



Change to foam flesh used by EEVC lower & upper legforms

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Advice received from manufacturers of Confor foam

- The flesh material specified in GTR 9 for the 'flesh' of both the EEVC lower legform and the EEVC upper legform is effectively Confor foam, made by Aero Technologies LLC – a 3M company:
 - “The foam flesh shall be 25 mm thick foam type CF-45 or equivalent”
- The foam being used currently is Confor foam type CF-45
- TRL was informed by the manufacturers in August 2013:
 - “The standard CONFOR product line is being replaced with two updated versions. Both the new CONFOR M foam and the CONFOR AC foam have the same slow recovery attributes as our current standard foams. The CONFOR M and CONFOR AC foams are both RoHS Compliant. Additionally, the CONFOR AC foam meets CAL 117 and FAR 25.253 (a) requirements.”

TRL action

- The properties of the foam are critical to the performance of both impactors in the dynamic certification tests
 - The foam is less important in vehicle tests, where the vehicle is the primary energy absorber
- TRL therefore requested and has gratefully received a sample sheet of both new types (CF-45M and CF-45AC)
- TRL has now evaluated their performance in dynamic certification tests

Certification tests

- From each sheet TRL was able to obtain four lower legform fleshers and four upper legform flesh sets, and hence was able to test each new foam type four times with each impactor
- An additional two tests were carried out with each impactor on the current CF-45 foam
- All tests were within tolerances for impact velocity, temperature and humidity

Lower legform dynamic certification test results

| Foam type | Sample | Tibia acceleration (g) | Knee bending angle (°) | Knee shear displacement (mm) |
|-----------|--------|------------------------|------------------------|------------------------------|
| | | 120 – 250 g | 6.2° – 8.2° | 3.5 – 6.0 mm |
| CF-45M | 1 | 164 | 7.00 | 4.52 |
| | 2 | 149 | 6.93 | 4.35 |
| | 3 | 146 | 6.78 | 4.25 |
| | 4 | 135 | 6.49 | 4.07 |
| CF-45AC | 1 | 163 | 7.12 | 4.63 |
| | 2 | 141 | 6.90 | 4.29 |
| | 3 | 138 | 6.74 | 4.17 |
| | 4 | 144 | 7.03 | 4.22 |
| CF-45 | B176 | 167 | 6.97 | 4.54 |
| | B177 | 144 | 6.86 | 4.18 |

Upper legform dynamic certification test results

| Foam type | Sample | Bending Moment (Nm) | | | Force (kN) | |
|-----------|--------|---------------------|-----------|-----------|----------------|--------|
| | | Upper | Centre | Lower | Top | Bottom |
| | | 160 - 220 | 190 - 250 | 160 - 220 | 1.20 – 1.55 kN | |
| CF-45M | 1 | 165 | 193 | 161 | 1.26 | 1.23 |
| | 2 | 171 | 201 | 168 | 1.31 | 1.30 |
| | 3 | 175 | 203 | 170 | 1.37 | 1.33 |
| | 4 | 168 | 195 | 163 | 1.29 | 1.27 |
| CF-45AC | 1 | 172 | 201 | 168 | 1.32 | 1.28 |
| | 2 | 177 | 206 | 172 | 1.35 | 1.31 |
| | 3 | 173 | 201 | 168 | 1.34 | 1.30 |
| | 4 | 172 | 201 | 168 | 1.31 | 1.29 |
| CF-45 | B171 | 174 | 203 | 169 | 1.34 | 1.29 |
| | B172 | 166 | 193 | 161 | 1.26 | 1.23 |

Discussion

- All tests resulted in a 'Pass'
- However, some of the upper legform tests were very close to the lower limit
 - This was also the case with the current CF-45 foam, so the new types appear to be comparable in this respect
 - The rig used by TRL was a relatively lightweight rig, used for dynamic certification tests in support of TRL's sales of pedestrian impactors. The bearings would not be adequate for vehicle tests, where the side loads might be much higher. Heavier bearings, as typically used for vehicle tests, would add more rotational energy to the impact, thus increasing its severity.

Request

- TRL has only be able to carry out a few tests with the sample sheets, using only one sheet of each of the new types
- These are enough to cover fully repeatability issues, especially batch-to-batch repeatability, nor reproducibility
- Therefore, TRL would welcome test data from anyone else testing the new foam types

Conclusions

- The new foam types seem to be performing reasonably well in the dynamic certification tests performed by TRL, and no worse than the current CF-45 foam, so no changes to the certification test procedures appear to be necessary
 - Should be no need to change the GTR to specify the new types, as they should be covered by “or equivalent”
- However, this conclusion is based on very limited data, so it is too early to rule out completely the possibility of the new foam types causing problems, such as more frequent failures in the dynamic certification tests
- Those responsible for computer models of the Confor foam may need to revise their models

Thank you... Questions?

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