3. AUTOMATED DIMENSIONING AND ULTRASONIC INSPECTION CAPABILITY WITHIN THE TESI ROBOTIC INSPECTION SYSTEM

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The TESI (Turbine Engine Sustainment Initiative) fully automated ultrasonic inspection system developed by the University of Dayton Research Institute for the U.S Air Force has demonstrated embedded defect inspections for numerous rotating engine components since its delivery in 2005. Use of a 6-axis robotic manipulator with probe positional accuracy correctable to within 0.010" (0.25mm) and phased array ultrasonics has provided highly repeatable inspection capability with a probability of detection (POD) that is operator independent. Rotating engine component inspection is performed using the "scan plan" concept, where the inspection can be programmed off-line using a standard PC and GUI interface starting from the part CAD drawing. Recently inspection capability was required for components which are known to exhibit large axial dimension errors, as well as service induced distortion and warpage. Execution of scan plans based solely on the ideal part was at risk for incomplete inspection coverage as well as probe collisions due to the disk distortions. To overcome these risks, system capability was developed to include part dimensioning capability during component inspection. During component inspection, the current position of inspection surfaces is determined so that the probe path and inspection parameters can be automatically adjusted for the specific surface location at the time of inspection. Details of the TESI system current capability, automation, positional accuracy, phased array implementation, POD results, system and probe diagnostics, and new dimensioning capability will be discussed in this presentation.