Certification Memorandum CM-PIFS-0xx

Fuel Tank Drop Test as per 27.952(a) or 29.952(a)

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CM Fuel Tank Drop Test

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1.0 Background:

- Crashworthy fuel tanks are an important design feature.
- In service experience shows a marked safety improvement by reducing Post Crash Fires, to the extent such tanks are becoming a commercial argument.
- Required for all new type certifications and significant changes since 1994.

Major project risk

Test rule built to create a standardised test: more severe than real survivable impact.
2.0 Drop Test Requirement:

CS 27/29.952(a) requires:
- drop height: 15.2m (50ft),
- impact surface: non deforming,
- tanks filled to 80% with water.
- The test specimen shall include in-tank equipment and representative surrounding structure.
- Tank dropped freely, horizontal impact ±10°.

Pass fail criteria is simple: no leaks!
3.0 CM PIFS-0xx

Written to present EASA's position on different topics concerning the test.

Those positions have already been discussed with one or more applicants during certification exercise.

The CM allows EASA to share its position with all applicants.

The surrounding structure (§952(a)(4)) is already covered by CM-S-011.
CM Fuel Tank Drop Test

3.0 CM PIFS-0xx (cont’d)

What is not this CM:

» A new interpretation of the rule.
» A new mean of compliance definition.
» A new rule making exercise.
3.1 Angle at impact / Platform design:

» Is not intended to be a pass fail criteria but as a result of the drop becomes one.

» The prediction of the angle of impact is very difficult without the use of a guiding system.

» Lead to the use of a platform in almost all test.

» AC not very talkative on plateform layout

NOTE: Dimensions a and b shall not exceed cell dimentions (when the loaded cell is in place for test) by more than 12 inches in either direction.

Figure 3.1: Crash impact test fixture (from MIL-T-27422B, including the note)
3.2 Multiple tank testing

Figure 3.2: Multiple tank filled at 80%
3.3 Impact surface:

- Concrete.
- Used in 100% of the test performed in last certification exercise.
3.4 Free Drop

- The fall has to be as close as possible of a free fall.
- Friction forces between guiding cable and specimen has to be as low as possible.
- Verification of the free fall condition is not obvious but could induce evident discrepancy between test labs.
- Speed measurement not mandatory but might be necessary to support further compliance demonstration.
3.5 Simulation

The regulation requires a test, pass/fail criteria = no leak.
The simulation use to support drop test compliance demonstration is under discussion (design change, surrounding structure, specimen selection,...).

And some more practices:
The “no leak” criteria assessment of the tank upper volume (20%)
lessons learnt from visual inspection of the drop tested specimen
...
4.0 Schedule:

- CM is currently in internal review at EASA, before public consultation.
- Will be published on EASA website by end of January 2018 for 6 week public consultation.
- Any participant is warmly invited to provide his comments on EASA website.
Thank You!

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