

Technical Justification for Ultrasonic Inspection Procedure Applied to Helicopter Components

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Abstract:

For many Non-Destructive Evaluation (NDE) applications, traditional Probability of Detection (POD) assessments are impractical because of the cost, time, and complexity associated with manufacturing and preparing the required specimen representative of in-service conditions. Various alternative methods have been developed to reduce the number of test specimens required for the reliability estimation.

Technical justification is a process that includes analytical and experimental based supporting evidences, physical reasoning, summary and recommendation. Those are gathered and compiled in a structural format to verify that the target examination technique, equipment and written procedure conform to the requirements and can meet its stated objective. Inspection qualification through technical justification minimizes the reliance on manufacturing test pieces and their time consuming inspection trials. This promising approach is being applied to demonstrate the reliability of an ultrasonic NDE procedure for a helicopter component upper tail-cone assembly.

The technical justification approach, in accordance with European Network for Inspection and Qualification (ENIQ) guideline, was selected to accomplish the objective of this study. It is aimed to provide comprehensive evidence for determining whether the minimum detectable discontinuity size by an ultrasonic inspection procedure for a helicopter upper tail-cone assembly can be reduced from 1.27 mm (0.050 inches) to 0.64 mm (0.025 inches), without compromising the current level of confidence. The study shows that, based on primarily physical reasoning analysis although 0.064 mm is detectable in a laboratory environment it is not justifiable to lower the current detectable size (1.27 mm). Inferences were made considering modelling, prior experimental trial supportive evidences and several other essential parameters of inspection including in-service crack geometry, orientation, environmental conditions that can significantly effect the inspection results and can lead to a missed flaw.

Keywords: Non-Destructive Testing, Technical Justification, Inspection Qualification, Ultrasonic Inspection