

# Rotorcraft Occupant Protection Background & Supporting Analysis



Federal Aviation  
Administration



Presented By: FAA Rotorcraft Directorate

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# Background

- **Issue**

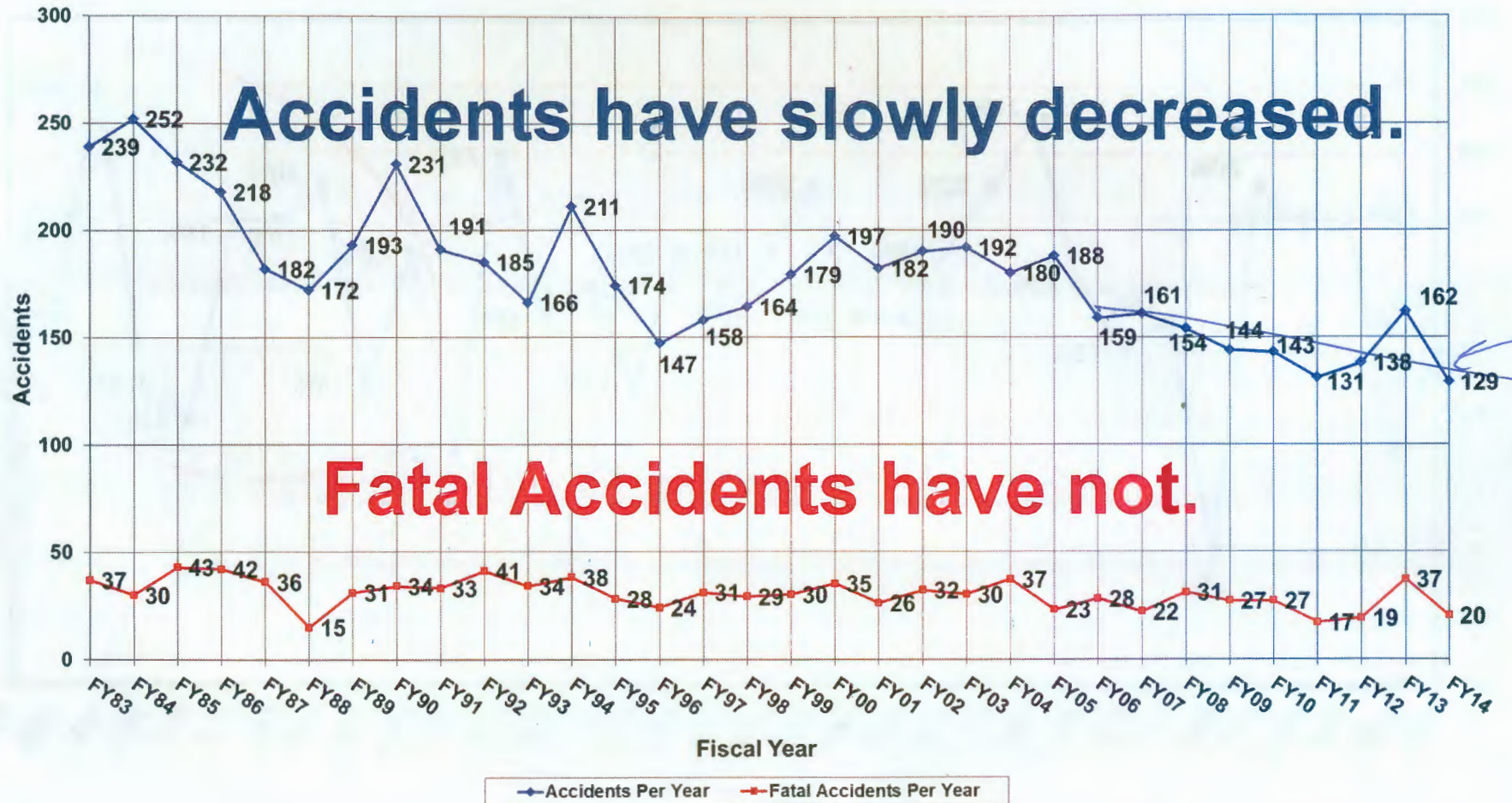
- U.S. helicopter accidents over the past few decades have steadily decreased, while fatal helicopter accidents and fatalities remains virtually unchanged

- **Contributing Factor**

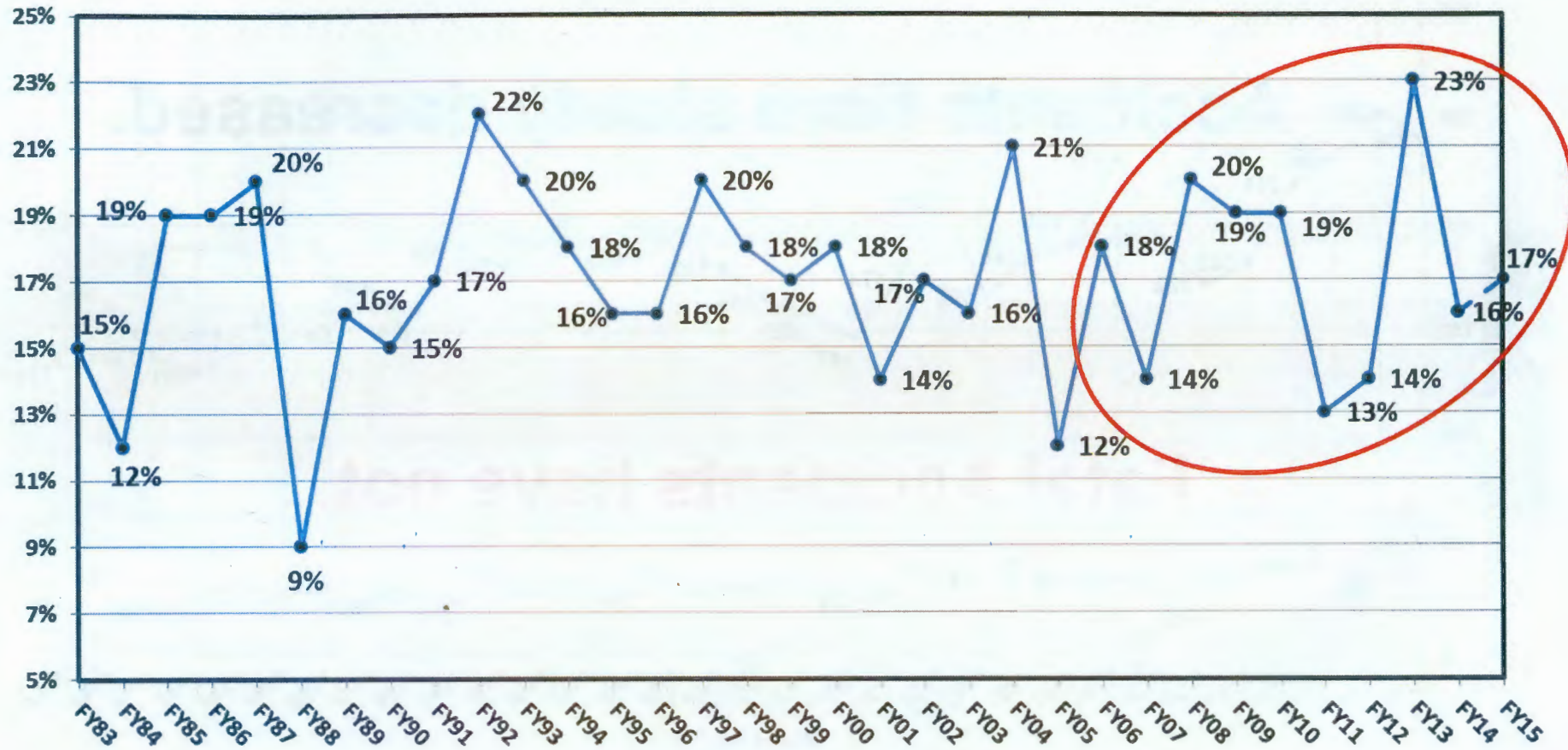
- Slow incorporation of occupant protection requirements into the overall U.S. rotorcraft fleet
- Rules in effect for 20+ years, but percentages of rotorcraft that meet requirements is low
  - Crash resistant fuel systems: 16% of U.S. fleet
  - Increased blunt force trauma protection: 10% of U.S. fleet



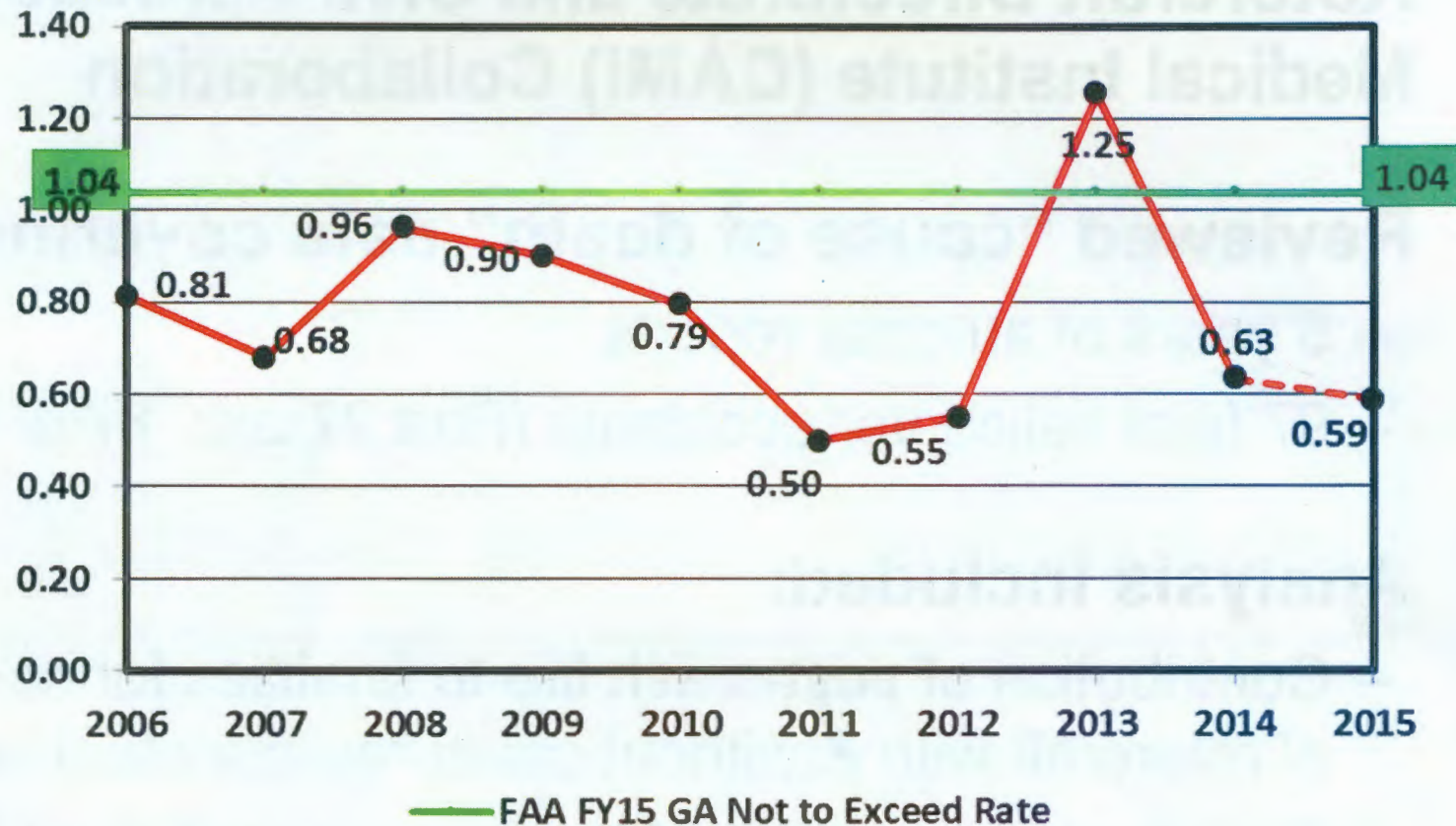
## U.S. Registered Rotorcraft Accidents FY83 - FY14



# Percentage of Rotorcraft Accidents with a Fatality



# Estimated U.S. Rotorcraft Fatal Accident Rates Per 100,000 hours – 10 Year Look Back



Historic rotorcraft flight hours extracted from FAA's General Aviation and Part 135 Activity Survey. Years 11 & 14 based on FAA's FY2015-2035 Forecast.



# 2013-14 FAA Fatal Accident Study

- **Rotorcraft Directorate and Civil Aerospace Medical Institute (CAMI) Collaboration**
- **Reviewed “cause of death” data covering:**
  - 5 years of autopsy reports
  - 97 fatal helicopter accidents (Part 27 a/c: 87 of 97)
- **Analysis included:**
  - Contribution of post-crash fire to fatalities for cases of rotorcraft with & without crash resistant fuel tanks
  - Statistical comparison of the frequency of blunt force injury patterns compared to previous research



# 2013-14 FAA Fatal Accident Study

- **Post crash fire**

- For Part 27 rotorcraft fatal accidents where a fully crash resistant fuel system was not installed:
  - Present in 39% of fatal accidents
  - Contributed to a fatality in 20% of the cases when present
  - No significant differences between different makes/models

- **Blunt force trauma**

- Studied frequency of skeletal & organ injury patterns
  - No statistically significant change over last 10 years
  - Core body region and head most frequently cited
  - Existing rule, if incorporated, would have offered increased protection to same body areas cited in fatal accidents



# Long Term Historical Perspective

- **For 25 years (1989-2014) since the increased blunt force trauma rule became effective:**
  - $\approx$  4,200 rotorcraft accidents with  $\approx$  9,000 total occupants
  - Only **2%** of a/c in those accidents met rule's requirements
  - The other **98%** of a/c in those carried  $\approx$  8,800 occupants
  - Over **1,300** fatal injuries to the  $\approx$  8,800 occupants





# FAA and NTSB Safety Recommendations

- **July 22, 2015, FAA Safety Recommendation for initiating retroactive rule requiring crash resistant fuel systems for all rotorcraft manufactured after January 1, 2020**
- **July 23, 2015, NTSB Safety Recommendation to require, for all newly manufactured rotorcraft regardless of the design's original certification date, that crash resistant fuel systems be installed**



# Regulations Identified

- **Many rotorcraft in production today are older type designs not incorporating safety enhancements.**
- **The regulations affected include**
  - dynamic seat systems,
  - maintaining a survivable volume for occupants,
  - restraining large items of mass above and behind the occupant,
  - crash resistant fuel systems.



# Rotorcraft Occupant Protection Tasks

- **Recommend how occupant protection standards should be made effective for newly manufactured rotorcraft**
- **Present cost/benefit analysis**
- **Follow-on task**
  - Recommend how to incorporate rotorcraft occupant protection improvements and standards into the existing rotorcraft fleet

