

Probability of Detection Demonstration Transferability

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objective

- The objective of the this task is to investigate several of the factors that may influence the transferability of POD demonstration tests. Initial testing will address the liquid penetrant inspection technique.
- Some of the factors to be considered in this task are crack aspect ratio, the extent of the crack opening, the material and the distance between the inspection surface and the inspector's eye.



background

The ongoing Mars Science Laboratory (MSL) Propellant Tank Penetrant Nondestructive Evaluation (NDE) Probability of Detection (POD) Assessment (NESC activity) has surfaced several issues associated with liquid penetrant POD demonstration testing.

- The fundamental assumption that a fatigue crack is the conservative flaw case for liquid penetrant POD demonstration tests.
- Demonstration tests are typically performed on fatigue cracks with aspect ratios ($a/2c$) between 0.3 and 0.5. It is then assumed that the inspector can find flaws with aspect ratios from 0.1 to 0.5 with a flaw equal area assumption.
- How well does demonstration on 4 by 8 inch flat panels translate to the inspection of large complex shapes.
- What effect does the material have on the inspection process. We incorrectly assumed titanium panels would pose a more difficult demonstration test than aluminum because of the tight nature of fatigue cracks in titanium. As it turns out, the titanium panels have extremely low background compared to aluminum and hence make the demonstration testing easier.