



EASA
European Aviation Safety Agency

Certification Memorandum CM-PIFS-0xx - Fuel Tank Drop Test as per 27.952(a) or 29.952(a)

Christian GERRI
EASA - Powerplant and Fuel System Expert

Rémi DELETAIN
EASA - Powerplant and Fuel System Senior Expert

6 Dec 2017

Your safety is our mission.

An agency of the European Union 

TE.GEN.00409-001



CM Fuel Tank Drop Test

- Content:
 - 1.0 Background
 - 2.0 Requirement
 - 3.0 Certification Memorandum
 - 3.1 Angle of impact / Platform design
 - 3.2 Multiple tank testing
 - 3.3 Impact surface
 - 3.4 Free drop
 - 3.5 Simulation
 - 4.0 Schedule



➤ 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 $\pm 10^\circ$.

➤ Pass fail criteria is simple: no leaks!



➤ 3.0 CM PIFS-0xx

- Written to presents EASA position on different topic 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.



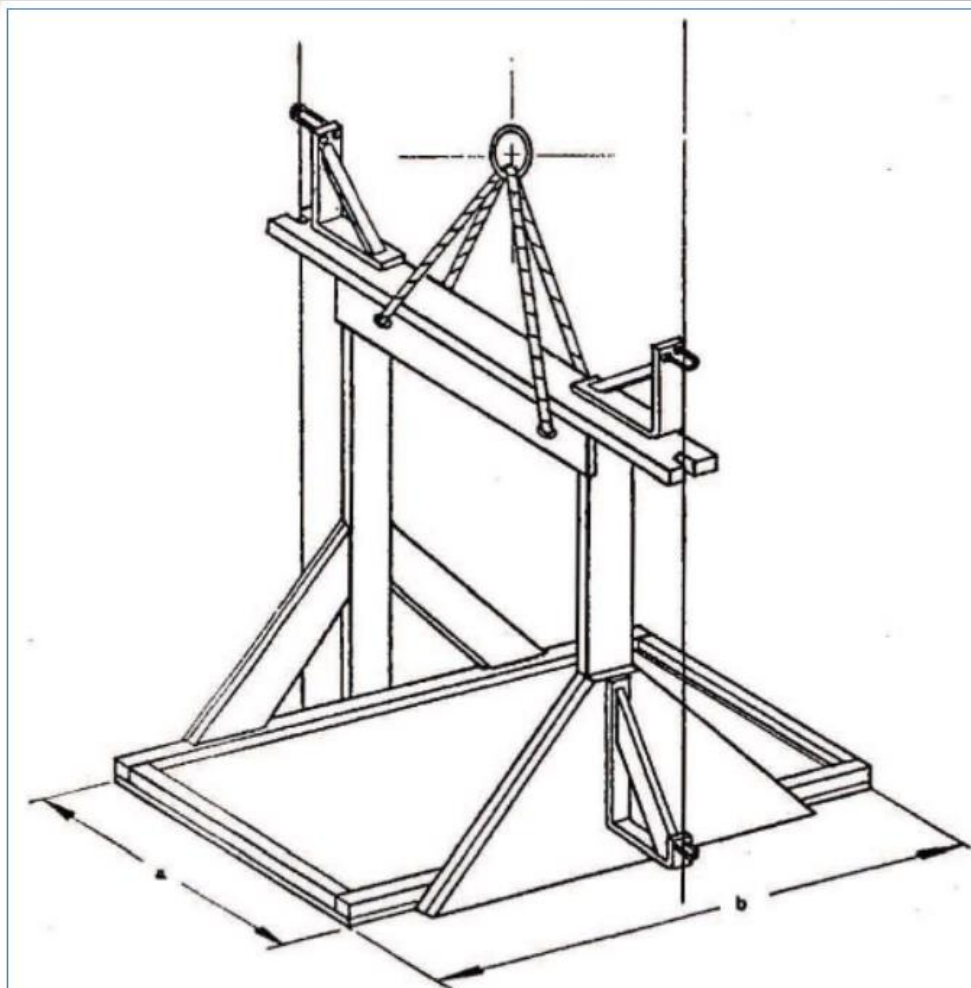
CM Fuel Tank Drop Test

- 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.



CM Fuel Tank Drop Test

- 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 platform layout



NOTE : Dimensions a and b shall not exceed cell dimensions (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

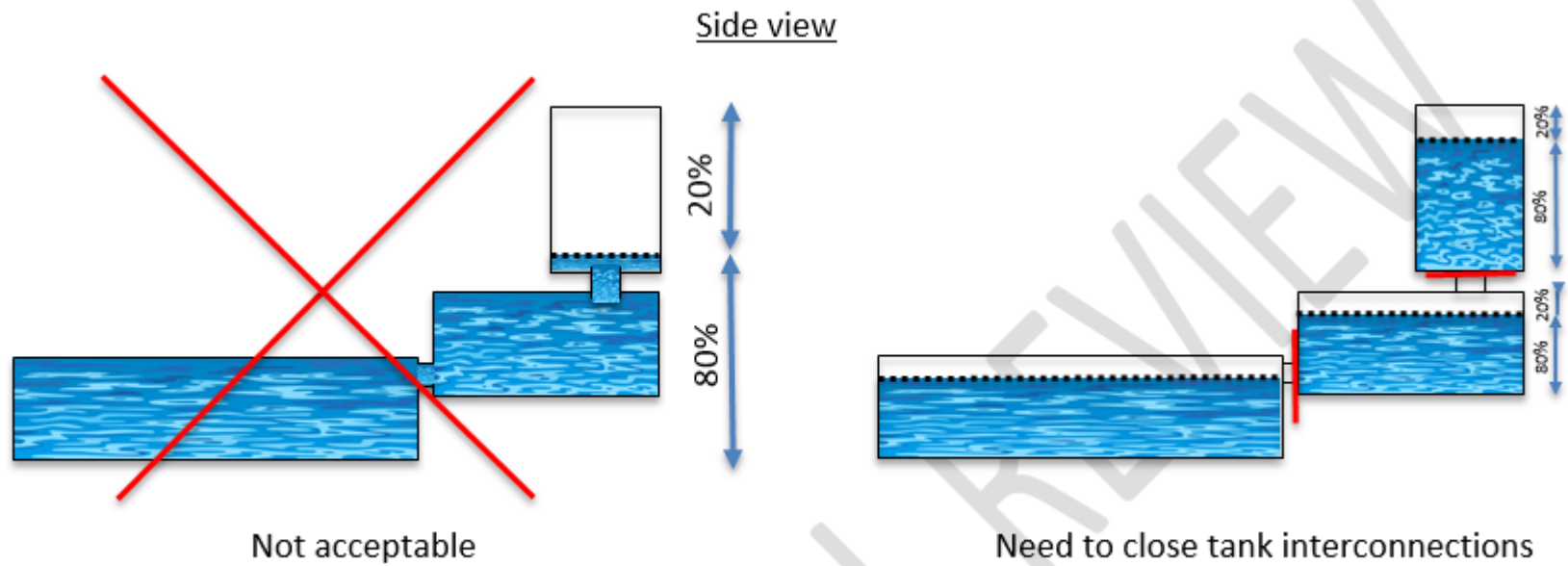


Figure 3.2 : Multiple tank filled at 80%



CM Fuel Tank Drop Test

➤ 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 provides his comments on EASA website.



EASA
European Aviation Safety Agency

Thank You !

Contact:

christian.gerri@easa.europa.eu

remi.deletain@easa.europa.eu

Your safety is our mission.

An agency of the European Union 