Last of a series on F-111 options

F-111: Our soundest aircraft

By Dr Carlo Kopp

The pernicious myth about the F-111 is that the aircraft is structurally unsafe because of age and could soon fall out of the sky. This is absurd.

The F-111, in structural terms, is arguably the safest aircraft in ADF service. With structural, cold-proof load testing, it is the only ADF airframe where primary structural integrity can be demonstrated as safe.

The F-111 fleet has considerably more airframe structural fatigue life than the F/A-18A fleet – if fatigue were the driving issue the Hornets would go first. While most modern fighters are built for a 6,000 hour fatigue life, the F-111 was built for 10,000 hours. DSTO concludes 2020 is achievable.

Because of the original intention to fly the F-111 airframe off carriers, our F-111s inherited a heavily over built, common structural design. So tough is this airframe that several aircraft, seriously damaged in landing and take off accidents, were rebuilt under the `FrankenVark' program. The RAAF's A8-112 flew home after a fuel tank overpressure event which would have torn a lesser aircraft to pieces.

Wings

The main fatigue issue in the F-111 has always been the wings, especially the D6AC steel wing pivot fitting (WPF) at the wing root. The wing-centre carry-through box (WCTB) has had very few problems statistically. DSTO Melbourne regarded the WPF as a priority and devised a modification which arguably `fatigue-proofs' this critical component.

The RAAF's wing replacement program resulted from gaps in the fatigue analysis of the FB-111A/F-111C `long' wing and delays in analysing fatigue test articles in Australia. With perhaps 90 per cent or more of its key, fatigue-limited components concentrated in the wings, the fatigue life of the RAAF fleet can be extended by swaps as long as surplus wings remain in mothballs in the US – some 200 airframes, many under 3000 hours. Additional wing hours can also come from reskinning, fastener reworking and selective component replacement, as is done with the B-52H, B-707 and other types.

The aluminium honeycomb sandwich skins can be replaced with DSTO-devised and more durable and tougher carbon-fibre composite replacements.

Engines

The existing pool of TF30 engines will last until at least 2020. GE initiated design work on adapting the F110 retrofit kit for the F-14B/D to the F-111 during the early 1990s. In principle, an F-111 retrofit with high-thrust, low-maintenance F110 engines, common to the F-16 fleet, is a low-risk, low-cost conversion.

With an engine retrofit the F-111 can have a propulsion package supportable well past 2030. In terms of raw aerodynamic capability the F-111 outperforms everything in the market other than the F/A-22A – newer engines would increase that margin.

Avionics

Avionics retrofits are not an issue given the size of the F-111 – with newer liquid cooling this becomes even easier. With large radar and avionics bays it can accommodate many alternatives.

There are no obvious engineering reasons why the F-111 cannot be life-extended into the 2030-2040 period, like the US Air Force B-52H and B-1Bs – both programmed for use until 2040, using small block retrofits during scheduled down time.

Budget spikes

A billion dollars buys very few shiny new fighters, but it does buy an enormous amount of life-extension upgrades on the F-111 fleet. New fighter buys put enormous cost spikes into the budget. Incremental, life-extending upgrades on the F-111 can be spread over decades in small block upgrades.

Why is there so little interest within Defence in the idea of extending the life of the F-111? The budget crunch between 2005 and 2015 is a major agenda item.

Deferring F-111 replacement defers significant expenses in buying new. Pushing F-111 retirement from 2020 to 2030 pushes replacement expenditures back a decade, 2040 two decades.

If the US can do this with the larger, F-111-like B-1B and the much older B-52H, why must Australia follow a path so different? Stretching the F-111 is a cheap and low risk way to save taxpayers' money without sacrificing vital capabilities.