2001 Fire and Cabin Safety Research Conference
October 2001
Evacuation Studies Session

An Update on Biodynamics Research Activities at the FAA Civil Aerospace Institute

Van Gowdy
FAA Civil Aerospace Institute (CAMI)
Biodynamics Research Lab

Presentation ….

- This presentation describes some of the key recent research and impact testing projects conducted at CAMI's Biodynamics Research Laboratory.
- This is an update of CAMI activities since the previous International Fire and Cabin Safety Research Conference in 1998.
- All of the presented programs are in support of FAA's certification, policy, and research organizations responsible for the establishment and development of regulations and policies associated with aircraft crashworthiness.

Presentation ….

- Child Restraints for Transport Passenger Seats
- Side Facing Seats - Occupant Restraint Methods
- Vertical Impact Energy Absorbing Seat Developments
- Modifications to the Hybrid III ATD for FAA Seat Certification Tests
- Sport Parachutists - Restraint Systems

Child Restraints

FAA Administrator Jane Garvey
Speech at NTSB Child Restraint Meeting
Arlington, Virginia
December 15, 1999

"Let me be clear, we are committed to two things: mandating the use of child restraint systems in aircraft and assuring that children are accorded the same level of safety as are adults."

No more belly-belts

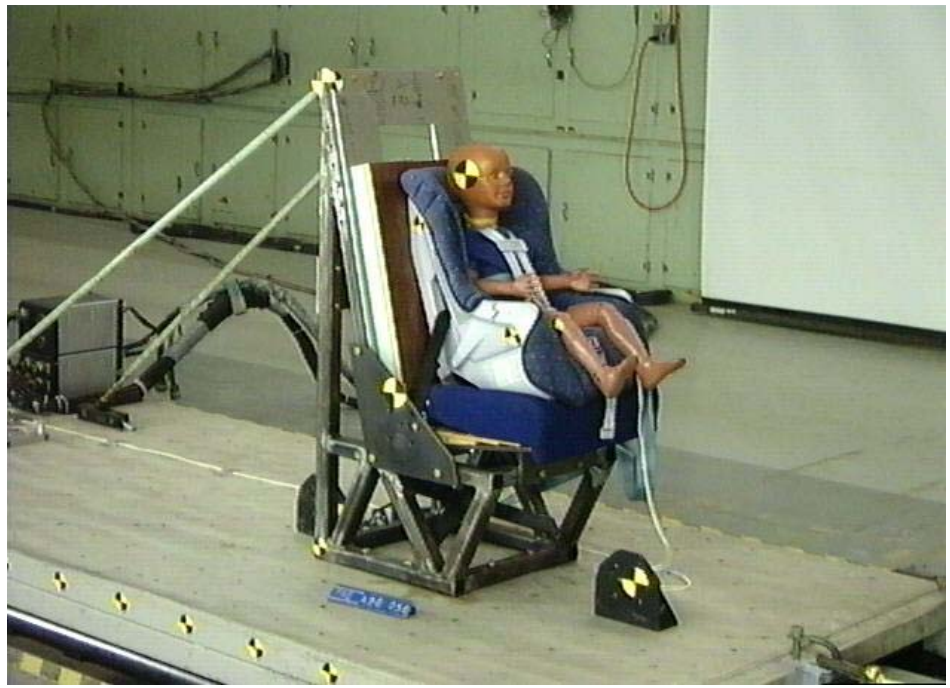
No more lap held infants

Child Restraints

Research Activities:

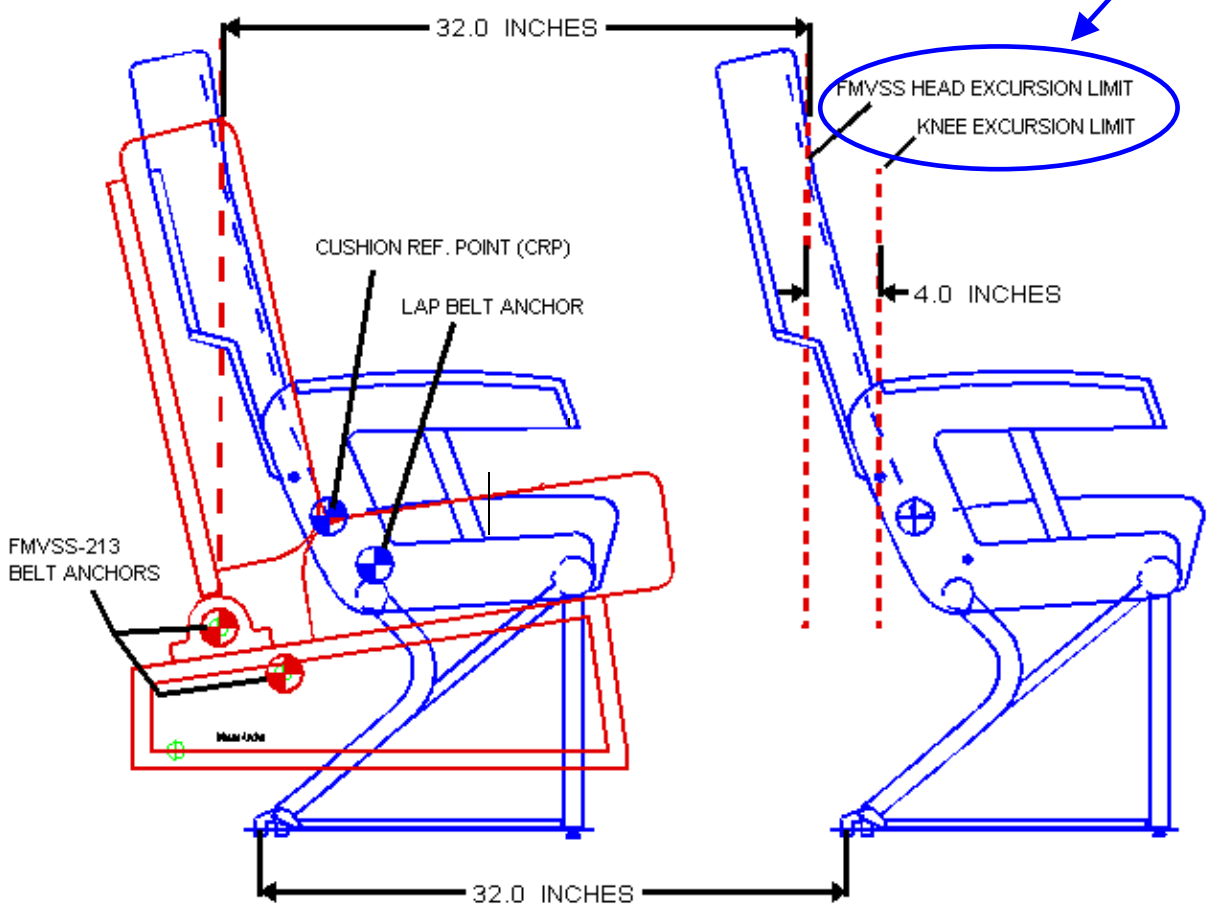
Development of test methodology and pass/fail criteria for new SAE Aerospace Standard.

- Conducted rigid seat tests to establish lap belt, seat cushion, and test fixture parameters.
- Methods based on criteria used in automobile child restraint regulations (FMVSS-213)

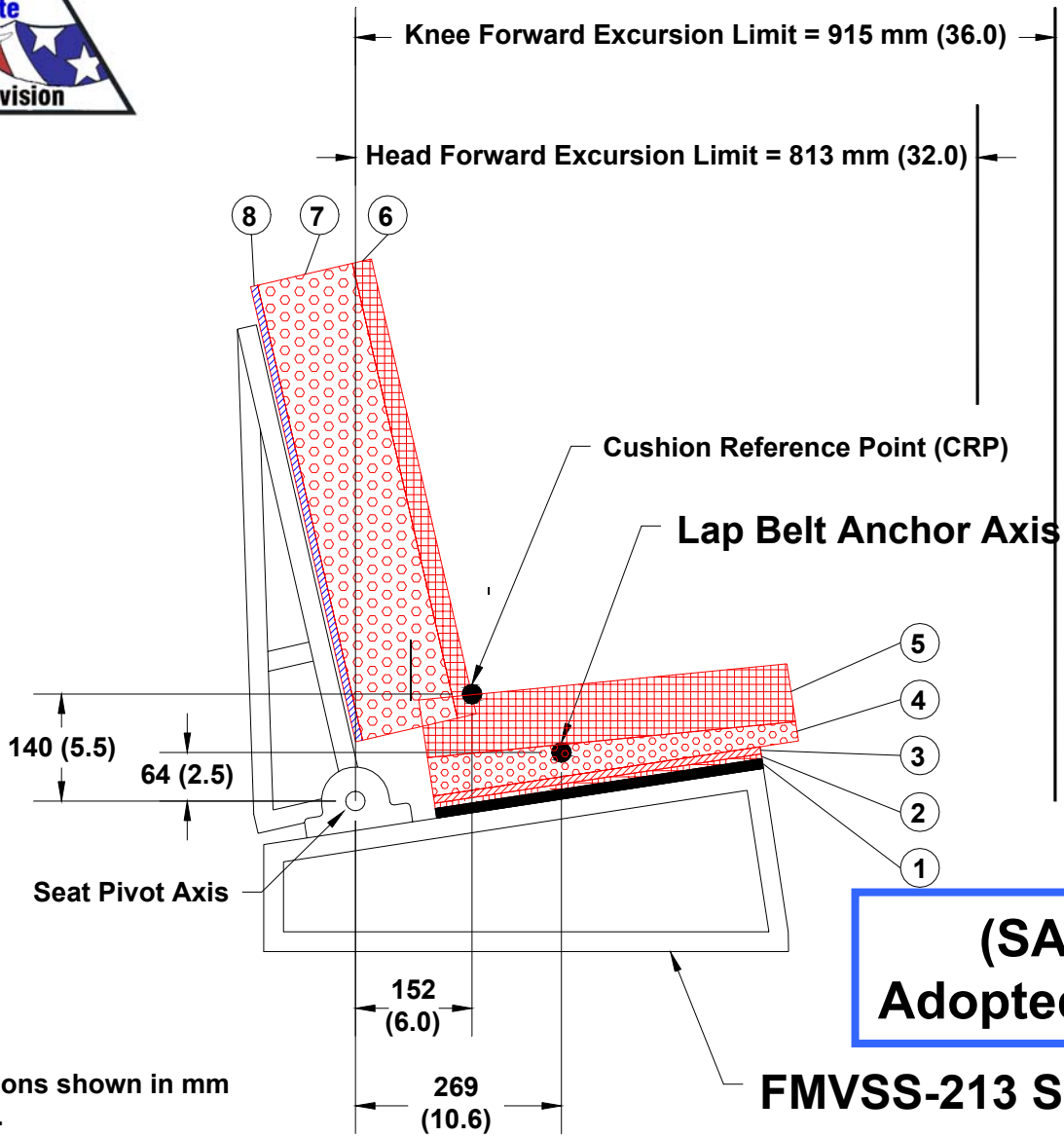


Child Restraints

Current Performance Criteria per FMVSS-213



Child Restraints



(SAE AS-5276-1)
Adopted November 2000

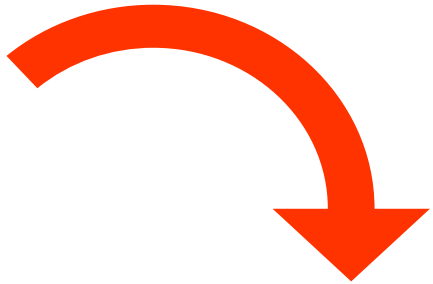
Dimensions shown in mm (inches).

Child Restraints

16g 44 f/s dynamic test with AS 5276 type cushions and lap belt anchor configuration

Child Restraints

(SAE AS-5276-1)
Adopted November 2000

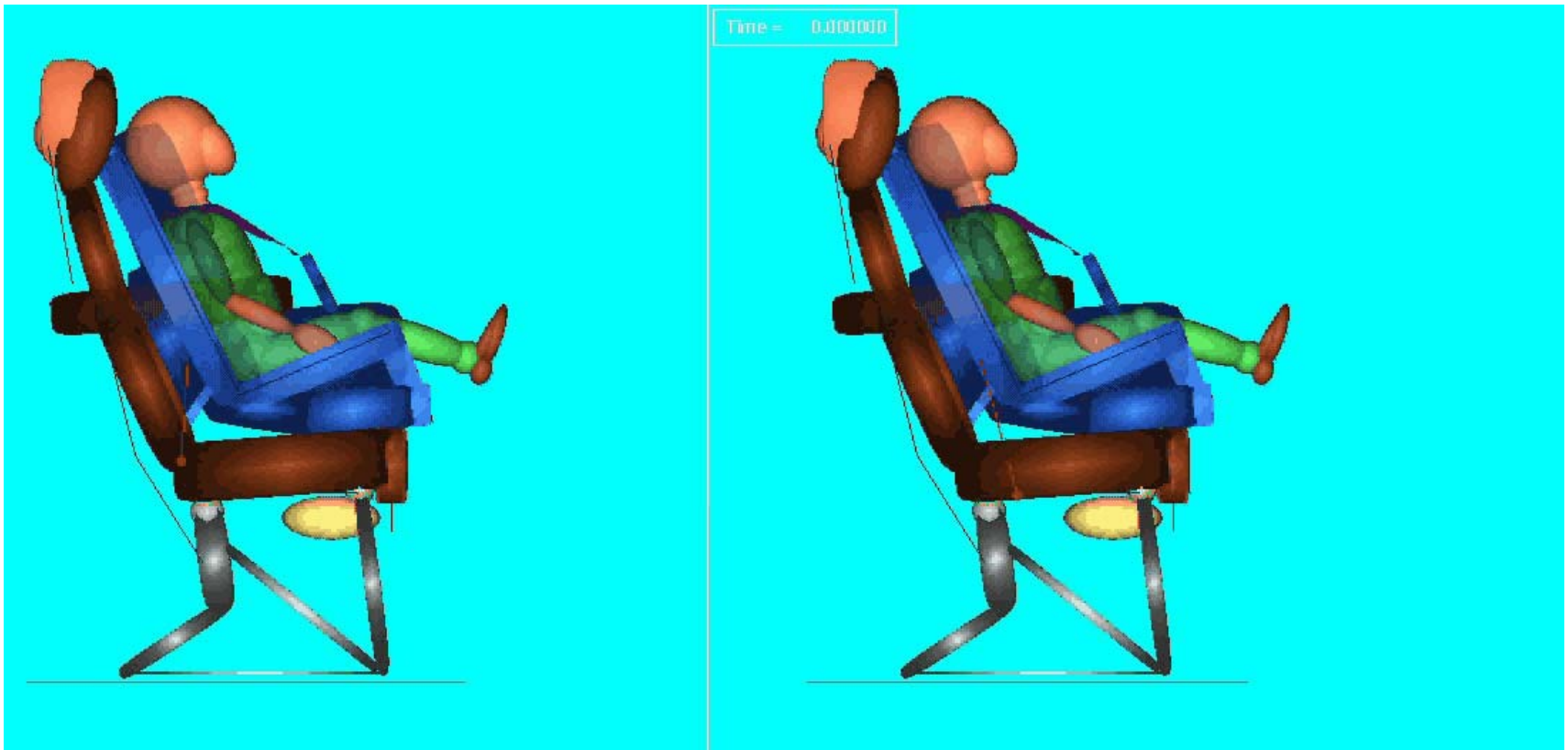


TSO C-100b Notice of Proposal - Request for Comments
Federal Register Announcement - August 7, 2001

Child Restraints

Computer Modeling of Child Restraint in Airplane Seat

"Development of a Validated Aircraft Child restraint Model"
SAE 2000-0102110, Pipino, Mugnal, DeWeese
SAE Advances in Aviation Safety Conf., April 2000

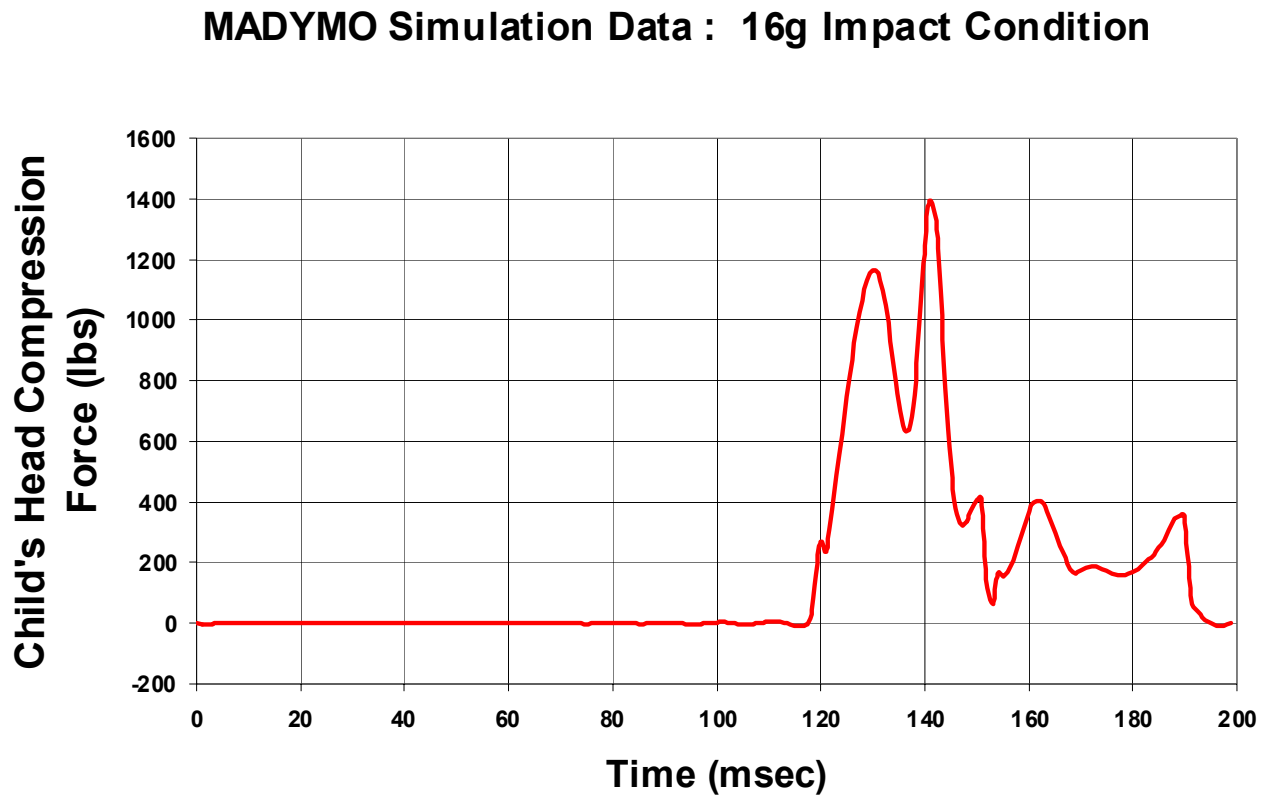


Child Restraints

New Concepts (Golden Talon Consulting)

Child Restraints

Continued research addressing the hazards for lap-held infants and “belly-belt” type restraints

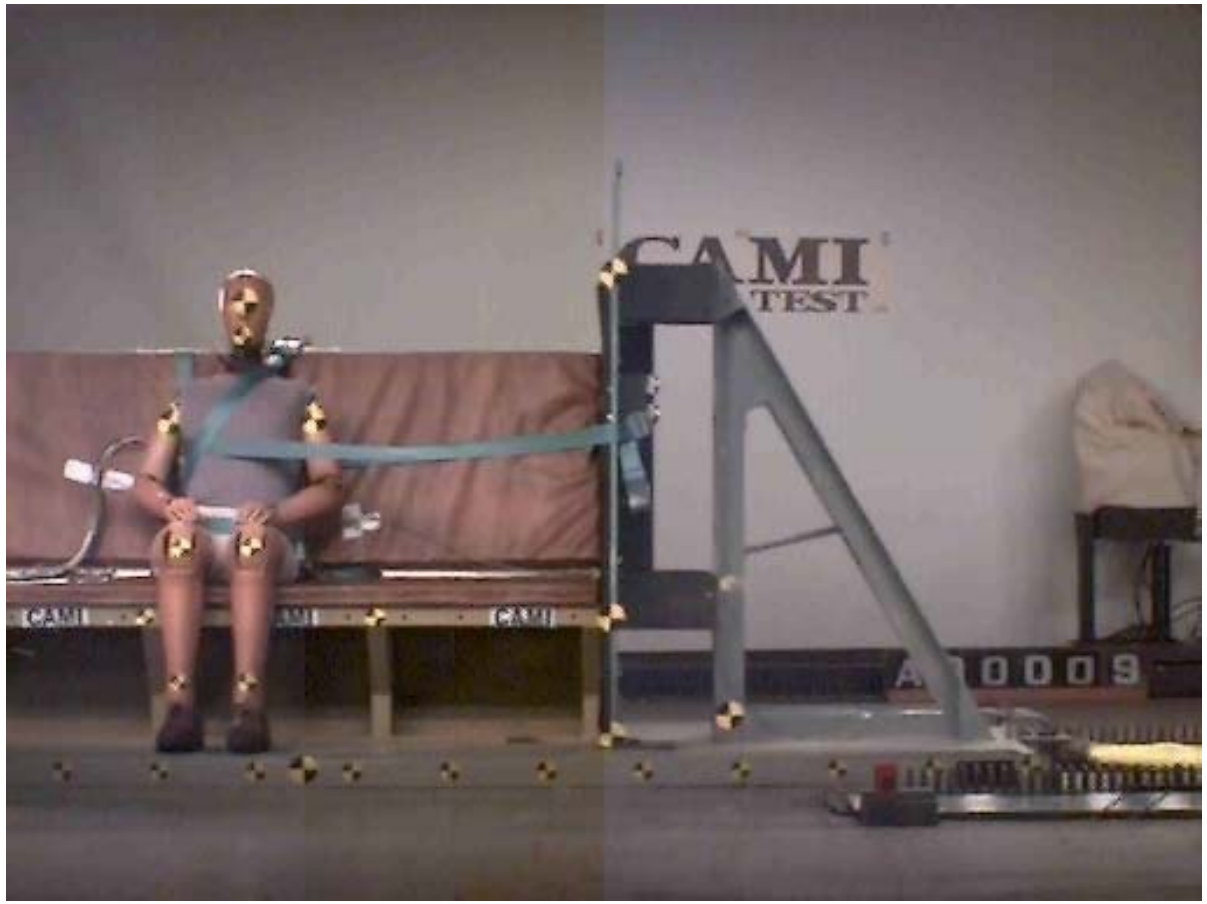


Side Facing Seats Occupant Restraints

Inflatable Tube Torso Restraint System (ITTR)
Developed by Simula Safety Systems

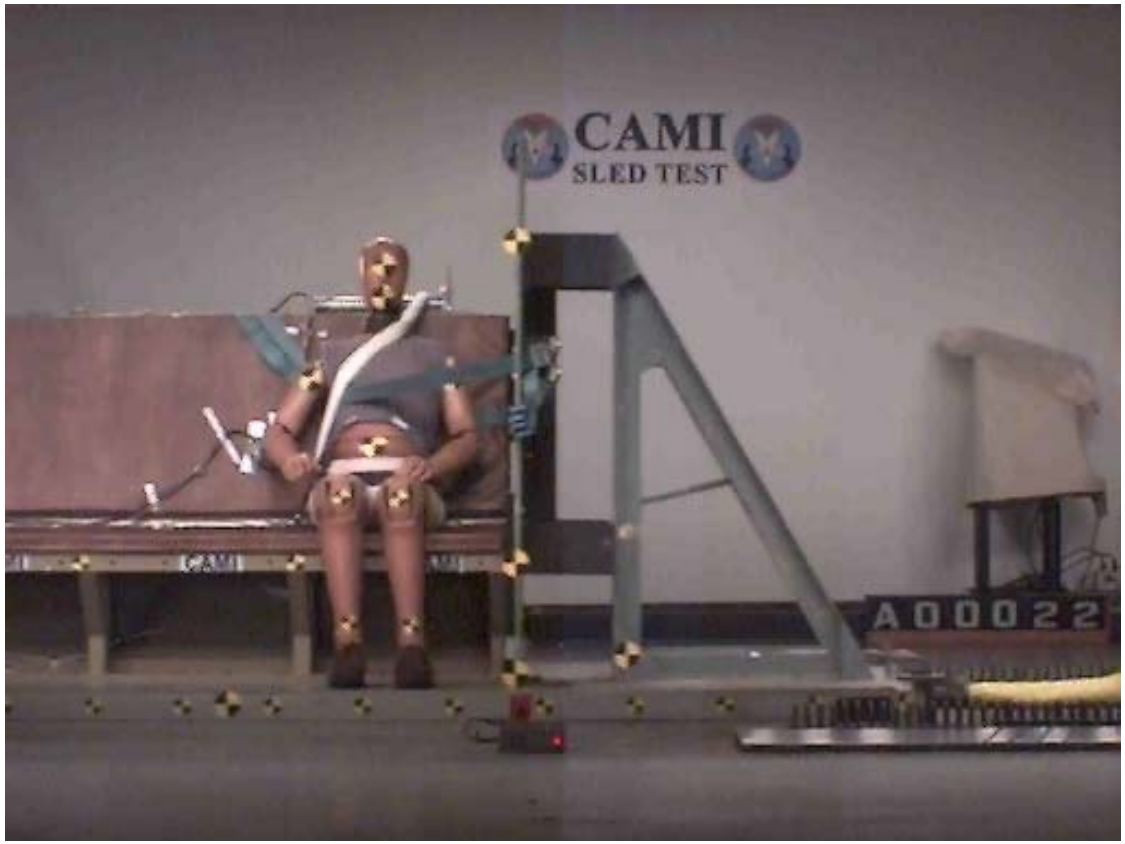
"Simula Lines of Inflatable Restraints Technologies"
A. Grierson, D. Dutton, USAARL Report 2000-21,
US Army Aeromedical Research Laboratory
August, 2000

Side Facing Seats Occupant Restraints



16g, 44 f/s Impact, Side facing Hybrid III ATD, Normal Restraint
Neck Loads Instrumented, CAMI Rigid Seat Fixture.

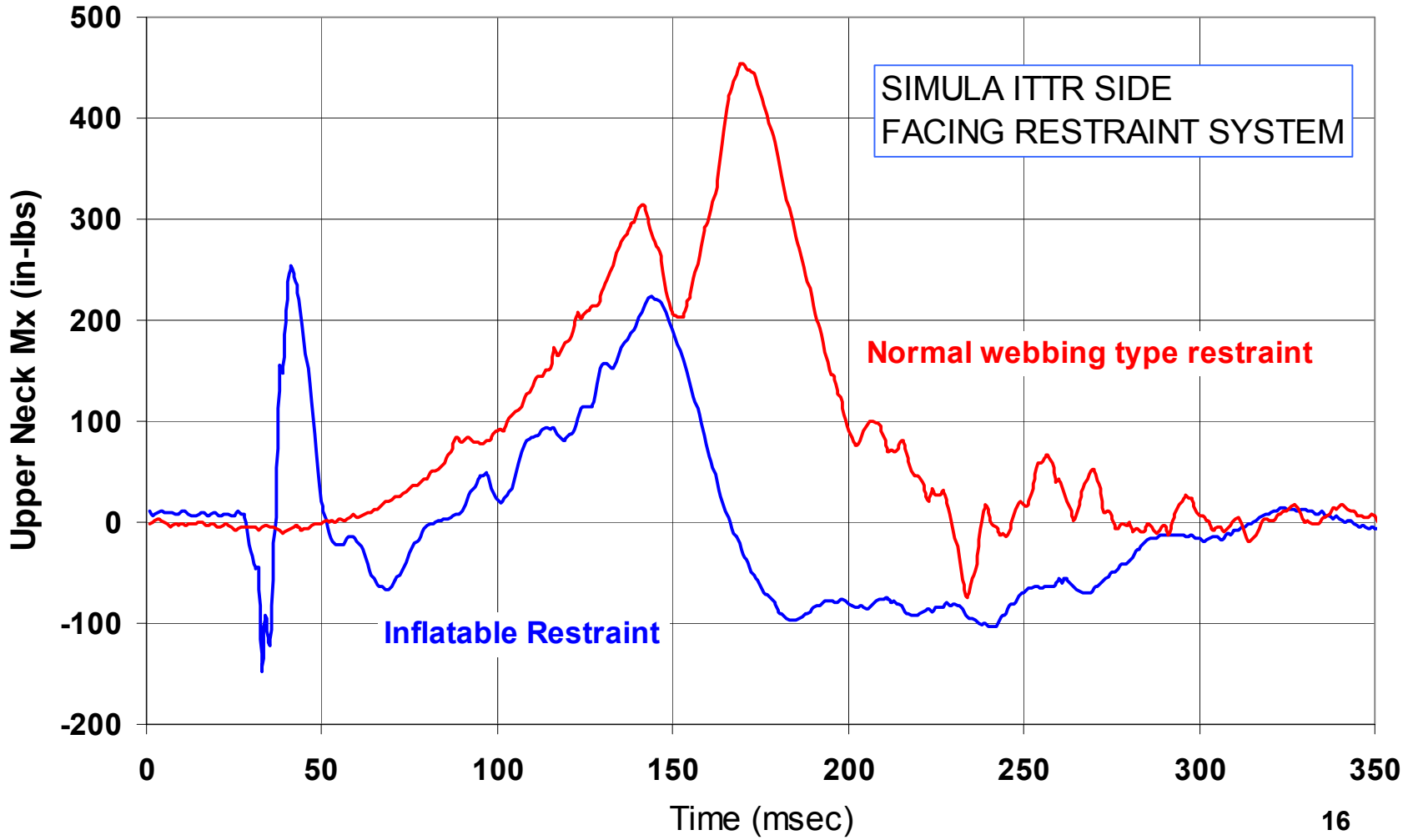
Side Facing Seats Occupant Restraints



16g, 44 f/s Impact, Side facing Hybrid III ATD, Inflatable Restraint Neck Loads Instrumented, CAMI Rigid Seat Fixture.

Side Facing Seats
Occupant Restraints

CAMI SLED TEST
A00022



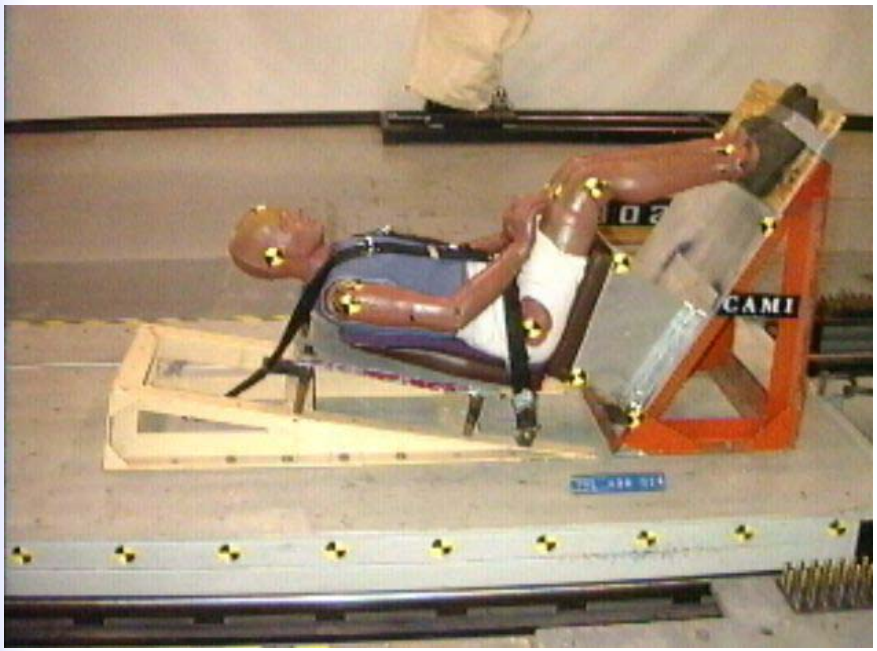
Side Facing Seats Occupant Restraints

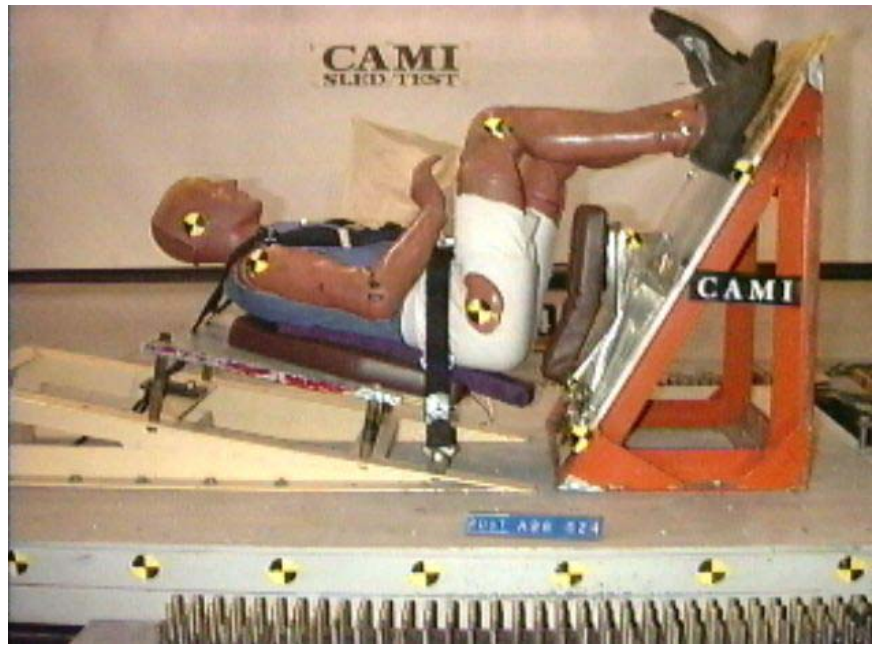
Goodrich Inflatable Restraint System Tested at CAMI

Vertical Impact Energy Absorbing Seat Developments

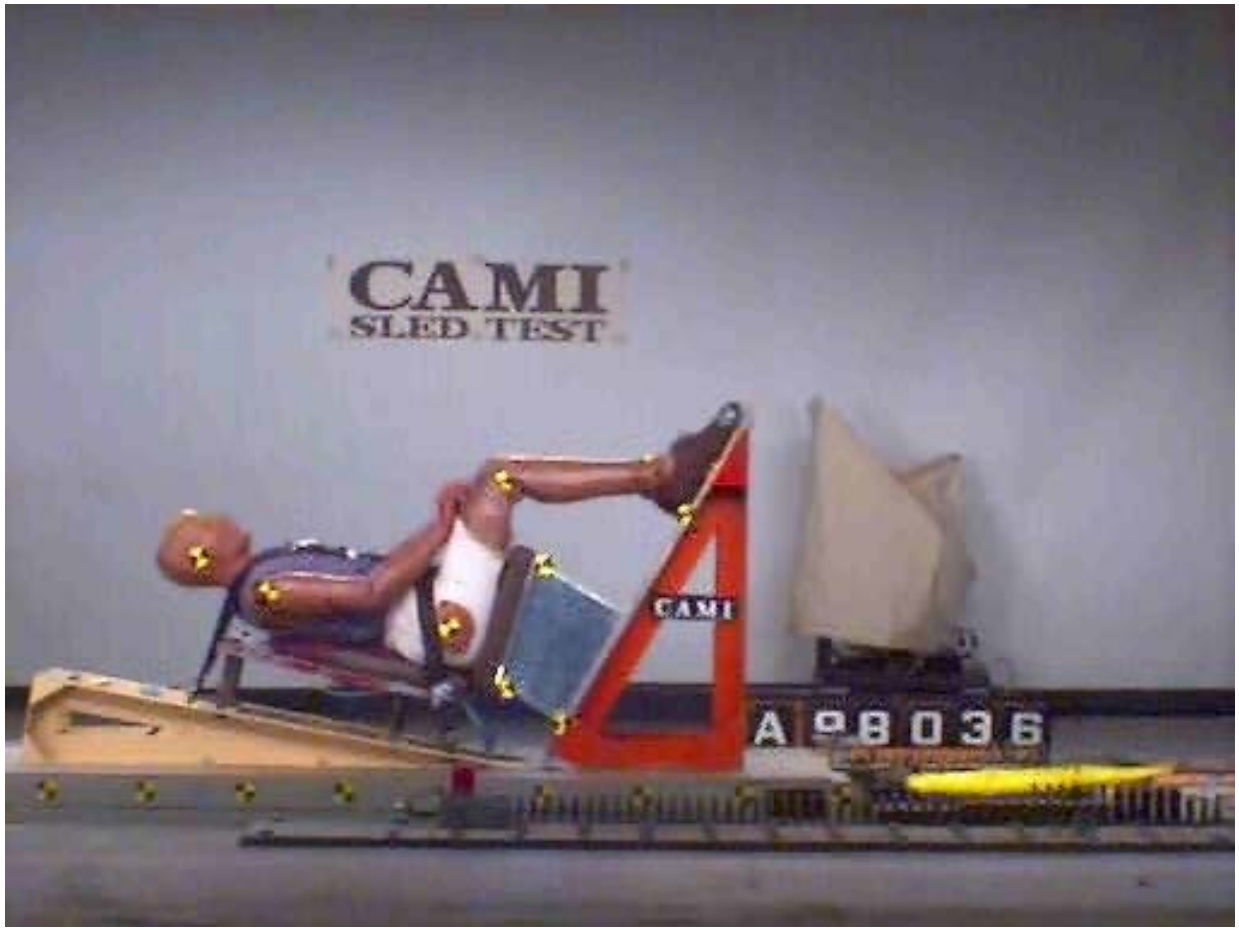
"Design and Testing of Buckling Monocoque Seating Structures for Aircraft Seats", Nicholson, Turnour, Chapman,

SAE Paper 1999-01-1599, April 1999

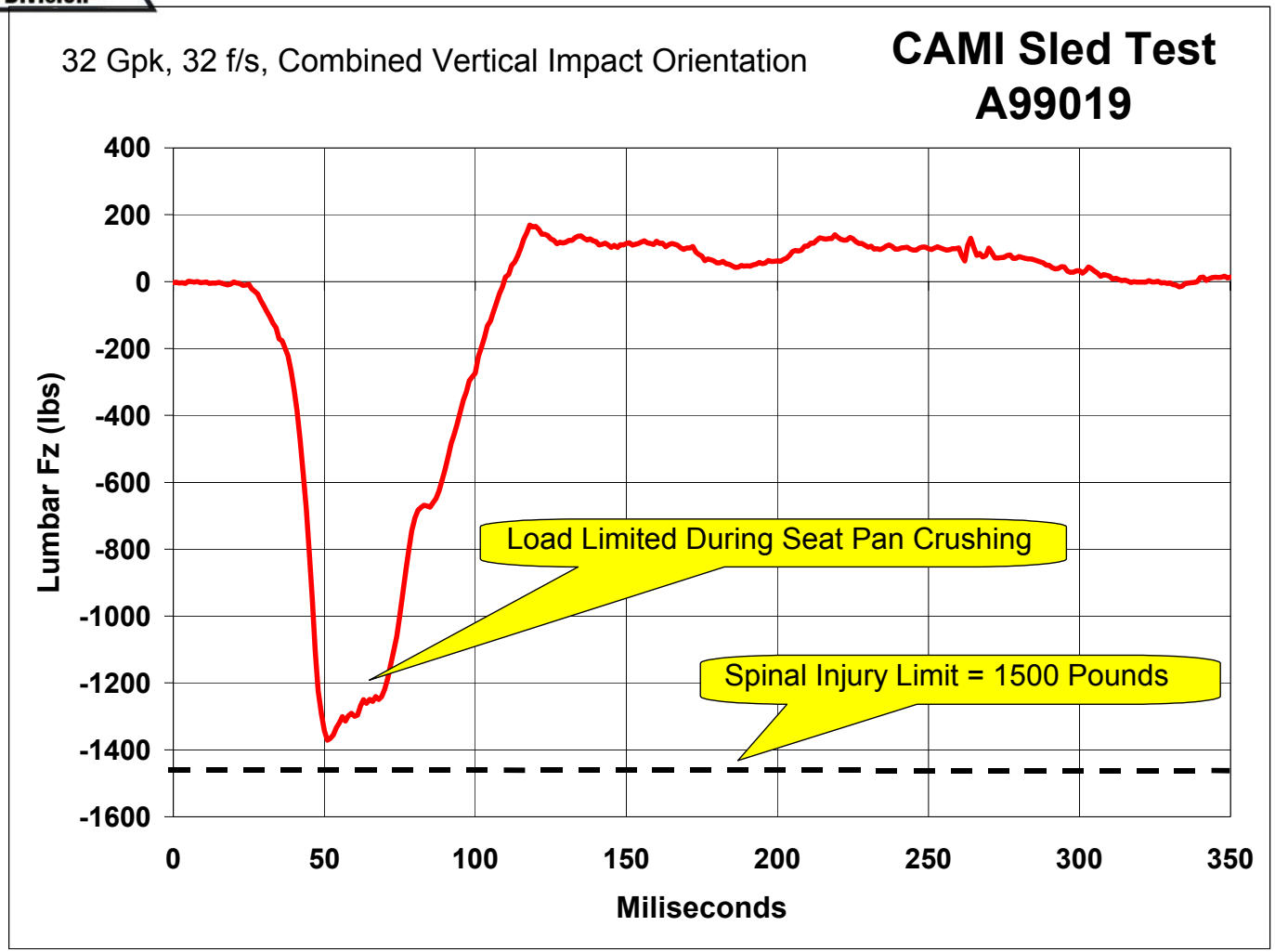




Vertical Impact Energy Absorbing Seat Developments



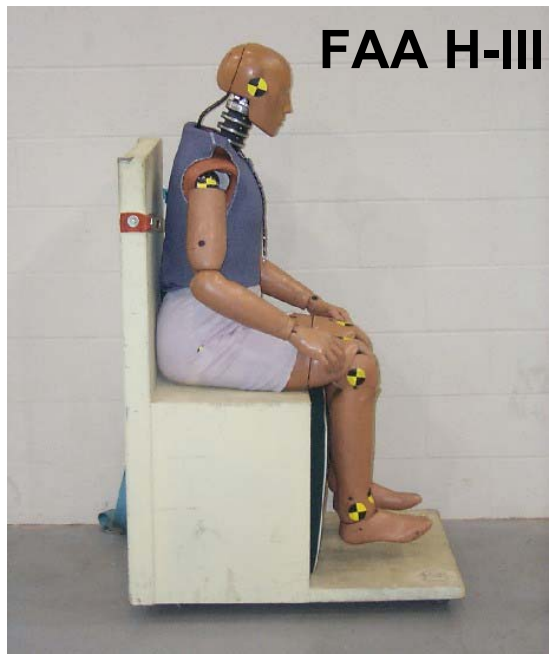
Vertical Impact Energy Absorbing Seat Developments

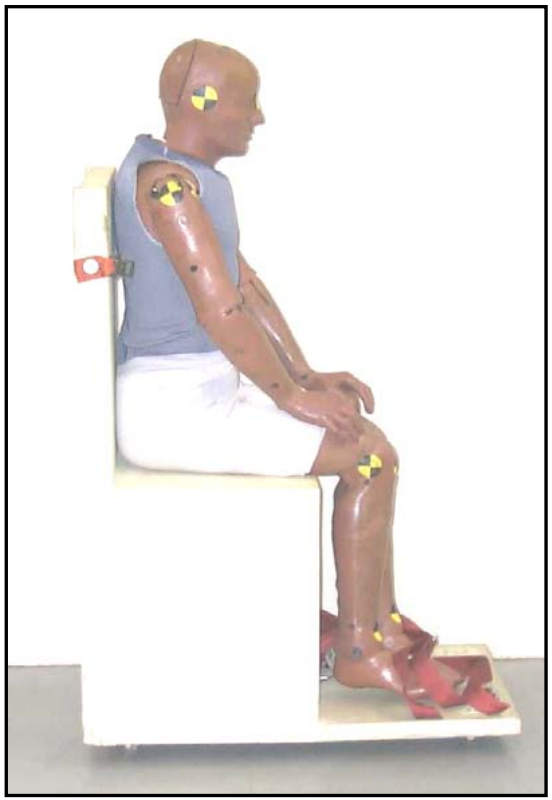


Hybrid III ATD Modification for FAA Certification Tests

"A Lumbar Spine Modification to the Hybrid III ATD for Aircraft Seat Tests",

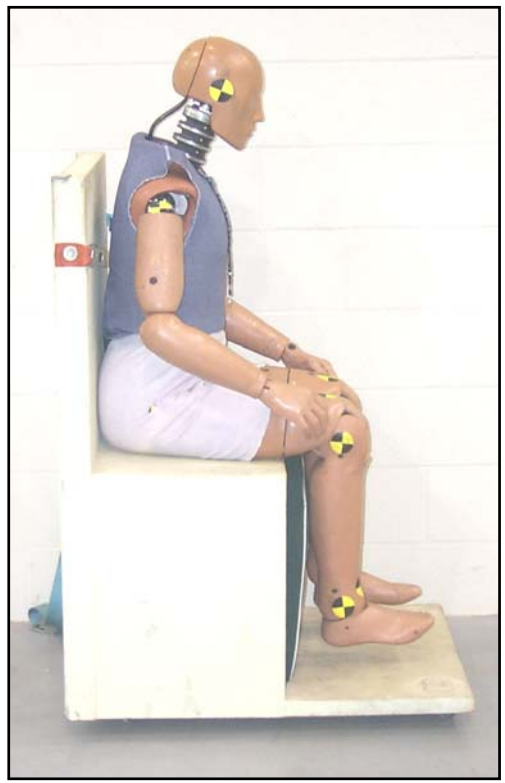
Gowdy, DeWeese, Beebe, et.al.,
SAE Paper 1999-01-1699, April 1999





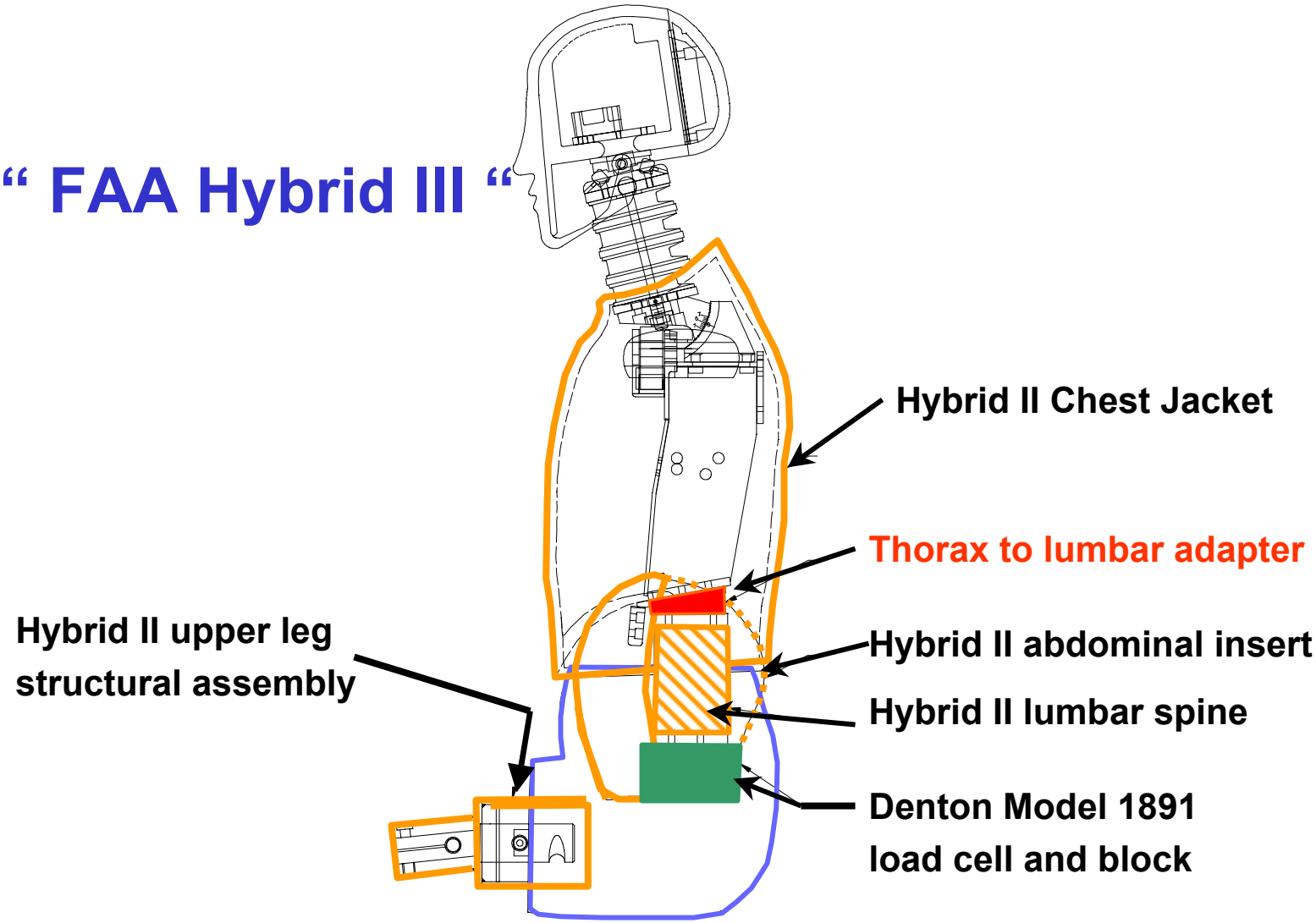
Standard
Hybrid II

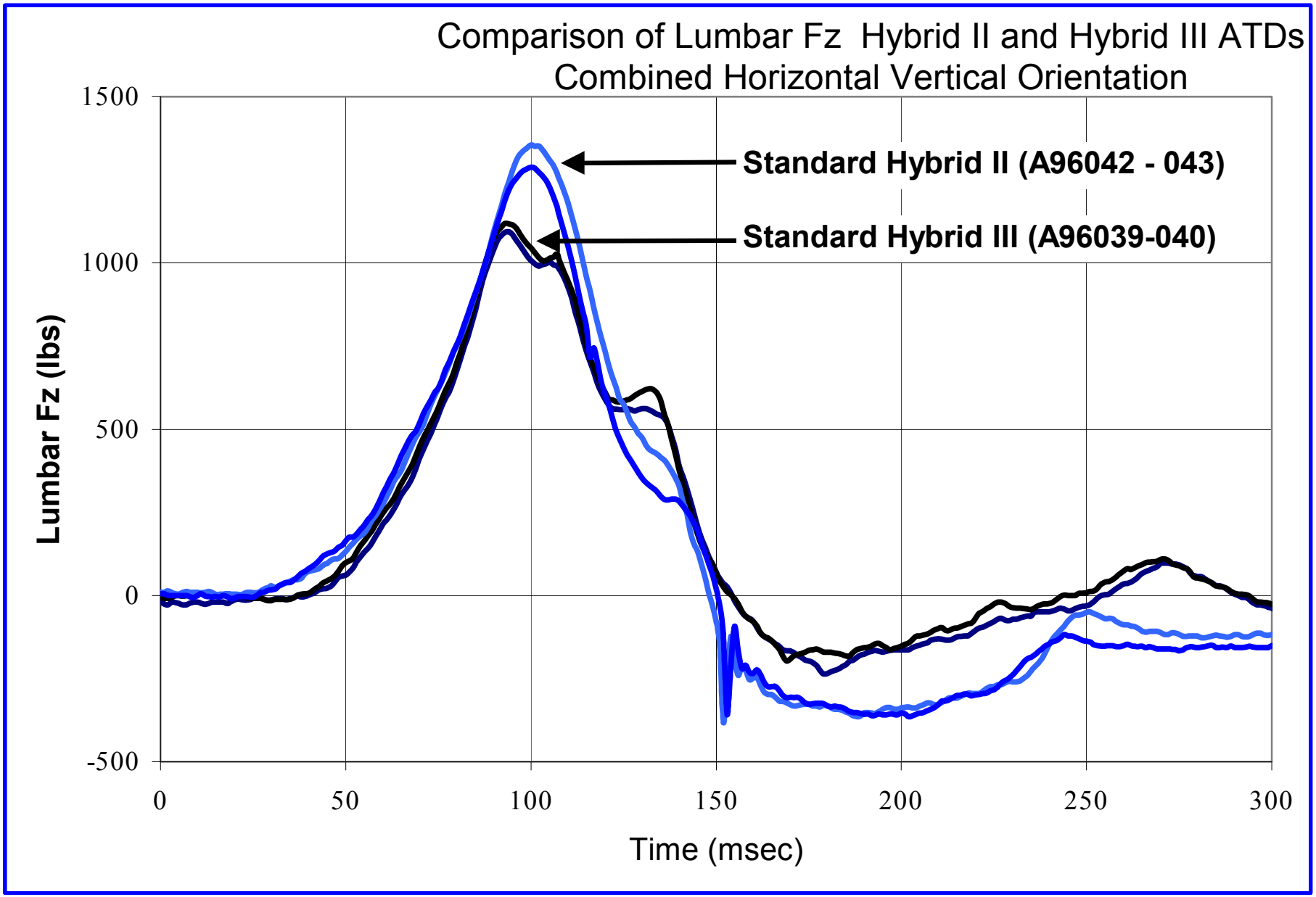
Standard
Hybrid III

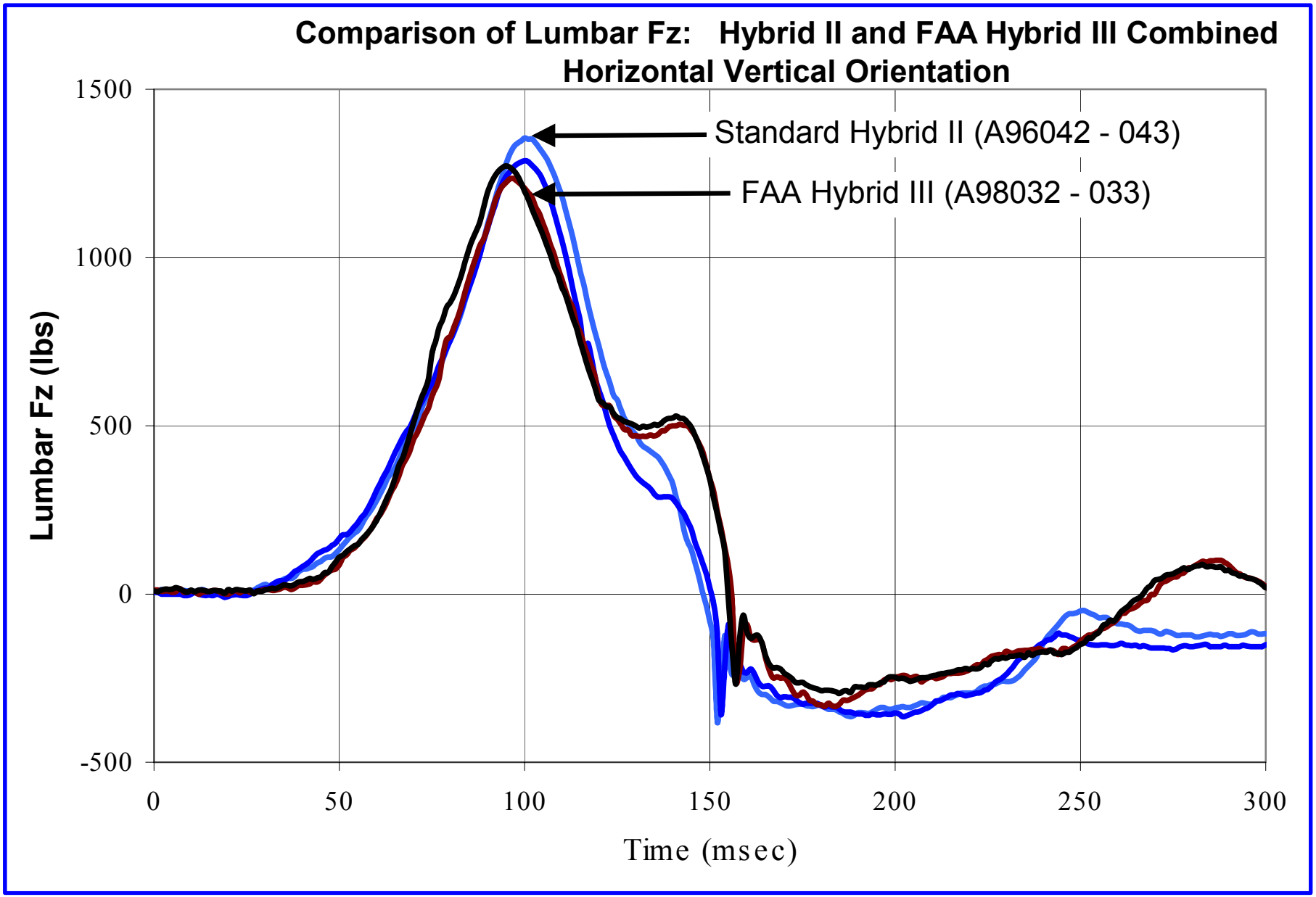


FAA
Hybrid III

The “ FAA Hybrid III “




Comparison of Lumbar Fz Hybrid II and Hybrid III ATDs
Combined Horizontal Vertical Orientation
Standard Hybrid II (A96042 - 043)
Standard Hybrid III (A96039-040)
Lumbar Fz (lbs)
1500
1000
500
0
-500
0
50
100
150
200
250
300
Time (msec)


Comparison of Lumbar Fz: Hybrid II and FAA Hybrid III Combined
Horizontal Vertical Orientation
Standard Hybrid II (A96042 - 043)
FAA Hybrid III (A98032 - 033)
Lumbar Fz (lbs)
1500
1000
500
0
-500
0
50
100
150
200
250
300
Time (msec)

Sport Parachutists - Improved Cabin Restraint Systems

Evaluation of Improved Restraint Systems for Sport Parachutists

Gowdy, DeWeese
FAA Office of Aviation Medicine Report
DOT/FAA/AM-98/11

Sport Parachutists - Improved Cabin Restraint Systems

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(Utility Aircraft Corporation and Pacific Aerospace Corp.)

10g, 32 f/s impact test