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Allied Ammunition Storage and Transport Publication number 4 (AASTP -4)
Stautus and future updates

Presentation for 2018 International Explosives Safety Symposium & Exposition

7 Aug 2018

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Presentation contents:

- History introduction and risk terms
- AASTP -4 part I
    - System for risk decisions
    - Model for risk assessment
    - Listed national approaches
- AASTP -4 part II
    - NATO recommended models
    - Where there is only one model
    - Multiple models presented by nations
- Future layout off AASTP-4

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History

- 1978 – ABRAM, Quantitative risk calculation (UG)
- 1980s – Swiss/Netherlands development Explorisk/RISKNL
- 1990s – Workshops in NATO STSG
- 2000 – Tom Pfitzer came up with strawman paper
- 2002 – First draft AASTP-4, issue 2003
- 2016 – AASTP-4 version 4 Sept 2016
- Central driving forces:
  - Bengt Vretblad Chairman SG 6.
  - Peter Kummer On behalf of Swiss custodianship -2016.
  - Meredith Hardwick Creating the document.
  - DDESB sponsoring the activity

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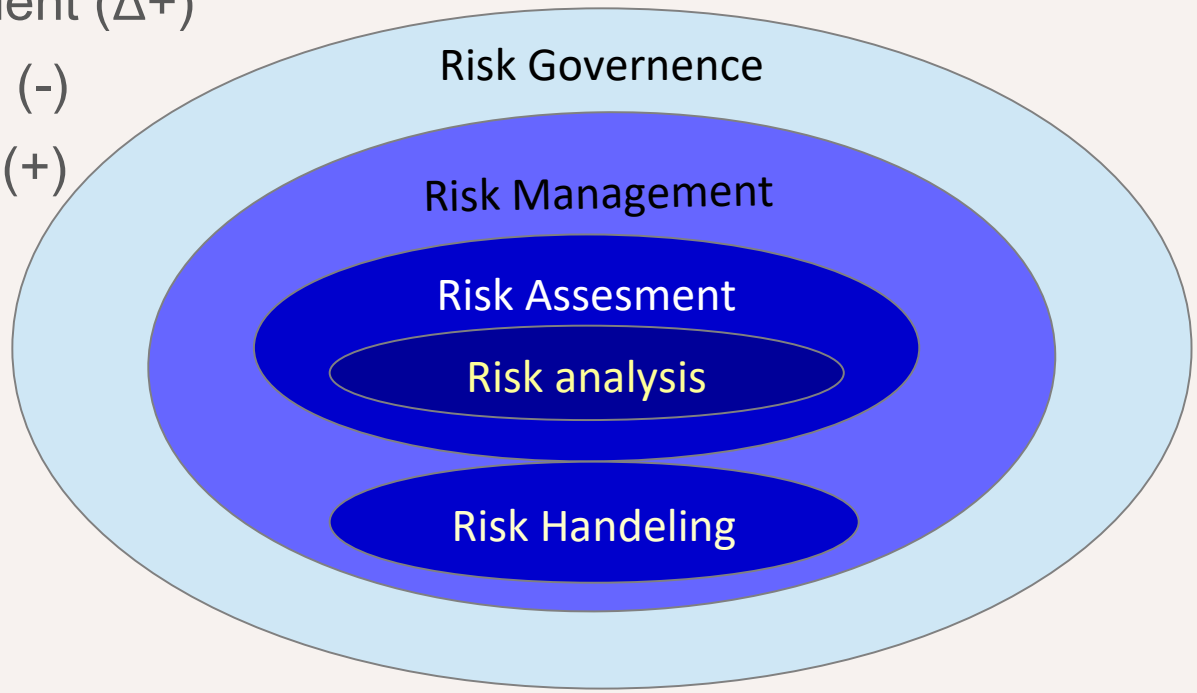
Risk terms

- There are a hierarchy of risk terms:
  - Risk Governance (-)
  - Risk Management (Δ)
  - Risk Assessment (Δ+)
  - Risk Handling (-)
  - Risk Analysis (+)



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AASTP -4 orientation

- Special adaption of ISO -31000 for explosives safety
- Uncertainties are differently understood:
  - Science (-maths supposed to be 100% -true)
  - Engineering (Risks 10^{-9} , 10^{-3})
  - Law -Justice system (Reliability about 99.9)
  - Politics (50%)
  - Religion (100%?)
  - Twitter (?)
- The AASTP-4 deals with engineering, but a risk based system have to communicate with different understanding by the parties involved

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System for risk decisions

- Goal: Improve basis for decisions
- Measures: Match criteria and calculated values
- Criteria: Individual risk, group risk
- Risk formula: Consequence, Frequency, exposure
- Combine: Model
- Protocol: Establish routines
- Build and maintain consensus: Communication with other than engineers

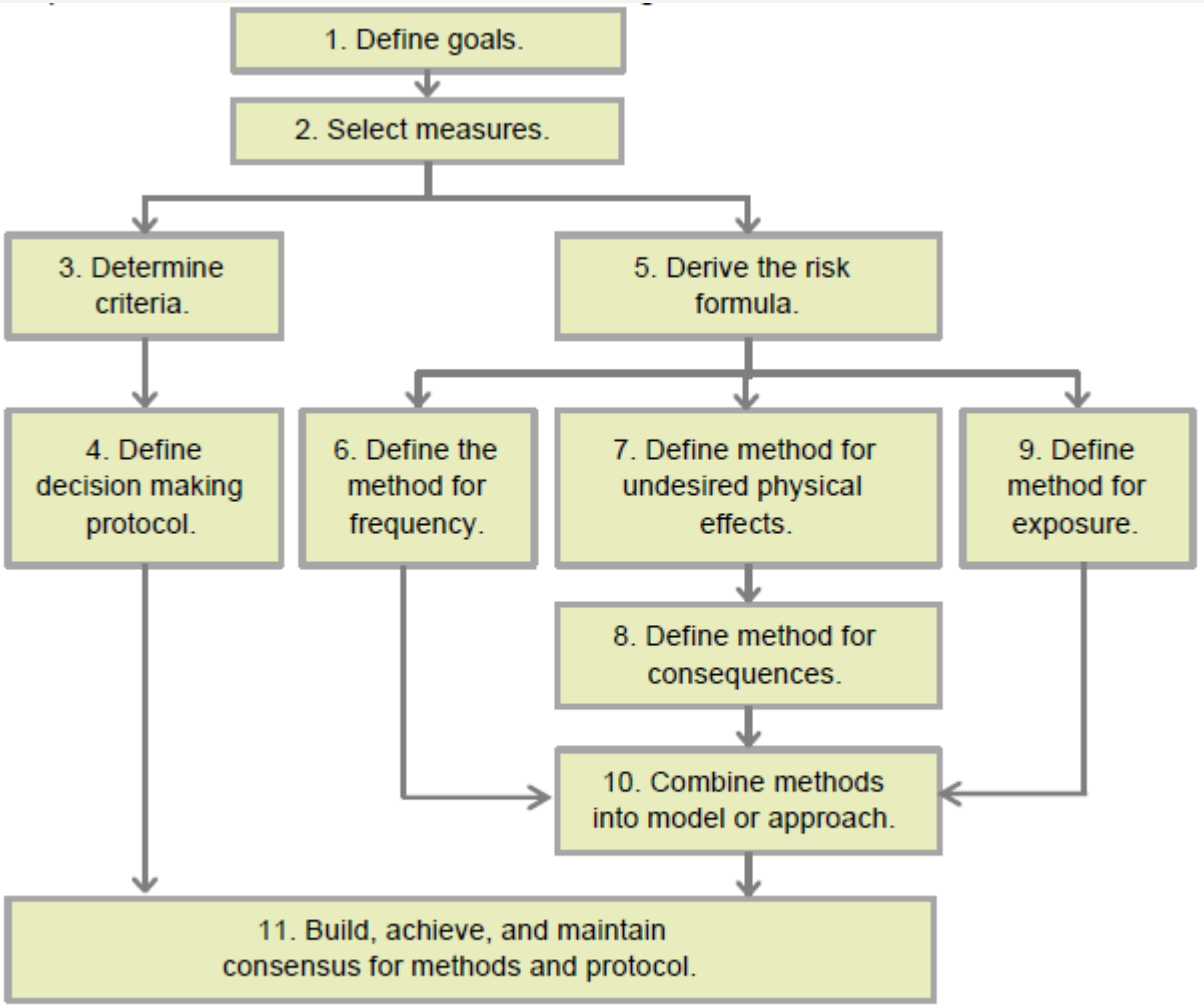

Figure 2. Developing a Risk-Based Decision Approach.

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Model for assessing risk

Iterative model:
- Analysis reveals most risk driving factors.

Redefine situation:
- Until acceptable risk

Monitor risk: Risk handling

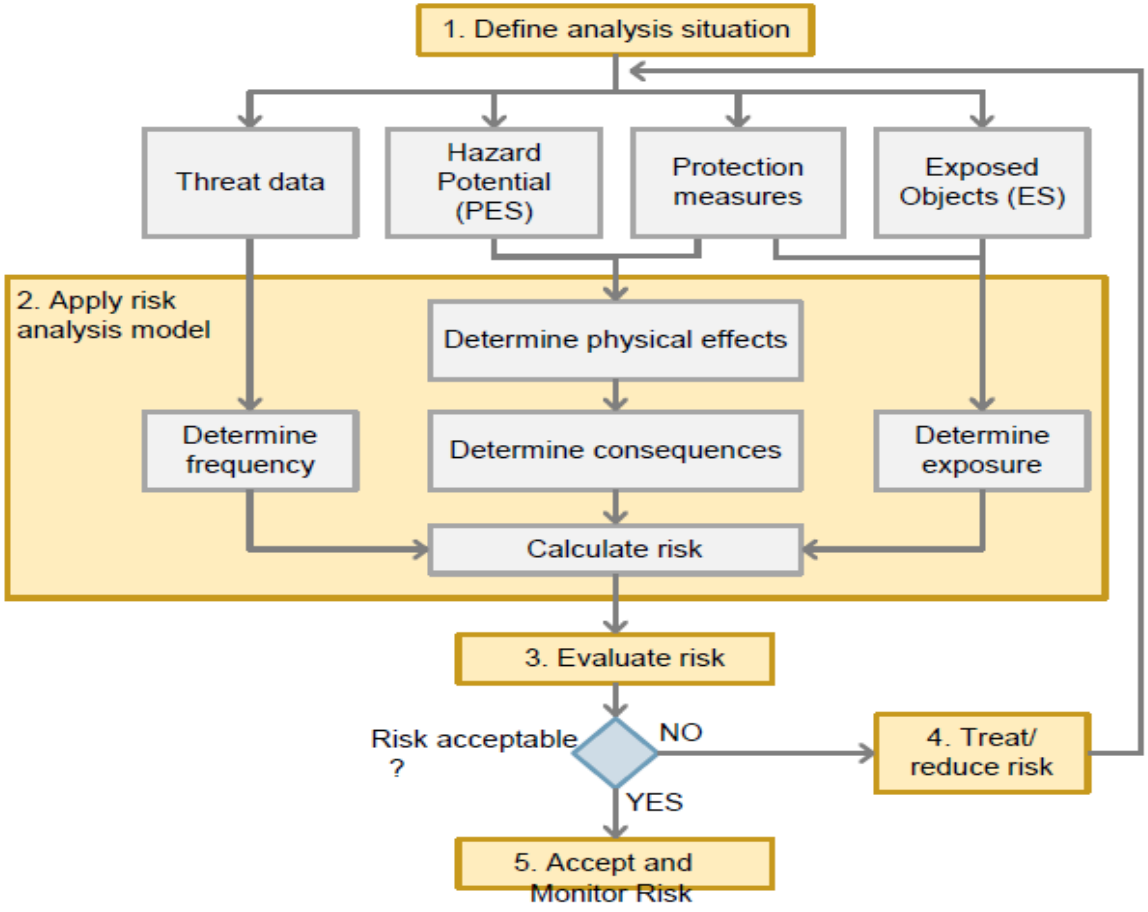

Figure 3. Practical Application of the Risk Based Method.

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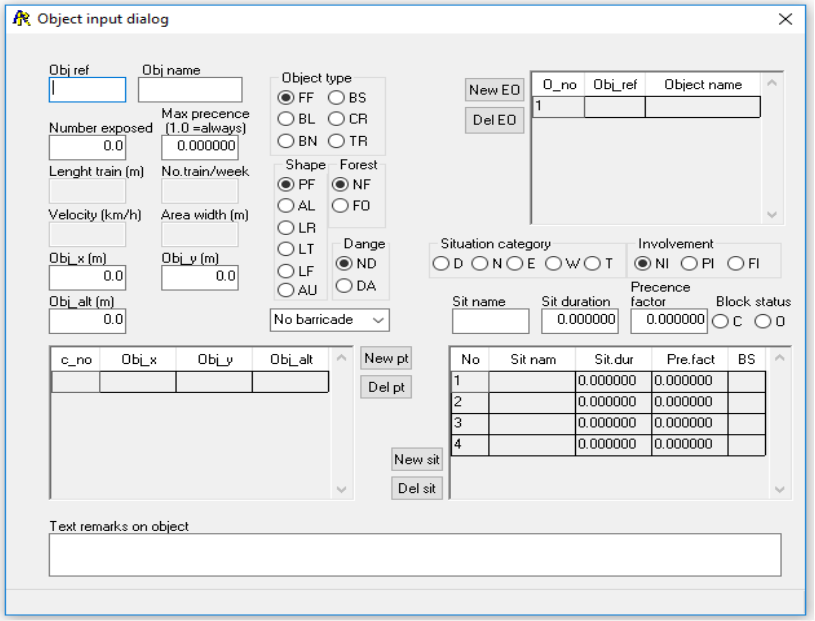
Listed national approaches

There are general description of approaches from 10 nations, The models are described according to the mentioned 11 step model. POC and information of organization are given

- Australia -General description of concept
- Canada -General description of concept
- France -General description of concept
- Germany -ESQRA-GE
- Netherlands -Risk-NL
- Norway -AMRISK
- Sweden -AMRISK
- Switzerland -RIMANA
- United Kingdom -XRA
- USA - SAFER



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AASTP -4 part II

- AASTP- 4 part II outlines how to calculate risk from explosives storage (a number of models are necessary)
- Three groups of models:
  - NATO recommended models
  - Only one model made available
  - Several models made available by nations
- Goal to come to NATO recommended methods
  - Make sure not to loose quality, granularity and scientific background
  - Extensive effort to analyse, compare and agree on models

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NATO recommended models

- Probability of event in operational storage
- Models for blast effects (whole of chapter 3)
- Debris models for underground ammunition storage
- Ground-shock model for underground am storage
- General models for lung injury from air blast
- Consequences from combined effect to personnel and assets applicable to operational storage situations.
- Relevant body areas for debris/fragment impact
- Comparison of glass breakage models

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Where only one model is listed

- Lethality from direct blast inside buildings
- Asset damage assessment
- Lethality from ground shock in the open
- Lethality from ground shock in vehicles
- Structural consequences from ground shock

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About 30 models for risk calculation are presented by nations

Frequency methodology (US,NL,GE, CHE/NO/SW)

Structural consequence from air blast(US, NL, CHE, SW)

Structural consequence from debris(US, NL, CHE)

Personnel consequences from air blast(GE, NL, US, UK, CHE)

Personnel consequences from debris(NL, US, UK, CHE)

Thermal effect (US, NL, CHE, NO/SW, UK)

Consequences form thermal effect (NL, CHE, NO/SW, UK, US)

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Future layout of AASTP-4

- Next edition will be without described national models- instead they will be referenced.
- References must be made available.
- Nominate models for NATO recommendation.
- Improve models:
  - Explosive effect for accidents in structures
  - Effects models for other than detonation
    - Burn
    - Deflagration
    - Explosion
    - Fragmentation
  - Frequency of event

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Conclusions

- State of the art methodology to perform ESQRA.
- Useful in calculation of explosives effects and response.
- AASTP-4 supports other related STANAGs
- There is still room for improvement
- It is important that the nations continue to support this important work.