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Bombardier CRJ series

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EUROPEAN AVIATION SAFETY AGENCY

Operational Evaluation Board Report

Bombardier CRJ Series

CRJ 100/200 – 700 – 705/900 – 1000

Flight Crew Qualifications

10 September 2013

European Aviation Safety Agency
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Bombardier CRJ Series
CRJ 100/200 – 700 – 705/900 – 1000

Operational Evaluation Board – Flight Crew Qualifications

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Contents

Acronyms

AC ..... Advisory Circular

AEG ..... Aircraft Evaluation Group

AFM ..... Airplane Flight Manual

AOC ..... Air Operator Certificate

AOM ..... Aircraft Operating Manual

AMC ..... Acceptable Means of Compliance

ATO ..... Approved Training Organisation

ATQP ..... Alternative Training and Qualification Programme

AWO ..... All Weather Operations

BA ..... Bombardier Aerospace

BATC ..... Bombardier Aerospace Training Centre

BFTC ..... Bombardier Flight Test Centre

CATS ..... Computer-Aided Training System

CBT ..... Computer Based Training

CPD ..... Common Procedure Document for conducting Operational Evaluation Boards dated June 10, 2004 signed jointly by JAA, FAA and TCCA

CRM ..... Crew Resource Management

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

EGPWS ..... Enhanced Ground Proximity Warning System

EICAS ..... Engine Indication and Crew Alerting System

ETOPS ..... Extended range operations for two-engine aeroplanes

EU-OPS ..... Commission Regulation (EC) No 859/2008 of 20 August 2008, amending Council Regulation (EEC) No 3922/91 as regard common technical requirements and administrative procedures applicable to commercial transportation by aeroplane

FAA ..... Federal Aviation Administration

FCL ..... Flight Crew Licensing

FCTM ..... Flight Crew Training Manual

FD ..... Flight Director

FFS ..... Full Flight Simulator

FMA ..... Flight Mode Annunciator

FMS ..... Flight Management System

FMST ..... FMS Trainer

FSB .....FAA Flight Standardization Board

FSTD .....Flight Simulation Training Device

FTD .....Flight Training Device

GPWS .....Ground Proximity Warning System

JAA .....Joint Aviation Authorities

JAR .....Joint Aviation Requirements

JOEB.....JAA Joint Operational Evaluation Board

LIFUS.....Line Flying Under Supervision

LOFT.....Line Orientated Flying Training

LVO.....Low Visibility Operations

MCC .....Multi Crew Coordination

MDR.....Master Differences Requirements

NAA.....National Aviation Authority

ODR.....Operator Differences Requirements

OEB .....Operational Evaluation Board

OTD .....Other Training Device

Part-ARA.....Annex VI to Commission Regulation (EU) No 290/2012 of 30 March 2012 amending Regulation (EU) No 1178/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

Part-ARO .....Annex II to Commission Regulation (EU) No 965/2012 of 05 Oct 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

Part-CAT .....Annex IV to Commission Regulation (EU) No 965/2012 of 05 Oct 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

Part-FCL .....Annex I to Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

Part-ORA .....Annex VII to Commission Regulation (EU) No 290/2012 of 30 March 2012 amending Regulation (EU) No 1178/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

Part-ORO.....Annex III to Commission Regulation (EU) No 965/2012 of 05 Oct 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

Part-SPA.....Annex V to Commission Regulation (EU) No 965/2012 of 05 Oct 2012 laying down technical requirements and administrative procedures related to air

operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (as amended)

PIC ..... Pilot In Command

PFD ..... Primary Flight Display

PM ..... Pilot Monitoring

TCAS ..... Traffic Alert Collision Avoidance System

TCCA ..... Transport Canada Civil Aviation

TCM ..... Training Control Manual

ZFTT ..... Zero Flight Time Training

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.

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[1] CRJ 200/700 evaluation (2001)

[2] CRJ 900 evaluation (Nov 2004)

[3] CRJ 705 evaluation (2005)

[4] CRJ 1000 evaluation and operational suitability flights (May/Jul 2010)

[5] CRJ 1000 evaluation and operational suitability flights (Aug/Sep 2010)

[6] CRJ 1000 CTLC evaluation (Jul 2013)

Executive Summary

Scope of the evaluations

This report combines JAA and EASA operational evaluations of the Bombardier CRJ series aircraft and specifies the relevant EASA pilot qualification requirements.

In particular, this report addresses:

- Aircraft Type Designation and Pilot License Endorsement ;
- Master Differences Requirements (MDR) for flight crews transitioning between aircraft variants;
- Aircraft design and operational concepts and CRJ specifics;
- Operator Difference Requirements (ODR) tables;
- Initial type rating training;
- Differences and Familiarization training;
- Operations on more than one type or variant;
- Pilot checking, currency and recent experience;
- Operational suitability; and
- Aircraft Regulatory Compliance Checklist (Part-CAT, Subpart D).

This report does not address qualifications for cabin crew or maintenance certifying staff, FSTD data evaluation, qualification requirements for the use of equipment or functions such as the Electronic Flight Bag (EFB), Enhanced / Synthetic Vision Systems (E/SVS), or Wake Vortex Categorization, etc.

The evaluation of the Rockwell Collins HGS 4200 Head-up Guidance System for the CRJ 1000 has been evaluated by a separate OEB in a dedicated report.

All relevant reports are available on the EASA OEB website at http://easa.europa.eu/certification/experts/flight.php.

Team Composition and Regulatory Framework

Most operational evaluations were conducted jointly by integrated teams composed of TCCA, FAA and JAA/EASA members. 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.

The evaluations were performed in compliance with the (J)OEB Handbook and the EASA Terms of Reference for OEBs. Further guidance was found in the Common Procedures for Conducting Operational Evaluations, and the applicable regulations at the time of the relevant evaluations,

laying down technical requirements and administrative procedures related to civil aviation aircrew and to air operations.

Conclusions

All Bombardier CRJ series aircraft have been assessed as variants requiring familiarization or differences training, as applicable.

The license endorsement for the Bombardier CRJ series aircraft is established as "**CL65**".

The CRJ initial and differences type rating training syllabi which have been evaluated are referred to in this report. Relevant training footprints evaluated and acceptable to the OEB, including the minimum course duration and training devices used, are shown at Appendix 1, 2 and 3. A general description of the CRJ training programmes is contained at Appendix 4.

The report contains Training Areas of Special Emphasis (TASE) and addresses operation on more than one type or variant.

With regard to operational requirements for aircraft instruments and equipment / communication and navigation equipment (Part-CAT, Subpart D), compliance was confirmed against EU-OPS requirements for the CRJ 1000 at the time of the evaluation.

Operational Evaluation Report – Flight Crew Qualifications

1. Purpose and Applicability

This report addresses:

- Aircraft Type Designation and Pilot License Endorsement for the Bombardier CRJ 100/200, 705, 900 and 1000 series aircraft;
- Master Differences Requirements (MDR) for flight crews transitioning between aircraft variants;
- Bombardier design and operational concepts and CRJ specifics;
- Operator Difference Requirements (ODR) tables;
- Initial type rating training;
- Differences and Familiarization training;
- Operations on more than one type or variant;
- Pilot checking, currency and recent experience;
- Operational suitability;
- Aircraft Regulatory Compliance Checklist (Part-CAT, Subpart D); and
- Additional operational recommendations.

2. Sequence of Operational Suitability Evaluations

2.1 CRJ 100/200 and CRJ 700 Evaluations

In 2001, Bombardier Aerospace requested that a JOEB be conducted to determine the aircraft type designation and pilot training requirements for the first CRJ series aircraft, the CL-600-2B19 (referred to as "CRJ 100/200") and the CL-600-2C10 (referred to as "CRJ 700") series aircraft. The JOEB designated the CRJ 700 as a variant to the CRJ 100/200. Initial type rating training and differences training from the CRJ100/200 to the CRJ 700, and vice versa, were evaluated as described in this report. The JOEB further established the type rating designation "**CL65**".

2.2 CRJ 900 Evaluation

In 2002 the JOEB completed an evaluation of the CL-600-2D24 series aircraft (referred to as "CRJ 900"). Initial type rating training for the CRJ 900 and differences training from the CRJ 100/200 and from the CRJ 700 to the CRJ 900 and vice versa were evaluated. The JOEB designated the CRJ 900 as a variant to the previously evaluated CRJ series aircraft, requiring differences training between the CRJ 100/200 and the CRJ 900; and familiarization training between the CRJ 700 and the CRJ 900, as described in this report.

2.3 CRJ 705 Evaluation

In 2005 a JOEB was conducted to assess type rating training for the CL-600-2D15 (referred to as "CRJ 705") and to revise the existing recommendations to identify performance improvements that were being introduced for the CRJ 900.

Due to the limited nature and scope of the changes to the CRJ 900 and its latest derivative, the CRJ 705, this particular tripartite operational evaluation was conducted through analysis. Since very few of the CRJ 900BP sub-variants have been produced and will not be produced anymore, the JOEB decided that the evolution from CRJ900BP to CRJ900IP would not be part of this evaluation, both sub-variants being named CL-600-2D24 (CRJ 900).

The JOEB designated the CRJ 705 as a variant to the previously evaluated CRJ series aircraft, requiring differences training between the CRJ 705 and the CRJ 100/200 and familiarization training between the CRJ 705 and the CRJ 700 and CRJ 900; as described in this report.

2.4 CRJ 1000 Evaluation

On 6 February 2009, Bombardier applied for a tripartite operational evaluation by TCCA, the FAA and EASA for the Bombardier CL-600-2E25 series aircraft (referred to as "CRJ1000").

The CRJ1000 initial type rating training and differences training was evaluated in the summer of 2010. EASA and TCCA undertook a further partial evaluation of the differences training from the previous CRJ series aircraft to the CRJ 1000. Differences courses from the CRJ 1000 to the previous CRJ series aircraft have not been validated; therefore, a full type rating training should be accomplished in those cases.

The OEB designated the CRJ 1000 as a variant to the previously evaluated CRJ series aircraft, requiring differences training as described in this report.

2.5 CRJ 700 / 1000 Evaluation of Credit for Recent Experience

A dedicated operational evaluation of credit for recent experience requirements in accordance with Part-FCL, FCL.060(b)(4) and with Part-ORO, ORO.FC.140(a) was performed on 9-12 July 2013 upon request of Bombardier.

The "T6“ test as described in FAA AC 120-53A and EASA Draft CS-FCD was chosen as the most conservative methodology. 4 pilots current and qualified in the CRJ 700 and with no previous experience on the CRJ 1000, performed a representative sample of take-offs and landings in a CRJ 700 FFS as base aircraft, in a CRJ 1000 aircraft, and in a CRJ 1000 FFS.

When evaluating the results, the EASA OEB team took into account the CRJ 700 / 1000 aircraft data, the provisions in Part-ORO, AMC1 ORO.FC.200(a)(a) for the determination of inexperienced

crew members, as well as the experience levels of the test subjects. The CRJ 700 / 1000 recent experience requirements are reflected in this report.

3. Aircraft Type Designation and Pilot License Endorsement

With reference to Part-FCL, FCL.010 ('type of aircraft') and GM1 FCL.700, the Bombardier CRJ series aircraft have been evaluated for aircraft categorisation and license endorsement.

All Bombardier CRJ series aircraft have been assessed as variants requiring familiarization or differences training, as applicable.

The license endorsement is established as "**CL65**".

1 Manufacturer	2 Aeroplanes		3	4 Licence Endorsement
	Model	Name		
Canadair (Bombardier)	CL600-2B19	(CL65 Regional Jet series) CRJ - 100 - 200 - 440 - Challenger 850	(D)	CL65
	CL600-2C10	- 700 - 701 - 702 - Challenger 870		
	CL600-2D15 CL600-2D24	- 705 - 900 - Challenger 890		
	CL600-2E25	- 1000		

4. Aircraft Specifics

The CRJ series aircraft design ensures similar characteristics between all 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.

4.1 Take-Off Profiles and Speed

The take-off profiles are similar for all CRJ series aircraft. The only difference is that the CRJ 100/200 has one less callout for flap retraction.

4.2 Minimum Height for use of Autopilot

The minimum height for the autopilot engagement after take-off is 600 feet AGL for all CRJ series aircraft.

4.3 Approach Profiles and Speed

The approach profiles are similar for all CRJ series aircraft.

Approach speeds are dependent upon aircraft weight. Landing weight for the CRJ 1000 is the greatest while the CRJ 100/200 is the lightest of all CRJ variants. Nevertheless, critical speeds are presented to the pilot in a standardized manner for all CRJ series aircraft.

4.4 Aircraft Approach Category

With reference to Part-CAT, CAT.OP.MPA.320(b) the approach category for the CRJ series aircraft is as follows:

Aircraft	Landing Flap	Category
CRJ 100/200 (CL-600-2B19)	45 degrees	D
CRJ 700 (CL-600-2C10)	45 degrees	C
CRJ 900 (CL-600-2D24)	45 degrees	C / D *
CRJ 705 (CL-600-2D15)	45 degrees	C / D *
CRJ 1000 (CL-600-2E25)	45 degrees	C
The normal “final landing flap setting” is 45 degrees.		

* The aircraft are offered in three versions: standard (Std), extended range (ER) and long range (LR). The VREF at the maximum landing weight associated with the Std and ER versions satisfies Category C requirements. The LR version has an increased maximum landing weight such that its associated VREF brings the airplane into Category D. When utilized, the approach speed associated with maximum landing weight satisfies the Category C requirement for the LR aircraft.

The categories are based on the approach speed provided by the Manufacturer and need to be reconsidered if operators increase the approach speed. When flight crews are operating more than one variant, the use of the highest approach category for all variants operated should be considered.

4.5 Altitude Callouts

The use of automatic voice callouts are the same for all CRJ 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.

4.6 Maximum Flap Speed Vfe

Although the CRJ 700, 705, 900 and 1000 have flaps and slats while the CRJ 100/200 has flaps only, the slat / flap or flap extension speeds are similar for all CRJ series aircraft.

Flap Setting (degrees)	CRJ 100/200 (CL-600-2B19)	CRJ 700 (CL-600-2C10)	CRJ 705 / 900 (CL-600-2D15/2D24)	CRJ 1000 (CL-600-2E25)
1	N/A	230 KIAS	230 KIAS	230 KIAS
8	230 KIAS	230 KIAS	230 KIAS	230 KIAS
20	230 KIAS	230 KIAS	220 KIAS	220 KIAS
30	185 KIAS	185 KIAS	185 KIAS	185 KIAS
45	170 KIAS	170 KIAS	170 KIAS	170 KIAS

4.7 Abnormal and Emergency Procedures

Immediate Action items are identical for all CRJ series aircraft. Abnormal and emergency procedures are presented in Quick Reference Handbooks of an identical format for all CRJ series aircraft. Although individual steps may differ, the steps are carried out under the guidance of the handbook in a logical decision-making manner.

4.8 Operational Suitability

The OEB performed a representative number of operational suitability flights in the CRJ 1000 and concluded that the CRJ1000 is operationally suitable for its certified use.

The OEB recommends that an operator using more than one CRJ variant in its fleet, should, when possible, use a unique cockpit configuration for the following safety related items:

- unit system (metric or non-metric) on all displays;
- altimeter settings (QNH/QFE);
- callouts; and
- FMS specifications and functions (software and hardware).

5. Master Differences Requirements (MDR)

5.1 MDR Tables

MDR tables for the CRJ series aircraft are shown below. Definitions of the various levels for Training / Checking / Currency are those used in the CPD.

Master Differences Requirements (MDR) Table						
Aircraft Type Designation: CL65		**FROM AIRPLANE**				
TO AIRPLANE		**CRJ 100/200 (CL-600-2B19)**	**CRJ 700 (CL-600-2C10)**	**CRJ 705 (CL-600-2D15)**	**CRJ 900 (CL-600-2D24)**	**CRJ 1000 (CL-600-2E25)**
	CRJ 100/200 (CL-600-2B19)	**n/a**	**D/D/C**	**D/D/C**	**D/D/C**	**1)**
	CRJ 700 (CL-600-2C10)	**C/C/B**	**n/a**	**A/A/A**	**A/A/A**	**1)**
	CRJ 705 (CL-600-2D15)	**C/C/B**	**A/A/A**	**n/a**	**A/A/A**	**1)**
	CRJ 900 (CL-600-2D24)	**C/C/B**	**A/A/A**	**A/A/A**	**n/a**	**1)**
	CRJ 1000 (CL-600-2E25)	**D/D/E** [2) 3)]	**D/D/D** [2) 3)]	**D/D/A** [2) 3)]	**D/D/A** [2) 3)]	**n/a**

1) The CRJ 1000 to CRJ 100/200, 700, 705/900 differences training has not been evaluated. In the interim, a full type rating training should be accomplished instead.

2) With regard to differences training and checking, the following items should be trained and checked in a Level C or level D FFS (level D training and checking, as defined in the CPD):

   - Taxiing, Normal Take-off & Landing;
   - Engine Failure at V1 (only when transitioning from the CRJ 100/200 to the CRJ 1000);
   - No-Flap / No-Flap and Slat Approach & Landing; and
   - Rudder Failures.

3) The “Nav-to-Nav Transfer” function requires Level C training and checking (as defined in the CPD).

6. Operator Differences Requirements (ODR)

ODR tables are used to show an operator’s compliance method. Bombardier generic ODR tables concerning differences between the CRJ series aircraft have been evaluated by the JAA/EASA. These ODR tables are Bombardier generic and therefore may not include items that are applicable

to particular operators. The ODR tables assume that pilots are current and qualified in operating the base aircraft.

The Bombardier 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 the JAA/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.

7. Specifications for Training

With reference to Part-ORA, AMC2 ORA.ATO.125(b), additional familiarisation training for CRJ variants may be included in the theoretical knowledge training of the initial type rating course. Flight training should be conducted on a single CRJ variant.

A general description of the CRJ training programmes is contained at **Appendix 4**.

7.1 CRJ Initial Type Rating Training

Initial type rating training for all CRJ series aircraft was evaluated by the JAA/EASA and found in compliance with JAR-FCL 1, Subpart F, AMC 1.261 (c) (2).

A training footprint for the CRJ 1000 initial type rating training, including the minimum course duration and training devices used is shown at **Appendix 1**.

7.2 CRJ Differences and Familiarization Training

Difference levels for training / checking / currency are described in the MDR tables of this report.

7.2.1 Differences Training from the CRJ 100/200 to the CRJ 700, and vice versa

The differences training from the CRJ 100/200 to the CRJ 700 requires Level C training using a CRJ 700 FTD Level 2 (or higher). Differences training from the CRJ 700 to the CRJ 100/200 requires Level D training using a CRJ100/200 FTD Level 2 or higher.

7.2.2 Differences Training from the CRJ 100/200 to the CRJ 900, and vice versa

The differences training from the CRJ 100/200 to the CRJ 900 requires Level C training. Differences training from the CRJ 900 to the CRJ 100/200 requires Level D training using a CRJ100/200 FTD Level 2 or higher.

7.2.3 Familiarization Training from the CRJ 705 to the CRJ 900, and vice versa

The familiarization training from the CRJ 705 to the CRJ 900 and vice versa, requires Level A training.

7.2.4 Differences Training from either the CRJ 100/200, the CRJ 700, or the CRJ 705/900 to the CRJ 1000

Bombardier differences training from the CRJ 100/200, the CRJ 700 and the CRJ 705/900 to the CRJ 1000 was evaluated and found in compliance with Appendix 2 to JAR-FCL 1.240 & 1.295 and AMC FCL 1.261 (c) (2).

With regard to differences training and checking, the following items should be trained and checked in the relevant Level C or D FFS (level D training and checking, as defined in the CPD):

- Taxiing, Normal Take-off & Landing;
- Engine Failure at V1 (only when transitioning from the CRJ 100/200 to the CRJ 1000);
- No-Flap / No-Flap and Slat Approach & Landing; and
- Rudder Failures.

The “Nav-to-Nav Transfer” function requires Level C training and checking (as defined in the CPD).

7.2.5 Differences Training from the CRJ 1000 to the CRJ 100/200, the CRJ 700, and the CRJ 705/900

Differences training from the CRJ 1000 to any other variant has not been evaluated. In the interim, a full type rating training should be accomplished instead.

7.3 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 suitability evaluation. Part-ORO, ORO.FC.145(b) addresses operator requirements to include the relevant elements as defined in the operational suitability evaluation when establishing the training programmes and syllabi.

7.3.1 TASE for CRJ 100/200 to CRJ 700 Differences Training

The following aircraft systems or procedures should receive special emphasis during CRJ 100/200 to CRJ 700 differences training (in ground and flight training):

- Pre-flight walk around (landing gear, door configuration, APU location, wings)
- Pitch during climb out and approach
- Engine failure during take-off
- ECS, APU and power management (FADEC)

- Approach to stall and recovery
- No Slat / No Flap & Slat / No Flap approaches
- Landing flare

7.3.2 TASE for CRJ 700 and CRJ 705/900 Initial Type Rating Training

The following aircraft systems or procedures should receive special emphasis during CRJ 700 and CRJ 705/900 initial type rating training (in ground and flight training):

- Systems integration training:
  - Flight Control Panel (FCP)
  - Flight Mode Annunciator (FMA)
  - **FADEC**
  - Flight Management System (FMS) **(an expanded training footprint should be considered for pilots without previous FMS experience**)
- Flight training (Full Flight Simulator or Aircraft):
  - Aileron PCU Runaway
  - Dual Hydraulic System Malfunctions (System 1 or 2 AND 3)
  - Air Driven Generator (ADG) Deployment
  - Dutch Roll (with and without both yaw dampers operative)
    - High Altitude / Slow Speed
    - 10,000 feet / Landing Configuration
  - ILS Approach on Standby Instruments
  - Landing with Ground Lift Dumpers (GLD) not deployed
  - Aircraft performance in balked landing situations
  - Circling approach and manoeuvring at night

7.3.3 TASE for CRJ 1000 Initial Type Rating Training

The following aircraft systems or procedures should receive special emphasis during CRJ 1000 initial type rating training (in ground and flight training):

- Systems integration training:
  - Primary Flight Displays (PFDs) and Multifunction Displays (MFDs)
  - Flight Control Panel (FCP), including light bar/switch position functionality
  - Flight Mode Annunciator (FMA)
  - Full Authority Digital Engine Control (FADEC) and Engine Indication and Crew Alerting System (EICAS)
  - Flight Management System (FMS) (an expanded training footprint should be considered for pilots without previous FMS experience)

- Coupled and non-coupled V-Nav

➢ Flight Training (FFS):

- Aileron PCU Runaway
- Dual Hydraulic System Malfunctions (System 3 and 2 or 1)
- Air Driven Generator (ADG) Deployment
- Dutch Roll (with and without both yaw dampers operative)
  - High Altitude / Slow Speed
  - 10,000 feet / Landing Configuration
- ILS Approach on Standby Instruments
- Landing with Ground Lift Dumpers (GLD) not deployed
- Take-off and Landing rotation / de-rotation
- Aircraft performance in low energy go-around situations
- Circling approach and manoeuvring at night
- Flight control system (modes of operation, control-by-wire rudder system)

7.4 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);
- wind shear and predictive wind shear escape manoeuvres;
- operation of aircraft in icing environments including super cooled liquid droplet (SLD) events (depending on FFS software); and
- manual flight with minimum use of automation (e.g. raw data, without FD).

7.5 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.

7.6 Recurrent Training

Recurrent training must be compliant with EU regulations for civil aviation aircrew and air operations, as applicable, and include the Training Areas of Special Emphasis as identified in this report. These requirements should be considered as a minimum and expanded, as appropriate, for pilots who have had only limited exposure and/or who do no longer fulfil the currency requirements.

Operators must establish an approved recurrent training and checking programme which is relevant to the aircraft variant flown and its intended operation. The recurrent training programme may vary with several factors which have a significant influence. Some of these factors are: actual exposure of the flight crew member(s), specific routes and aerodromes used by the operator and new developments in technology. These factors and/or a combination thereof will determine the required recurrent training.

Recurrent training should incorporate special events training as described in this report, on a rotational basis.

Recurrent training performed on one CRJ series aircraft is valid for other CRJ variants flown, provided that the differences are addressed.

8. Specifications for Checking

License skill tests and operator proficiency checks must be performed in accordance with applicable EU regulations for civil aviation aircrew and air operations.

8.1 Skill test following CRJ 1000 Initial Type Rating Training

The following features must be checked following CRJ 1000 initial type-rating training:

- use of the “two-stepped” flight director;
- knowledge of CBW rudder system and associated failures;
- knowledge and skills related to the use of FMS and crosschecks using the FMA ;
- use of EICAS; and
- use of FADEC controlled thrust setting system .

8.2 Recurrent Checking

Recurrent 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.

Low Visibility Operations (LVO) recurrent training and checking should be in accordance with AMC1 SPA.LVO.120 (f).

A proficiency check conducted on one variant is valid for all variants, provided that the differences have been covered during the recurrent training. However, recurrent training and proficiency

checking should be alternated between the CRJ 100/200, the CRJ 700/705/900, and the CRJ 1000, as applicable.

8.3 Head up Guidance System (HGS)

When the use of a HGS is approved, checking must include suitable demonstration of HGS use for modes and phases of flight authorized. Checking standards for HGS are equivalent to those for non-HGS operations. Periodic assessment of non-HGS skills should also be demonstrated. Therefore, an instructor / examiner may request that manoeuvres be performed without the use of a HGS.

Note: The evaluation of the Rockwell Collins HGS 4200 Head-up Guidance System for the CRJ1000 has been evaluated by a separate OEB in a dedicated report.

8.4 Line Checks

With reference to Part-ORO, AMC1 ORO.FC.240(a)(4)(vii), the OEB has determined that a line check performed on either CRJ series aircraft is valid for all variants.

9. Recent Experience and Currency

9.1 Recent Experience

In accordance with Part FCL, FCL.060(b)(4) and with Part-ORO, ORO.FC.140(a), the following credits are defined for recent experience requirements when operating more than one CRJ series aircraft:

Recent experience requirements for operation on more than one CRJ series aircraft				
	CRJ 100/200 (CL-600-2B19)	**CRJ 700 (CL-600-2C10)**	**CRJ 900 / 705 (CL-600-2D24 CL-600-2D15)**	**CRJ 1000 (CL-600-2E25)**
CRJ 100/200 (CL-600-2B19)	---	no credit	no credit	no credit
CRJ 700 (CL-600-2C10)	no credit	---	full credit	• credit of 2 take-offs and landings • full credit [1)]
CRJ 900 / 705 (CL-600-2D24 CL-600-2D15)	no credit	full credit	---	full credit
CRJ 1000 (CL-600-2E25)	no credit	• credit of 2 take-offs and landings • full credit [1)]	full credit	---

[1)] Flight crews operating the CRJ 1000 and CRJ 700 variants may receive full credit after completion of the associated line flying under supervision and

- having achieved either 100 flight hours and flown 10 sectors (as PF) within a consolidation period of 120 consecutive days; or
- 150 flight hours and flown 20 sectors, as PF (no time limit)

on the associated variant.

9.2 Currency

Flight crews operating the CRJ 100/200 and any other CRJ series aircraft must complete one sector (as PF or PNF) on each variant within the previous 90 days.

Where the HGS is available, every pilot should use the HGS whenever deemed useful during normal operations, and should alternate to perform all flight phases using the Head-Down indication systems in order to maintain currency in both indicating systems.

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

10.1 LIFUS

LIFUS should be performed in accordance with 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.

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

10.2 LIFUS following initial type rating training on the CRJ 1000

In the case of an initial type rating training on the CRJ1000, a minimum of 8 sectors of LIFUS (as PF) including a line check is recommended. This may be reduced at the discretion of the competent Authority, taking in account the recommendations of this report and previous Bombardier CRJ experience of the pilots.

10.3 Familiarization Flights when transitioning from the CRJ 100/200 to either the CRJ 700 or to the CRJ 705/900, or vice versa

In the case of pilots transitioning from the CRJ 100/200 to either the CRJ 700 or to the CRJ 705/900, or vice versa, a minimum of 4 sectors of Familiarization Flights are recommended.

10.4 Familiarization Flights when transitioning from the CRJ 100/200 to the CRJ 1000

In the case of pilots transitioning from the CRJ 100/200 to the CRJ 1000, a minimum of 8 sectors of Familiarization Flights (as PF) are recommended.

10.5 Familiarization Flights when transitioning from either the CRJ 700 or the CRJ 705/900 to the CRJ 1000

In the case of pilots transitioning from either the CRJ 700 or the CRJ 705/900 to the CRJ 1000, a minimum of 2 sectors of Familiarization Flights are recommended.

10.6 Summary of LIFUS / Familiarization Flight Requirements

LIFUS / Familiarization Flights for initial training and when transitioning between CRJ variants				
	CRJ 100/200 (CL-600-2B19)	**CRJ 700 (CL-600-2C10)**	**CRJ 900 / 705 (CL-600-2D24 CL-600-2D15)**	**CRJ 1000 (CL-600-2E25)**
Following initial type rating	not evaluated	not evaluated	not evaluated	8 sectors
CRJ 100/200 (CL-600-2B19)	---	4 sectors	4 sectors	not evaluated
CRJ 700 (CL-600-2C10)	4 sectors	---	0 sectors	not evaluated
CRJ 900 / 705 (CL-600-2D24 CL-600-2D15)	4 sectors	0 sectors	---	not evaluated
CRJ 1000 (CL-600-2E25)	8 sectors	2 sectors	2 sectors	---

11. Specification for operations on more than one type or variant

11.1 Prerequisites

Requirements for operations on more than one type or variant 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).

11.2 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.

11.3 Operation on more than one CRJ variant

In accordance with AMC1 ORO.FC.240(a)(4)(vii), the OEB has determined that, when operating more than one CRJ variant:

- recurrent training and checking on any CRJ variant is valid for all variants operated, provided that the differences between the variants are addressed; and
- recurrent training and proficiency checking should be alternated between the CRJ 100/200, the CRJ 700/705/900, and the CRJ 1000, as applicable.

12. Aircraft Regulatory Compliance Checklist (Part-CAT, Subpart D)

EASA performed an evaluation of aircraft instruments and equipment / communication and navigation equipment, on the CRJ 1000 and confirmed compliance with EU-OPS, Subparts K and L for the CRJ 1000.

Operators must demonstrate to the competent Authority, compliance with Part-CAT, Subpart D (Instruments, Data, and Equipment) relevant to their aircraft prior to entry into service.

Appendix 1

CRJ 1000 Initial Type Rating Training

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction (CBT) (1:00) **MCC** (as required) (7:00)	**Classroom Instruction (CBT)** (4:00) **FMST and CATS/Systems Trainer** (4:00)	**Classroom Instruction (CBT)** (4:00) **FMST and CATS/Systems Trainer** (4:00)	**Classroom Instruction (CBT)** (4:00) **FMST and CATS/Systems Trainer** (4:00)	**Classroom Instruction (CBT)** (4:00) **CATS/Systems Trainer** (4:00)
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
Classroom Instruction (CBT) (4:00) **FTD/Systems Trainer** (4:00)	**Classroom Instruction (CBT)** (4:00) **FTD/Systems Trainer** (4:00)	**Classroom Instruction (CBT)** (4:00) **FTD/Systems Trainer** (4:00)	**Computer Access** (1:00) **FTD/Systems Trainer** (4:00)	**FTD/Systems Trainer** (3:00) **Written Test** (3:00)
Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
FFS MODULE 1 (6:00)	**FFS MODULE 2** (6:00)	**FFS MODULE 3** (6:00)	**FFS MODULE 4** (6:00)	**FFS MODULE 5** (6:00)
Day 16	**Day 17**	**Day 18**	**Day 19**	
FFS MODULE 6 (6:00)	**FFS MODULE 7 (Review)** (6:00)	**LOFT FFS** (6:00)	**Skill Test FFS** (as required)	

Note:

Times for FTD and FFS Modules include time for briefing and debriefing

This table reflects the pilot training analysed 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 EASA OSD 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

Differences Training CRJ 100/200 to CRJ 1000

Day 1	Day 2	Day 3	Day 4
Introduction (0:30) **Classroom Instruction Aircraft Systems** (7:30)	**Classroom Instruction Aircraft Systems** (8:00)	**Systems Integration FTD** (4:00)	**FFS MODULE 1** (5:00) **Partial Skill Test FFS** (3:00)
Note: Times for FTD and FFS Modules include time for briefing and debriefing			

This table reflects the pilot training analysed 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 EASA OSD 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

Differences Training CRJ 700/705/900 to CRJ 1000

Day 1	
Introduction (0:30) **Classroom Instruction** **Aircraft Systems** (3:30) **FFS** **MODULE 1** (4:00) **Partial Skill Test** **FFS** (3:00)	
Note: Times for FTD and FFS Modules include time for briefing and debriefing	

This table reflects the pilot training analysed 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 EASA OSD 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 4

CRJ Training Programmes

The CRJ training programmes were evaluated against compliance with JAR-FCL 1, Subpart F, AMC 1.261 (c) (2)

Training Programme Review

Para 1 – Type

The TCM document which defines the objectives and conduct of the course is sub-divided into various chapters to address Initial and Differences Training.

Para 2 – Variants

Differences training is based upon clearly defined learning objectives and addresses all identified Operational Differences Requirements (ODR).

Para 3 – Training In Aeroplane and FSTDs

The allocated time is in compliance with the regulatory requirements. Student progress is recorded as required.

Para 4 – Skill Test

All students are “Trained to Proficiency”. The student’s skill is monitored throughout training and continuously measured to determine that the knowledge and skill objectives are being met. The student must continue to demonstrate knowledge and skill after achieving the required level. Skill tests are conducted in an FFS Level C or D.

Para 5 – Phase Tests and Final Theoretical Knowledge Examination

Phase testing is integrated throughout Phase 1 (Ground School) and Phase 2 (FFS Training).

In Phase 1, at the end of each CBT activity, a practical review is incorporated to challenge the student’s technical knowledge of the aircraft system. This is followed by an examination that addresses all learning objectives. The student must pass the examination and the test is reviewed and corrected to 100% before proceeding to new material. The student’s technical knowledge is challenged and confirmed during System Trainer / FSTD instructor-led training sessions. The student’s ability to apply the knowledge is judged against the established knowledge and skill requirements needed to pass the course. Prior to starting Phase 2 training, a system review is conducted where the student must reaffirm Phase 1 knowledge and skill requirements. Since the training course is an ISD controlled exercise, a final theoretical knowledge examination at the end of Phase 1 is not required.

Phase 2 testing is conducted continuously. The student must use system knowledge to identify system problems and demonstrate ability to safely complete the required manoeuvre. A Skill Test at the end of Phase 2 training is used to verify compliance with the regulatory requirements.

Para 6 - Facilities: Ground School Equipment

EU requirements for ATO approval apply.

Part 7 – Training Devices

FSTDs are subject to qualification in accordance with CS-FSTD(A). The following devices are suggested by the manufacturer, as applicable for the appropriate variant and relevant training:

- **FSTDs:**
  FFS Level D
  FTD 1
  FTD 2
- **OTDs:**
  CBT / CATS
  FMS / System Trainers
  Cockpit mock-ups

Part 8 – Computer Based Training (CBT)

CBT instruction is fully integrated within the CBT programme. An instructor is available full time to support the CBT learning and provide further non-programmed assistance, if required. Daily briefings and debriefings are conducted.

Part 9 – Theoretical Knowledge Instruction

All Phase 1 training is fully integrated. The student is introduced to new material through the CBT and the learning experience is continued by instructor-led integrated training sessions in a briefing room, system trainer and/or FTD. In addition to acquiring detailed system knowledge, the student must demonstrate proficiency in the following before proceeding to Phase 2 training:

- normal checklists and flows
- abnormal procedures and checklist compliance
- emergency procedures and checklist compliance
- operator SOPs

The TCM identifies the length of the course including the number of hours of training device utilization.

Part 10 – Flight Training

All skill test items are taught and the student must demonstrate proficiency in these training objectives before the student is recommended to proceed to the skill test. The TCM identifies the number of hours of FSTD utilization including skill test. The total hours allotted to programmed device training includes:

- System Trainer: 12 hours
- FSTD 2: 15 hours
- FFS Level D: 32 hours, plus additional time for the skill test