

Rotorcraft Policy & Guidance for HUMS, ADS-B and use of NORSEE



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OUTLINE

- **Health Usage Monitoring System (HUMS)**
- **Automatic Dependent Surveillance – Broadcast (ADS-B)**
- **Non-Required Safety Enhancing Equipment (NORSEE)**
- **Questions / Comments**



HUMS

- **The FAA is in the process of evaluating and updating current airworthiness certification guidance material for Rotorcraft Health Usage & Monitoring Systems (HUMS).**
 - The update to the HUMS guidance will be based on certification experience on past projects, information gained from the FAA's HUMS Research & Development programs, and EASA's recently issued AMC 29.1465.



Current & On Going HUMS Research

1. Verification and Validation of Regime Recognition Algorithms (RRA) – Conduct research with outcome of accuracy requirements for RRA, and the methodology to verify and validate the RRA.
2. Conduct research on HUMS for usage credit using flight regime recognition algorithm results with crack growth fatigue methods.
 - Research to date has only used the safe-life fatigue method, which is not sufficient for current regulatory requirements.
3. Evaluate past HUMS research reports for applicability to AC 29-2 MG-15.



HUMS for Usage Credit

- The approach for used in a HUMS for Usage Credit program is to replace the CWC usage with actual usage and recalculate Remaining Useful Life (RUL)
- Regime Recognition – Regime Recognition Accuracy Issue
- HUMS for credit – Reliability impact of using actual usage
- **AC 29-2 MG-15 does not currently:**
 - address the impact of usage monitoring on the reliability of the fatigue life RUL calculation
 - contain guidance for RRA accuracy requirements

Currently, the RCO is working on two HUMS for credit proposals from Rotorcraft OEMs.



ADS-B Out Installation

- Due to recent challenges with the installation of ADS-B equipment on rotorcraft to meet the U.S. 2020 equipage mandate.
- Previously ADS-B policy restricted the approval method for ADS-B Out systems.
 - Type Certificate (TC)
 - Amended Type Certificate (ATC)
 - Supplemental Type Certificate (STC)
 - Approved Model List (AML) STC



ADS-B Field Approval Policy Memo

- **New Policy Memo released to allow for field approvals under specified conditions.**
 - Released October 10, 2012
 - ADS-B Installation Policy Memorandum can be found on the FAA Regulatory and Guidance Website.



Conditions For Field Approvals

- **ADS-B out systems may be field approved if:**
 - Equipment authorized under TSO-C166b or TSO-C154C
 - GNSS sensor approved under TSO-C129 or later or TSO-C145a/C146a or later or TSO-C196 or later.
 - ADS-B equipment, GNSS sensor, and interconnecting wiring is identical.
 - Installation is in accordance with manufacturer's installation guidance.
 - The installation is performed in accordance with AC 20-165A Chapter 3 and 4.
 - All other aspects of the installation qualify for installation under 14 CFR part 43.



ADS-B Compliance Monitor (CM)

- CM Purpose
 - Primary purpose is to support AFS with compliance & enforcement of §§91.225 and 91.227
 - Identifies ADS-B equipped aircraft performing below the requirements defined in §91.227
 - Also supports:
 - **Aircraft Certification test flight process for new approvals**
 - Monitors ADS-B equipage growth
 - Supports avionics performance trend analysis



Post Installation Performance Statistics

- Approximately 20% (≈ 1150) of rule equipped aircraft are not fully compliant to §91.227 equipment performance requirements
- **Unique to Rotorcraft & Common Causes for Non-Compliance**
 - **Antenna location, location, location**
 - improper configuration of the equipment.
 - Mode 3/A issues, no transmit or UAT code disagrees with transponder code
 - Software compatibility
 - Emitter category
 - Baro/Geo drop/spike
 - Mode S address errors
 - Missing Flight ID



NORSEE

Required Systems and Equipment

Known Loss of function
up to Catastrophic

Malfunction/Failure (HMI)
up to Catastrophic

System DAL
commensurate with
Assessed Hazards levels

Non-Required Systems and Equipment

Known Loss of function up to Minor

Malfunction/Failure (HMI) up to Catastrophic

System DAL commensurate with Assessed Hazards levels

Safety Enhancing Equipment (NORSEE)

**System DAL -1 from
Assessed Hazard**



Non-Required Safety Enhancing Equipment (NORSEE) Definition

- **What is NORSEE?**

- Subset of Non-Required Equipment that can be shown to improve overall safety in rotorcraft
 - Considers the risk side of the safety equation (as with any system)
 - 2X.1301 Function and Installation
 - 2X.1309 Equipment, systems and installations (FHA)
 - Also considers the overall safety benefits of that system
 - Weighs the risk from failure or misleading information to an individual rotorcraft under unusual conditions against the overall safety benefit to the rest of the rotorcraft fleet under most conditions
 - » May allow a reduction in the system design assurance level (DAL) if safety benefit is shown to exceed the potential risks



NORSEE Policy Statement Purpose

- **FAA goal is to encourage use of optional, non-required, safety enhancing equipment in rotorcraft**
- **Provide guidance and criteria to allow a reduction in the DAL for systems that can be shown to improve rotorcraft overall safety**
 - Lower equipment development cost
 - Allow for more rotorcraft to be equipped with NORSEE
 - Establish limitations for NORSEE installations



NORSEE Policy Overview

- **NORSEE policy allows relaxation in the DAL for systems/equipment that increase overall safety**
 - One level reduction in DAL
 - **Example:** FHA assessment that is hazardous for misleading information would typically require satisfying DAL B
 - If FAA accepts system as NORSEE, this policy allows for same system to satisfy only DAL C, even though FHA hazard classification remains Hazardous
 - Will require clear identification that NORSEE system does not meet certification standards for a required system, without further showing of compliance
 - Placards, RFM Limitations, STC Limitations



Examples of Potential NORSEE Candidate Systems

- **Primary Flight Information Displays**
- **Automatic Flight & Stability Systems**
- **Traffic Advisory Systems**
- **Terrain Advisory Systems**

– Systems that have been identified as NORSEE will be listed at:

http://www.faa.gov/aircraft/air_cert/design_approvals/rotorcraft/rot_regs/



NORSEE Policy Statement Status

- **NORSEE Policy Statement**

- Policy No: PS-ASW-27-29-10
- Issued 29 May 2013
- Available on the Regulatory Guidance Library web site or at the Rotorcraft Certification link shown below

- **As of Dec. 2014, **ONLY 6** Projects to install NORSEE equipment have been initiated or completed.**

- Two OEM Amended Type Certificate projects
- One ODA Supplemental Type Certificate project
- Several projects are in making the decision whether or not to utilize NORSEE

- **Expected more NORSEE applications bases on the very extensive and positive public comments we received.**



Questions and Comments

- **Contact information:**

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