



Joint Operational Evaluation Board

A380-800

Report of the A380-800 EFB Subgroup

Initial Issue  
20 November 2008



European Aviation Safety Agency  
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**EASA/JAA Joint Operational Evaluation Board – Airbus A380-800**  
**Report of the A380-800 EFB Subgroup**

In September 2002, Airbus requested a Joint Operational Evaluation Board (JOEB) process for the evaluation of the A380-800 (passenger aeroplane) to cover the following areas of activities:

- MMEL development;
- Flight crew type rating assessment, training and operations;
- Cabin crew type assessment, training and operations;
- A380-800 OIS (On board Information system), more commonly known as Electronic Flight Bag.
- Simulator evaluation.

As a consequence the following JOEB subgroups have been established:

- MMEL Subgroup;
- FCL&OPS Subgroup;
- Cabin Crew Subgroup;
- EFB subgroup; and
- JSET.

***This report only covers the activities of the JOEB A380-800 EFB Subgroup.***

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**Revision Record**

<b>Revision</b>	<b>Section</b>	<b>Publication/date</b>
Initial	All	20 November 2008

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**Acronyms**

<b>ACD</b>	<b>Additional Control Device</b>
<b>AFM</b>	<b>Aircraft Flight Manual</b>
<b>CCQ</b>	<b>Cross Crew Qualification</b>
<b>CDL</b>	<b>Configuration Deviation List</b>
<b>DTD</b>	<b>Document Type Definition</b>
<b>ECAM</b>	<b>Electronic Centralized Aircraft Monitoring</b>
<b>EMI</b>	<b>Electro-Magnetic Interference</b>
<b>FCTM</b>	<b>Flight Crew Training Manual</b>
<b>FCOM</b>	<b>Flight Crew Operating Manual</b>
<b>FFS</b>	<b>Full Flight Simulator</b>
<b>FMS</b>	<b>Flight Management System</b>
<b>FOCT</b>	<b>Flight Operations Consultation Tool</b>
<b>HMI</b>	<b>Human Machine Interface</b>
<b>MFD</b>	<b>Multi-function Display</b>
<b>MFTD</b>	<b>Maintenance Flight Training Device</b>
<b>NSS</b>	<b>Network Server System</b>
<b>OIS</b>	<b>On board Information System</b>
<b>OIT</b>	<b>On board Information Terminal</b>
<b>ORA</b>	<b>Operational Risk Assessment</b>
<b>OEB</b>	<b>Operational Engineering Bulletin</b>
<b>QRH</b>	<b>Quick Reference Handbook</b>
<b>TR</b>	<b>Temporary Revision</b>

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**Joint Operation Evaluation Board – EFB**

**Composition of the A380 JOEB EFB Subgroup:**

- Capt. P. Griffiths – A380 JOEB Chairman (UK CAA)
- Capt. G. Sturrock – EASA EFB focal point
- J.C.Albert: -F.DGAC
  
- Capt. J. Kling – FAA A380 FSB Chairman
- Capt. R. Tidy Transport Canada(TC) – A380 OE Chairman

Airworthiness experts, permanent members of the A380 JOEB EFB Subgroup:

- G Burtenshaw – UK CAA – A380 Flight Panel
- B.Rabiller – F-DGAC – A380 Avionics Panel
- Capt F.Fabre – F CEV – A380 Flight Panel

**Report Prepared and Submitted By:**

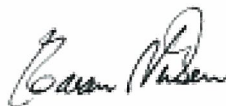


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**Captain P Griffiths**

**Report agreed by:**

**Mr E Nielsen**                      EASA – Certification, head of Flight Standards Department



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**Mr E.Nielsen**

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**Executive summary**

The European Aviation Safety Agency (EASA), Federal Aviation Administration (FAA), and Transport Canada Civil Aviation (TCCA) completed jointly the operational evaluation of the Airbus A380 On board Information System (OIS) with the Airbus application package, which includes for initial entry into service two groups of applications:

- Consultation of operational documentation
- Computation of aircraft performance.

These applications include on ground tools which allows the engineering operations staff to customize and regularly update the operational documentation.

Airport data is the responsibility of the operator. The operator is responsible for the data quality and accuracy of the runway/obstacle data.

The three Authorities have assessed the following Airbus applications:

- Operational documentation viewer: evaluated manuals include Flight Crew Operating Manual (FCOM), Master Minimum Equipment List (MMEL), Configuration Deviation List (CDL) and Flight Crew Training Manual (FCTM).
- Aircraft performance modules: Weight and Balance, Take off, In flight, Landing.

The Authorities have also assessed the Airbus recommendations for assisting the Operator in implementing the above listed applications without paper back-up, focussing on:

- The role of the administrator
- The administrator training
- The flight crew OIS training and Standard Operating procedures
- The means of mitigation for recommending operations without a paper back-up

As a consequence of this operational evaluation, the JOEB has determined that the Airbus OIS application package complies, at the manufacturer level, with the available guidance at the time of the demonstration (JAA TGL 36 and FAA AC 120-76A), the hardware being a Class 3 EFB and certified as part of the A380 initial type design.

The JOEB also determined that the Airbus recommendations and the Airbus OIS training programs developed to assist an operator in its operational approval are adequate.

**Operational Evaluation Report – EFB Subgroup**

**1. Purpose and applicability**

This JOEB report specifies recommendations to operators seeking operational approval to use the A380 On board Information System (OIS) that is considered as a class 3 Electronic Flight Bag. Findings and recommendations made in this report are consistent with the guidance contained in JAA TGL 36.

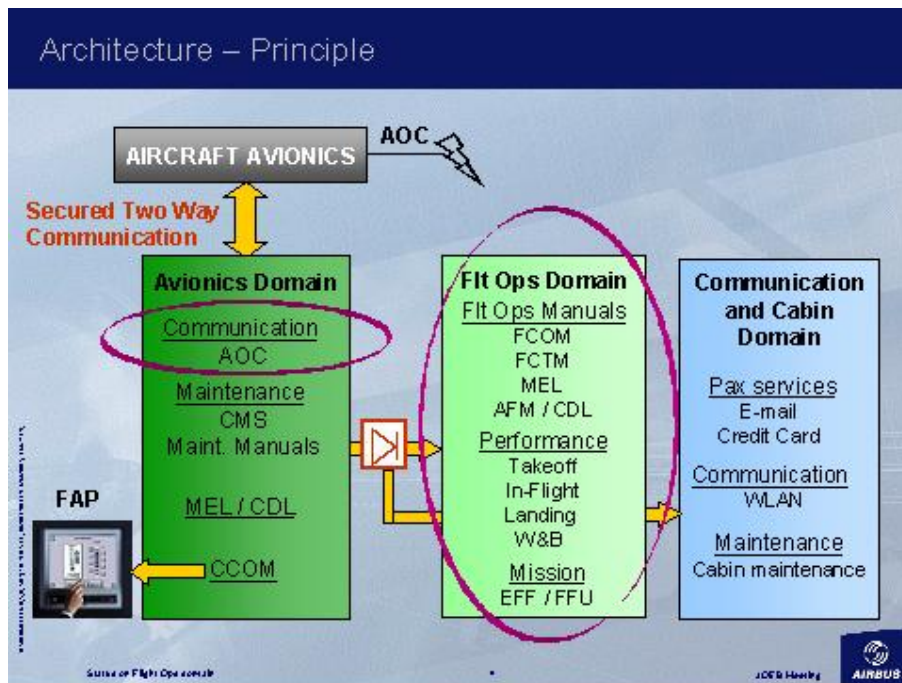
**2. Description of the A380 EFB (OIS) system**

**2.1 NSS/OIS Architecture overview**

The Airbus A380 is a large double deck transport aircraft which is equipped with an On Board Information System (OIS) to assist the crew with operating the aircraft.

The A380 OIS is installed on the Network Server System (NSS)

Basically the NSS consists of three domains, the Communication and Cabin Domain, The Flight Operations (FLT OPS) Domain and the NSS Avionics (NSS AVNCS) Domain.



The Communications and Cabin Domain will allow passengers to access their e-mail, make credit card transactions and provide a cabin maintenance function. This domain is out of the scope of the A380 JOEB EFB subgroup.

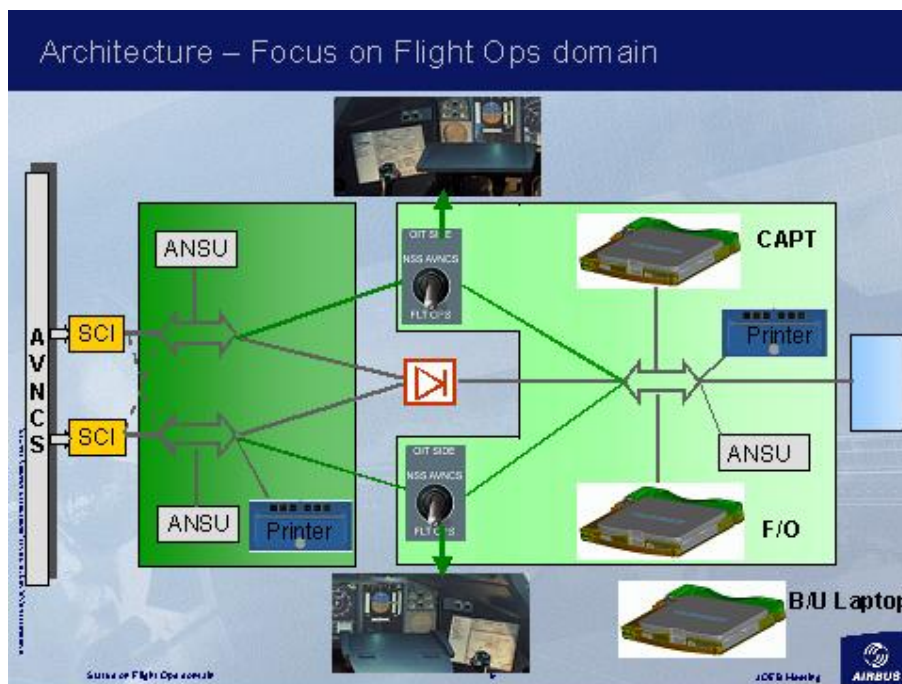
The NSS Avionics Domain hosts an AOC Communications function, a Cabin Crew Operating Manual (CCOM) and provision for an electronic logbook.



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Access to the NSS avionics domain is available to the flight crew by means of an OIT SIDE NSS AVNCS AVNCS/FLT OPS changeover switch. The aircraft avionics are protected by a Secure Communications Interface (SCI) between the NSS Avionics and the aircraft avionics.

Additionally there is a one-way diode between the NSS AVNCS and the FLT OPS domain. Through this diode, information can only flow from the NSS AVNCS side to the FLT OPS Side, or from the aircraft avionics to the FLT OPS side.



The Flight Operations Domain provides the flight crew with the functions normally associated with the flight operations library in paper form and the dispatch functions such as the load sheet and weight and balance calculations. This domain covers the major functions needed by the flight crew for safe operations and will be covered in detail in the body of this report.

### 2.2 OIS and Cockpit interfaces

The flight crew uses the On board Information Terminal (OIT) display to access and display the FLIGHT OPS or the NSS AVNCS applications. The OIT displays are located on the side of the captain's and first officer's stations.

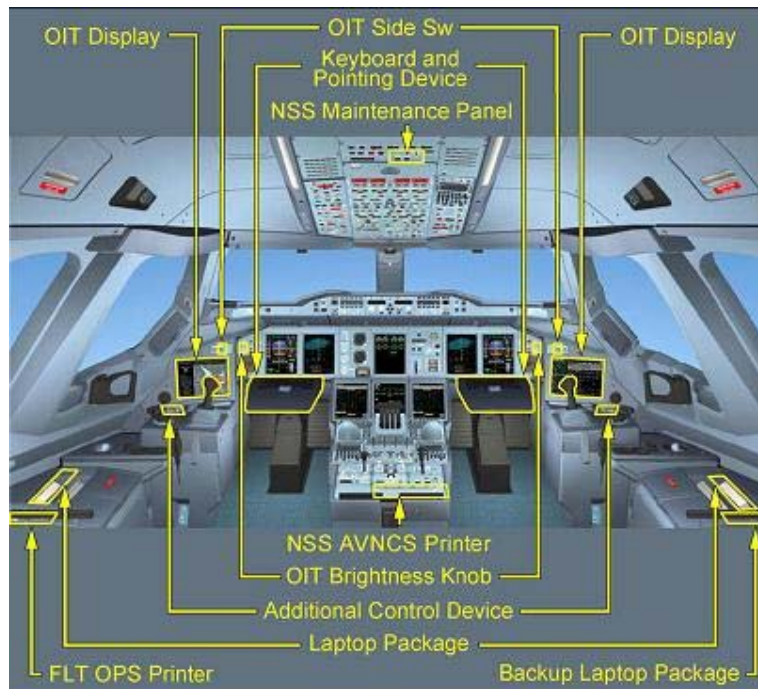
The OIT brightness knob enables each flight crewmember to turn their OIT on or off, and to adjust the brightness of their OIT screen.



The OIT belongs to the NSS AVNCS domain, and is connected to either the Avionics domain or the Flight Operational domain. A dedicated "OIT SIDE" switch enables individual selection by flight crew of the relevant domain, depending on which application he wants to use. For example FLT OPS for Flight Operations applications or NSS AVNCS for AOC application.



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Two laptop computers (CF18 Toughbooks), part of the FLT OPS domains host the flight operations applications.

These are housed in stowages adjacent to the captain and first officer's seats. The stowages connect the laptops to the system and provide electrical power to keep the laptops fully charged. The laptops can be removed by the flight crew, placed on the sliding table and used in a stand-alone mode in some failure cases. While "unstowed", the laptop remains powered and may remain connected to the network.

Interface with the laptops is through a built in keyboard on the sliding table and two additional reduced keyboards called ACD located below each OIT.



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A back up laptop stowed in the F/O lateral console is available in the case of a complete failure of the other two laptops and/or OIT. The stowage has an approved electrical supply to keep the backup laptop battery fully charged. This laptop hosts the same set of Flight Ops applications as the two other ones.

The X-OIS function enables one flight crewmember to display on his OIT the current display of the other OIT. The X-OIS function is available on the FLT OPS side only. The X-OIS function can be activated by pressing the OIS XFR key either on the ACDs or on the keyboards. By pressing again the OIS XFR key, the X-OIS function is deactivated. When a flight crewmember presses the OIS XFR key, his OIT displays the display of the other OIT and the message "X-OIS Activated" appears on his OIT.

A printer in the captain's lateral console allows documents to be printed out when required by the crew.

**Important note:**

*The NSS AVNCS domain and the NSS Flight Ops domain (host platform only) have been approved in accordance with the applicable airworthiness requirements; in particular the following aspects have been assessed:*

- *Human Factors (HF) considerations,*
- *Environmental equipment qualification (EMI)*

***This report will therefore only cover the operational aspects related to the Flight Ops applications and the use of the cockpit interfaces.***

**3. Software applications considered under this report**

**3.1 JOEB Evaluation**

The following software applications have been assessed by the JOEB. (Standard 2007- pEIS1b)

- Type A software applications
  - Flight Operations Consultation Tool (FOCT):
    - FCOM
    - MEL
    - AFM/CDL
    - FCTM
- Type B applications
  - Weight and Balance
  - Take off Performance
  - In Flight Performance
  - Landing Performance

### **3.2 Applications summaries**

#### **3.2.1 FOCT (Flight Ops Consultation Tool):**

The FOCT is a viewer of electronic documentation for the flight crew. It is a single application that displays all the required operational manuals that an airline needs to put on-board an aircraft. The manuals may consist of, but are not limited to, a Flight Crew Operating manual, a Flight Crew Training Manual, a Minimum Equipment list, airline specific operations manuals.

The FOCT is associated to ground tools that allow each airline to customize their operating manuals either from scratch or from Airbus source data. These manuals when loaded on an aircraft are under operator responsibility.

#### **3.2.2 Performance modules**

The Performance applications are available on the FLT OPS side and group the following modules:

- T.O PERF

This application computes takeoff performance data based on aircraft and environmental entries made by the flight crew.

- LDG PERF

This application computes landing performance data for dispatch or in-flight conditions, based on aircraft and environmental entries made by the flight crew.

- LOADSHEET

This application computes aircraft loading data.

- IN-FLT PERF

This application computes in-flight performance data based on aircraft and environmental entries made by the flight crew.

The Performance applications are associated with a ground tool that allows each airline to customize their operating conditions (settings). These modules when loaded on an aircraft are under operator responsibility.

### **4. Airworthiness approval**

The A380 OIS Hardware is a class 3 built in equipment and has been subject to the airworthiness approval process described in TGL 36 and FAA AC 120-76A.

Refer to A380 AFM Limitations Information Systems, that includes the following statement:

*“The Network Server System (NSS) has been approved only as a host platform (i.e. without applications installed) with regards to operational applications.*

*This airworthiness approval is based on the assumption that all applications will be developed and justified in accordance with the recommendations provided in:*

- JAA TGL36 “approval of Electronic Flight Bags (EFBs)” or AC120-76A.*

*and*

- Airbus document Guideline for Airframer Network Applications (GANA) A380 - NSS Avionics Domain ref L46D1-515.1644/2001 at the latest issue.*

*Authorization to install any application into the NSS must be obtained by the operator from the appropriate authority.”*

The laptops batteries comply with airworthiness requirements and the EMI transmissions have been checked by Airbus in accordance with Eurocae ED14 / RTCA DO 160 and confirmed not to interfere with any aircraft systems.

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Operators should apply the Airbus recommended interval between installation and removal of the battery as per the Airbus Maintenance Planning Document. Operator should also refer to the AMM for maintenance tasks related to laptop battery installation and removal.

### **5. Operational Approval**

Airbus A380 design goal was to deliver an airplane with an OIS for use without paper backup.

The JOEB therefore required Airbus to provide an Operational Risk Assessment for each application and to demonstrate the reliability and usability of the devices including crew procedures and dispatch considerations.

The operational assessment therefore consisted of the following:

- Assessment of the Airbus A380 OIS Flight Ops domain Verification and Validation strategy
- Assessment of operational risk analysis conducted by Airbus on each application;
- Assessment of Standards Operating Procedures
- Assessment of the administration procedures including administrator training;
- Assessment of the flight crew training programme; and
- An operational evaluation test and observations to confirm reliability and usability.

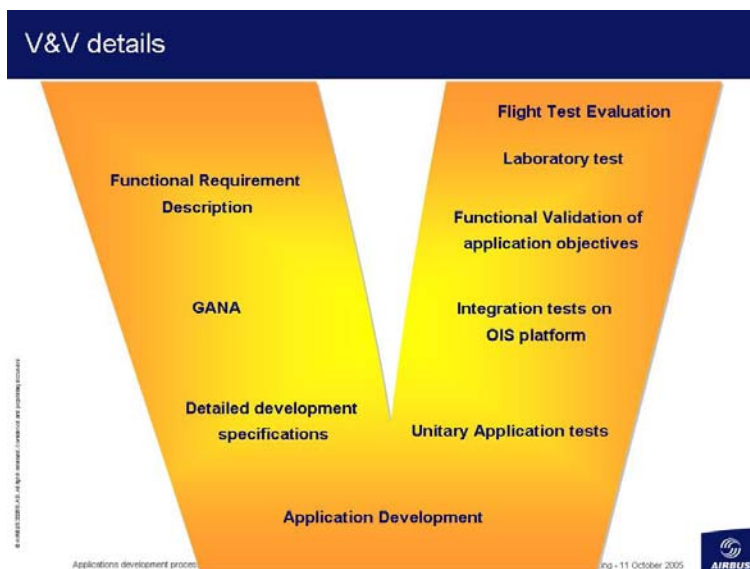
#### **5.1 Airbus A380 Flight Ops domain V&V Strategy**

The Verification & Validation (V&V) plan intends:

- To establish the strategy for the development of the Flight Ops applications
- To define the organization, responsibilities, activities and resources to achieve the strategy
- To identify the deliverables

The Compliance to the V&V plan ensures that the platform AND the applications are delivered with robustness and maturity.

The main steps of the V&V cycle can be summarized as follows:



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The detailed document titled A380 Flight Ops Domain V&V strategy (ref L46PL0601691 dated 30/07/07) has been presented to the JOEB team and found acceptable. This document is on file within EASA, and may be provided by Airbus upon request.

## **5.2 Risk Assessment for the A380 OIS**

### 5.2.1 Operational Risk Analysis

As per design objective, the A380 EIS will be without paperback-up, a full operational risk analysis was required by the JOEB team for each of the Airbus proposed application. (See list under §3.1)

The objective of the operational risk analysis (ORA) is to demonstrate that the application achieves at least the same level of integrity and availability as the “traditional” means that they would replace.

The operational risk analysis considers the following operational risks.

- Total loss of application
- Detected false output from the application.
- Undetected false output from the application.

Consequences are then defined and mitigated.

Mitigation means are processes and procedures defined to compensate each identified failure case. They are means to provide availability of the application and to ensure detection of a false output.

An ORA has been conducted for each Airbus proposed application and presented to the JOEB team for acceptance. These ORA are on file within EASA and may be provided upon request.

### 5.2.2 Performance

In the case of the Performance applications where operational data is produced for crew use the JOEB required additional assurance that the data produced was not misleading, nor inaccurate, and was consistent with the approved AFM information. They therefore sought the assistance of the certification team.

Two EASA A380 Performance panel experts were nominated, and their evaluation concentrated on OIS performance computation with an assessment of the results in comparison with the A380 AFM Approved data.

Through this evaluation a number of comments and recommendations for improvements were made by the JOEB team and taken into consideration by Airbus. During this assessment, the A380 performance panel experts explored the OIS performance data output validation process and conducted a comparison of OIS data versus PEP-Octopus approved AFM data output and no differences were noted.

### 5.2.3 Dispatch considerations

Assessment of the dispatch considerations with regards to the OIS system has been carried out by Airbus and presented for validation to the JOEB team. The aim of this document, which is on file at EASA and may be provided upon request by Airbus, is to assist the operator in developing its operations manuals and MEL.



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This OIS Dispatch Considerations document provides operational mitigation means proposed by Airbus, related to NSS-OIS failures prior to dispatch. It also describes the “next critical failure” in flight and the associated impact on operations.

This document has been elaborated based on the ATA 46 MMEL and the Airbus Standard Operating Procedures.

### **5.3 Standard Operating Procedures.**

#### 5.3.1. Procedures for use of the OIS

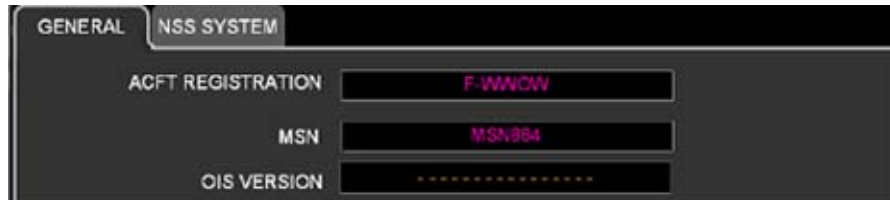
Details of the Standard Operating procedures recommended by Airbus are provided in the A380 FCOM.

The JOEB needed to be satisfied that the procedures were robust and guarded against gross errors. The SOPs therefore contain procedures for crew cross checks of any vital data and also a gross error check in relation to take off performance (See SOP extract in Appendix 3)

These procedures have been assessed during the OIS simulator evaluation sessions and found adequate.

#### 5.3.2 Flight Crew awareness of OIS revisions

An OIS Status page has been developed and provides identification of OIS version as well as aircraft identification.



Operators should ensure that the flight crew has a means to crosscheck the OIS version indicated on the OIS status page with another verified source.

### **5.4 Administration Procedures and Administrator Training.**

#### 5.4.1. Documentation (FOCT)

The airline manuals' administrator receives the package from Airbus. He is in charge of installing and distributing the data to the airline end users. He is the only contact between the operator and Airbus within the airline organisation.

The manuals administrator module, delivered with the data, contains a comprehensive tool to allow the airline administrator to:

- Customize (modify or add to) the content of the manuals (limited to authorized domains)
- Create a company specific manual
- Create the global data package to be distributed to the airline end users

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The airline administrator modifies the Airbus Manuals content and is responsible to ensure data consistency with other data source in the cockpit, e.g. to modify the normal check list displayed on the ECAM according to changes in the FCOM.

Manuals' updating process can be done in two different ways:

1. A complete issue of the airline fleet manual including the revised data is dispatched to the airline administrator as detailed above at a given date.
2. Only the revised data, including TR and OEB, are sent to the airline administrator who is in charge of accepting the modifications and distributing to the end users.

### **5.4.2. Performance**

The airline administrator receives the package from Airbus. He is in charge of installing and distributing the data to the airline end users. He is the only contact between the operator and Airbus within the airline organisation.

The administrator module, delivered with the Performance Applications, contains a comprehensive tool to allow the airline administrator:

- To create the global data package to be distributed to the airline end users;
- To define the aircraft fixed data;
- To customise the airline policies such as:
  - Units (°C or F°; Kt or m/s);
  - The list of output parameters on the detailed result page
  - Other general options such as: credit for reverse thrust, airport code selection (with ICAO or IATA code), runway modifications (enabled or disabled), accounting for crosswind limitation (enabled or disabled),
- And to integrate the runway/obstruction data in the module. These data are directly managed by the airline either on its own or by obtaining them from third parties. These remain under the complete and sole responsibility of the airline.

### **5.4.3. Administrator Training**

Details of the Airbus Administrator Training are included in Appendix 1.

The JOEB assessed the Airbus Administrator Training as adequate. Company personnel should be trained at least to this standard whether by attending training at Airbus or in house training to a similar standard accepted by Airbus.

## **5.5 Flight Crew Training**

Knowledge about OIS and use of its applications is fully integrated into, the A380 type rating courses.

A dedicated session relative to OIS is organised as part of the ground course. The objectives of this session are:

- To present the Network Server System (NSS) and On board Information System (OIS) architecture
- To develop NSS/OIS basic know-how
- To teach how to access the OIS operational library
- To introduce the practical use of OIS performance applications



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Then the OIS is used during practical training on MFTD and FFS, as its use is part of SOPs. Use of the MMEL, as well as computation of Performances for Take-off and landings are conducted on every FFS session allowing the pilot at the end of the A380 type rating process to be at ease with its basic functions. Practical use of additional functions, which are airline dependent, would be conducted under the Operator responsibility during the Line Flying Under Supervision (LIFUS) or using dedicated training session as necessary.

## **5.6 Operational Evaluation**

### **5.6.1 Operational evaluation by A380 JOEB EFB Subgroup members**

The A380 OIS evaluation started in June 2004 with a series of 3 meetings during which Airbus presented the OIS architecture, as well as the various applications, their development and V&V process, and the associated administrator functions and training.

This was followed by 2 additional meetings coupled with simulator evaluations in September 2006 and July 2007.

#### September 2006 evaluation:

The evaluation was based on use of the Step 1 configuration for OIS intended for Singapore Airlines Entry Into Service. This configuration makes use of two Panasonic CF-18 Tough Books running the following applications:

- Weight and Balance (WBA)
- Take-Off Performance (TOPA)
- In-Flight Performance (IFPA)
- Landing Performance (LDPA)
- Minimum Equipment List (MEL)
- Flight Crew Operating Manual (FCOM)
- Aeroplane Flight Manual (AFM)

Prior to conducting the simulator session, a training session was conducted using the Tough Books on the desk. An On-board Information Terminal (OIT) comprising table keyboard and side console display was installed on the aircraft for Step 1, but its use was limited to AOC applications. It was assessed in conjunction with the OIS laptop within the global scenario played.

The purpose of the evaluation was to assess the ease of use and effectiveness of the Standard Operating Procedures (SOP) for the OIS. Although used in a Step 1 configuration, it was understood that the SOP have been developed to be applicable to the Step 1 and 3 configurations i.e., Class 1 and Class 3 EFB, recognising that the Class 1 EFB may be used as a back-up under certain failure conditions.

The evaluation consisted of a simulated flight from LFPG (Paris Charles de Gaulle) to LFBO (Toulouse). Load Sheet and flight plans were provided to the flight crew in a representative airline scenario, including a last minute ACARS load sheet and late runway change. System failures were played to further assess ease of use of the EFB during the flight. The scenario involved use of the available EFB applications. Two independent evaluations were conducted involving 4 pilots from the evaluation team and an Airbus Test Director.

The JOEB, at the end of this evaluation session, concluded that:

- OIS is a significant improvement over the paper documentation, including the QRH. OIS is easier to use and has the potential to reduce the chances of a crew error.

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- The concept of the gross-error check is sound. However, it should not be considered as a substitute for an independent cross-check.
- Airbus was requested to consider JOEB team members comments for improvement
- A further evaluation at a point when the evaluators are more familiar with the aircraft and the SOPs will be considered by the JOEB.

July 2007 evaluation:

The evaluation was the second assessment made on OIS. The evaluation used the PIS configuration intended for first customer EIS, configuration name P EIS 1a. It made use, as for the previous evaluation, of two Panasonic CF-18 Tough Books running the following applications:

- Weight and Balance (WBA)
- Take-Off Performance (TOPA)
- In-Flight Performance (IFPA)
- Landing Performance (LDPA)
- Minimum Equipment List (MEL)
- Flight Crew Operating Manual (FCOM)
- Aeroplane Flight Manual (AFM)

Prior to conducting the simulator session, a detailed review of comments made in the previous evaluation took place. Airbus presented all improvements embedded into the OIS standard pEIS1.a, and a training session was conducted using the Tough Books on the desk

The evaluation consisted of a simulated flight from LFBO (Toulouse) to SBGL (Rio de Janeiro), and a flight preparation from SBGL to LFBO with an inoperative OIS item. Both flights allowed the use of performance, load sheet, AOC and operations library applications. A preliminary aircraft load sheet and flight plans were provided to the flight crew in a representative airline scenario, followed by a last minute final load sheet over ACARS and an ATIS change. System failures were played to further assess ease of use of the OIS during the flight. As for the first evaluation, two independent sessions were conducted involving 4 pilots from the evaluation team and an Airbus Test Director.

The evaluation demonstrated the improvements that Airbus has made in the OIS in terms of performance, function and operational considerations such as training and procedures, since the 2006 evaluation.

It was recognized that the engineering simulator called “aircraft 0” was not a fully representative environment and that limitations existed within the simulator. The representation was deemed adequate for the purpose of the evaluation. However it was identified that an aircraft visit would be needed to confirm hardware installation and assess mechanical issues such as racking and stowage. *(Note: This was finally checked on A380 aircraft at the occasion of the initial line flying under supervision of Airbus first Customer.)*

Certain training issues were identified, including adjustments to certain SOPs (e.g; OIT reset) and emphasis on the use of the keyboard, and have been since addressed by Airbus.

The performance applications had been evaluated by the A380 Performance panel (refer to § 5.2.2). Comments from the A380 Performance panel for consideration by the JOEB EFB team were satisfactorily addressed in the frame of meeting discussion and simulation evaluation conducted

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In summary the JOEB team concluded that operation of the A380 OIS at configuration pEIS1.a was acceptable for entry into service. The JOEB recommended that a follow-up of the Airbus generic application package be ensured.

### **5.6.2 Evaluation during flight crew type rating assessment process**

As explained under § 5.5, OIS training is fully integrated into the A380 type rating programs.

The assessment of the flight crew training was carried out by a combined team from EASA, the FAA and Transport Canada.

This included 4 evaluators undergoing special (T2) training, 6 team members with no previous Airbus fly by wire type experience undergoing the full A380 transition course, 4 team members undergoing an A330/A340 to A380 Cross Crew Qualification (CCQ). In addition the T2 evaluators observed key points of the training of the other JOEB team members. This included an observation of a LOFT exercise, a simulator competency check and items of the competency check repeated in the flight test aircraft. The team members completed the aircraft checks using the OIS to make performance calculations including normal, abnormal, and emergency situations as well as situations using the MEL considerations. All felt that the training received adequately prepared them to operate the aircraft.

For more detail of the flight crew training, refer to A380 JOEB Report FCL/OPS Subgroup.

Following completion of the training, and after skill test, all JOEB team members were participating in A380 base training flights. The team members used the OIS to operate the aircraft during base training and when positioning from Toulouse to the training airfield. A specific flight was also set up from Toulouse to Chateauroux with diversion to Frankfurt and return to Toulouse.

### **5.6.3 Observation of initial Customer training and monitoring of OIS reliability**

This phase was aimed at the demonstration of the reliability and usability of the A380 OIS.

To this effect, the A380 JOEB chairman was invited to participate in initial Customer sector training on the A380, for observation of the use of the OIS by airline crews. (8 sectors)

In addition and with agreement of the first A380 operator a dedicated questionnaire was set up to monitor the OIS reliability. (refer to Appendix 4) This questionnaire was filled in by crews during their line training and a similar form was used during the first commercial flights between Singapore and Sydney.

The first monitoring period lasted from July to end of September 2007, where 330 line sectors were conducted with a total of 337 hours flying time.

The second phase of the monitoring period started on 25 October 2007 on the commercial flight conducted daily between Singapore and Sidney.

By late January 2008, 161 flights for a total of 1170 hours were accumulated, without any major OIS failure.

There were no reported failures requiring the use of the back up laptop.

JOEB and EASA were satisfied by the OIS reliability.

## **6. Operational compliance summary**

In order to assist Airbus Operators for compliance with both JAA 36 and FAA AC 120-76A, a compliance summary matrix enclosed for reference in Appendix 2 has been set up.

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This compliance matrix has been validated by the JOEB and includes reference to all supporting documents that have been presented to JOEB and validated during the A380 Operational Evaluation process.

This compliance matrix and the associated documents will be made available to Operators by Airbus upon request.

## **APPENDIX 1**

### **A380 E.doc Administration for Flight Operations Engineers** **Airbus training course content**

#### **Description**

The aim of this course is to provide the airline's flight operations specialists with the necessary information to enable them to prepare their own operations manuals.

#### **Pre-requisites**

Target population: any person within the airline who is involved in the preparation of operations manuals (i.e. OIS Administrators, Flight Ops Engineers, Performance Engineers, Flight Ops Authors, Technical Data Authors)  
Fluency in English

#### **Duration**

FOSP course: 5 days  
FCOM course: 4 days + 1 (optional)  
AFM-CDL course: 2 days  
MMEL-MEL course: 2 days

#### **FOSP Course – 5 working days**

##### **Introduction to structured information – 1 working day**

- Objectives of the course
- Structured documentation philosophy
- XML standard overview

##### **Airbus Flight Operations data management – 4 working days**

- Overview of the Airbus Flight Operations documentation structure
  - FCOM / CCOM
  - MMEL / CDL
  - AFM
- Data administration
  - Organization & workflows
  - Data Loading
  - Data revision mechanisms
  - Approval workflow
  - Data Publishing & dispatch
  - FOCT customization
  - How to manage Airline's specific documents
- Data authoring
  - Navigation and customization
- Conclusion

**FCOM Course – 5 working days**

**FCOM Authoring Course – 4 working days**

- Objectives of the course
- Introduction to the OIS
- Introduction to the FCOM
- Presentation of the FCOM
- The information layer concept
- Introduction to the “contextualisation” of the FCOM
- Introduction to the flight ops controlled language
- FCOM configuration management
- Management of FCOM revisions
- Introduction to FCOM customisation
- Introduction to the ECAM customization and consistency with the FCOM
- Writing the FCOM (1): the FCOM Document Type Definition (DTD) and structure
- Writing the FCOM (2): the graphics
- Writing the FCOM (3): the links with external applications
- Conclusion

**Controlled Language Course (optional) - 1 working day**

- Objectives of the course
- Introduction to the Origins of Controlled Language and its Team Players
- Introduction to the Controlled Language Tools
- Use of Dictionary
- Use of the Writing Guide
- Practical Short Examples (class exercise)
- Practical Example (Group Exercise)
- Conclusion

**AFM-CDL Course – 2 working days**

- Objectives of the course
- Introduction to the OIS
- Introduction to the AFM & CDL
- Presentation of the AFM
- Presentation of the CDL
- AFM & CDL configuration management
- Management of AFM & CDL revisions
- Introduction to AFM & CDL approval process and marking
- Introduction to AFM & CDL customisation
- Writing the AFM & CDL (1): the AFM Document Type Definition (DTD) and structure
- Writing the AFM & CDL (2) : the graphics
- Writing the AFM & CDL (3) : the links with external applications
- Conclusion

**MMEL – MEL Course – 2 working days**

- Objectives of the course
- Introduction to the OIS
- Introduction to the MMEL-MEL
- Presentation of the MMEL
- The information layer concept

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- MMEL configuration management
- Management of MMEL revisions
- Introduction to MMEL approval process and marking
- Introduction to MMEL–MEL customization
- Writing the MMEL-MEL (1): the MMEL-MEL Document Type Definition (DTD) and structure
- Writing the MMEL-MEL (2): the graphics
- Writing the MMEL-MEL (3): the links with external applications
- Conclusion

## **APPENDIX 1 Cont'd**

### **A380 LPC Administrator Course Performance** **Airbus training course content**

#### **Description**

The aim of this course is to provide Flight Operations Engineers with the necessary knowledge to administrate and customize the OIS performance (Takeoff, Landing, In-Flight) and Weight and Balance applications.

#### **Pre-requisites**

Target population is Performance or Weight and Balance Engineers familiar with performance or weight and balance calculation techniques. It is recommended, but not mandatory, to previously attend a A380 Performance Engineer course or a A380 Weight and Balance Engineer course

Fluency in English

#### **Duration**

OIS Performance Administrator: 3 days

OIS Weight and Balance Administrator: 2 days

#### **Course content**

##### **1st module: OIS Performance Administrator - 3 working days**

The OIS general philosophy, environment and dataflow

Presenting and practicing on the OIS takeoff and landing applications:

- User mode presentation
- Airport manager presentation
- Administrator mode presentation: user interface customization, aircraft fleet definition, airport data management, general data customization
- 

Presenting and practicing on the OIS in-flight application:

- User mode presentation
- Administrator mode presentation: user interface customization, aircraft fleet definition, general data customization

##### **2nd module: OIS Weight and Balance Administrator - 2 working days**

The OIS general philosophy, environment and dataflow

Presenting and practicing on the OIS weight and balance application:

- User mode presentation
- LTS software presentation: cabin layout customization and OIS aircraft data files generation
- Administrator mode presentation: user interface customization, aircraft data customization, operational data customization, configuration codes definitions



## **A380 OIS Compliance Matrix**

### **Technical Report**

<i>REFERENCE</i>	L46RP0724725
<i>A/C APPLICABILITY</i>	A380
<i>ATA CHAPTER</i>	46
<i>CUSTOMER</i>	
<i>CONFIDENTIALITY</i>	

**SUMMARY:**

The JOEB A380 Compliance matrix document provides a summary of all elements demonstrated by Airbus against JAA TGL 36 and FAA AC 120-76A concerning the initial Airbus application package. It also provides reference to all documents provided for this for this compliance.

The approved standard of applications correspond to FOA (Flight Ops Application) V2.2 and contains the following applications:

- Flight operations consultation tools (for Ops manuals) (V2.8)
- Takeoff (V2.3)
- Landing (V2.3)
- In-Flight (V2.3)
- Loadsheet (V2.3)

Note: The documents referenced here-after are those provided to the JOEB during the generic approval process, and may not necessarily reflect the latest revision of the documents. Please contact Airbus for the latest available issue, if required.

<i>KEYWORDS</i>	
<i>RELATED DOCUMENTS</i>	

JAA TGL 36	FAA AC 120-76A	Proposed means of Compliance
Hardware classification: § 5.1.3 Class 3 §6.1.3	Hardware classification § 7.a 3 Class 3 §8.c (Page 3 & 5)	Certified as part of A380 TC
Software Application Classification § 5.2 §6.2	Software Application Classification §7.b §8.d §8.c (Page 3,4,5,6,7)	Review of Airbus proposed Applications took place in June 2004. The JOEB has agreed upon the following classification: <ul style="list-style-type: none"> <li>Type A : Documentation: CDL, FCOM, MMEL</li> <li>Type B : Performance : W&amp;B, Take Off, In flight, Landing</li> </ul>
Certification Documentation AFM§6.1.4 a)	Need for approved Manuals §12.k (Page 22)	AFM Statement regarding NSS/OIS limitations to be found: See AFM, LIMITATION chapter, ATA 46 – NSS.
Certification Documentation Guidelines for EFB Application Developers §6.1.4 b)		Refer to the latest available version of GANA
EFB Software applications Specific considerations for Performance §6.2 b)		Specific embedded function within the performance applications to check compliance with AFM. In addition a review with Airworthiness Performance experts has been conducted on July 2007, to provide evidence that EFB derived performance calculations provides results within AFM limitations
Operational Risk Analysis ORA §7.1	Risk mitigation §9 (Page 10)	ORA's have been reviewed and validated with the JOEB for the following applications: <ul style="list-style-type: none"> <li>Documentation: CDL, FCOM, MMEL</li> <li>Performance: W&amp;B, Take Off, In flight, Landing</li> </ul> <a href="#">Refer to compliance summary below.</a>

JAA TGL 36	FAA AC 120-76A	Proposed means of Compliance
Dispatch Considerations §7.1	Operational Approval Authorization §12 (q) (6) page 24	See A380 MMEL and the specific Dispatch consideration document <a href="#">OIS_STL_L4625D07016676_Dispatch_Considerations_v1.0.pdf</a>
HMI assessment for type A & B Software applications §7.2 Appendix D of TGL 36	HMI assessment for type A & B Software applications §10 (Page 11)	<ul style="list-style-type: none"> <li>• Human/machine interface</li> <li>• Legibility of text</li> <li>• Approach/departure and navigation chart display</li> <li>• Responsiveness of application</li> <li>• Off-screen text and content</li> <li>• Active regions</li> <li>• Managing multiple open applications and documents</li> <li>• Messages and the use of colors</li> <li>• System error messages</li> <li>• Data entry screening and error messages</li> </ul> <p>HMI considerations are part of GANA, see above.</p> <p>Proposed Airbus applications have been presented in detail during various meetings, and have been assessed in real time scenarios on A380 simulator.</p> <p><a href="#">Refer to compliance summary below.</a></p>
Flight Crew Operating procedures: procedures for using EFB systems with other Flight deck systems §7.3.1	Procedures for using EFB systems with other Flight deck systems §10, f (1) (Page 15)	Refer A380 FCOM SOP, Task Sharing
Flight Crew Awareness of EFB Software/database revision	Flight Crew Awareness of EFB Software/database revision	Covered by Procedure. Identification possible via OIS Status page.

JAA TGL 36	FAA AC 120-76A	Proposed means of Compliance
§7.3.2	§10, f. (2)	
Procedure to Mitigate and /or control workload §7.3.3	Flight Crew workload §10.c §10.f.(3) (Page14 & 15)	Covered by SOP see above.
Defining Crew responsibility for performance calculations §7.3.4	Defining responsibilities for performance calculations §10.f.(4) (Page 15)	Partially covered by SOPs, but Operator specific
Role of the Administrator And administrator training §7.5	Configuration control §12.d Data Base update process §12.e Software revision process §12.f Training §12.h	<p>Operator Specific, but generic definition of Administrator role provided by Airbus concerning documentation and performances applications. It also includes the definition for EFF, application that will be provided at a later stage. See:</p> <p>Administration workflows for documentation and performance are also being provided by Airbus for assistance to A380 Customers. See <a href="#">SWS_RP0510018_NSS-Uploading-Workflows_v2.0a.pdf</a></p> <p>Administrator Training:</p> <ul style="list-style-type: none"> <li>• Documentation <a href="#">E.doc Administration for Flight Operations Engineers.pdf</a></li> <li>• Performances (<a href="#">10_TOPA_Perfo Admin\A380F_admin_perf_course.pdf</a>)</li> </ul>
Flight Crew Training §7.6	Pilot Training Program §12.i (Page	<ul style="list-style-type: none"> <li>• An overview of the system architecture</li> <li>• Pre-flight checks of the system</li> <li>• Limitations of the system</li> <li>• Specific training on the use of each application and the conditions under which the EFB may and may not be used</li> <li>• Restrictions on the use of the system, including where some or all of</li> </ul>

JAA TGL 36	FAA AC 120-76A	Proposed means of Compliance
		<p>the system is not available</p> <ul style="list-style-type: none"> <li>• Procedures for cross checking of data entry and computed information</li> <li>• Phases of flight when the EFB system may and may not be used</li> </ul> <p>All the above is included as part of the A380 Type Rating course in relationship to Airbus documentation and performance applications. A380 Type Rating course have been validated by JOEB.</p>
Operational Evaluation Test §7.7.2	Operational Approval Process §12.j (2) §12 (Page 17)	2 LOFT sessions have been conducted with JOEB to validate the use of the EFB under operational conditions including normal and abnormal conditions.
Operational Compliance Summary §7.8	Operational Approval Authorization §12 page 23	<ul style="list-style-type: none"> <li>• EFB platform/hardware description</li> </ul> <p><a href="#">OIS_Hardware_status.pdf</a></p> <ul style="list-style-type: none"> <li>• Description of each software application to be included in the approval</li> </ul> <p> <a href="#">OIS_Applications_Status.pdf</a>  <a href="#">FOCT_FCOM_JOEB_presentation_Apr_06.pdf</a>  <a href="#">IN FLIGHT Perf.pdf</a>  <a href="#">JOEB_presentation_FOCT_MMEL_Jun_06.pdf</a>  <a href="#">JOEB_presentation_FOCT_CDL_Jun_06.pdf</a>  <a href="#">LDG PERF.pdf</a>  <a href="#">LOAD SHEET.pdf</a>  <a href="#">T.O. PERF.pdf</a> </p> <p>In addition A380 Operators are provided with a user manual for each performance application and a user guide for Documentation (FOCT).</p> <p>Quick presentations of ORA:</p>

JAA TGL 36	FAA AC 120-76A	Proposed means of Compliance
		<p> <a href="#">ORA FCOM quick presentation.pdf</a>  <a href="#">ORA MMEL quick presentation.pdf</a>  <a href="#">ORA CDL quick presentation.pdf</a>  <a href="#">ORA TOPA quick presentation.pdf</a>  <a href="#">ORA IFPA quick presentation.pdf</a>  <a href="#">ORA LDPA quick presentation.pdf</a>  <a href="#">ORA WBA quick presentation.pdf</a> </p> <ul style="list-style-type: none"> <li>• Risk analysis summary for each application and mitigation means put in place</li> </ul> <p> <a href="#">STLX L46PR0603781 ORA FCOM v4.pdf</a>  <a href="#">STLX L46PR0606589 ORA MMEL v3.pdf</a>  <a href="#">STLX L46PR0606621 ORA CDL v3.0.pdf</a>  <a href="#">STLX L46D06014133 ORA IFPA v4.pdf</a>  <a href="#">STLX L46PR0606698 ORA WBA v3.pdf</a>  <a href="#">STLX L46PR0603763 ORA TOPA v4.pdf</a>  <a href="#">STLX L46PR0603762 ORA LDPA v4.pdf</a> </p> <ul style="list-style-type: none"> <li>• Human factor assessment for the complete EFB system, human machine interface and all software applications <ul style="list-style-type: none"> <li>Pilot workload in both single-pilot and multi-crew flown aircraft</li> <li>Size, resolution, and legibility of symbols and text</li> <li>For navigation chart display: access to desired charts, access to information within a chart, grouping of information, general layout, orientation (e.g., trackup, north-up), depiction of scale information.</li> </ul> </li> </ul> <p>Demonstrated during JOEB simulator evaluation for initial Airbus application package, to be demonstrated at a later stage for future applications like Navigation Charts.</p>

JAA TGL 36	FAA AC 120-76A	Proposed means of Compliance
		<ul style="list-style-type: none"> <li>• Training</li> </ul> <p>OIS Flight Crew training fully included as part of A380 type rating course</p> <p> <a href="#">SWD4 UG0500517 TOPA User Manual v1.1.pdf</a>  <a href="#">SWD4 UG0500535 LDPA User Manual v1.1.pdf</a>  <a href="#">SWD4 UG0500536 IFPA User Manual v1.1.pdf</a>  <a href="#">SWD4 L46UG0500543 WBA User Manual v1.pdf</a>  <a href="#">SWD4 UG0500517 UserGuide FOCT.pdf</a> </p> <ul style="list-style-type: none"> <li>• EFB Administrator qualification</li> </ul> <p> <a href="#">STLX L46PR0609952 Administrator Role Definition v1.0.pdf</a>  <a href="#">SWD4 UG0500313 Performance Administration User Manual v1.pdf</a> </p>

## APPENDIX 3

### SOP extract relative to OIS

#### Preliminary Cockpit preparation :

#### SOP: Preliminary Cockpit Preparation

- OIS preparation (1)

<b>ON BOARD INFORMATION SYSTEM (OIS)</b>			
LAPTOP selector .....	ON	BOTH	
BACKUP LAPTOP .....	CHECK INSTALLED	CM2	
OIT BRIGHTNESS .....	AS RQRD	BOTH	

- Start laptops as early as possible
- Back/up laptop not started

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OIS- SOP



#### SOP: Preliminary Cockpit Preparation

- OIS preparation Preliminary TO Perf data

<b>PRELIMINARY PERFORMANCE DETERMINATION</b>			
Compute the preliminary performance data in accordance with the technical condition of the aircraft and/or any other criteria that may impact the performance data (e.g. NOTAM, runway condition, aircraft configuration).			
AIRFIELD DATA .....	OBTAIN	BOTH	
• If dispatch under MEL or CDL and in accordance with the logbook:			
MEL ITEMS (as relevant).....	CHECK ACTIVATED MEL ITEMS	BOTH	
CDL ITEMS (as relevant).....	ACTIVATE CDL ITEMS	BOTH	
OIS PRELIMINARY TAKEOFF PERF .....	COMPUTE AND CROSSCHECK	BOTH	

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OIS- SOP





## SOP: Preliminary Cockpit Preparation

- OIS preparation – Recommendations (FCTM)

### PRELIMINARY PERFORMANCE DETERMINATION



- First preliminary takeoff performance calculation during preliminary cockpit preparation:
  - ▶ Independent calculation by both CM1 and CM2
  - ▶ Crosscheck results
- Independent preliminary calculation to prevent bias confirmation errors
- Lower workload in this phase with Captain available
  - ▶ Both OIT ready for final takeoff performance computation if last minute change
- Provide an order of magnitude

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OIS- SOP



### Cockpit preparation :

## SOP: Cockpit Preparation

- Takeoff perf data

### TAKEOFF PERF DATA

PRELIMINARY TAKEOFF PERF DATA IN ..... INSERT PF  
FMS

- Preliminary data inserted in MFD FMS (PF)
  - ▶ Follow the cursor jump sequence during FM Init

### TAKEOFF PERF DATA CROSSCHECK

FMS INITIALIZATION ..... CROSSCHECK PNF  
*When the FMS is initialized , the PNF crosschecks with the OIS takeoff performance data the takeoff performance data entered in the FMS by the PF .*

- PNF crosschecks FMS entries based on his OIS preliminary computation (also crosschecked)

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OIS- SOP



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**Before pushback or Start**

**SOP: Before pushback or start**

- Loadsheet

<b>LOADSHEET</b>		
FINAL LOADSHEET	.....	CHECK BOTH
FUEL ON BOARD	.....	CHECK BOTH
ZFW / ZFCG in FMS	.....	CHECK/REVISE PF
ZFW / ZFCG in FMS	.....	CROSSCHECK PNF
LOADSHEET TOCG AND ECAM GWCG	.....	CROSSCHECK BOTH
ECAM GWCG	.....	CHECK WITHIN OPERATIONAL LIMITS BOTH

- Check CG and fuel



**SOP: Before pushback or start**

- Loadsheet

**OIS Loadsheet**

**Computerized Loadsheet**

<b>TAKEOFF DATA</b>		
FINAL OIS TAKEOFF DATA .....	CONFIRM or RECOMPUTE	BOTH
FMS TAKEOFF DATA .....	CHECK / REVISE AS REQUIRED	PF
<i>The PF checks or revises the takeoff data in the MFD FMS ACTIVE / PERF page T.O. panel.</i>		
REVISED FMS TAKEOFF DATA .....	CROSSCHECK	PNF
<i>The PNF crosschecks the takeoff speeds and the flexible temperature. The flight crew should pay particular attention in determining the takeoff configuration.</i>		

- | <b>TAKEOFF DATA</b>  |                            |      |  |
|--|----------------------------|------|--|
| FINAL OIS TAKEOFF DATA .....   | CONFIRM or RECOMPUTE       | BOTH |  |
| FMS TAKEOFF DATA .....   | CHECK / REVISE AS REQUIRED | PF   |  |
| <i>The PF checks or revises the takeoff data in the MFD FMS ACTIVE / PERF page T.O. panel.</i>   |                            |      |  |
| REVISED FMS TAKEOFF DATA .....   | CROSSCHECK                 | PNF  |  |
| <i>The PNF crosschecks the takeoff speeds and the flexible temperature.</i>                      |                            |      |  |
| <i>The flight crew should pay particular attention in determining the takeoff configuration.</i> |                            |      |  |

- 016-500

- Takeoff data
- Final takeoff performance calculation
  - ▶ Based on final loadsheet
  - ▶ Not systematic
    - To be run only when final data different from initial data
    - If no change, both sides already OK from preliminary preparation
- Ensure both sides are up to date with latest data if runway change / conditions during taxi

-

Taxi:

## SOP: Taxi

- Takeoff data

### TAKEOFF DATA/CONDITIONS

If the takeoff data has changed, or in the case of a runway change, prepare updated takeoff data and recompute takeoff performance, as appropriate.

- New takeoff data if takeoff conditions / runway changed
  - ▶ Using multiple runway selection, or
  - ▶ Launching new computation (PNF)
    - Crosscheck to be made (PF)
  - ▶ New entries in FMS (PNF)
    - Crosscheck to be made (PF)
- Whoever is PNF (CM1 or CM2), last changes based on latest and up to date takeoff data

OPS- SOP



Descent preparation :

## SOP: Descent preparation

- Landing Performance

### LANDING PERFORMANCE

Compute the landing performance if:

- No preliminary landing performance was established at departure, e.g. landing performance application (LDPA) initialized with the destination airport only, or
- Landing conditions have changed, e.g. due to weather conditions or in-flight failure affecting the performance.

LANDING PERFORMANCE ..... CALCULATE PNF

- Landing performance based on actual aircraft condition
- As required, store landing performance results in EFF

OPS- SOP



- O/S

<b><u>ON BOARD INFORMATION SYSTEM (OIS)</u></b>		
OIT <sub>s</sub> .....	OFF	BOTH
<i>Both OIT<sub>s</sub> should be switched off.</i>		
LAPTOP selector .....	OFF	BOTH
<i>Switch off all laptops only if the aircraft is left unattended.</i>		
<i><u>Note:</u> The Network Server System ( NSS ) automatically shutdowns at aircraft power down.</i>		

- All laptops to be switched off, including backup laptop (if used during the flight (OIS 2a))

## APPENDIX 4

### A380 OIS LOGSHEET

**Please, fill in this form for each sector and if no malfunction report behaviour satisfactory in comment box.**

**FLT NBR**

**BT** ☐

**IOE** ☐

**DATE**

**Sector:**

#### PHASE OF FLIGHT

FLIGHT PREPA ☐ TO/CLB ☐ CRZ ☐ DESC ☐ AFTER FLIGHT ☐

☐ **LAPTOP(S) CRASH**

WHICH ONE(S) ?

IF ALL CRASH: WAS BACK UP QRH USED ☐ Y ☐ N

WAS OTHER MEANS USED ?

☐ DID YOU TRY TO REBOOT THE LAPTOP ☐ Y ☐ N

☐ **NO DISPLAY AVAILABLE ON OIT**

WHICH ONE(S) ? CM1 ☐ CM2 ☐

BACK UP LAPTOP USED ? ☐ Y ☐ N

☐ **OIS CAPT (F/O) OIT FAULT PROCEDURE APPLIED ?**

SUCCESSFULLY ? ☐ UNSUCCESSFULLY ? ☐

☐ **KEYBOARD NOT OPERATIVE** CM1 ☐ CM2 ☐

☐ **ADDITIONAL CTL DEVICE (ACD) NOT OPERATIVE** CM1 ☐ CM2 ☐

☐ **NO CAPACITY TO ACCESS FLT OPS**

☐ **AN APPLICATION CANNOT START OR DOES NOT OPERATE**

WHICH ONE ?

☐ **AN APPLICATION DOES NOT OPERATE NORMALLY**

WHICH ONE ?

☐ **ERROR MESSAGE DISPLAYED**

PREVENTING USE OF APPLICATION ? ☐ Y ☐ N

WHICH APPLICATION ?

Comments:

Instructor signature: