EUROPEAN AVIATION SAFETY AGENCY

Operational Evaluation Board Report

Boeing 747-400 / -400F / -8 / -8F
Report of the FCL/OPS Subgroup

Report

18 October 2011

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Boeing 747-400 / -400F / -8 / -8F

Operational Evaluation Board (OEB) – OPS / FCL Subgroup

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Contents

Acronyms

AFM ..... Airplane Flight Manual
AMC..... Acceptable Means of Compliance
AP..... Autopilot
AT ..... Auto Throttle
ATO ..... Approved Training Organisation
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
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
EU-OPS..... Annex III to Regulation (EEC) No 3922/91
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
FFS..... Full Flight Simulator
FMA..... Flight Mode Annunciator
FMS..... Flight Management System
FSB..... Flight Standardization Board
FPT ..... Flat Panel Trainer
FSTD ..... Flight Simulation Training Device
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

Terminology

Base aircraft means an aircraft or group of aircraft used as a reference to compare differences with another aircraft.

Common Takeoff and Landing Credit (CTLC) means a programme/process that allows credit for recent experience between aircraft that can be demonstrated to have the same handling and flying characteristics during takeoff and initial climb, approach and landing, including the establishment of final landing configuration.

Currency means the experience necessary for the safe operation of aircraft, equipment and systems.

Recent experience means the recent experience described in JAR-FCL 1 and EU-OPS.

Difference level means a designated level of difference as defined in the CPD, between a base and a candidate aircraft, for the evaluation of pilot training, checking, and currency.

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.

A subsequent operational evaluation of the B747-8 and -8F was performed by an integrated team composed of EASA and FAA 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 JAR-FCL 1 and EU-OPS. This report also contains finding of operational acceptability with regards to EU-OPS.

The OEB recommends the approval of:

- Boeing referenced ODR tables;
- Boeing proposed type rating courses for the B747-400 and -400F;
- 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 recommends a single licence endorsement "**B747-400**" for the B747-400, -400F, -8 and -8F as variants, applicable to the B747-400 series equipped with Rolls Royce, General Electric, and Pratt and Whitney engines, and the B747-8 series equipped with General Electric GEnx-2B engines.

The OEB further recommends the included conditions for operations on more than one type or variant with reference to JAR-FCL 1 and EU-OPS.

The evaluations were conducted in compliance with the applicable EASA OEB Handbook and Common Procedure Document (CPD*)* for conducting Operational Evaluation Boards.

1. OEB B747-400 / -400F FCL/OPS Subgroup Composition (Catch-up Process)

Name	Capacity	Task
Capt. Graham Pass	EASA	OEB Chairman
Capt. Graham Stokes	EASA	OEB Team Member
Capt. Philip Adrian	Boeing	Advisor

2. OEB B747-8 / -8F FCL/OPS Subgroup Composition

Name	Capacity	Task
Capt. Graham Pass [1) 2)]	EASA	OEB Chairman
F/O Jo Geodert [2) 3)]	EASA	Team member
Capt. Axel Herbst [2)]	EASA	Team member
Capt. Sten Rossby [1) 2)]	EASA	Team member
Capt. Udo Schauss [2) 3)]	EASA	Team member
F/O Joerg Steible [2)]	EASA	Team member
Capt. John LaBrow [1) 2)]	FAA	FSB Chairman
Capt. Mikal Campanello [2) 3)]	FAA	Team member
Capt. Mike Eitel [2)]	FAA	Team member
Capt. Steve Foss [1)]	FAA	Team member
Capt. Bill Jackson [2) 3)]	FAA	Team member

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)

Executive Summary

1. Scope of the evaluation

This report specifies the EASA type rating licence 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://easa.europa.eu/certification/flight-standards/fs-overview.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 Evaluation of the B747-8/-8F

A subsequent operational evaluation of the B747-8 and -8F was conducted jointly by an integrated team composed of EASA and FAA members, to simultaneously meet the EASA OEB and FAA FSB requirements. Each Authority used 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 license endorsement;
- Differences Training B747-400/-400F to B747-8/-8F; and
- Familiarization Training B747-8 to B747-8F and vice versa.

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.

Only familiarization training between the B747-8 and B747-8F (and vice versa), and differences training from the B747-400/-400F to the B747-8/-8F have been evaluated.

Difference courses from the B747-8/-8F to the B747-400/-400F and a full type rating course for the B747-8/-8F have not been assessed for the time being.

As a consequence of this operational evaluation, 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;
- familiarization training between the B747-8 and B747-8F (and vice versa); and
- acceptance of the enclosed recommendations for operations on more than one type or variant with reference to JAR-FCL 1 and EU-OPS

Pilots who are qualified in the B747-400 (or -400F) and the B7474-8 (or -8F) may complete proficiency checks in either variant, provided the applicable differences are covered.

4. 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 JAR-FCL 1 and EU-OPS. This report also contains finding of operational suitability with regards to EU-OPS.

The Operational Evaluations were conducted in accordance with the EASA OEB terms of reference, the OEB Handbook, the CPD, and applicable JAR-FCL and EU-OPS requirements.

Operational Evaluation Report – FCL & OPS Subgroup

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 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);
- 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; and
- recommendations for instructor training.

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.

2. Pilot Type Rating requirements

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 B747-400/-400F to B747-8/-8F Differences Course and familiarization training between the B747-8 and B747-8F (and vice versa).

EASA recommends that a single license endorsement, "**B747-400**" is applied for all B747-400, B747-400F, B747-8 and B747-8F aircraft.

1 Manufacturer	2 Aeroplanes		3	4 Licence endorsement
	Model	Name		
Boeing (1) (2)		B747 - 400 series - 400F series	(D)	B747-400
		B747 - 8 series - 8F series		
	(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 and a full type rating course for the B747474-8/-8F have not been assessed for the time being.			

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.

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 Altitude callouts during landing

The use of automatic voice callouts for landing is the same for all B747-400/-400F/-8/-8F variants. Consistent with the applicable regulations, 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, than 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 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.

3.11 Aircraft approach and circling categories

With reference to EU-OPS Appendix 2 to 1.430(c) the approach categories are as follows:

Aircraft	Category
B747-400 B747-400F B747-8 B747-8F	D

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					
License endorsement: B747-400		**FROM AIRPLANE**			
TO AIRPLANE		**B747-400**	**B747-400F**	**B747-8**	**B747-8F**
	B747-400	**n/a**	**A/A/A**	*****	*****
	B747-400F	**A/A/A**	**n/a**	*****	*****
	B747-8	**C/C/A**	**C/C/A**	**n/a**	**A/A/A**
	B747-8F	**C/C/A**	**C/C/A**	**A/A/A**	**n/a**
***** 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 2. “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 experienced in operating the base aircraft.

For the B747-8/-8F, the Boeing ODR tables have been developed in accordance with EU-OPS 1.980 and TGL 44 AMC & IEM to Appendix 1 to OPS 1.980.

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

Initial Type Rating courses for the B747-8/-8F have not been evaluated for the time being.

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

6.4.1 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 JAR-FCL and EU-OPS this requires the trainee to have a valid License Skill Test (LST) or License Proficiency Check (LPC) and have met the EU-OPS 1.970(a)(1) recent experience requirements on the B747-400/-400F.

6.4.2 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 2.

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.

6.4.2.1 Training Areas of Special Emphasis

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).

6.4.3 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.

6.5 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.

6.6 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).

6.7 Low visibility training

Low visibility training is addressed in EU-OPS 1.450. In accordance with Appendix 1 to EU-OPS 1.450 § (d), an abbreviated course may be acceptable subject to NAA approval, for a pilot already experienced in low visibility operations.

For a pilot qualified and experienced in low visibility operations on the B747-400/-400F aircraft, the OEB recommends that one low visibility approach and landing should be included in the differences training from the B747-400/-400F to the B747-8/-8F.

6.8 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).

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

6.9 Recurrent training

The recurrent training programme must comply with EU-OPS 1.965.

All B747-400/-400F/-8/-8F variants are covered under the same licence endorsement and therefore, recurrent training on one variant is valid for any other, provided that the differences between variants are covered.

Differences between the B747-400/-400F/-8/-8F variants are identified in ODR tables, as specified in EU-OPS 1.980.

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.

Consequently recurrent training can be conducted on any approved B747-400/-400F/-8/-8F Full Flight Simulator, provided that the differences identified in ODR tables are covered.

7. Specification for Checking

7.1 Recurrent Checks

Proficiency checks must be conducted in compliance with JAR-FCL 1.245 and EU-OPS 1.965. The A proficiency check conducted on any B747-400/-400F/-8/-8F variant is valid for any variant, provided that the differences have been covered during the recurrent training, as per the approved ODR tables.

Consequently proficiency checks can be conducted on any approved B747-400/-400F/-8/-8F Full Flight Simulator.

7.2 Line checks

As all B747-400/-400F/-8/-8F variants share same single licence endorsement, a line check on any variant is valid for all.

8. Specification for Currency / Recent experience

Compliance with EU-OPS 1.970 or JAR-FCL 1.026 as appropriate is required for recent experience. Take-offs and landings performed on any B747-400/-400F/-8/-8F variant are valid for all variants. This means that for pilots flying more than one variant, the recent experience requirement is satisfied as soon as they achieve 3 take-offs, approaches and landings, as handling pilot, regardless of the variant flown.

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

9.1. Purpose of LIFUS/Familiarization Flights

There are a variety of reasons why the OEB may specify LIFUS/Familiarization Flights in conjunction with Master Differences Requirements. One or more of the reasons described below may apply:

a. Introduction of new aircraft types or variants;
b. Introduction of new systems (e.g., FMS, ECL, TCAS);
c. Introduction of new operation (e.g. oceanic, polar or ETOPS operations);
d. Experience for a particular crew position (e.g. PIC, SIC, F/E);
e. Post qualification skill refinement (e.g. refining alternate or multiple ways to use particular equipment to increase operating efficiency, operating flexibility, or convenience); or
f. Special characteristics (e.g. airport category in accordance with EU-OPS 1.975, mountainous areas, unusual or adverse weather, special air traffic control procedures, non-standard runway surfaces and dimensions, etc.).

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

The OEB recommends a minimum of 2 sectors of familiarization flights following B747-4007-/-400F to B747-8/-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 NAA.

10. Synthetic flight Instructor (SFI) (A) Type Rating Instructor (TRI) (MPA) training

JAR-FCL 1.410 / 1.365, applies. However, for a holder of a license with a valid endorsement SFI(A) or TRI(MPA) B747-400, the OEB recommends the following:

Completion of the B747-400/-400F to B747-8/-8F differences training, followed by instructor differences training which must be described in the OPS Manual Part D and/or TRTO/ATO Manual, and approved by the NAA. The above does not remove any TRI restriction.

11. Specification for operations of more than one type (Mixed Fleet Flying – MFF)

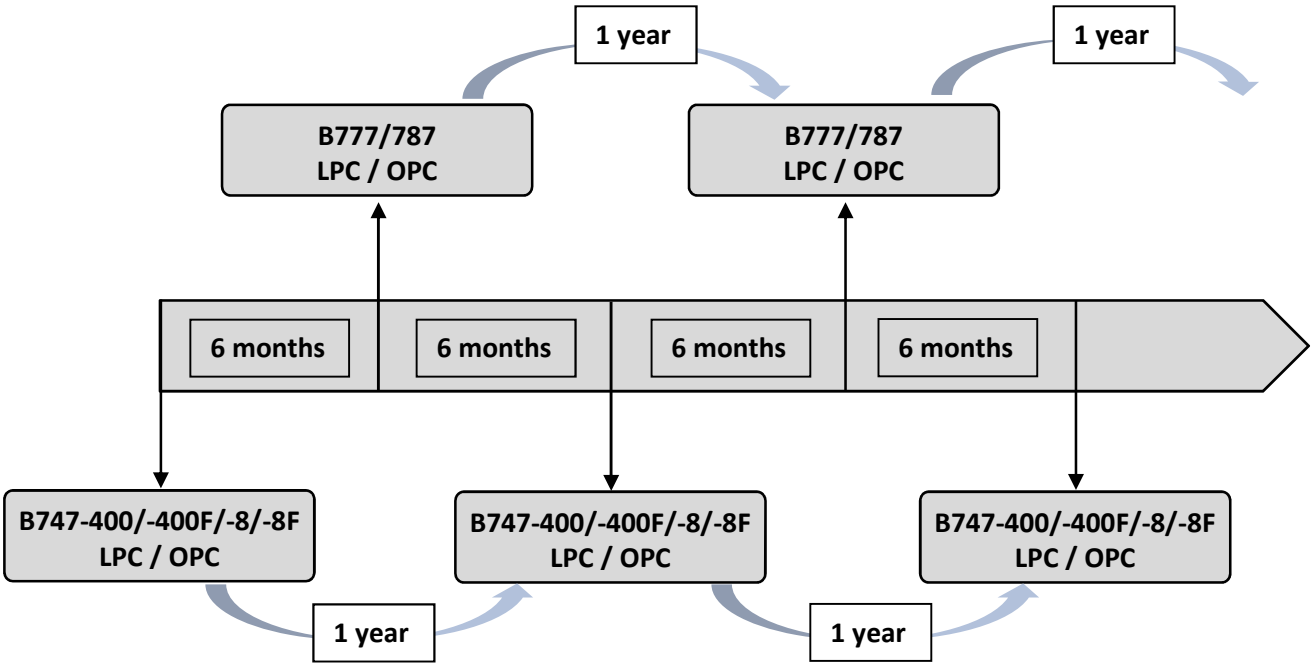
11.1 Prerequisites

Prerequisites for operations of more than one type (Mixed Fleet Flying – MFF) are contained in EU-OPS 1.980. Typically it consists of a consolidation period following the initial line check on the new type of 50 flying hours or 20 sectors, to be achieved solely on aircraft of the new type rating. The B777/787 is given here as an example, however, other aircraft types may be considered at the discretion of the NAA.

11.2 Recurrent training and proficiency checks

The recurrent training programme must comply with EU-OPS 1.965. All B747-400/-400F/-8/-8F variants are under the same type rating licence endorsement. As a consequence, recurrent training on one variant is valid for all, provided that the differences between variants are covered.

In accordance with Appendix 1 to EU-OPS 1.980 §(d)(7)(i), an alternate recurrent training and checking programme can be established. Therefore, the NAA may approve an alternate recurrent training and checking programme for the Operator, and the OEB recommend the following implementation plan:



The above scheme allows compliance with the mandatory 1 year for type rating revalidation under JAR-FCL 1.245 (b), as well as with the operator proficiency check requirement taking benefit of the alternate provision as set up in Appendix 1 to EU-OPS 1.980 (see § (d)(7)(i)).

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.

11.3 Line checks

Line checks are required in compliance with EU-OPS 1.965 (c). However, for operation on more than one type or variant credit may be given in accordance with Appendix 1 to EU-OPS 1.980 § (d)(7)(ii).

11.4 Currency / Recent experience

Compliance with EU-OPS 1.970 or JAR-FCL 1.026, as appropriate is required for recent experience.

Under Mixed Fleet Flying, EU-OPS 1.980 applies. In compliance with Appendix 1 to EU-OPS 1.980 § (d) (5) & (7), NAAs may consider common take-off and landing credit (CTLC) between different types.

Appendix 1

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

Day 1 *	Day 2	Day 3	Day 4
CBT 1.5 hrs **Practical EFB** 1.5 hrs	**CBT** 7.0 hrs	**CBT** 1.5 hrs **OTD** 4.0 hrs	**CBT** 1.5 hrs **OTD** Operator Specific
* 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).			

Appendix 2

Boeing B747-8 Flat Panel Trainer (FPT)

Description of the device used in the B747-400/-400F to B747-8/-8F 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.