Updated SID-IIs Iliac Wing

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Summary

A problem has been discovered with the original SID-IIs iliac wing design; the wing can deform over time and cause underreporting of iliac forces. The dummy supplier, First Technology Safety Systems (FTSS), has redesigned the wing to fix the problem. Updated iliac wings can be ordered directly from FTSS. SID-IIs dummies used in future Insurance Institute for Highway Safety (IIHS) side crash tests will have the updated iliac wing design.

Iliac Wing Load Path Issue

Problem: In the SID-IIs dummy, the iliac wing is attached to the iliac load cell with four mounting bolts. These bolts push on a thin steel plate molded into the iliac wing, which serves to distribute the load to the load cell (Figure 1). However, the plate is separated from the load cell by 3 mm (0.125 in) of urethane. Figure 2 shows a new/undeformed iliac wing mounted on a load cell (the areas of the wing designed to contact the load cell are shown with orange highlight). Over time, the 3 mm section of urethane deforms under pressure and eventually contacts the center of the load cell (shown with blue highlight). This causes the input force to bypass the correct load path and results in underreporting of the true force value. Figure 3 shows an example of a severely deformed iliac wing.

Solution: FTSS has worked with the Occupant Safety Research Partnership (OSRP) SID-IIs Upgrade Task Group to address the iliac wing deformation, or creep, problem. The FTSS solution uses metal standoffs in the iliac wing to prevent any contact between the urethane and load cell. With the updated design, the attachment force passes from the mounting bolt heads to the load cell through the metal standoffs (Figure 4). An additional iliac wing design change was modification to the urethane material (see section below). Part numbers 180-4322-1 (left iliac wing) and 180-4322-2 (right iliac wing) can be used to order the replacement wings from FTSS.

Iliac Wing Material Change

The original urethane formula (Material 1) for the iliac wing was used from 1994 until April 2004 when it was discontinued. It was replaced with a new urethane formula (Material 2), but stiffness tests showed Material 2 to be considerably less stiff than the original (Figure 5). Discovery of this problem lead to a new urethane formula (Material 3) with stiffness similar to the original (Figure 6). Ongoing research by the OSRP SID-IIs Upgrade Task Group is assessing the differences between Material 1 and Material 3 using dynamic loading conditions.

Note: The recent National Highway Traffic Safety Administration (NHTSA) SID-IIs final rule for 49 CFR Part 572 (Docket No. NHTSA 25442) specifies an iliac wing made from Material 2 without standoffs. IIHS will petition NHTSA to change the specification to the solution recommended by FTSS and the OSRP SID-IIs Upgrade Task Group (Material 3 with standoffs).

Figure 1
SID-IIs Iliac Wing (Original) Attached to Iliac Load Cell (Anterior-Posterior View)

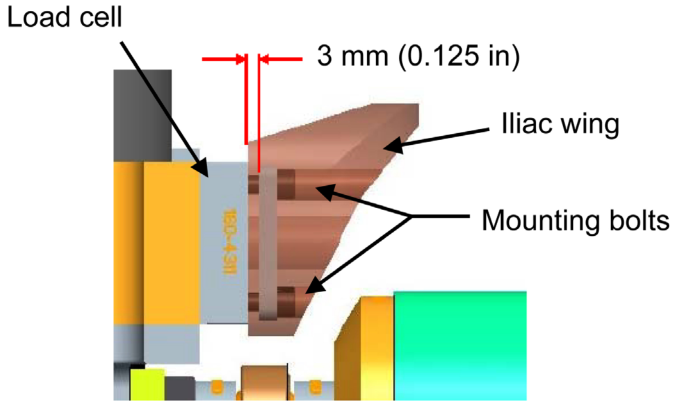
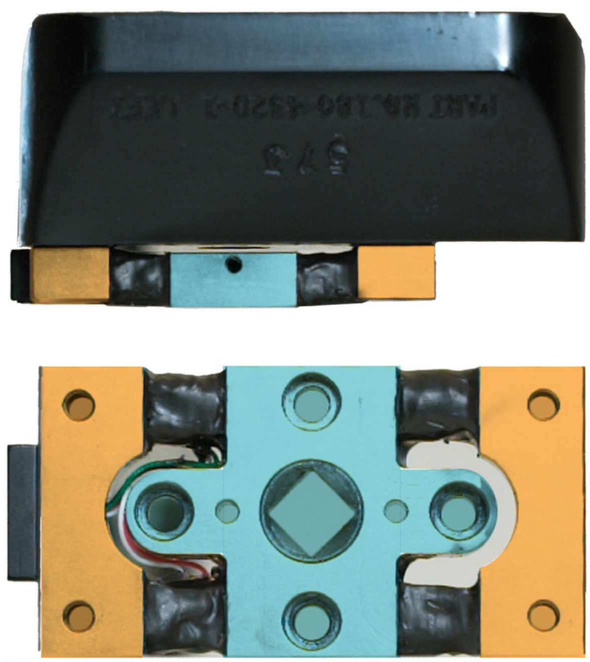


Figure 2
Superior-Inferior View of Iliac Load Cell and Iliac Wing (Top Photo)
and Lateral-Medial View of Load Cell (Bottom Photo)



Note the normal gap between the iliac wing and center of the load cell. Tightening of the attachment bolts causes the ends of the load cell (orange highlight) to creep into the wing. Over time, there is sufficient creep (about 2 mm) for the wing to load the center of the load cell (blue highlight). This allows an externally applied force to bypass the correct load path.

Figure 3
Deformed Iliac Wing Showing Measured Creep Levels

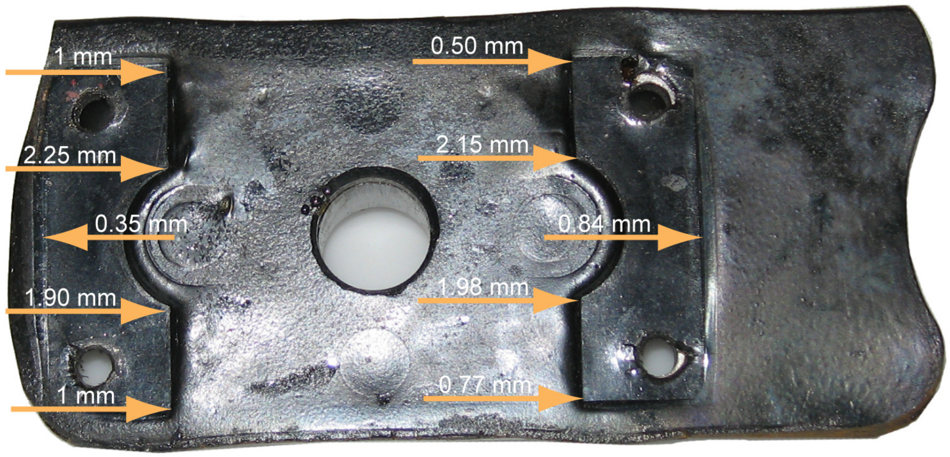


Figure 4
Modified Iliac Wing Design with Built-In Metal Standoffs

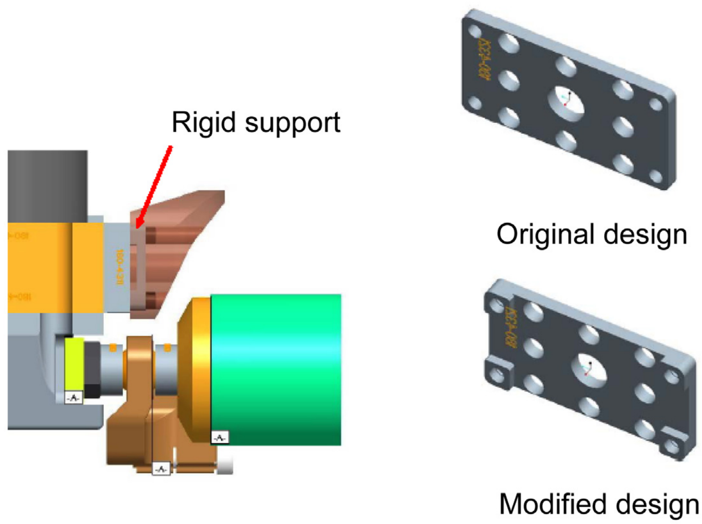


Figure 5
Urethane Stiffness for Material 1 (Red) and Material 2 (Blue);
Tests Were Conducted by FTSS on Iliac Wings without Standoffs

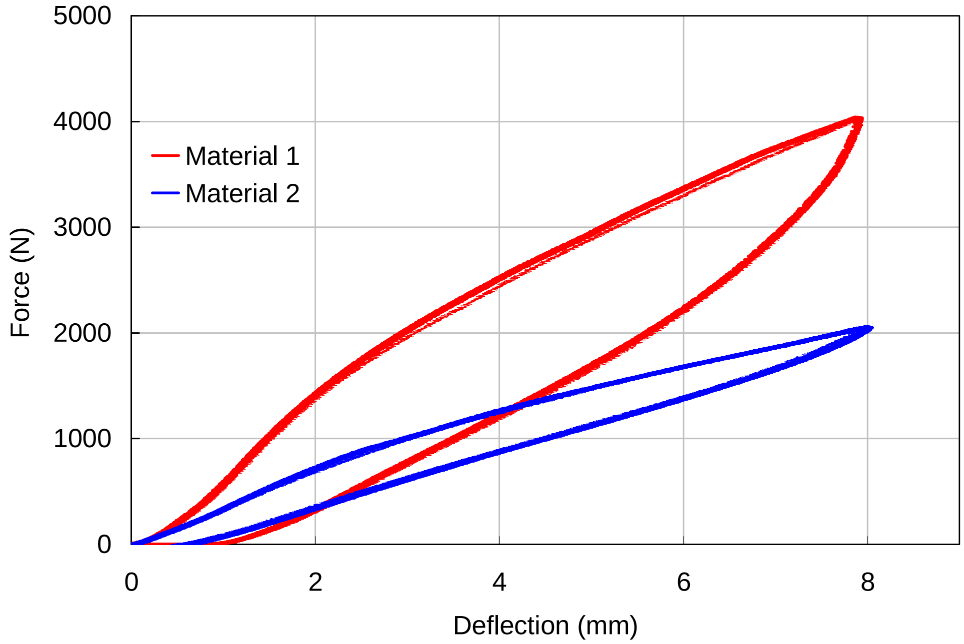


Figure 6
Urethane Stiffness for Material 1 (Red) and Material 3 (Green);
Tests were Conducted by FTSS on Iliac Wings without Standoffs