



Australian Government
Department of Defence
Capability Acquisition and
Sustainment Group

Engineering Assessments and Their Dependence on Test and Evaluation



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1. Aim
2. Background – Life Assessment Overview
3. Through Life Examples
4. Benefits for Defence



Demonstrate how EMB conducts **EO safety assessments** with OQE.

- Engineering structure
- Through life safety and suitability for service
- Evidence based assurance

Support **Australian manufacture**.

- Quality assurance of product
- Growing demand signals
 - The need to do more
- Drive efficiencies in test programs

Highlight engineering challenges and T&E examples.



Robust S3 engineering assessments conducted through life depend upon T&E.

- Typical life assessment phases
 - Design configuration
 - Role and environment
 - Manufacture to target or disposal sequence
 - Failure modes
 - Subject matter expert's judgement
 - Risk assessment
 - Likelihood and consequence
 - The Swiss cheese...
 - **Testing**
 - Informs decision making
 - De-risks hazards
 - Assessment
 - Usage
 - Inventory management



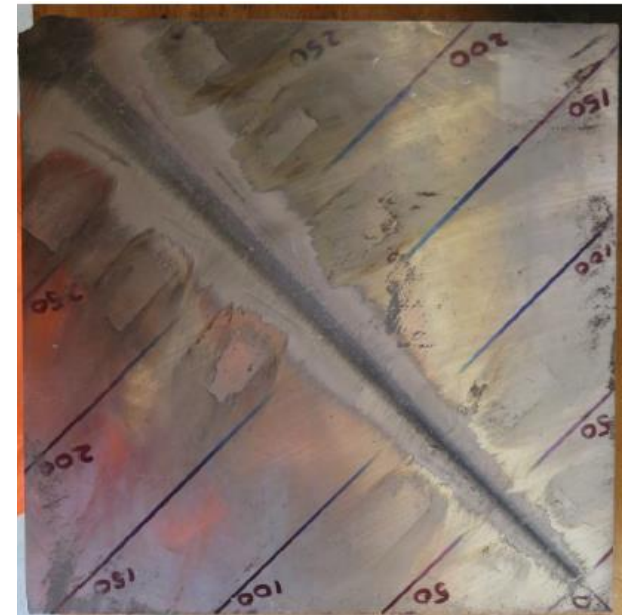
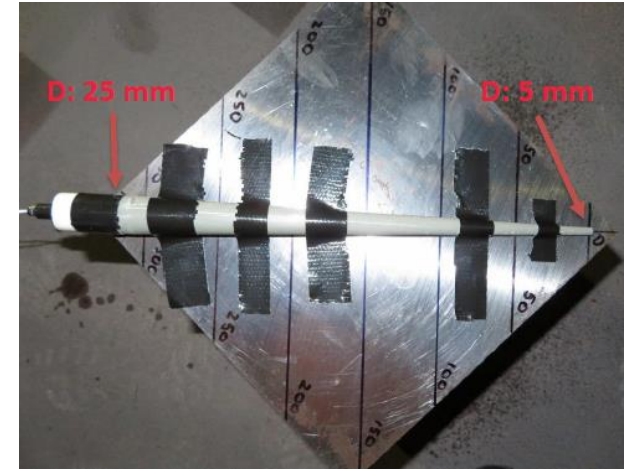
Through life examples in the next few slides...

A new to AUS melt-cast explosive under evaluation for Air Force Bomb applications.

- In-country manufacture to provide increased surety of supply

R&D and industrialisation effort required.

- R&D testing required
 - Assess in-country viability
 - Investment decisions
 - Support similarity assessment
 - Overseas Type Qualification
 - Enable data read-across
- Industrialisation confidence tests to scale-up

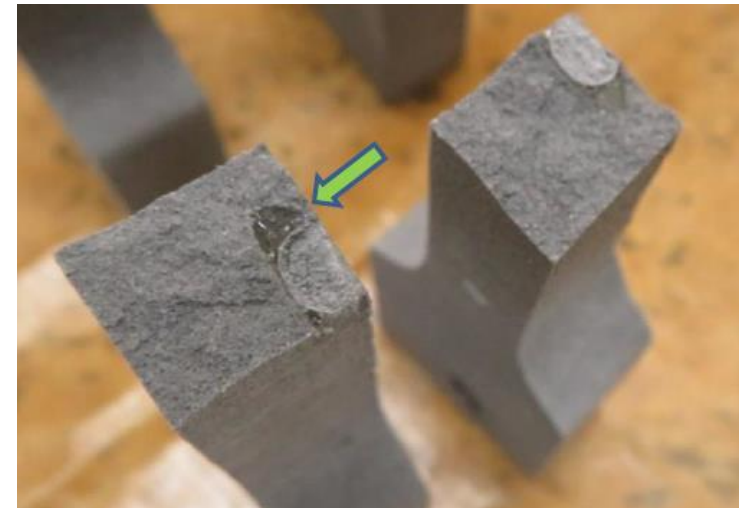
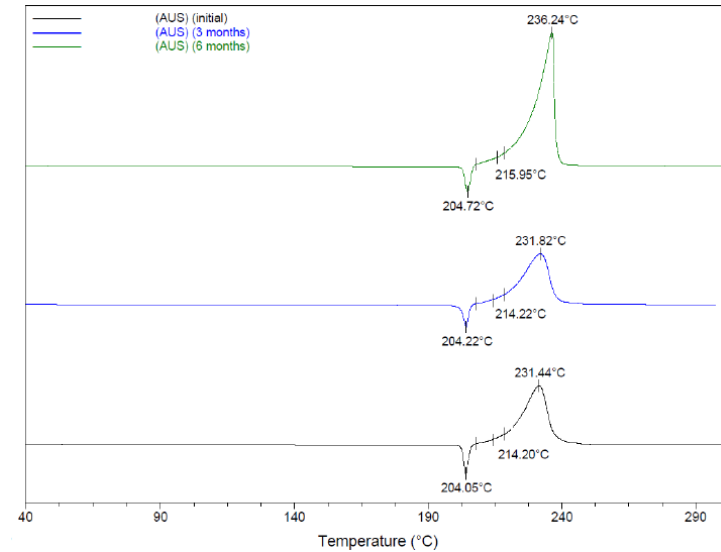


EMQ for new explosives.

- Steady state production
- Characterised IAW STANAG 4170 / DEOP-102
- Mandatory tests for HE

EMQ assures that energetic materials are S3 for the military application.

- Requalification triggers
 - Change of ingredient vendor
 - Captured in DEF(AUST)
 - Triggers testing to assure no inadvertent impact is caused by the change
 - Thermal stability
 - Compatibility with age
 - Mechanical properties

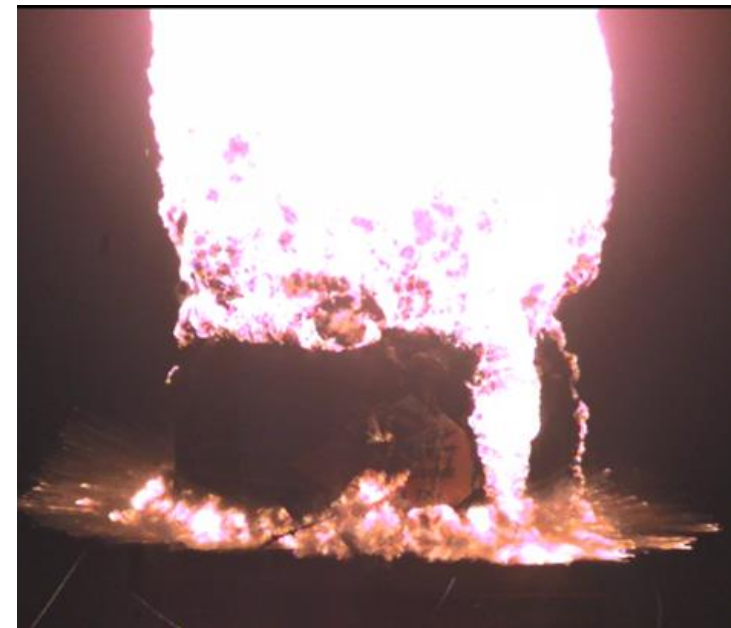
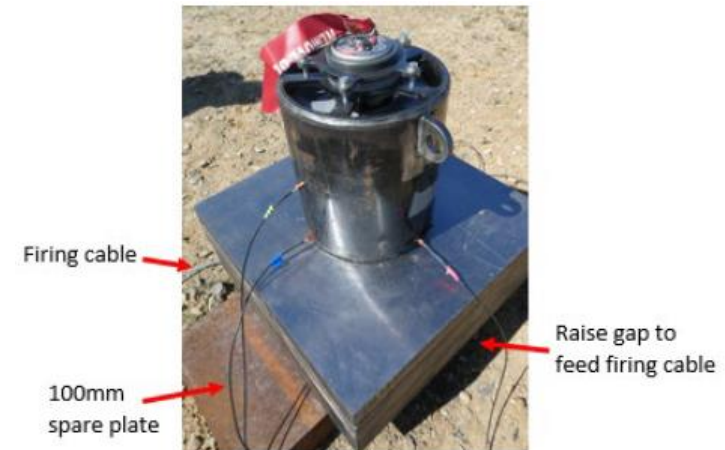


Specification tolerances need to be understood in terms of S3 impact and adjusted accordingly.

Test plans developed to determine tolerable gaps between Warhead Fuze and explosive.

- Gaps 4 to 20 mm at ambient
 - In triplicate
- 12 and 16 mm at temperature extremes
 - Time of arrival
 - Witness plate assessment
 - High speed video

Make informed decisions to revise manufacturing tolerances and save on rejection rates.



Video:

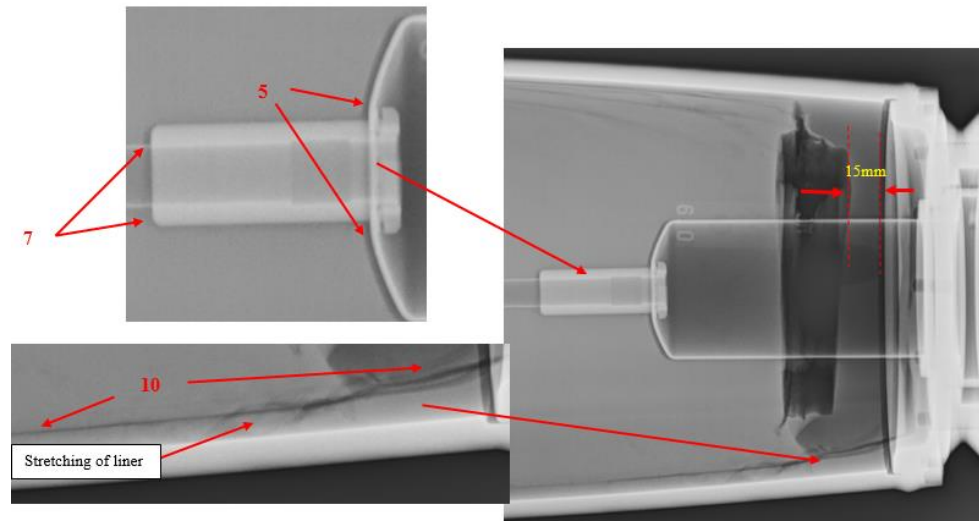
- 20 mm gap at ambient

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Sequential Environmental Trial (SET) program for Air Force Bombs.

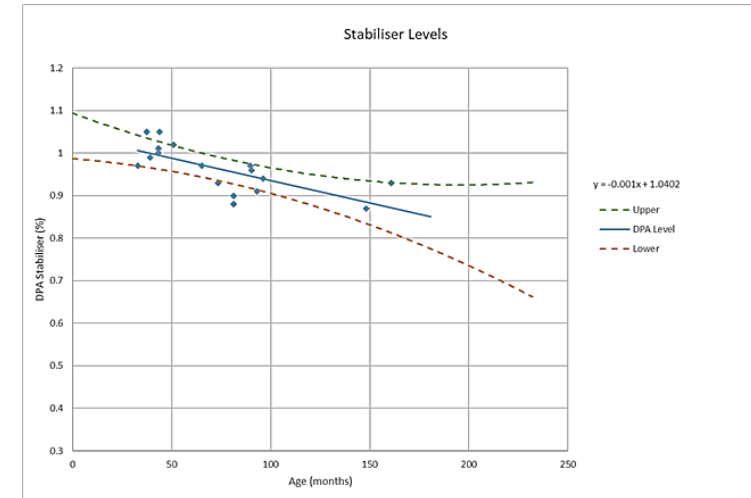
- Assess the environmental impact of the MTDS
- An efficient program developed to test a sub-set of impactors to build upon overseas data
- Radiography pre and post environmental trials
 - High and low temperature storage
 - Solar radiation and diurnal cycling
 - 28 day temperature and humidity
 - Transport vibration:
 - C-17
 - C130J
 - Road
- Defect identification
 - Liner flow and separation
- Informs risk assessment



ISS routinely carried out by the EOS&R program.

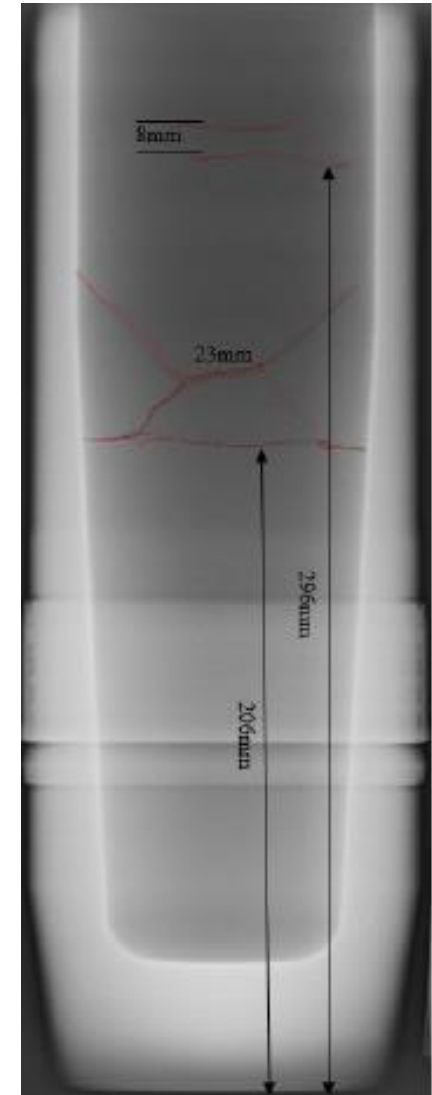
- Provides continued S3 assurance through life
- Well established for Small Arms Ammunition (SAA)
 - Stabiliser
 - Heat flow

The extension of this program to Guided Weapons leads to further realisation of the benefits in terms of reduced whole life cycle (WLC) costs.



Australian road transport vibration requirements.

- Increase to the life cycle exposure
 - 10 000 km, 20 000 km and 30 000 km
- Assess the S3 impact of defects
 - Positive LAT results
 - Through life deviation from manufacturing specification
 - Premature failure of the projectile
- Positive outcome of testing
 - NDT
 - Performance
 - Supported by overseas work
- Worst case assessment of environment
 - Confidence with service life extension
 - Reality tracked with ISS



Successful outcomes:

- New explosive validated and transitioned to industry
- EMQ and requalification assured S3 nature of HE
- Manufacturing tolerance adjusted with OQE
- Introduction of AF Bombs with SET program
- Through life assurance with ISS
 - Extrapolation to guided weapons would reduce WLC
- Increase in road transport limits with test

Pan Defence approach to provide engineering solutions and assessments.

- Delivering an S3 capability to Defence



Questions ?



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