Australian Government
Department of Defence
Defence Aviation Safety Authority

Observations on the evolution of ADO ESI management 2002-2017

ADF Propulsion Systems Symposium

Defending Australia and its National Interests
www.defence.gov.au

Preliminaries:

I intend to be frank about the good and the not-so-good

- **This presentation provides my opinions**
  - No claim to anything more than a vignette into ESI issues, based on my experience
- Also provides some opinions of others I think are worthy of your awareness

- I want to be critical but not criticise
- I want to challenge and be challenged
- Very happy for hard questions, or to be told you think I am wrong

- Think about the material presented
- Think about how this relates to you/your organisation
- Work to improve your expertise/that of others

SPO experiences – TFSPO

F404 engine, SPS and engine GSE fleet manager

- My first foray into ESI – Junior FLTLT
- Easily the largest aircraft engine fleet in ADF service
- 'A lot going on':
  - Tail end of F404 Engine Recovery Program
  - Significant backlog of engineering decisions (300+) affecting engine production from ILM and DM
  - Active OEM engine improvement program – very engaged, supportive OEM
  - Numerous OEM component re-lifing events (not always downwards)
  - F404 engine 'best build' philosophy introduced

SPO experiences – TFSPO

F404 engine, SPS and engine GSE fleet manager

- What did I know about ESI management?
  - Understood what Type Design was (TAREGs defined)
  - Understood that the ‘standard designed’ is the ‘standard maintained’
  - Robust ‘Design Change’ process
    - TAREGs for progressing ‘changes to an item or its configuration documentation’ (TAREG definition)
    - Colloquially: ‘changes to form, fit, or function or configuration documentation’
  - Understood the F404 Engine Specification (held by TFSPO)
    - But did I in context?
    - Engine specification a mix of performance and airworthiness requirements

SPO experiences – TFSPO

F404 engine, SPS and engine GSE fleet manager

- What did I know about ESI management?
  - No understanding of what the aircraft Certification Basis (CB) was
  - No robust effort to ensure design changes complied with CB
    - Design changes were shown to comply with the engine specification
    - This did not necessarily cover ESI aspects adequately
    - OEM engineering support (on site) and judgment used
    - Design changes were relatively cosmetic in nature (little/no impact on ESI)
  - Adopted USN Risk Assessment methodology by default in assessing risk

SPO experiences – TFSPO

F404 engine, SPS and engine GSE fleet manager

- We need to do better than this:
  - Do you understand your aircraft CB and where ESI partitions into this?
  - Do you understand what your Type Design is (and is not)?
  - What risk criteria are you using?
  - Senior staff need to support JENGOs. Thorough oversight/leadership

- DASRs should enable improvements
  - Focuses on the CB (TCB), and the need to maintain it in-service
  - Clarity in Type Design

PO experiences – AIR8000 Ph 2 (C-27J)

C-27J Platform Certification Manager

- Certification strategy evolved...
- Concurrent, two-phase certification approach:
  - Short term: platform AwIP to allow aircraft to operate (430 pages..)
  - Medium term: certification of platform (*based on* FAR25)
- What ESI challenges did we have?
  - Few. Relatively speaking, ESI one of the easier challenges
  - Platform complexity extended to propulsion system:
    - CRE (high altitude, 'dirt strip' ops)
    - ETOPS and Extended Overwater Operations (DLRO policy)
    - HUMS
    - Engine performance for aircraft TOLD
    - Which mission profiles to use (FAA? Military JCA? Alenia/RR? Does it matter?)

PO experiences – AIR8000 Ph 2 (C-27J)

C-27J Platform Certification Manager

- Recognising, understanding and dealing with complexity is crucial
- Engineers should prize the following attributes/abilities:
  - Ferocious curiosity. Look for problems/issues. Question why
  - Analytical skills
  - Critical thinking skills
  - Communication skills. Distil complexity into nuanced but simple (communicable) outputs/solutions
  - SALOC: avoid generating solutions without seeking proper advice / consultation
- Lack of consultation with PO by other stakeholders who misunderstood complexity:
  - Beta mode engine operation versus Steep Descent mode engine operation
  - Propulsion system ETOPS and Extended Overwater Operations requirements
  - Recent DDAAFS investigation into C-27J CDR certification

Evolution of ESI section

Then (2005-2008) and now

- Retained much of the good:
  - CBLP and DAVENG CT program
  - Health matrices
  - Formal training: PROPSYSENG, Thermal Power, APSS, etc
  - ESIMPs (structure/content)
- And made material improvements:
  - Annual task management/review process
  - ESI Working Groups
  - Formalising ESIP to PSIP
  - CM capability initiatives
  - Use of AC39-8 (albeit need to critically think about how we intend to use)

Evolution of ESI section

Then (2005-2008) and now

- But: flux relating to organisational change:
  - DGTA org change commenced in late 2008 (DD EHSI established)
  - Difficulty in recruiting DD
  - **Confusion over ESI role and responsibilities (?)**
  - DASR learning curve
  - Change fatigue?
- Corporate memory:
  - Experience levels across 2005-2008 practically identical to those now:
    - Average: around 3 years
    - Greatest: around 6 years
  - What history do we remember? What lessons do we learn?

Transition to DASRs

Observations (broader than but relevant to ESI)

- For the record: On balance, I support the evolution to DASRs

- So much change, but so much stays the same. I would contend:
  - Fundamental principles have not changed
  - Inherent safety in operations is largely unaffected
- Some very important improvements:
  - Importance of certifying against, then maintaining, TCB
  - Transition from AwIPs alone to CRI (+ AwIP?) => change to TCB
  - Less prescription as a general rule – encourages innovation
  - Common regulatory language internationally
  - Mutual recognition efforts increase flexibility, improve capability

Transition to DASRs

Observations (broader than but relevant to ESI)

- Risks/challenges:
  - Do we re-write history to a degree?
    - Do we tend to 'sell' DASR by over-emphasising problems with old regulatory framework / DGTA?
  - DASA becomes an 'arms-length' regulator
    - Language (the "regulated community") and behavior ("us/them", "not our job")
  - Is there an emerging view that?:
    - Those who 'ensure' are accountable
    - Those who 'assure' are exempt from accountability
  - ADO organisational construct: not well suited to DASR?
    - Is widespread organisational restructure required to resolve?
  - Will DASA limit expertise of ESI section by driving roles towards purely regulatory functions?
    - Will anyone take up the gap?

Final words – an 'organisational realist' view?

Various senior RAAF Engineer's observations on post DRP/CSP organisation and competencies: [1]

On Defence:

- 'the downsizing of the Air Force and the contracting out philosophy will make the breeding of [engineers] in uniform virtually impossible."
- 'DMO [is] no longer a 'smart' or competent buyer. For some 20 years, engineering skills have been declining... with the concomitant result... of progressive dependence on system suppliers.'
- 'One major reason for Defence's lack of engineering skills is the inability or reluctance of the Public Service to offer sufficient financial incentive and career paths for young engineers to join the PS.'
- 'management of Australia's air power demands skilled and experienced... engineering professionals... It is not a task for 'generalists' – that is, managers who understand not what they are managing.'

[1] *Shaft Of The Spear Broken – The Deskilling of the Royal Australian Air Force*, AIRCDRE (Ret'd) E.J. Bushell, Feb 2017, Parts E and F

Final words – an 'organisational realist' view?

Various senior RAAF Engineer's observations on post DRP/CSP organisation and competencies: [2]

On DSTO:

- 'DSTO also suffered down-sizing and de-skilling... [and] formed part of a Defence bureaucracy that possesses no science or technology awareness... DSTO thus became just another 'business activity' that must be managed along 'business lines', especially in the outsourcing of its functions.'

On Industry:

- 'there will always be an underlying conflict of interest between Defence and its contractors, particularly when the contractor is a major foreign prime... DMO's talk about teaming arrangements with industry is illogical... [Defence and industry] objectives are fundamentally different, so how can there be effective 'teaming'.'

[2] *Shaft Of The Spear Broken – The Deskilling of the Royal Australian Air Force*, AIRCDRE (Ret'd) E.J. Bushell, Feb 2017, Part F

Final words – AIRCDRE David Tindal, c. 2009

Reflecting on his experience and of ADO 'aviation domain' engineers in general: [Brief to DGTA staff]

[My interpretation of his presentation]

- We have much better education (both formal and informal) today
- We have much better engineering tools/systems today
- We have a robust airworthiness framework today
  - He meant TAREGs, I believe the same applies to DASRs
- We integrate much better today with S&T, industry and other partners

- **This means that although we have fewer engineers today, they are much more capable. 'Much more capable.'**

Summary of observations

- Recognising, understanding and dealing with complexity is crucial
- Engineers should prize the following attributes/abilities:
  - Ferocious curiosity
  - Analytical skills
  - Critical thinking skills
  - Communication skills
  - Self-Assessed Level of Competency. Know your limits. Consult
- Know the DASRs (TCB, Type Design, your responsibilities, etc)
- ESI: not to be an 'arms-length' element of the Authority
- We must never forget ultimately, we exist to support the war fighter
- We are all on the same team. Be proud of the part you play – ESI management is crucial

QUESTIONS

“the chief obstacles to the success of individual engineers
or of the group comprising a unit [are]
of a personal and administrative
rather than a [procedural] nature.” [1]

little Hoody’s translation:

Process facilitates. But its mostly up to us.
Our attributes and abilities
as individuals and as a team.

[1] *The Unwritten Laws of Engineering*, King, W.J., University of Melbourne, 1952