FFS H160 : AH SIMPACK DEVELOPMENT

HELICOPTERS

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05 June 2019

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Summary

- **FFS H160 : context**
- **What is a Simpack ?**
- **HDP H160**
- **SSP H160**
- **AH strategy for FFS vs. complexity of H/C systems**
- **Conclusion**

FFS H160 : Context

→ FFS level D Simulator developed in concurrent engineering (in parallel to the real H/C) in order to be ready for the Entry Into Service of the H/C

→ Choice made by AH : no interim qualification for the FFS

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What is a Simpack ?

Simulation **Pack**age for H/C type (**Simpack**)

- **1 – H**elicopter **D**ata-**P**ackage (**HDP**)
- **2 – S**imulation **S**oftware **P**ackage (**SSP**)
- **3 – R**eal **H**elicopter **P**arts
- **4 – T**echnical **S**upport

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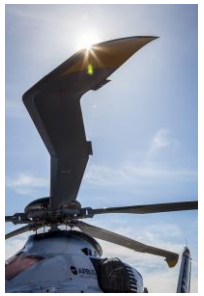
HDP H160 Content & Activities



Helicopter Data-Package (HDP)

H/C Customer documentation:
Flight Manuals,
Technical Helicopter Manuals,
User Manuals…

H/C Design documents:
Electrical wiring,
Drawings and Extracts of Digital Mock-up,
Technical Notes…

Qualification Data:
Flight Tests recordings,
Flight control data,
Sound and Vibration recordings
Validation Data Roadmap
Engineering data

In coordination with all AH specialists :

- Collect data from real H/C documentation with a close follow-up of H/C changes
- Ensure protection of sensitive industrial heritage
- Manage IP rights and authorization to distribute AH and Suppliers (vendors) data to Simulator manufacturer

- Concurrent engineering → to have the documents mature enough regarding H/C development

- Feed-back from simulator manufacturer on other projects →to have more accurate documentation for simulation needs

Concurrent engineering → perform the recordings at the right moment i.e. when the H/C is mature enough (very deep analysis performed to be sure to have recordings compliant with serial H/C)

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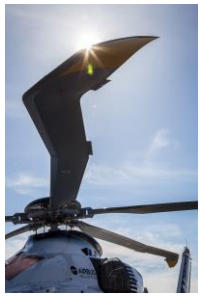
HDP H160 in concurrent engineering



How to be efficient for the H160 ?

→ AH Simulator development team is in close contact with H/C development team to follow all the H/C evolutions in real time.

→ AH Simulator development team follows closely choices done during the H160 H/C development in order to anticipate H/C evolution.

→ Necessity to have a very close cooperation and partnership with simulator manufacturer in order to take into account the H/C evolutions. Meetings have been organized between simulator manufacturer and AH Design Office specialists to give the best information and explanation.

AH top objective = SAFETY → to have a simulator at the highest level of fidelity to ensure a high quality training

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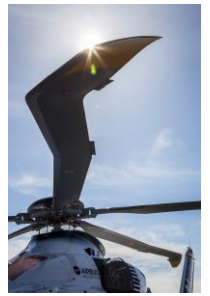
H160 Qualification data and SIMD



→ SIMD (Simulation Data) is a new requirement for certification of a new aircraft. It has to follow the EASA CS-SIMD regulation to describe data necessary to develop a simulator for this new aircraft.

→ The H160 is the first A/C for which the SIMD process will be applied.

→ Qualification data must cover requirements of the CS-FSTD (H) standards but also to take I nto account this new need.

→ The AH SIMD process has been created from the beginning within AH airworthiness department and in cooperation with the EASA to be compliant with the regulation (CVE (Certification Verification Engineer) nomination…).

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SSP H160 Content & Activities

Simulation Software Packages (SSP)

Flight Loop Models:
AFCS (Autopilot)
Fligt Control Kinematics
Flight Dynamics
Engines (including Full-Authority Digital Electronic Control)

Avionics & Mission Models:
Air Data Unit
Aircraft Management Computer (AMC) (**V**ehicle **M**onitoring **S**ystem, **F**irst **L**imit **I**ndication…)
Aircraft **P**iloting **I**nertial **R**eference **S**ystem
Integrated Electronic Standby Instrument

Vehicle Models:
Electrical system
Hydraulic system
Fuel
Landing Gear sensors

⇨ AH Simpack baseline

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SSP H160 : AH strengths

AH Simpack quality guaranteed by :

→ Starting point for AH SSP is the simulation used for the real H/C development

→ AH performs assessment and tuning of the simulator by AH flight test crews and AH design office development engineers

→ AH choice is to reuse airborne SW, OEM components and real equipment wherever appropriate

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AH strategy vs. H/C systems complexity (1/4)

Complexity of systems increases :

- Latest generation of helicopters are equipped with complex avionics systems that rival those of their fixed-wind counterparts

- Pilots must be fully trained in the system capabilities and their limitations.

→ Training has to be adapted

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AH strategy vs. H/C systems complexity (2/4)

FFS Accuracy to avoid negative training

- Impossible to have documents describing with all details especially in case of failure.
- Algorithm more and more complex : in case of failure, impossible to have data in flight even with hundreds of flight hours.

→ **Accuracy increased with embedded SW**

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AH strategy vs. H/C systems complexity (3/4)

Standards requirements :

- No QTG objective tests regarding automation and complex embedded SW, only subjective tests required
- No objective requirements for automation accuracy

→ **Standards not adapted to the modern evolution of the aircrafts.**

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AH strategy vs. H/C systems complexity (4/4)

AH CHOICE :

As long as the standards will not be adapted, AH will make the exclusive choice of embedded SW or OEM for systems linked to safety (e.g. AFCS or FADEC) in order to avoid negative training due to possible failing in the Simulator SW.

CONCLUSION :

AH point of view : Regulation should be adapted to take into account the evolution of the Aircrafts.

How to go ahead ?

THANK YOU !

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