Low Plasticity Burnishing (LPB) as an MRO Technology to Improve Component Life, Damage Tolerance, Performance and Safety

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As both the commercial and military fleets age, the increasing frequency of required inspections to determine the current damage conditions and take corrective actions could lead to prohibitive costs, aircraft downtime, and of course immeasurable deleterious impact on the environment due to the premature and unnecessary scrapping of expensive metallic alloy components. Developing new materials or modifying component designs to improve damage tolerance is very time consuming and extremely costly. Even in the systems under development, unanticipated failure modes in turbine engines will significantly delay deployment.

Introduction of compressive residual stresses using Lambda's Low plasticity burnishing (LPB) at critical regions of the part can mitigate corrosion, fretting, or damage induced failures without changing either the material or the design. LPB has evolved as a lead technology for life extension and improved damage tolerance, and therefore a critical MRO technology for rejuvenating and recycling of components, both in the commercial and military aircraft applications. Significant cost benefits to both the DOD and commercial airlines are projected over the next decade.

With the recent approval of LPB as an MRO process by the FAA (Part 145 Repair) and the growing interest in the use of LPB from commercial MRO outfits, LPB applications for the commercial aircraft engines, structures and landing gears are likely to far outpace the military jet engine applications.

Examples of successful applications of LPB to compressor and fan blades and disks using Lambda's Fatigue Design Diagram method will be discussed. The quality assurance (QA) program associated with LPB by way of closed-loop monitoring and control at every moment of the treatment process will be discussed. The QA exceeds six sigma and leads to repeatable safe and stable material state in the component. The component life extension and resulting maintenance cost savings that can be achieved are illustrated using standard fracture mechanics based life assessment.