PROPULSION CRAIG HOYLE / LONDON

Engine coating is a Gem for UK Lynx operations

MoD borrows Russian technique to counter effects of sand erosion on powerplants

The UK Ministry of Defence has borrowed a Russian innovation to improve the operational availability of the Rolls-Royce Gem engines that power the British Army's Westland Lynx battlefield utility helicopters.

A titanium nitride coating intended to reduce the effects of sand erosion has been applied to alternate low-pressure compressor blades on both engines of a Lynx operating in Iraq since early last December. This comprises "hard layers for surface protection and soft layers that have elastic properties to encourage particles to bounce off without penetrating", says the UK Defence Logistics Organisation's (DLO) Helicopter Engines Integrated Project Team.

The result of a collaborative study involving R-R and the UK's Defence Science and Technology Laboratory, the advance could cut Gem overhaul demands and deliver a "drastic increase" in engine life, says the DLO. Previous Russian and US trials of titanium nitride coatings have seen engine blades last up to four times longer in a corrosive environment, it adds.

The trial is scheduled to conclude by mid-March. A successful upgrade could reduce Lynx fleet operating costs in sandy conditions by around £540,000 ($950,000) a year, according to DLO estimates.

AGUSTAWESTLAND

A successful upgrade could reduce Lynx fleet operating costs in sand

MANUFACTURING

Semi-solid parts could fly with thixoforming

The Boeing Advanced Manufacturing Research Center (AMCR) at UK's University of Sheffield expects to confirm later this year that a manufacturing process known as thixoforming can be used with aerospace alloys.

Already used by the automotive and electronics industries, thixoforming has been tested by AMCR researchers on a variety of alloys applicable to aerospace.

Thixoforming involves heating a metal until it demonstrates semi-solid properties. The mixture of solid- and liquid-phase metal is then poured into a mould or a die to form the net shape of a part. Thixoforming is viewed as a hybrid between casting and forging.

Thixoformed parts have so far shown superior mechanical properties compared with castings – they can be welded, and their formation is gas free. In the automotive industry, the process is used to produce net-shape parts.

"We have to verify the properties for aerospace," says Plato Kaprano, research fellow on thixoforming. "If we can reproduce the recent results, then we're close for some alloys to be used by industry."

MATERIALS

Explosive bonding offered

US company Reactive Nanotechnologies (RNT) is seeking a commercial partner for its thin-film igniter technology, NanoFoil, which could be used for metal bonding or ejection seat pyrotechnics.

Nanofoil is fabricated by the vapour deposition of thousands of alternating nanoscale layers of aluminium and nickel. When initiated by an electrical, thermal, mechanical or optical source, the layers mix and react to release heat energy in a controllable manner. Varying the composition and thickness of the layers can control the velocity, temperature and total energy of the reaction.

Another potential use is as an igniter for infrared countermeasure flares or for the room temperature bonding of mismatched metals. "You could bond large areas of metals with this. As an igniter, in demonstrations we have used a 9V battery as the electrical source," says John Hannafin, RNT business development and marketing vice-president.

The material, Hannafin claims, could be used to bond mismatched metals that have different rates of thermal expansion. With heat-related joining, warping can occur where the surfaces of mismatched metals become stressed. Nanofilm would be placed between the surfaces and ignited, with a reaction propagation rate of 30m/s (5,900ft/min), to bond them.

PROCESS ROB COPPINGER / LONDON

NASA funds rapid hybrid welding/forging

A hybrid welding and forging process that joins dissimilar metals in a second has been developed with funding from NASA, which is interested in using the technique for Moon base fabrication.

The Michigan Research Institute, NASA and Michigan-based engineering company Delphi have developed the deformation resistance welding (DRW) process and claim it can produce welds that are stronger than the parent metals.

In DRW, welding electrodes are placed around the area to be welded. The electrodes pulse electricity into the weld area. This brings the metal to be joined almost to melting temperature. Then force is applied rhythmically to deform and merge the mating surfaces.

DRW can join tubes to solids and sheet metal. Unlike conventional welding technologies it does not need a gas environment or consumable. "We have welded cast iron and stainless steel together," says Delphi's new venture creation specialist Jayson Pankin. "We'll have further combination testing and for leak-tight welds. We are working to scale up the process for production." The process, he claims, will also limit or stop potential causes of galvanic corrosion that could weaken the weld.