

# Full Width Deformable Barrier Repeatability

Robert Thomson

GRSP FI 17<sup>th</sup> Meeting

2012-11-23

# Background

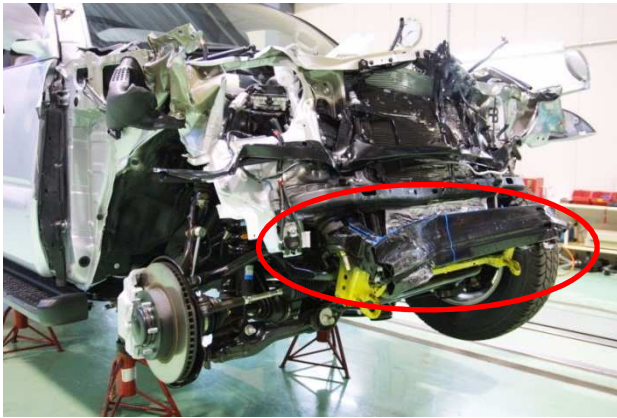
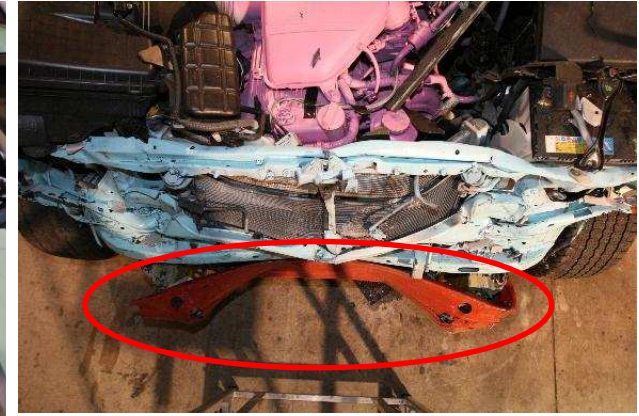
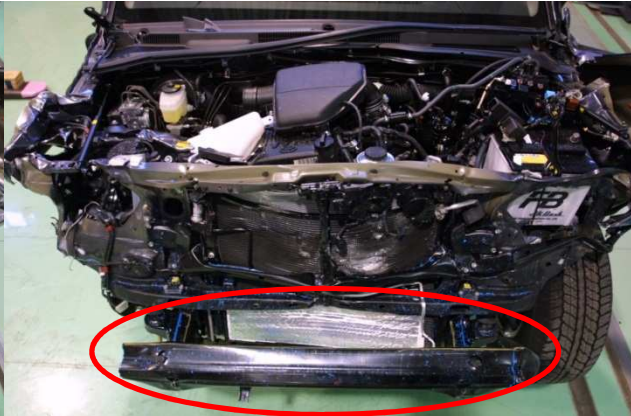
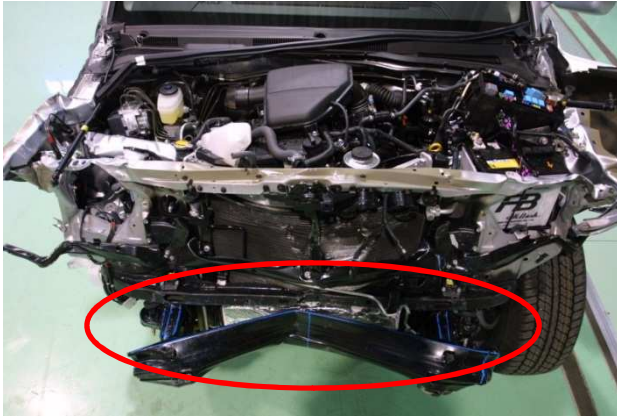
- The Japanese expert provided FWDB repeatability tests with the Toyota Surf at the last 16<sup>th</sup> GRSP FI group meeting
- The Japanese tests from 2005 (as extracted from the presentation) are compared to available data from:
  - A recent FWDB Toyota Surf test provided to FIMCAR by JAMA
  - A European SUV with a similar structure tested in VC-Compat project

# Vehicle after Tests

Test 1

Test 2

Test 3



Tests from 2005

JAMA Test 2011

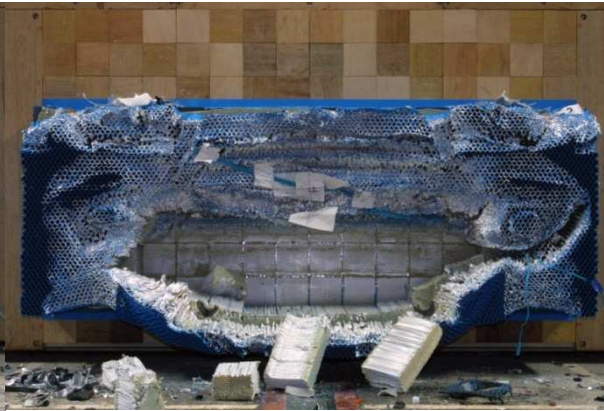


# FWDB after Tests

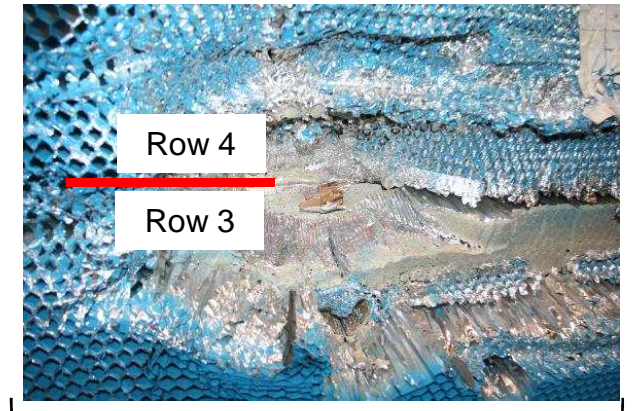
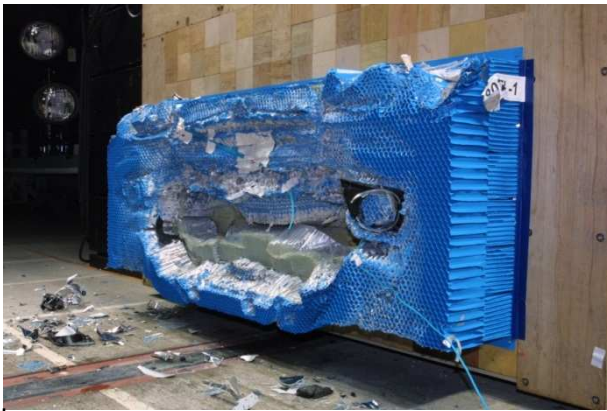
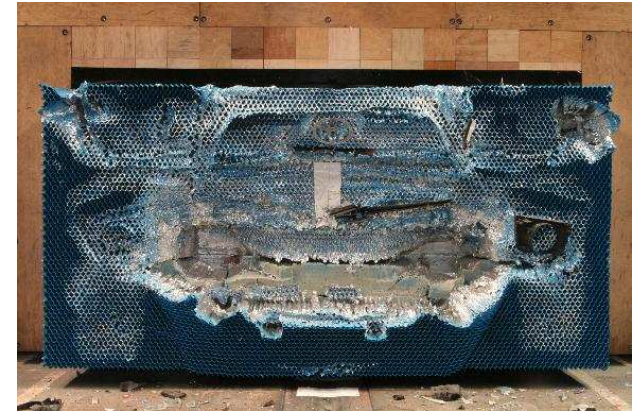
Test 1



Test 2



Test 3 (JAMA)

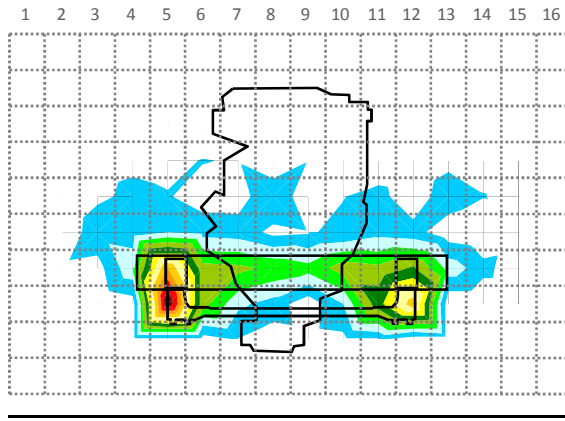


Tests from 2005

JAMA Test 2011

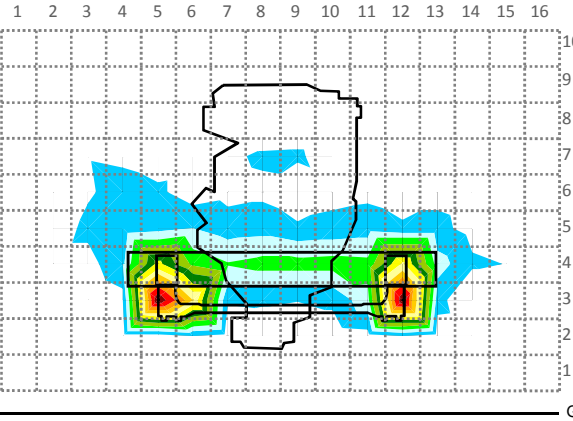
# Barrier Force Distribution

Test 1



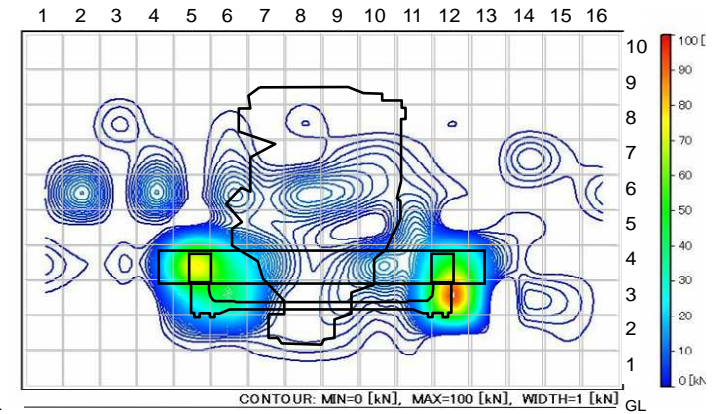
Time (unknown)

Test 2



Time (unknown)

Test 3 (JAMA)



Time (40 ms)

- **Structure alignment is identical in all three tests**
- **Bumper cross beam and longitudinals are contained in Row 4 with a small overlap in Row 3**

# Observations

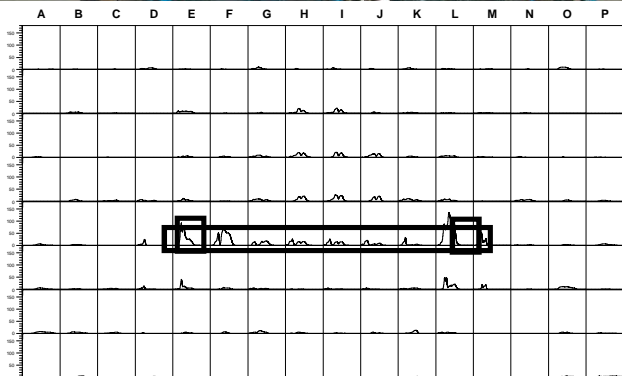
- The 2005 tests have different results reflected in load cell force distributions and barrier deformations.
- The most recent Surf Test (2011) appears to have a crash box which do not seem present in the earlier (2005 tests).

# Comparison of Recent Tests

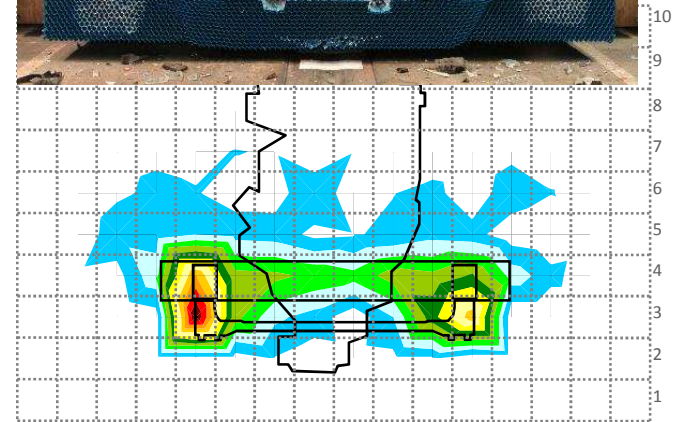
- The following slide compares a European SUV with a single load path to the most recent Toyota Surf test
- Both vehicles load the same part of the barrier (Row 4 – see lower figures)
- The segmented rear layers in both tests appear to be stable and deformation is visually consistent with vehicle loading



# European SUV



# Toyota Surf





# Conclusions (1)

- All vehicles tested with the FWDB to date have not been explicitly designed for this test and this may be most problematic for vehicles explicitly designed for a FWRB:
  - The softer initial contact in the FWDB may not activate crush triggers that were designed for a FWRB pulse (undeformed crush cans observed in FWDB and car-car tests in FIMCAR were perfectly deformed in FWRB)
  - Deformation behaviour that depends on a high contact force / high friction force locking the longitudinal ends on the barrier will not be duplicated in a FWRB
    - FWDB load cell measurements will provide better indication of stable deformation during impact than the FWRB

## Conclusions (2)

- The 2005 tests presented by Japan exhibited poor repeatability but the vehicles may not represent modern vehicle designs (ie lack of crash cans)
- Recent tests with the FWDB have more consistent behaviour but limited data is available
- Recent barrier specifications must be re-evaluated and retested to confirm repeatable performance at the proposed test speed of 50 km/h