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Operational Suitability Data (OSD)
Flight Crew

Gulfstream G150

19 May 2015

Gulfstream G150

Operational Suitability Data (OSD) – Flight Crew

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Revision Record

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OEB Report Original	G150 Initial Evaluation	20 Mar 2008
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Acronyms

AC ..... Advisory Circular

AEG ..... FAA Aircraft Evaluation Group

AFCS ..... Automatic Flight Control System

AFM ..... Aircraft Flight Manual

AMC ..... Acceptable Means of Compliance

AP ..... Autopilot

APR ..... Automatic Performance Reserve

AT ..... Auto Throttle

CBT ..... Computer Based Training

CPD ..... Common Procedures Document for conducting Operational Evaluation Boards, dated 10 June 2004

CRM ..... Crew Resource Management

CS-FCD ..... Certification Specifications for Operational Suitability Data (OSD) Flight Crew Data CS-FCD, Initial issue, 31 January 2014

CS-FSTD(A) ..... Certification Specifications for Aeroplane Flight Simulation Training Devices of 4 July 2012

Difference Level ..... A designated level of difference as defined in CS-FCD

DU ..... Display Unit

EASA ..... European Aviation Safety Agency

EFB ..... Electronic Flight Bag

EFIS ..... Electronic Flight Instrument System

EGPWS ..... Enhanced Ground Proximity Warning System

EICAS ..... Engine Indicating and Crew Alerting 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

FADEC ..... Full Authority Digital Engine Control

FAR ..... Federal Aviation Regulation

FCP ..... Flight Control Panel

FCS ..... Flight Control System

FFS ..... Full Flight Simulator (Level C/D)

FMA ..... Flight Mode Annunciator

FMS ..... Flight Management System

FPA ..... Flight Path Angle

FPV ..... Flight Path Vector

FSB ..... Flight Standardization Board

FTD ..... Flight Training Device

GALP ..... Gulfstream Aerospace Limited Partnership

GM ..... Guidance Material

IAI ..... Israel Aerospace Industries

JAA ..... Joint Aviation Authorities

JAR ..... Joint Aviation Requirements

JOEB ..... Joint Operational Evaluation Board

LIFUS ..... Line Flying Under Supervision

LPC ..... Part-FCL Licence Proficiency Check

LOFT ..... Line Orientated Flying Training

LST ..... Licence Skill Test

MCDU ..... Multifunction Control Display Unit

MDR ..... Master Difference Requirements

MEL ..... Minimum Equipment List

MFD ..... Multi-Function Display

MMEL ..... Master Minimum Equipment List

MMO ..... Maximum Operating Mach Number

NAA ..... National Aviation Authority

OEB ..... Operational Evaluation Board

ODR ..... Operator Differences Requirements

OPC ..... Operator Proficiency Check

OSD ..... Operational Suitability Data

Part-FCL ..... Flight Crew Licensing: 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-ORO ..... Organisation Requirements for Air Operations: 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 ..... Specific Approvals: 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)

PF ..... Pilot Flying

PFD ..... Primary Flight Display

PIC ..... Pilot In Command

PM ..... Pilot Monitoring

PTM ..... Pilot Training Manual

QRH ..... Quick Reference Handbook

Route Sector ..... as defined in Part-FCL [“Route sector" means a flight comprising take-off, departure, cruise of not less than 15 minutes, arrival, approach and landing phases]

SIC ..... Second In Command

TASE ..... Training Areas of Special Emphasis

TAWS..... Terrain Awareness and Warning System

TCAS ..... Traffic Alert and Collision Avoidance System

V2 ..... Take-off Safety Speed

VNAV ..... Vertical Navigation

Preamble

1. Introduction

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 this document. Users should take account of subsequent amendments to any references, in particular concerning requirement for civil aviation aircrew and air operations.

Determinations made in this document are based on the evaluations of specific configurations of aircraft models, equipped in a given configuration and in accordance with current regulations and guidance.

Modifications and upgrades to the aircraft evaluated require additional OSD assessment for type designation, training / checking / currency, operational credits, and other elements within the scope of the OSD evaluations.

In accordance with Commission Regulation (EU) No 69/2014 of 27 Jan 2014, the Operational Suitability Data contained in this document are identified as follows:

[M]..... mandatory Operational Suitability Data, bearing the status of rule (see GM No 3 to 21A.15(d))

[AMC] ..... non-mandatory Operational Suitability Data, bearing the status of Acceptable Means of Compliance (see GM No 3 to 21A.15(d))

2. Operational Evaluation G150

An initial evaluation of the G150 was performed in January / February 2006 by a joint team of 4 operational experts from the FAA FSB and the JAA / EASA.

The group of 4 pilots received initial ground school instruction at the facilities of Flight Safety International (FSI) at Dallas-Fort Worth, TX. Ground school training was a combination of instructor led power point presentations and some specific interactive computer based training. As the theoretical training presented at that time did not meet the regulatory requirements of JAR-FCL, a re-evaluation of the theoretical training was performed in November 2006 and concluded with the acceptance of JAR-FCL compliant theoretical training in June 2007.

The practical part of the type rating training was evaluated during the last 2 weeks of October 2007, when the first European clients were trained in accordance with the described curriculum. Flight training was performed in one of the first experimental aircraft, N150GA, once it was available at the Gulfstream production test flight center at Dallas Love Field. A G150 FFS was not available at the time. The ground school examination, as well as the type-rating skill test (in the aircraft) was performed in accordance with FAA standards for all 4 pilots. A LOFT flight, which

followed after the successful completion of the type rating skill test was part of the training program.

A total of 3 operational suitability flights were executed by the FSB / JOEB to validate the proposed AFM normal, abnormal and emergency procedures and to establish operational suitability in the actual operational environment.

The JOEB operational evaluation was conducted in compliance with the JAA Terms of References for JOEBs and the JOEB Handbook. Further guidance was found in the CPD.

3. Operational Evaluation – Group Composition

Name	Organization	Function
Evan NIELSEN	EASA	EASA Flight Standards Manager
Jaap MEIJER	EASA	JOEB Chairman
Mark A. HUMPHREYS	FAA	FSB Chairman
Stephen L. FORD	FAA	FAA pilot
Al V. PEYUS	FAA	FAA pilot

Operational Suitability Data (OSD) – Flight Crew

1. Aircraft Type Designation and Pilot License Endorsement [M]

With reference to Part-FCL, FCL.010 ('type of aircraft') and GM1 FCL.700, the Gulfstream G150 aircraft has been evaluated for aircraft categorisation and license endorsement.
The license endorsement is established as "**G150**".

Manufacturer	Aircraft Model / Name	License Endorsement	Variants	Complex	SP / SP HPA / MP	OEB FC REPORT / OSD FC available	Remarks
Gulfstream Aerospace LP (GALP)	Gulfstream G150 (G150)	G150	—	X	MP	X	OSD FC G150, dated 19 May 2015

2. Aircraft Specifics

2.1 History

The G150 was designed as a derivative of the LTD ASTRA SPX, which is also known as Gulfstream G100. The new member in the family received its type certificate in Israel during 2005. This type certificate was validated by the FAA in 2005 after the aircraft was launched in the USA as the new Gulfstream G150. The partnership of IAI with Gulfstream was structured in a new company, Gulfstream Aerospace Limited Partnership (GALP) Ltd.

The G150 features a wider cabin, a re-designed nose section, up-rated engines and a new avionics suite, Rockwell Collins Pro-Line 21.

Changes to the AFM and related documents have to be approved by the Aviation Authority of the manufacturer's country, Israel, as well as by EASA

2.2 Overview

The G150 is a swept wing executive aircraft, designed for up to 9 passengers and 2 cockpit crew. The MTOW of the G150 is 11.838 kg (26.100 lbs). It is capable of cruise speeds up to Mach 0.85 (Mmo) at a maximum altitude of 45,000ft MSL. The maximum demonstrated crosswind component for a dry runway is 28kts.

The aircraft is equipped with two Honeywell TFE731-40AR medium by-pass ratio turbofan engines. Normal thrust rating is 4420 pounds per engine. A Thrust Reverser System is installed on each engine to assist in deceleration. An Automatic Performance Reserve (APR) system increases the Inter Turbine Temperature (ITT) limits, which, in case of an engine failure, allows normal rated thrust to be maintained up to a higher ambient temperature.

Of the primary flight controls, the elevators and rudder are mechanically operated and the ailerons are hydraulically boosted with mechanical inputs. Artificial control loading is provided for aileron

deflection force at the control wheels. Trim systems are installed for rudder, aileron and stabilizer and operate electrically. The Automatic Flight Control System, a subsystem of the Collins ProLine 21 avionics system, is a fully integrated flight control system. It includes a dual channel three-axis autopilot with automatic pitch trim control.

Hydraulically actuated airbrakes provide drag for use in flight as well as on the ground. The trailing edge flaps are electrically operated and can be selected to 4 positions: 0 – 12 – 20 – 40 degrees. The leading edge slats are operated electrically as well and can be selected in 2 positions, up and down. They extend automatically at high angles of attack.

The Collins ProLine 21 EFIS and avionics package features one primary flight display and one multifunction display and the associated controls on each side of the cockpit.

A flight management system, controlled by MCDU's on each side, is fully integrated in the operation of the aircraft. It provides Vspeeds and performance computations and builds an operational flight plan from take-off until landing, including overlay non-precision approaches and can calculate a vertical path.

2.3 Aircraft Approach Category [M]

With reference to Part-CAT, CAT.OP.MPA.320(b) the approach category for the G150 is as follows:

Aircraft	Category
G150	C

The approach category can be higher dependent on the operation. The determination should be made by the operator based on approach speed calculations in accordance with applicable regulations.

2.4 Memory items

The Gulfstream position is not to develop "Memory Items" for emergency and abnormal check-lists.

[AMC] Gulfstream has developed procedures to be followed in case of abnormal and emergency situations. Although pilots are expected to perform some steps as "immediate actions without reference to the checklist", none of these QRH-procedures contain defined Memory Items. Emergency procedures are an essential part of the training curriculum. To avoid confusion during training, as well as during actual operations, Training Organizations and pilots need to be made aware of the steps to be performed without immediate reference to the checklist. These steps should be defined before training is started, preferably by the operator as part of its Standard Operating Procedures.

[AMC] Operators should develop their own memory items in accordance with their operating philosophy.

2.5 All Weather Operations

Neither Low Visibility Take-Offs, nor approach capabilities other than ILS CAT I, non-precision and FMS overlay instrument approaches were evaluated.

2.6 Part-CAT, Subpart D – Instruments, Data, Equipment

EU operators must show compliance with applicable elements of Annex IV to EU Regulation 956/2012 (Part-CAT, Subpart D), prior to beginning commercial transport operations.

The G150 was evaluated in September 2007 and found compliant with JAR-OPS Subparts K and L.

Notes:

- Windshield wipers are not installed. Rain repellent coating is applied to the windscreens
- A Flight Data Recorder is normally not installed, but is required for operations under JAR-OPS 1.

3. Operator Differences Requirements (ODR)

No evaluation of credits for commonality or variant determinations between the G150 and any other models were performed. Consequently, ODR's do not apply.

4. Master Differences Requirements (MDR)

No evaluation of credits for commonality or variant determinations between the G150 and any other models were performed. Consequently, MDR's do not apply.

5. Specifications for Training

5.1 G150 Initial Type Rating Training

5.1.1 Prerequisites

[AMC] Prior experience in multi-engine transport turbojet aircraft and prior knowledge on EFIS, FMS operation and integrated avionics is recommended for initial training on the G150.

[M] Pilots entering the G150 Type rating training course must hold an ATPL, or a PPL/CPL with Multi-Engine / Instrument Rating and theoretical knowledge at ATPL level. Have completed 70 hrs as Pilot In Command and a Multi Crew Coordination (MCC) course.

5.1.2 G150 Training

[AMC] Early exposure to the FCP, FMA and FMS is important, especially for pilots with no previous EFIS or FMS experience. Establishing early confidence in manually flying the aircraft, converting from manual to automatic (FMS controlled) flight mode and back is equally important due to heavy reliance on the Automatic Flight Control System (AFCS). In the event of a flight path deviation due to input error or system malfunction, the flight crew must be able to comfortably transition from automatic to manual mode and back in an orderly fashion.

[AMC] The safe operation of the airplane is predicated upon the awareness, at all times and of both pilots, of the airplane's Flight Modes and flight parameters. Strict adherence to Crew Coordination Procedures (CCP's) is essential and should be regarded as mandatory. These CCP's should be fully integrated in the training. Training Organizations should be made aware of the Crew Coordination Procedures as established by the operator, before training is started. Pilots having no relevant experience with the application of Crew Coordination Procedures will benefit from a bridge-course on this topic.

[AMC] Appendix 1 shows the footprint of the evaluated training.

5.1.3 Training Areas of Special Emphasis (TASE)

[M] The following items must receive special emphasis as specified:

- **Systems Integration Training**
  - Primary Flight Display (PFD) - Mode Annunciators
  - Multi Function Display (MFD) - Controls
  - Flight Guidance System (FGS)
  - Flight Management System (FMS)
  - Cursor Control Device (CCD)
  - Elevator Trim Systems (Normal, Override, Emergency)

- **Flight Training (FFS – Level C or D and / or aircraft)**
  - Dual Generator Failure procedure
  - Loss of cabin pressure procedures
  - Instrument flying on standby instruments
  - Fuel leaks
  - Smoke procedures, including smoke removal
  - Approach & Landing from left seat with forward windscreen obscured (using left side window for forward view)
  - Related and un-related multiple EICAS messages

[AMC] Operators may add additional elements as required by their operation, and these will vary. Training organisations should review their training courses when applicable aircraft modifications occur. Training organisations may add additional elements as required by the operator.

5.2 Recurrent Training

Recurrent training must be compliant with EU regulations for civil aviation aircrew and air operations, as applicable, and include the identified Training Areas of Special Emphasis.

6. Line Flying Under Supervision (LIFUS) / Supervised Operating Experience (SOE)

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. Supervised Operating Experience (SOE) may be established in accordance with Part-FCL, FCL.720.A (g) through the operational suitability evaluation.

[AMC] Where there is a change of operating conditions or route structure, this should be taken into account and may need additional route sectors to cover these elements.

7. Specifications for Recent Experience and Currency

Recent experience requirements are contained in Part-FCL, FCL.060.

Appendix 1

[AMC] G150 Initial Type Rating Training

The following curriculum is considered to be the minimum for the initial type rating training for the Gulfstream G150:

Theoretical Training (8 days, 64 hrs), consisting of:

- Classroom presentations of aircraft systems, including normal, abnormal and emergency procedures
- Classroom presentations on aircraft and system limitations
- Classroom presentations on Mass & Balance and Performance
- Systems Integration Training in fixed base simulator to support classroom presentations (3 hrs per pilot)
- Written Test (scheduled on last day)

Fixed Base Simulator phase, consisting of:

- Two fixed base simulator sessions (2 x 4 hrs per crew, 2 x 2 hrs per pilot as PF and 2 x 2 hours per pilot as PM)

Full Flight Simulator phase, consisting of

- Six full flight simulator training sessions (6 x 4 hrs per crew, 6 x 2 hrs per pilot as PF and 6 x 2 hrs per pilot as PM) + briefing/debriefing. All required relevant elements are trained to proficiency
- License Skill Test

Aircraft training (landings):

- as required by regulations