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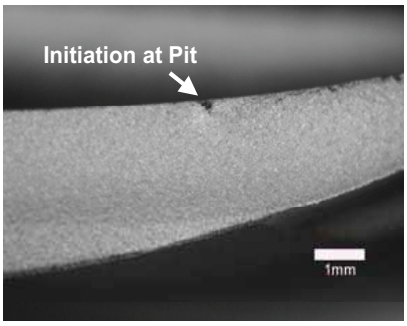
LPB® Application Note

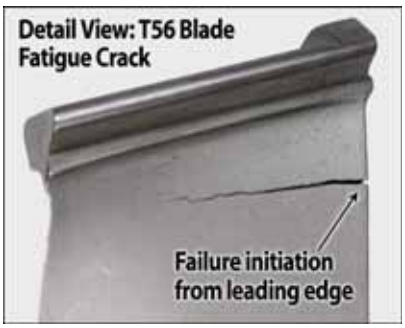
IMPROVING COMPONENT LIFE AND PERFORMANCE

ENGINE COMPONENTS

LPB processing of a stainless steel 1st stage compressor blade in the T56 turboprop engine

IMPROVING FOD TOLERANCE & HCF LIFE IN COMPRESSOR BLADES





Low Plasticity Burnishing (LPB®) mitigates pitting, diminishes foreign object damage (FOD), and improves damage tolerance and high cycle fatigue (HCF) while reducing the replacement costs of the 17-4 PH Stainless Steel 1st Stage Compressor Blade in the T56 Turboprop Engine.

- Reduces Inspection Times
- Increases Time in Service
- Decreases Maintenance and Replacement Costs
- Increases Safety for Military Personnel

LPB extends the service life and eliminates premature replacement costs of compressor blades. By providing a deep surface layer of high magnitude compression, LPB mitigates the fatigue debit associated with active salt-water corrosion and delays the initiation and early propagation of fatigue cracks from FOD.

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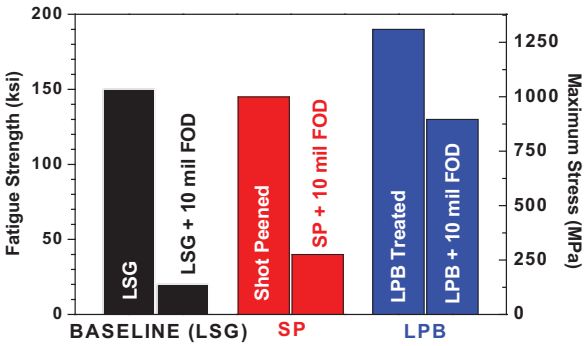
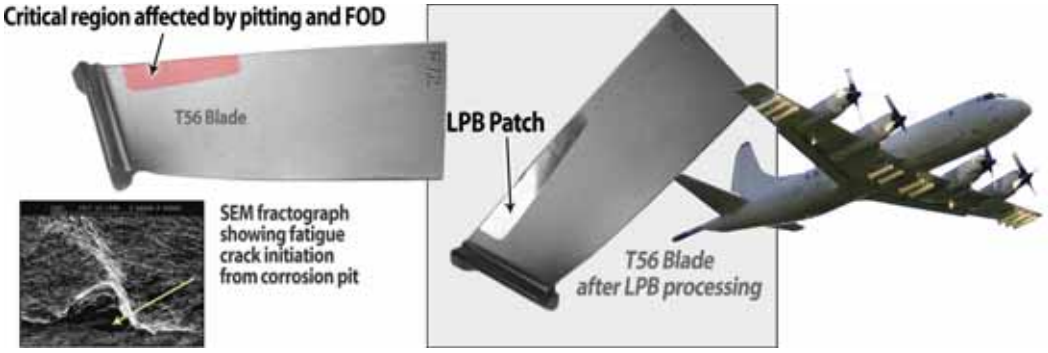
Mitigating HCF & FOD in Engine Components

High cycle fatigue, corrosion fatigue and general corrosion tests were performed on LPB, shot peened and low stress ground 17-4 PH specimens. The effects of these surface treatments on the high cycle fatigue strength, damage tolerance, and salt water corrosion fatigue behavior were studied using both thick section and blade-edge feature specimens, as well as actual retired T56 1st stage blades.



The results demonstrated that LPB dramatically improved the high cycle fatigue and corrosion fatigue performance of 17-4 PH by producing compressive residual stresses to a depth of 0.040 inches with low associated cold work. T56 blades treated in this manner were able to withstand 0.050 in. FOD along the blade edge with significantly less detriment to fatigue life when compared to baseline or shot peened specimens.

As the military fleets age, aircraft are being required to stay in service for much longer than their initial design life. The costs of repair, inspection and replacement of critical parts is rising dramatically and the need to keep planes in service is growing. With LPB, rotating engine components can last years beyond their expected lifetimes, increasing time in service and decreasing the frequency of downtime due to maintenance, repair and inspection.



To learn how LPB can increase the life of your engines, please visit www.LambdaTechs.com or contact Kim Bellamy at (513) 561-0883.

References:

- R. Ravindranath, N. Jayaraman and P. Prevey, "Mitigation of FOD and Corrosion Fatigue Damage in 17-4 PH Stainless Steel Compressor Blades with Surface Treatment." 9th National Turbine Engine High Cycle Fatigue Conference. Pinehurst, North Carolina, March 16-19, 2004.
- P. Prevey, N. Jayaraman. "Application of Low Plasticity Burnishing for Mitigation of FOD and Corrosion Fatigue Damage in 17-4 Ph Stainless Steel T56 Engine 1st Stage Compressor Blades," NAVAIR SBIR Contract No: N68335-02-C-0384 Phase II. December 1, 2003.

http://www.lambdatechs.com/publications/all-technical-papers.html

Accreditation:

- ISO/IEC 17025 Accredited Laboratory
- ISO 9001:2008 Certified
- FAA Accepted

For more information on Lambda, LPB® or to read complete papers, please visit www.LambdaTechs.com

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