AFI Flight Operations Safety Awareness Seminar (FOSAS)

EFB, FlySmart and eQRH

ICAO/Airbus
Nairobi, 19-21 Sep. 2017
Introduction

EFB, what is it?

How to implement EFB?

Next steps
Introduction

Situation we want to avoid...
What is in a pilot’s flight bag?

Flight Crew uses a lot of paper:

- Aircraft documentation
- Data for loading the aircraft (Weight & Balance)
- Aircraft data for performance determination
  - Navigation charts
  - In-flight data logging
- Airline documentation, security forms
  - Logbook
Digitalization: EFB Solution
Introduction
EFB, what is it?
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What is an EFB?

**EFB**
Electronic Flight Bag

A set of hardware and software applications enabling **paper elimination and improving cockpit operations**.

- Optimized flight preparation and operations
- Optimized aircraft computations
- Reduced aircraft weight and costs
- Enabled transition to full digital operations

Traditional paper

Less Paper in Cockpit (LPC)

FlySmart with Airbus
EFB Hardware

**Ex-class 1**
«Portable device»

**A320**
**A330**
**A350**
**A380**

**Ex-class 2**
«Portable mounted devices»

**A320**
**A350**

**Ex-class 3**
«Aircraft installed Devices»

**A380**
**A330**

**Flight Operations solutions** for Flight Crew

**Ground Applications** for customization and administration

**Maintenance solutions:** A380, A350 XWB & A330/340

**Cabin solutions:** A380, A350 XWB
EFB Hardware

ex-class 1

A320  A330  A350  A380
EFB Hardware

Mount designed for iPads 2 / 3 / 4 / Air / Air 2 / Pro 9.7”

EFB usable all flight phases

Power supply through USB plug (5Vdc/12.5 W)

Certified

Modular SBs Mount and/or Power Supply
EFB Hardware

- EFB usable in all flight phases
- Power Supply with Cockpit Power Outlet
- Certified
EFB Hardware

ex-class 2

A320 A350
EFB Hardware
EFB Hardware

ex-class 3

A380 A330
EFB Hardware

CLASS 1 EFB
CLASS 2 EFB
CLASS 3 EFB

PORTABLE EFB + INSTALLED RESOURCES*

INSTALLED EFB

JAA TGL36
AC120-76C

EASA
AMC 20-25
AC120-76D

*Installed resources are optional
EFB Software

2 Platforms

iOS

Windows
EFB software

FlySmart with AIRBUS
Common to all Airbus aircraft / EFB

LOADSHEET  TAKE-OFF PERF  LANDING PERF  IN-FLIGHT PERF  Ops Lib BROWSER

e FLIGHT FOLDER
Optional modules

Hosting Capability (contract with third party)
EFB main menu

Fully customizable menu

FLT OPS MENU

MISSION

FLT FOLDER
TERML CHART
ENROUTE
AIRLINE APP

DOCUMENTATION

OPS LIBRARY
AIRLINE DOC

PERFORMANCE

LOADSHEET
T.O PERF
LDG PERF
IN-FLT PERF

UTILITIES

LOAD BOX
EXPORT BOX
AIRLINE APP
EFB Status page

Allows checking the validity of EFB version

EFB VERSION: L6.0.1 - STLO4
Losesheet

Remove Trim Sheet paper processes

- Non accurate
- Paper processes
- Non easy LMC

+ Accurate
+ LTS paper processes removal
+ Very easy LMC consideration
Take-off

Remove Takeoff charts paper processes

- Conservative paper corrections
- Non optimized computations
- Loss of revenue

+ 300kg to 1200kg additional payload
+ Flex Temp increase by 3°
+ Increase your revenues
Landing (including In flight landing distances with failures)

Remove Landing charts paper processes

- Conservative paper corrections
- May lead to be over penalized
  - Loss of revenue

+ Stop being over penalized with MEL/Inop items
+ Dispatch / In Flight Landing perf. calculations
  + Accurate consideration of MEL/Inop item
In flight

Remove In Flight charts paper processes

- Paper calculations
- High workload: risk of errors
- Not optimized

+ Easy and accurate computations
+ Climb, Cruise, Plan, Descent, Holding, Atmos.
+ Risk of errors and workload reduced
Ops Library Browser

FCOM. MEL. AFM. CDL. CCOM. FCTM.

+ Enhanced consultation of operational manuals provided in XML format:
  3 information layers
  ECAM and word search
  Web-like consultation

+ Links between Manuals and Performance applications

+ Optimized Flight Ops Manuals data management thanks to the association with Airbus ground tools
Traditional paper flight folder:
- Lot of paper to manage
- Huge and costly processes
- Non optimized operations

All flight briefing packages in electronic format: weather data, NOTAMS (Highlighting, Note & Edit tools), electronic forms such as Air safety reports, Journey log (XML customizable)
eFlight Folder

Automatically filled in with Airbus class 2 and class 3

Operational Flight Plan

- FMS init
- Fuel & Load revision
- Fuel/time follow-up
- Signature
- XML customizable
e-Charts hosting capability
Integrated in partnership with...

+ Integrated in Airbus EFB, run as others EFB soft.
  + Quickly download & revise your charts
  + Easily zoom in & out
+ Remove paper charts processes
  + Reduce your costs
EFB administration – Generic Airline Process

Operator’s Ground process

Performance administrator

PEP / PAAdmin

Aircraft performance data

GAS

Gateway

FODM

ADOC

Ops manuals

ADOC

Web site

Airport data providers

PEP / PAAdmin

Performance administrator

GAS

Gateway

FODM

ADOC

Web site

Airport data providers

EFB Administrator

Documentation Administrator

IP Comm (or USB)

Wi-Fi
EFB administration – Generic Airline Process

FlySmart update
GAS/Gateway update
FODM Update
Ops manuals revisions (FCOM, MEL…)
PEP/PAAdmin tools
Airport data
eCharts

Create configuration
Validate
Deploy

Tech pilots

EFB software

On-board EFBs

Configuration report

EFB Administrator

Customize & publish

NAA approval

Documentation Administrator

Customize & generate

Performance Administrator

Monitor fleet configuration
Introduction
EFB, what is it?
How to implement EFB?
Next steps
What needs to be implemented
EFB operations are governed by National Authorities
The Authorities requirements
The Authorities requirements

AMC 20-25

AC 120-76C
The Authorities requirements

**Hardware**
- Portable?
- Mounting device?
- Mounted?
- Power supply?
- Electro Magnetic Interferences?
- Depressurization?

**Software**
- Type A: Certificates, Crew rest calculation
- Type B: Ops Library Browser, Charts, Perfo and W&B application

**HMI (Human Machine Interface)**
- Consistent and intuitive interface
- Use of colors
- System error messages…

- AMC 20-25
- AC120-76C
The Authorities requirements

Perfo / W&B Apps
Separation of inputs/outputs
Display of critical assumptions
Clear of outdated data
Robust validation

SOP
Implementation of EFB use in SOP
Flight crew task sharing and workload
Flight crew vs dispatch responsibility
Flight crew awareness of EFB version

Training
• On each application
• On system architecture
• On back-up procedures
The Authorities requirements

**Perfo / W&B Apps**
- Separation of inputs/outputs
- Display of critical assumptions
- Clear of outdated data
- Robust validation

**SOP**
- Implementation of EFB use in SOP
- Flight crew task sharing and workload
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**Training**
- On each application
- On system architecture
- On back-up procedures

The following tasksharing is based on the use of two laptops in order to reduce the risk of erroneous inputs. Airbus recommends operating with two laptops.

**EFB PREPARATION**

LAPTOPS
Set the laptops to ON sufficiently early to give enough time for laptop power up.

STATUS/VERSION
The PF checks that the FlySmart with Airbus applications for Windows version, available on the laptop, is the applicable one.

Each flight crewmember enters the following data:
- Aircraft type
- Aircraft registration
- Flight number
- The departure and arrival airports.

Then, both flight crewmembers crosscheck all the data.

**REQUIRED APPLICATIONS**
START (BOTH)

**MEL/CDL ITEMS CHECK (IF REQUIRED)**

Each flight crewmember should check in the MEL and CDL, the dispatch conditions corresponding to the applicable MEL/CDL items.
Then the flight crew should select the MEL/CDL items, if any.
The Authorities requirements

**Perfo / W&B Apps**
- Separation of inputs/outputs
- Display of critical assumptions
- Clear of outdated data
- Robust validation

**SOP**
- Implementation of EFB use in SOP
- Flight crew task sharing and workload
- Flight crew vs dispatch responsibility
- Flight crew awareness of EFB version

**Training**
- On each application
- On system architecture
- On back-up procedures
The Authorities requirements

**Administrator role**
Responsible of the EFB system with appropriate authority
- EFB updates scheduling and dispatch
- Responsible for EFB security and integrity

**Quality assurance**
EFB policy and processes
Included in Ops Manual or EFB Manual

**Security**
- At software level
- At hardware level
The Authorities requirements

Dispatch considerations
Definition of crew actions in the event of any EFB system deficiency.
MEL to be updated

Risk analysis
Evaluation of the risks associated with the use of each EFB function
  • Identification of potential losses
  • Analysis of operational consequences
    • Mitigating measures

Ops evaluation
Airbus support for Operation Approval

- Generic Compliance Dossier
  = Set of documents agreed with EASA and FAA
- Compliance Matrix

- Delivered to all our FlySmart with Airbus Customers
Airbus support and airline’s effort for approval
EFB Ops Approval – Project Roadmap

Ground tools deployment & training

- Analysis
- Tailored recommendations
- Follow-up of the deployment by the Airline
- Operational Dry run

Assistance to operational approval

- Review NAA’s regulatory framework
- Inputs & assistance to build-up the approval dossier
- Final review meeting with NAA

- Customized compliance matrix
- Inputs for the approval dossier
- Meeting with A/L & NAA

Months before EIS

-12 -9 -6 -3 -1
Introduction
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EFB / Non-EFB Customers

FCOM & QRH

EFB CUSTOMER

WITH

NON EFB CUSTOMER

PERFORMANCE TABLES

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING - 1 ENGINE OUT CRUISE : LONG RANGE DESCENT ICA - 100 KT FUEL CONSUMPTION (KGS)

<table>
<thead>
<tr>
<th>DIST (NM)</th>
<th>FLIGHT LEVEL</th>
<th>CORRECTION ON FUEL CONSUMPTION (KGS/KNOT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>100</td>
<td>FL100</td>
</tr>
<tr>
<td>300</td>
<td>150</td>
<td>FL250</td>
</tr>
<tr>
<td>400</td>
<td>200</td>
<td>FL300</td>
</tr>
<tr>
<td>500</td>
<td>250</td>
<td>FL350</td>
</tr>
<tr>
<td>600</td>
<td>300</td>
<td>FL400</td>
</tr>
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</table>

IN CRUISE QUICK CHECK FROM ANY MOMENT IN CRUISE TO LANDING - 1 ENGINE OUT CRUISE : LONG RANGE DESCENT ICA - 100 KT FUEL CONSUMPTION (KGS)

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<td>300</td>
<td>FL400</td>
</tr>
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</table>
Today’s Flight Operations – A380 & A350

Limited Paper QRH (SMOKE & EMER EVAC) + ECAM

EFB SOPs

No Performance Tables in FCOM/QRH/MMEL

Optimized Performance Computations

Takeoff, Landing, Loadsheet, In Flight
Tomorrow’s Fight Operations – A320, A330 and A340

No Paper in the Cockpit

eQRH

EFB SOPs

Optimized Performance Computations

No Performance Tables in FCOM/QRH/MMEL
eQRH workshop

Workshop Outcomes:

• Not on Dedicated Platform
  • Not PDF like
  • Interactive Checklist
  • Removal of Performance Tables
  • Generic Operational Approval
Electronic QRH on A320/A330/A340 Families

EFB Based Operations & First Paperless Cockpit

+ **Electronic QRH**
  Checklists & Procedures management

+ **QRH Content**
  QRH layout enhancement
Electronic QRH – eQRH Functions*

+ Management of Normal Checklists

![Management of Normal Checklists](image)

+ Management of Abnormal Procedures

![Management of Abnormal Procedures](image)

+ Display of Operational Data

![Display of Operational Data](image)

* Refer to the eQRH demo and presentations in Airbus World for more details
**TWO HOT/COLD COCKPIT AND CABIN TEMPERATURE IN FLIGHT**

**PACKS OUTLET TEMP (BLEED SD PAGE)..........................CHECK**

- **If difference between both packs is below 10 °C:**
  - AIR COND HOT AIR switch..........................OFF
  - A difference between both packs lower than 10 °C may reflect a mixer temperature sensor failure. Switching OFF the HOT AIR results in the use of the duct temperature sensors only and no longer in the use of the mixer temperature sensors. A normal cabin and cockpit temperature will be recovered.

- **If difference between both packs is at or above 10 °C:**
  - PACK (WITH THE HIGHEST OUTLET TEMP)...OFF
  - A difference between both packs of 10 °C or greater than 10 °C may reflect a contamination of packs resulting in too hot cabin and cockpit air temperature. The situation may be alleviated by switching OFF the pack discharging the hottest air.
eQRH Concept

eQRH hosted on EFB
eQRH Improvements

- Initialization
- Normal Operations
- Abnormal Operations
- Additional features
eQRH – Design Assumptions

- **HMI:**
  + Common HMI on iOS and Windows
  + Airbus cockpit colour philosophy
    - FlySmart colour coding
    - A350 ECAM Checklists and Procedures
    - Colour coding
  + The HMI reflects the data content and eQRH configuration
    - Tab panels = PSLs in the QRH order
    - OEB panel created if no OEB
    - NCL page = list of NORMAL PROC + LIST of other items
    - List of procedures = Procedures in the PSL
    - Procedure content = XML data content
Adaptation of the QRH content & layout to electronic display

+ Enhanced Content

• ABN procedures reviewed:
  • Mains steps visible immediately
  • Procedure structure visible immediately
eQRH – ABN procedures adaptation to electronic display

Adaptation of the QRH content & layout to electronic display

+ Enhanced Display
eQRH – Quick Access
eQRH – computation/display issue mitigated

<table>
<thead>
<tr>
<th>AFTER TAKEOFF / CLIMB</th>
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<tbody>
<tr>
<td>LDG GEAR: UP</td>
</tr>
<tr>
<td>FLAPS: RETRACTED</td>
</tr>
<tr>
<td>PACKS: ON</td>
</tr>
<tr>
<td>BARO REF: SET (BOTH)</td>
</tr>
<tr>
<td>BARO REF: // END</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

C/L COMPLETE
eQRH evaluations

Operational and Human Factor evaluations conducted

+ Human Factor involvement agreed with EASA
+ Evaluation scenarios agreed with EASA
+ 4 Airlines involved

Faster and more efficient operations compared to paper

Brilliant and very intuitive.
very simple to use.
eQRH Evaluation – eQRH Cockpit Configurations

Several Cockpit Configurations evaluated

Fixed EFB + Moveable eQRH

OR

All-in-one Fixed EFB + Fixed EFB

Fixed EFB + Moveable eQRH
eQRH Evaluation – Operational Suitability

- EASA & FAA evaluation in 2016
- EASA and FAA Operational Suitability Letters (OSL) issued in 2017
- “eQRH User and Compliance Manual” validated by EASA and FAA
- CAAC validation planned in Q2 2017

First Paperless Cockpit worldwide

+ EASA & FAA evaluation in 2016
+ EASA and FAA Operational Suitability Letters (OSL) issued in 2017
+ “eQRH User and Compliance Manual” validated by EASA and FAA
+ CAAC validation planned in Q2 2017

Sep 19-21, 2017 Electronic Flight Bag - ICAO/AIRBUS FOSAS
Support for implementation – eQRH User and Compliance Manual

Generic Compliance Manual to help for the eQRH Approval

- Specific eQRH considerations identified by Airbus, the EASA, and the FAA
- Validated by the EASA and FAA in the corresponding Operational suitability Letters
- To be tailored and completed by the Operator in accordance with the applicable local regulation
- Delivered with the eQRH application
Support for implementation – Installation, Administration, and User Guides

- Provides useful information to install, administrate and use the eQRH application
- Compatible Operating Systems and Hardware
- Delivered with the eQRH application
Support for implementation – eQRH eLearning

- Flight Crew eLearning covering the training items of the eQRH User and Compliance Manual
- Validated by the EASA and FAA in the corresponding Operational suitability Letters
- Delivered with the eQRH application (standalone version)
- Available in Airbus LMS with additional functions
eQRH Roadmap

Entry into service

- Available since March 2017 on Windows
- Available from May 2017 on iPad
- EFB operators (FlySmart & Third Party EFBs)
- Paper QRH printing stoppage by end 2017

(FOT 999.0088/16 Rev 02 dated 29-MAR-2017)
Electronic QRH – Communication

AIRBUS/NAVBLUE
communication to Operators

- **Worldwide FOT** announced the eQRH EIS end of March
- **Worldwide “Keynote”** event in April
- “Flight Ops and Training” **Worldwide Web Conferences** planned beginning of May
- Communication and workshops planned in the “**Flight Ops and Training**” **seminars** from June
CONCLUSION
Conclusion

Benefits of operating with an Electronic Flight Bag

- **Remove paper processes:**
  - Takeoff charts, Flt Ops manuals, charts, Flight briefing data...

- **Improves airline operations’ efficiency**

- **Reduces costs:**
  - Reduce Engine Maintenance costs
  - Remove paper management
  - Simplify ground processes

- **Ease Flight Crew duty and enhance safety**

- **Improves airline’s reactivity**

- **Ops approval framework based on international rules (EASA/FAA)**
Conclusion

To implement EFB => Consider complete approval process
Any questions?

Thank you