



NTSB National Transportation Safety Board

Office of Research and Engineering

Safety Study Report: Introduction of Glass Cockpit Avionics into Light Aircraft

Quantitative Analysis
Results

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Quantitative Analysis

- Goals
 - Identify operational differences between two groups of aircraft
 - Determine effect of glass cockpits on safety
- Comparisons
 - Accident information
 - Aircraft activity
 - Accident rates

Study Aircraft

- Single-engine piston airplanes, built 2002-2006 with both conventional and glass cockpits
- Two cohorts identified by serial number and aircraft registry
 - Conventional (2,848 aircraft)
 - Glass Cockpit (5,516 aircraft)

Study Aircraft Makes/Models

- Cessna Aircraft Corporation - 172, 182, and 206 series
- Cirrus Design Corporation - SR20 and SR22
- Diamond Aircraft - DA40
- Lancair/Columbia Aircraft/Cessna Aircraft Company
 - 300/350, and 400
- Mooney - M20 series
- Piper Aircraft Inc.
 - PA-28-161, PA-28-181, PA-28-201, PA-32-301 series, and PA-46-350P
- Hawker Beechcraft Corporation - 36 series

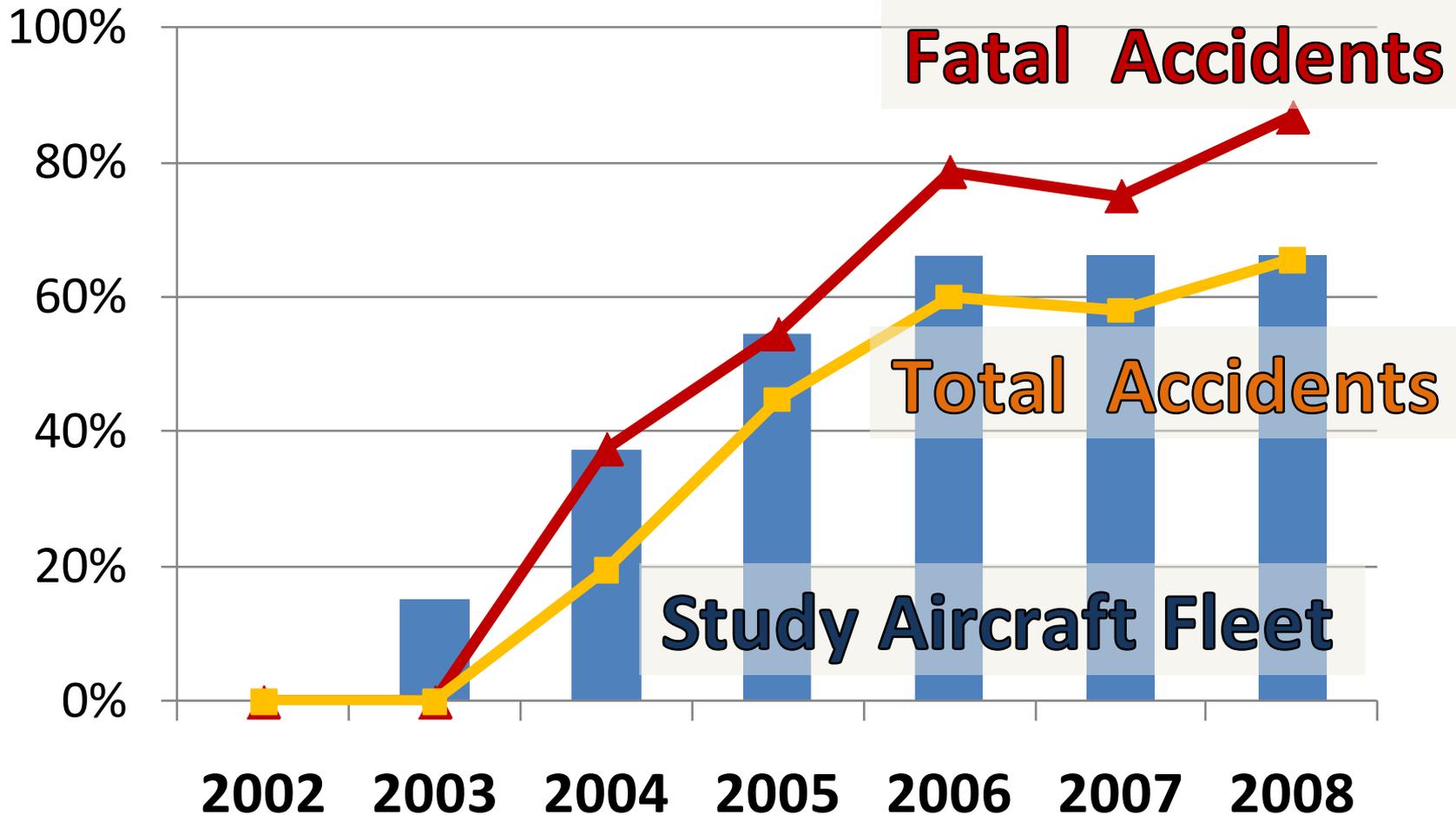
Statistical Comparisons

- Accident Flights
 - Accident severity
 - Time of day, planned length, purpose, weather conditions, flight plan, phase and event details
- Accident Pilots
 - Number of flight crew, age, highest certificate, instrument rating, flight hours

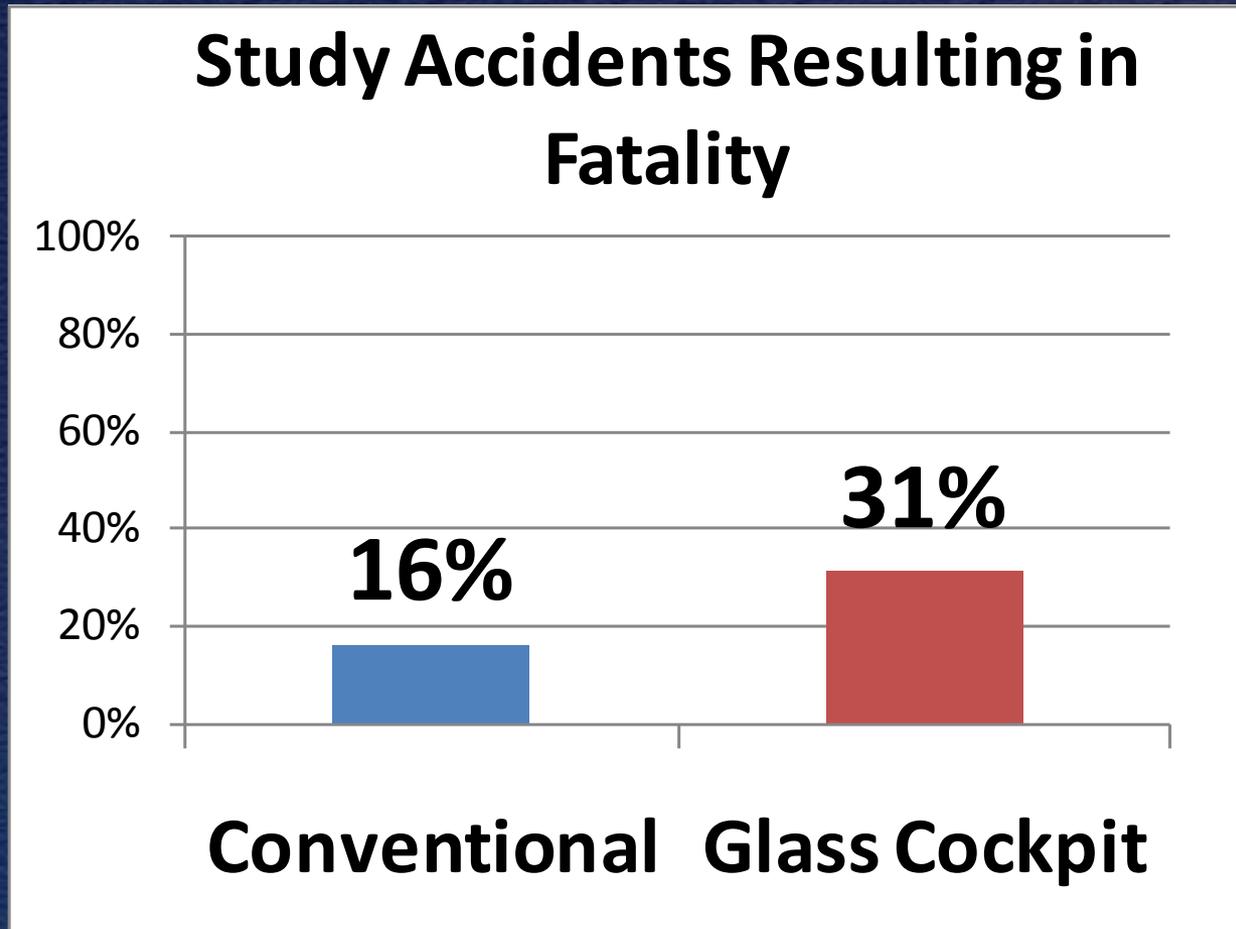
Accident Data, 2002 - 2008

- NTSB accident investigation records for U.S. registered aircraft
- 266 total accidents
 - Conventional = 141 total, 23 fatal
 - Glass Cockpit = 125 total, 39 fatal
- Sufficient data to make statistical comparisons

Glass Cockpit Cohort, 2002-2008



2002-2008 Accident Data



2002-2008 Accident Data - Flights

	Conventional	Glass Cockpit
Purpose of flight	Instructional	Personal/business
Planned length	Local/shorter flights	Longer flights
Flight plan	Visual/none	More instrument



2002-2008 Accident Data - Flights

- Conventional
 - More during ground phases like taxi, takeoff, and landing
 - More loss of control on ground and hard landings
- Glass Cockpit
 - More during flight phases like climb, cruise, and approach
 - More loss of control in flight, collision with terrain, and weather encounters

2002-2008 Accident Data - Pilots

	Conventional	Glass Cockpit
Flight crew		More single pilot
Pilot age	Younger	Older
Pilot certificate	More students	More private pilots
Instrument rating		More instrument - rated
Total flight hours	Less	More

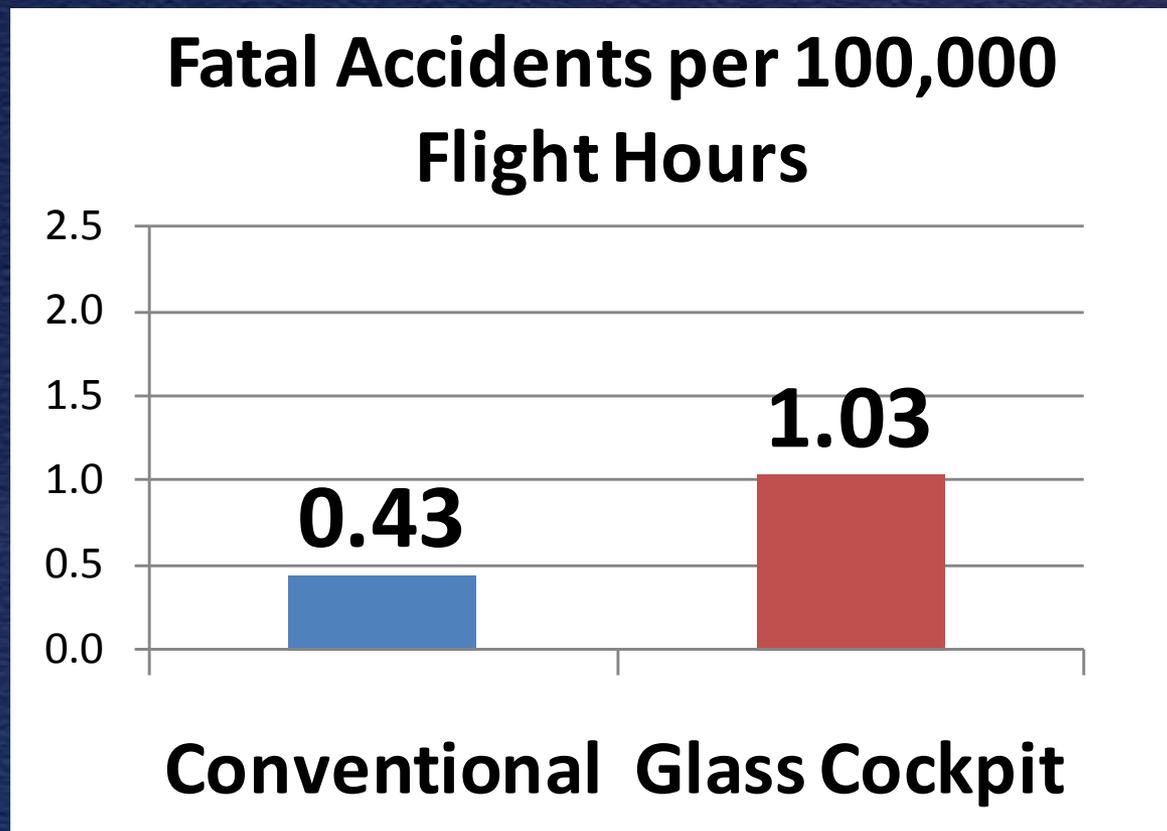
Activity Data

- Manufacturing and registration records supplemented with FAA GAATAA Survey Data
 - Subset of survey responses from study aircraft
 - Activity data for 2006 and 2007
 - Used to calculate accident rates

2006-2007 Activity Data

- Glass Cockpit
 - Fewer hours per aircraft
 - Higher percentage of hours flown for personal/business
 - Lower percentage of hours for instructional flights
 - Higher percentage of hours flown in IMC

2006-2007 Accident Rates



Summary of Results

- Lower total accident rates for glass cockpit cohort
- Higher fatal rate for glass cockpit cohort
- Accidents reflect differences in aircraft use that might explain differences in accident severity
- Pattern of results does not show a safety benefit for glass cockpit group during the studied period





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