Deviation Request ETSO-C80#2 for an ETSO approval for CS-ETSO applicable to Flexible fuel and oil cell material (ETSO-C80)
Consultation Paper

1 Introductory Note

The hereby presented deviation requests shall be subject to public consultation, in accordance with EASA Management Board Decision No 7-2004 as amended by EASA Management Board Decision No 12-2007 products certification procedure dated 11th September 2007, Article 3 (2.) of which states:

"2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency."

2 ETSO-C80#2 Flexible fuel and oil cell material

2.1 Summary of Deviation

Deviates from ETSO-C80, Appendix 1, § 7 Slosh test, specifically from § 7.1.15, performing slosh test without including water and dye in the test fluid as required by the test procedure.

2.2 Original Requirement

ETSO-C80, Appendix 1, § 7 Slosh test

7.1.5 Test Procedure. The test cell complete with filler cap, vents and typical outlet fittings shall be installed in a suitable mounting structure, then mounted on the support jig and rocker assembly. Sections of flexible hose shall be connected to the vent and outlet flexible hose shall be connected to the vent and outlet fittings. The other end of each of these sections shall be rigidly attached to the support jig. The hoses shall be installed and supported in a manner representative of an actual installation in an aircraft.
The tank mounting structure is to be representative of an actual aircraft fuel cell compartment. Recommendations of the cell manufacturer for supporting or mounting the fuel cell in the aircraft fuel cell compartment are to be incorporated. The interior of the support jig shall be completely lined with brown paper held in place by a suitable adhesive.
The test specimen shall be filled two-thirds full with the applicable test fluid containing a suitable dye. For fuel cells, one-half gallon of water shall also be added. For oil cells intended for use in aircraft using an oil dilution system, 30 percent by volume of fluid 4.2a. shall be added to the test fluid. At the conclusion of this test, the test specimen shall be completely filled with the applicable test fluid and thoroughly inspected for leakage or other evidence of failure.

2.3 Industry

Regarding the slosh test, the water quantity to be added is negligible against fuel volume and will neither change the fluid density nor the chemical attack of the fluid.
As slosh test is a mechanical test, the lack of water will not affect test results. Indeed, if we take into account the density of Jet A1 and water which is respectively about 0,8kg/litre and 1 kg/litre and of the quantity required in the test, the global density would be:

$$\frac{\frac{2}{3} * 0.762 * 0.762 * 0.610 * 1000 * 0.8 + \frac{1}{2} * 3{,}78 * 1}{\frac{2}{3} * 0.762 * 0.762 * 0.61 * 1000 + \frac{1}{2} * 3.78} = 0.801$$

which is roughly the same density than the Jet A1.
Moreover, the dye has no influence in the fluid comportment, it is only here to check leakage occurrence. This will be done through brown paper wrapped around the test cell.

2.4 Equivalent Level of Safety

The slosh test is a mechanical test, so the chemistry of the fluid used does not have an impact on such test. Basically based on the test nature being essentially mechanic not depending from chemical composition, not adding water to the test fuel affects in a negligible manner the global density consequently not affecting test purpose.
Test fluid required characteristics are equivalent to the proposed ones, leakage will be detected via brown paper wrapped around the test cell. Detecting leakage via brown paper with or without a dye won't change the test outcome as well.

Thus proposed test procedure provides ELOS as standard ones.

2.5 EASA position

We accept the deviation.