

EUROCOPTER BLADE SLEEVES

COMPONENT PURPOSE/REQMTS:

- react centrifugal loads from blades to the rotor
- component requires infinite fatigue life, excellent fretting fatigue resistance, high specific strength and good toughness
- minimum rotating mass, low cost

COMPONENT CONFIGURATION:

- Eurocopter helicopters (N4, EC120) are used for civilian law enforcement and search and rescue in Europe, the US and other countries
- forged Ti alloy with holes for bolt attachments

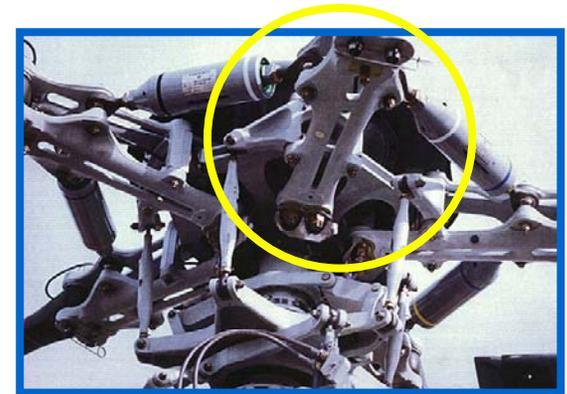


PROBLEM:

- initial Ti component added weight, cost

PREFERRED SOLUTION:

- support rotating forces and reduced mass
- maintain same form, fit and function
- minimum risk of insertion



CANDIDATES:

- extruded and forged *Al 2009/SiC/15p-T4* DRA

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TEAM AND APPROACH:

- collaboration between Eurocopter, DWA Al Composites, Forges de Bologne
- collaborative design trade studies and M&P studies
- generation of tensile, fatigue and toughness data

MATERIAL AND PROCESS:

- P/M billets ($\phi = 36\text{cm}$) were extruded and cut to produce forging preforms
- blocker forging and closed die forging produce sonic envelope, which is also the final part
- drilling of attachment holes and final machining produces only 1% waste
- extensive testing and certification is conducted, with 25 year traceability

RESULTS/PAYOFF:

- excellent fatigue life (270 MPa at 10^7 cycles) allows DRA to compete successfully with Ti alloy component
- adequate fracture toughness ($25 \text{ MPa}\sqrt{\text{m}}$)
- specific strength equivalent to initial Ti alloy
- significant reduction of rotating mass (14 kg) achieved
- lower cost than Ti component
- first DRA in fracture-critical aerospace component

