Risk based Independent Safety Assessment

How to add value and reduce safety and project risks

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What is risk based ISA?

Identify safety and project risks for ISA and client using selected tools and competent team

Use risks to inform:

- Planning
- Tools
- Depth
- Re-planning

Develop Claim Argument - assure assessment is complete
What is risk-based ISA? (2)

- Clearly defined remit
- Planned approach
- Principles
- ISA Toolkit
- Trusted Specialists
Safety issues encountered in practice

Two contrasting examples discussed:

- Insufficient / late attention to system risks that impact platform
- Where the ISA identified vulnerable design in time to find solution

Followed by some perpetual problems
Example 1: identifying a problem but not the risk

- Designing a system that interfaces to weapons – required to safely interface
- Insufficient weapon information re functional safety – not contracted
- Problem recognised at interface level but not addressed for long period – until well beyond design commitment
- Potential major impact at platform level
- True ALARP solution achievable?
Developing in formation
Underlying problems

- ISA performed at platform level by individual skills – uncoordinated and with minimal system assessment
- Many competing issues at platform level, insufficient weight given to system/sub-system issues
- Responsibilities unclear – Platform, Weapon, System and Sub-systems
- Safety assessment of integrated systems performed after sub-system design commitment
How risk-based ISA deals with this

Coordinated assessment of all relevant aspects

Open-minded view, look across boundaries, challenge assumptions

Early involvement – reveal those problems early

Ensure adequate attention paid to the key risks and to their mitigation

Safety designed in, in preference to risk mitigated out

Rigorous processes being applied?
Example 2: The devil in the detail

- A sub-system design failing to meet integrity requirements
- Good architecture – second generation triple channel rail control product
- ISA risk-based assessment of modified / newly developed areas found:
  - Detailed design had ‘feature’ to improve built-in-test, involving links between channels in a 2 out of 3 voting function
  - Feedback monitoring of safe state not obviously robust
  - Insufficient safety analysis of common mode /cause failure performed to justify
Problem solved

- Analyse, to justify to ISA, confirmed voting design to be vulnerable to single faults and common cause failure
- Design modified to remove specific inter-channel links, improve feedback design: greatly improved fault tolerance
- Found via early involvement with design, assess risk areas before design commitment
- One of several design improvements made during development as result of ISA challenge
- Robust system certified
Perpetual issues

• Safety risks arise at all levels:
  – Insufficient attention to cross-boundary risks and responsibilities
  – Difficult to get safety decisions made where cross-boundary issues
  – Assumptions made at all levels need to be challenged
  – Is the safety architecture adequate?
  – Is the implementation meeting the architecture requirements?
• Are all these risks being adequately assessed?
ISA in the modern context

Objectives unchanged:
High degree of proof that safety requirements met

- Increasing Complexity
- Compelling Safety Arguments
- Proprietary and Novel methods
The safety argument

• A safety case should present a compelling safety argument, not just a statement of compliance with standards

• Safety argument comprises a complex set of stronger and weaker arguments and supporting evidence, built over time

• A great deal of skill is required to construct and independently assess a sound and valid case for a complex system
ISA Adding value

Differences in interpretation can lead to conflict – these need to be identified and resolved

Need to flush out as early as possible

Need early agreement on use of novel methods

Provide a trusted escalation route in case of disagreement

The focus should remain on design for safety, supported by robust processes
Conclusions (1)

• Independent assessment must be performed with the capability to look at safety in the large and delve into detail
  – independence allows the focus to remain on designing in safety and mitigating risks
  – the design requirements, implementation and developing safety case must be scrutinised
  – rigorous processes must be assured
Conclusions (2)

- Risk-based ISA adds further value via
  - early identification of risks
  - early agreement on methods, design
  - facilitation of action to mitigate risks
  - systematic but risk-based assessment and auditing with clear evidential objectives