



Wedgetail In-Service Software

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Overview

- Wedgetail In-Service Support (ISS) Software Management Plan (SMP)
 - FLTLT Scott Harvey
- Key lessons learnt from 1st year of ISS software management
 - Mr Matt Sprakel



Wedgetail Software

- Airborne Mission Segment
 - Green Aircraft
 - FAA Certified safety-related software
 - Mission Systems
 - Mission Computing
 - Radar/IFF
 - ESM/EWSP
 - Comms
 - Nav
- Ground Support Segments



Software

- New Aircraft with software. What do I need to do?
- SCI1 – (get to know them well)
 - Comply with TAMM Regs
 - Use AAP 7001.054(AM1) guidance
 - Software Management Plan



SMP

- SPO needs one
- ISSC needs one
- Solution
 - Joint SMP
 - Management
 - Multiple stakeholders & interfaces
 - Software Engineering Plan
 - Internal focused
 - Software processes



SMP Development Approach

- So how easy was it?
 - Initial difficulties
 - Rework
 - Common understanding
 - Successful SMP



- Wedgetail Team SMP/SEP
 - Joint Signatories
 - Both AEOs responsible
 - Together, meets TAMM Reg and Contractual req's

Wedgetail ISS SMP

- On-aircraft software
- Ground Support Segments (GSS) & S&TE
 - Operational Flight Trainer
 - Operational Mission Simulator
 - Mission Support Segment
 - AEW&C Support Facility
- Software Compliance Finding Plan
 - Standing SCFP - FAA Certified software
- Entire Software Life Cycle
 - Includes Software Design Acceptance and release activities



Types of Software Designs

1. ISSC AEO developed

- Mission System, GSS & S&TE
- No safety-related software
- Generic development cycle
- Acceptance, installation, and utilisation



2. OEM developed safety-related - FAA certified

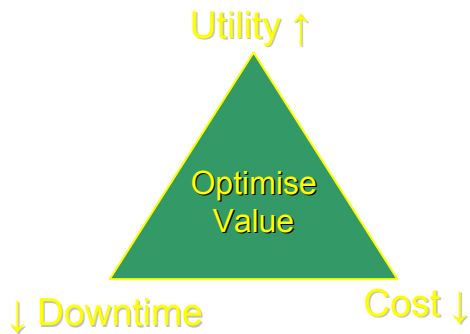
- AEO ensure design meets ADF CRE

3. OEM developed safety-related - non-FAA certified

- TAR endorsed SCFP required

SMP Summary

- New SMP
- Joint Approach
- Maximise Utility

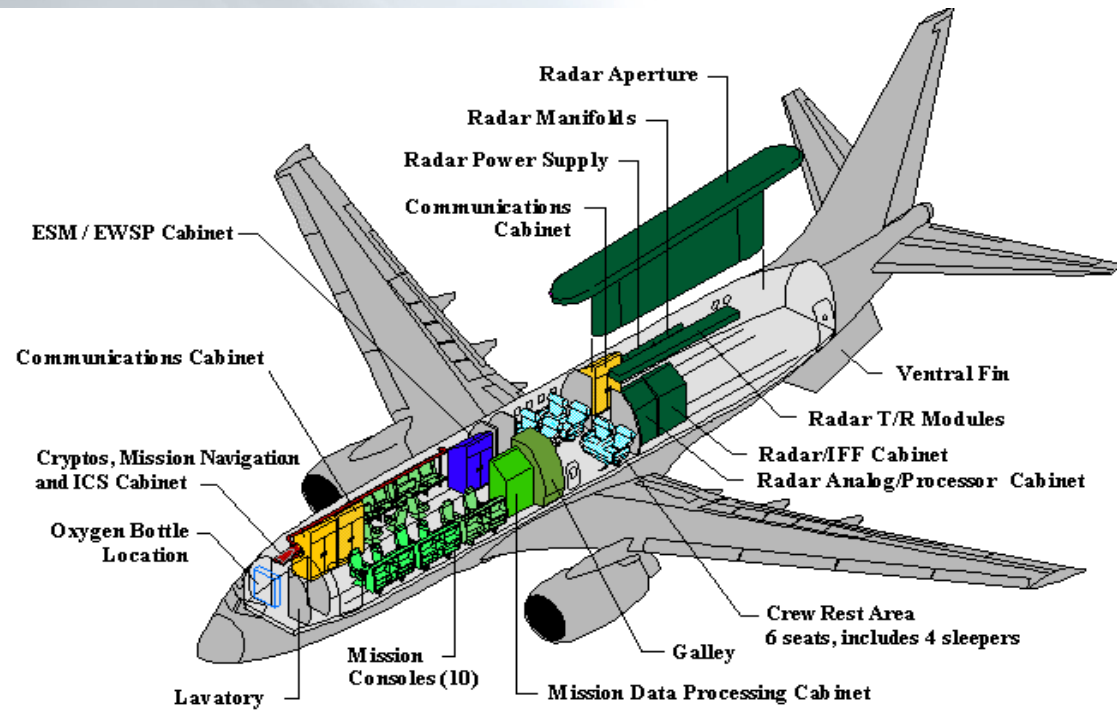




1st Year Lessons Learnt

Entry into Service

- February 2010, Wedgetail formally enters into service under an SFP.
- Has been operating now for 16 months.
- These slides summarise software / firmware issues, their resolution and preventative actions during operations.



Navigation Database Upload



- Issue
 - No single list of software versions that tied to part numbers.
 - Maintenance unable to validate software load.
- Case Study
 - Special Servicing 61 requires the Navigation Database to be uploaded to the FMC every 28 days
 - The Navigation database is released to all 737NG operators and is downloaded from the OEM's website.
 - 2SQN successfully download and install on the aircraft. However per the AMM task they are told to confirm they have the correct FMC software loaded. Easy task if you know what the software version is authorised for fitment to the aircraft.

Navigation Database Upload Cont'd

- Lesson Learnt / Mitigation
 - Need to get a single document out to the Squadron where they can link software / firmware version numbers to part numbers. We create our Software Configuration Manual.
 - At the early phase of a programs life, it will require updating several times
 - Didn't just rely on the Squadron raising the issue with us, but we actively looked through our MRI to associate part numbers with software / firmware versions
 - This document now forms part of our regular maintenance publications suite.



Heads Up Display

- Issue
 - Configuration control and OEM design disclosure.
- Implication
 - Operators not informed of changes to functionality and displays.
- Case Study
 - HGS Computer consists of hardware plus firmware and the customer modules (loaded locally by our AMO)
 - HUD was U/S when A30-001 was inducted into its R7. Same part number was returned for fitment. Due to obsolescence issues a new graphics card was fitted with new firmware. Only indication was a small mod label that was not picked up by the DM technicians.
 - CAMM2 managed item and CAMM2 only tracked the part number, not the mod plate status.



Heads Up Display Cont'd

- The change was released under a Deviation to ensure the configuration is documented.
- Pilot takes the aircraft for the first flight out of deeper maintenance and at the flight debrief told us that the HUD operated differently to the last time he used it.
- Investigation revealed that the new customer operating system that came with the repaired HGS was 2 versions ahead of current MRI.
- Lesson Learnt / Mitigations
 - Need to ensure that repair venues return LRU's with the software / firmware versions they left with. We have ensured that our supply team make this part of the T&C's with the repair venue
 - If the OEM cannot return the LRU with original software / firmware versions then they disclose the change in the paperwork and get AEO authorisation before proceeding.
 - During the modification and testing of the aircraft, not all OEM product improvement service bulletins were incorporated. We are working with our DSN member to get a list of all product improvement SB's not incorporated.
 - Additional training of people to understand there are several ways that LRU hardware and software / firmware are marked on the LRU.
 - Engineering is looking at re part marking some LRU's that do not clearly identify the configuration.

Disk Generation Tool



- Issue
 - Alignment of support equipment with OEM operating systems.
- Implications
 - Unable to maintain current navigation database on aircraft, suspended flying operations.
- Case Study
 - As mentioned earlier, 28 day nav database is downloaded from a designated website.
 - Download requires Disc Generation Tool (DGT) software to be loaded onto the computer so that the NAV database can be saved onto floppy discs to load onto the FMC.
 - Current computer authorised to run DGT 05-01 has Windows 2000 installed.
 - OEM informs us that to access the latest navigation database you need DGT 06-01 or higher and the only DGT you can download from the website is the latest version DGT 08-01.
 - However DGT 08-01 is not compatible with Windows 2000.
 - Overcame the problem by authorising DGT 08-01 to run on a stand alone computer with a compatible operating system.
- Lesson Learnt / Mitigations
 - Not all OEM's produce design disclosure to the standards we require. For this case, nowhere in the information provided for DGT 08-01 did it mention not compatible with Windows 2000.

Incompatibility of software

- Issue
 - Incompatibility of related software versions.
- Case Study
 - 2SQN create the floppy discs and go to load it onto the FMC. The load goes well until they perform the FMC cross check and it errors out.
 - Called the OEM and they told us that the latest navigation database is not compatible with DGT 08-01. The issue was only just discovered by the OEM as well.
 - We suspend flying until the issue is resolved
 - OEM resolves the issue within 24 hours by changing some files in the navigation database.
- Lesson Learnt / Mitigations
 - Quick and clear communication is essential.
 - Some things you simply can't control.



Configuration Files / User Files

- Issue
 - User files versus configuration files.
- Case Study
 - While trouble shooting the ESM system, we change some files in the ESM software to assist with fault finding. For disk recording space, the parameters are normally turned off, however for troubleshooting we need to turn them on.
 - Failed to adequately explain that the software was always capable of performing these functions so a deviation to configuration is not required.
- Lessons Learnt / Mitigations
 - Additional training to Engineers explaining how Configuration Files / user files can be changed and tracked.
 - Clearer documentation in our work instructions.



SMDAU data

- Issue
 - LRU not functioning per design.
- Case Study
 - Structural Monitoring Data Acquisition Unit has not been recording data correctly. This device is relied upon to keep count of our flight profile so the data can then be analysed and used to keep account of the fatigue life of the aircraft.
 - Each flight is recorded as a file and the device has the potential to record up to 20 flights. However the SMDAU is failing to increment files.
 - We inform the OEM of the problem and they track it down to a simple issue. They define a fix and tell us how to fix the issue.
- Lesson Learnt / Mitigations
 - Constant data collection and analysis on our part helped identify the problem as quickly as possible
 - Some options require alternates to be quickly authorised



Flight Deck and Mission Audio Panel Update.

- Issue
 - Installation of some firmware can corrupt the LRU.
- Case Study
 - Modification is rolled out to the Flight Deck Audio Panel and the Mission Audio Panel to install the latest firmware.
 - Required updating of the actual unit on the aircraft, the test lab and then all the spare cards.
 - All aircraft successfully upgraded.
 - Spares are upgraded off aircraft and tested on the OEM test rig. Two of the twenty cards were corrupted by the firmware installation
- Lessons Learnt / Mitigations
 - Were able to realise the corrupted cards only by having a test capability other than installing them in the aircraft. Without the OEM test rig we would not have found this.
 - Firmware updates are not as simple and easy as first thought. We are much more careful with authorising the loading of firmware.

Summary

- Linkage of firmware / software to part numbers is essential. Without this configuration is easily lost.
- Use of Commercial of The Shelf products can be unusually difficult to ensure that configuration is maintained due to the manufacturer loading on the latest firmware (whether you wanted it or not)
- We now take greater caution in authorising software and firmware loads.
- We look to get a better understanding of why things changed. Will the change effect other parts of our LRU's, aircraft and ground support segments?

Questions ?

