Federal Aviation Administration

Part 23 Advanced Flight Path Control Certification

Highly Augmented Flight Controls

Presentation to: On Demand Mobility Workshop

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Objectives

1. Stimulate discussion through questions

- Opportunity for certification of flight control systems to be treated differently

2. Provide update on current FAA efforts

- Fixed Wing
- Rotorcraft (John Vanhoudt)

Discussion Topics (1 of 4)

1. **What is the difference between Part 25 and Part 23?**
    - 19,000 pounds and 19 seats

2. **How did the FAA certify Part 25 Fly By Wire?**
    - Current Rules do not address modern FBW
    - FAA did not “dictate” design
    - FAA accepted Boeing + Airbus approach
        - But FAA Levied Special Conditions (7)
        - Fit into existing regulatory structure

Discussion Topics (2 of 4)

3. Should we treat FBW **AFPC** cert differently for Part 23?

- Scalable level of risk
- Assumptions for operators
- Whole vehicle parachutes
- New methods of design/architecture
  - Run time assurance, Redundancy
- Opportunity to reduce fatal accidents
  - Safety Record in General Aviation
  - Built in Envelope protection

Discussion Topics (3 of 4)

4. **Part 25 FBW Fatal accidents**
    - Did special conditions + existing rules address root cause and human factors issues?

5. **Traditional Flight Control Handling Qualities Testing**
    - Currently, still rely on Mil STD techniques
    - How should we test new designs?
        - focus on inherent characteristics of modern flight control systems

Discussion Topics (4 of 4)

6. How can we make FBW **AFPC** affordable in GA?

7. What will be required to implement FBW **AFPC** in a significant portion of the GA fleet?

FAA Current Efforts (Fixed Wing)

Develop **MOC** for specific Technology

- Small Airplane Safety Enhancement Program (SASEP)

Technologies selected in conjunction with GA-JSC (General Aviation Joint Steering Committee)

- AOA, Enhanced Envelope Protection, Digital Parachute
- Flight Path Trajectory Management
- Highly Augmented, Manually flown

Technologies selected based on feasibility and effectiveness to reduce Fatalities (i.e. LOC)

- Retrofit Fleet *and* New Aircraft
- Make Implementable and Affordable

Advanced Flight Path Control Disconnects

1) Good designs

-- may not comply with existing Rules

2) Testing to show compliance to existing Rules

-- may not be sufficient to expose unsafe designs

3) Handling Qualities and Integration Testing

-- needed for standardization and Human Factors

FAA Funding in place to address these issues

Looking for collaboration with Industry / NASA / Academia

Current Rotorcraft Research

- FAA Research Contract with Hoh Aeronautics, Inc
- Bell 525 – first civilian rotorcraft with Adv Flt Ctrls
- Developing a minimum set of performance specs
    - Handling Qualities via analysis (incl PIO)
    - Degraded modes
    - Qualified bench testing for credit
- Output documents
    - Policy and Guidance (AC and Handbook)
    - Regulations

Highly Augmented Flight Controls

Questions?

- BACK UP SLIDES

We are Human – We make mistakes, so…

- Let *Machines* do what they do best
  - Tedious Tasks (like monitoring)
- Let *Humans* do what they do best
  - Critical Thinking
  - Judgment
  - Strategic Planning

- **Don’t Let OLD Rules Block New Technology**
- **Research Looking at New ways to Certify:**
  - **Flight Controls + Displays + Crew Interface**

FAA Research Goals

- High Level Rules
  - Specified in Part 23 Re-write
- Recommendations for Lower Level Guidelines
  - Methods of Compliance (MOC)
- Recommendations for Updates
  - Policy and Guidance

Selected Technologies

- Angle of Attack
- Energy State Awareness
- Improved Envelope Protection
- Simple Autopilots and Cockpit Automation
- Enhanced Displays
- Electronic Parachute (Emergency Auto-land)
- Flight Path Trajectory Management
  - Highly Augmented, Manually Flown

SUMMARY

- Focused on Implementation of New Technology
  - highly augmented flight path control with
  - sensors and displays to help pilot maintain Situational Awareness
  - include envelope protection and automation