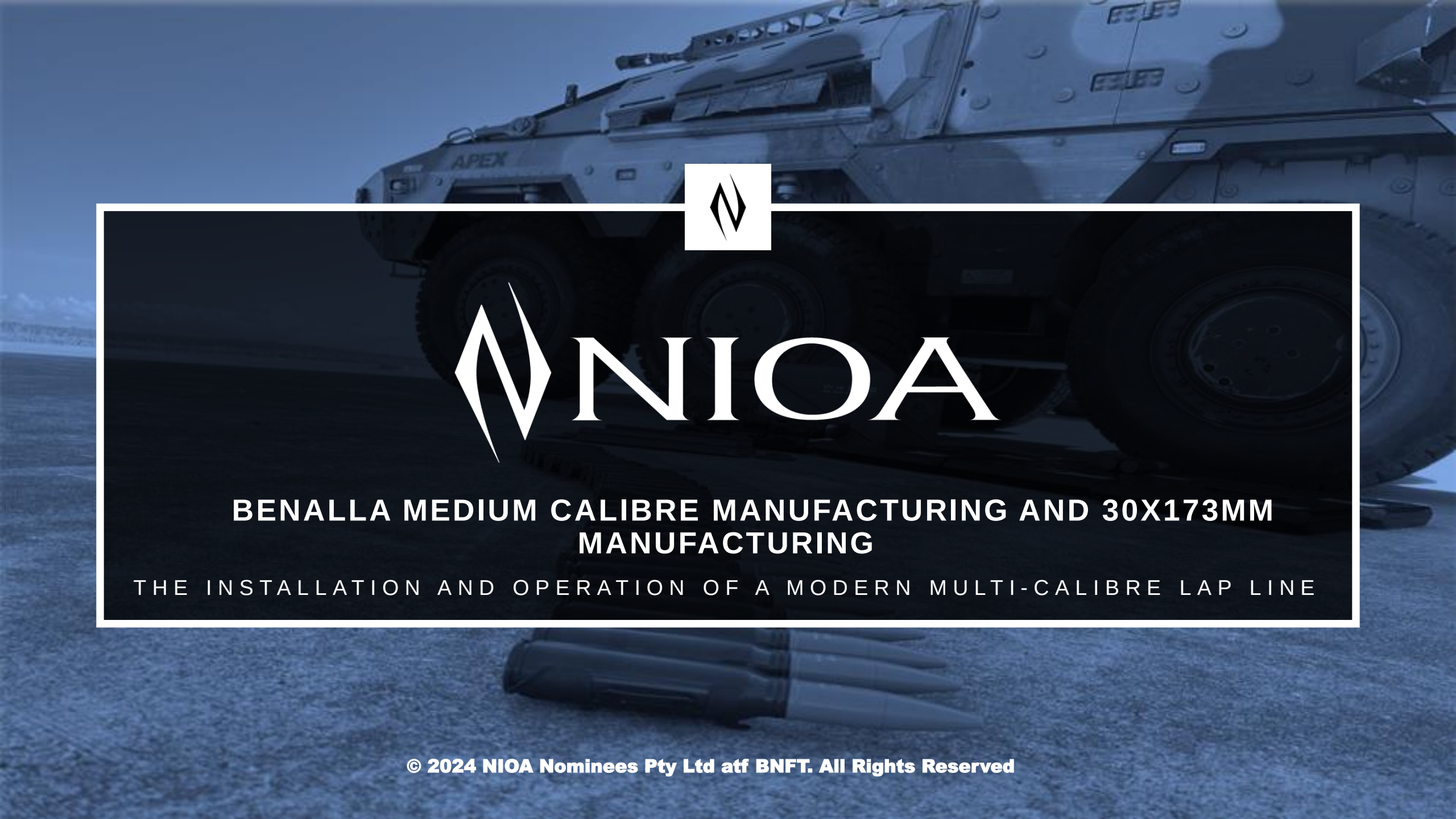

NIOA

BENALLA MEDIUM CALIBRE MANUFACTURING AND 30X173MM MANUFACTURING

THE INSTALLATION AND OPERATION OF A MODERN MULTI-CALIBRE LAP LINE

PRESENTERS / AUTHORS

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BENALLA

As a strategic munitions partner under the Munitions Manufacturing Arrangement (MMA), ***NIOA*** has a long-term tenancy at the Australian Government Owned, Contractor Operated (GOCO) munitions plant in Benalla, Victoria.

NIOA's tenancy houses the Australian Defence Force's domestic production facilities for primary energetics, pyrotechnics, medium calibre, and tank ammunition, hand grenades, fuzes, primers and various munitions laboratory test facilities.

NIOA is working closely with the Commonwealth of Australia and the Australian Defence Force, to determine future munitions production requirements.

The company recently completed recapitalisation of 120mm tank ammunition for the Australian Army's M1A1/M1A2 Abrams tank fleet and has commenced production of Australian Defence Force 30mm ammunition for the Boxer Combat Reconnaissance Vehicle (CRV) Fleet.

MUNITIONS MANUFACTURING ARRANGEMENT

NIOA Munitions and the Commonwealth of Australia entered agreement for ***NIOA*** to operate the 'NIOA Benalla Precinct' within the Commonwealth's Benalla Government Owned Contractor Operated (GOCO) Facility. A key objective of the MMA is "to establish an environment that identifies and encourages investment in the Benalla Facility that enables enhanced use of the facilities".

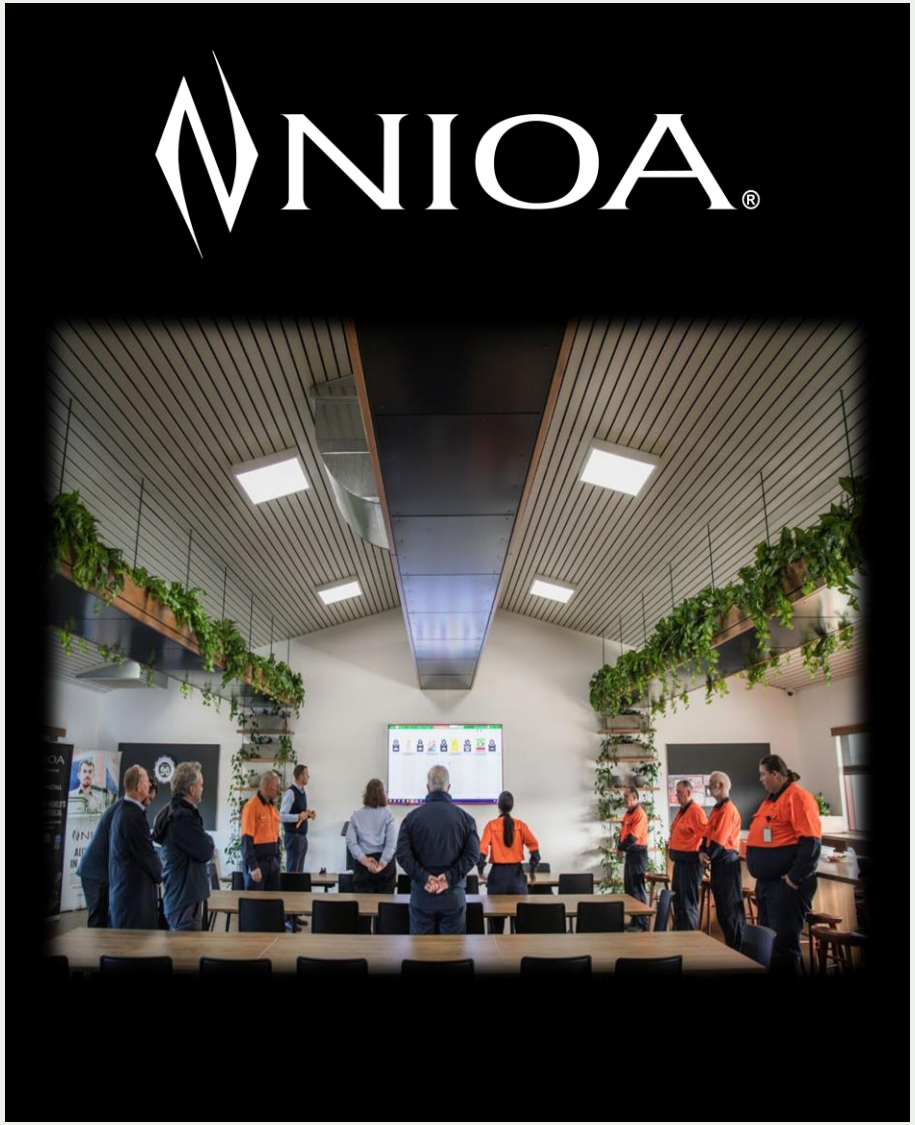
Key timings of the MMA are as follows:

OPERATIVE DATE: 1 July 2020

INITIAL TERM: 10 Years from 1 July 2020

MAXIMUM TERM: 15 Years to July 2035

INVESTMENT



NIOA and partners have made $12m in private investment in:

- **120mm M1028 Tank Recapitalisation and LAP line**
- **Medium Calibre LAP Line**
- **Administration and Staff Amenities**

NIOA invested in a 320 acres of immediately adjacent, industrial zoned land to accommodate additional potential production activities.

The Commonwealth has also invested substantially in the modernisation of infrastructure to support these new industrial base capabilities.

PRODUCTION ACTIVITIES

NIOA and Rheinmetall Waffe Munitions (RWM), through a Joint Venture in Rheinmetall NIOA Munitions (RNM) established a Medium Calibre Load, Assembly and Pack line at the Benalla Facility as an expansion of the joint venture between the companies. The primary purpose of this line is to produce 30 x 173mm TP-T ammunition for the Boxer Combat Reconnaissance Vehicle (CRV) now entering service with the Australian Defence Force. The line has also been used for the manufacture of 35mm ammunition for the export market, including projectile assembly and fuzing operations necessary for the manufacture of 35mm KETF/AHEAD munitions.

UPGRADE OF THE PRODUCTION HALLS

The Medium Calibre Production line was installed in two buildings at the GOCO Benalla Munitions Manufacturing Facility. These buildings were state-of-the art when they were built, but enough time has passed that the buildings require refreshing.

With financial assistance from the Commonwealth for infrastructure upgrades, NIOA has updated both of the buildings housing the private investment in the Medium Calibre Line equipment.

In the production hall, the lights, floor and paint were modernised. In the supporting production hall, interior walls were repainted. The paint line and projectile preparation is housed in this building.

REUSE OF EXISTING CAPABILITY

Wherever possible, existing infrastructure and building capability was used.

The main production hall was purpose built for the manufacture of medium calibre ammunition. Bays suitable for unheading propellant drums already exist. These were modernised with the installation of a new vacuum line for propellant delivery to the Dosing Station.

Off the shelf solutions were installed to assist with lifting the propellant drums to the hopper. A tool for opening the drums was designed in-house, again to reduce risk of muscle strain or other injury to the operators.

INSTALLATION OF THE MANUFACTURING LINE

The Medium Calibre Line was delivered and installed during 2021 and 2022. Design included adaptations for AU/NZ regulations and standards including Factory Acceptance Testing (inert LAP) at OEM facilities.

Throughout the world, there were significant barriers in the way of travel. This meant that installation and commissioning was supported by video calls and emails. Due to time differences, this was challenging.

There is no substitute for physically being in the space where you are trying to install a line. Challenges occurred when a workflow that worked on paper did not quite fit into the space available.

WHAT IS THE CAPABILITY?

The Medium Calibre Line is a LAP (Load, Assemble, Pack) facility, which is designed to replicate the other RWMS facilities. In order to achieve interchangeability of the munitions, commissioning, manufacturing, and testing - processes were developed in collaboration with RWMS.

The medium calibre process has stations that perform dedicated roles. There is the capability to prime cases with screw-in primers, the capability to assemble, paint and print projectiles and the loading line. In the loading segment, propellant is dispensed, silicon applied to projectiles, rounds are crimped. Every round is checked through an automated gauging system, then linked if desired, and packed.

SAFEGUARDING

Australia has very stringent standards for safeguarding moving parts in industrial machinery. Essentially, all moving parts that might impact on a person must be guarded. The crimper on the loading line is such a moving part. In the original design intended for use in Europe, there was no safeguarding around the moving parts.

This element was redesigned with review and collaboration between the equipment OEMS, RWMS, and NIOA Engineering.

Shielding was installed around the hydraulic ram. Interlocked doors were put in place, to allow rounds to be inserted and removed.

On the extended use, metal fatigue of the cables in the door was found to be an issue, which lead to machine downtime.

BILINGUAL HUMAN MACHINE INTERFACES

One challenge was that the human machine interfaces that control much of the line were programmed in German.

When the HMI were converted to English, the error messages were still in German. This took some time and effort to overcome.

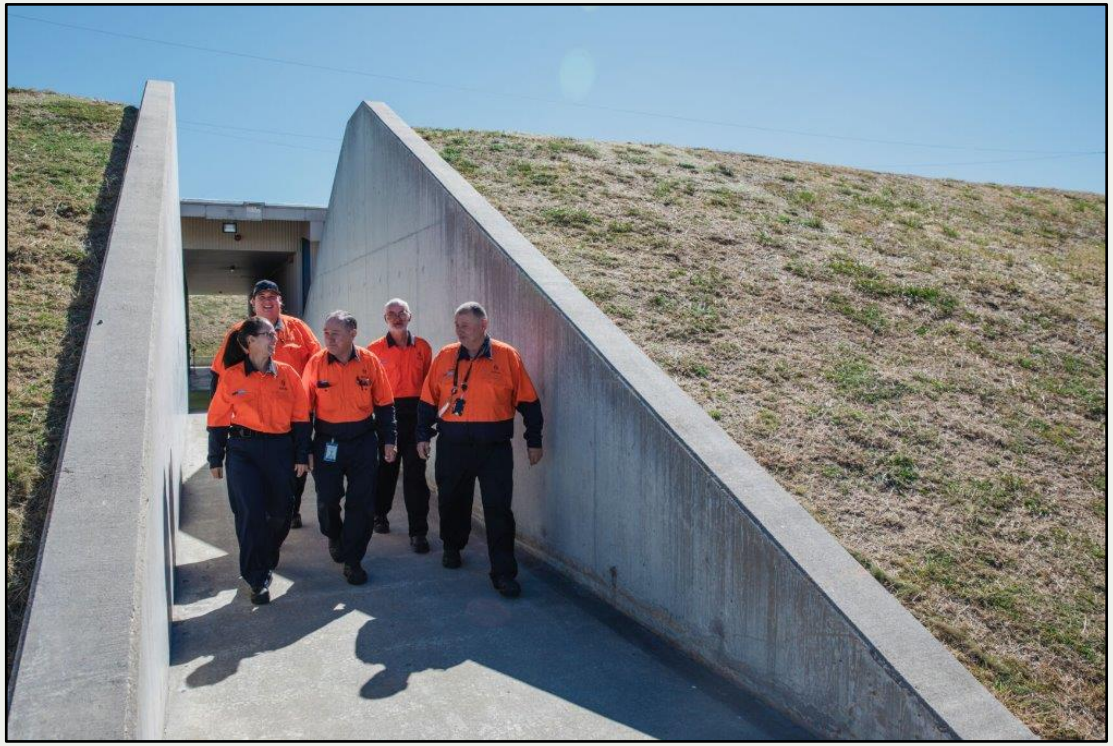
At this time, both standard interactions and error messages are displayed in English.

TRAINING

Ideally, you would send at least some of the operators to see the lines working and be trained by experienced operators and engineers. However, the COVID-19 border closures made travel costly and impractical.

The pilot lot, in 2023, was manufactured when the world was beginning to travel again. Engineers travelled from Switzerland to Benalla and trained the crew.

Training is continuous and ongoing. The work instructions were developed in conjunction with RNM. Every operator is trained against the work instructions and deemed competent before they can perform a task independently.



IN-PROCESS TESTING

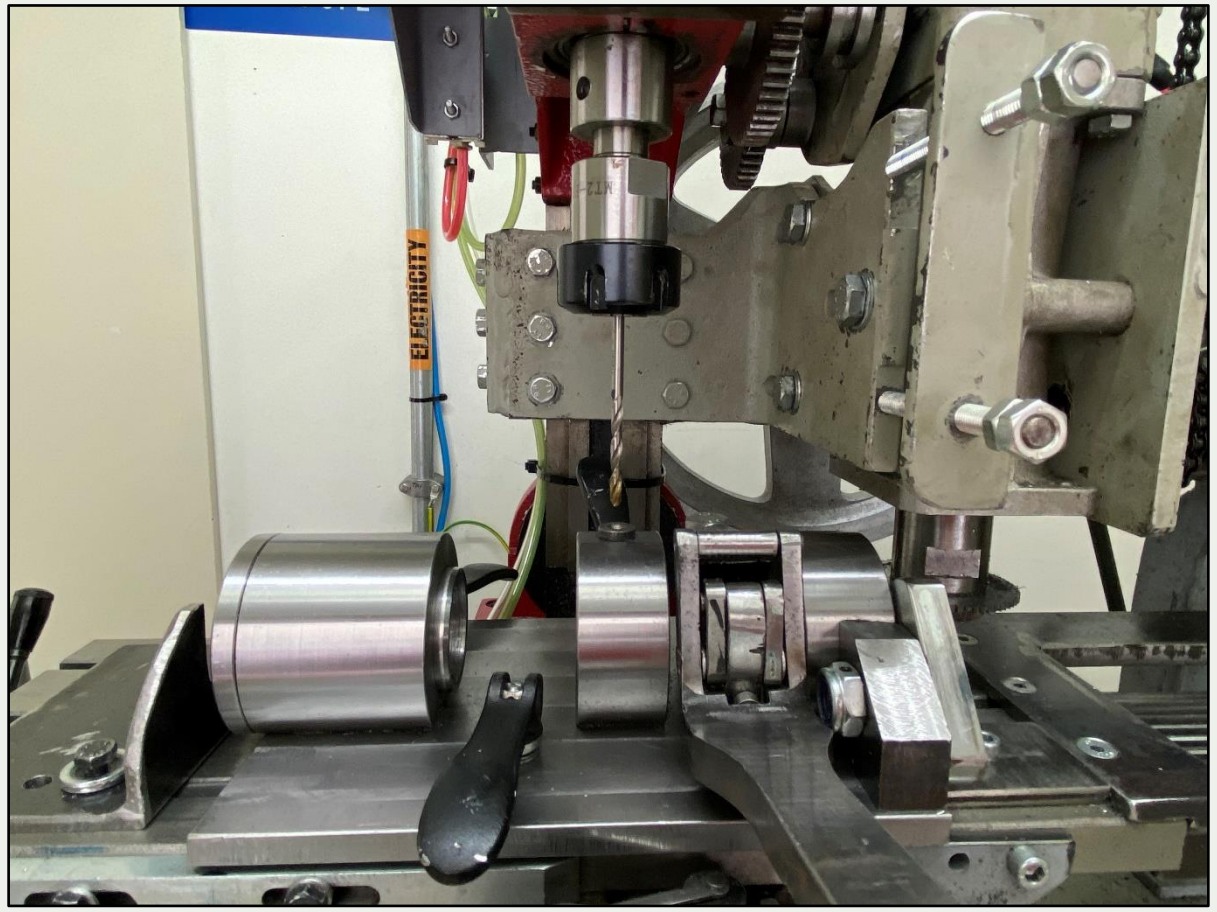
In-process testing includes an automated gauging station, where 100% of the rounds are checked for physical dimensions and weight. Settings for the automated gauging machine are established through consultation with RNM, for each nature of rounds.

Additionally, there are manual testing processes. Routinely, during production, rounds are selected for proof testing and final lot acceptance testing. Both in-process and randomly selected rounds are selected for destructive testing, where the pull-out resistance of the projectile in the crimped case is measured using a dedicated tensile tester. The tensile testing is performed in a blast bay outside the main production hall, at regular intervals throughout the day. A specialised bay was established for quality testing of the propellant, to ensure that the moisture content had not changed in transport or storage.

SUPPORTING PROOF TESTING

NIOA Benalla also designed and installed a remotely operated notching and drilling set-up to support EPVAT (Electronic Pressure, Velocity, and Action Time) testing.

Due to the nature of the case, a hole must be drilled in the case to allow the chamber pressure to be accurately recorded. Since rounds are selected at random throughout the production run, notching and drilling is performed on fully assembled rounds. Additionally, NIOA has supported JPEU in preparing rounds for their trials and barrel commissioning activities.



IMPROVEMENTS TO THE PROCESS

A very small crew runs the line, and it is important that their time is spent on making ammunition, rather than grappling with packaging.

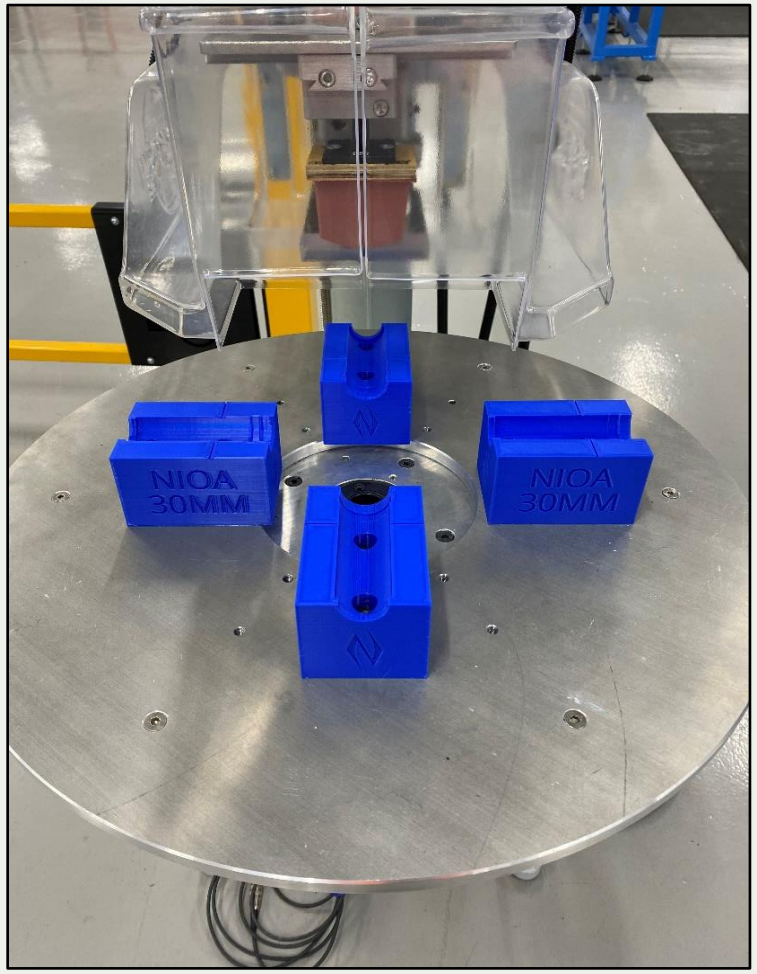
Some of the components come packed in wooden boxes (more on them later). Opening them takes a lot of operator time. A solution was designed in house, which reduced the effort required to open dozens and dozens of wooden boxes.

IMPROVEMENTS TO THE PROCESS

Other improvements include using conveyor trolleys instead of tables, to make it easier to supply each workstation with components.

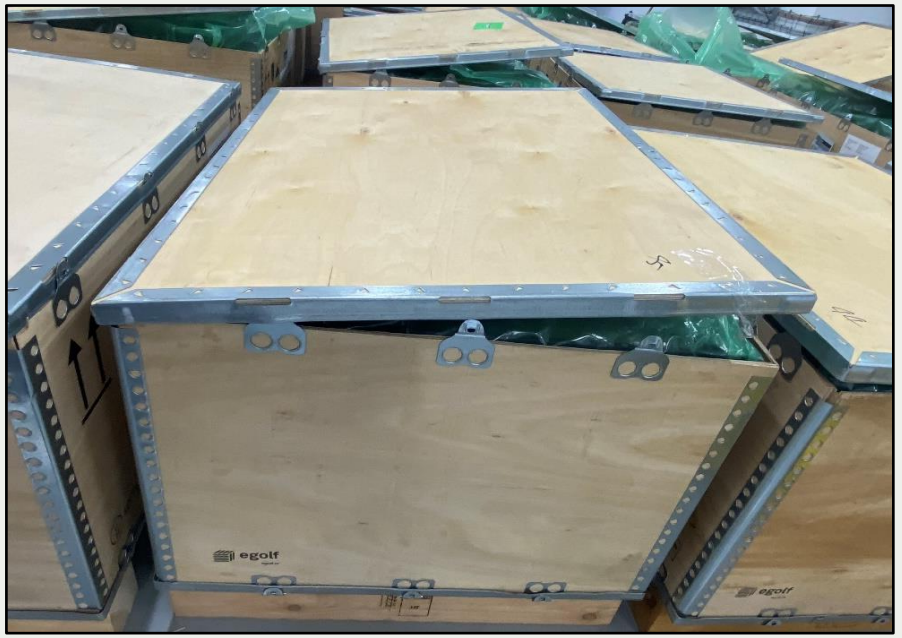
We redesigned the cradles to hold the projectiles during the printing phase. Printing works best when the printer operates continuously, and seconds lost fumbling reduce efficiency immensely.

Running the medium calibre line involves the operators spending a lot of time on their feet. Specialised anti-fatigue matting improves operator comfort.



WASTE ELIMINATION

A particular challenge was the recycling and disposal of the packaging materials associated with the components. Packaging includes metal boxes, plastic internal furniture of various natures, and wooden boxes. Due to initiatives by NIOA, the metal and wooden boxes are repurposed avoiding landfill. NIOA has worked with a number of local plastic recycling companies and all rigid polymers are recycled. One last waste stream of a foam-based packaging remains, and a recycling stream for that polymer is being actively sought. The packaging originates in Europe and returning it to be recycled there is cost-prohibitive. Finding environmentally sustainable waste management methods is one example of how NIOA is using the Benalla tenancy in a responsible manner.



CONCLUSIONS

With the assistance of our partner, RNM and the support of the Commonwealth, we have spent the last 12 months successfully engaged in the manufacture of medium calibre ammunition at Benalla.

Over 70,000 rounds have been manufactured in the last year. We have demonstrated that this facility is ready and able to manufacture medium calibre ammunition to support Australian warfighters.

We are eager to now branch out into other natures of medium calibre ammunition, and continuing the production of the natures we have already successfully produced.

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' **[This Presentation – NTP-Part 1]**	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 **[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**]

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)

Dr Emma Coen has dedicated her career to advancing Explosive Ordnance manufacturing processes since 2007. Holding a PhD in Physical/Theoretical Chemistry and an M.Sc in Explosives Ordnance Engineering, along with degrees in Science and Chemical Engineering.

Dr Coen is a Chartered Engineer specialising in Chemical and Risk Engineering.

As a Senior Engineer at NIOA's tenancy at the Benalla GOCO facility, Dr Coen oversees ongoing munitions production and evaluates new production opportunities.

Mr Jeff Gordon is a values driven leader who has over 15 years' experience in the manufacturing, wholesale distribution, sales and marketing of munitions and weapons across local and international markets. Jeff has a Diploma of Management and certificates in Finance, Leadership, Explosive Ordnance, and Public Speaking.

Jeff has provided his extensive leadership skills to the commission phase of this project and the operation of the NIOA Benalla Facility.

Mr Andrew Kay utilised his extensive experience in Project and Manufacturing Management in the Defence Industry, as well as experience in Maintenance and Logistics Management in Defence and Commercial environments, to provide a stability and direction to the installation and commissioning project through periods of significant organisational change and external factors.

With a degree in Applied Business Management, graduate certificate in Education, vocational qualifications in Electronics, Engineering, Training, and industry training in guided weapons and maintenance management – Andrew brings a wealth of experience to the NIOA Benalla operations

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