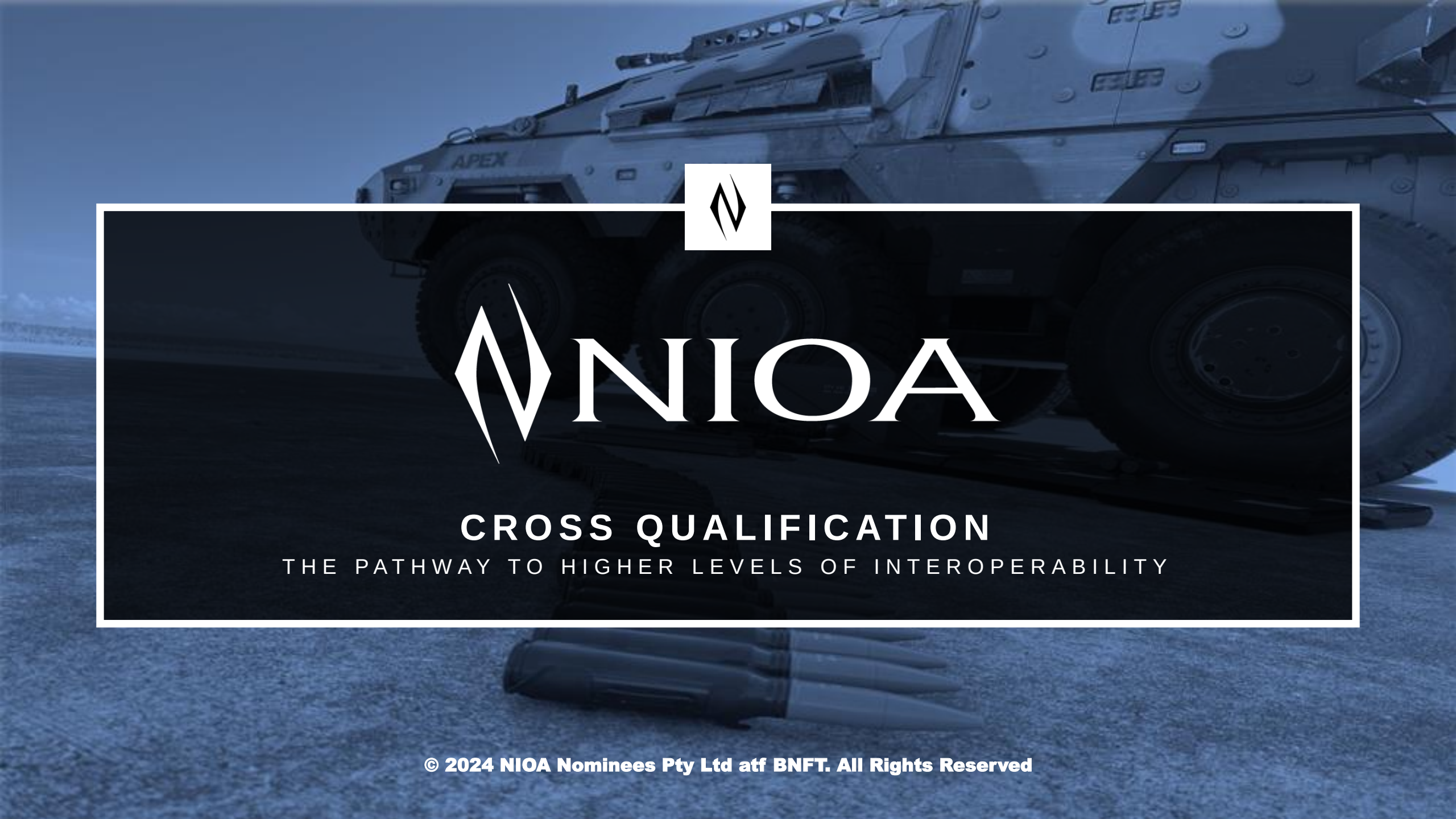


NIOA

CROSS QUALIFICATION

THE PATHWAY TO HIGHER LEVELS OF INTEROPERABILITY

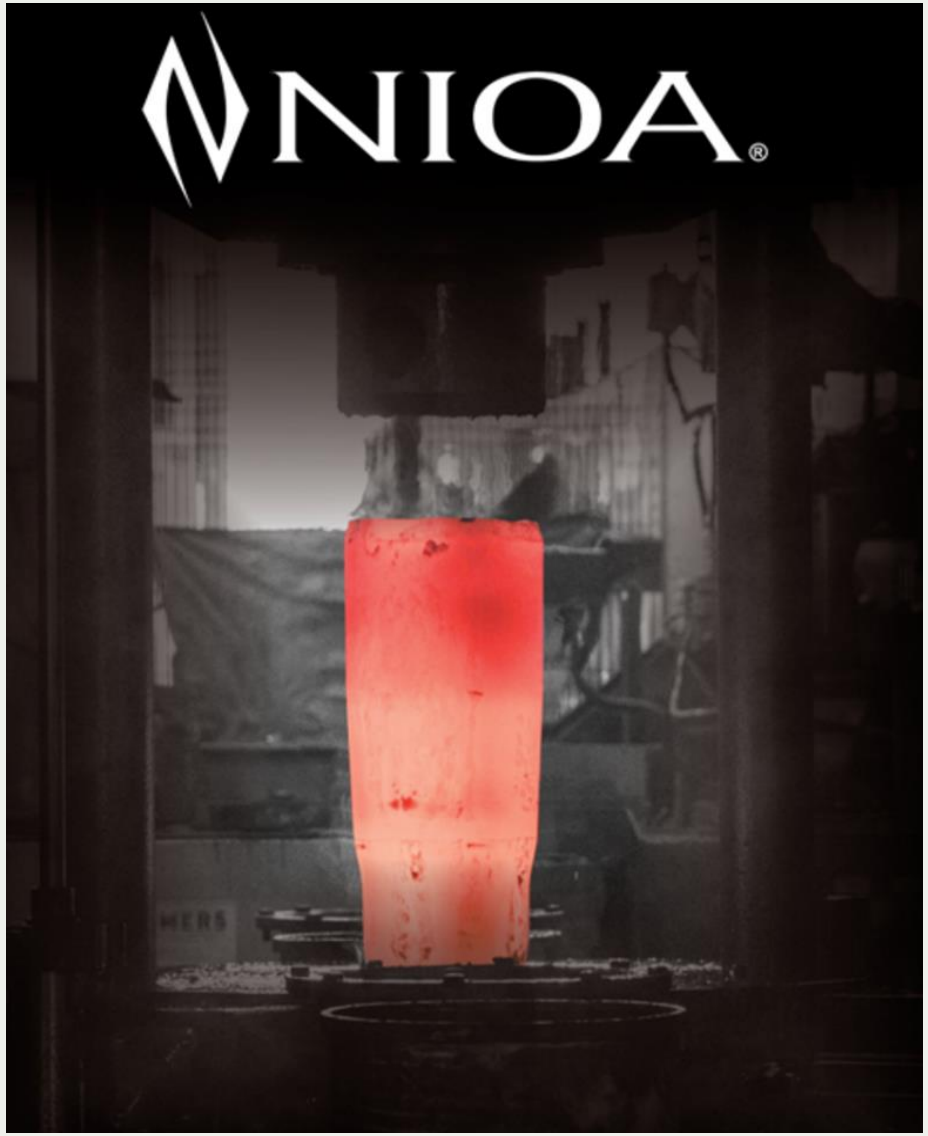
PRESENTERS / AUTHORS

Mr Rudi Bekker

General Manager of Engineering and Chief Engineer at NIOA Australia & New Zealand.

Mr Peter Schaumburg

Regional Engineering Manager for Queensland Operations at NIOA Australia & New Zealand.



CROSS QUALIFICATION

THE PATHWAY TO HIGHER LEVELS OF INTEROPERABILITY

The Australian Defence Force (ADF) procures various Large Calibre (LC), Medium Calibre (MC) and Small Arms Ammunition (SAA) of the same calibre from various Original Equipment Manufacturers (OEMs) for use in their respective weapon systems and/or platforms.

Challenges leading us to the mixed munitions inventories:

- **Foreign Military Sales**: FMS mandates munitions used on Gov-to-Gov acquired weapon platforms.
- **Direct Commercial Sales**: DCS administered through a competitive tender process specify calibre allowing Platform OEM's to recommended alternate munitions to what in service.
- **Supply**: Supply issues, supply disruption, lead times and obsolescence (seeing more of this as Five Eyes (FVEY) starts stockpiling munitions; more to come if supply lines are disrupted).
- **Performance**: Performance edge (range, lethality, precision or reduced collateral damage) required over our adversaries - not achieved by legacy munitions.

The risk:

- Not knowing if similar munitions or their constituent parts are **interchangeable and interoperable** between weapons and platforms – *knowing this upfront is critical to the safety of our operators and platforms*.
- Inability to dig deep into all corners of our magazines and munition reserves in time of need - *this will be key to our operational and industrial resilience and central to our deterrence strategy*.

CROSS QUALIFICATION
THE PATHWAY TO HIGHER LEVELS OF INTEROPERABILITY

Aim:

- Support preparedness and resilience through a pre-emptive and muti-tiered approach to Cross Qualification ('X-Qual') of mixed munition inventories of similar calibre and function, including their constituent parts.
- To quantify the compatibility, safety and performance of Explosive Ordnance inventories of the same calibre or its subcomponents.
- Provide a more operationally and industrial resilient capability.
- Focus the sovereign manufacturing effort to provide critical mass.

In the context of this presentation, Cross Qualification is defined as:

"The verification of various munitions configurations of the same calibre in either fixed (i.e. All Up Round), semi-fixed or subcomponent form, to confirm INTERCHANGEABILITY and INTEROPERABILITY within ADF weapon systems and platforms to maximise use of our munitions stockholdings and increase resilience and preparedness."

CURRENT MUNITIONS LANDSCAPE

Ukraine Conflict

- Rapidly depleting the global munitions stockpiles including 155mm Artillery Ammunition.
- Resulting in significant re-armament programs across Western Militaries as they seek to both replenish and increase munition stockpiles.
- For 155mm Artillery Ammunition, demand is outpacing supply, resulting in shortfalls and long lead times for key subcomponents.
- Fire what you can get hold off with interchangeability and doctrine verified at the gun line.

ADF inventory – 155mm artillery ammunition

- 155mm Inventory managed as two separate fleets (FMS and DCS) now spread across 2 platforms.
- With current increased demand, it is highly likely that the ADF will experience shortfalls in their explosive ordnance (EO) stockholdings, specifically critical or long-lead munitions subcomponents.
- The nett effect will compromise the ADF's ability to issue and fire a 'matched' and technically certified combination of EO configuration items including subcomponents.
- This will be further exacerbated in times of conflict when supply lines are compromised, and procurement lead-times spirals even further out of control.
- The modus operandi will quickly turn from firing 'matched' and technically certified EO combinations of paired subcomponents to reaching deep into our stockpiles and firing a mixed array of inventory or items Defence Industry are able to readily manufacture in Australia.

CROSS QUALIFICATION PROPOSAL
155MM – CASE STUDY

This paper proposes a pre-emptive and structured approach to **Cross Qualification** of the ADF's mixed munitions inventory of Large Calibre (LC), Medium Calibre (MC) and Small Arms Ammunition (SAA).

To help articulate the objectives and multi-tiered approach proposed for Cross Qualification, this paper will first focus on the ADF's Large Calibre 155mm Artillery Ammunition as a case study.

155mm Capability Overview:

- The ADF operates both FMS sourced US '**M-series**' 155mm artillery ammunition and DCS supplied EU/RSA '**Assegai**' Future Artillery Ammunition (FAA).
- The **M777A2 Towed Howitzer** platforms were supplied under FMS along with the in-service M-Series artillery munitions. LAND 17-1C.2 have introduced the Assegai FAA munitions currently at Initial Material Review (IMR) nearing introduction into service.
- The M-series and the Assegai FAA are currently being verified and certified in the ADF's newly acquired LAND 8116 **AS9 Self-Propelled Howitzer** and AS10 Ammunition Resupply Vehicle.

CROSS QUALIFICATION PROPOSAL

155MM – CASE STUDY

M-Series Artillery Ammunition

- **Projectile**: high explosive, training, illumination and screening smoke projectiles.
- **Fuze**: Fuzing systems includes an array of US FMS supplied fuzes including a Multi-Option Fuze Artillery (MOFA), Point Detonate (PD), and course correction fuze.
- **Propelling Charge**: propelled by the low and high zone Modular Artillery Charge System or 'MACS' charge system.
- **Primer**: US M82.

Assegai FAA

- **Projectile**: RDM's ballistically similitude family incl. Boat Tail, Base Bleed and Velocity Enhanced projectiles. Training & Operational system include Drill, Inert, HE Practice, HE pre-fragmented, HE Insensitive Munition, Velocity Enhanced (VLAP), Visual and IR Illumination and Screening Smoke.
- **Fuze**: JUNGHANS Microtech artillery fuzes (MOFA, PD, ET, SQ, PRF).
- **Propelling Charge**: Training system propelled by low zone of RDM Modular Charge System (MCS). Operational propelled by low and high zone of RWM Nitrochemie MCS.
- **Primer**: RDM M82A2.

CROSS QUALIFICATION PROPOSAL
X-QUAL OBJECTIVES

Maximise munition inventory resilience through Cross Qualification to:

1) quantify any residual risk posed to ***operator safety*** when firing mixed munition inventories;

2) quantify any residual risk posed to ***platform safety*** when firing mixed munition inventories;

3) quantify any ***performance variation*** when firing mixed munition inventories;

4) qualify any ***interim solutions*** put in place to compensate for variation in performance or use when firing mixed munition inventories; and

5) focus the munitions industrial base and industrialisation efforts to identify 'common threads' and commodity munition subcomponents.

CROSS QUALIFICATION PROPOSAL

X-QUAL MULTI-TIERED APPROACH

Tier 1 – Introducing alternate Munition Systems

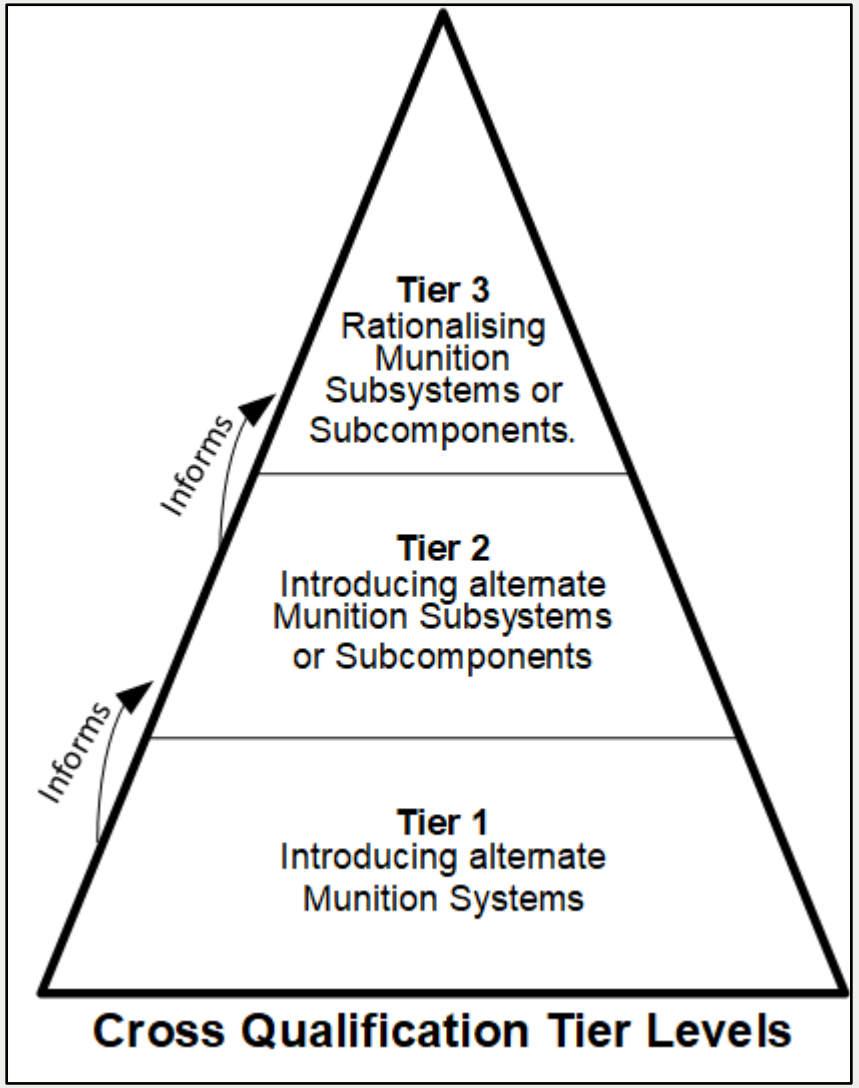
The pre-emptive quantification of the residual risk to operator and platform plus performance variation of an **alternate or substitute Munition Systems** in either fixed (e.g. All Up Round) or semi-fixed (e.g. separate-loading artillery ammunition) forms.

Tier 2 – Introducing alternate Munition Subsystems or Subcomponents

The pre-emptive quantification of the residual risk to operator and platform plus performance variation of an **alternate or substitute matched Munition Subcomponent/s**.

Tier 3 – Rationalising Munition Subsystems or Subcomponents

The pre-emptive quantification of the residual risk to operator and platform plus performance variation of **rationalised commodity munition subsystems or subcomponents.**



Cross Qualification Tier Levels

CROSS QUALIFICATION PROPOSAL
155MM ARTILLERY LARGE CALIBRE EXAMPLE

155mm Artillery LC Case Study - Example

Tier 1 - Introducing alternate Munition Systems

- IIS of Assegai FAA on M777A2.
- IIS of both M-Series and Assegai FAA on AS9/AS10.

Tier 2 - Introducing alternate Munition Subsystems or Subcomponents

- Verify Assegai FAA fuze family on M-series.
- Verify M-series course correction fuze on Assegai FAA.
- Verify Assegai FAA primer on M-series MACS and vice versa.
- Verify Assegai FAA MCS on M-Series projectiles (*FCI impact).

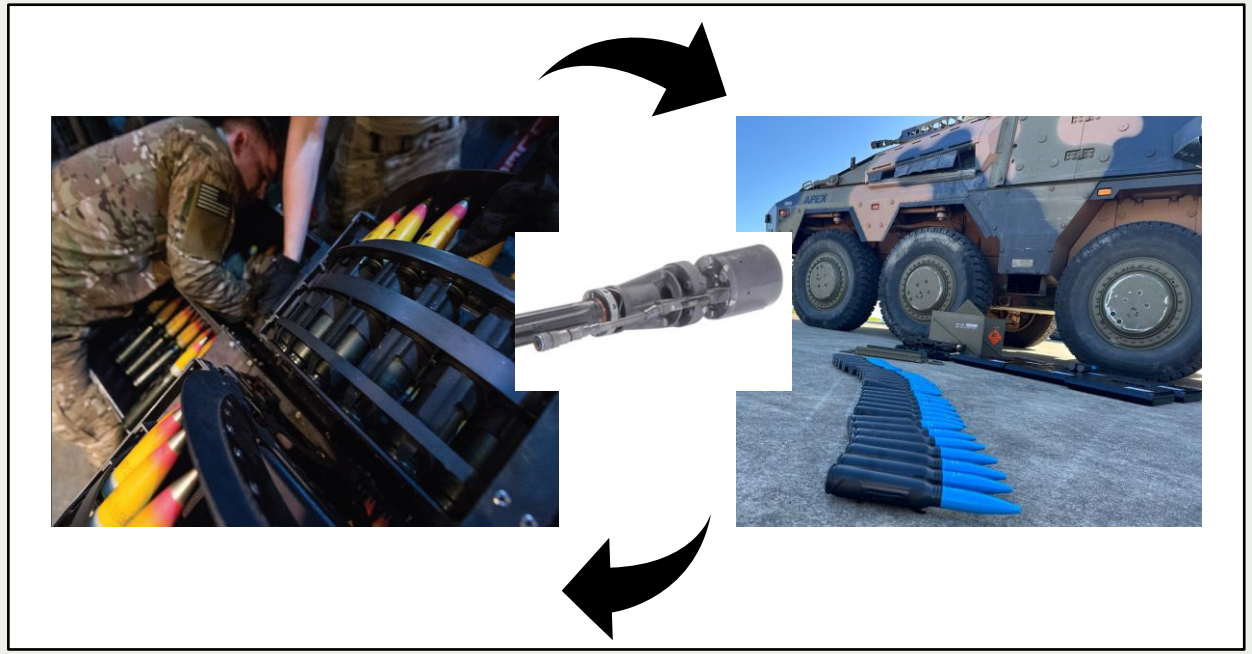
Tier 3 - Rationalising Munition Subsystems or Subcomponents

- Verify Assegai FAA IHE projectiles with AU press fill.
- Verify Assegai FAA fuzes with AU booster and explosive train.
- Verify Assegai FAA primers with AU case/propellant.
- Verify Assegai FAA MCS or M-Series MACS with AU combustible cart case.

CROSS QUALIFICATION PROPOSAL
30X173MM MEDIUM CALIBRE EXAMPLE

Medium Calibre (30x173mm) – Overview

- The LAND 400 Ph 2 Boxer Combat Reconnaissance Vehicle (CRV) fitted with RWM MK30-2/ABM cannon, fires the Rheinmetall Waffe Munition Schweiz (RWMS) and NIOA Benalla manufactured 30x173mm medium calibre.
- The LAND 400 Ph 3 Redback Infantry Fighting Vehicle (IFV) fitted with NGDS MK44 Bushmaster cannon fires the Northrop Grumman Defence Systems (NGDS) 30x173mm medium calibre ammunition.



Medium Calibre (30x173mm) – Case Study Example

Tier 1 - Introducing alternate Munition Systems

- Verify RWMS AUR in IFV MK44.
- Verify NGDS AUR in CRV MK30-2/ABM.
- Repeat for Navy weapons if opting for 30mm.

Tier 2 - Introducing alternate Munition Subsystems or Subcomponents

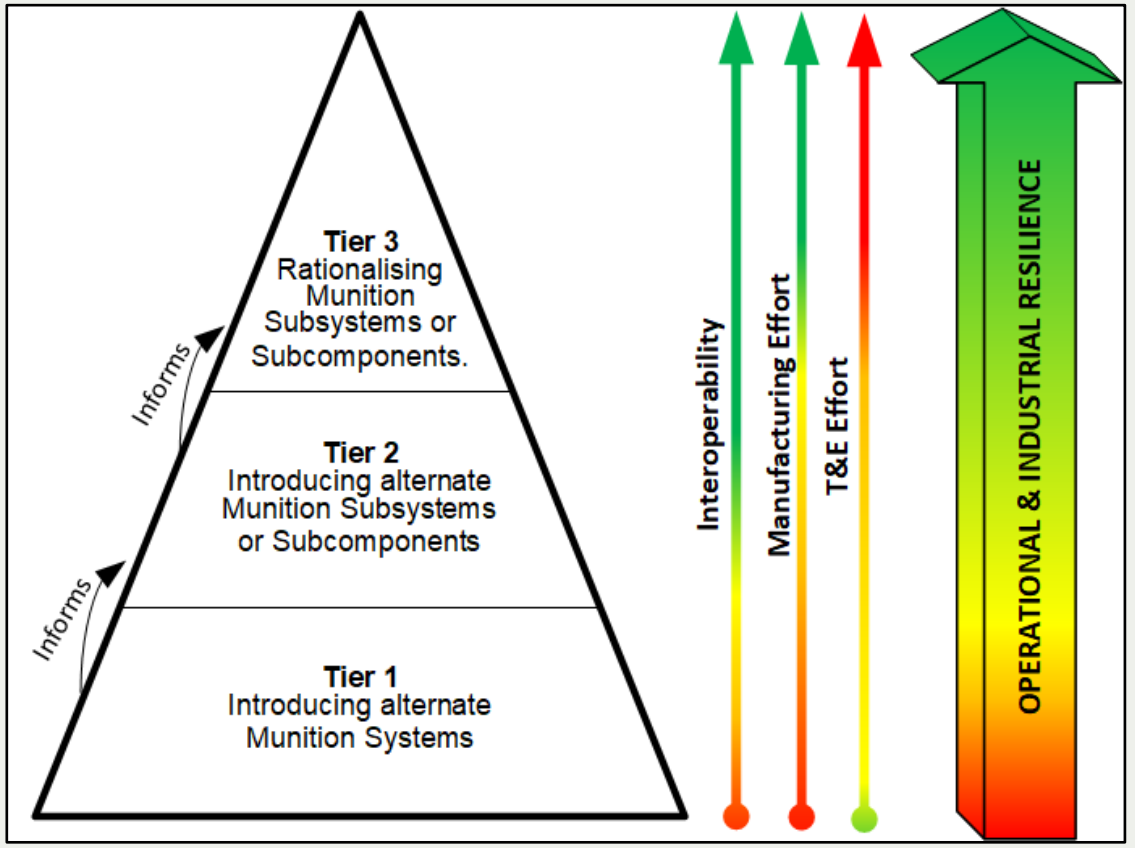
- If NGDS AUR brass case an issue on CRV MK30-2/ABM, consider hardened cartridge case and verify om MK30-2 ABM (verify backwards compatibility to IFV MK44).
- Verify RWMS KETF AUR in IFV MK44 (incl Air Burst Module on muzzle to program time fuze).
- Once qualified, verify NGDS XM1182 HEAB-T in IFV and CRV incl programming considerations.

Tier 3 - Rationalising Munition Subsystems or Subcomponents

- Based on Tier 2 outcomes, explore co-investment options for Cartridge case manufacturing line for common cart case – verify via X-Qual.
- Based on Tier 2 outcomes, explore co-investment options for Rationalizing Primer manufacturing line for common cart case – verify via X-Qual.
- Other: Common propellant for common cart case; common energetics for HE projectiles.

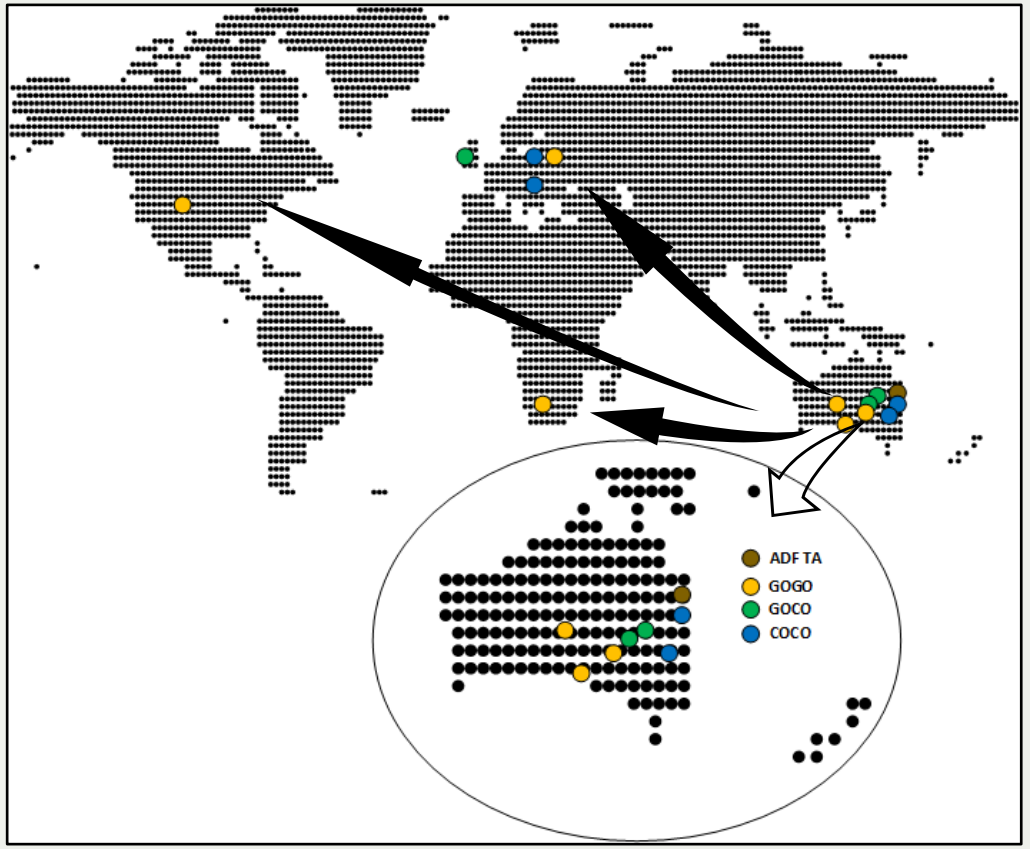
CROSS QUALIFICATION - CONCLUSION

- The multi-tiered approach to Cross Qualification creates a pathway to higher levels of interoperability along with an increased manufacturing effort focussed on rationalised inventories of known interchangeable munitions subsystems or components.
- Cross Qualification will require increased T&E capability and capacity (need to open the T&E aperture to include o/s agencies and ranges).
- Cross Qualification provides an increase in both operational and industrial resilience.



CROSS QUALIFICATION - CONCLUSION

- Increased reliance on Test & Evaluation capability requires significant investment in T&E for GOGO Ranges and GOCO Facilities.
- Need to open up the aperture to use more GOCO T&E facilities and use overseas ranges and test agencies.



THANK YOU

Thank-you for attending today's session!

Other NIOA Presentations (Wed, 20 Nov – Thu, 21 Nov)

Title	Presenters	Session Details/Presentation Time
Benalla medium calibre manufacturing and 30 x 173mm manufacturing, 'The installation and operation of a Modern multi-calibre LAP line' [NTP-Part1]	Dr. Emma Coen Mr. Jeff Gordon Mr. Andrew Kay	Session 3B - Manufacturing **Wednesday,** Nov 20, 2024 9:50 AM - 10:50 AM Bradman Theatre [Presentation Time **10:20 AM - 10:50 AM**]
Benalla medium calibre manufacturing and test and evaluation, an inseparable interrelationship [NTP-Part 2]	Mr David Nink Mr Matthew Hampton	Session 4C - Regulation and Risk Management **Wednesday,** Nov 20, 2024 11:20 AM - 12:50 PM Menzies Theatre [Presentation Time **11:20 AM - 11:50 AM**]
Cross qualification, the pathway to higher levels of interoperability [This Presentation – NTP-Part 3]	Mr Rudi Bekker Mr Peter Schaumburg	Session 6A - Risk Management / Interoperability **Wednesday**, Nov 20, 2024 4:00 PM - 4:30 PM Royal Theatre [Presentation Time **4:00 PM - 4:30 PM**]
National Australia Explosives Laboratory (NAEL)	Mr. William E. Post (SMS) Mr. Kirt N. Sasser (SMS) Dr. Emma Coen	Session 7C - Test Evaluation **Thursday**, Nov 21, 2024 10:10 AM - 12:10 PM Menzies Theatre [Presentation Time **11:10 AM - 11:40 AM**]
Successful integration of process hazards analysis into manufacturing and testing of explosives materials and articles	Mr. Scott E. Genta (SMS) Mr. William E. Post (SMS) Mr. Jeff Gordon	Session 7C - Test Evaluation **Thursday,** Nov 21, 2024 10:10 AM - 12:10 PM Menzies Theatre [Presentation Time **11:40 AM - 12:10 PM**]

"Victory in the field begins in the factory"
Scranton Army Ammunition Plant, visit by Ukrainian President Volodymyr Zelenskyy (22 Sep 2024)

AUTHORS

About NIOA

NIOA is a family-owned global firearms, weapons and munitions company. Our operations include NIOA Australia, NIOA New Zealand, the Australian Missile Corporation, Barrett Firearms (USA) and joint venture company Rheinmetall NIOA Munitions. Since our early beginnings in regional Queensland, Australia in 1973, we have always been driven by loyalty, trust, serving people and exceeding their expectations. That means delivering world-leading products and technologies for the benefit of our customers wherever they are around the globe. NIOA is the largest privately-owned supplier of munitions to the Australian and New Zealand Defence, Law Enforcement, and Commercial markets.

US-based Barrett Firearms, the most recent addition to our group, is the world leader in long range, large calibre precision rifle manufacturing, supplying the US military and more than 75 US Department of State approved countries around the world, as well as law enforcement agencies and sport shooter.

About the Author(s)

Mr Rudi Bekker is the General Manager Engineering and Chief Engineer for NIOA Australia & New Zealand. Rudi commenced with NIOA in 2015, bringing with him more than 25 years' manufacturing experience in Defence Industry. His experience spans the full engineering life cycle from R&D, industrialisation, manufacturing, integration to Verification and Validation (V&V) and through life support including systems currently in-service in air, land, and sea domains.

Rudi is a Chartered Professional Engineer MIEAust CPEng EngExec APEC Eng IntPE (Aus) with Engineers Australia.

Mr Peter Schaumburg is the Regional Engineering Manager for NIOA Queensland Operations. Peter has over 35 years' of ADF and Defence Industry experience – 22 years as an Armament Engineer/Technician in the Royal Australia Air Force and 15 years in Defence Industry working as a Defence consultant in the Introduction-Into-Service of various small arms, munitions, weapons integration on various aircraft and associated Test and Evaluation activities.

Peter is a Chartered Engineering Associate AMIEAust CEngA NER IntEtn (Aus) with Engineers Australia

NIOA

FIND US ON

www.nioa.com.au