

WORLDSID-5TH SHOULDER & PELVIS UPDATE

Sept 19, 2012

Agenda

- Shoulder
 - Background
 - Requirements
 - Next Steps
- Pelvis
 - Background
 - Next Steps

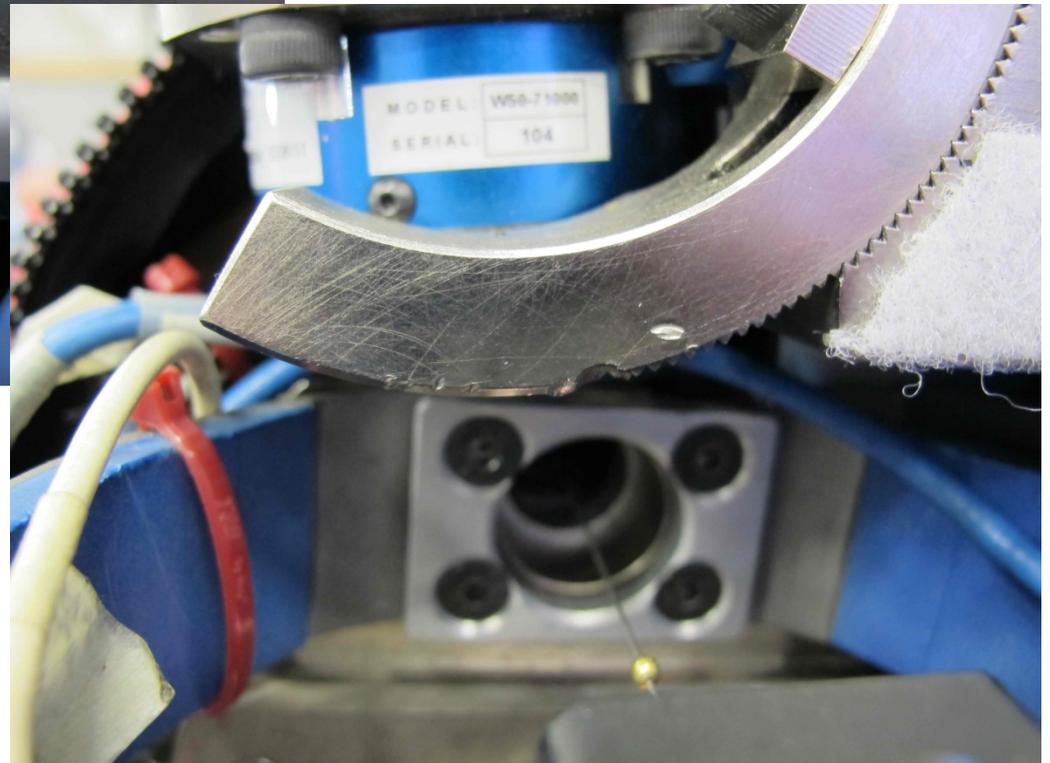
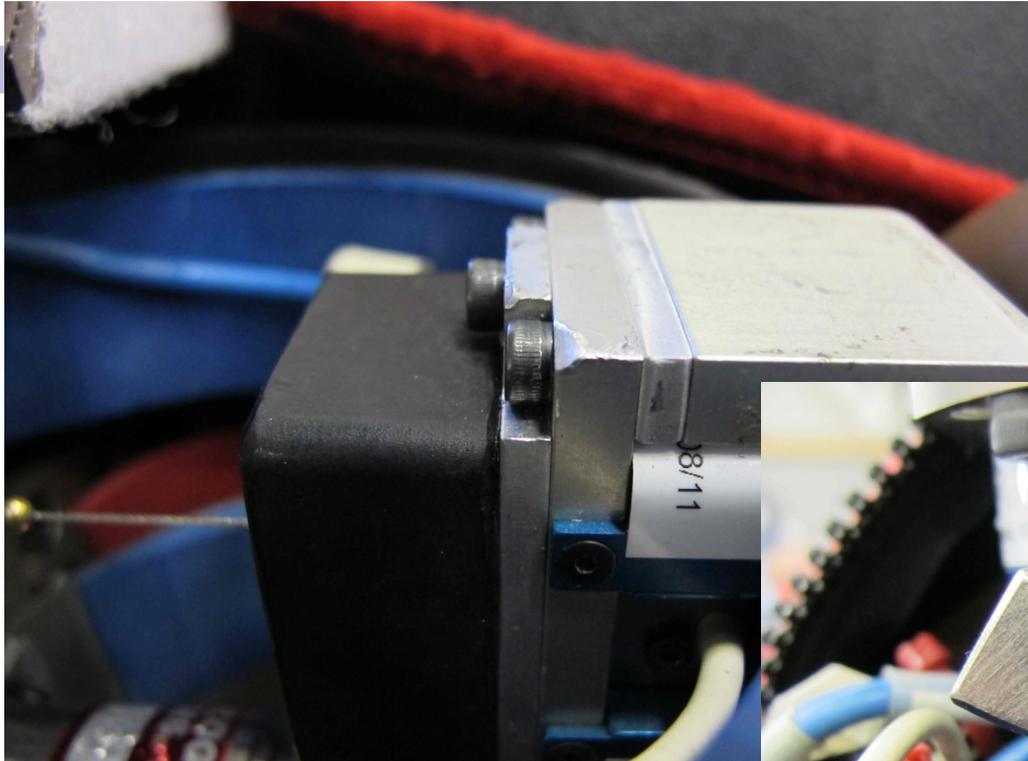


Background

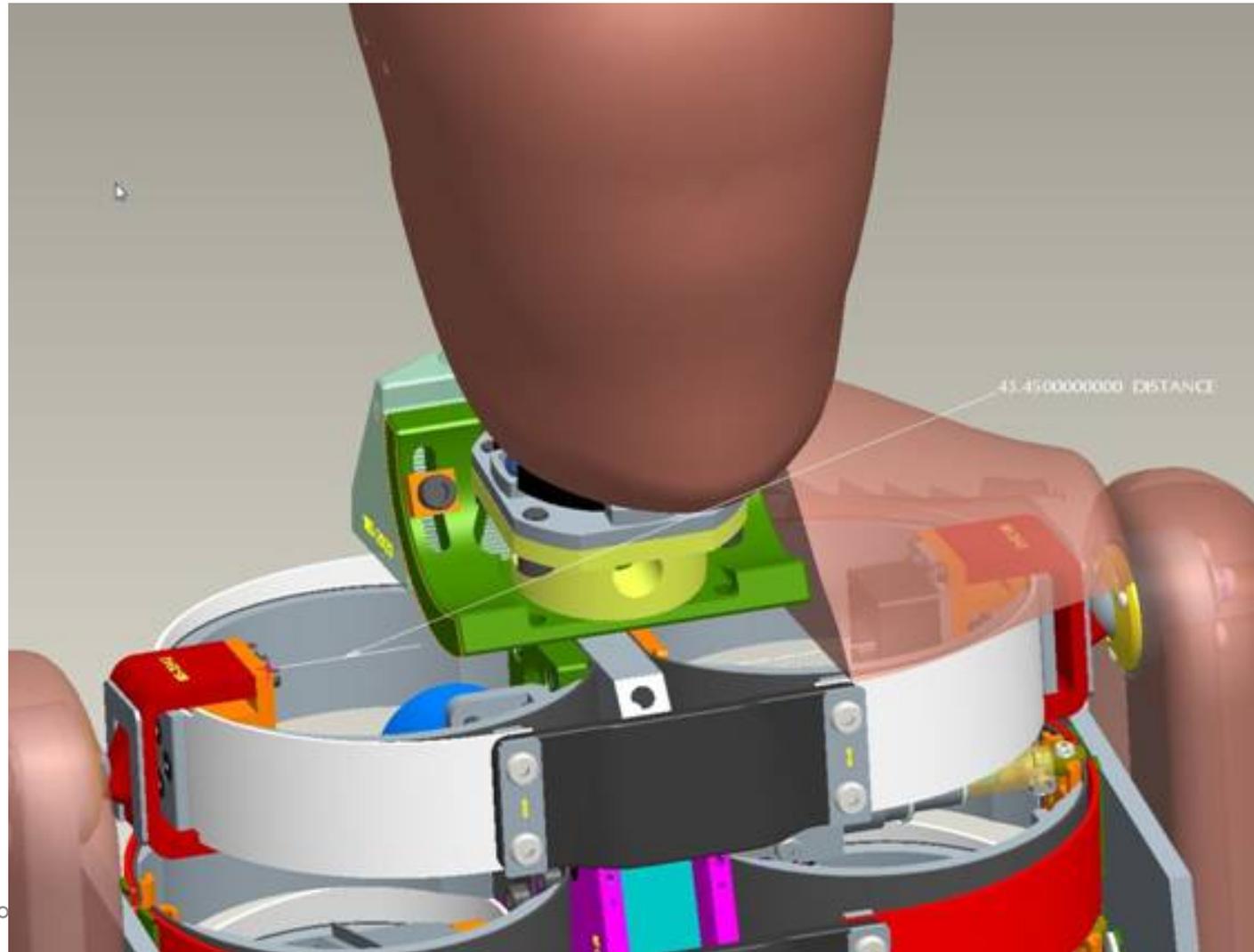
- TRL reported shoulder contacts in their testing at around 45 mm of displacement with upward motion
- Transport Canada provided photographic evidence of contacts



Background: Photos



Background: Current Design



Requirements

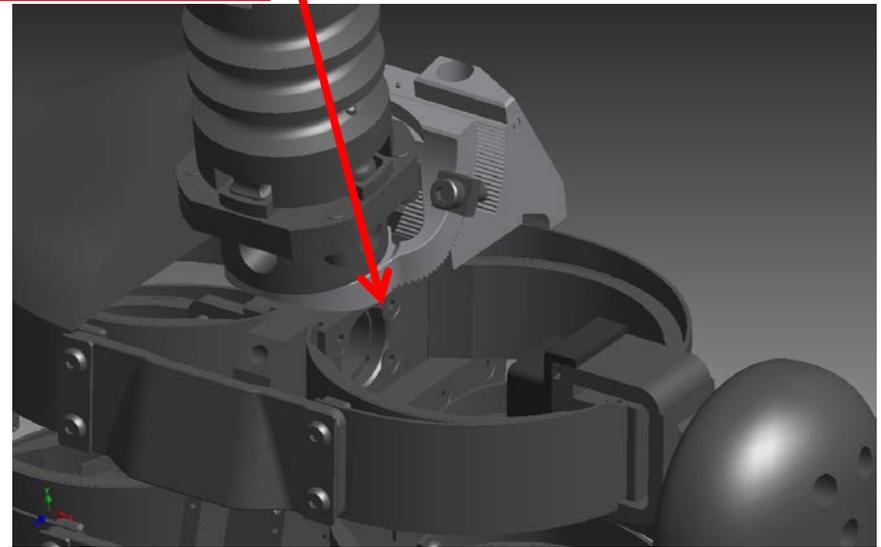
- ***Displacement: 70 mm***
 - *hard contact ok*
- Remove bumper protecting string pot attachment ok
- Lower neck load requirement
 - Absolute Minimum
 - ▶ $M_x = 105 \text{ Nm}$ combined with $F_y = 1060 \text{ N}$
 - Target (goal)
 - ▶ **$M_x = 210 \text{ Nm}$ combined with $F_y = 2200 \text{ N}$ (100% overload)**
 - Use Same for M_y & F_x



Next Steps

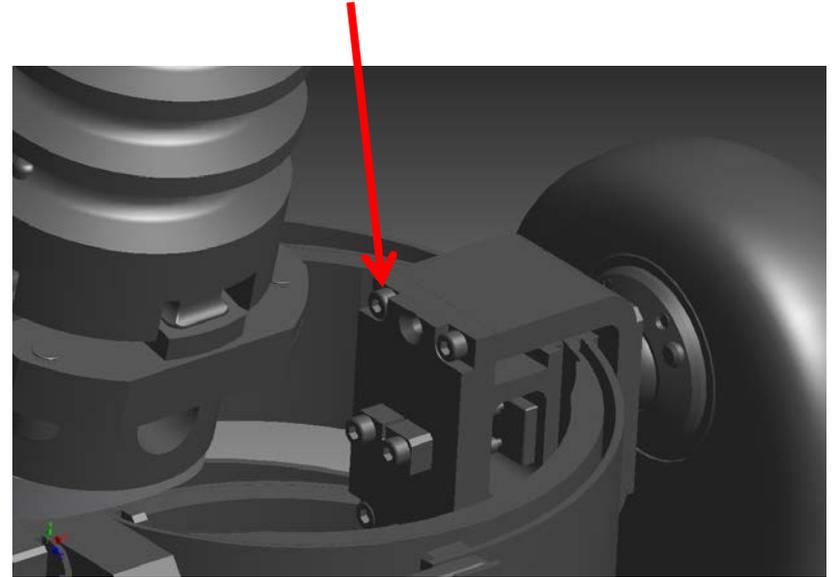
- Determine if the WS neck load cell (upper & lower) can be modified (including existing load cells) to use a pigtail to connector instead of a connector on the load cell. If so, we will try to determine a length that would work for upper & lower WS 5 & 50 locations so that one load cell can do all.

Cut back upper and lower neck brackets as much as possible



Next Steps

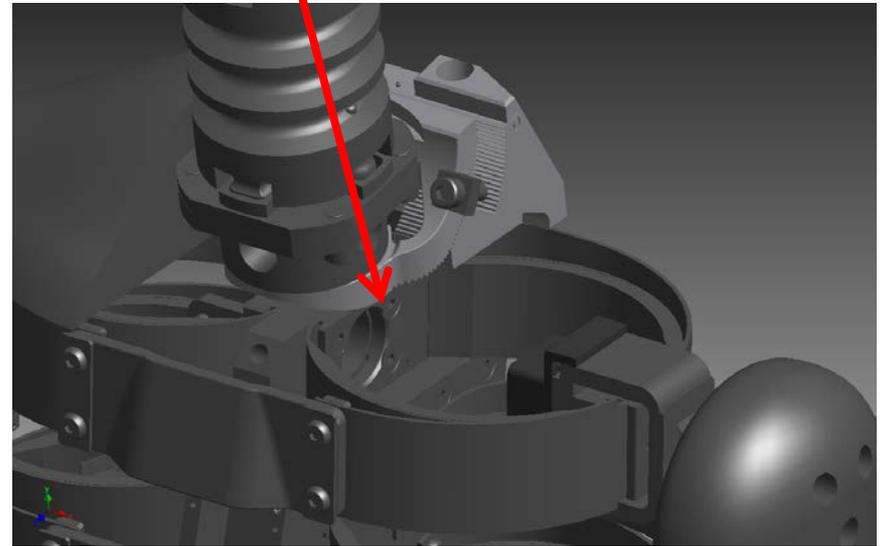
- Determine if the shoulder load cell can be modified to use FHCS to attach to rib clevis & mount string pot string holder directly to load cell instead of interface plate. If so, the interface plate will be eliminated.
- Eliminate the big rubber stop on the inside of the shoulder rib.



Next Steps

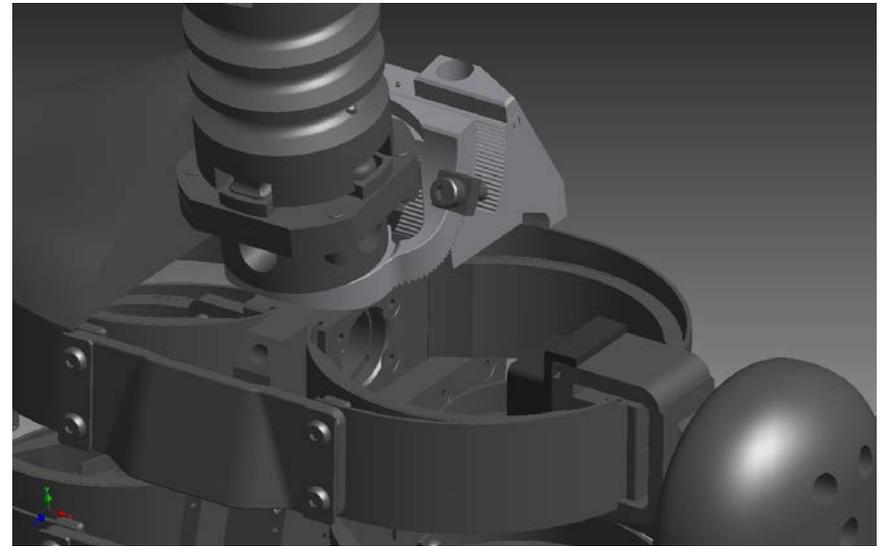
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Cut back upper and lower neck brackets as much as possible



Next Steps

- Redesign the upper and lower neck brackets to give 70+ mm clearance for rib travel. To do this we will explore using a slot in the upper neck bracket for the load cell cables to go through.
- Hit minimum strength targets shown in presentation in red.
- Readjust other parts to maintain total thorax mass.



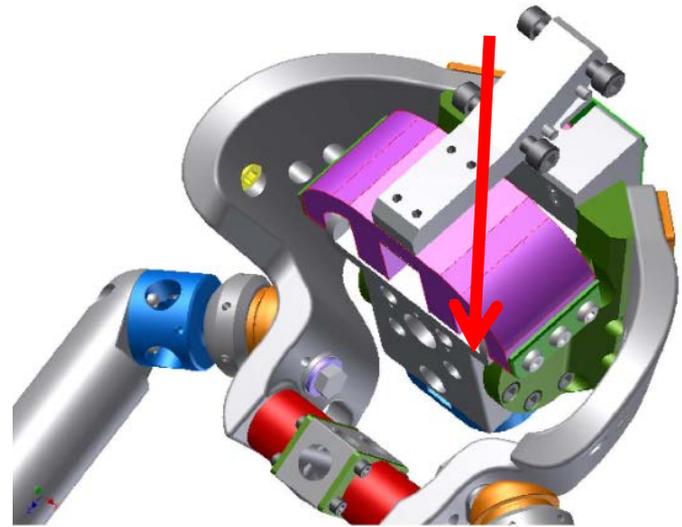
Shoulder Schedule

- Proposal Oct/November meeting



Pelvis update

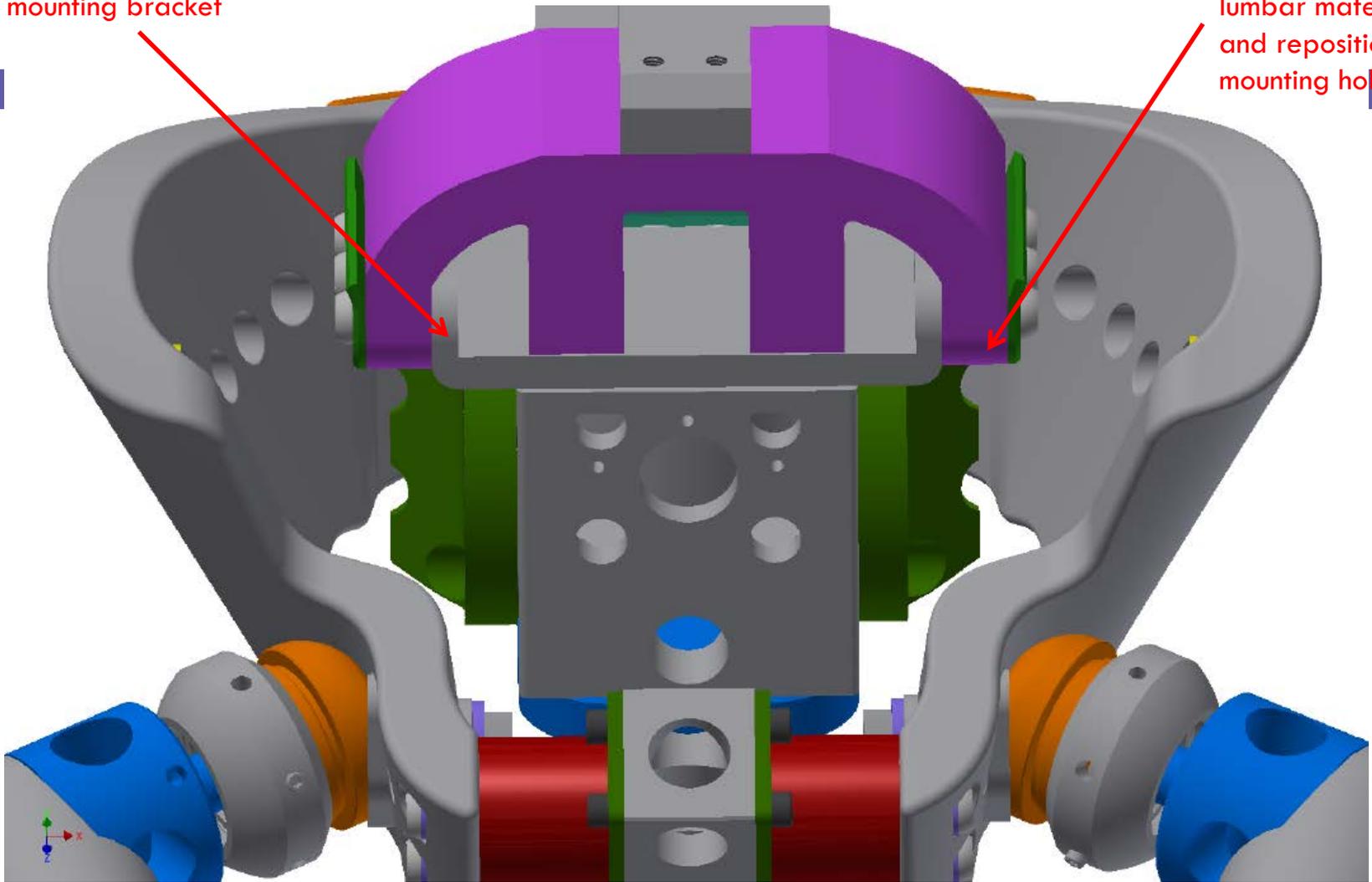
- Background
 - Contact between iliac wing and sacrum
 - ▶ Main issue is that the lumbar and sacrum was not scaled from the 50th
 - Problem was modeled
 - Modification to rear mounting of lumbar was tried



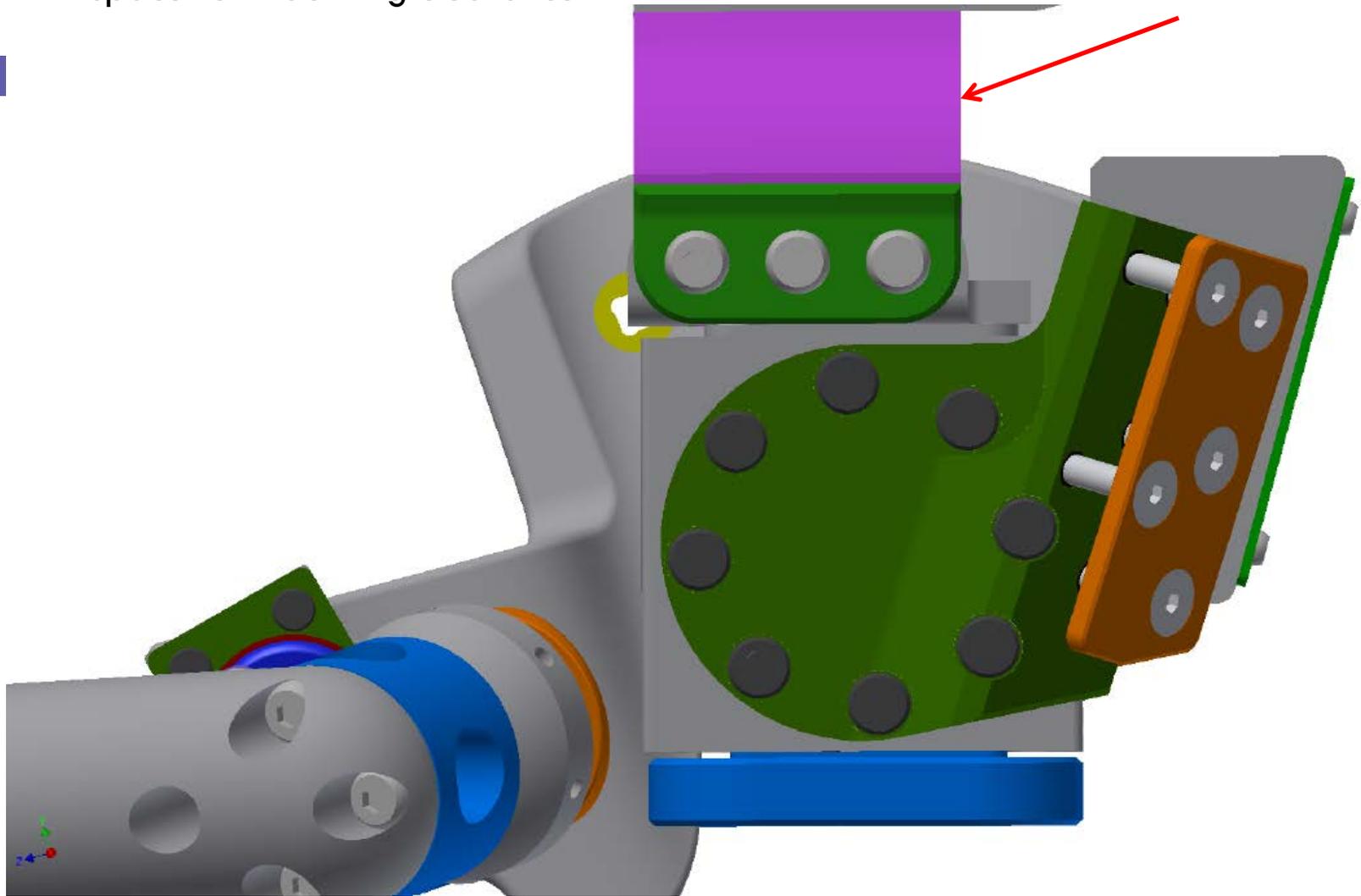
VRTC modifications were tried but did not eliminate the issue

Flipped lumbar mounting bracket

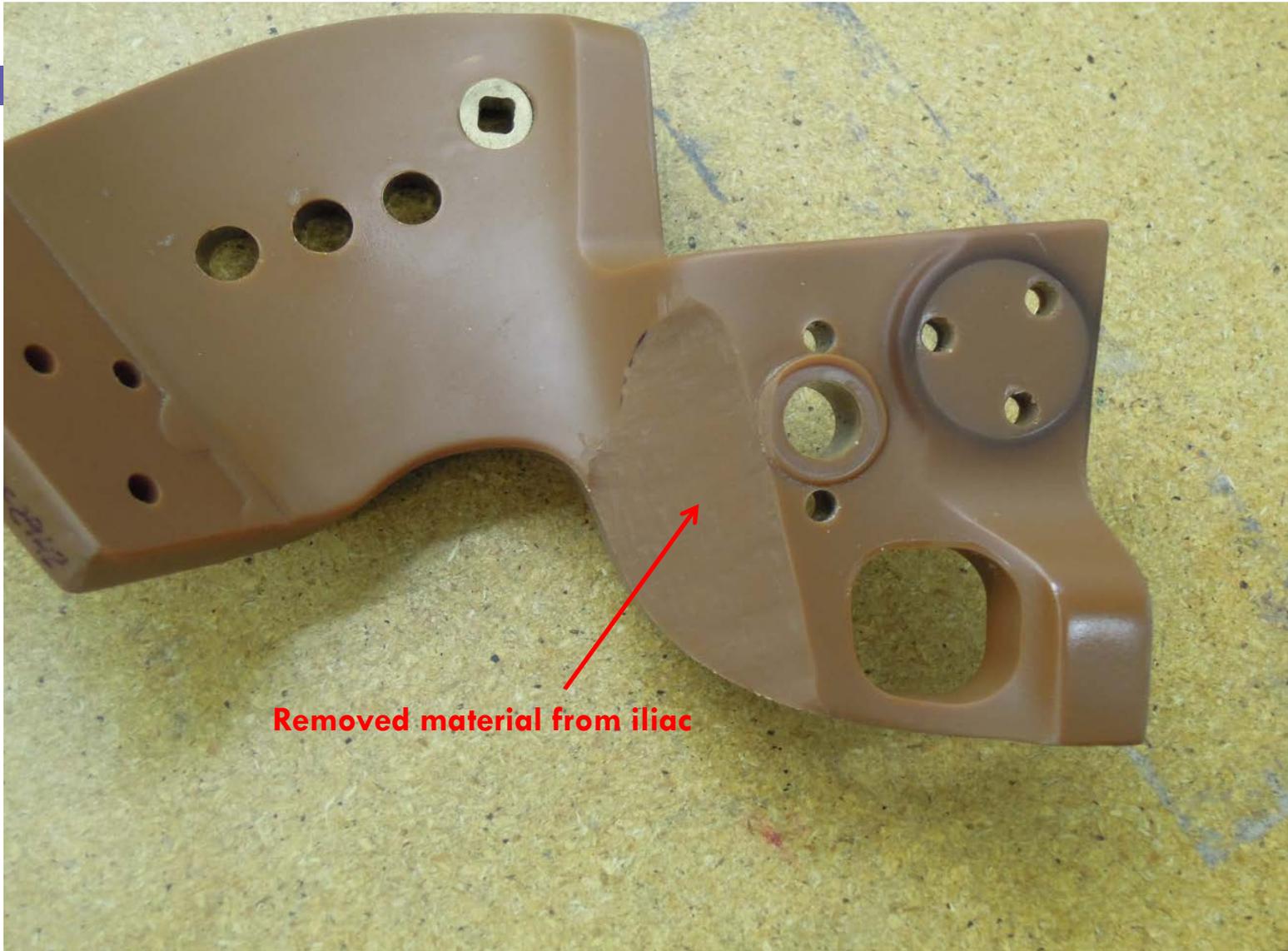
Removed excess lumbar material and repositioned mounting holes

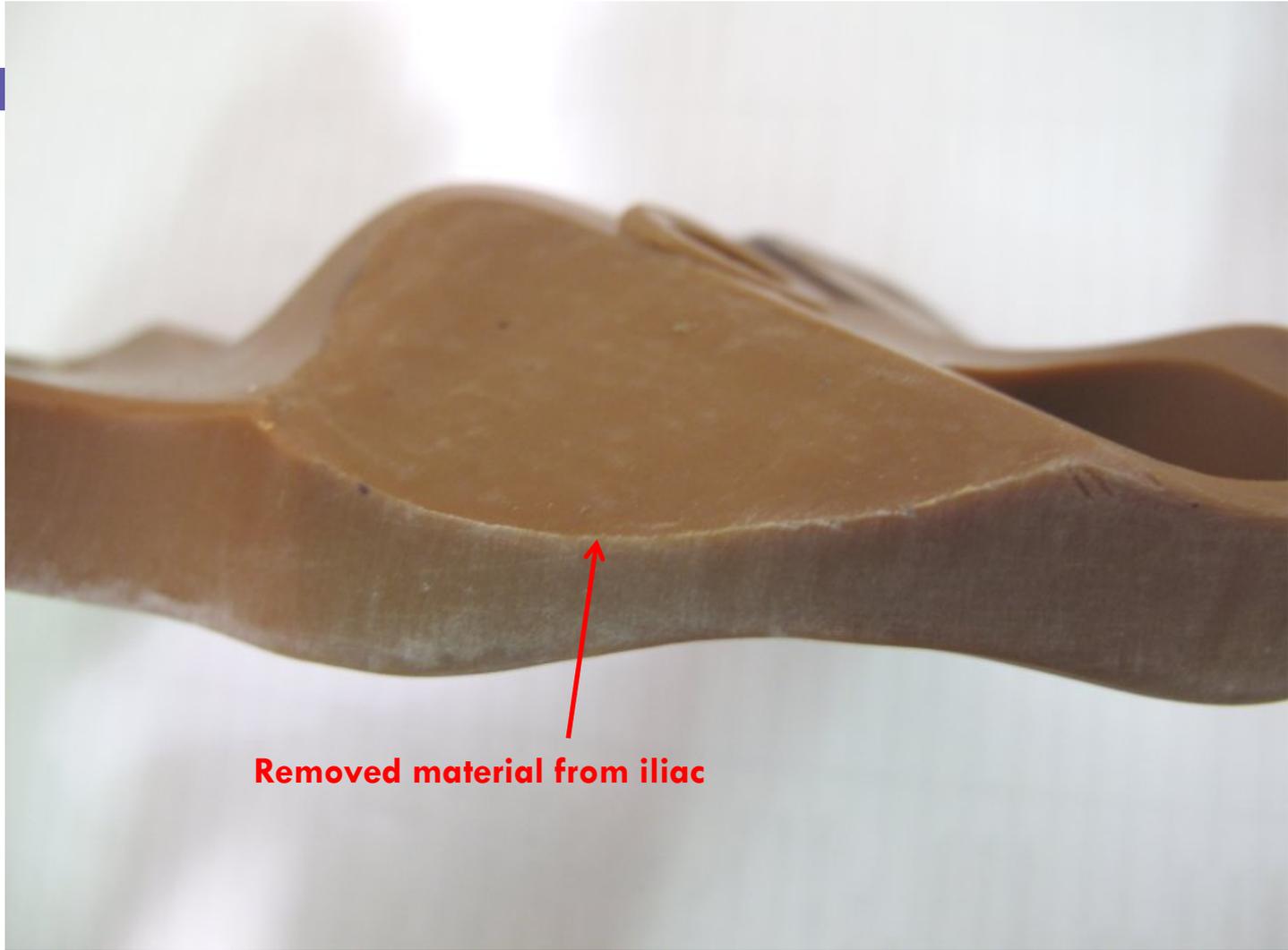


VRTC is currently reviewing if it is possible to move the lumbar and sacrum to obtain more space for illac wing clearance



VRTC removed some material from the iliac to provide additional space.

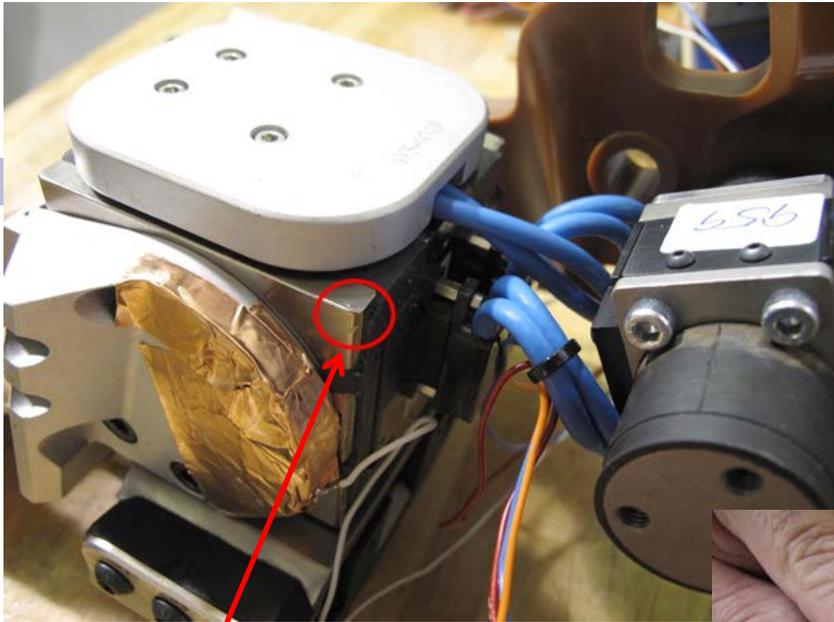




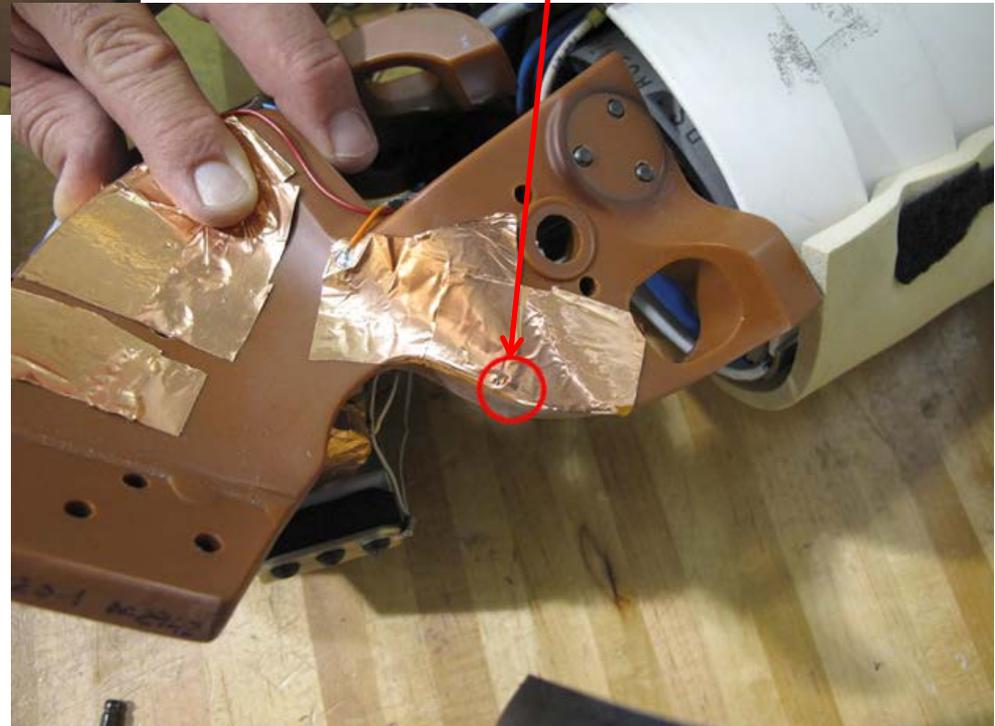
Removed material from iliac



After modifying the pelvis, VRTC still observed minor contact during pelvis impactor tests conducted at 6 m/s (cert test speed is 6.7 m/s)



Point of contact on pelvic wing



Point of contact on sacro-iliac load cell



Next Steps

- At next meeting it will be decided if Humanetics should redesign the lumbar, sacrum, etc... of lower torso to improve clearance.
 - This redesign could take up to a year with mold redesigns, new load cell, and verification testing by committee
- Meeting will be end of Oct or Nov.

