



Air Safety Group

A voluntary effort to promote greater safety for air travellers - Founded 1964



WHAT IS AN ELECTRONIC FLIGHT BAG (EFB) ?

- An EFB is an electronic method of performing functions that were traditionally performed using paper;



- An EFB is usually a small portable computer (laptop or PC tablet) that is used by aircrew on the flight deck;
- EFB's store navigation charts (IACs) Ops Libraries, forms and calculate aeroplane performance and weight and balance.

**DOES THE EFB
INTRODUCE
RISKS TO AIR
SAFETY?**

Yes in 3 key areas!

- 1) *Aircrew or user data entry errors*
- 2) *Electro Magnetic Interference*
- 3) *LIB (Lithium-ion Battery) Fire*

EFB DATA ENTRY ERRORS

- *Take Off Performance data entry errors where ZFW and LWT used instead of ATOW;*
- *Weight & Balance data entry errors producing incorrect CoG and ATOW – in some software i.e. Boeing OTP W&B data feeds into the TOF Performance page;*
- *Apperceptive mass and automation complacency.*
 - 1) *Change to keyboard layout to the same as the FMS CDU i.e. non qwerty;*
 - 2) *Ban all personal computers from use on the flight deck;*
 - 3) *Expedite work on TOPMS and pass into European law;*
 - 4) *Training for all staff involved with EFB operations and support;*
 - 5) *IT Qualified personnel on the JOEB and NAA teams;*
 - 6) *Increase research into LIB safety;*
 - 7) *Research into HMI and EFB data entry errors – apperceived mass and automation complacency/loafing.*

WHAT IS APPERCEPTIVE MASS?

- *The process whereby perceived qualities of an object are related to past experience.*
- *A second definition : The already existing knowledge base in a similar or related area with which the new perceptual material is articulated.*
- *For example unusually low V speeds for an A330 are accepted by a pilot that usually flies an A320; or*
- *Proof reading work that has been written by us.*

LITHIUM ION BATTERIES (LIBs)

- Thermal runaway
- Dropped or banged
- [Laptop Fire Demonstration](#)
- CAA MORs 2006-2012 3 reports of overheating batteries, 1 in the cruise. All resolved by the removal of the battery from the laptop.
- At least 2 hull losses due to LIB fires;
- EASA AMC 20-25 states: 6.1.1.2 Batteries
During the procurement of Class 1 EFB devices, special consideration should be given to the intended use and maintenance of devices incorporating lithium batteries. In particular, the applicant should address the following issues:
 - a. Risk of leakage;*
 - b. Safe storage of spares including the potential for short circuit;*
 - c. Hazards due to on-board continuous charging of the device, including battery overheat;*
 - d. Any other Hazards due to battery technology*

The operator is responsible for the maintenance of EFB system batteries and should ensure that they are periodically checked and replaced when required.”

LIBs CONTINUED

- *Stand-by Battery AMC 20-25 says: In order to achieve an acceptable level of availability, certain software applications, especially when used as a source of required information, may require that the EFB system has an alternate power supply or that procedures exist to mitigate against EFB power supply failures. Mitigation may be in the form of maintenance and/or operational procedures; examples being:*
 - a. Scheduled maintenance task to replace batteries as required;*
 - b. *Fully charged back-up battery on-board;*
 - c. Procedures for the flight crew to check the battery charging level before departure;*
 - d. Procedures for the flight crew to switch off the EFB in a timely manner when the aircraft power source is lost.”*

** Note: Operators using I pads or Android PC Tablets cannot comply as the embedded batteries are inaccessible.*

LIBs CONTINUED

The “explosive” effect as the battery case fails and the solvent vents is not judged to be of a size that would cause damage to the aircraft structure. However, there will be severe harm to any passengers in the immediate vicinity of the fire. There may also be other effects from smoke inhalation and panic.

CAA PAPER 2003/4 Dealing With In-Flight Lithium Battery Fires In Portable Electronic Devices

UPS DC8 Fire KPHL 2006 Caused by Li-Ion batteries



EFB REPORTED INCIDENTS AND ACCIDENTS

- *Between 2006-2012 there were 14 reported incidents to the CAA – which included:*
- *1 EMI – EFB interfered with aeroplane pressurisation;*
- *3 Overheating/Arcing LIBs (1 in the cruise)*
- *3 Serious incidents where incorrect TOF performance figures (V speeds) nearly caused an accident;*
- *OCT 2004 EFB contributed to a fatal accident of B747F CYHZ (UK based airline Ghanaian AOC)*
- *2006 Corsair (French) B747 wrong V speeds when crew used ZFW iso TOW on EFB;*
- *2009 EK A340 Melbourne serious TOF incident. Data entry error by 100 tonnes into EFB (flex power used!)*
- *2010 Finnair A340 takes off from the taxiway (HKG) when crew became distracted by the EFB*

AIR SAFETY GROUP PROPOSALS

- *Greater research into Apperceptive mass and automation complacency to prevent data entry errors and blind acceptance of erroneous information;*
- *Prohibition of the use of personal laptops, ipads, tablet pc's on the flight deck;*
- *Portable computers used as a class 1 or 2 EFB should be modified so that their batteries are removed and run solely on aeroplane power systems;*
- *Greater research into wireless EMI from EFBs and passenger carry-on PEDs;*
- *Mandatory EFB inclusion in the MEL if the device is used to produce flight safety critical information (Nav data, Performance, Check-lists, Paperless operations)*
- *IT qualified personnel to sit on rulemaking and operational assessment groups involved with EFBs.*
- *Rejuvenate AAIB recommendations for the fitment of TOPMS to all civilian airliners*

**ANY
QUESTIONS?**

- Remember there is no real substitute for paper
- Thank you very much for your time