Complementing the EMAD-R process for non-EU recognition

The PBP Bow-Tie assessment and Iris Charts

FLTLT Leon Purton
Mutual Recognition Research
DGTA-ADF

Dr Kyriakos Kourousis
Senior Lecturer
University of Limerick (formerly RMIT)

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It was agreed at ASIC June 2013 that the EMAD-R process would be utilised by ASIC.

It was noted that the EMAD-R had a reliance on EMARs for establishing a baseline.

AU took an action to develop a method of assessing regulatory frameworks for baseline establishment (EMAD-R Step 5).

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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

- Design
- Produce
- Maintain

- Management
- Supply

Technical Item Lifecycle
The PBP Bow-Tie – Making an Attestation

Axiomatic Barriers

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The PBP Bow-Tie – Overlaying the concepts

Loss of technical integrity

Top Event
Operating an Aircraft in a known role and environment

PRODUCT INTEGRITY
PREVENT
BEHAVIOURAL INTEGRITY
PROCESS INTEGRITY

PRODUCT CONSEQUENCE
RECOVER
BEHAVIOURAL CONSEQUENCE
PROCESS CONSEQUENCE
Top Event

Operating an Aircraft in a known role and environment
Identifying Regulator Interaction

Key to visualising regulatory framework

<table>
<thead>
<tr>
<th>Independence Metric</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>External Regulator / Legislation</td>
<td>5</td>
</tr>
<tr>
<td>Internal Regulator</td>
<td>4</td>
</tr>
<tr>
<td>Manager</td>
<td>3</td>
</tr>
<tr>
<td>Supervisor</td>
<td>2</td>
</tr>
<tr>
<td>Practitioner</td>
<td>1</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>N</td>
</tr>
</tbody>
</table>

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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**

**TEST POINT 1 – Product Integrity in Design**

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

### Contents

1.1: Defining the Standard
1.2: Progressive Inspections
1.3: Assessing against the required standard
1.4: Identifying deficiencies and rectifications
1.5: Attestation of acceptability
1.6: Supply

### 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
Example test point comparison

<table>
<thead>
<tr>
<th>TP</th>
<th>ADF</th>
<th>NZDF</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4</td>
<td>4</td>
<td>3</td>
<td>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.</td>
</tr>
<tr>
<td>1.5</td>
<td>3</td>
<td>4</td>
<td>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.</td>
</tr>
<tr>
<td>1.6</td>
<td>3</td>
<td>4</td>
<td>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.</td>
</tr>
</tbody>
</table>
The ASIC Nations

UK MAA Bow-Tie Assessment

US Army Bow-Tie Assessment

NZDF Bow-Tie Assessment

US Navy Bow-Tie Assessment

(b)

(c)

(d)

(e)
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). Importantly single point of responsibility; either the Senior Designer or other.

- Its use will be adopted into an ASIC AIR STD detailing how to complement ASIC recognition using EMAD-R
- It can be used/adapted in many different scenarios, as the same principles apply

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
Questions

**PAPER 1**

**PAPER 2**

**PAPER 3**

**PAPER 4**