



NTSB National Transportation Safety Board

Office of Aviation Safety

Seats and Restraints **Cindy Keegan**

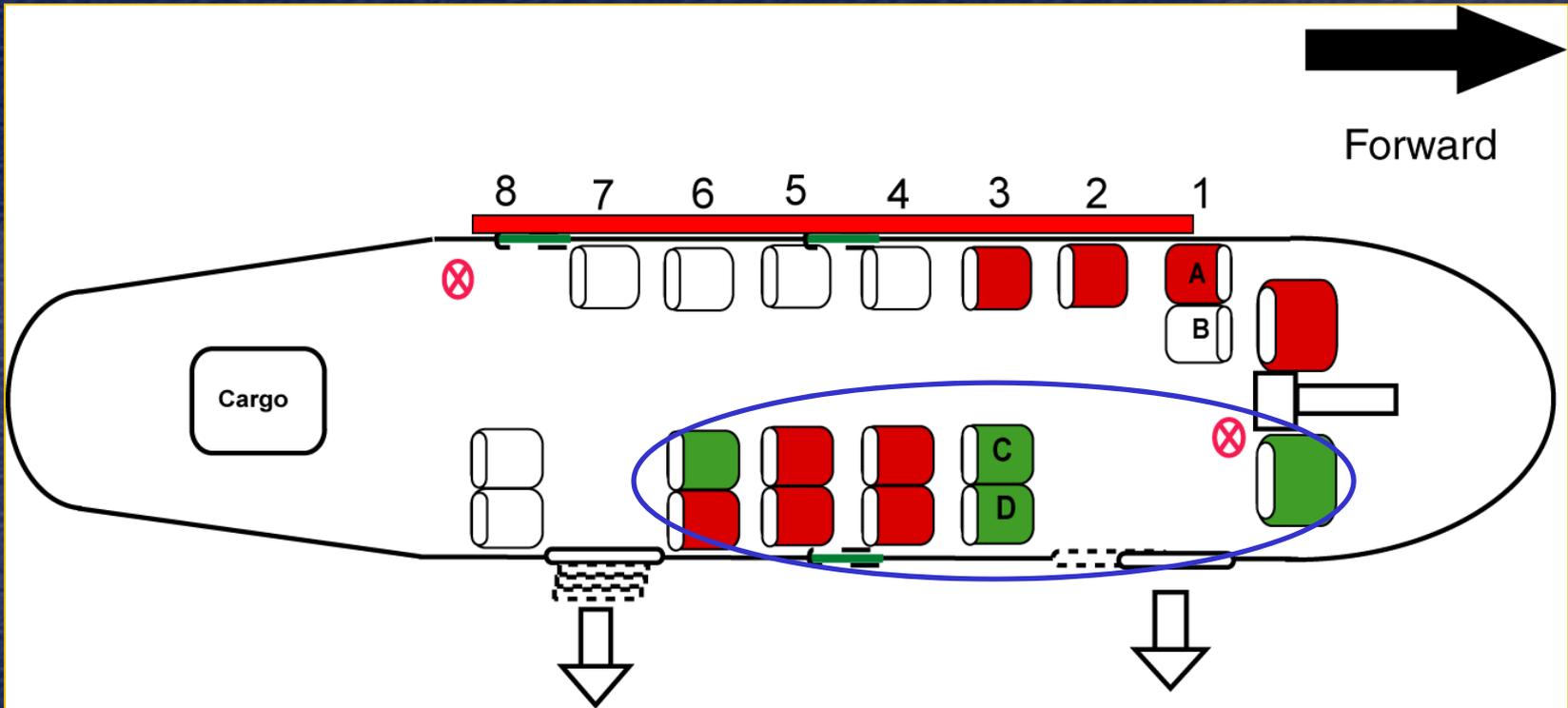


Carson Helicopters S-61N
Operated by U.S. Forest Service
Weaverville, CA
August 5, 2008

Carson Helicopters



Carson Helicopters



Legend

<p> Exits</p> <p> Fire Extinguishers</p> <p> Sliding Main Cabin Door</p> <p> Airstair Exit</p>	<p> Emergency Exit Hatch</p> <p> Fatal</p> <p> Serious</p> <p> Vacant</p>
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06/27/2008

Carson Helicopters

Seats and Restraint Compatibility

- U.S. Forest Service
 - Carson install shoulder harness on existing seats
- Issues
 - Non-locking, folding seatback
 - Flailing of upper body
 - Compression loads on spine
 - Overturning moment of seat
- FAA evaluation
 - Installation meets regulatory requirements

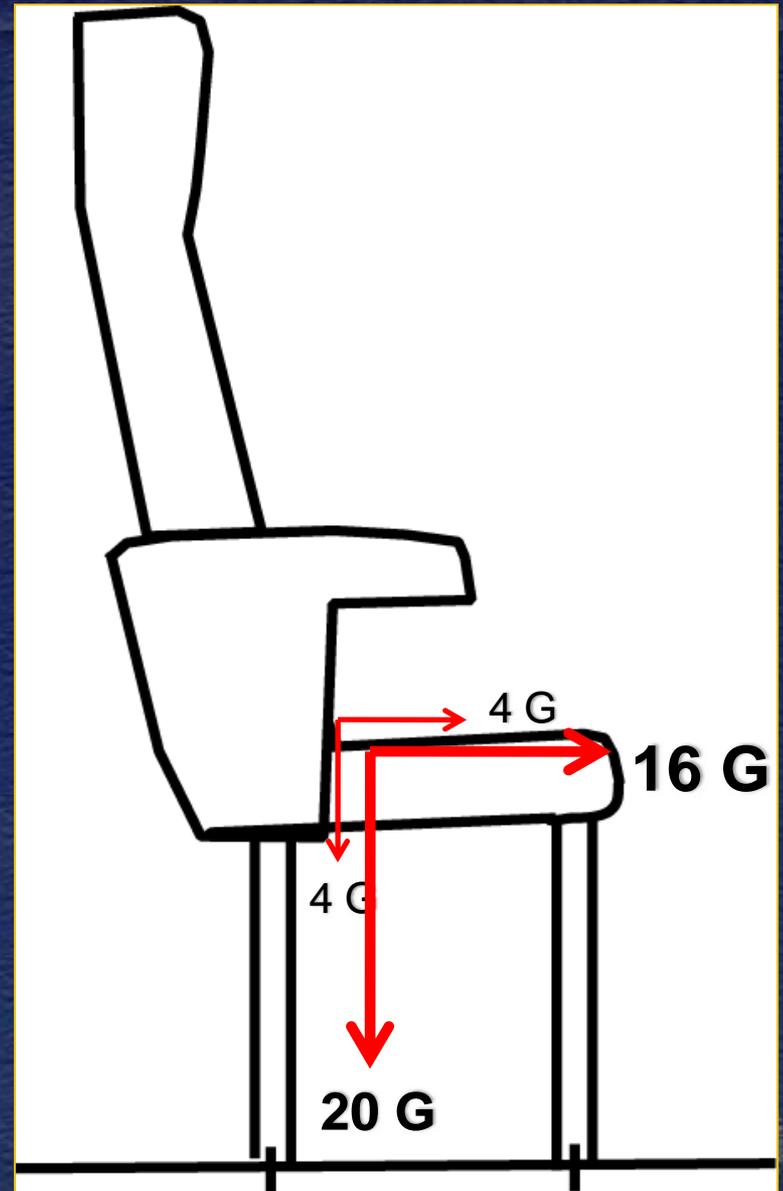


DER Guidance and Adherence

- DER provided data to support shoulder harness attachment to seat
- AC 21-34
 - False security and shoulder harness geometry
 - Integrity of rear seat legs
 - Entire seat strength – when shoulder harness applies loads to seatback
- DER did not follow guidance

Seat Design Standards

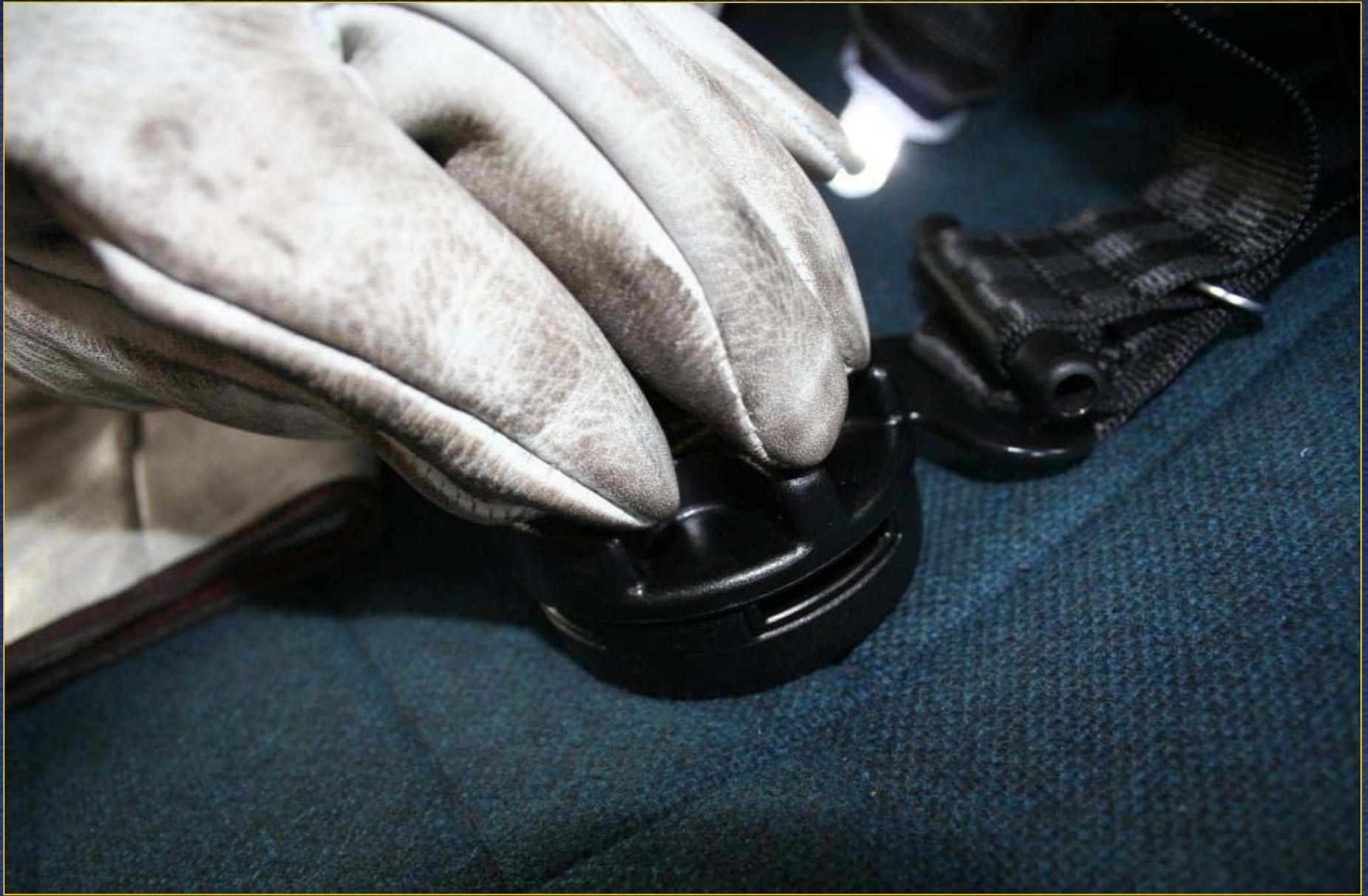
- **Original standards**
 - CAR 7
 - 4 G forward
 - 4 G downward
- **Current standards**
 - 14 CFR 29.561
 - 16 G forward
 - 20 G downward



Buckle Familiarity

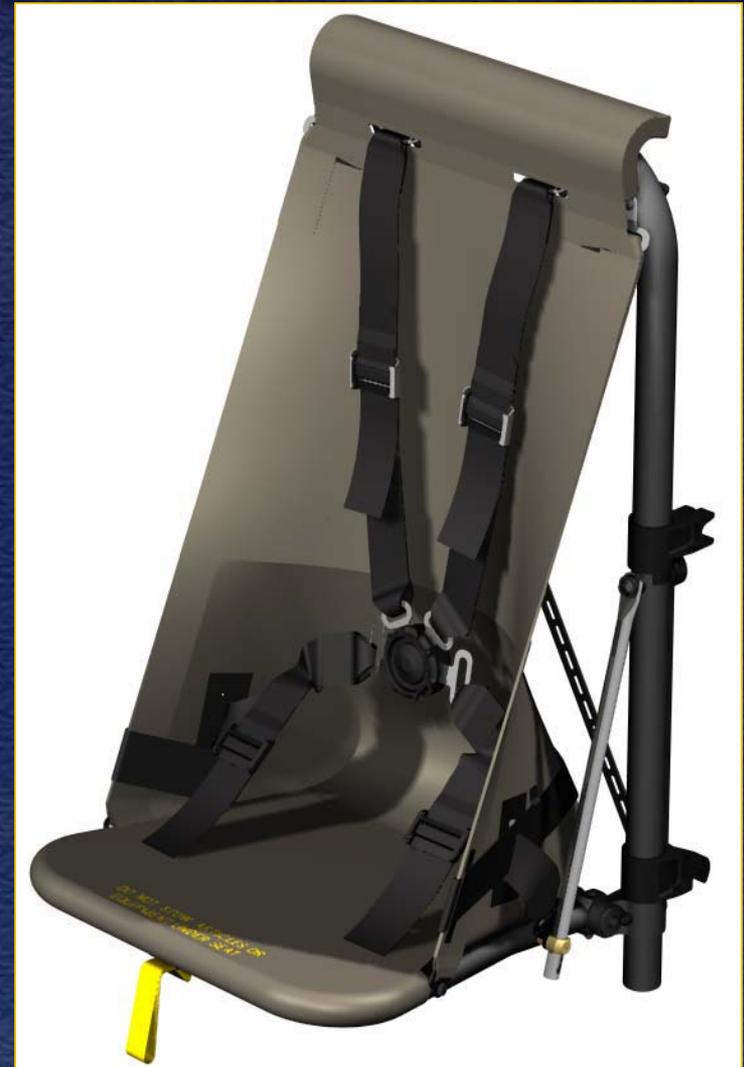
- Survivors unfamiliar with rotary buckle
- More familiar with lift-latch buckle
- 10 of 15 rotary buckles remained latched





Carson STC Seats

- STC SR02327AK
- December 5, 2008
- Martin Baker side-facing energy-attenuating seats
 - 10 G lateral
 - 30 G dynamic



STC Supporting Data

- Review of STC Data
 - Seat attachment brackets rated to 4 G
 - Improved energy attenuating seat is not effective with only 4 G attachments



DER STC Approval

- No requirement beyond CAR 7
- AC 21.101 – “Establishing Certification Basis of Changed Aeronautical Products”
 - Intent: enhance safety
- DER concluded
 - Compliance with 14 CFR 29.561 and 29.562 “does not substantially increase safety” and is an “economic burden”





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