Post Ejection Survival

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Background

- Martin-Baker is known as an escape system manufacturer:
  - 16836 seats in service with 92 Air Forces
  - 7491 lives saved

However:
- It is more than just getting out of the aircraft
- Lots of design effort and Human Factors input goes into making the whole escape, from pulling the handle to being back at home, as safe as possible

- We are all here because we are aircrew safety professionals, so increasing safety should be our primary aim
Ejection

- Terrain clearance is key:
  - Out of the aircraft and on a parachute as quickly as possible
- But this is only the first step
Terrain clearance

CF-18, 23 July 2010 – out of envelope, late ejection decision
Design input

- Human Engineering is autonomous to design, and embedded into MBA projects from early concept, through design and qualification, to in-service support to end users

- Ensure the cockpit, as well as seat design, is optimised for the anthropometric range of the user group

- Ensure potential errors are removed by design, procedure or training:
  - Procedures and training have to be robust as we should be designing for a smart and well trained end user
Design input

▼ Human qualification of all aspects of Post Ejection Survival
▼ We use all of the equipment we supply and integrate with, on all platforms, in all countries:
  ▼ 92 Air Forces who all use different equipment with different procedures
  ▼ Each one thinks they are doing it the right way
  ▼ Example: Strapping-in procedures Tucano vs. Hawk T2
▼ Therefore we have more knowledge and experience than any single end user group
▼ Work with end users to optimise procedures and provide training
Scope of Post Ejection Survival

- Covers everything from the point of pulling the handle to being back at home:
  - Parachute descent
  - Parachute landing and release (on land or at sea)
  - Life raft boarding
  - Survival aid selection and use
  - Recovery

- But…. Safe post ejection survival starts with safe ejection, and that means correct ingress / egress procedures
Ingress / egress procedures

- Correct ingress (strapping in) is one of the key factors in preventing injury during ejection.
- Many examples seen over the past few years of the lack of knowledge and training on correct strapping-in procedures.
- Some a direct cause of ejection injuries, others will be if not addressed.
- Also non-qualified equipment in the cockpit has caused ejection injuries.
- Lots of assumed knowledge.
Strapping-in procedures

▼ What is wrong with this picture?
▼ Harness Power Retraction only works if you strap in correctly!
Cockpit equipment #1
Cockpit equipment #2
Cockpit equipment #3

End to end training being introduced

Pilot ingress / egress training performed at MBA expense shown to improve pilot comfort and will vastly improve ejection safety:
  - Not enough, but it is a start

Post Ejection Survival Training funded by the programme – being performed at all US F-35 bases

Importantly uses the correct equipment – harness, SSK, parachute, survival aids

USN Pensacola set up for all initial pilot training, with end bases being rolled out for refresher training:
PEST seat

- Specifically designed to allow correct strapping-in procedures while minimising cost and maintenance effort
PEST seat occupied
PEST activities

Incorporating platform specific equipment into the current training syllabus
Training benefits #1

- Correct strapping-in prevents ejection injuries
- Correct parachute procedures prevents PLF injuries
- Correct post ejection survival procedures saves lives

Training saves lives!
Training benefits #2

- Correct strapping-in improves comfort and reduces fatigue
- Issues raised with equipment comfort are often down to misuse or incorrect fitting
- Equally applies to flight clothing, helmets, O2 masks and other PFE

Training improves performance!
Training benefits #3

- Misuse of equipment causes aircraft downtime
- Comfort or fatigue issues cause pilot injuries
- Broken equipment requires replacement

Training also saves money!
The way forward

▼ Ejection seat design, safety and procedures have evolved a lot over the past 40 years

▼ Procedures are vastly different across different aircraft types:
  ▼ Ingress procedures for a Tucano are not the same as for a Hawk. Tornado, Typhoon and F-35 are all different again
  ▼ Addressed for some end users, as presented at SAFE 2014, to introduce common procedures through common equipment
  ▼ Training must be type and equipment specific to make it safe and effective
  ▼ You would not rely on engine failure or instrument failure drills being performed in a Tucano for use by Typhoon pilots

▼ Training must be routine and up to date, using the latest information and current equipment:
  ▼ And should be outward looking to learn lessons from around the world, not insular and always assuming “we know best”
Questions?