easa.europa.eu/certification/flight-standards/fs-overview.php).

2. **Aircraft Type Designation and Pilot License Endorsement**

With reference to Part-FCL, FCL.010 (‘type of aircraft’) and GM1 FCL.700, the B747-400, B747-400F, B747-8 and B747-8F aircraft have been evaluated for aircraft categorisation and license endorsement.

The B747-400, B747-400F, B747-8 and B747-8F aircraft have been assessed as variants. The license endorsement is established as “B747-400”.
Type Ratings List (Aeroplane) – Multi Pilot

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<td>B747 - 8 series - 8F series</td>
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(1) The differences training course is valid from the B747-400/-400F to the B747-8/-8F for crew members previously qualified on the B747-400/-400F variants.

(2) Difference courses from the B747-8/-8F to the B747-400/-400F have not been assessed for the time being.

EASA recommends the Boeing B747-400 Standard Training Syllabus for initial type rating, the current recommendations for pilots converting from B747-'classic' to the B747-400/-400F (and vice versa), and the Familiarization Training between the B747-400 and B747-400F (and vice versa).

EASA further recommends the Boeing B747-8/-8F Standard Training Syllabus for initial type rating, the Boeing B747-400/-400F to B747-8/-8F Differences Course and familiarization training between the B747-8 and B747-8F (and vice versa).

3. Boeing Family Concept and B747 specifics

The B747 series design ensures similar characteristics between the B747-400/-400F/-8/-8F variants regarding cockpit layout, system operation, and handling characteristics. This level of commonality has a direct and significant impact on the design and construction of the training programmes.

3.1 Cockpit Layout

The cockpit layout has been designed to provide similar panel arrangements, similar controls (nomenclature, etc.) and the same "dark cockpit and push button" concept.

3.2 System Definition and Operation

The following are incorporated into the design of the B747-400/-400F/-8/-8F variants:

- EFIS Primary Flight Displays (PFD) and Navigation Displays (ND) provide similar information, with similar symbology, colour coding and display principles;
- EICAS System displays provide similar information, with the same operational philosophy when dealing with supplementary normal and non-normal operations;
- Autopilot, Flight Director, Auto throttle incorporate similar architecture, and generally provide the same functions for auto-flight control;
• The B747-8/-8F has an incorporated ECL based on the same system principles as the B777 Series;
• The Standard Normal and Non-Normal Procedures concept minimizes the impact of system dissimilarities, when dealing with normal and non-normal operations. Crew response to CAUTIONS and WARNINGS incorporates the same philosophy.

3.3 Handling Characteristics
Although the size, gross mass, and aerodynamic characteristics of the B747-8/-8F differ from the B747-400/-400F variants, differences in terms of handling characteristics are minimal.

3.4 Commonality in aircraft operational philosophy
The B747-400/-400F/-8/-8F variants have been designed to permit commonality of procedures as far as possible:
• similar normal procedures;
• similar supplementary normal and non-normal procedures dictated by EICAS and the ECL (for B747-8/-8F);
• similar control location for non-normal procedures;
• same CRM and task sharing between PF and PM.

3.5 Combi and Freighter Variants
Even though passenger, combi and freighter aircraft may be within the same variant group the MDR table identifies difference levels due to differences in fire protection provisions, emergency escape or evacuation, and other such differences. For other variant groups (e.g. B747-400 to B747-8F) differences training must also address necessary freighter or passenger items.

The familiarization briefing should emphasize the weight and balance characteristics, including reference to maximum landing mass, cg limits, loading and loadsheet application(s), cargo securing, and procedures for the occupancy of the Class E cargo compartment (e.g. communication, fire fighting procedures, use of portable oxygen equipment, recovery of an incapacitated person, etc.).

Occupants of the Class E cargo compartment (e.g. couriers) should be briefed by a flight crew member prior to each flight:
• on the communication procedures between the flight deck and the Class E cargo compartment;
• on the use of the emergency escape means and on preparation for an emergency landing;
• on the location and usage of oxygen equipment and on the procedures to be followed in case of cabin depressurization; and
• on the application of the cargo compartment smoke procedure, including depressurisation and use of oxygen masks.
3.6 Automatic Voice Callouts
The use of automatic voice callouts are the same for all B747-400/-400F/-8/-8F variants. Consistent with the applicable regulations for civil aviation aircrew and air operations, these callouts may be customized for low visibility operations in accordance with operator requirements. Callouts should be standardized within the applicable aircraft fleet when operating more than one type or variant or conducting mixed fleet flying.

3.7 Automatic Landing
Because of the similarity among the autoland systems of the B747-400/-400F/-8/-8F variants, autoland training (including CAT II, III A and III B procedures) and qualification may occur in either variant with differences training as specified by ODR tables. If a rollout system is installed on any variant flown, then autoland training must also address use of rollout capability.

3.8 Flight Management System
The FMS functions are similar in all B747-400/-400F/-8/-8F variants. Differences Training is specified in the ODR tables.

3.9 Systems and Procedures Specific to the B747-8/-8F
- FMS – significant upgrade;
- ECL – new to the B747-8/-8F variants;
- EFB – customer specific options.

3.10 Customization of Procedures and Checklists
The OEB evaluated standard Boeing procedures and checklists. Any customization should be evaluated by the Competent Authority.

3.11 Hazardous weather and winter operations
Specific engine anti-ice limitations differ in terms of limitations between the B747-400/-400F/-8/-8F variants. Differences training as applicable in the ODR tables should be carried out for the aircraft variant and engine type.

3.12 Aircraft Approach Category
With reference to Part-CAT, CAT.OP.MPA.320(b) the approach category is as follows:

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<td>B747-400</td>
<td></td>
</tr>
<tr>
<td>B747-400F</td>
<td></td>
</tr>
<tr>
<td>B747-8</td>
<td>D</td>
</tr>
<tr>
<td>B747-8F</td>
<td></td>
</tr>
</tbody>
</table>
4. Master Differences Requirements (MDR)

4.1 MDR Tables

MDR tables for the B747-400/-400F/-8/-8F variants are shown below. Definitions of the various levels for Training/Checking/Currency are those used in the CPD.

Master Differences Requirement (MDR) Table

<table>
<thead>
<tr>
<th>License endorsement: B747-400</th>
<th>FROM AIRPLANE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B747-400</td>
</tr>
<tr>
<td>TO AIRPLANE</td>
<td></td>
</tr>
<tr>
<td>B747-400</td>
<td>n/a</td>
</tr>
<tr>
<td>B747-400F</td>
<td>A/A/A</td>
</tr>
<tr>
<td>B747-8</td>
<td>C/C/A</td>
</tr>
<tr>
<td>B747-8F</td>
<td>C/C/A</td>
</tr>
</tbody>
</table>

* Difference courses from the B747-8/-8F to the B747-400/-400F have not been assessed for the time being.

Training at Level A assumes that crew members receive exposure to operation of doors/emergency exits on static aircraft or other suitable means.

Level C training and checking should be accomplished in a device meeting at least the requirements as described in Appendix 3.

"n/a" means "not applicable"

4.2 Excerpts from the CPD

**Level A Training.** Level A difference training is applicable to functionally equivalent aircraft with differences that can adequately be addressed through self-instruction. Level A training represents a knowledge requirement such that, once appropriate information is provided, understanding and compliance can be assumed to take place. Compliance with Level A training is typically achieved by methods such as issuance of operating manual page revisions, dissemination of flight crew operating bulletins or differences hand-outs to describe minor differences between aircraft.

**Level B Training.** Level B difference training is applicable to functionally similar aircraft with system or procedure differences that can adequately be addressed through aided instruction. At Level B aided instruction is appropriate to ensure crew understanding, emphasize issues, provide a standardized method of presentation of material, or to aid retention of material following training. Level B aided instruction typically employs means such as slide/tape presentations, computer based training (CBT), stand-up lectures, or video tapes.

**Level C Training.** Level C differences training can only be accomplished through use of devices capable of systems training. It is applicable to variants having "part task" differences that affect skills or abilities, as well as knowledge. Training objectives focus on mastering individual systems, procedures, or tasks, as opposed to performing highly integrated flight operations and manoeuvres in "real time".

**Level A Checking.** Level A checking indicates that no check related to differences is required at the time of differences training. A crew member is, however, responsible for knowledge of each
variant flown, and differences items may (and should) be included as an integral part of subsequent recurring proficiency checks.

**Level B Checking.** Level B checking indicates a "task" or "systems" check is required following transition and recurring differences training. Level B checking typically applies to particular tasks or systems such as INS, FMS, TCAS, or other individual systems or related groups of systems.

**Level C Checking.** Level C checking indicates a partial check using a device suitable for meeting Level C differences training requirements (or higher) is required following transition and recurring differences training. The partial check is conducted relative to particular manoeuvres or systems designated by the OEB. An example of a Level C check would be evaluation of a sequence of manoeuvres demonstrating a pilot's ability to use a flight guidance control system or flight management system.

**Level A Currency.** At Level A currency is considered to be common to each variant. Thus, assessment or tracking of currency for separate variants is not necessary or applicable. Maintenance of currency in any one variant or a combination of variants suffices for any other variant.

**Use of Devices Exceeding Requirements.** Training differences levels represent minimum requirements. Operators may always use a device normally associated with a higher difference level to satisfy a training differences requirement. For example, if Level C differences have been assessed due to installation of a different FMS, operators may train pilots using the FMS installed in a FFS as a system trainer if a dedicated part task FMS training device is not available.

### 5. Operator Differences Requirements (ODR)

ODR tables are used to show an operator’s compliance method. Boeing generic ODR tables concerning differences to the B747-8 and B747-8F are on file with EASA. Copies are available on request. These ODR tables are provided as Boeing generic and therefore may not include items that are applicable to particular operators. The ODR tables assume that pilots are qualified, current and qualified in operating the base aircraft.

For the B747-8/-8F, the Boeing ODR tables have been developed in accordance with EU regulations for civil aviation aircrew and air operations. These ODR tables have been found acceptable by EASA. They represent an acceptable means of compliance with MDR provisions for the aircraft evaluated, based on those differences and compliance methods shown. These tables do not necessarily represent the only means of compliance for operators with aircraft having other differences.

Operators using more than one variant must have approved ODR tables pertinent to their fleet.

### 6. Specification for Training

#### 6.1 B747-400/-400F Initial Type Rating course (transition course)

The OEB reviewed the Boeing B747-400 Standard Transition Course for initial Pilot Type Rating (Revision 13, dated 1 December 2009) and found it to be compliant with JAR-FCL 1. The OEB
recommends this course as a baseline for the B747-400 type rating training and checking. Operators may add additional elements as required by their operation, and these will vary.

Since numerous training courses for specific B747-400/-400F variants have already been approved, examples of acceptable training courses are not provided in this report. While handling qualities aspects of the B747-400/-400F variants are common, display format differences may require additional training emphasis.

6.2 B747-400 to B747-400F (and vice versa) Familiarization Training

The OEB reviewed the differences between the B747-400 and B747-400F (and vice versa) and concluded that Level A Familiarization Training is sufficient.

6.3 B747-400/-400F to B747-8/-8F Differences Courses

6.3.1 Prerequisites

The Boeing B747-400/-400F to B747-8/-8F Differences Course requires the trainees to be "current and qualified" on the Boeing B747-400/-400F. In accordance with the EU regulations for civil aviation aircrew and air operations this requires the trainee to have a valid License Skill Test (LST) or License Proficiency Check (LPC) and have met the Part-FCL recent experience requirements on the B747-400/-400F.

6.3.2 Training

The OEB has determined that the maximum level of differences that exist between the B747-400/-400F and the B747-8/-8F are Level C as shown in the MDR table. The training requires the use of a Flat Panel Trainer (OTD device) meeting the minimum requirements as described in Appendix 3.

The training is based upon clearly defined objectives and addresses all items as identified in the ODR tables and validated by the integrated OEB team in the joint evaluation.

The Boeing B747-400/-400F to B747-8/-8F differences courses provided have been assessed and found acceptable.

Note: Training organisations should review their differences courses when applicable aircraft modifications occur.

6.3.3 Checking

In addition to the progress tests carried out during the ground school element, a final written differences exam should also be completed, as part of the initial differences training. Alternatively, classroom instruction in Questions and Answer style may be performed, together with trainees demonstrating proficiency in the FPT to ensure a standard level of competency.
6.4 B747-8/-8F to B747-400/-400F Differences Courses

Differences training courses from the B747-8/-8F to the B747-400/-400F have not been evaluated for the time being.

6.5 B747-8 to B747-8F (and vice versa) Familiarization Training

Differences from the B747-8 to the B-747-8F and vice versa, have been evaluated at training Level B to be addressed by aided instruction (e.g. CBT). Checking level A has been assessed (no checking related to differences is required).

6.6 B747-8/-8F Initial Type Rating course (transition course)

The OEB reviewed the Boeing B747-8/-8F Standard Transition Course for initial Pilot Type Rating (Revision 15, dated 01 Jan 2013) and found it to be compliant with the applicable EU regulations for civil aviation aircrew and air operations. The OEB recommends this course as a baseline for the B747-8/-8F type rating training and checking.

The training footprint is provided at Appendix 2.

Operators may add additional elements as required by their operation, and these will vary.

6.7 Training Areas of Special Emphasis (TASE)

Part-FCL, FCL.710(a) and FCL.725(a) address training requirements for type rating, differences and familiarization training to include the relevant elements as defined in the operational evaluation. Part-ORO, ORO.FC.145(b) addresses operator requirements to include the relevant elements as defined in the operational evaluation when establishing the training programmes and syllabi.

6.7.1 TASE for B747-400/-400F to B747-8/-8F Differences Courses

The OEB has identified aircraft systems and/or procedures that should receive special emphasis during ground training:

- Flight Management System (FMS) new functionality (e.g. alternates function, data link, approach / VNAV / LNAV functions, IAN and GNSS/GLS procedures, etc.)
- Navigation Display (ND) (e.g. clock function, airport moving map and vertical situation display, ANP/RNP symbology, etc.)
- Electronic Checklist (ECL) (normal, supplementary normal and non-normal functions)
- Flight control system (modes of operation, FBW system, auto-throttle “wake up” function)
- Crosswind take-off limit(s)
Note: The above training areas of special emphasis should be addressed at the appropriate point during the ground training (e.g. during CBT and/or FPT training).

6.7.2 TASE for B747-8/-8F Initial Type Rating Course

The OEB has identified aircraft systems and/or procedures that should receive special emphasis during ground training:

- Flight Management System (FMS)
- Navigation Display (ND) and Primary Flight Displays (PFD)
- Electronic Checklist (ECL)
- Flight control system (bank angle and speed/stall protections, FBW system)
- Manual & automatic flight
- EGPWS and Predictive Wind Shear System
- EFB, if installed

Note: The above training areas of special emphasis should be addressed at the appropriate point during the ground and flight training.

6.8 Low visibility training

Low visibility operations are addressed in Part-SPA. In accordance with SPA.GEN.120 operators shall take into account the relevant elements as defined in the operational evaluation.

With reference to AMC1 SPA.LVO.120, the OEB recommends for pilots current and qualified in low visibility operations on the B747-400/-400F aircraft, that they should perform one low visibility approach and landing on the B747-8/-8F under the supervision of a current and qualified pilot designated by the operator, following differences training from the B747-400/-400F to the B747-8/-8F.

6.9 Alternative Training and Qualification Programme (ATQP)

Part-ORO, ORO.FC.A.245 addresses the alternative training and qualification programme. Where an ATQP has been approved by the Competent Authority, the programme should be consistent with the requirements and recommendations of this evaluation, taking into account any training areas of special emphasis and ODR tables, as applicable.
6.10 Special Events Training

Special events training is recommended to improve basic crew understanding and confidence regarding aircraft handling qualities, options and procedures as these relate to design characteristics and limitations. Examples of this training should include the following:

- recovery from unusual attitudes;
- handling qualities and procedures during recovery from an upset condition (e.g., wake vortex encounter, loss of control incident);
- high altitude high and slow speed buffet margins and flight characteristics;
- Controlled Flight Into Terrain (CFIT), TCAS, EGPWS (emphasis on avoidance and escape manoeuvres, altitude awareness, TCAS / EGPWS warnings, situational awareness and crew co-ordination, as appropriate);
- manual flight with minimum use of automation, including flight under degraded levels of automation.

Note: The above special events training applies to flight training (e.g. in a full type rating course).

7. Line Flying Under Supervision (LIFUS) / Familiarization Flights

7.1. LIFUS

LIFUS should be performed in accordance with Part-ORO, ORO.FC.220 and AMC1 ORO.FC.220(e). Furthermore, GM1 ORO.FC.220(d) provides guidelines for operators to use when establishing their individual requirements.

In the case of pilots completing the initial type rating for the B747-8I/-8F, it is recommended that a minimum of 10 flight sectors of LIFUS should be performed.

Where there is a change of operating conditions or route structure this should also be taken into account and may need the addition of sectors to cover these elements.

7.2 Familiarization Flights following B747-400/-400F to B747-8I/-8F Differences Training

The OEB recommends a minimum of 2 sectors of familiarization flights following B747-400/-400F to B747-8I/-8F Differences Training. This requirement is intended to permit pilots to obtain additional operating experience in order to become fully cognizant of the differences between these variants. Familiarization flights can be conducted with a supervisory pilot designated by the operator and approved by the Competent Authority.
8. Specification for operations of more than one type or variant (Mixed Fleet Flying – MFF)

8.1 Prerequisites
Requirements for operations on more than one type or variant (Mixed Fleet Flying – MFF) are contained in Part-ORO, ORO.FC.140, ORO.FC.240 and AMC1 ORO.FC.240. Furthermore, Crewing of inexperienced flight crew members is addressed in ORO.FC.200(a).
In accordance with AMC1 ORO.FC.240(a)(4)(iv), the OEB recommends a consolidation period on the new variant following B747-400/-400F to B747-8/-8F differences training, of 50 flying hours or 20 sectors.

8.2 Recurrent Training and Checking
Recurrent training and checking is addressed in Part-ORO, specifically in ORO.FC.130, ORO.FC.220, ORO.FC.230, AMC1 ORO.FC.230, GM1 ORO.FC.230, ORO.FC.240, and AMC1 ORO.FC.240.

8.2.1 When operating more than one B747-400/-400F/-8/-8F variant
The differences between the B747-400/-400F/-8/-8F variants for recurrent training have been assessed as Level B. For variants at level B, recurrent training shall be addressed through aided instruction such as:
- Slide / tape presentations;
- Computer Based Training (CBT) which may be interactive;
- Video;
- Classroom instruction.

In accordance with AMC1 ORO.FC.240(a)(4)(vii), the OEB has determined that, when operating more than one B747-400/-400F/-8/-8F variant:

- recurrent training and checking on any B747-400/-400F/-8/-8F variant is valid for all variants operated, provided that the differences between the variants are covered; and
- recurrent training and checking should be alternated between the variants operated.

8.2.2 When operating two type of aircraft of either the B737 300-900 (with EFIS/PFD-ND and FMS), the B747-400/-400F/-8/-8F, the B757/767 or the B777/787
In accordance with AMC1 ORO.FC.240(a)(4)(vii), the OEB has determined that, when operating two type of aircraft of either the B737 300-900 (with EFIS/PFD-ND and FMS), the B747-400/-400F/-8/-8F, the B757/767 or the B777/787:

- recurrent training and checking may be alternated between the relevant two aircraft types operated (as illustrated in Figure 1).
The above example allows compliance with the mandatory 1 year for type rating revalidation under Part-FCL, as well as with the operator proficiency check requirements in accordance with AMC1 ORO.FC.240(a)(4)(vii).

Note: Concerning the recurrent training for low visibility operations, the OEB team considers that full credit applies between variants/types, provided that low visibility training is conducted during recurrent training every 6 months.

8.3 Line checks
In accordance with AMC1 ORO.FC.240(a)(4)(vii), the OEB has determined that line checks may be alternated when operating two type of aircraft of either the B737 300-900 (with EFIS/PFD-ND and FMS), the B747-400/-400F/-8/-8F, the B757/767 or the B777/787, or when operating variants among those aircraft types.

8.4 Recent Experience and Currency
Recent experience requirements are contained in Part-FCL, FCL.060.

With reference to Part-ORO, ORO.FC.140(a), full credit is granted for recent experience requirements when operating B747-400/-400F/-8/-8F variants.
8.4.1 Common Take-Off and Landing Credit (CTLC)

In accordance with Part-FCL, FCL.060(b)(4), EASA has established CTLC when operating the B787-8 aircraft type together with any of the B747-400/-400F/-8/-8F variants:

- one take-off, approach and landing performed in the preceding 90 days, in any of the B747-400/-400F/-8/-8F variants may be credited towards the requirement for take-off and landings performed in the B787-8.

Note: CTLC form other type of aircraft towards the B747-400/-400F/-8/-8F variants has not been evaluated.
Appendix 1

B747-400/-400F to B747-8/-8F Differences Training

<table>
<thead>
<tr>
<th>Day 1 *</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBT (1:30)</td>
<td>CBT</td>
<td>CBT (1:30)</td>
<td>CBT (1:30)</td>
</tr>
<tr>
<td>Practtial EFB</td>
<td>(7:00)</td>
<td>OTD (4:00)</td>
<td>OTD</td>
</tr>
<tr>
<td>(1:30)</td>
<td></td>
<td></td>
<td>(Operator Specific Training)</td>
</tr>
</tbody>
</table>

* Day 1 includes operator specific Electronic Flight Bag Training, if applicable.

A higher category of training device may be substituted for the OTD (e.g. a B747-8 Full Flight Simulator).

This table reflects the Differences Training course evaluated by EASA, which was found to be compliant with applicable requirements. Any variations to this course should be evaluated by the Competent Authority or through an OEB evaluation. This serves to ensure that an equivalent level of training and safety are reached, and may lead to variations to the table above.
### Appendix 2

#### B747-8/-8F Initial Pilot Type Rating Training

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablet Introduction</td>
<td>CBT 2 (7:00)</td>
<td>CBT 3 (3:30)</td>
<td>CBT 4 (3:30)</td>
<td>CBT 5 (3:30)</td>
</tr>
<tr>
<td>CBT 1 (7:00)</td>
<td></td>
<td>FTD 1 (4:00)</td>
<td>FTD 2 (4:00)</td>
<td>FTD 3 (4:00)</td>
</tr>
<tr>
<td>Day 6</td>
<td>Day 7</td>
<td>Day 8</td>
<td>Day 9</td>
<td>Day 10</td>
</tr>
<tr>
<td>CBT 6 (3:30)</td>
<td>CBT 7 (3:00)</td>
<td>CBT 8 (3:00)</td>
<td>CBT 9 (3:00)</td>
<td>CBT 10 (3:00)</td>
</tr>
<tr>
<td>FTD 4 (4:00)</td>
<td>FTD 5 (4:00)</td>
<td>FTD 6 (4:00)</td>
<td>FTD 7 (4:00)</td>
<td>FTD 8 (4:00)</td>
</tr>
<tr>
<td>Day 11</td>
<td>Day 12</td>
<td>Day 13</td>
<td>Day 14</td>
<td>Day 15</td>
</tr>
<tr>
<td>CBT 11 (3:00)</td>
<td>CBT 12 (3:00)</td>
<td>Written Examination</td>
<td>Tutorial EFB (7:00)</td>
<td>FFS 1 (6:00)</td>
</tr>
<tr>
<td>FTD 9 (4:00)</td>
<td>FTD 10 (4:00)</td>
<td>TKE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 16</td>
<td>Day 17</td>
<td>Day 18</td>
<td>Day 19</td>
<td>Day 20</td>
</tr>
<tr>
<td>FFS 2 (6:00)</td>
<td>FFS 3 (6:00)</td>
<td>FFS 4 (6:00)</td>
<td>FFS 5 (6:00)</td>
<td>FFS 6 (6:00)</td>
</tr>
<tr>
<td>Day 21</td>
<td>Day 22</td>
<td>Day 23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FFS 7 (6:00)</td>
<td>FFS 8 (6:00)</td>
<td>FFS 9 (7:00)</td>
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<tr>
<td></td>
<td></td>
<td>Skill Test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Times for FPT include 1.5 Hour briefing and .5 Hour debriefing.
- Times for FFS include 1.5 Hour briefing and .5 Hour debriefing.
- FTD: Boeing B747-8 Flight Training Device, compliant with JAR FSTD A Level 2
- FFS: B747-8 FFS Level C or D
- TKE: Technical Knowledge Examination
- EFB: Electronic Flight Bag

This table reflects the Full Type Rating course evaluated by EASA, which was found to be compliant with applicable requirements. Any variations to this course should be evaluated by the Competent Authority or through an OEB evaluation. This serves to ensure that an equivalent level of training and safety are reached, and may lead to variations to the table above.
Appendix 3

Boeing B747-8 Flat Panel Trainer (FPT)

Description of the device used in the B747-400/-400F to B747-8/-F Differences Course evaluation and recommendations.

1. Description of the device used

The three dimensional type specific device consisted of graphically simulated, interactive touch panels, instruments, switches and controls in a spatially correct position.

Instruments and panels were computer generated, interactive touch activated graphics displayed on multiple screens, however aircraft panels requiring intensive manipulation such as Mode Control Panel (MCP), Display System Panel (DSP), EFIS Control Panels (complete glare-shield excluding clock, map lights and Mic. Switches), Multifunction Control Display Units (MCDUs), Rotary Cursor Control Device (RCC) and Electronic Flight Bag (EFB), if installed; consisted of replicated aircraft panels with physical controls, knobs and switches. The throttle box was displayed on a computer generated graphics display.

Airplane systems were operative for flight and ground conditions. Simulated aircraft systems were fully integrated to ensure correct interaction, especially between the FMS, AFCS, ECL, flight instrument displays and EFB, if installed. The device was able to simulate the different approach modes with either go-around or automatic landing. Warning and caution sounds were simulated.

Computer generated schematics to visualize aircraft system operation were provided.

The device incorporated the necessary malfunctions to accomplish the training of Normal, Supplementary Normal and Non-Normal operating procedures.

The device was adequately configured to permit the incorporation of future updates. It also incorporated the necessary navigational databases to complete the defined training scenarios over a local or world-wide area.

An instructor facility was available to allow the modification of flight and environmental conditions (wind, temperature, pressure, etc.). It permitted repositions (flight and ground), freezes, system resets, airport selection, aircraft services (doors, ground power, virtual circuit breaker, etc.). Lesson plan tools were provided.

The computer(s) had sufficient capacity and capability to ensure an accurate and reliable operation, with realistic responsiveness and aliasing free graphics.

The device was located in a suitable quiet room, free of training distractions, with adequate temperature and lighting conditions.
2. **Recommendations**

2.1 The device should allow airline specific options.

2.2 The competent Authority approving the Training Organisation should review the device for suitability to complete the customer specific training programme.

2.2 The training organisation operating the device should have a Quality Assurance Programme in place to cover, at least, the following training device aspects:

- Recording, monitoring and rectification of failures and discrepancies;
- Failure analysis and reliability figures;
- Link with the aircraft manufacturer to ensure the device continues to reflect the real aircraft;
- Link with the training device manufacturer for the incorporation of updates and modifications;
- Configuration control processes to ensure adequate tracking and recording of software and hardware modifications; and
- Resources and personnel training to support its operation.
Appendix 4

One-Engine Inoperative Ferry Flight Recommendations for the B747-400/-400F/-8/-8F
“Three-Engine Ferry (3EFF) Operations”

1. Introduction

The operator/holder of the Air Operator’s Certificate (AOC) is responsible for obtaining operational approval for the 3 Engine Ferry Flight (3EFF) from the Competent Authority.

The operator must refer to the manufacturer’s approved documentation and relevant provisions for the performance of 3EFF operations. This includes the Aircraft Flight Manual (AFM), MMEL and MEL, relevant EU requirements, and requirements established by the Competent Authority. Cross reference to these documents must be made when developing the operators’ own 3EFF procedures, with specific SOPs, MEL and briefing guides to ensure that all the relevant requirements have been met. The 3EFF Manual must as a minimum provide detailed guidance with respect to the following 3EFF operations:

- Limitations
- Normal Procedures
- Non-Normal/ Emergency Procedures
- Performance
- Validation/approval process for 3EFF approved airports and runways
- Approval by the Competent Authority

Authorisation processes to approve 3EFF must be described in the approved Operations Manual Part A, and must include:

- Briefing and Simulator Training
- Documents to be carried
- National Aviation Authorities Approvals

It is the recommendation of the OEB that all 3EFF operations must be described and defined in a specific 3EFF Manual.

2. Crew qualification and Training

The 3 EFF qualification and training should be approved by a nominated post holder for flight operations or flight crew training and this should be included in his/her terms of reference, written in the Operations Manual Part A. To ensure a safe preparation and management of a 3EFF operation, the following requirements and training should be applied.
2.1 Crew prerequisites

Both flight crew members (captain and first officer) must be qualified, current, and experienced on the applicable B747 variant and be specifically designated to carry out 3EFF operations. Inexperienced flight crew members as defined in Part-ORO, ORO.FC.200(a) are not eligible for such operations.

If operators require the carriage of a Safety or relief Pilot, they must also be qualified and current for 3EFF operations with their duties clearly defined in the SOP’s.

Boeing Pilots who are current and qualified on the applicable B747 variant and who have had specific 3EFF training are authorised to conduct 3EFF flights, subject to approval by the Competent Authority.

2.2 Crew Training

2.2.1 Initial training

Before conducting a 3EFF operation, all designated crew members shall follow a B747 Three Engine Ferry Flight course approved by the Competent Authority.

The training must be conducted by a TRI/SFI who is qualified in accordance with the Operations Manual (Part D).

2.2.2 Refresher Training

All designated crew members should follow refresher training on an annual basis to include all elements of the initial training course at airfields and in conditions where the operator is likely to conduct 3EFF on its network. The refresher training should also be used to review any 3EFF operations undertaken by the operator in the preceding 12 months.

2.2.3 Prior to any actual 3EFF operation

Whenever refresher training on an annual basis is not implemented by the operator, prior to conducting any 3EFF operation, all crew members should perform a simulator session in order to practice handling techniques and operational items. This practice session should use the forecast weather conditions, the actual aircraft conditions (inoperative engine, aircraft weight, etc.) and, ideally, the airport from which the 3EFF will depart.

2.2.4 Briefings for the Simulator session and briefing prior to the actual ferry flight, as applicable

A dedicated briefing should be performed and should include the following:

- Technical condition of the aircraft - MEL
- Airworthiness release
- Performance computation
- FMC Differences.
- Use of checklists
- Operating Limitations
- CG and TRIM setting
- Weather minima
- 3EFF operating procedures, with specific emphasis on Fuel Management
- EICAS messages
- Takeoff procedures
- Thrust setting procedures, highlighting the importance of coordination and communication between crewmembers. It is important that the recommended thrust setting is achieved at each speed “gate” so that the required take off performance is met
- 2nd Engine failure procedure and performance implications, including fuel jettison
- Non-normal procedures, including pilot incapacitation on take-off

The above list is not exhaustive.

3 Three-Engine Flight (3EFF) Procedures

3.1 Technical condition of the aircraft
The inoperative engine must be configured in the specified condition as per Aircraft Maintenance Manual (AMM) procedures (i.e. in windmilling, locked rotor), by the maintenance crew.

The operative engines must be inspected by the maintenance crew as per Aircraft Maintenance Manual (AMM) procedures.

Other systems must be configured or set in specific condition for the flight.


3.2 MEL
Some aircraft systems are required operative prior to dispatch. Three Engine Ferry Flights are limited to 2 sectors. Flights must be made without passengers and without any freight that would not belong to the ‘spare parts kit’. Limited ballast may be used if required for specific loading limitations. Reference must be made to the MEL.

3.3 Flight planning and weather conditions
A careful study of the route has to be performed. The Flight plan must be prepared at relevant speeds and altitudes for the appropriate engine configuration. During the en-route phase the aircraft should be capable of clearing all obstacles should a second engine fail. Weather minima for actual and forecast weather conditions should be considered. Known icing conditions should be avoided.
3.4 Performance
The RTOM performance determination differs from that normally applied for Commercial Air Transport (CAT) operations. A thorough understanding of 3EFF performance is required prior to any 3EFF operations.

The 3EFF take-off, en route net flight path, go-around and landing performance must be determined by using calculations made in accordance with the AFM, or other performance applications, e.g. electronic means, dependent on approval by the Competent Authority.

Special note should be taken of the implications of Vstop compared to V1. Vstop is the speed to which the aircraft can be accelerated with all serviceable engines operating, and brought to a full stop within the accelerate-stop distance available. Full handling capability with regard to the failure of a serviceable engine is provided from Vr, whilst permitting a reduced level of performance, less than that normally assumed by CS 25. It is considered suitable for non-revenue, non-passenger operations to return the aircraft to a place where an engine may be repaired or changed. At or above Vstop and with a second engine failure, the decision should always be to continue the take-off, as the crew has no means to predict at which speed the aircraft will cross the runway end in case of takeoff abortion above Vstop.

4 Operating Limitations

4.1 Crew
The number of crew carried during 3EFF operations must be restricted to nominated essential crew as approved by the Competent Authority.

4.2 Sectors
3EFF will be limited to a maximum of two planned sectors.

4.3 Maximum Airspeed
Do not exceed 320kts IAS / Mach .85, or 270kts / Mach .80 if encountering unexpected icing conditions.

4.4 Performance Limited Take-off Mass and Landing Mass
The maximum performance limited Take-off and Landing mass must be determined by either:
- Electronic methods approved by the Competent Authority
- Computer based RTOM data held by a route planning department approved by the Competent Authority
- The performance charts in the AFM
4.5 Take-off Conditions
Take-off shall be made using Flap 10.

4.6 Maximum Pressure Altitude
The Pressure altitude for take-off and landing must not exceed 9,500ft.

4.7 Airport Conditions
Take-off is authorised on a dry or wet runway. It is not authorised on a contaminated runway.

4.8 Limiting Crosswind Component
The crosswind component of the tower reported or forecast reported wind velocity must not exceed 7kts from the side on which the unserviceable engine is located for take-off or landing. Crosswind from the other side is in accordance with the AFM or operator limitations.

4.9 Weather Conditions
For 3EFF operations, a minimum ceiling of 1000ft and a minimum visibility of 3 kilometres at departure, and a minimum forecasted ceiling of 500ft and a visibility of 3 kilometres at destination and alternate airports should be used.

4.10 Icing Conditions
It is not recommended that 3EFF be dispatched into regions of known, predicted or reported icing conditions, as no anti-icing is available on the inoperative engine.

4.11 Route Limitations
No place along the intended track shall be more than 240 minutes flying time from a suitable alternate airport.

4.12 Fuel Requirements
3EFF flight plans should be provided for either windmilling or locked rotor. Flight planning must be used using the correct flight planning data for the configuration being flown either from the flight planning system or the AFM. Special consideration must be given for increased fuel burns associated with a locked rotor.
5 Operating Procedures

Specific operating procedures must be applied for the following:

- Aircraft line-up
- Rudder Trim Setting
- Thrust application

Follow specific one-engine inoperative procedures, if provided. Operators should develop specific callouts for the thrust setting procedure which will provide the Pilot Flying (PF) with sufficient information to increase the thrust on the asymmetric engine appropriately during the take-off roll. Emphasis on crew coordination and communication should be part of the briefing, as listed above. This is required because the attention of the Pilot flying is focused outside in order to maintain directional control during the asymmetric thrust application. The Pilot Monitoring will therefore need to monitor the engine thrust settings at defined speeds (speed gates) and call these out to the Pilot Flying.