The Rotorcraft Safety Challenge

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Overview

• Where are the opportunities to improve rotorcraft safety?
  – What operations experience the most accidents?
  – Do some operations contribute more than their “fair share?”
  – What are the most frequent contributing factors to rotorcraft accidents?

• What role will technology play?
  – Improve safety
  – Diminish safety

• Will fixed-wing technology successfully transfer to improve rotorcraft safety?
  – Different equipment environment and integration challenges
  – Different aircraft operating environment
  – Different safety challenges

• Should we think about rotorcraft safety differently?
• What is the “Rotorcraft Safety Challenge?”
What Does the Data Tell Us?

“I have no data yet. It is a capital mistake to theorise before one gets data. Insensibly one begins to twist facts to suit theories, instead of theories to suit the facts.”

Sir Arthur Conan Doyle
The Adventures of Sherlock Holmes
Rotorcraft Accidents by NTSB Classification
10 Years from CY01 to CY10 – 1,672 Accidents

- Instruction/Training 21.7%
- Personal/Private 20.0%
- Aerial Application 8.2%
- EMS 7.8%
- Public Use 7.8%
- Aerial Observation 3.3%
- Positioning 4.9%
- Other Work 7.4%
- Business 4.7%
- Not Categorized 9.3%
- External Load 1.9%
- Flight Test 1.4%
- 6 Other Categories 1.5%
Rotorcraft Accidents by NTSB Classification
5 Years from CY06 to CY10 – 747 Accidents

- Instruction/Training 22.1%
- Personal/Private 20.9%
- Aerial Application 8.3%
- Not Categorized 8.0%
- EMS 7.6%
- Public Use 6.7%
- Aerial Observation 4.0%
- Business 4.7%
- Positioning 4.8%
- Other Work 6.0%
- Flight Test 1.3%
- External Load 3.6%
- 6 Other Categories 1.9%
- Other Work 6.0%
- EMS 7.6%
Rotorcraft Accidents – FY 2011 Analysis
130 Accidents

- Personal/Private: 27.7%
- Aerial Application: 22.3%
- Instructional/Training: 18.5%
- Commercial: 10.0%
- EMS: 7.7%
- Public Use: 6.2%
- Aerial Observation/Patrol: 0.8%
- Electronic News: 0.8%
- External Load: 3.1%
- Utilities Patrol/Construction: 3.1%
- Construction/Utilities Patrol: 3.1%

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Personal/Private Accidents Compared to Flight Hours

U.S. Personal/Private Helicopter Accidents and Flight Hours

% of Rotorcraft Hours

% of Rotorcraft Accidents

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

3% 6% 6% 4% 4% 4% 4% 4% 4% 4%

18% 20% 19% 20% 19% 20% 20% 21% 22% 22%
**Instruction/Training Accidents Compared to Flight Hours**

**U.S. Instructional/Training Helicopter Accidents and Flight Hours**

- **% of Rotorcraft Hours**
- **% of Rotorcraft Accidents**

![Graph showing the comparison between percentage of Rotorcraft Hours and percentage of Rotorcraft Accidents from 2001 to 2010.](image)

- 2001: 11%, 11%
- 2002: 21%, 9%
- 2003: 21%, 10%
- 2004: 18%, 13%
- 2005: 24%, 24%
- 2006: 20%, 16%
- 2007: 31%, 16%
- 2008: 16%, 16%
- 2009: 16%, 16%
- 2010: 17%, 16%

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Federal Aviation Administration

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Aerial Application Accidents Compared to Flight Hours

U.S. Aerial Application Helicopter Accidents and Flight Hours

- % of Rotorcraft Hours
- % of Rotorcraft Accidents
From IHST’s 3 Year Data Analysis
523 Accidents

• Personal/Private: 97 Accidents (18.5%)
  – 41% occurred from a Loss of Control
    • Most frequently the result of performance management
  – 90% had problems with Pilot Judgment/Actions, occurring most frequently in the following more specific areas:
    • Decision Making
    • Landing Procedures
    • Procedure Implementation
    • Flight Profile
From IHST’s 3 Year Data Analysis

• **Instruction/Training:** 92 Accidents (17.6%)
  – 61% occurred from a Loss of Control
    • Most frequently the result of performance management
    • 42% occurred during a practice autorotation

  – 93% had problems with Pilot Judgment/Actions, occurring most frequently in the following more specific areas
    • Procedure Implementation
    • Landing Procedure
    • Crew Resource Management
    • Decision Making
Safety Opportunities

• Three types of operations account for more than 50% of the rotorcraft accidents.
  – Personal/private
  – Instruction/training
  – Aerial applications

• These operations contribute more than their “fair share” to the number of accidents.

• For these “high offender” categories, the following are the most significant contributors –
  – Loss of Control
  – Pilot Judgment/Action
What Role Will Technology Play in Rotorcraft Safety?

• **Improve Safety?**
  – Improved situation awareness
  – Training enhancements
  – Smart power management
  – Smart cockpit

• **Diminish Safety?**
  – Gee-whiz, distracting or misleading information
  – Snow tire syndrome
Will Fixed-Wing Solutions Work?

• The helicopter operational environment –
  – To boldly go where no other aircraft would go
  – Near the ground
  – Near obstacles
  – Low and slow
  – Confined spaces
  – Unprepared surfaces

• Significant adaptations may be required.
• All new solutions may be necessary.
Should We View Safety Differently?

• **Today’s Approach - evaluation based only on safety risk:**
  – Risk assessment
  – Risk management
  – Perform intended function
  – Not create a hazard
  – Single aircraft
  – Worst case operational conditions

• **Is something missing?**

• **Possible New Approach – based on safety risk and safety benefit:**
  – Individual aircraft risk
  – Individual aircraft safety benefit
  – Fleet risk
  – Fleet benefit
Rotorcraft Systems and Equipment

Required Systems and Equipment

Non-Required Systems and Equipment

Non-Required Safety Enhancing Equipment (NORSEE)

Perform Intended Function(1)/No Hazard

No Hazard

PIF(2)/NH(2)
The Rotorcraft Safety Challenge

- Recognize that rotorcraft are unique aircraft, with unique safety challenges that may not lend themselves to fixed-wing solutions.
- Determine how to use technology to improve rotorcraft safety, particularly in “high offender” operations.
- Find means to encourage practical and economical installations of safety enhancing systems – which may require that we broaden our concept of “safety” to include an evaluation of both risks and benefits.