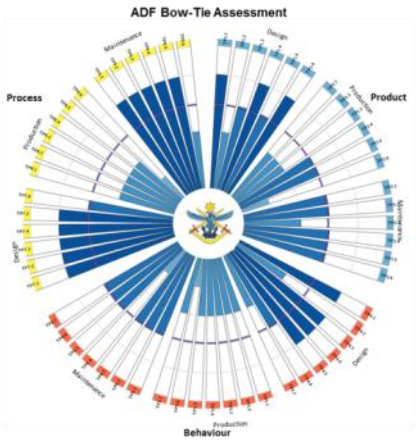
Complementing the EMAD-R process for non-EU recognition

The PBP Bow-Tie assessment and Iris Charts



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Mutual Recognition Research
DGTA-ADF

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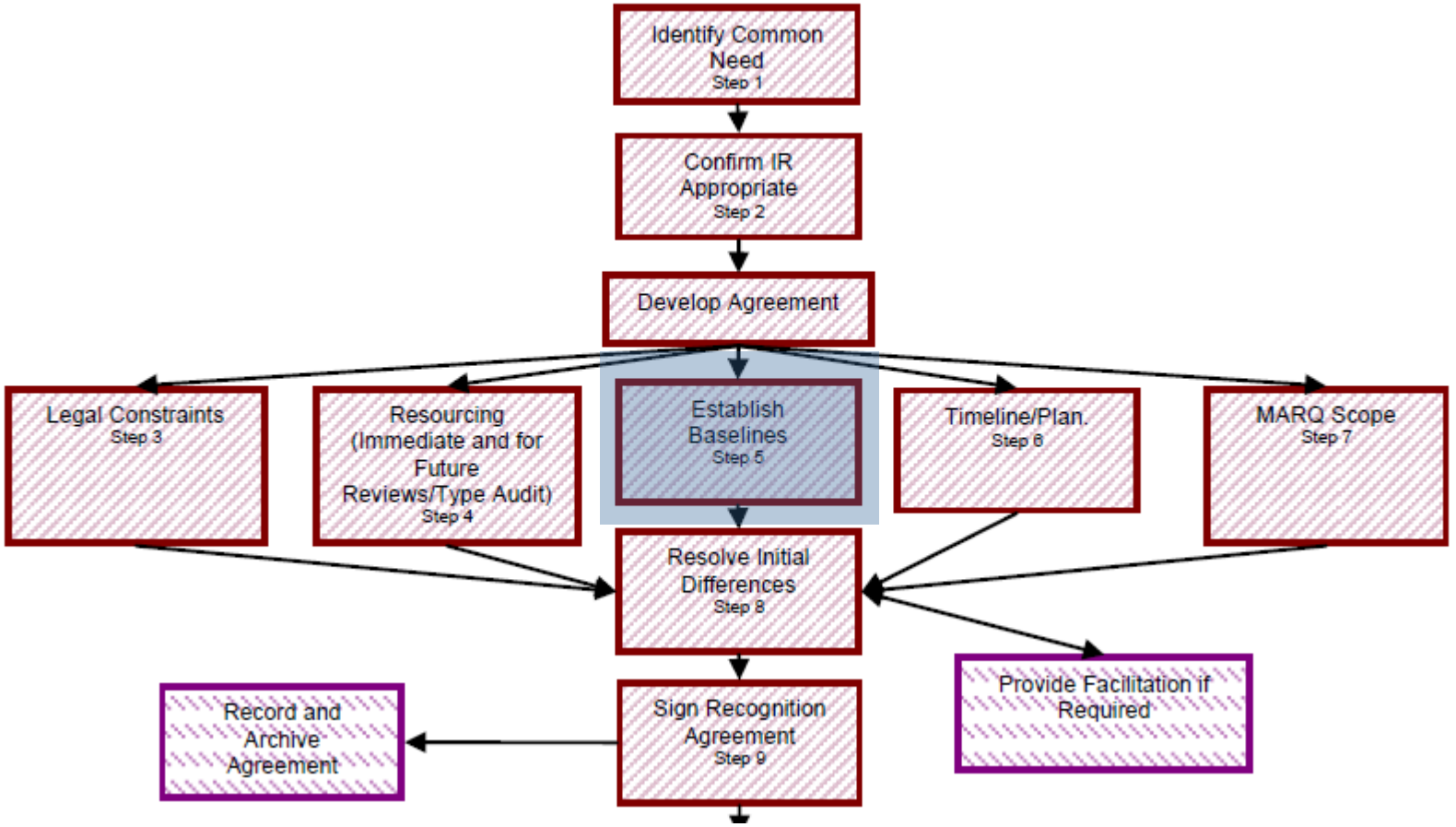
Context


Identify Common Need
Step 1
Confirm IR Appropriate
Step 2
Develop Agreement
Legal Constraints
Step 3
Resourcing (Immediate and for Future Reviews/Type Audit)
Step 4
Establish Baselines
Step 5
Timeline/Plan.
Step 6
MARQ Scope
Step 7
Resolve Initial Differences
Step 8
Record and Archive Agreement
Sign Recognition Agreement
Step 9
Provide Facilitation if Required

Scope

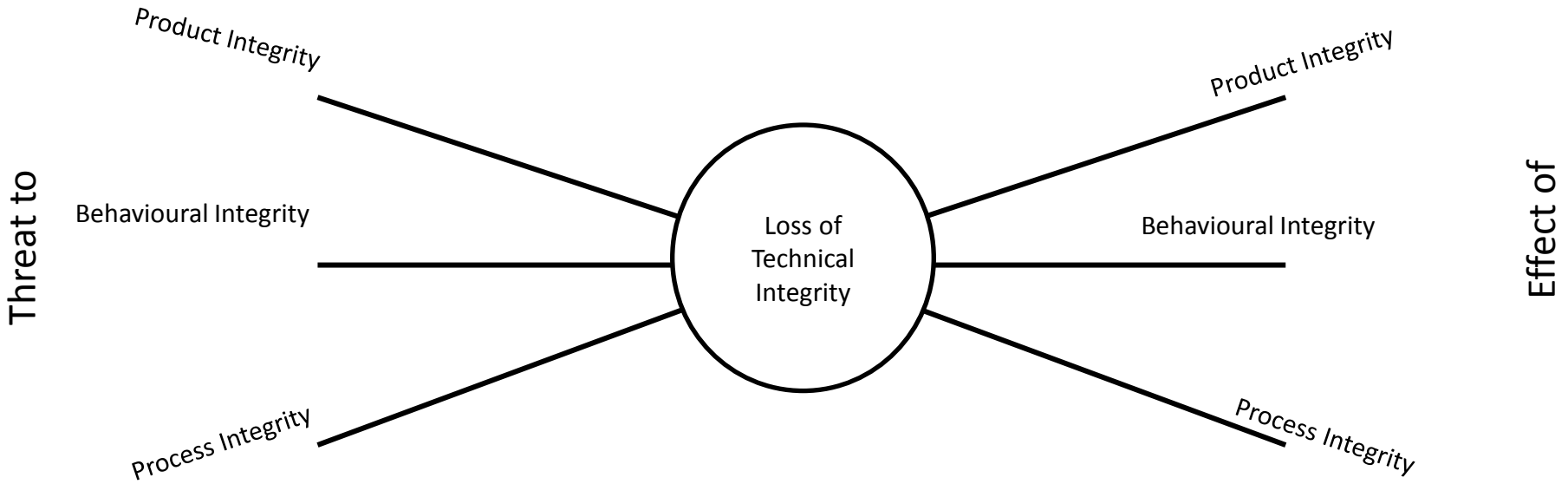
- Development of an assessment methodology
- What are test points
- Representing the assessment pictorially
- Types of representation
- Some examples
- Analytical comparison

Process

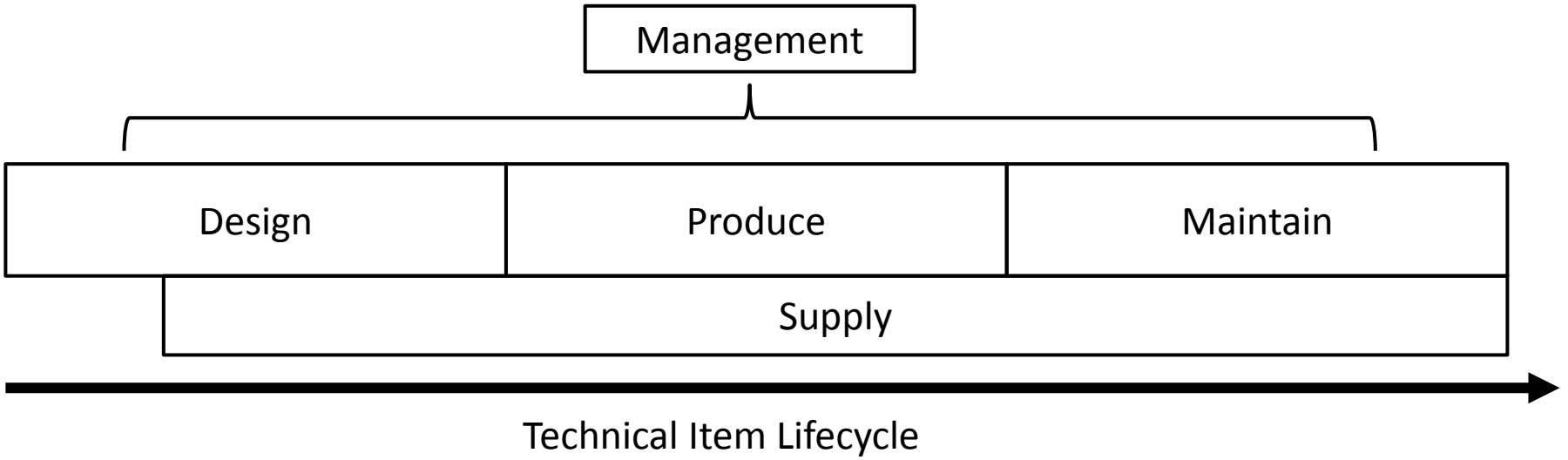
- AU realised that attempting this while holding down other duties would be difficult
- Established research position within RMIT University
  - Focused on addressing this goal while assisting current recognition goals
  - Assisted by intellectual rigour of academia
  - Resulted in a published thesis
- Conducted a review of Western military aviation to understand requirements for diverse application

The PBP Bow-Tie – Technical Integrity

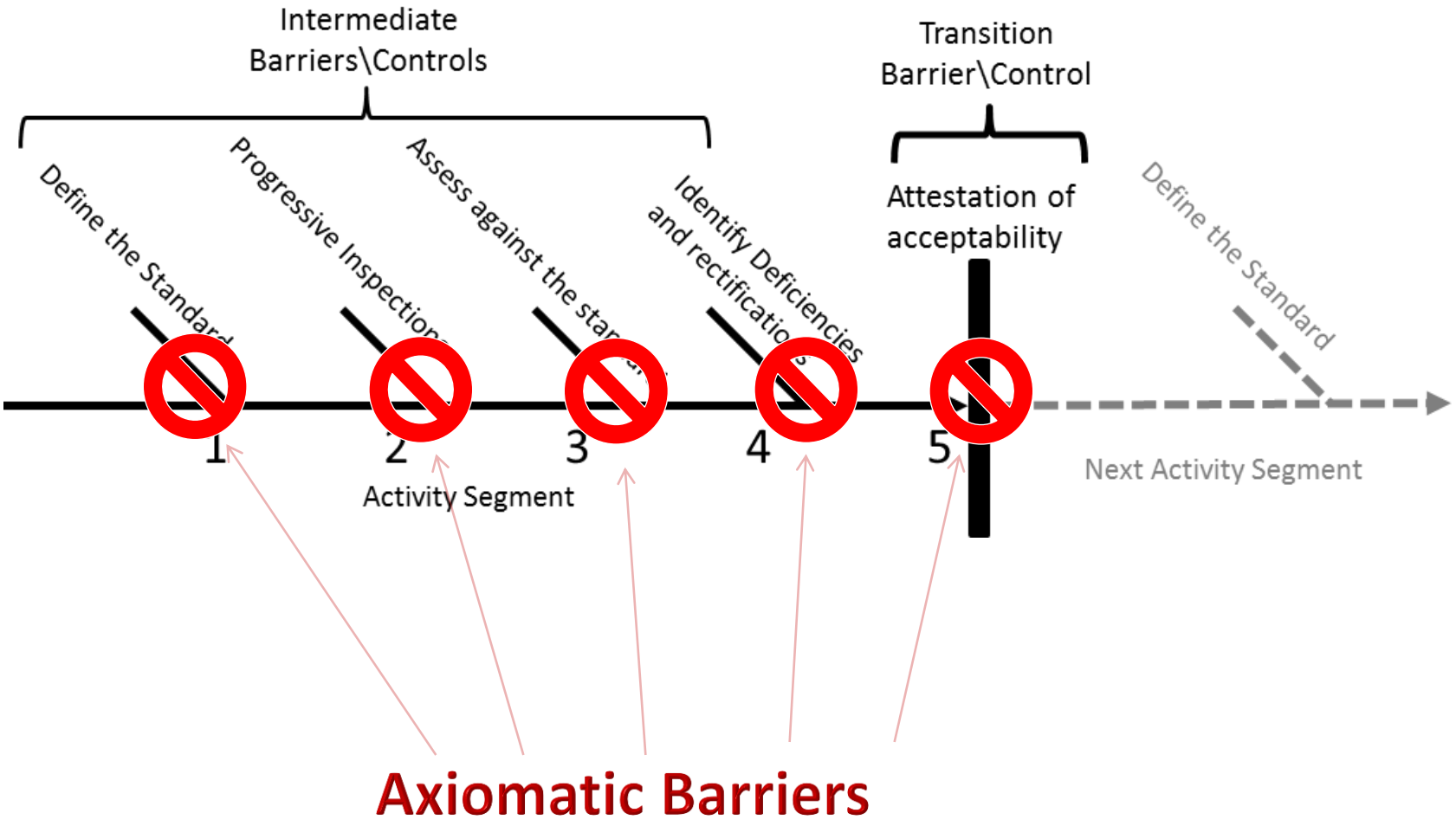
- Good Product, Good People, Good Processes



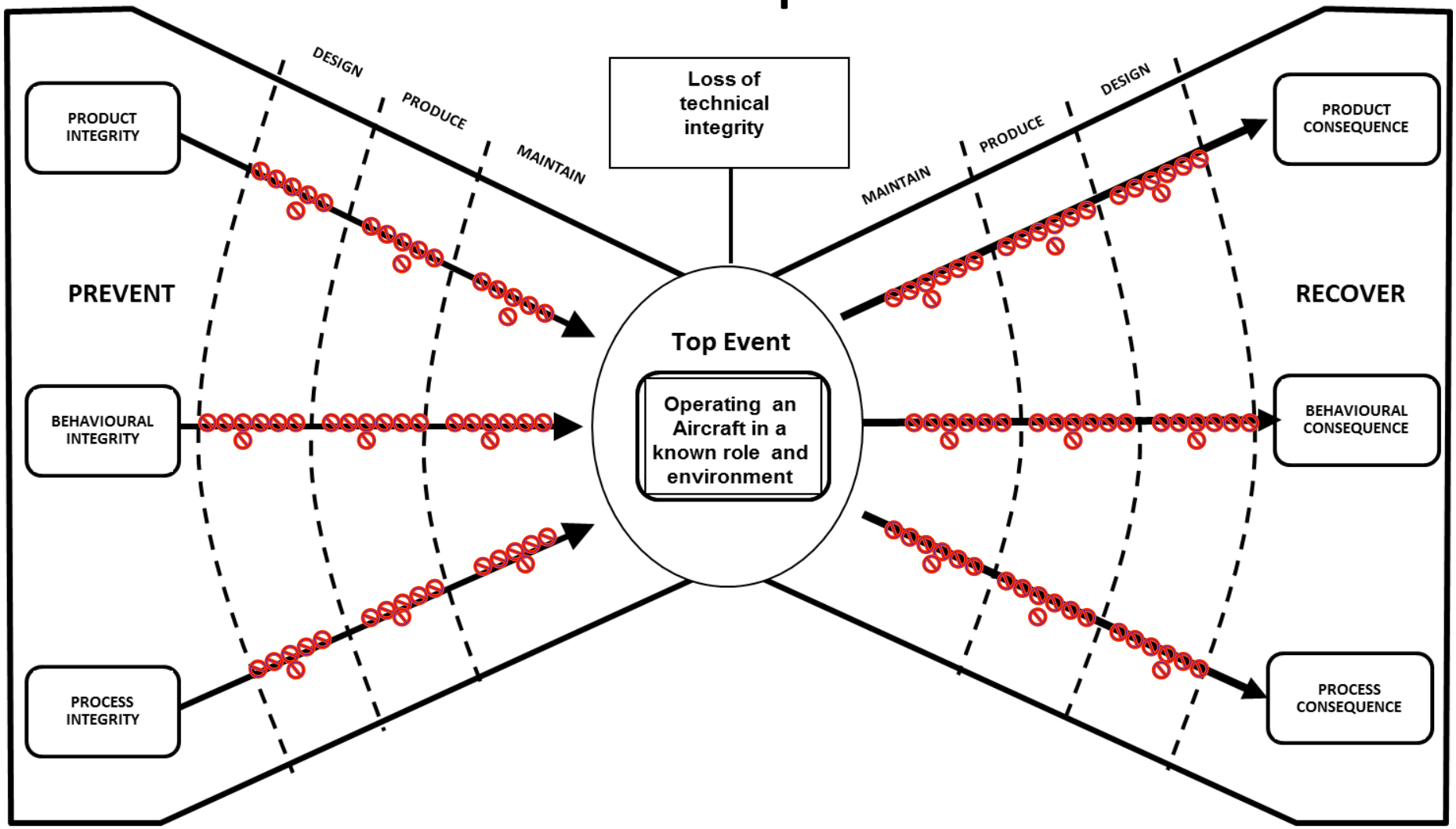
The PBP Bow-Tie – Technical Lifecycle

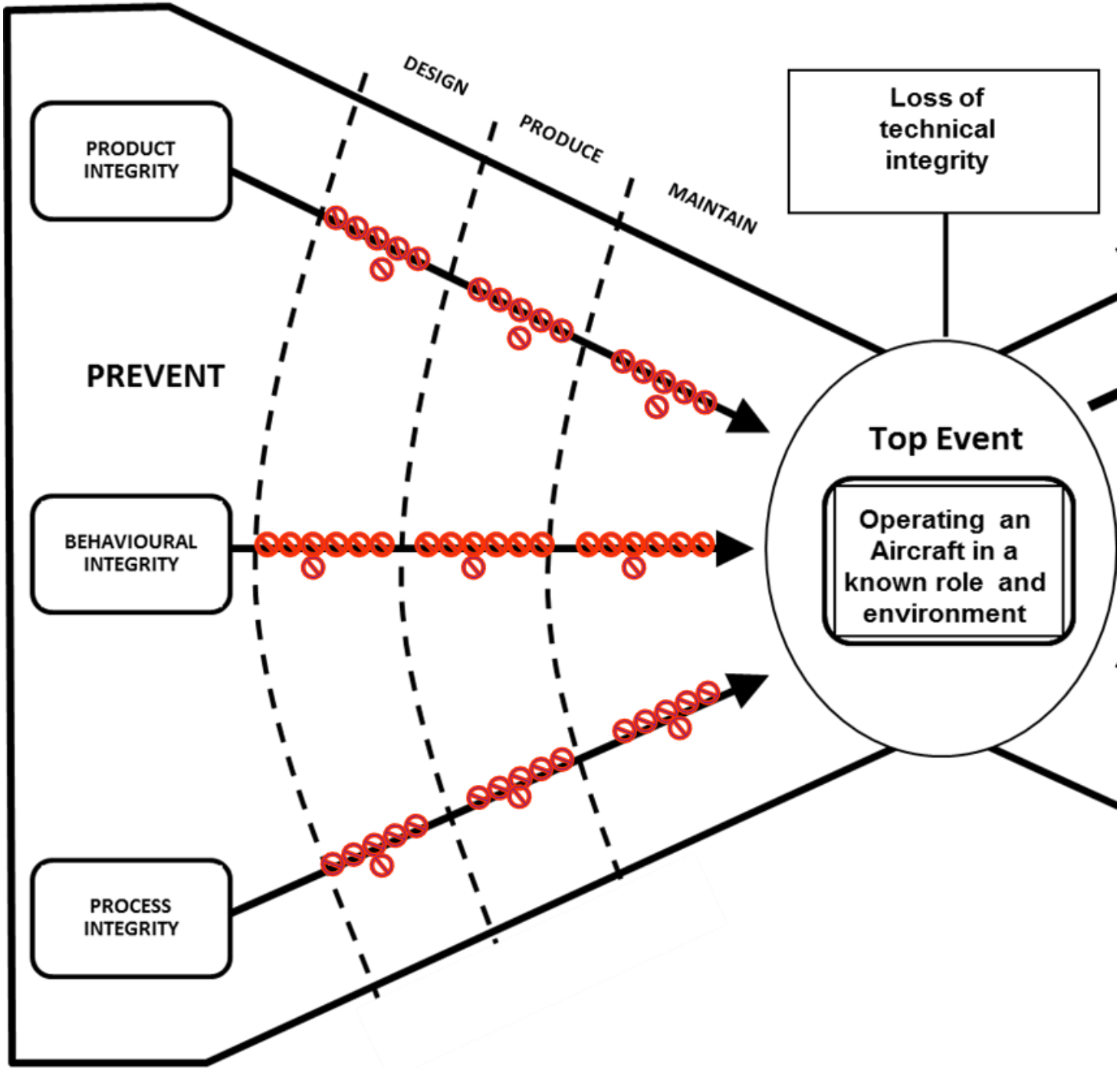


The PBP Bow-Tie – Making an Attestation



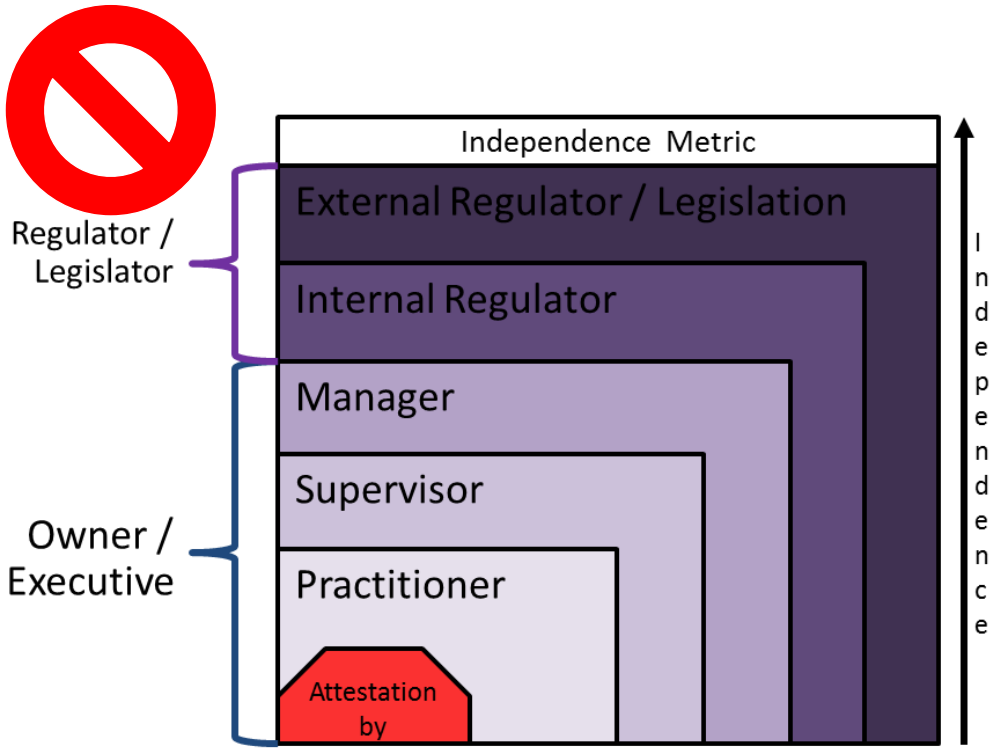
The PBP Bow-Tie – Overlaying the concepts



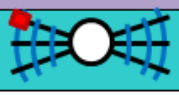

DESIGN
PRODUCE
MAINTAIN
Loss of technical integrity
PRODUCT INTEGRITY
PREVENT
BEHAVIOURAL INTEGRITY
PROCESS INTEGRITY
Top Event
Operating an Aircraft in a known role and environment

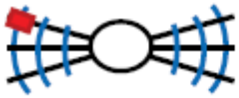
Identifying Regulator Interaction

Independence Metric	
External Regulator / Legislation	5
Internal Regulator	4
Manager	3
Supervisor	2
Practitioner	1
Not Applicable	N



Key to visualising regulatory framework

Rationale PRODUCT *Good Product*	The 'test point questions' determine whether an technical item has been designed, verified and certified to appropriate design standards and requirements; and if not, that deficiencies have been adequately dealt with so as to retain a sufficient level of safety for an technical item's configuration, role and environment.			
Product		Design	Organisation	Short discourse
TP1.1	Design standards and requir functional characteristics of safety. Describe how and to prescribed by either: An external regulator/legisla An internal regulator. (Score A managment organisation, A delegate of the airworthin (Score 3). A supervisor inependent of t A practitioner, performing th Not applicable (Score 0).			ired for design of Civil EU. n Specifications



PRODUCT - DESIGN

TEST POINT 1 – Product Integrity in Design

Rationale

The purpose for this test point is to determine the level of independence associated with defining the applicable functional and physical design standard/s for a technical item, assuring integrity during product design.

Contents

Requirements

1.1: Defining the Standard

Design standards and requirements have been prescribed for the physical and functional characteristics of the technical item to assure a reasonable level of safety.

1.2: Progressive Inspections

Progressive inspections of the design characteristics may be required to verify the prescribed physical and functional standards and requirements.

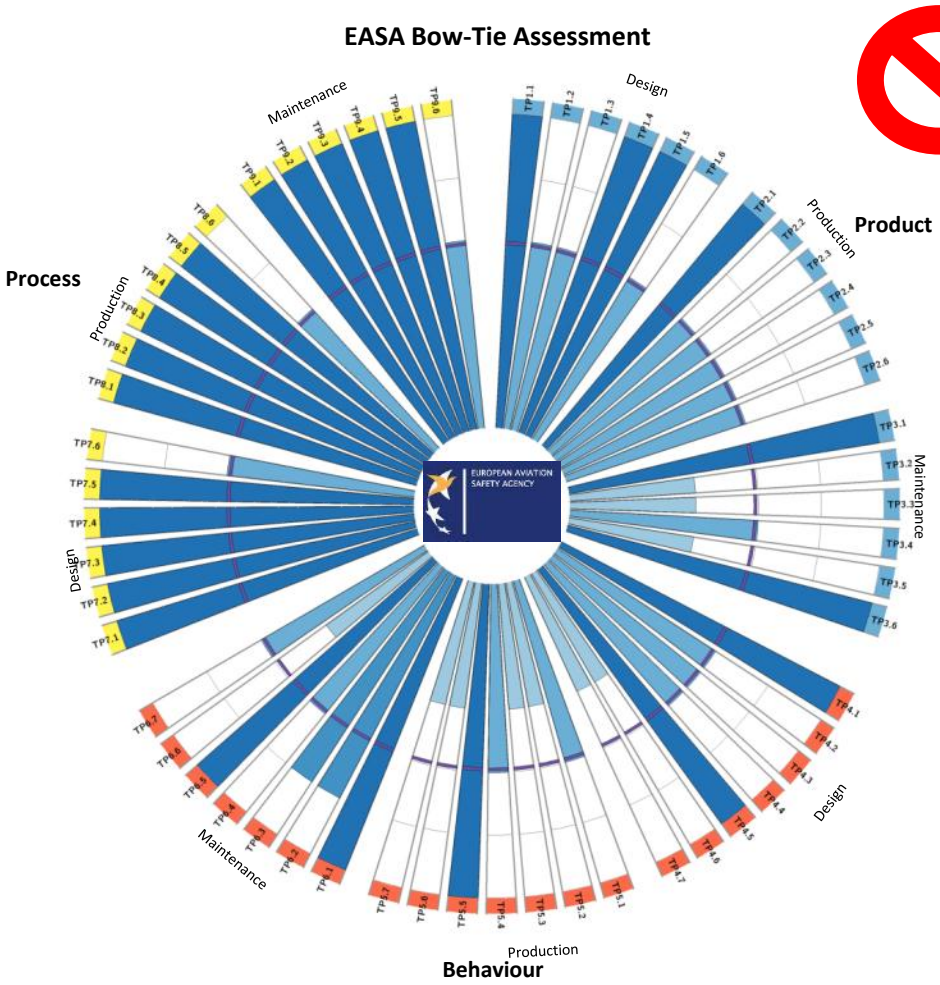
1.3: Assessing against the required standard

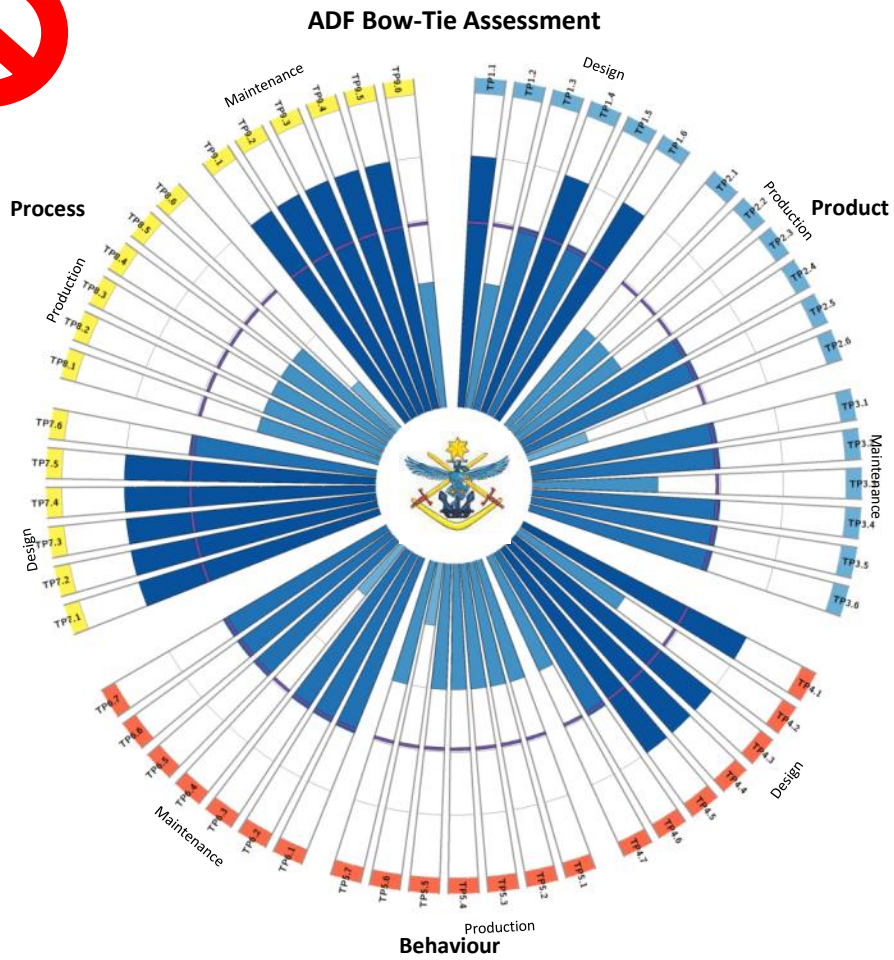
The physical and functional characteristics of the technical item design have been verified against the prescribed standards and requirements to assure a reasonable level of safety. Describe how and to what extent design standards and requirements have been verified

1.4: Identifying deficiencies and rectifications

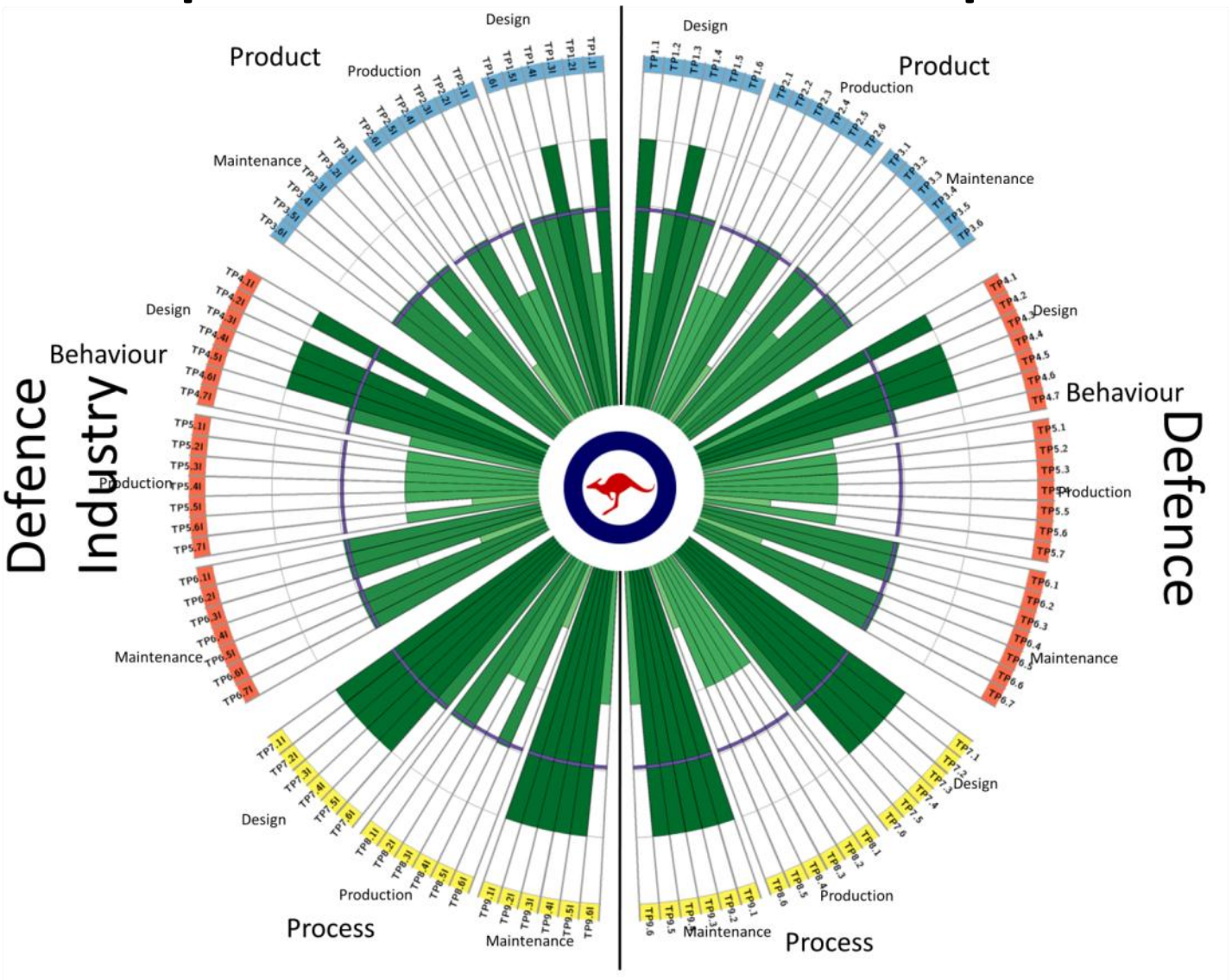
Physical and functional deficiencies in the technical item design against the prescribed standards and requirements are escalated appropriately to assure a reasonable level of safety. Describe how and to what extent functional and physical deficiencies that represent a hazard to a reasonable level of safety are controlled.

Examples - representation

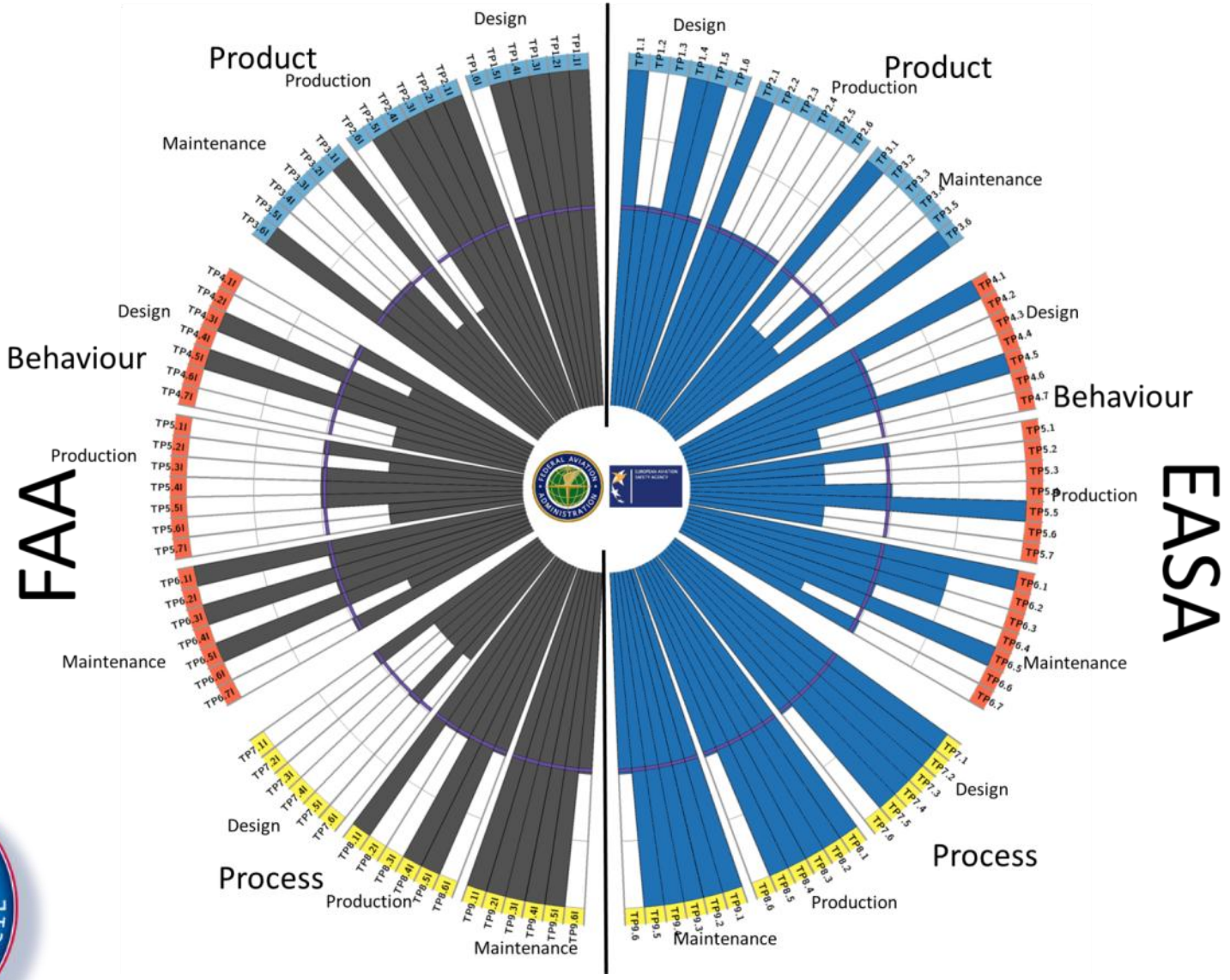




Examples – internal comparison



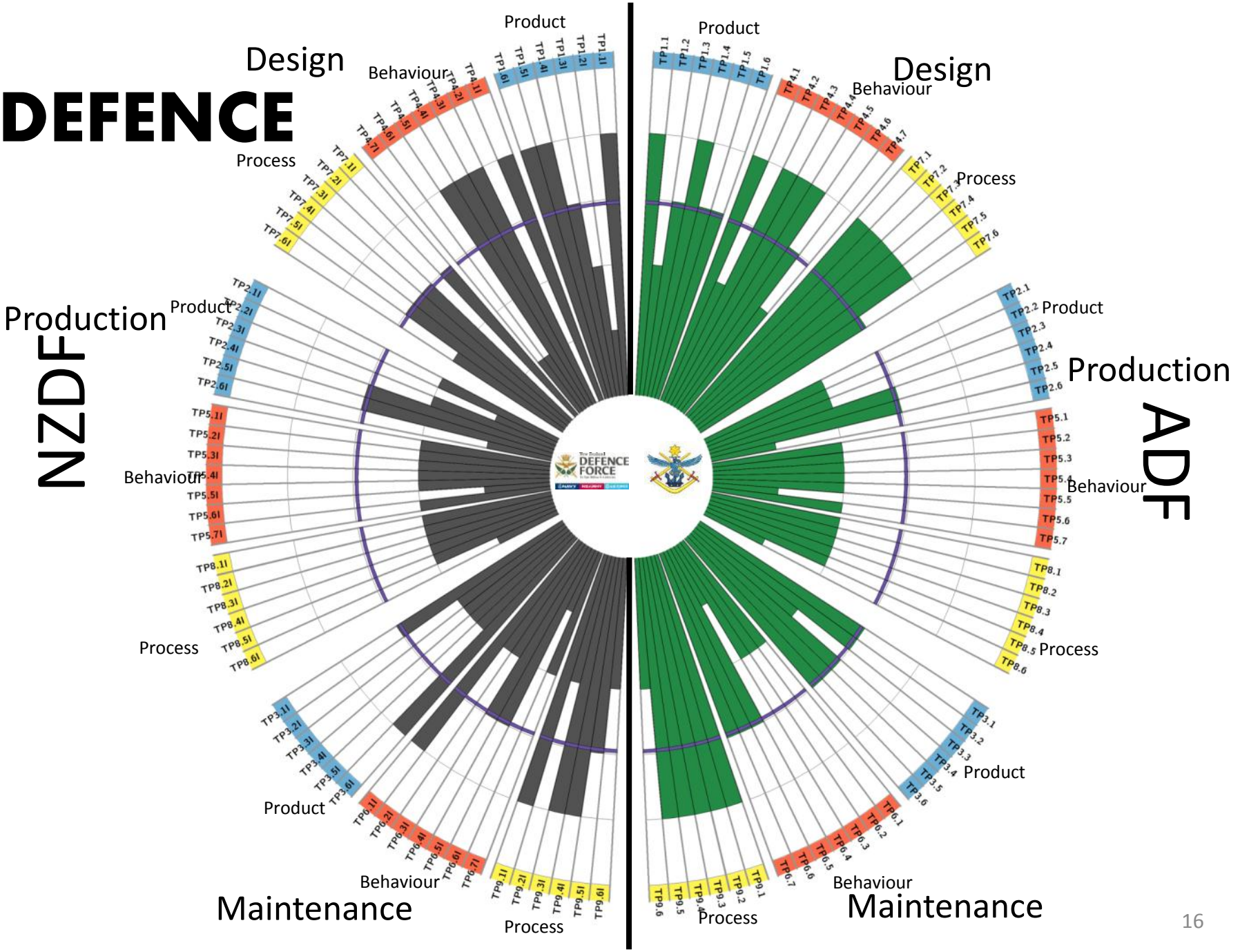
Examples – External comparison



ASIC Nations

- I have assessed the seven service organisations within the five Nations.
- Detailed analysis based on Iris Chart visualisations of ADF comparison with:
  - NZDF
  - US Army
  - US Navy
- Used to complement recognition activities

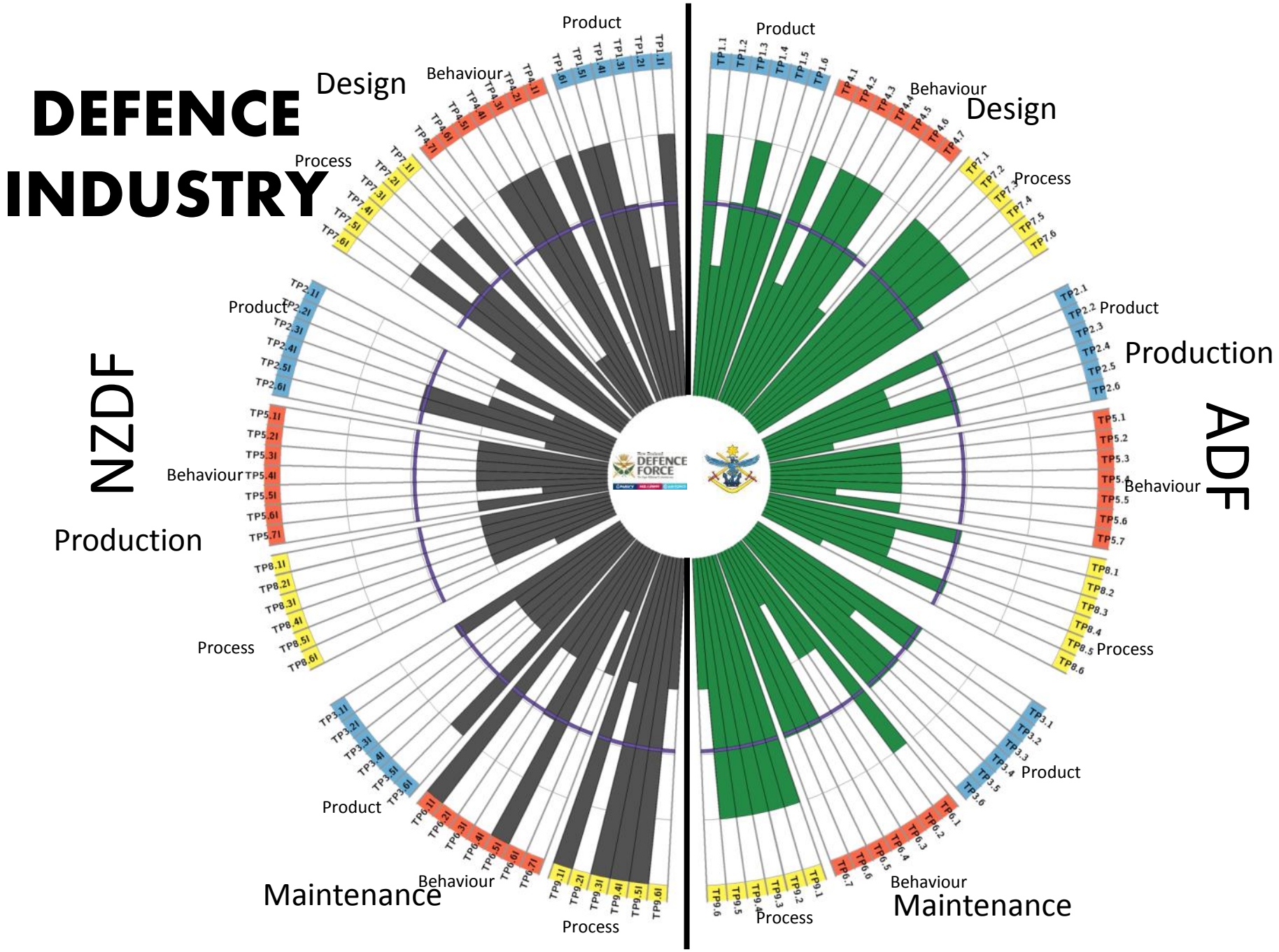
DEFENCE


NZDF
Production
Design
Product
Behaviour
Process
Product
Behaviour
Process
Maintenance
ADF
Production
Design
Product
Behaviour
Process
Product
Behaviour
Process
Maintenance

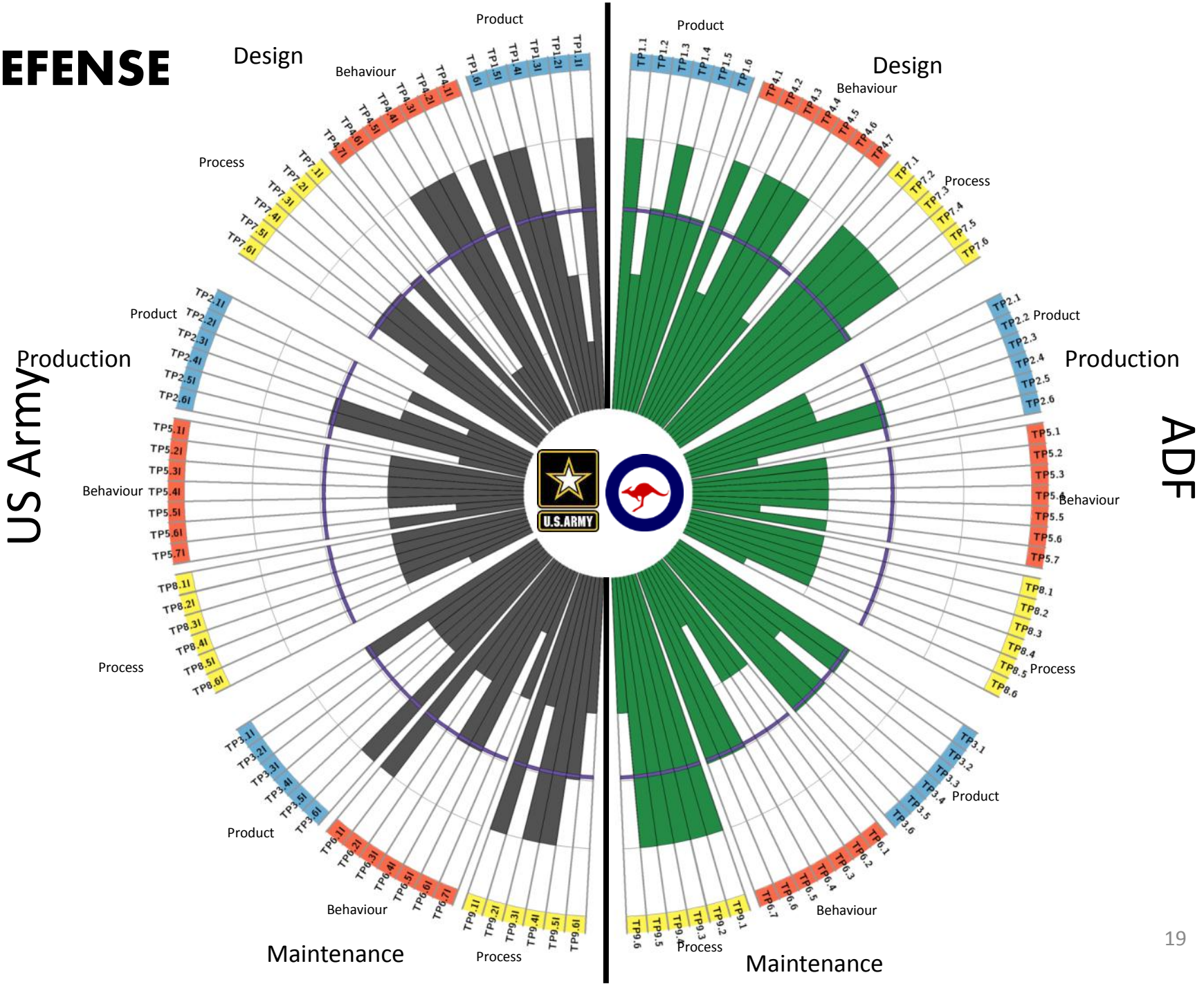
Example test point comparison

TP	ADF	NZDF	Explanation
1.4	4	3	This test point relates to identification of product deficiencies and proposed rectifications within design. The ADF elevates these outages to the TAA and OAA for acceptance prior to certification (normally issue papers, approved deviations, etc). The NZDF Prime DEA or Acquisition DEA handles outages within Design. Of course, this can be handled at a lower level for non-significant design.
1.5	3	4	This test point relates to attestations of acceptability of product during design. The ADF delegates this authority to the DAR, which is then verified by the TAA and OAA if appropriate. The NZDF attestation is made by the TAA.
1.6	3	4	This test point relates to entry control for supplied product during design. The ADF requires the Design Engineer to verify the product meets the design standard. The NZDF TAA regulates the required certification for acceptable product. This is a common trend in product supply scores.

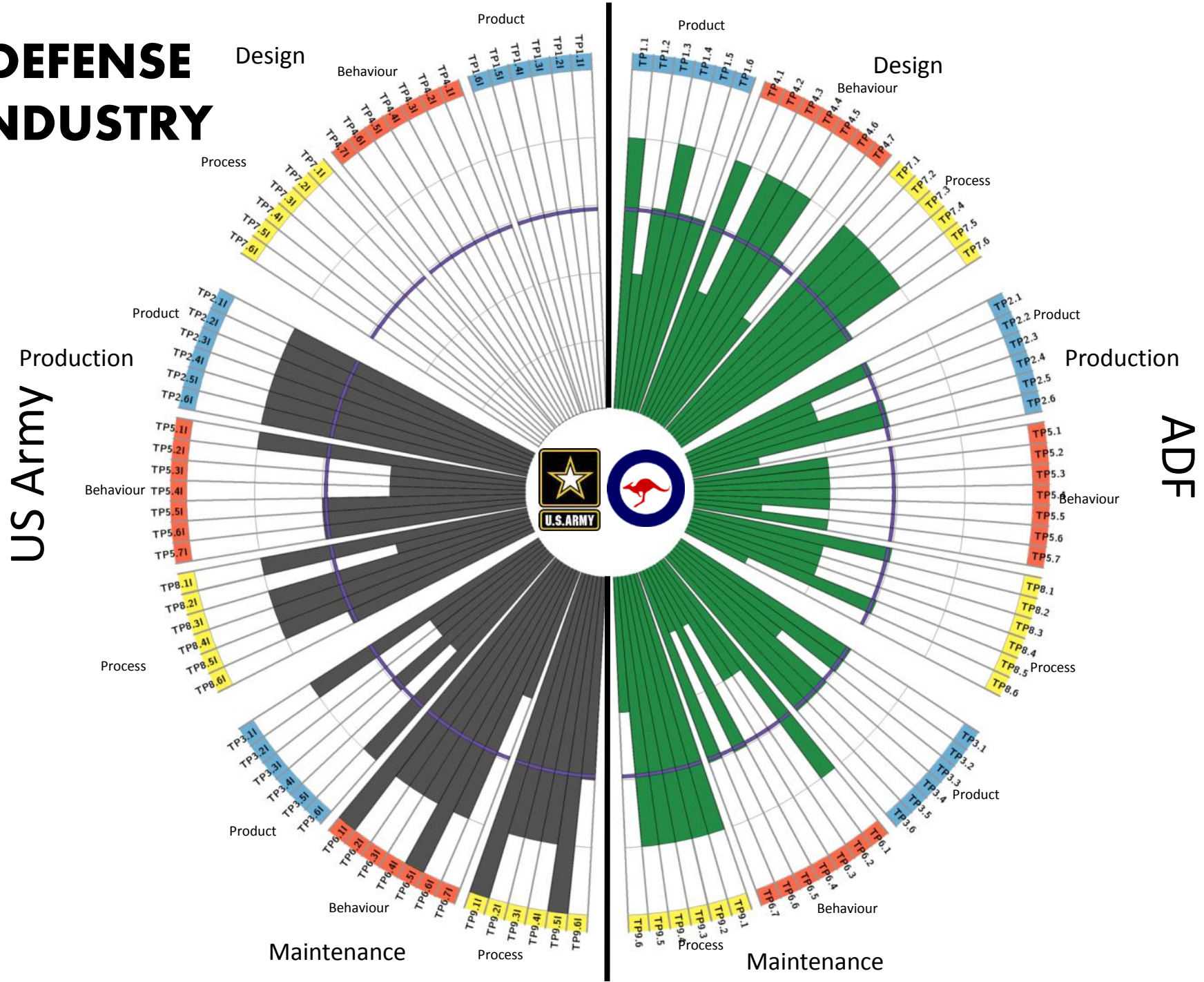
DEFENCE INDUSTRY



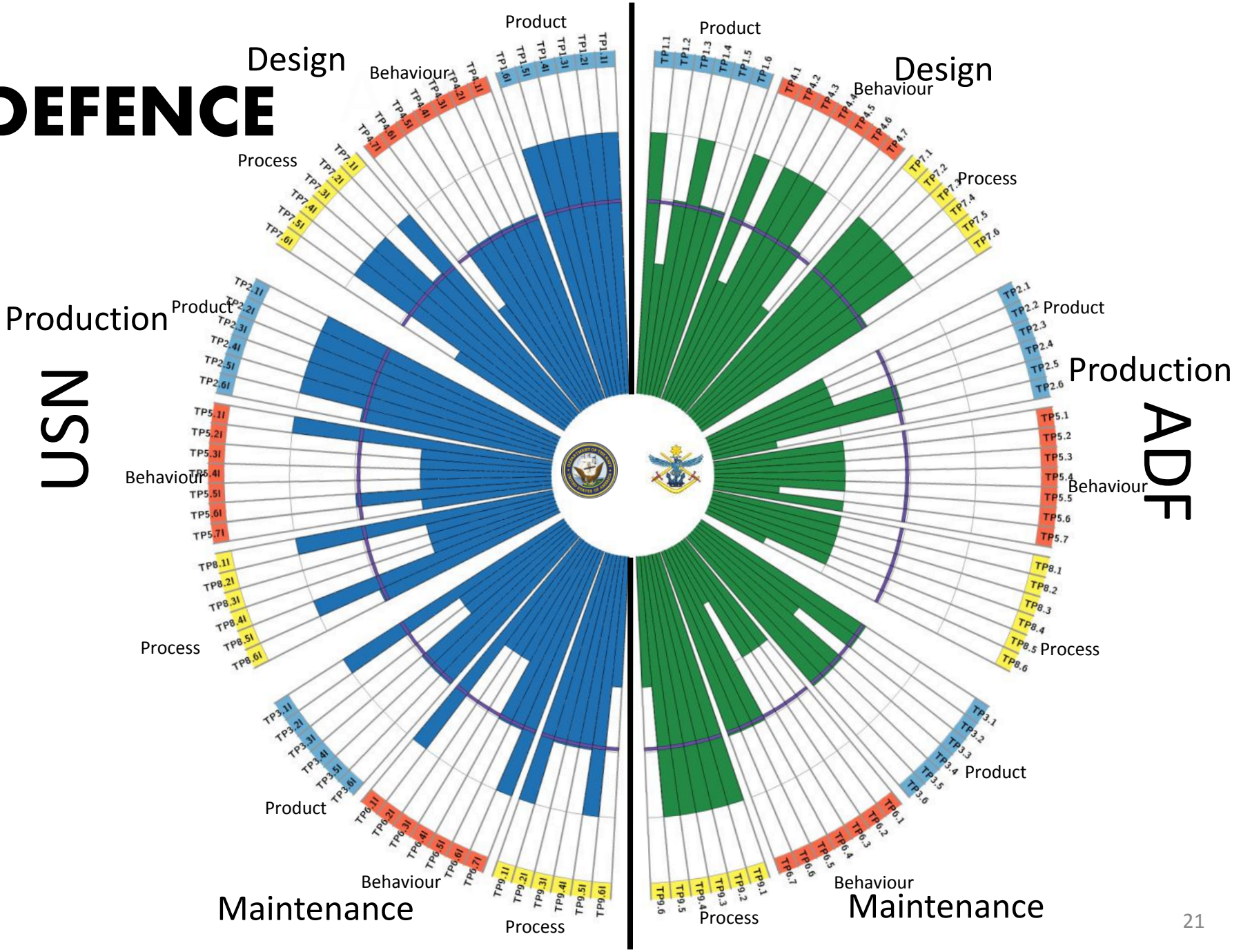
DEFENSE


US Army
ADF
Design
Behaviour
Process
Product
Production
Product
Design
Behaviour
Process
Product
Production
Behaviour
Process
Product
Behaviour
Process
Maintenance
Product
Behaviour
Process
Maintenance
U.S.ARMY

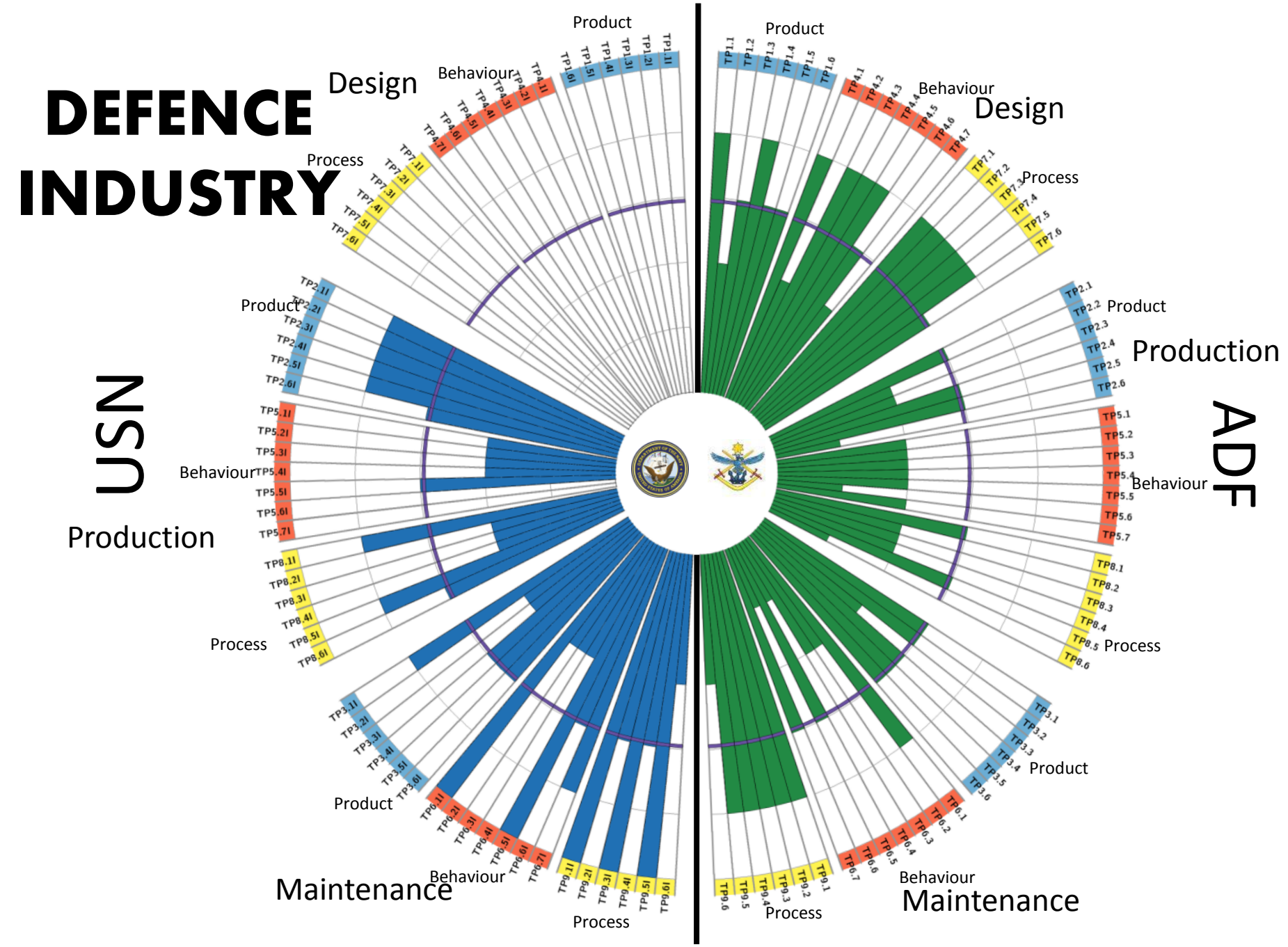
DEFENSE INDUSTRY



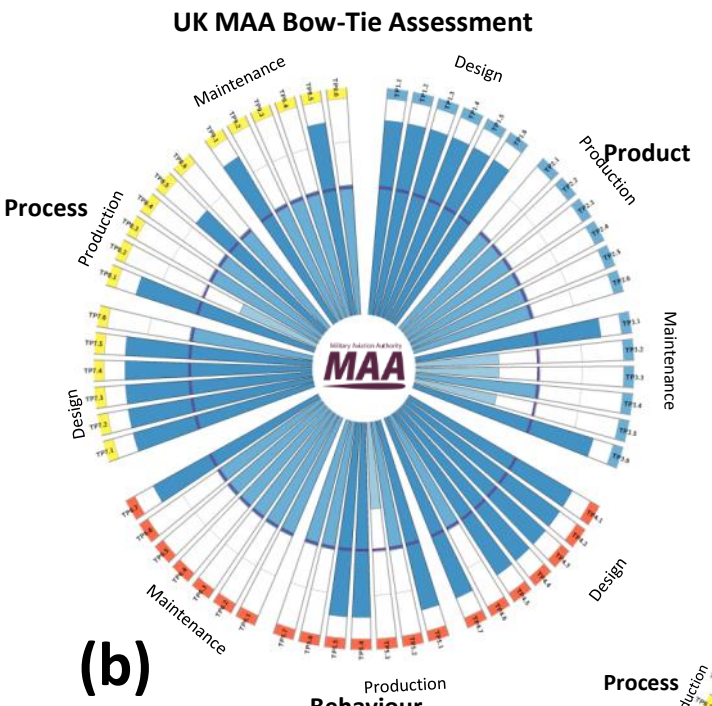
DEFENCE

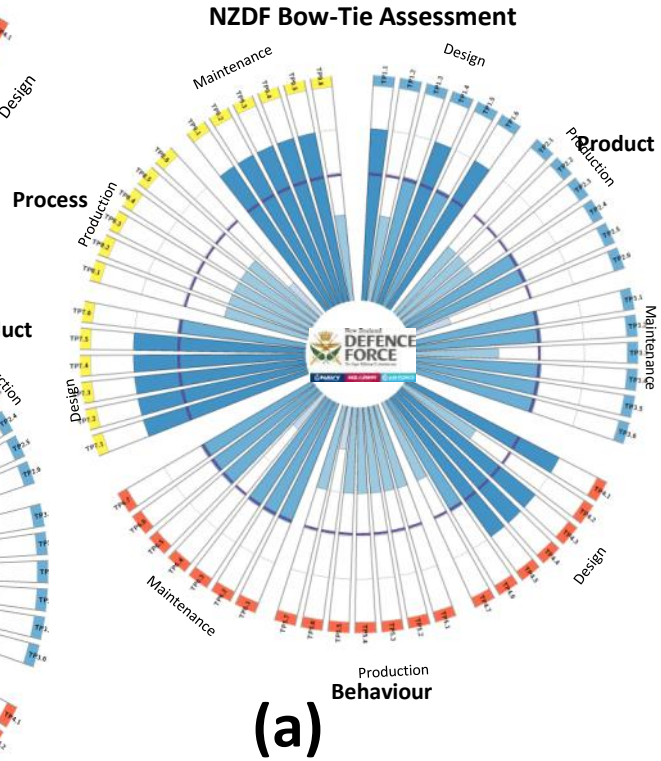

Design
Product
Behaviour
Process
Production
Product
USN
Behaviour
Process
Product
Behaviour
Maintenance
Process
Design
Product
Behaviour
Process
Production
Product
ADF
Behaviour
Process
Product
Behaviour
Maintenance
Process

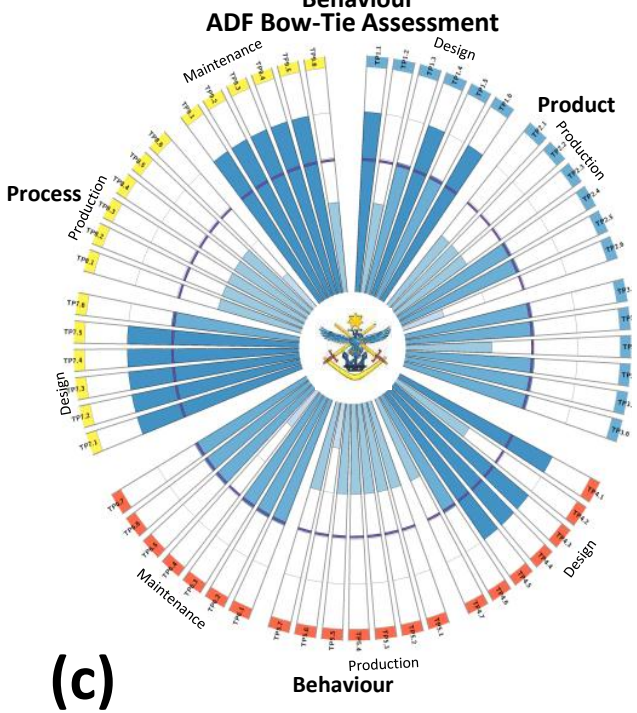
DEFENCE INDUSTRY

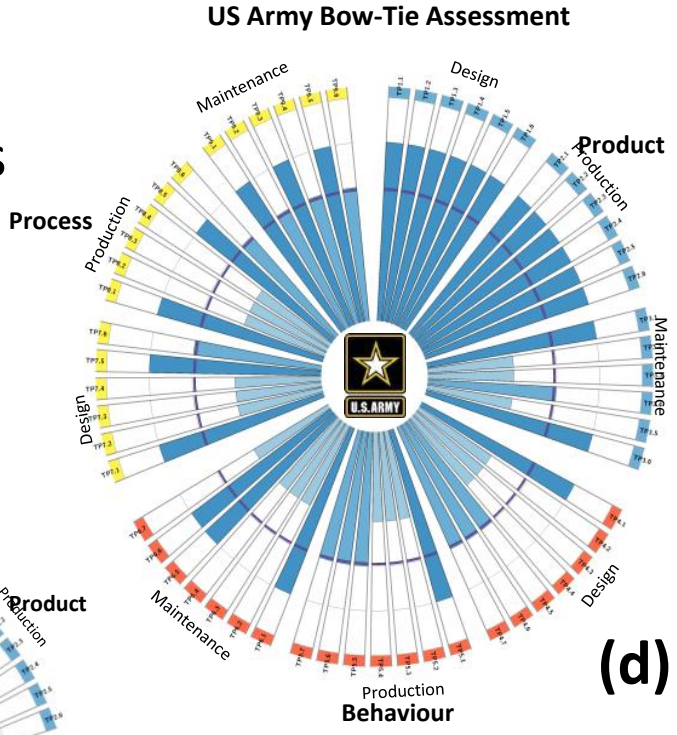


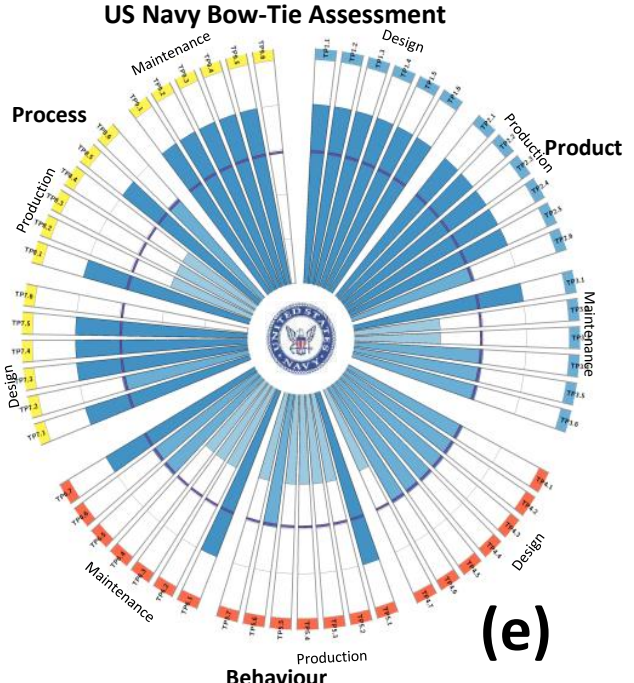
The ASIC Nations











1.3. **Symmetry.** In Figure 1 the symmetrical shape of the Iris chart is visually apparent. This symmetry characterises the method of inclusion for Defence industry into the ADF regulatory framework. The ADF utilises the same mechanisms of including Defence and Defence Industry organisations within the technical airworthiness framework. The Authorised Engineering Organisations (AEOs) and Approved Maintenance Organisations (AMOs) provide the airworthiness entry mechanism for both Defence and Defence industry. This provides a symmetrical inclusion mechanism.

1.4. **Regulatory organisations.** Figure 1 highlights where the ADF utilises independent regulators for attestations. This is illustrated in the segments that extend beyond the purple circle with scores of four on Figures 1 and 2. The ADF only has one internal regulator providing attestations in the technical regulatory framework, this is DGTA-ADF who is as independent as possible but still resides within the Executive command chain (therefore scores of four not five). DGTA-ADF interacts heavily in process integrity for design and maintenance. DGTA-ADF discharges two regulatory responsibilities; prescribing revising and interpreting regulations (TAR), and determining acceptability of technical product (TA

1.5. **Regulatory authority delegations.** The ADF system approval based on processes, these processes (consistent with expositions in the civil systems). Impo single point of responsibility; either the Senior Desig

1.6. **Activity primacy.** This is characterised by the areas with most frequent regulator interaction (segments greater than the purple circle). It is seen in Figure 2 that the ADF has the most regulatory controls within design. The frequent segments that extend beyond the purple line indicating regulator interaction is much more pronounced within design than the other technical activity areas. The other noticeable regulator interaction is within maintenance process. The process regulator controls surround the organisational approval mechanisms; this is seen in process integrity for design and maintenance and is consistent across Defence and Defence Industry (requirements for engineering and maintenance management plans).

1.7. **Design.** The ADF has the most regulator interaction within design. There are three main reasons for this; the TAA offers approvals and handles deficiencies within the aircraft type design, the TAR establishes regulatory requirements for design engineers and the TAR approves design organisations (AEOs). This is the only area in which DGTA-ADF interacts with product, behaviour and process within a technical activity. Importantly, the ADF applies the same regulatory controls on Defence and Defence Industry.

a. Within product integrity the TAA approves the Product Design Acceptance Strategy (PDAS) and Certification Basis Description (CBD) for new aircraft or major changes to existing aircraft, and

ıted on a Bow-Tie,
rotection Analysis
not really translate
werful

- Its use will be add
  detailing how to c
  using EMAD-R
- It can be used/ad
  scenarios, as the

Questions

PAPER 1

Purton, L. and K. Kourousis, *Military airworthiness management frameworks: a critical review*. Procedia Engineering, article in press.

PAPER 2

Purton, L., R. Clothier, and K. Kourousis, *Assessment of Technical Airworthiness in Military Aviation: Implementation and Further advancement of the Bow-Tie Model*. Procedia Engineering, article in press.

PAPER 3

Purton, L., et al., *Mutual Recognition of National Military Airworthiness Authorities: A Streamlined Assessment Process.* International Journal of Aeronautics and Space Sciences, http://ijass.org/PublishedPaper/topic_abstract.asp?idx=436

PAPER 4

Purton, L., et al., *The PBP Bow-Tie Framework for the Systematic Representation and Comparison of Safety Regulatory Frameworks.* RAeS Aeronautical Journal, article in press.