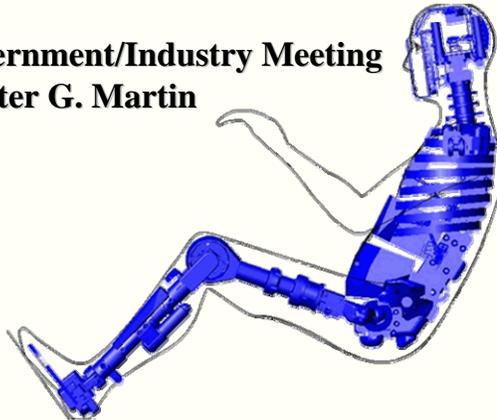
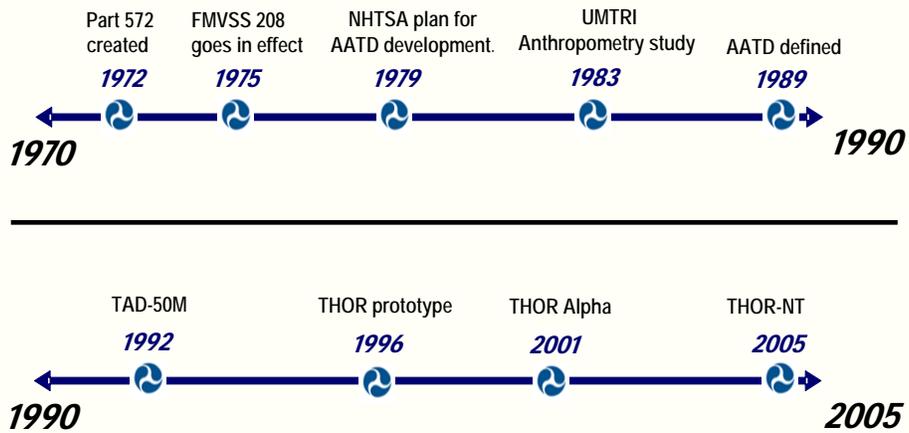


NHTSA'S THOR-NT DATABASE

2007 SAE Government/Industry Meeting
Peter G. Martin



Development Timeline THOR Advanced Frontal Impact Dummy



Database Contents

THOR Advanced Frontal Impact Dummy

- Data from over one hundred tests
- ATD developmental reports
- THOR engineering design drawings and specifications
- Auxiliary tools: Data processing software and computer models
- Literature: journal and conference papers and references.

Test Data

Priority: THOR-NT

Three categories:

1. Sled/Crash tests
2. Component tests
3. Qualification tests

Test Data also includes:

1. Time-history data
2. Test reports
3. Digital images: JPG's and AVI's

Sled and Vehicle Crash Tests

- Tests usually performed to evaluate a safety system or a specific test configuration

- Include companion tests with post-mortem human subjects (PMHS) or the Hybrid III and other dummies

Sled and Vehicle Crash Tests

Test Series Focus	THOR Tests	Match Tests	Test Lab
1. THOR-NT vs. HIII in OOP scenario	6	HIII	DCX
2. IIHS full vehicle test	2	HIII	DCX
3. ATD Compare THOR-NT and HIII	12	HIII	DCX
4. Evaluation of crushable table	1	HIII	FRA
5. ATD Comparison: THOR-NT and HIII	18	HIII	Ford
6. Pretensioner configurations	10	HIII	Hyundai
7. ATD compare: THOR-NT, THOR-FT, HIII	5	HIII, THOR-FT	JARI
8. Biofidelity of neck in extension	11	HIII, THOR-FT	JARI
9. Influence of seating position on ATD response	4	---	JARI
10. OOP behavior with fleet air bags	10	HIII	L-3/Jaycor
11. ATD repeatability in OOP configuration	24	HIII	L-3/Jaycor
12. Seat/restraint performance in far side crashes	6	PMHS, WorldSID	MCW
13. Evaluation of rear seat restraints	2	HIII	TRC of Ohio
14. Race car seat performance	2	HIII	Univ. Nebraska
15. THOR-NT shoulder design confirmation.	8	---	UVa
16. Biofidelity/Injury Criteria Development	9	PMHS, HIII	UVa
17. Thoracic response in low speed frontals	3	PMHS, HIII	UVa

Component Tests

- Include drop tests and pendulum impacts to body segments.
- Often performed to assess the biofidelity of the dummy.
- In some instances, the test protocol requires the dummy to be partially disassembled.

Component Tests

Test Series Focus	Matching Tests	Test Lab
1. Neck characterization: human vs. HIII, THOR	HIII	Duke
2. Compare THOR-NT, THOR-FT, HIII	HIII, THOR-FT	JARI
3. ATD compare neck extension with BioRid, Rid-2	HIII, Volunteer	JARI
3. Design Check: Biomechanical Response Req.	---	JARI
4. THOR-NT lower extremity biofidelity	---	JARI
5. Neck characterization: human vs. HIII and THOR	PMHS, HIII	MCW
6. Biofidelity of the knee-thigh-hip region	PMHS, HIII	UMTRI
7. ATD thorax coupling and muscle tensing effects.	PHMS, HIII	UVA
8. Head injuries in football players	HIII	Va. Tech

Qualification Tests

16 separate tests

- Thorax certification (4 tests)
- Abdomen qualification (2 tests)
- Femur qualification (2 tests)
- Head qualification (2 tests)
- Neck qualification (4 tests)
- Face qualification (2 tests)



Application: Thorax Deflections

Background: “CRUX” (x,y,z) deflections at four points on the ribcage.



Objective: Observe how deflections vary depending on the restraint condition and test configuration.

Test Selection: Four series of tests run under very different conditions are selected for consideration.



Static OOP repeatability tests.



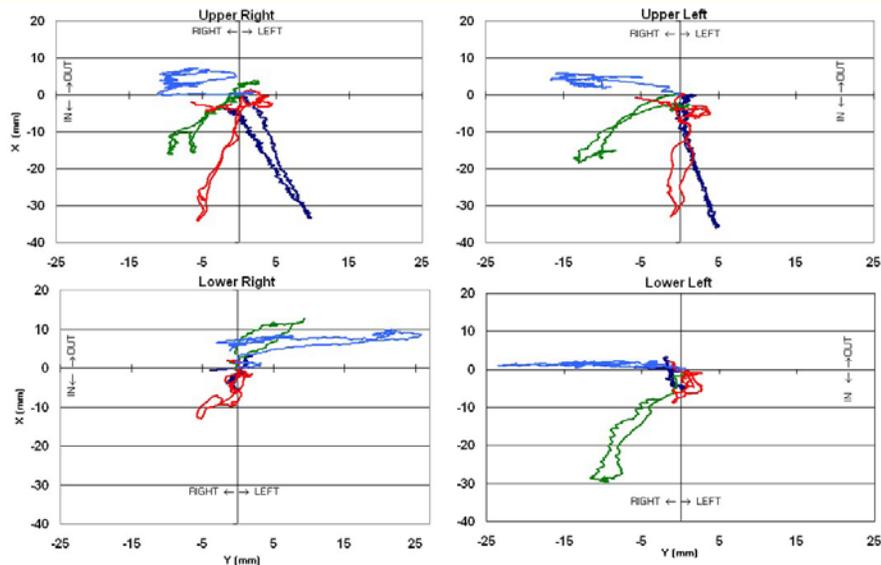
40 km/hr frontal sled; airbag only.



56 km/hr frontal sled, passenger; 3pt load limited belt only



200 km/hr into SAFER barrier, 6-point harness, HANS.



Key:
— 200 km/hr NASCAR 25° oblique side impact
— 56 km/hr UVA frontal sled test, 3-pt belt, no air bag
— 40 km/hr Ford frontal sled test, unbelted
— Static Jaycor OOP-1 air bag deployment

THOR Materials

- Technical Data Package
- THOR software GUI
- Computer Models
- ATD Development Reports
- Journal and Conference Papers
- NHTSA THOR-NT Website

Summary

- Over 100 tests since 2005.
- Central repository of design specifications, reports, and test data
- Facilitates exploration of occupant safety systems
- Facilitates THOR evaluation: R/R, durability, biofidelity
- **Website posting: To be determined.**

Thank you!

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