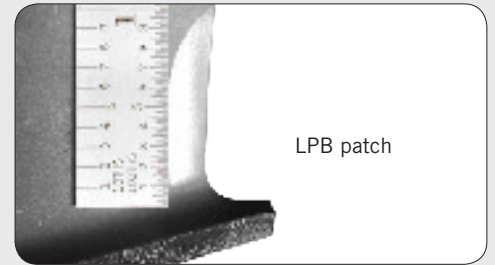
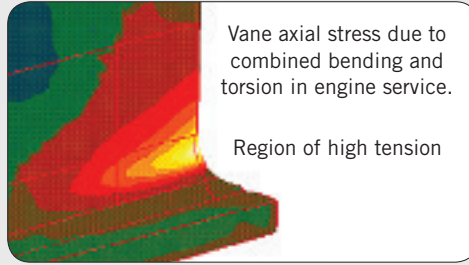
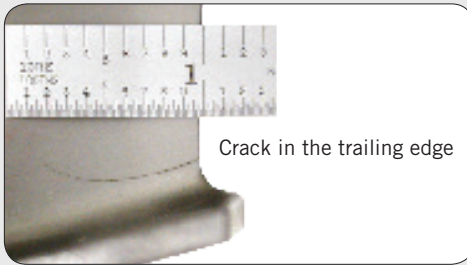
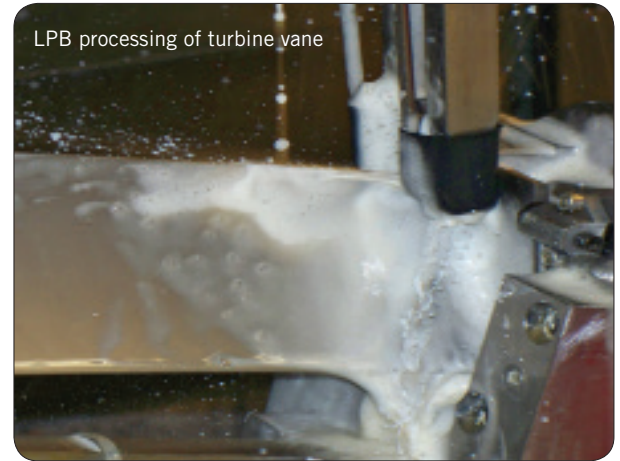




The US Marine Corps AV-8B Harrier jets are powered by F402-RR-408 (Pegasus) engines. The LPC1 (1st stage low pressure compressor) vanes in these engines were prone to failure from cracks in the inboard trailing edge (TE) of the airfoil near the platform. Several Class A mishaps involving loss of aircraft have been attributed to fatigue cracking and fracture. The LPC1 vanes were determined to have extremely low foreign object damage (FOD) tolerance, posing an ongoing safety concern for the fleet. Frequent inspections and regular vane replacement were then required, unavoidably limiting fleet readiness and increasing maintenance costs. The limited availability of F402 replacement parts threatened eventual fleet grounding.



SOLUTION: The F402-RR-408 LPC1 vanes proved to be excellent candidates for application of low plasticity burnishing (LPB®) to improve damage tolerance and operational safety. Laboratory fatigue testing verified that LPB treatment completely mitigates 0.020 inch deep FOD and restores fatigue properties of both test coupons and LPC1 vanes. Production LPB processing was developed and applied to vanes for engine testing. ASMET engine testing by the OEM proved that LPB resulted in complete mitigation of even 0.025 inch deep FOD introduced by ballistic impact at the TE failure location. NAVAIR approved Lambda's LPB process for improving the damage tolerance of both new and in-service LPC1 vanes.

IMPACT: Over 16,000 LPC1 in-service vanes have been LPB treated and installed in the F402-RR-408 engines over the last decade. The improved damage tolerance has eliminated a major flight safety issue threatening continued operation of the AV-8B Harrier fleet, and substantial cost savings for the USMC. The ease of implementation of LPB into existing manufacturing process in CNC mills has made it a very cost-effective means of improving the damage tolerance of an existing flight critical component without altering the original OEM material or design.

