

Rotorcraft Structural Integrity and Safety Health and Usage Monitoring R&D



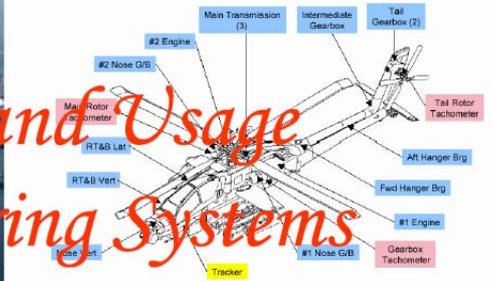
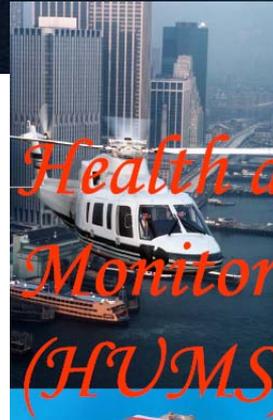
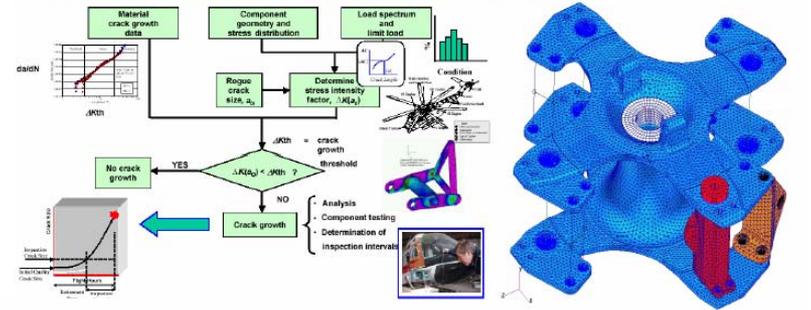
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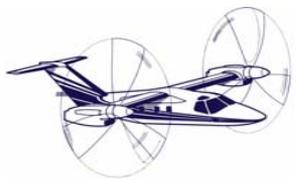
**Rotorcraft Program Manager
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April 20, 2004

Rotorcraft Structural Integrity and Safety





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FAA Rotorcraft

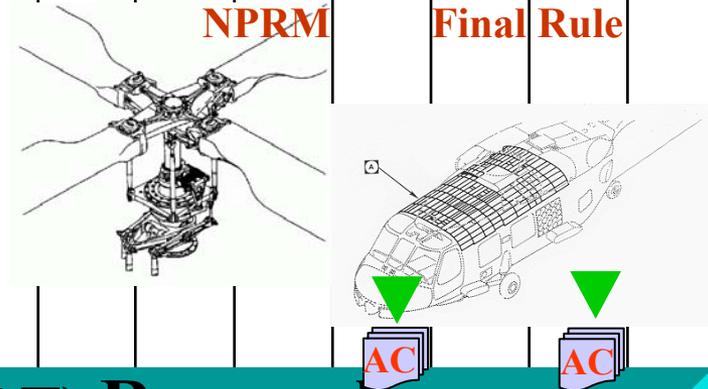


Structural Integrity and Safety

Outputs/Tasks

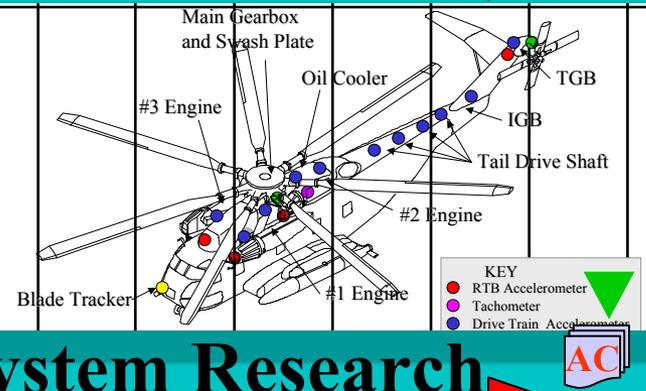
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Data and Technical Information (i) to Revise 14 CFR 29.571 to Reflect and Update Fatigue and DT Assessment Guidance Material in AC 29-2C



✈️ Rotorcraft Damage Tolerance (DT) Research

Data and Technical Information to Validate HUMS Advisory Circular (AC) for Part Part 29 for Compliance



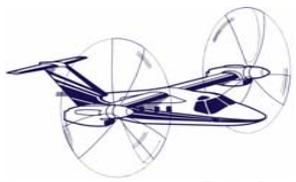
✈️ Health and Usage Monitoring System Research



→ Advisory Circular: Airworthiness Approval of Rotorcraft Health and Usage Monitoring Systems

ref: http://www2.faa.gov/certification/aircraft/Rot_Pol_Hums.htm

→ Provide guidance to achieve airworthiness approval for rotorcraft Health and Usage Monitoring System (HUMS) installation, credit validation, and Instructions for Continued Airworthiness (ICA) for the full range of HUMS applications.

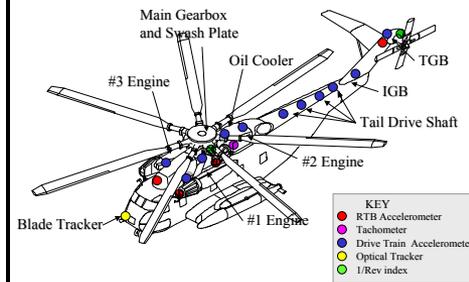


FAA HUMS R&D



Program Objectives:

- Provide ACO with data and technical information necessary in the validation and revision of AC on HUMS Installation and Maintenance Credit.
- Merge HUMS and fatigue including DT technologies to maximize safety benefits.



Technical Approaches:

- Collaborate with rotorcraft community (e.g., NRTC, RCOE, DoD, NASA, RITA, academia) to conduct a wide range of HUMS R&D.
- Collaborate with DoD and helicopter operators to collect usage data.
- Fully validate and transfer HUMS technologies to rotorcraft industry for certification and compliance.

Support:

- AC's 29.2A & 27.1A, HUMS, 20.95,
- FAA Order 8110.9
- Damage Tolerance Rulemaking, FAR's 29.571 & 27.571,



HUMS Strategic R&D Plan



- ➔ In collaboration with HUMS community, the FAA will support the development of HUMS strategic (Roadmap) R&D plan.
- ➔ ID essential HUMS R&D to support validation of FAA HUMS AC
- ➔ Define critical HUMS issues
- ➔ Develop milestones that prioritize tasks
- ➔ Develop HUMS output requirements & formats
- ➔ ID resources and develop costs required to complete R&D
- ➔ Develop HUMS R&D exit criteria
- ➔ HUMS Roadmap R&D plan needed by September 2004.



Major FAA HUMS R&D Areas



- HUMS R&D will include efforts covering all aspects of HUMS development and certification.
 - Rotorcraft Operational Development of HUMS
 - Commercial HUMS Validation
 - HUMS On-Board Warning
 - Flight Testing With HUMS-Installed Helicopters

- Additionally, combined DT and HUMS technologies to address safety will also be considered.



Operational Development of HUMS



Technical Objectives:

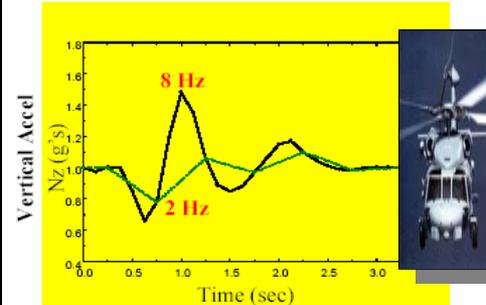
- Determination of HUMS system requirements for various applications and mission mix.

Technical Approaches:

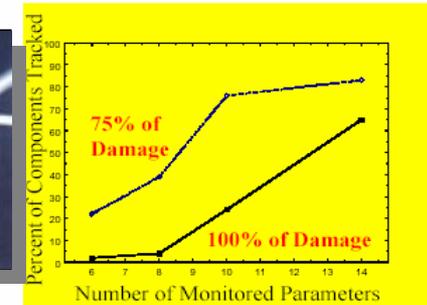
- Conduct assessment and identification of key design parameters and sampling rates required for monitoring systems.
- Conduct the Functional/Usage Hazard Assessment of a HUMS.
- Evaluate various types and levels of severity of system degradation to determine the impact on overall structural monitoring capability.
- Validate FCR algorithms and health monitoring techniques for impending problem recognition.

Data Rate and Parameter Assessments

Data Rate Assessments Effect of Inadequate Data Rate



Monitored Parameter Damage Assessments



Outputs:

- Validation of the new AC for HUMS certification and new regulatory material if required.
- complete system guide including ground based cots, on board monitors, and recording systems to be included in AC.



Commercial HUMS Validation



Technical Objectives:

- Evaluation of HUMS AC during the design, fabrication, installation, and flight tests to assure that the means of compliance practices are adequate and just for the systems intended



Technical Approaches:

- A commercially developed HUMS system will be installed and evaluated using the HUMS AC.
- Using WJHTC's S-76 flying test bed and/or other aircraft, usage credit and maintenance action issues will also be addressed.
- Flight-tests are to be conducted using scripted flights for validation of flight condition algorithms and measure loads.

Outputs:

- Validation of the new AC for HUMS certification and new regulatory material if required.
 - Design, fabrication, installation of HUMS
- Outputs will also include assessments of rotorcraft fatigue spectrums and mission profiles that will be used in damage tolerance and fatigue spectrum definition.



HUMS On-Board Warning



Technical Objectives:

- Assessment of on-board warning/display devices
- Assessment of pilot interface with operational aspects of the system



Technical Approaches:

- Evaluate HUMS display devices and the types of information to be displayed or audible
- Validate HUMS information display or warning reliability and functionality.
- Study human factor interface

Outputs:

- Validation of the new AC for HUMS certification and new regulatory material if required.
- Assessments of pilot reactions to warning, display devices and the initiation of maintenance, due to HUMS warnings.



HUMS Flight Tests



Technical Objectives:

- Validation and assessment of various aspects of HUMS via flight testing using commercially-developed HUMS and accessory prototypes.



Technical Approaches:

- Conduct assessment and identification of key design parameters and sampling rates for monitoring systems.
- Conduct the Functional/Usage Hazard Assessment of a HUMS.
- Install HUMS prototype systems on several different types of rotorcraft to validate flight condition recognition algorithms and health monitoring techniques.
- Evaluate various types and levels of severity of system degradation to determine the impact on overall structural monitoring capability.

Outputs:

- Validation of ground based cots, on board monitors, and recording systems
- Validation of FCR algorithms and monitoring techniques
- Validation of design, fabrication, installation of HUMS
- Early assessments of pilot reactions to warnings and the initiation of maintenance, due to HUMS warnings.
- Early assessments of rotorcraft fatigue spectrums and mission profiles that will be used in damage tolerance and fatigue spectrum definition.



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Questions?