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ABSTRACT

This paper summarises some of the significant outcomes of a fatigue test program for ex-service aircraft structure. Seventeen F/A-18 Hornet aircraft aluminium alloy 7050-T7451 centre fuselages (referred to as centre barrels (CBs)) were tested, torn down and inspected in this program. Significant results of the test program included the demonstration of the repeatability of service fatigue cracking locations, the collection of data to characterise the types of defects that typically nucleate fatigue cracks in aircraft components and a more accurate assessment of the safe operating life of this structure. The results of the program also enhanced the existing understanding of fatigue cracking in aluminium alloy 7050-T7451. Furthermore, the improved understanding of the fatigue cracking that occurred in service F/A-18 CBs and the damage tolerance of this structure allowed increased aircraft availability and reduced maintenance costs in the Royal Australian Air Force (RAAF) F/A-18 fleet.

Keywords: Fatigue crack growth; Full-scale fatigue tests; F/A-18 Hornet aircraft; fatigue lifing

List of Acronyms

| | |
|-----------------------|--|
| a | Current crack depth |
| a_0 | Initial crack depth per exponential crack growth model, equivalent to the EPS. |
| AA | Aluminium Alloy |
| a_{Crit} | Crack depth at fracture |
| AFHRS | Airframe Hours |
| $a_{\text{max FT55}}$ | Maximum crack depth that occurred on FT55 |
| a_{RST} | Largest crack depth that can safely sustain RST loading |
| ASLMP | Aircraft Structural Life Monitoring Program |
| b | Geometry factor |
| b_{FT55} | Geometry factor for cracking in FT55 |
| b_{RST} | Geometry factor for a_{RST} |
| CB | Centre Barrel |
| CBR | Centre Barrel Replacement |
| DIL | Damage Item Location |
| DLL | Design Limit Load |
| DST | Defence Science and Technology |
| EOS | End of Service |
| EPS | Equivalent Pre-Crack Size |
| FALSTAFF | Fighter Aircraft Loading Standard For Fatigue evaluation |
| FC | Fracture Critical |

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