

WorldSID-50M Material Update to GTR IWG



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Agenda

- ▶ Necessary Material Changes
 - ATD Materials which become unavailable
 - WorldSID parts requiring change
 - Action plans

ATD Materials which become unavailable

- ▶ **Materials are becoming unavailable: Why?**
 - Environmental reasons
 - ▶ Raw materials are banned (EPA, etc...) or undesirable to use
 - ▶ This will continue to be more common in coming years
 - ▶ Effects all ATD's
 - Economic Reasons
 - ▶ Suppliers no longer will supply, change of ownership, no longer profitable for them to produce

Example of an ATD Materials which has become unavailable from current supplier

► Examples

- Damping material used on most steel ribs
 - ▶ SAE committee is working on how to validate new materials
- Ureol
 - ▶ Plastic used in many dummies
 - ES-1, ES-2, ES-2re
 - ▶ Iliacwings, cord holders, shoulders
 - Q dummy family
 - ▶ ribs, bones, skull
 - Worldsid-50 & -5
 - ▶ Iliacwings, skull

Other reasons why an ATD Materials may become unavailable

- ▶ Likely candidates for future problems
 - Lead and lead based ballasts
 - Urethanes
 - ▶ Mercury catalysts
 - ▶ Other ingredients
 - PVC vinyl skins
 - ▶ Phthalates
 - ▶ Metals
- ▶ Over the coming years it is likely some materials will become unavailable

WorldSID Parts Requiring Change

▶ WorldSID-50

- Iliac wings
- Skull

▶ WorldSID-5

- Iliac wings
- Skull

ILIAC WING MATERIAL CHANGE

Iliac Wing Material Change

▶ Problem

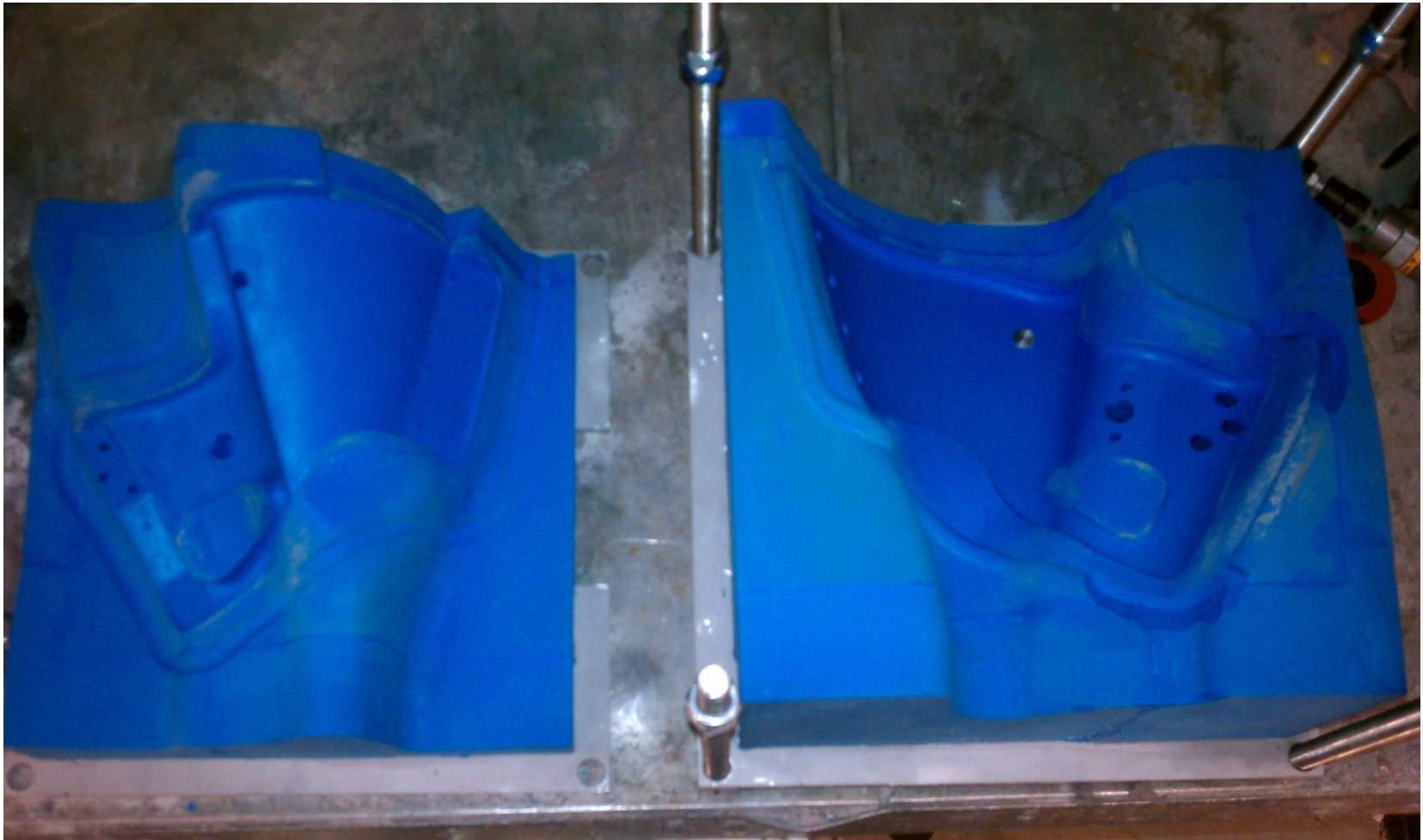
- Ureol material no longer available
- Will run out in coming months

▶ Action plan

- Design & build new mold
- Develop equivalent material
 - ▶ Develop process with new material
 - ▶ Match Ureol at material sample level
 - ▶ Static & Dynamic component level tests
- Final verifications
 - ▶ Dummy certification tests
 - ▶ Dummy pendulum biofidelity tests
 - ▶ WorldSID task group trials

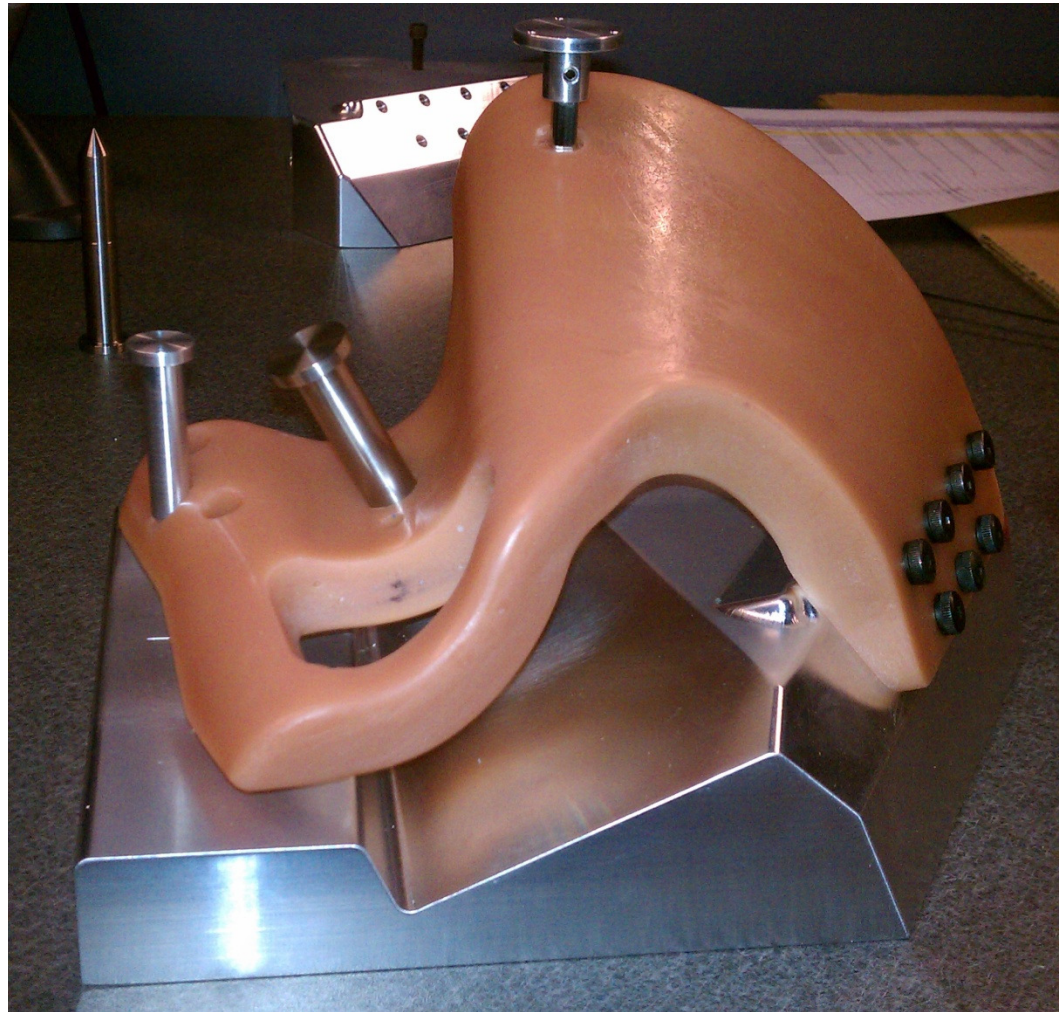
Design & build new mold

- ▶ Left side mold complete



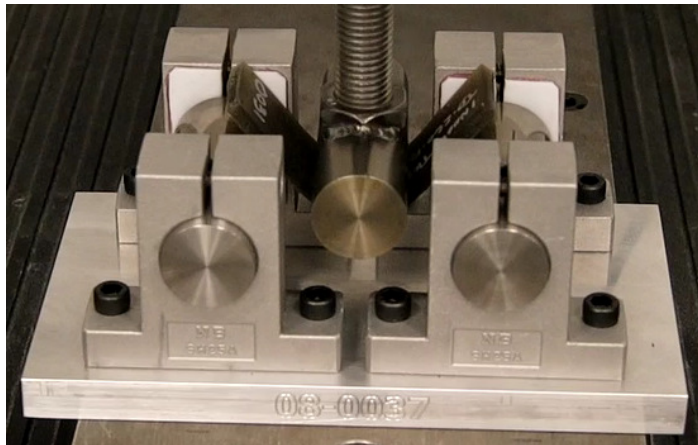
Develop process with new material

- ▶ Started trials with thermoset

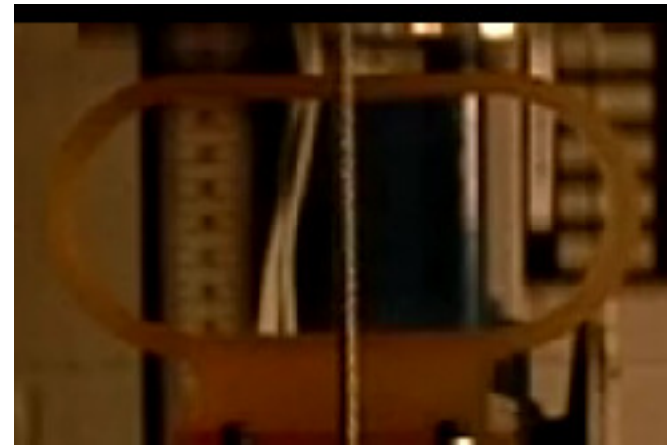


Match Ureol at material sample level

- ▶ Make material samples for quasi-static and dynamic material sample testing



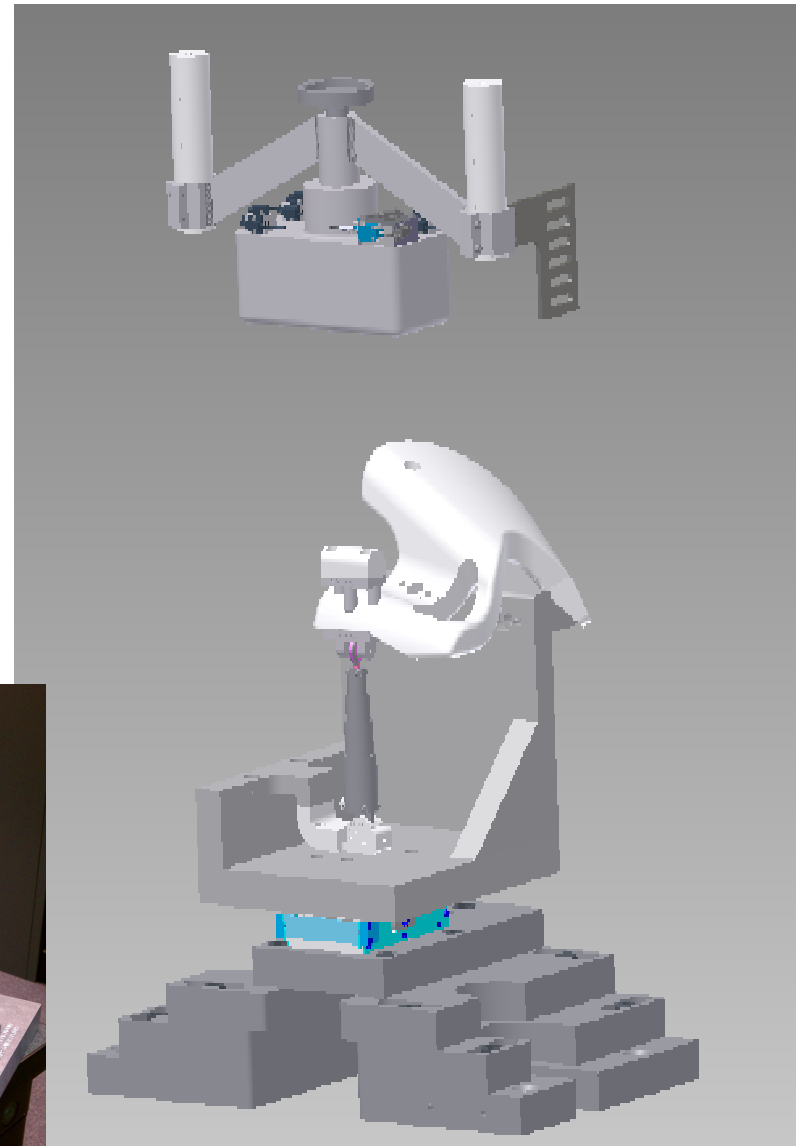
Quasi-static 3-point bending



Dynamic Impact & Durability Testing

Static & Component level tests

- ▶ **Components**
 - Ureol iliacs
 - Thermoset iliacs
- ▶ **Stiffness Tests**
 - Quasi-static
 - Dynamic drop tower
- ▶ **Fixture is almost complete**



Final Verification

- ▶ Certification Tests
 - Run 5 sets of new iliacs in lab dummy to verify compliance to corridors
- ▶ Pendulum biofidelity tests
 - Several iliacs
 - 3 velocities
- ▶ Provide several iliacs to WorldSID task group for trials

5TH ILIAC MATERIAL CHANGE

5th Iliac Material Change Plan

- ▶ Same Ureol blend as 50th
- ▶ Plan
 - Complete 50th work
 - Use same process and thermoset material blend as for 50th
 - Run certification tests with 3 iliac pairs to verify blend
 - Run pendulum biofidelity tests
 - Make parts available to customers to try

WORLD SID SKULL

Skull

- ▶ Example of work so far for same replacement on Q & Worldsid dummies
- ▶ Benchmark material Ureol 100
- ▶ Candidate replacement: Rencast 6444
- ▶ Methodology:
 - Resonance
 - Dynamic: Frontal and lateral head drop test
 - Durability: Head drop test
- ▶ Observation in Q10
 - Rencast 6444 appears to have no resonance below 10KHz
 - The part made from Rencast 6444 met cert corridor
 - Barium sulfate was used to ballast the head, need more investigation to compensate weight