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New Developments of the of Ultrasonic Phased Array for the inspection of thick titanium casting structural parts

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Abstract

Currently, there is limited use of titanium castings, in aerospace applications, due to the inability of non-destructive inspection (NDI) technology to consistently detect flaws, such as, shell inclusions and hard alpha, in thick sections of titanium castings. At present, the common inspection technique is radiographic inspection. This technique is effective only in thin structures. Aerospace structures could range in thickness from less than half inch to several inches thick. Radiographic inspection technique was unable to detect any inclusions in casting structures that were more than 1.75 inches thick.

The growing use of titanium casting to build structural part of some aerospace vehicles brought about the need for a high-resolution, non-destructive testing technology to characterize it. Because of its large grain structure and the orientation of the defects, the ultrasonic inspection is a real challenge. The use of Ultrasonic Phased-array creates a breakthrough in the inspection of casting by getting a much better detectability than conventional methods.

This paper will summarize the work done by Boeing and RDTECH on some samples of titanium casting. Detectability, sizing capability offered by ultrasonic phased-array will be discussed.