LAMBDA Technologies Group.

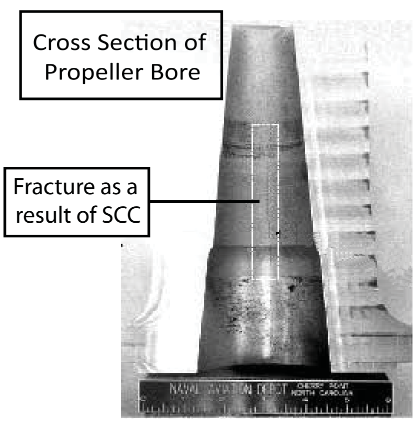
LPB® Application Note

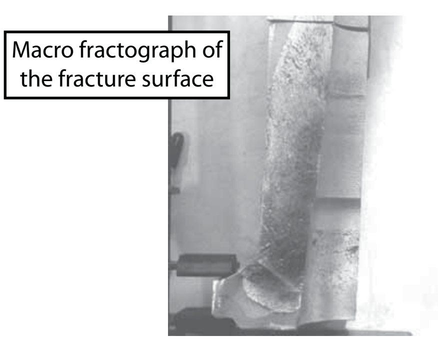
IMPROVING COMPONENT LIFE AND PERFORMANCE

PROPELLER BLADES

LPB processing of an aluminum alloy propeller blade

MITIGATING SCC IN PROPELLER BLADES





Low Plasticity Burnishing (LPB) mitigates stress corrosion cracking (SCC) and improves corrosion fatigue strength while increasing the service life and reducing the total maintenance costs of the aluminum alloy 7076-T6 propeller for the U.S. Navy's maritime patrol aircraft.

- Optimizes Maintenance Procedures
- Increases Time in Service
- Decreases Maintenance Costs
- Eliminates Scrapping

LPB eliminates premature replacement costs of the P-3 propeller taper bore by providing a deep layer of high magnitude compression of sufficient depth to mitigate SCC and improve corrosion fatigue.

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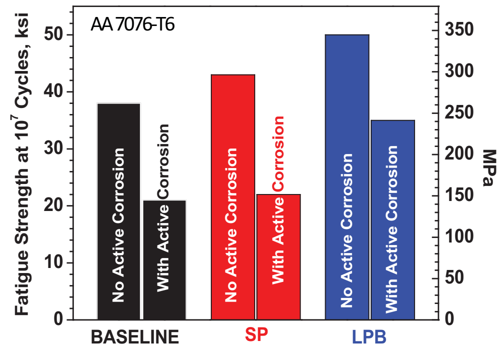
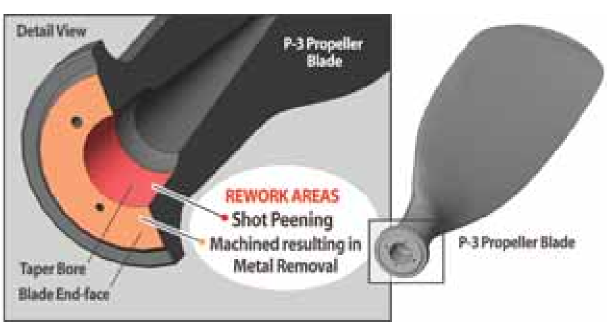
Optimizing Processes with LPB

Over time with environmental exposure, pitting corrosion occurs on the taper bore surface, creating the need to rework the bushing and taper bore area within the propeller blade. The pitting serves as a site for SCC and fatigue crack initiation. Shot peening is currently used to impart compresive residual stress and prolong the life of the taper bore. This leaves a dimpled surface which requires reaming of the bore to reduce the surface roughness and maximize the contact between the bronze bushing and the bore surface. Shot peening is also performed as a rework process at various stages, requiring further reaming of the taper bore. This shot peening and reaming process requires the blades to be scrapped every three cycles.



Corrosion fatigue, SCC and general corrosion tests conducted on aluminum alloy 7076-T6 demonstrated superior performance of the LPB process relative to the current shot peening and reaming process. Lambda Technologies developed the appropriate compressive residual stress distribution, performed corrosion and fatigue tests, designed and fabricated the tooling, LPB processed taper bores for component testing and prepared a production implementation plan.

LPB greatly reduces labor and material costs by eliminating the need for remachining and and entirely removes the need to scrap blades. With LPB, turboprop engines can last years beyond their expected lifetimes, increasing time in service and decreasing the frequency of downtime due to maintenance, repair and inspection.




P-3 Orion

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

References:

- D. Hornbach, G. Kauffman, T. Nguyen and P. Prevey, "Life Extension of the P-3 Aircraft by Robotic Applications of LPB." Aircraft, Airworthiness and Sustainment 2011. http://www.meetingdata.utcdayton.com/agenda/airworthiness/2011/proceedings/presentations/P4619.pdf. San Diego, CA, April 18-21, 2011.
- D. Hornbach, J. Scheel and P. Prevey, "Safe Life Conversion of Aircraft Aluminum Structures via Low Plasticity Burnishing for Mitigation of Corrosion Related Failures." DoD Corrosion 2009. Washington, D.C., August 10-14, 2009.

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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