



Post Ejection Survival

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Background

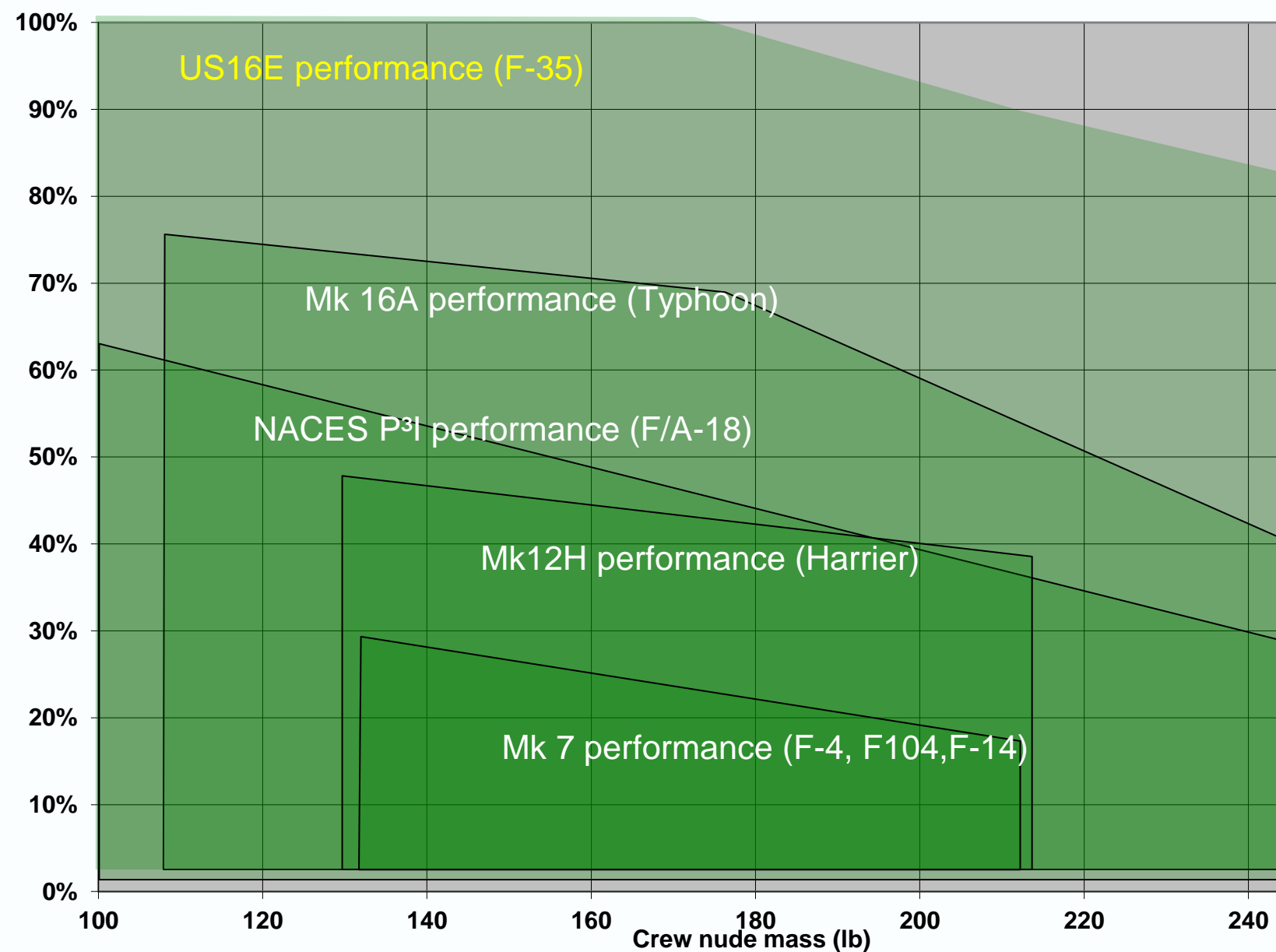
- ▼ Martin-Baker is known as an escape system manufacturer:
 - ▼ 16836 seats in service with 92 Air Forces
 - ▼ 7491 lives saved

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



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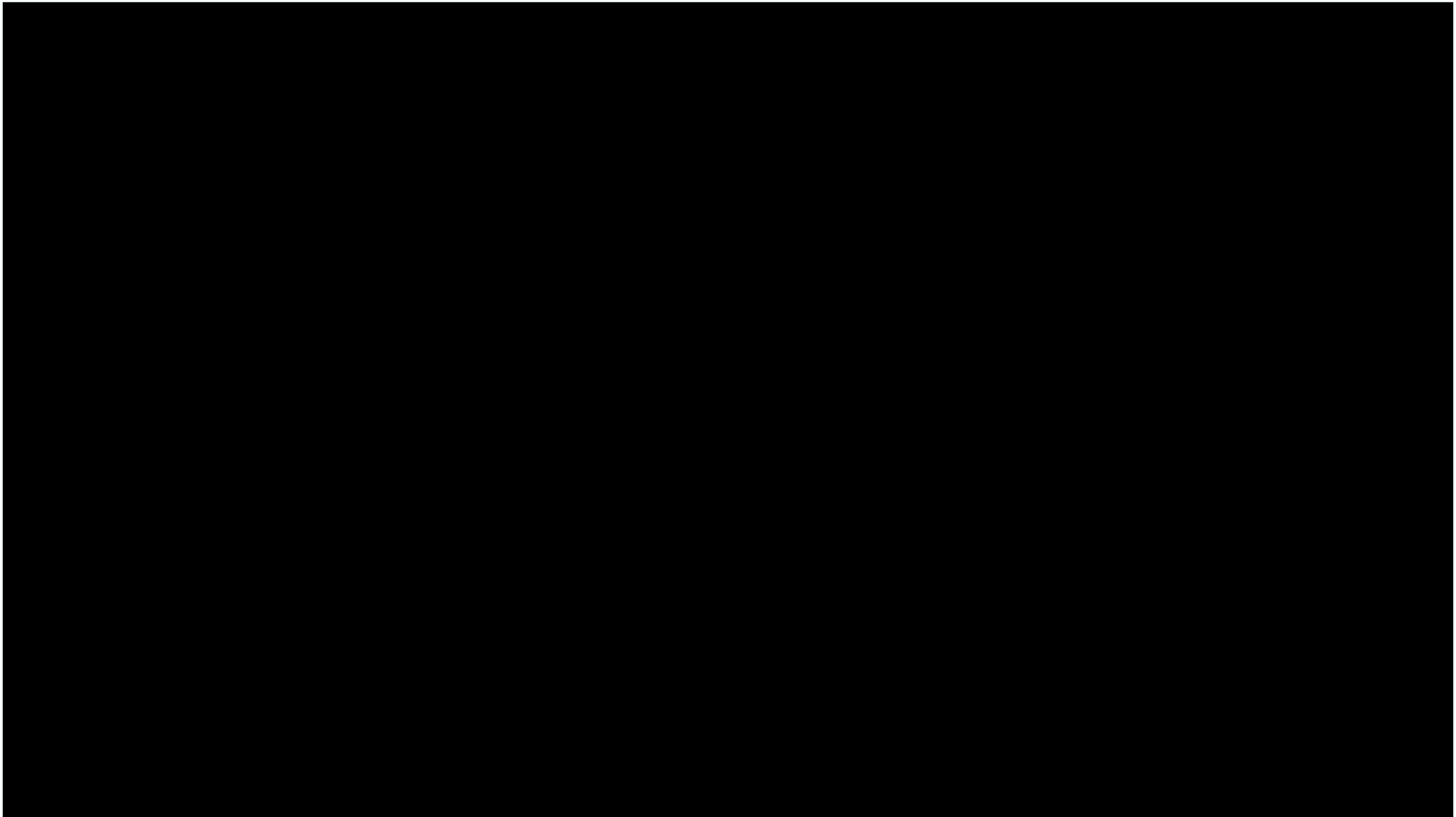
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▼ Harrier GR9, 14 May 2009 – Kandahar, Afghanistan

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





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Cockpit equipment #3

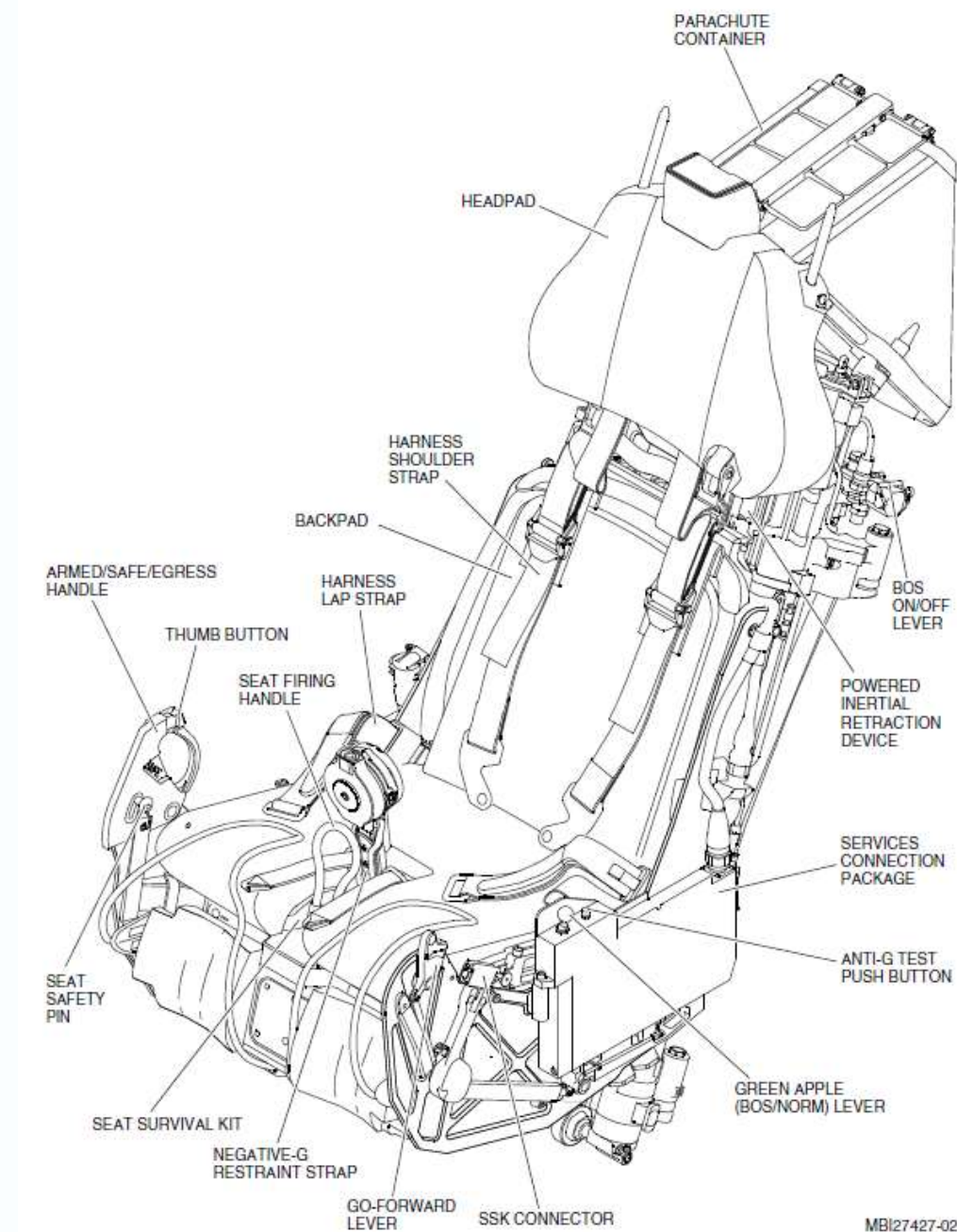
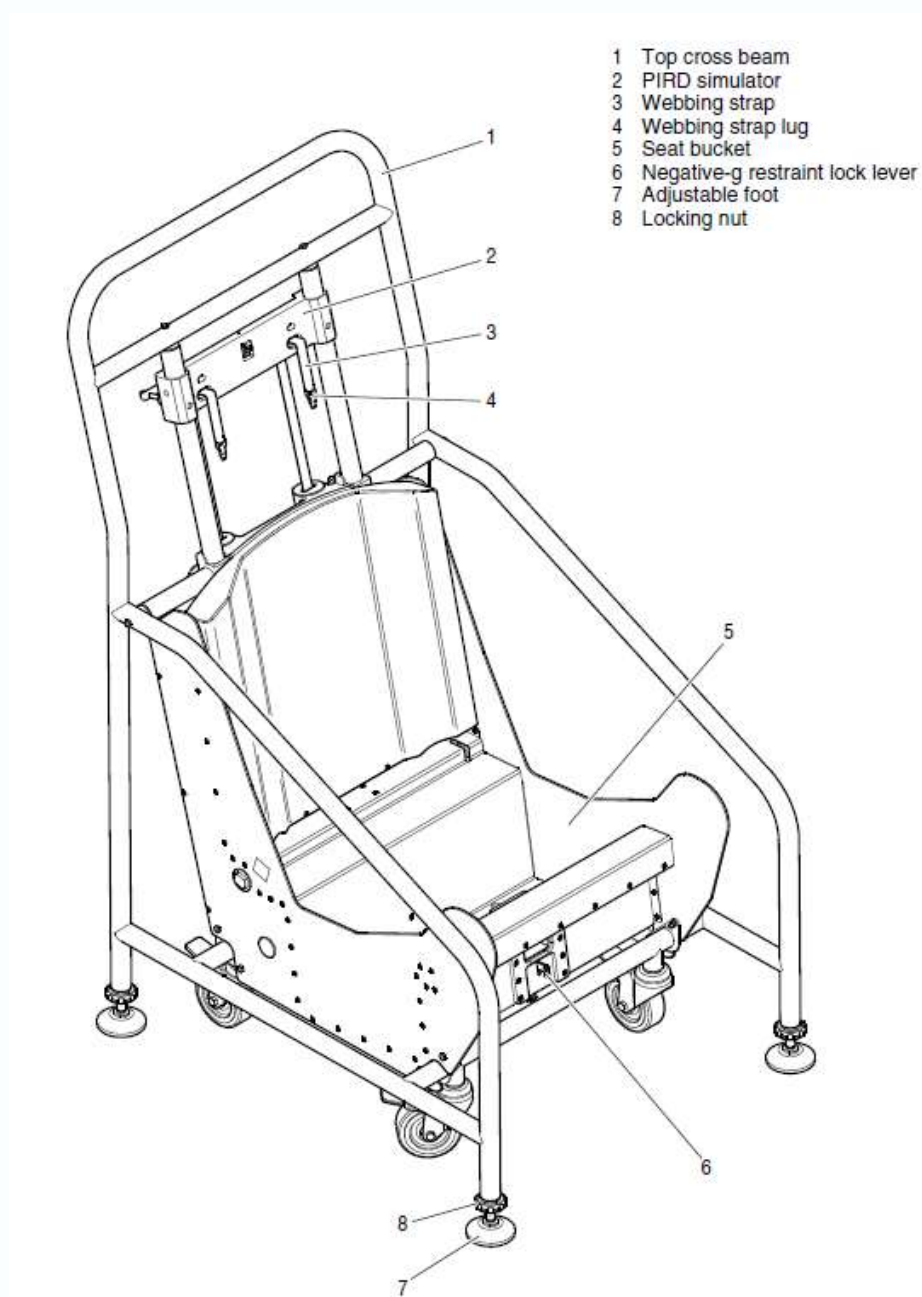


US F-35 training

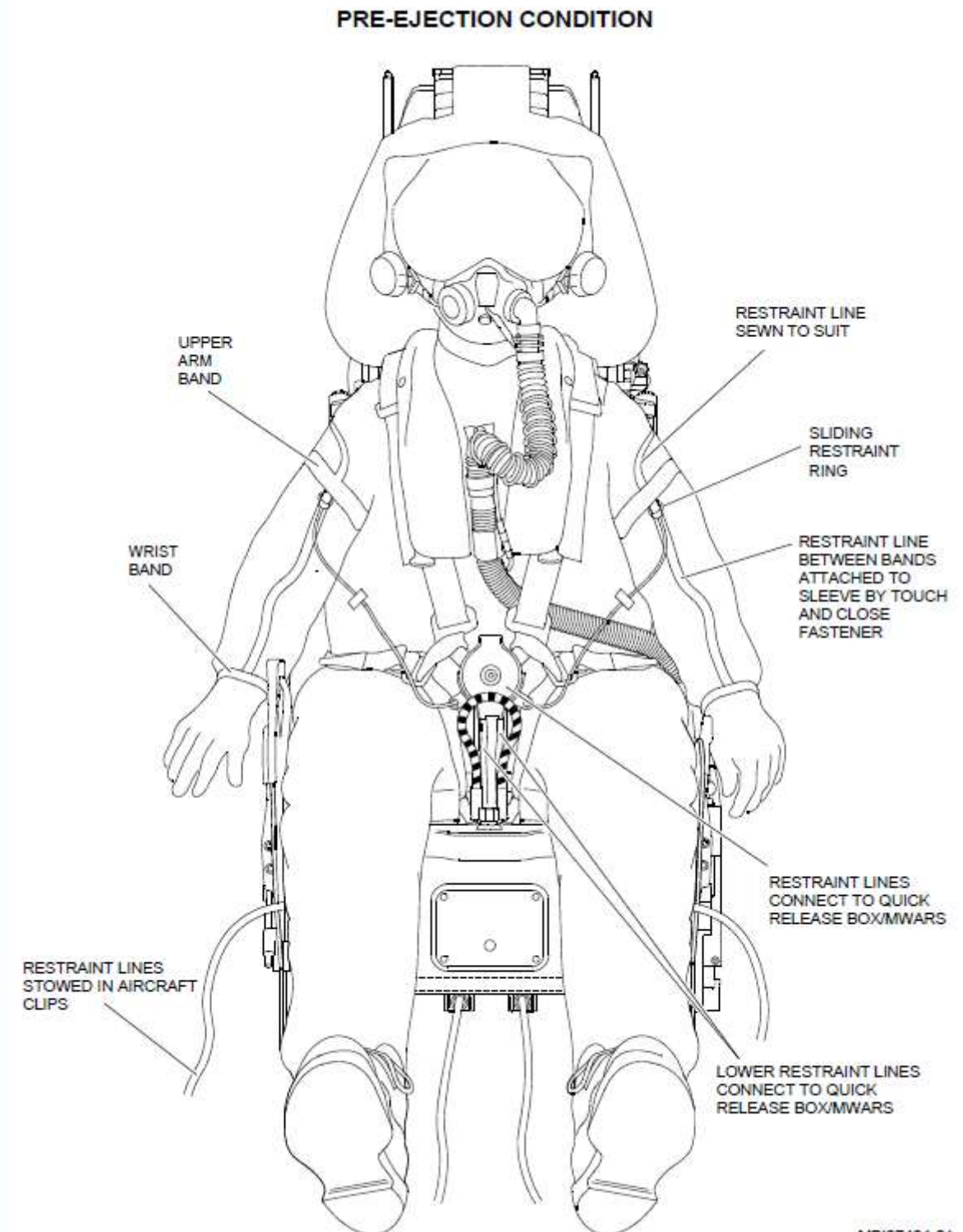
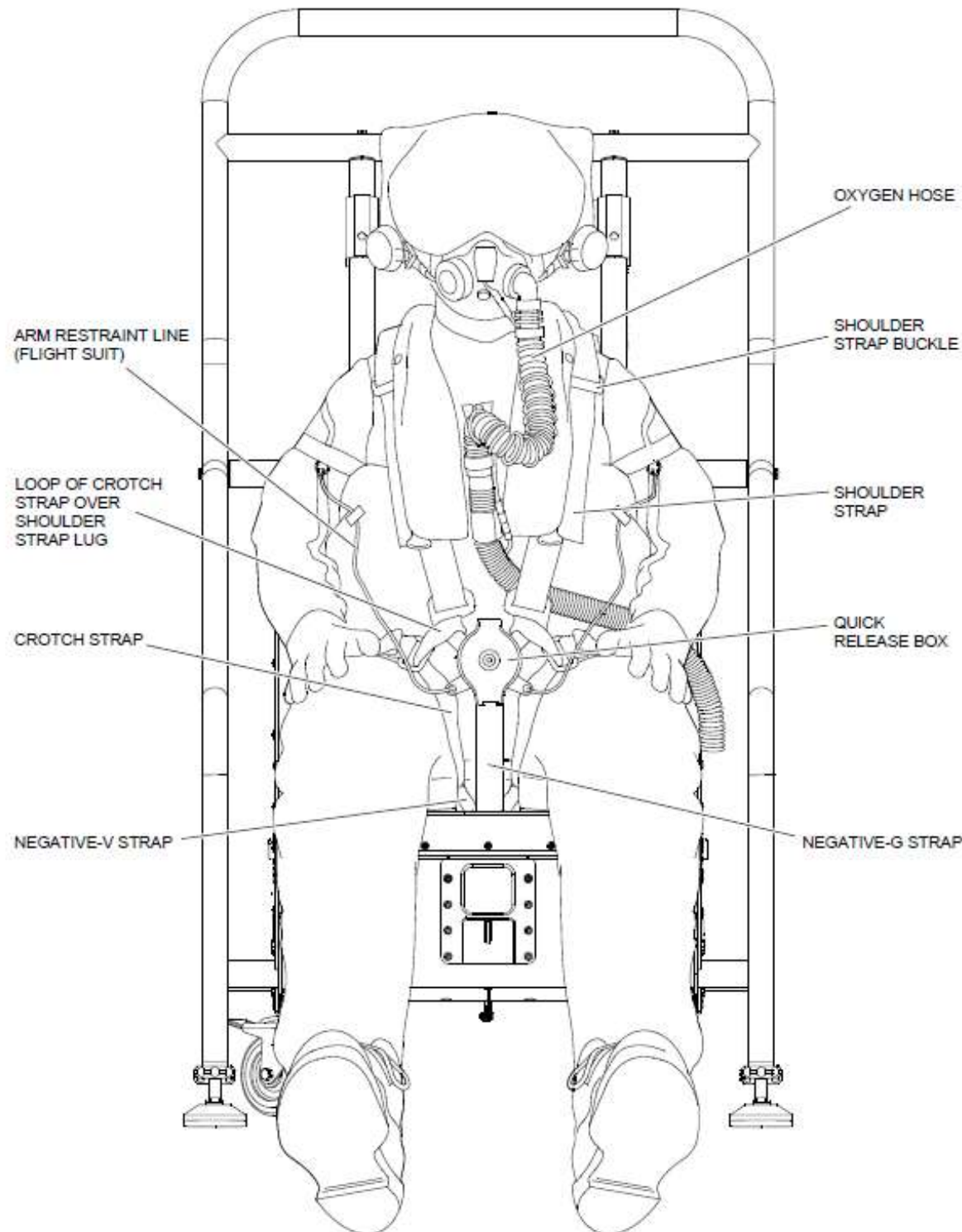
- ▼ End to end training being introduced
- ▼ Pilot ingress / egress training performed at MBA expense shown to improve pilot comfort and will vastly improve ejection safety:
 - ▼ Not enough, but it is a start
- ▼ Post Ejection Survival Training funded by the programme – being performed at all US F-35 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:
 - ▼ USAF Luke, USAF Hill, USAF Eglin all in summer 2016

PEST seat

- ▼ Specifically designed to allow correct strapping-in procedures while minimising cost and maintenance effort



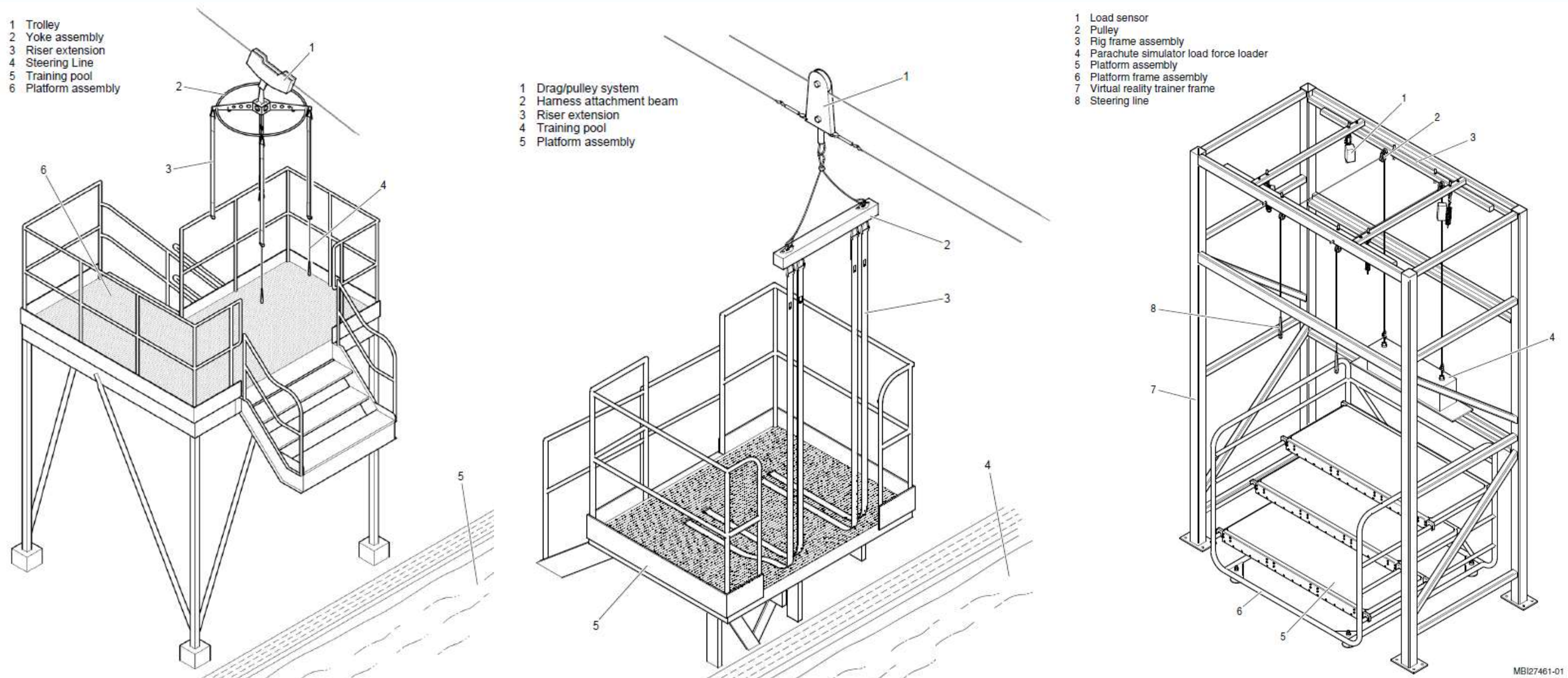
PEST seat occupied



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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”



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Questions?

