



# Influence of Risk Tolerability on Approaches to S3 Assessment

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## Aim

### Part 1: Summary of National S3 Assessment Practices

- What is S3 Assessment?
- How is S3 assessed?
  - “Standard” approaches to S3 assessment
  - “Novel” approaches to S3 assessment
  - “Formal recognition”

### Part 2: Factors Influencing National S3 Assessment Practices

- What factors are most important?
- Implications for “Formal Recognition” approaches to S3 assessment

## Conclusions

- Two ongoing MSIAC workstreams:
  - Review of risk tolerability in the member nations WRT munition systems and activities
  - Review of “Novel” approaches to S3 assessment
  - **Considered together – conclusions can be drawn which are of importance to munition systems procurements making use of information from international partners**
- Methodology:
  - Literature review (incl. relevant defence policy documents, where available)
  - Interviews with S3 practitioners & policy makers in MSIAC nations
    - AUS; BEL; CAN; DEU; FIN; FRA; GBR; NLD; NOR; USA (Army)

# Part 1: Summary of National S3 Assessment Practices

# What is S3 Assessment?

## Safe & Suitable for Service / S3 (AAS3P-1):

*For a munition to be regarded as Safe and Suitable for Service it must be demonstrably expected to remain safe... throughout its planned life cycle, remain acceptably free from hazard due to enemy attack or accident (e.g. Insensitive Munitions – IM and Electromagnetic Environmental Effects – E3) and the explosive materials should function within acceptable safe parameters. Safe and suitable for service does not imply that the item will meet all performance requirements.*

## S3 Assessment (undefined by NATO):

*Process to assess Safety and Suitability for Service (S3) (inferred)*

## S3 Assessment Testing (undefined by NATO):

*Testing which provides evidence and data to enable S3 assessment (inferred)*

# What is S3 Assessment?

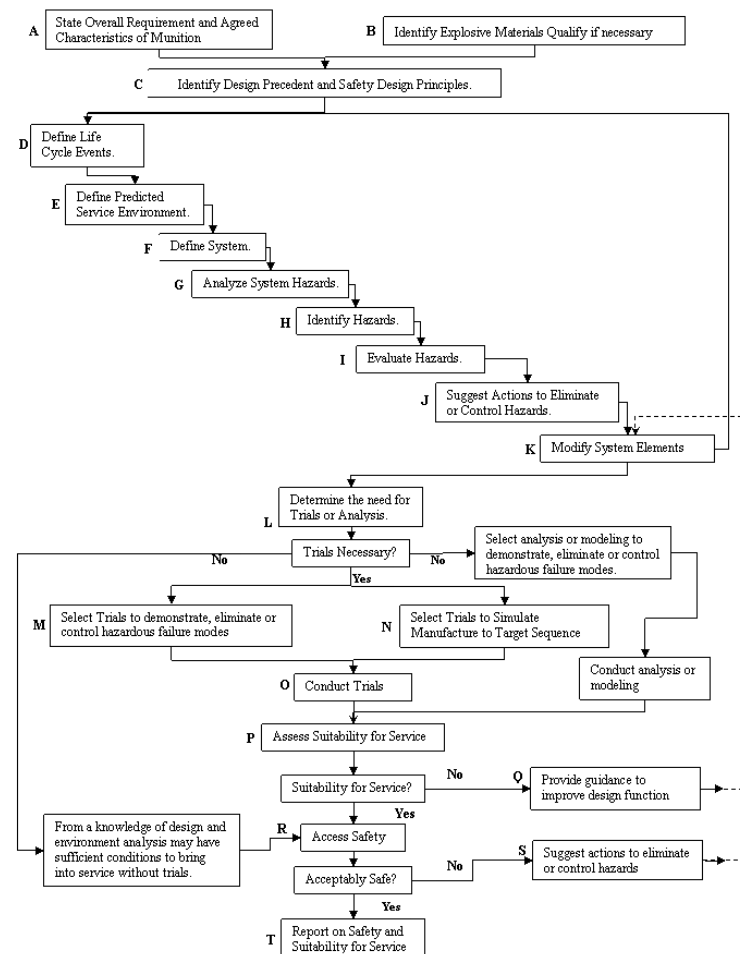
## Qualification (AOP-38 Ed. 5):

*Assessment and **statement by an accredited authority** that the subject materiel possesses and will maintain the properties which are acceptable with regard to safety and suitability for service in a specified role, a specified environment, during its specified life cycle, and that the **associated risks are acceptable**.*

- Qualification and S3 Assessment are distinct activities, with qualification **based on** S3 assessment
- Qualification **must** be done within the context of a nation's legislative framework
  - Acceptance of foreign qualification = acceptance of same risk levels; local context?
- Qualification & S3 assessment often combined in national policy, leading to (erroneous) interchangeable use of terms
  - National attitudes towards risk tolerability may influence S3 assessment practices

# How is S3 Assessed?

- “Standard” approach to S3 assessment – AOP-15
  - **Step 1:** establish the context
  - **Step 2:** identify, evaluate & control hazards
  - **Step 3:** collect evidence & data
  - **Step 4:** assess & reduce risks
  - **Step 5:** document, report & monitor
  
- Ongoing working group under AC/326 SG/B to update AOP-15 – to publish 2023/24



# How is S3 Assessed?

- Standard national approaches (mostly) based on AOP-15 principles
  - ...but not always explicitly
- Differences in national application – ranges from:
  - **Inductive (bottom-up)**
    - AOP-15-like process explicit in national policy
    - Rigid requirement set – compliance assessment against each → S3 determination
    - Risk assessment associated with non-compliances
  - **Deductive (top-down)**
    - No explicit AOP-15 –like process; instead, goals/outcomes based
    - Comprehensive system safety engineering activity in place of rigid requirements
      - Some prescriptive requirements (e.g. EMQ)
    - S3 determination inferred from determination that all risks are tolerable



# How is S3 Assessed?

- “Novel” approaches to S3 assessment
  - Applied when “standard” approach is impossible, impracticable or unnecessary
  - AOP-15 activities may be modified, abridged or omitted
- Drivers towards adoption of novel approaches might include:
  - Low-risk and /or low consequence munition systems
  - Time pressures associated with ongoing operations
  - Influence of procurement strategy on availability, credibility or applicability of evidence
  - Organisational issues (e.g. limited personnel resource, competence)
  - Infrastructure issues (e.g. limited T&E capability)
- Application of novel approaches dependent on national context – particularly risk tolerability

- Types of “novel” approach:
  - **Exemptions**
    - Commercial ammo (e.g. SAA)
    - Small NEQ
    - NATO interchangeable (e.g. AEP-97 (MC-MOPI) SAA)
    - Testing / experimentation
    - Non-munition energetics (e.g. CADS/PADS; AAES)
    - Exceptional
  - **Urgent Requirements**
    - Scope of assessment limited to immediate operational needs
  - **Abridged Assessment for Low-Risk / Low Consequence Munitions**
    - Small NEQ / established design
    - Commercial items (e.g. SOLAS, SAA)

# How is S3 Assessed?

- Growing international interest in “mutual assurance”, “trusted partnerships”, **“formal recognition”** etc.
  - Qualification and / or S3 assessment based on assessment by another nation for the same munition
  - Driven by time, cost, resource, evidence...
- Can be realised at one of three levels:
  - **Recognition of qualification:** involves implicit risk acceptance
  - **Recognition of specific aspects of qualification:** e.g. EMQ, IM assessment etc.
  - **Recognition of S3 assessment processes of another nation:** supports credibility of evidence / data received – but still demands local S3 assessment
- Achievable level strongly depends on national ability to tolerate risk

## Part 2: Factors Influencing National S3 Assessment Practices

- National factors influencing approach:
  - Resource availability
    - Population of nation → GDP → Defence budget → S3 Personnel
    - Non-linear scaling of munition portfolio size with size of armed forces
    - Smaller nations have less resource for same burden – “proportional approach to S3”
    - **Can lead to triaging of effort based on perceived risk**
  - National procurement practices
    - E.g. preference for COTS/MOTS/FMS/bespoke development
    - Driven by resource availability; national defence industry etc.
    - **Availability & applicability of S3 evidence → tolerance of “gaps” → risk assessment as a measure of uncertainty**
  - Organizational structure
    - Separation of procurement and S3 assessment functions – function of nation size
    - Can influence evidence available for S3 assessment → “gaps”

Primarily influenced by:

- **National legal system**
  - **Civil Law:** based entirely on codified law. Prevalent in Europe.
  - **Common Law:** codified law, but heavy emphasis on judicial precedent. Prevalent in English speaking world.
    - A tolerable level of risk can be inferred from preceding legal judgments
- **National WHS legislation**
  - **Absolute duty to protect H&S:** often interpreted liberally by the courts
  - **Qualified duty to protect H&S:** e.g. SFARP – obligation on duty holder to show gross disproportion
- **Defence exemptions from legislation**
  - To provide flexibility, as defence activities are inherently risky
  - Common for defence organisations to “self-regulate” through internal policy

**Risk tolerable to one nation not necessarily tolerable to another nation**

- **Deductive approach:**

- More commonly observed in Common Law nations
- Especially those with qualified WHS duty (e.g. SFARP)
  - S3 assessment integration with system safety provides the framework to make the argument that risks are eliminated / reduced SFARP

- **Inductive approach:**

- More commonly observed in Civil Law nations
- S3 determination made by compliance assessment against ~rigid requirement set
  - Each req. (notionally) in place to address a specific safety hazard
- Compliance assessment results in one of three outcomes:
  - Req. met → hazard controlled [**→ implicitly tolerable risk**] → **decision automatic**
  - Req. partially met → risk assessment → **informed risk decision made**
  - Insufficient evidence → tolerance of “gap” → **(informed?) risk decision made**

- National attitudes to risk tolerability will limit achievability:
- **Formal recognition of qualification:**
  - Involves implicit acceptance of all risks associated with a munition system - nation would need to review supplying nation and assure themselves that:
    - National legislative constructs are compatible (e.g. need to prove SFARP)
    - CONUSE is identical (different LCEP / platforms = different risk level)
    - Risk mitigation measures are able to be applied in identical way
    - Through-life management strategy is identical (e.g. definite vs indefinite lifing; ISS)
  - Unlikely to be practicable for anything other than simple / low-risk systems
  - No nations currently apply this level of recognition
    - Some nations have exemptions for NATO interchangeable SAA – must be previously qualified in another nation – *de facto* risk acceptance

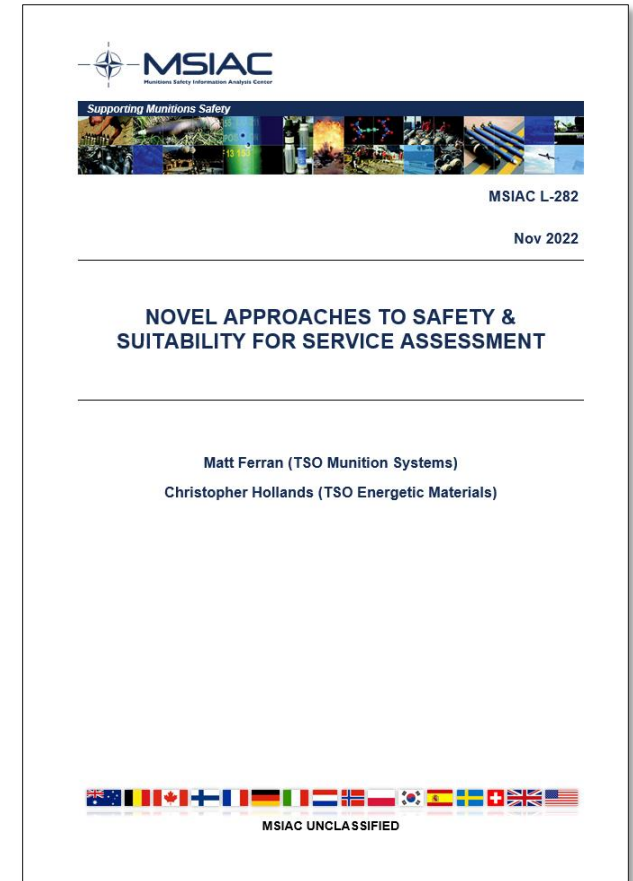


- **Formal recognition of specific qualification aspects:**
  - Acceptance of qualification aspects where:
    - Subjectivity of results is low
    - Requirements are prescriptive, and common between nations
    - **No judgement on tolerability of risk, or explicit / implicit risk acceptance**
  - Examples:
    - Energetic material qualification
    - IM assessment
    - EID characterisation
    - E3 assessment (e.g. HERO)
  - Likely nation-to-nation agreements – potentially reciprocal
    - E.g. GBR and FRA agreement on EMQ
  - Still challenges establishing equivalence (e.g. national test methods, threat environments)

- **Formal recognition of S3 assessment processes:**
  - Assures credibility of foreign evidence / data / assessments for use in national S3 assessment processes
    - Can reduce burden for smaller nations
  - National risk assessment / reduction / acceptance activities still required
    - Differences national attitudes to risk tolerability have no direct impact
    - Must still consider how attitudes *indirectly* impact data received (e.g. safety margins, pass/fail criteria etc.)
  - **Potentially the most achievable approach to formal recognition**
    - Several nations already applying this approach – several more interested

- Clear link between risk tolerability and S3 assessment practices
  - Inductive approach → implicitly tolerable risks
  - Limited resource → triaging of S3 efforts
- Differences in legislation etc. mean a risk may be tolerable in one nation, but not in another nation
- Some impact on implicit risk associated with info received
- Formal recognition approaches:
  - Recognition of qualification unlikely to be practicable for all but lowest risk munitions
  - Recognition of S3 assessment approaches achievable (national risk acceptance still required); in-use; likely of benefit to most nations → increased S3 information credibility

## MSIAC Report L-282 – Publication Late 2022



Questions?