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Advances in Fast Jet Aircraft Safety – Mk 42 /43 Modular Aircraft Life Preserver: A Customer Perspective

What is DE&S?

To equip and support our Armed Forces for Operations now and in the future.



LIFE PRESERVERS (LPs)

Present
Vs.
Future



Mk 40M /41M LP

Performance concerns of previous iteration:

- Auto-inflation failures
- Self-righting failures
- Insufficient freeboard /flotation angle



Modifications:

1. Delivered interim standard LP that addressed issues of previous version
2. ADHs accepted Risk to Life (RtL) due to the flotation performance



FAST JET Mk 42M /43M LP

Key benefits:

- In water performance exceeds requirement
- Inherent stole redundancy – twin stole
- Excellent protection against worst case fire scenario
- Good abrasion /wear resistance



Primary Design Improvements:

- To be compliant with standards collated by the Design Organisation, RAFCAM and DSTO
- Incorporate a twin stole to increase the reliability of the LP

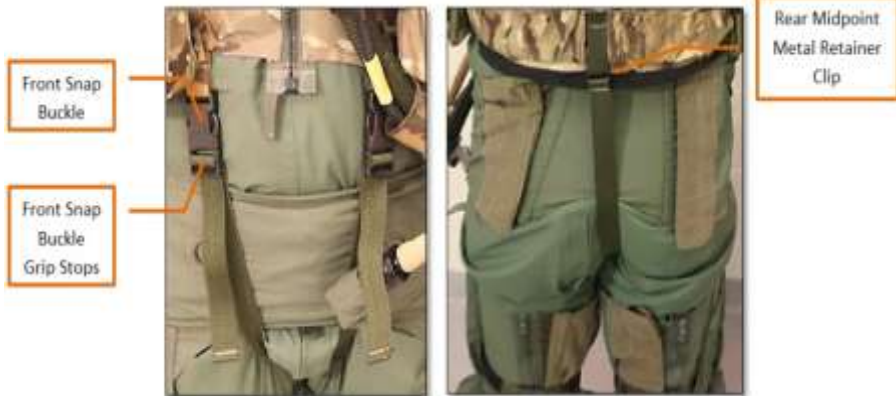
Secondary Design Improvements:

- Addressed issues identified through the in-service use of the Mk40M /Mk41M LPs.

The Evolution of Design

Significant design changes:

Crotch Strap



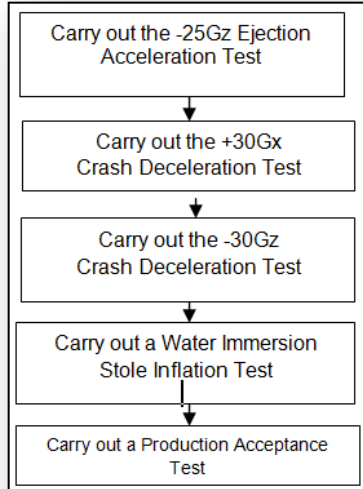
- Ensures the LP does not move upon water entry, improves flotation and freeboard characteristics

Power Mesh Panel (Underside)



- Allows redistribution of the CO² within the stole

Tests Conducted



Tests Performed WRT

EASA ED Decision 2006 004/R &

British Standard BS EN ISO 12402 &

Defence Standard 05-134:

Wind Blast

Tower Tests

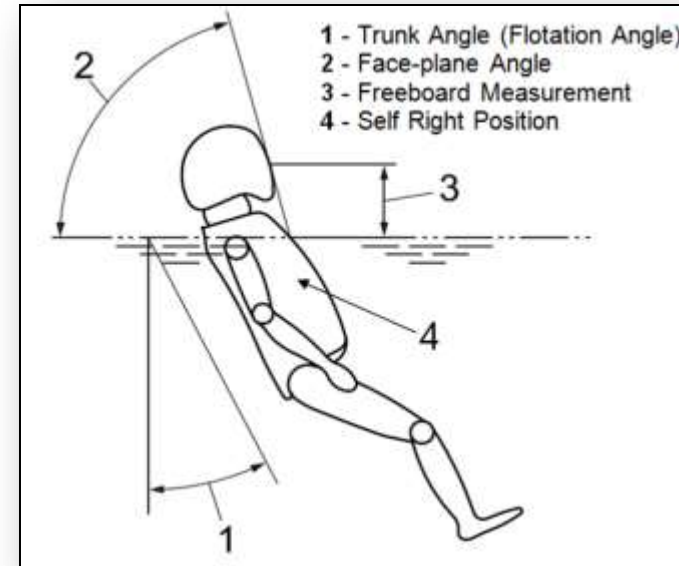
Acceleration and Deceleration Tests

In-Water: Freeboard and Flotation Angle

Auto-Inflation and Self Righting

Aircraft Integration

Flight Trials



Acceleration/deceleration test facility



Trials Conducted

In-water Tests conducted

- Water Entry
- Auto-inflation
- Self-Righting
- Freeboard measurement
- Angle of Flotation (Trunk)
- Face Plane Angle
- Parachute Dragging
- Life Raft Boarding

Water entry



Parachute dragging trials

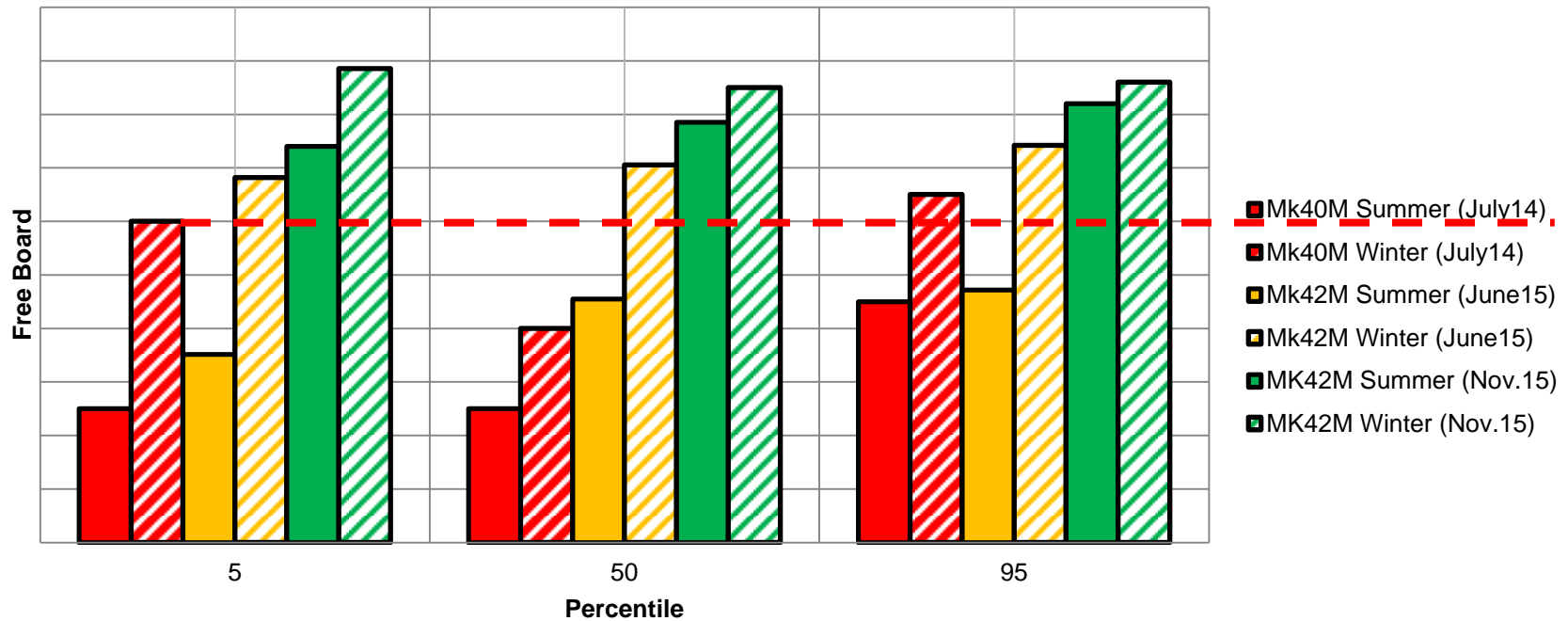
- Submarining
- Access to the cutter
- Simulated cutting of parachute riser lines
- QRF release.

Parachute dragging trial test subject



Results from in-water testing

UK Summer & Winter - INITIAL Mk40M & CONCEPT MK42M vs CURRENT Mk42M



Wind blast testing

- The aim of the LP is to maintain functionality post ejection sequence
- Three scenarios were used to represent the knots equivalent airspeed (KEAS) that could be experienced:
 - 600 Knots (Head On)
 - 450 Knots (Side On)
 - 450 Knots (Side On)

Windblast tunnel



Tower testing

- The tower test confirms that Aircrews limbs are restrained in the optimum position upon exiting the Aircraft during an ejection sequence.
- It helps prevent contact during the exit as well as limb protection from the windblast effect.
- Provides evidence that the arm restraint system on the Mk 43M will secure the arms of Aircrew and allow them to be functional post ejection.

Test info

- Used a Martin Baker Mk10 Ejection Seat
- Future LP Arm Restraint System Requirement Test
- Test 1 conducted at 10Gz
- Test 2 conducted at 20Gz



Martin Baker Type 10A Ejection Seat Test Tower

Cockpit integration includes (iaw DEF STAN 05-134):

- Donning and Doffing
- Walk out and entry
- Strapping-in procedures
- Work station manoeuvres
- Normal egress
- Emergency egress

Aircraft involved:

- Hawk TMk1 and TMk2
- Tucano TMk1
- Tornado GR4



Simulated pitch movement of control stick



Hawk T1



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Flight Trials



Learning From Experience

- Robust requirement
- Consider design changes in isolation
- Agree testing protocols with all stakeholders
- Understand impact on risk and opportunities in the event of project slippage
- Work closely with Design Organisation, testing organisations and all stakeholders

Current State of Play

- The Fast Jet variant of the Mk 42M /43M has been tested and has been produced
- Flight trials to provide evidence
- Further development is required for the Rotary and Large Fixed Wing Variant



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