



EUROPEAN AVIATION SAFETY AGENCY



Operational Evaluation Board Report

**Dassault Aviation
Falcon 7X**

**Revision 6
28 June 2012**

**European Aviation Safety Agency
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Appendices are available on request to the National Aviation Authorities.

Dassault Aviation F7X

Operational Evaluation Board (OEB)

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Revision Record

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05	Paragraph 7, 15.1 and 15.3	22 November 2010
06 (Draft)	Addendum A	12 April 2012
06	-	28 June 2012

Dassault Falcon 7X OEB Composition

Name	Capacity	Task
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- 1) Initial JOEB Evaluation
2) Noise Abatement Departure Procedure (NADP)
3) Steep Approach Landing Procedure

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 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.

Acronyms

AC	Advisory Circular
AFM	Airplane Flight Manual
AFCS	Automatic Flight Control System
AGM	Advanced Graphic Modules
AMC	Acceptable Means of Compliance
AP	Autopilot
AT	Auto throttle
CCD	Cursor Control Device
CCW	Counter Clock Wise
CODDE 1	Crew Operational Documentation for Dassault EASy – Airplane Description
CODDE 2	Crew Operational Documentation for Dassault EASy – Operations Manual
CODDE 3	Crew Operational Documentation for Dassault EASy - QRH 1 and QRH 2
CMC	Centralized Maintenance Computer
CPD	Common Procedures Document for conducting Operational Evaluation Boards, dated 10 June 2004
EASA	European Aviation Safety Agency
EASy	Enhanced Avionics System
ECL	Electronic Check List
EDM	Emergency Descent Manoeuver
EFIS	Electronic Flight Instrument System
EGPWS	Enhanced Ground Proximity Warning System
EU-OPS	Commission Regulation (EC) No 859/2008 of 20 August 2008 amending Council Regulation (EEC) No 3922/91 as regards common technical requirements and administrative procedures applicable to commercial transportation by aeroplane.
EVS	Enhanced Vision System
FAA	Federal Aviation Administration
FGS	Flight Guidance System
FMS	Flight Management System
FSB	Flight Standardization Board
GPWS	Ground Proximity Warning System
HUD	Head Up Guidance Display
IEM	Interpretative / Explanatory Material
I-NAV	Integrated Navigation Display
IPT	Integrated Procedure Trainer
IRS	Inertial Reference System

JAA Joint Aviation Authority
Lab session Ground training with use of IPT
MAU Modular Avionics Units
MCDU Multi-Function Control Display Units
MDU Multi-functions Display Units
MKB Multi-function Key Board
NADP Noise Abatement Departure Procedure
ND Navigation Display
ORI Operational Review Item
PDU Primary Display Unit
RAT Ram Air Turbine
SFD Secondary Flight Display
SFI Synthetic Flight Instructor
SOP Standard Operating Procedure
TCAS Traffic Alert and Collision Avoidance System
TCCA Transport Canada
TRTO Type Rating Training Organization
VGS Visual Guidance System
VNAV Vertical Navigation
WOW Weight on Wheels

Executive Summary

An initial Operational Evaluation was performed by an integrated team composed of FAA and JAA members. Subsequently EASA performed an operational evaluation of the Noise Abatement Departure Procedure (NADP). In a third evaluation, F7X steep approach procedures were evaluated.

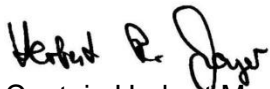
These evaluations were performed in compliance with the applicable Terms of Reference, corresponding complementary procedures, the JOEB/OEB Handbook and the CPD.

This report specifies the EASA recommendation of minimum requirements for the initial type rating training course, checking and currency on the Dassault Falcon 7X, as specified in JAR-FCL 1 and EU-OPS.

This report also contains the findings of the operational suitability of the Dassault Falcon 7X with regards to EU-OPS.

The OEB recommends the approval of the Dassault Aviation proposed training course for initial type rating on the Dassault Falcon 7X.

The OEB recommends the licence endorsement "**Falcon 7X**".



Captain Herbert Meyer
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Experts Department, EASA Certification Directorate

Operational Evaluation Report FCL/OPS Subgroup

1. Purpose and applicability

This report addresses:

- Operational evaluation,
- Type Rating assigned to the Falcon 7X,
- Recommendations for initial Training,
- Recommendations for checking,
- Recommendations for currency,
- Findings on the operational suitability.

1.1 Initial Evaluation

Dassault Aviation initiated the JOEB process on the Falcon 7X in December 2004.

The Falcon 7X is a new type of aircraft. The “Fly by Wire” system is introduced for the first time in the Falcon family.

Part of the human machine interface is already known and evaluated as the EASy concept on previous aircraft such as Falcon 2000 EX EASy and Falcon 900EX EASy.

For type rating purposes the JOEB has not yet considered any commonality with other existing types of Falcon.

The JOEB team had five dedicated pilots:

- Four JOEB and four FAA pilots followed the first Pilot Type Rating Training Course at CAE Training Centre in Whippany (NJ-USA) with the task to assess the pilot training course (13 March to 6 April 2007). They flew the aircraft on 16 April 2007.
- Two of the four JOEB pilots above participated in a complementary training course to review the performance module course which was not completely achieved during the initial T5 test (3 to 5 May 2007). At this occasion, they also checked the associated briefing, instructor proficiency and simulator status during a simulator session.
- Two DGAC Flight Inspectors pilots flew the aircraft to support the Operational Evaluation and Operational Suitability on 9 February 2007, and 19 and 20 April 2007.
- The UK-CAA Flight Inspector pilot flew the aircraft on 16 February 2007 to gain aircraft experience to allow him to assess the Falcon 7X full flight simulator.
- The UK-CAA Flight Inspector pilot and the Certification Test pilot participated to:
 - the Falcon 7X initial simulator qualification on 12 March 2007 at CAE NETC (USA, NJ),
 - the initial qualification interim Level C from 17 to 20 April 2007 at CAE NETC (USA, NJ), and
 - final Level D qualification from 31 July to 03 August 2007 at CAE Burgess Hill (UK).

The involvement of the Certification Test Pilot and a DGAC - France Simulator Inspector permitted to assess the representativity of the simulator, particularly for handling characteristics.

After completing the training course, two pilots participated into the operational flights.

A total of 20,5 flight hours have been performed to serve the Falcon 7X JOEB process:

5 short range, 5 medium range (among which 4 during Function and Reliability flights), and 1 long range flight were performed to determine the Falcon 7X operational suitability.

The experience acquired during the training course and the operational flights showed that the fly by wire technology makes the F7X a very pleasant and easy to fly aircraft.

However, the use of some systems requires a special ability or a particular attention.

The points listed below do not follow any specific order but have been encountered by one or more pilots of the JOEB team.

Ground steering. The non-conventional steering using the rudder pedals instead of a steering tiller may need special attention from the pilot.

Air brakes. The speed limitations with auto pilot engaged at different altitudes could be confusing to the pilot.

Overhead panel. The push button function is not intuitive (five different functionalities).

Go-around push button. The position of these push buttons is not ergonomic.

RAT (Ram Air Turbine). The RAT extension time limitation (3h45min) must be considered as an operational limitation. Dassault should produce performance documentation for operation with RAT extended.

Emergency panel. Located on the rear part of the pedestal and hidden by an opaque cover, all push buttons of this panel may be overlooked by the pilot. Push buttons used as part of the emergency procedures must be clearly identified. The location of push buttons on this panel should be highlighted within abnormal and emergency procedures requiring their use.

ECL (Electronic Check List). In certain abnormal or emergency Check list the wording needs to pay attention in order to avoid a misunderstanding.

Electronic Flight Bag (EFB). A map display, hosted on any of the Multi-function Display Units (MDUs), may be installed as optional equipment. The display consists of standard Jeppesen Terminal Charts that can be panned, zoomed and scrolled as desired. On the ground only, own-ship position is overlaid on the chart. It is possible that an offset position can be displayed which may result in misleading position information being presented to the pilot.

Note: according to AFM/CODDE2, airplane position displayed on the AIRPORT diagram must not be used as a primary means for the guidance during taxiing. Airplane position displayed on AIRPORT diagram must be cross-checked with visual reference position prior to its use. When no visual position cross-check can be established to use airplane position on AIRPORT diagram, Pilot Flying FMS must be in GPS navigation mode.

Though the basic display has been certified as a MDU, when displaying EFB functions, the display is considered to be a Class 3 EFB system hosting Type B and Type C software applications.

A full operational evaluation to the specific criteria of TGL 36 (Approval of Electronic Flight Bags) would have to be conducted before the JOEB is able to make any recommendation regarding the system's suitability to be granted an approval under JAR-OPS 1.135(b) (*"Information presented in a form other than on printed paper"*).

Note: the full airworthiness certification has been performed by EASA according to Falcon 7X CRI F-38.

Without such operational evaluation, NAAs should consider placing limitations on the use of electronic Jeppesen Charts with regards to JAR-OPS 1.135(b).

1.2 Noise Abatement Departure Procedure (NADP) Evaluation

Dassault Aviation has proposed the Falcon JOEB to evaluate a thrust reduction procedure at 400 feet AAL during a close-in noise abatement departure procedure (NADP).

Further to the examination made by the Falcon JOEB of the substantiations provided by Dassault Aviation and the simulator trials undertaken by the Falcon JOEB (see §13.1.2 below), the Falcon JOEB has determined that a thrust reduction at 400 feet AAL during a close-in Noise Abatement Departure Procedure is safe and acceptable.

This thrust reduction height (400 feet AAL) can be used by Operators as an Acceptable Means of Compliance (AMC) to meet OPS 1.235 of JAR-OPS 1 and Annex III to the European Council Regulation (EEC) No. 3922/91 ("EU-OPS 1"), as amended (see applicability in paragraph 13.1.4).

Prior to operating the Falcon 7X on a close-in NADP with a thrust reduction at 400 feet AAL, the Falcon JOEB recommends the areas of training emphasizes outlined in §13.1.3 below.

1.3 Steep Approach Landing Evaluation

Dassault Aviation made an official request to EASA for an Operational Suitability Evaluation of the Steep Approach Landing Procedure for the Falcon 7X.

An OEB of Falcon 7X Steep Approach has been performed by EASA OEB based on:

- experience of one Falcon OEB member who operates Falcon 7X in Steep Approach on a regular basis,
- Operational Suitability Evaluation performed by EASA OEB of Steep Approach on Falcon 2000, Falcon 2000EX, Falcon 2000EX EASy Series, Mystère-Falcon 900, Falcon 900C, Falcon 900EX, and Falcon 900EX EASy Series, and
- DA-7X FAA FSB Report.

The EASA OEB found that Falcon 7X are operationally suitable for steep approach landing operations up to an approach path angle of 6.0 degrees with aircrew trained in accordance with the requirements set in this addendum, and using associated CODDE2 procedures provided by Dassault Aviation.

2. Pilot License Endorsement

With reference to JAR-FCL 1.220 and the JOEB Evaluation Process, a new Pilot Type Rating is assigned to the Falcon 7X and the designated pilot Licence Endorsement is "**Falcon 7X**".

3. Specific operational limitations

3.1 Aircraft approach and circling category

As per Appendix 2 to JAR-OPS 1.430(c), the Falcon 7X is in Category C.

3.2 Abnormal and Emergency procedures

The Electronic Check-List (ECL) is the primary reference for the crew. The AFM, CODDE 3 and ECL should be updated simultaneously (to the extent practicable), to ensure that there are no discrepancy between them. However, any discrepancy that may exist due to the nature of the paper versus the electronic, should be brought to the knowledge of the Operator.

3.3 Customisation of Normal Checklists

The customisation process of Normal Checklists within the ECL was evaluated by the JOEB, and was found acceptable, provided Operators comply with the guidance provided by Dassault's "General Rules - Guidance for Customising Normal Procedures" document reference DGAC-07-DOT-097 dated 01 April 2008 at Issue 02 and as amended. This document is available at Dassault Aviation upon request.

4. MDR and ODR

4.1 Acceptable Master Difference Requirements (MDR)

Reserved.

Due to the fact the Falcon 7X is a new type of aircraft, no MDR table has been published.

4.2 Acceptable Operator Difference Requirements (ODR)

Reserved.

Due to the fact the Falcon 7X is a new type of aircraft, no ODR table has been published.
5. Specifications for Pilot Training

5. Specifications for Pilot Training

5.1 Full Initial Pilot Type Rating training course

The JOEB received the Falcon 7X initial pilot ground training course, provided by CAE Simuflite, Whippany, New Jersey, USA. Several GFI and SFI instructors gave both the computer based classroom instruction and the supplemental "Lab" sessions on IPT (Integrated Procedure Trainer). These sessions are designed to reinforce classroom learning, as well as to introduce crews to SOPs and to the practical operation of the aircraft.

This training course referenced as **CAE-F7X-CURR-IA-001** is recommended for approval by the Falcon 7X JOEB team.

5.2 Specifications for training areas of special emphasis

5.2.1 The pilot type rating training course, as proposed by Dassault Aviation and CAE Simuflite, was found suitable for pilots with previous experience in operating EFIS/FMS and multi-engine aircraft. For pilots not having experience in operating EFIS/FMS and multi-engine experience, additional requirements may be appropriate as determined by JAA NAAs.

Furthermore, the JOEB has no objection with the philosophy developed by Dassault Aviation to treat Emergency situations and the Operating Techniques (refer §5.2.3 below), as well as operationally oriented training course.

5.2.2 Use of CODDE

The CODDE (Crew Operational Documentation for Dassault Easy) divided in 3 books as CODDE1, CODDE2 and CODDE3, are specific for standard operational procedures (SOPs) and must be presented as preamble of the training course.

5.2.3 The JOEB has identified several aircraft systems and / or procedures that should receive special emphasis in a Falcon 7X initial pilot type rating training course:

- Fly by wire and associated system, procedure and failures
- Philosophy to treat Emergency situations: Dassault Aviation philosophy for Emergency situations is requiring no memory effort (there is no Phase 1 / memory items for Falcon 7X) and the crew has to use the ECL first.
- Operating techniques which are “piloting actions” that must be performed as an educated reflex. Most of the Operating Techniques are common to the different types of aircraft.
- Avionics system and associated failures (MAU)
- Steering on ground
- Go Around technique
- Oxygen mask
- Use of manual pressurization

5.2.4 In addition of the Falcon 7X specific feature above listed, all the characteristics of the EASy concept should be emphasised during the pilot training program as they have been identified on the previous JOEB report for the Falcon using the EASy concept:

- Use and interpretation of colour code of avionic System
- Use of flight path symbol
- Use of acceleration symbol
- Interpretation and use of the Crew Alerting System (CAS)
- Use of CCD (Cursor Control Device)
- Use of the Electronic Check List (ECL)
- Use of QRH in one specific case (MAU Failure)

5.2.5 The Dassault Aviation and CAE Simuflite proposed pilot initial type rating training course (type rating) is in compliance with the AMC 1.261 (c)(2) of JAR-FCL 1 (A) Subpart F. Refer to Syllabus in Appendix 3 of this Report. The course is divided in the following phases:

- Theoretical Ground phase, including Lab sessions,
- Written test (split in two parts, day 8 and 18 of the ground course),
- Simulator phase,
- Evaluation

Note: the pilot type rating training course is recommended for approval provided that operator specific documentation (CODDE 1,2,3) is used throughout the course.

5.2.6 Recurrent training

Recurrent pilot training should be performed as specified in JAR-FCL 1 and JAR-OPS 1.

6. Specifications for checking

6.1 Skill test

As required by Appendix 1 and 2 to JAR FCL 1.240 and 1.295.

6.2 Recurrent Checking

Proficiency Checks must be conducted in compliance with JAR-FCL 1.245 and JAR-OPS 1.965.

6.3 Line checks

As specified in Appendix 1 to JAR-OPS 1.965.

7 Specifications for Currency/Recent Experience

JAR-OPS 1 applicants must meet the requirements of JAR-OPS 1.970 "Recent Experience", or JAR-FCL 1.026 "Recent Experience for pilots not operating in accordance with JAR-OPS 1".

The term "Recency" is the ability to maintain recent experience, this term is used throughout the JAR-OPS1/EU-OPS.

- Recency is the recent experience necessary for safe operation of the aircraft type or variants related to a quantity of takeoffs, landings, segments or sectors, Low visibility Operations etc. within a prescribed previous period.
- The Recurrent Training is a periodic training required to ensure that flight crew are adequately trained and currently proficient with respect to the aircraft type (all flight crew training requirements applicable when authorities find specific training is necessary before the flight crew serve on a particular variant of the aircraft).

Note: In the Common Procedure Document the term "Currency" is used to describe the ability to maintain "Recent Experience".

8 Specifications for LIFUS

In the case of an initial pilot type rating on the Falcon 7X, a minimum of 10 legs plus a line check is recommended for LIFUS.

For pilots already qualified and current on Falcon 2000EX EASy and / or Falcon 900EX EASy, due to similar EASy avionic suits on Falcon 7X, the JOEB has determined that the Falcon 7X LIFUS could be reduced to 5 legs plus a line check.

9 Additional JOEB findings and recommendations

The CODDE1, CODDE2, and CODDE3 as referenced in paragraph 15 of this JOEB Report are recommended for approval by the JOEB for pilot training and day-to-day operations. The operators are strongly recommended to use CODDE 1, 2, 3 provided by Dassault Aviation.

10 Aircraft Regulatory Compliance Check-List

The Falcon 7X, as defined by its Type Certificate, has been evaluated by the JOEB and found compliant with Subpart K and L of JAR-OPS 1 Amendment 13.

See Appendix 2 for the Compliance Check List.

The Falcon 7X has also been shown compliant with Commission Regulation (EC) 859/2008 Subparts K&L which applies in the EU States starting September 20th, 2008 - see Appendix 2bis for this Aircraft Regulatory Compliance Check List.

Note: Aircraft Regulatory Compliance Check List to JAR-OPS 1 Subparts K&L (Appendix 2) is kept in this JOEB Report for JAA States not belonging to the EU.

11 Specifications for Devices and Simulators

The JOEB recommends the use of a Falcon 7X full flight simulator qualified to the Level C minimum according to JAR-STD 1A to undergo the Falcon 7X pilot type rating training course.

The Falcon 7X full flight simulator, located in Whippany, New Jersey, USA, has been assessed by the JSET Subgroup according to JAR-STD 1A Amendment 3 and qualified to interim Level C.

The Falcon 7X full flight simulator, located in Burgess Hill, UK, has been assessed by the JSET Subgroup according to JAR-STD 1A Amendment 3 and qualified to Level D.

12 Application of JOEB Report

This JOEB Report applies to AOC holders, however in the case of private operation, JOEB recommends following the findings in this JOEB Report.

13 Alternate means of compliance

13.1 Operational procedure for close-in Noise Abatement Departure Procedure (NADP)

13.1.1 Falcon JOEB Recommendation

Dassault Aviation has proposed the Falcon JOEB to evaluate a thrust reduction procedure at 400 feet AAL during a close-in noise abatement departure procedure (NADP).

Further to the examination made by the Falcon JOEB of the substantiations provided by Dassault Aviation and the simulator trials undertaken by the Falcon JOEB (see §13.1.2 below), the Falcon JOEB has determined that a thrust reduction at 400 feet AAL during a close-in Noise Abatement Departure Procedure is safe and acceptable.

This thrust reduction height (400 feet AAL) can be used by Operators as an Acceptable Means of Compliance (AMC) to meet OPS 1.235 of JAR-OPS 1 and Annex III to the European Council Regulation (EEC) No. 3922/91 ("EU-OPS 1"), as amended (see applicability in paragraph 13.1.4).

Prior to operating the Falcon 7X on a close-in NADP with a thrust reduction at 400 feet AAL, the Falcon JOEB recommends the areas of training emphasizes outlined in §13.1.3 below.

13.1.2 Supporting substantiations provided by Dassault Aviation

This proposal has been substantiated by Dassault Aviation to the Falcon JOEB through:

- an analysis document (ref. DGT114673),
- an operational procedure for close-in NADP (CODDE2), and

- an evaluation of the thrust reduction procedure, based on the CODDE2 close-in NADP, using a Falcon 7X full flight simulator. This evaluation on the full flight simulator has involved a pool of 4 Falcon JOEB pilots, each one being under the control of a Dassault Aviation pilot and test engineers. A total of 17 take-offs with a thrust reduction at 400 feet AAL have been performed by this pool of Falcon JOEB pilots. Abnormal situations, including engine failure and windshear conditions, were introduced to assess a crew's ability to discontinue the noise abatement procedure and adopt the procedure appropriate to the abnormal condition.

No flight testing in the aeroplane was deemed necessary by the Falcon JOEB.

13.1.3 Associated areas of training emphasizes

Prior to operating the Falcon 7X on a close-in NADP with a thrust reduction at 400 feet AAL, the JOEB recommends the following areas of training emphasizes:

- Crew must be trained using the procedure provided by Dassault Aviation in their CODDE2 (close-in NADP),
- Crew should be made aware that the CODDE2 close-in NADP - and only this one - supersedes normal Falcon 7X's Standards Operating Procedures (SOPs). Crew training should also emphasize on the task sharing described in CODDE2, in particular for the thrust reduction at 400 feet AAL which is to be performed by the PNF under the authority of the PF,
- Crew training should emphasize the two key parameters during the departure briefing: N1 to be set at 400 feet AAL, and PATH angle to be set. These two parameters (reduced N1 and PATH angle) are computed by Dassault Aviation and can be found in the CODDE2,
- The initial NADP training should comprise, as a minimum, three normal take-offs, and two abnormal take-offs (e.g. engine failure / medium windshear at thrust reduction),
- The recurrent NADP training should be annually, and should include, as a minimum, one normal take-off and one abnormal take-off,
- If both pilots are intended to act as PF, all take-offs should be conducted with PF position in right seat, then PF position in left seat.

13.1.4 Applicability to specific airports

See Attachment 1: London City Airport and Other Airports.

14 Cabin Crew

There is no requirement for cabin crew to be carried, but the JOEB recommends that if any are carried, they are to be fully trained in accordance with JAR-OPS 1 Subpart O. Dedicated evaluation for Safety & Emergency Procedures Training is not performed at the time of this issue.

15 Optional devices

15.1 Head Up Display

The HUD is only certified for manual or automatic CAT I operations and for monitoring automatic CAT II operations. The OEB has evaluated the HUD, and found it suitable for these

types of operation. The initial type rating training course includes the use of the HUD for these operations. A HUD is fitted in the simulator.

This HUD is not yet certified for manual CAT II and CAT III operations. Upon Dassault Aviation application, the OEB will perform an evaluation and will publish its report consecutively.

15.2 Electronic Jeppesen Chart

This option will probably be installed in the majority of aircraft. If applicable, simulators should be equipped with the Electronic Jeppesen chart option. No specific procedure is introduced in the CODDE 2 for use of the Electronic Jeppesen Charts, however recommendations for the display of the charts during different phases of flight are included in CODDE 2.

15.3 Enhanced Flight Vision System (EFVS)

Note:

EU OPS use the following term and abbreviation: “Enhanced Vision System (EVS)” as being an electronic means of displaying a real-time image of the external scene through the use of imaging sensors.

Dassault Aviation uses the following term and abbreviation for the same type of system: “Enhanced Flight Vision System (EFVS)”.

The abbreviation EFVS will be used throughout this report for simplification.

15.3.1 Introduction

EASA has certified the F7X EFVS modification with Operational Credit Capability.

15.3.1.1 Appendix 1 (New) to OPS 1.430 of the COMMISSION REGULATION (EC) No 859/2008 of 20 August 2008 (EU-OPS) allows “Operational credit” as indicated below:

- To continue an approach below DH or MDH to 100 feet above the threshold elevation of the runway as per Appendix 1 (new) to OPS 1.430 (h)(1)(i).
- To reduce the calculated RVR/CMV for the approach as per Appendix 1 (new) to OPS 1.430 (h)(1)(ii) -Table 9.

15.3.1.2 As the EU-OPS is applicable to Commercial Air Transport only, regulations for non-commercial EFVS operations may be different and are currently subject to National regulations. However, it is recommended that such regulations follow EU-OPS and the recommendations in this report.

15.3.2 OEB evaluation.

The EASA OEB performed an operational evaluation of the EFVS to establish the training requirements for the intended functions with regard to situational awareness and operational credit.

15.3.2.1

EFVS for Situational Awareness.

EASA OEB found the EFVS operationally suitable for providing situational awareness for the crew during ground and flight operations in VMC during day and night; in particular the EFVS

provided assistance for the crew in respect of situational awareness during circling approaches in mountainous terrain at night.

15.3.2.2

EFVS for Operational Credit.

The EASA OEB has evaluated the EFVS system and found it suitable for applying operational credit when operated by crew members trained and qualified according to the provisions of this report.

15.3.2.2.1

The OEB recommends that any credit available be subject to the Right Hand Seat pilot having a useable EFVS presentation available.

15.3.2.2.1.1

The provision for a head-down view of the EFVS image is intended to allow the pilot non-flying to monitor the approach in accordance with Crew Resource Management (CRM) principles.

15.3.2.2.2

The OEB team performed 9 approaches for assessment of the EFVS capabilities.

15.3.2.2.3 AFM caution

The AFM supplement for the use of the EFVS has the following caution:

CAUTION

The IR image must be removed from the HUD whenever:

- **It impairs the pilot's natural vision.**
- **It degrades the readability of the HUD symbology.**
- **It is degraded by weather conditions (e.g. rain, ice, mist ...).**

15.3.2.2.3.1 No credit can be utilized when the EFVS image has been removed from the HUD.

15.3.2.2.3.1.1 If the EFVS image has been removed after passing the Outer Marker or an equivalent position according to OPS 1.405 (a) and the reported RVR/Visibility is less than the applicable minima for the approach flown without the use of EFVS, the approach shall not be continued.

15.3.2.3 Workload increase during EFVS operations with operational credit.

15.3.2.3.1 Use of EFVS during low visibility instrument approaches increases the flight crews physical and mental workload during an already busy phase of flight. Some of the required flight crew tasks for EFVS instrument approach include:

- a. Ensure EFVS cockpit switch is in LOW mode
- b. Complete EFVS calibration above 1,000 ft Above Airfield level (AAL).
- c. Position hands/fingers on sidestick & throttles to control/manipulate:
 - i. EFVS Kill/Dim Switch (short click = Kill, momentary hold = Dim)
 - ii. AP disconnect

- iii. AT disconnect
 - iv. Go-Around button(s)
- d. Mentally program/remember/anticipate two separate minimum descent altitude values:
- i. Barometric Minimums (published DA or MDA)
 - ii. EFVS minimums (100 ft above TDZE)
- e. Determine if the required RVR/CMV for the approach to be flown utilising EFVS is available, this determination must be based on the required RVR for the approach as indicated on the approach plate, the reduced required RVR as derived from Appendix 1 (new) to OPS 1.430 (h)(1)(ii) and the reported RVR.
- f. Make two separate/distinct “Continue” – “Go-Around” decisions:
- i. The first decision (at DA or MDA) requires the flight crew to determine if specific runway visual references are “distinctly visible & identifiable” using EFVS (or pilot’s normal vision).
 - ii. The second decision (no later than 100 ft above TDZE) requires the flight crew to determine if specific runway visual references are “distinctly visible & identifiable” without reliance on the EFVS.
 - iii. Both decisions above require the flight crew to make a qualitative judgment of the visual scene on the HGS. Each decision may (often will) require the pilot flying to first manipulate the EFVS Kill/Dim switch in order to clearly discern if the visual image is generated by the EFVS system, or is from natural vision.

15.3.3 EFVS Minimum requirements for pilot training syllabi.

Initial and recurrent EFVS training is considered essential for safe and effective operation of EFVS. Flight crews will need to gain a thorough understanding and appreciation of the capabilities and limitations of the EFVS operations in different environmental conditions. Recurrent training will be required, especially for maintaining proficiency managing the crew coordination and increased workload of EFVS operations during low visibility instrument approaches.

15.3.3.1 Appendix 1 to EU OPS 1.450, stipulates rules for Low visibility operations — Training and qualifications, paragraph (h) (3) stipulates rules for training and qualifications for EFVS as follows:

Operators conducting approach operations utilising EVS with RVR of 800 m or less shall comply with the requirements of Appendix 1 to OPS 1.450 — Low Visibility Operations — Training and Qualifications applicable to Category II operations to include the requirements applicable to HUD.

15.3.3.2 Dassault provided a General Specification for EFVS pilot training by reference DGAC06DOT0124 dated 30 June 2010. This document has by Dassault Aviation been declared compliant to the relevant requirements of Appendix 1 to OPS 1.450 and forms an acceptable basis for the use of the EFVS system.

a) Prerequisite

Before attending the EFVS training, and in addition to a current type rating on the aeroplane, the trainee must be qualified for using the HUD and prove ability to use it safely as a primary flight display in all phases of flight.

b) Training areas of special emphasis

- Infra-red theory and associated limitations: The trainee should be made aware of the general infra-red theory and the characteristics of the EFVS image, including the dependency of the image on the weather conditions, thermal crossover (not exhaustive). In particular, the trainee should be made aware of the effect of rain (roman candles, ...) which may degrade the EFVS image and require it to be removed.
- Sensorial illusions: During EFVS ground course - "operational credits" part - the trainees should be made aware of the effects of lack of peripheral vision, which are sensorial illusions and image fascination. These effects give the rationale for not flying the aircraft trajectory through the EFVS image but flying it using the flight director until natural vision is acquired. The EFVS image is used to back-up the lateral alignment and the touch down point on the runway.
- Possible automatic call-outs delay: The trainee should be made aware of the importance of the PNF call-out "EVS MINIMUM" at the EVS minimum, because of possible delays in automatic EFVS call-outs due to prioritization of others automatic call-outs (call-out of autopilot disconnection for example).
- Low altitude flight manoeuvre: Under certain meteorological conditions (night clear sky) the quality of the image gives the pilot the impression that he can fly the aircraft trajectory through the image. The trainee should be made aware that this is false. Furthermore, in bad weather conditions, if the aircraft trajectory was flown through the image, the pilot would have a natural tendency to « dive » into the runway. Some approaches not aligned along the runway axis would necessitate low altitude flight manoeuvres to recover runway axis, which is to be avoided using the image.
- Eligibility of runway for EFVS approach: Based on approach charts, the trainee should be capable to recognise runways eligible for EFVS approaches with "operational credits" from the ones not eligible. For example, discuss one eligible non-precision approach and one non-eligible non-precision approach and explain.
- PAPI lights: The trainee should be made aware about PAPI indication through the EFVS: PAPI always shows 4 white lights in HUD/EVS image, indicating HIGH even if the aircraft is on the correct descent slope, which could make the pilot descent for the 2 RED/2 WHITE which never appears.
- Role of the kill/dim switch: In addition to check of proper operating condition, the trainee should be made aware that the use of the kill/dim switch before arriving to minima is useful for transition from EFVS to Visual, as it improves the "see through".
- Cross-wind approaches: The trainee should be made aware of the characteristics of the EFVS display during approaches made in cross-wind conditions.

c) Recurrent Training and checking

The requirements for recurrent training and checking are prescribed in Appendix 1 to EU OPS 1.450.

In addition, the ground course should recall the training areas of special emphasis referenced in b) above.

It should be noted that the HUD and EFVS training programs focus principally upon training events flown in the left seat by the PIC as the PF.

Nevertheless, EFVS training in the duties of the PNF in the right seat is required. PNF EFVS familiarization flown in the left seat is recommended.

d) Recency

Recency is maintained by the recurrent training and checking as prescribed in Appendix 1 to EU OPS 1.450.

15.3.4 Standard Operating Procedures (SOP)

The requirements for Low visibility operations — Operating procedures are described in OPS 1.455 and associated Appendix, in addition the OEB recommends that National Aviation Authorities ensure operators include the following items in their Operations Manual:

- a. Procedures for call-outs during approach based on the EFVS image available for both pilots.
- b. Procedures for calibration of the EFVS
- c. Procedure for the use of the kill/dim switch, especially when “frozen” images are displayed.
- d. Detailed procedures for both precision and non-precision EFVS approaches including crew coordination and call out items.
- e. Procedures to ensure, that the EFVS image is removed whenever it is degraded by weather conditions (e.g. rain, ice, mist...).
- f. Procedures to be followed whenever the EFVS image has been removed during an approach.

16 CODDE's reference

The referenced documents are:

- CODDE 1 (Airplane Description) ref. CODDE1 Falcon 7X DGT97831 - Issue 2
- CODDE 2 (Operations Manual) ref CODDE2 Falcon 7X DGT105609 - Issue 2
- CODDE 3
 - QRH 1 (Quick Reference Handbook 1) - ref. QRH1 Falcon 7X DGT105610 - Issue 2
 - QRH 2 (Quick Reference Handbook 2) - ref. QRH2 Falcon 7X DGT105611 - Issue 1

Addendum A

Operational Evaluation Board Report Dassault Falcon 7X

Steep Approach Landing

A.1 General Description of the Steep Approach

A.1.1 A Steep Approach is used primarily when there are obstacles in the approach path that are too high to allow a normal 3° approach path. An approach path angle of 4,5 degrees or more is considered a steep approach.

A.1.2 The EASA OEB has determined that the conduct of steep approach landing operations requires no higher piloting skill level than that of normal 3° approaches. However, since steep approach landing operations are often tailored to demanding airports - located in mountainous areas, having short runways - the EASA OEB requires flight training, including briefing (no formal academic training, i.e. no classroom training), for competency in conducting steep approach landing operations.

A.1.3 The EASA OEB found that Falcon 7X are operationally suitable for steep approach landing operations up to an approach path angle of 6.0 degrees with aircrew trained in accordance with the requirements set in this addendum, and using associated CODDE2 procedures provided by Dassault Aviation.

A.2 The Operational Suitability Evaluation process

An Operational Suitability Evaluation of Falcon 7X Steep Approach has been performed by EASA OEB based on:

- experience of one Falcon OEB member who operates Falcon 7X in Steep Approach on a regular basis,
- Operational Suitability Evaluation performed by EASA OEB of Steep Approach on Falcon 2000, Falcon 2000EX, Falcon 2000EX EASy Series, Mystère-Falcon 900, Falcon 900C, Falcon 900EX, and Falcon 900EX EASy Series, and
- DA-7X FAA FSB Report.

A.3 EU-OPS Requirements for Steep Approach Procedures

The following EU-OPS and associated AMC references relate to steep approaches:

- Appendix 1 to OPS1.515(a)3: Steep approach procedures
- EU-OPS1.975: Route and aerodrome competence qualification
- AMC OPS1.975 §5 (TGL44): Route and aerodrome competence qualification (Category C aerodrome)

A.4 Falcon 7X References

Refer to appropriate CODDE2 and AFM Annexes.

A.5 Steep Approaches Aerodrome Requirements

Operators must comply with any aerodrome specific requirements for steep approaches (e.g. in London City - EGLC).

Note: Pilots performing steep approaches at Lugano airport (LSZA) must be informed about the Dassault letter titled "Falcon - Lettre de non-objection pour les approches de Lugano" (Reference DGT-DTC/CER 568463 dated 22 June 2006). This letter specifies that Dassault has no objection regarding the initial phase of the approach flown at 6.65° provided that the aircraft is operated in accordance with the AFM or the associated operating manual, and that the operator has obtained operational approval from the competent Authority.

A.6 Specifications for Training

A.6.1 Pilot Training Prerequisite

No prerequisite is required before entering the Steep Approach pilot course except a current type rating on the aeroplane, or full initial type rating training up to, but excluding, the check ride.

A.6.2 The crew must be trained in using the procedure provided in the Dassault Aviation CODDE2 Operating Manual (Normal Operations - Special Procedures - Operations) or in the equivalent company SOP's.

The Steep Approach pilot training course can be included as an integral part of the aeroplane type rating training course.

A.6.3 Steep Approach Pilot Training Programme

A.6.3.1 Flight Training

Flight training (as PF or PNF) may be conducted in a Level C or D FFS, or in the aircraft with a Type Rating Instructor (TRI) and must address the following:

- Briefing prior to the simulator session, or during the flight preparation to include: AFM/CODDE2 Limitations, Normal / Abnormal Procedures, Performance with special emphasis on increased landing distance.
- Phases of the Steep Approach, to include: Stabilized approach concept as a key success for steep approach landing, appropriate slats / flaps configuration, approach speed, and flare initiation.

A.6.3.2 Initial Training

The initial training should comprise, as a minimum, three Steep Approaches:

- one approach following a 5.5° Approach Path Angle with full stop landing to comply with normal procedures; and
- one approach following a 6° Approach Path Angle with engine anti-ice management introducing an abuse in speed, managed by crew using AB1 and AB2 alternatively (pilot has to demonstrate his ability to be stabilized at 1000 ft), until touchdown followed by a go-around; and
- one approach following a 5.5° or 6° Approach Path Angle with an engine failure below 400 ft, followed by a full stop landing or a go-around at pilot discretion.

When a HUD is installed, the OEB recommends to perform the first approach using the HUD (final phase is VMC), and in accordance with the CODDE2/AFM Limitations section applicable for steep approaches. In flight, the OEB recommends HUD use during the VMC phase.

A.6.3.3 Recurrent Training

The Recurrent Steep Approach training should be performed every 6 months, and should include, as a minimum, one Steep Approach and a second Steep Approach where non-normal situations are introduced during the Approach.

A.6.3.4 Training Areas of Special Emphasis

The approach briefing should include all aspects of the Steep Approach, including as a minimum:

- normal and abnormal procedures during the Steep Approach;
- transition from a glide path reference system to a visual glide path indicating system; and
- computation of the field length data when using steep approach criteria.

The crew should become proficient on the task sharing described in the Special Procedure for Steep Approach, in particular regarding go-around. Both pilots shall be trained in the procedure as PF and PNF, as applicable.

A.7 Recent Experience / Currency

The OEB determined that there is no specific recent experience or currency requirement for Steep Approaches.

A.8 Training credit

None.

A.9 Period of Validity of Competence

Before performing Steep Approach Landing Operations, an operator shall ensure that the pilot in command fulfils the requirements of EU-OPS1.975(b)(c) and (d).

A.10 Checking Requirements

There is no requirement for knowledge checking or flight proficiency testing for Falcon 7X steep approach qualification.

Proof of completion of Falcon 7X steep approach training is sufficient to demonstrate qualification.

Attachment 1

London City Airport / Other Airports

1. Applicability to London City Airport

This procedure has been assessed by the Falcon JOEB team for London City Airport.

Refer to Dassault CODDE2, reference DGT105609.

2. Other Airports

The process and the associated close-in NADP procedure have been developed for the London City Airport, and can be validated for other airports, provided:

- The new NADP procedure is accepted by the local Authority, and
- All obstacle clearance requirements are fulfilled.