BAE SYSTEMS

The Bulletin

News on munitions, combat vehicles and bridging

Winter 2018/9

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Foreword

I share this edition of The Bulletin with you not long after announcing Land UK's intent to create a Joint Venture (JV) with Rheinmetall. We have signed a JV agreement to jointly develop and grow a UK-based military combat vehicles design, manufacturing and support business. January enabled us to announce our intent and currently we are proceeding through regulatory approval before we formally establish Rheinmetall BAE Systems Land (RBSL) as a separate company. We are hopeful of achieving this in the coming months.

There's no doubt that both companies are excited about the potential the JV holds for our UK and international customers, with the combined capabilities offering a more comprehensive portfolio of military vehicles and associated technologies.

From a personal perspective I am delighted that the company will be based at our facility in Telford, and fully involve our vehicles employees at Washington, Bovington and Bristol too. If approved, the deal provides renewed purpose for our combat vehicles business and aims to create new jobs in this sector over time.

RBSL will not include our munitions capabilities, our weapon systems business, or our holding in the CTAI JV with Nexter. I am however eager to ensure that collaboration where we can add value continues and we work across the wider Land business to develop solutions and effective support.

The activities involved in establishing the JV will add a different dimension to our priorities this year, coupled with our continued drive to deliver stronger performance, develop smarter technology and focus on winning new business.

In this edition you can read about our contract win for smoke and illuminating rounds, as well as our efforts to grow global relationships through our Munitions Management and Supply services. In parallel, our engineers have been developing a new 155mm Extended Range prototype shell, and made several significant design improvements to our suite of heavy munitions. It's this appetite from our engineers to make cutting-edge improvements to our products which makes me confident in our ability to remain a trusted partner to the British Army and meet the future head on.

Jennifer Osbaldestin
Managing Director,
BAE Systems Land UK

A Joint Venture for a stronger future

Rheinmetall and BAE Systems to create a UK-based combat vehicles Joint Venture company.

Rheinmetall and BAE Systems have signed an agreement to create a joint UK-based military vehicle design, manufacturing and support business.

The new Joint Venture (JV) is subject to regulatory approval which we hope to receive in the first half of 2019.

The JV will be headquartered at BAE Systems' facility in Telford, England, and will sustain over 400 jobs in the UK, as well as preserve key technology and engineering skills.

Rheinmetall will purchase a 55% stake in BAE Systems' combat vehicles business, with BAE Systems retaining 45%. The new business will be known as Rheinmetall BAE Systems Land (RBSL).

The intent is for the new JV to play a major role in strategic combat vehicles pursuits, such as the delivery of the British Army's new Mechanised Infantry Vehicle (MIV) programme.

The combination of Rheinmetall's military vehicles technology and products, with the capabilities and products brought to the Joint Venture from BAE Systems, will create a European market leader in the military vehicles sector. RBSL will have the potential to create hundreds of additional UK jobs, both in Telford and the wider supply chain.

While initially focused on major UK combat vehicle programmes, RBSL will also form an integral part of Rheinmetall's Vehicle Systems Division and will participate in and contribute to various global vehicle contracts.

The proposed Joint Venture does not include BAE Systems' munitions and weapon systems business or its holding in the CTAI Joint Venture with Nexter.

Jennifer Osbaldestin, Managing Director of BAE Systems' Land UK business, said: "We are committed to evolving our combat vehicles business so that we better serve our customers' future interests. **Joining forces with Rheinmetall in the UK provides renewed purpose for our vehicles business** and allows us to deliver products, services and technology that help land forces excel in their vital roles. We look forward to working together to ensure the Joint Venture is a trusted supplier to the British Army and our international customers."

155mm Extended Range ammunition – the sky's the limit

The Land UK Heavy Munitions team has demonstrated a **25% increase in firing range from a 155mm Extended Range prototype**, compared to the in-service 155mm L15A4 shell.

The live firing demonstration was part of a programme to extend the firing range achievable from the 155mm L15A4 shell currently in service with the British Army. The team, based at Land UK's Glascoed facility in South Wales, made changes to the design of the shell to maximise efficiency and capability.

Jamie Weller, Senior Project Engineer, said: "Put simply, we modified the tail of the 155mm shell currently in service to accommodate something called a Base Bleed Unit, which acts as a gas vent. This reduces the air resistance, or drag, on the shell whilst in flight so it can travel further."

The team travelled to QinetiQ Eskmeals to demonstrate the effectiveness of the new design when fired from an in-service AS90 Self-Propelled Howitzer. During the demonstration, the ammunition delivered an impressive range increase of over 25%, compared to the in-service 155mm L15A4.

Weller continued: "Ammunition is one of soldiers' most vital assets, so we know it needs to adapt to remain competitive and futureproof. The trials were a great achievement for the team, but we won't stop here. We'll continue to push the quality and performance of our products for our armed forces and their battlefield capability."

This milestone is part of the team's longer-term goal of achieving > 40km firing range from a 52cal barrel, which they plan to demonstrate towards the end of 2019. This work seeks to support the British Army with their future artillery requirements, as part of the MOD's ongoing AS90 capability upgrade programme.

The team's work to date has received particular interest from the Defence Ordnance Safety Group (DOSG), Army HQ and Defence General Munitions (DGM). A proposal to qualify this configuration of Extended Range shell into service is due to be submitted by the Land UK team later this year.

£1.6m in through-life support costs saved for British Army over two weeks

A new and improved, cleanable, air filtration system fitted to the heavy armour fleet during the Saif Sareea 3 training exercise has led to performance success.

In the autumn edition of The Bulletin, we featured one of our Field Support Representatives who had recently returned from Oman, where he supported Saif Sareea 3 – a joint training exercise between the British and Omani armies.

The exercise saw the deployment of 18 Challenger 2 Main Battle Tanks, six CRARRV armoured recovery vehicles, as well as two Titan and two Trojan combat engineer vehicles.

Due to the arid conditions of the Omani desert, dust – which can be as fine as talc – accumulates in the vehicles' filters. Prior to the exercise, it was forecast that 500 of the old-type disposable filters would be needed to service the exercise.

With the new, cleanable, filtration system, just two filters were replaced during the exercise due to dust ingestion and 32 due to damage; a staggering 93% decrease. This saved almost £1.6m in replacement filters over two weeks for the British Army.

Iain Fletcher, Heavy Armour Platform Manager at Land UK said: "The need for a new air filtration system was identified and agreed through the Heavy Armour Automotive Improvement Programme (HAAIP) steering board which includes DE&S and Army equipment sponsors as well as Land UK representatives.

We then produced a specification for the new system, leading to a commercial competition run by the MOD to manufacture the preferred solution. We then led the integration and testing activities to allow a functional system to be deployed in Oman.

"The adaptability of the British Army and the heavy armour fleet to any operating environment is always something to be admired and I'm pleased the British Army could benefit, logistically and financially, from this improvement. Land UK continues to work closely with DE&S and Army on further HAAIP improvements for the heavy armour fleet."

User feedback from Oman is that the system continues to perform very well, with the benefit delivered during the exercise being regarded as a resounding success.

Radway Green hosts Shrivenham Staff College students

Over sixty students from the MOD Defence Academy in Shrivenham visited Land UK's Radway Green site in Cheshire, as part of their Advanced Command and Staff Course.

The scheme brings together some of the brightest military minds from across the world, including representatives from British, American and Scandinavian armed forces, as well as defence industry. The day included talks from senior figures in the Land UK team, including Future Programmes Director Craig Fennell.

Craig explained:

"These visits are important because we want to make sure our customers can build relationships, understand how industry works and ultimately receive the products and services they want. Seeing where those products come from allowed for real engagement."

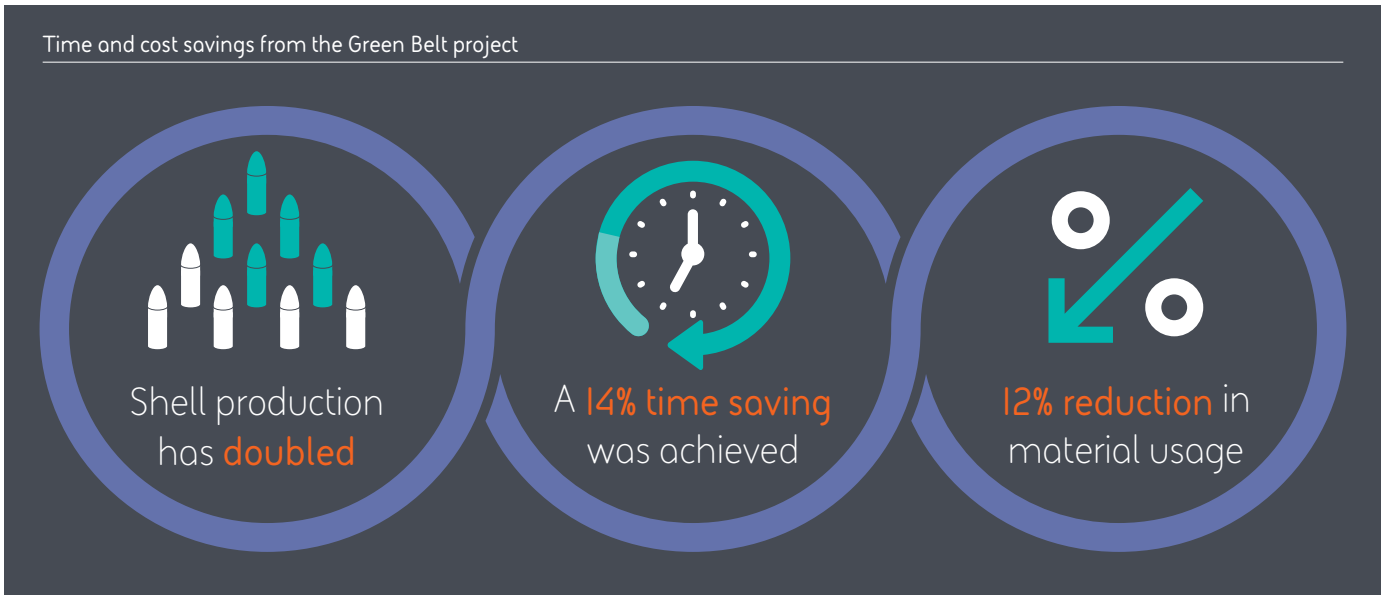
One of the day's main themes was the future of munitions supply. Craig introduced the delegates to Land UK's Next Generation Munitions Solution (NGMS) proposal which outlines how the business would manage the longer term supply of munitions to the UK customer, once the MASS contract finishes in 2022.

Managing Director of our CTAI Joint Venture, Anna Barba, also gave an industry perspective and led a discussion on translating defence plans into capability. Anna offered a unique view from the CTAI business, which produces the revolutionary Cased Telescoped 40mm cannon from Bourges, France.

It's the third year the course has visited Radway Green, which also included a tour of the light munitions manufacturing facility where delegates saw the production of a round from start to finish. It was an excellent opportunity to showcase Land UK's modern production facilities and engage with a wide group of customers and industry.

> We want to make sure our customers can build relationships

Manufacturing efficiency – more Greenbelt success



Land UK's manufacturing engineers continue to scrutinise our machinery and processes, making further improvements to the delivery of our munitions products.

Case study 1: Special machining for warhead components

A group of machines which produce an essential warhead component had been assessed and some obsolete machine parts were identified. To avoid keeping ageing assets, which can increase the frequency and duration of down time, a Green Belt project was launched.

Three new machines were procured which converted a lot of the manual processes to automatic. As a result, shell production has doubled.

This also prompted investigation into optimising the role of our machine operators. A diagram was produced to map the route taken by machine operators during production and from this, the team was able to simplify the route and place assets more logically.

Case study 2: Swarf safety

When manufacturing a shell, long strands of swarf – metal off-cuts – tend to clump together and become difficult to remove thoroughly without causing damage to the shell or wasting time. This specific type of swarf is also very sharp, meaning it can be dangerous to handle.

The Land UK manufacturing team began trialling new tool tips for machining the inside cavity of a shell, which can all produce different types of swarf. After analysis, the chosen tip created smaller chippings which proved far more manageable.

The quality of the shell's internal cavity 'run-out' – where the cutting tool exits the cavity – improved by 25%. A 14% time saving was also achieved and, most importantly, the process is deemed much safer.

Case study 3: CTA end caps

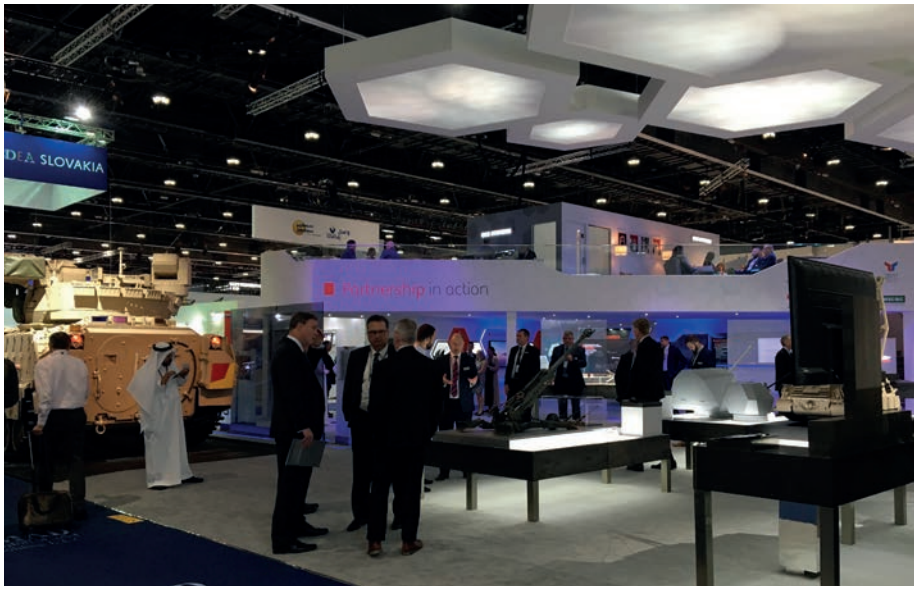
When manufacturing a 40mm Cased Telescoped Ammunition (CTA) round, the billet – the solid piece of metal before it has been shaped – was found to be longer than needed for the cartridge case end caps.

The Land UK manufacturing team conducted a feasibility study into reducing the billet size, to ensure we were buying the exact amount of material needed for the product, and not wasting time machining any excess.

They led a number of trials on the factory floor, and by changing the manufacturing setup, achieved a 12% reduction in material usage.

Both significant cost and time savings were achieved, to be captured in 2019, and opportunities to reduce manufacturing costs with other products are now being investigated.

Land UK exhibits at IDEX 2019



The Land UK Business Development team presented our Cased Telescoped 40mm ammunition (CT40) and Small Arms Ammunition (SAA) to over 100,000 visitors at the 25th biennial International Defence Exhibition (IDEX).

Hosted in Abu Dhabi, IDEX showcases the latest defence developments and technology trends from the Fourth Industrial Revolution and artificial intelligence.

Matthew Foster, Land UK Business Development Director said:

"The show's theme this year was 'Defence for Security and Safety' and for me, quality and innovation are two fundamental pre-requisites to achieve that. With that in mind, Land UK exhibited CT40 and our Small Arms Ammunition amongst BAE Systems' wider land, air and sea solutions.

"Our Cased Telescoped Ammunition demonstrates a complete step-change in power over previous-generation medium calibre weapons; taking up less space, weighing less and being much simpler to maintain and operate.

"With our Small Arms Ammunition, we have been trusted to provide high volumes of precision rounds which soldiers can rely on since 1940. Today, our state of the art manufacturing facility ensures that quality is embedded within every round.

"IDEX was a valuable opportunity to promote these robust and advanced manufacturing capabilities to our key strategic partners and customers in the region; it is always a well-attended event with good customer interaction."

With SAA, we have been trusted to provide high volumes of precision rounds which soldiers can rely on since 1940

3D scanning capability introduced to Telford site

After a third party was regularly used for laser scanning, Land UK has invested in its own 3D laser scanning capability.

The machine has already been used by the Land UK Engineering and Quality teams to determine space allowances in a Challenger 2 Main Battle Tank engine bay. It has been integral to a Pinzgauer upgrade programme, and has also been used for smaller components such as Challenger 2 road wheels and Bulldog gearbox casting.

The Metrascan 750 Elite uses seven lasers to gather data and can achieve an accuracy better than 0.1mm. The state-of-the-art model is relied upon by many industries including automotive and aerospace.

The 3D laser scanner will predominantly be used to develop parts where no Computer Aided Design (CAD) models or engineering drawings exist. This will help with 3D modelling, tooling, jig development and maintenance, repair and overhaul. It will also be used as a quality-inspection tool on supplier products and to ensure manufactured parts conform to designs.

Building careers with ABF The Soldiers' Charity

Since January 2017, BAE Systems' support for ABF The Soldiers' Charity has enhanced the employment opportunities of 72 soldiers and veterans experiencing hardship.

The partnership between The Soldiers' Charity and BAE Systems provides educational and vocational training grants to soldiers and veterans experiencing difficulties finding a civilian career.

Beneficiaries, representing 18 different regiments and corps from across the British Army, have enhanced their long-term employment prospects across a range of industries including construction, welfare and marketing. Grants have funded a range of training courses from rigging and dog grooming, to PRINCE2 Practitioner exams in project management.

One grant recipient commented: "When you're in the deepest, darkest hole and you can't see any way to get up and out, just imagine that somebody's throwing you a rope. The help of The Soldiers' Charity is setting me up for a new career: hopefully a long and happy second career."

Our continued partnership in 2019 will ensure that even more soldiers and veterans have the best opportunity to capitalise on their existing skills and gain sustainable employment for their future.

Grants have funded a range of training courses from rigging and dog grooming, to PRINCE2 Practitioner exams in project management

Maintaining global relationships through Munitions Management and Supply

Komatsu Defense, a long-standing Land UK customer from Japan, has travelled to Washington and Glascoed to discuss future collaboration.

Land UK provides Komatsu Defense, who produce large-calibre munitions, with a number of items to support their manufacturing operations in Japan.

During the visit, delegates received a tour of the facilities, discussed the current range of products Komatsu Defense produce under license for the Japanese MOD, and explored how they would like to expand the business they do with Land UK.

Sean Jones, Munitions Management and Supply Programme Manager, said: "The Munitions Management and Supply team manage the procurement and delivery of products and components to customers, like Komatsu Defense, across the globe. It was fantastic to have face-to-face time with the Japanese team and discuss opportunities in a more tangible way.

"Maintaining and reinvigorating these long-term relationships is essential, and is proving effective as we see an increase in contracts with our other global customers."

Electromagnetic Compatibility trials completed on Land UK's Thermal Imaging (TI) solution

Land UK's solution for the UK MOD's Thermal Imager Sustainment Programme (TISP) on Challenger 2 **reaches the next milestone with the successful completion** of Electromagnetic Compatibility trials.

During the trials, Land UK engineers analysed any electromagnetic interference and checked compatibility between the new TI solution and the vehicle, to ensure other systems such as communications were unaffected. This data was then compared to the electromagnetic signature of the existing TI solution, to ensure the current level of performance had not been compromised.

This latest milestone represents the successful progression of the TISP contract to cost and time. Following the Electromagnetic Compatibility testing, two Challenger 2 vehicles will be handed over to the Armoured Trials and Development Unit at Bovington for User Acceptance Testing and training system compatibility testing.

Once accepted, Land UK Field Support Representatives and Support Engineers will work with the British Army to convert vehicles using the new solution.

This milestone represents the **successful progression of the TISP contract** to cost and time

Lethality improvements to the 81mm mortar bomb

Through extensive design and trial phases, Land UK Heavy Munitions engineers have achieved an equivalent lethality to the current 81mm High Explosive (HE) mortar bomb, **using 10% less explosive filling.**

Land UK engineers based across the country have collaborated to investigate how to increase the lethality of 81mm mortar bombs. The team used new materials and designs to directly control the size of fragments created from the bomb body upon impact.

If the fragment size can be controlled and optimised for the target, it reduces the amount of bomb body material which is lost as dust or as larger, less effective fragments.

Following product development, trials and operational analysis, the team has achieved an equivalent lethality to the current 81mm HE mortar bomb, using 10% less explosive filling, providing improved performance and potential cost savings.

Next stages involve conducting comparison trials between the design variations, before selecting the best one to take forward to development, qualification and manufacture.

Land UK's LOVA propellant trials

The Land UK Heavy Munitions team **conducted a trial to assess LOVA as a potential replacement of conventional Rowanite® propellant** currently used in 120mm tank ammunition charges.

The trial saw the LOVA propellant perform as strongly as conventional Rowanite® propellant based charges and confirmed the value of pursuing LOVA propellant as an alternative.

LOVA, or Low Vulnerability Ammunition, is an insensitive munition, which means it will not detonate when subjected to heating, shrapnel or nearby explosions. It is 'insensitive', making it safer for troops.

Mark Penny, Heavy Munitions Senior Design Engineer based at Land UK's Glascoed facility in South Wales, explained:

"There are several reasons why this development is important. The current 120mm charges we use are coming to the end of their life and will soon need replacing.

"We decided to explore LOVA propellant as an alternative as this comes in stick form, whereas the current propellant, conventional Rowanite®, has a stick-granule configuration.

"This means there's potential for improvements in performance and safety, as well as time and cost to manufacture."

The information gathered during the trial will be used to compare to current performance data and further assess LOVA's viability as an alternative propellant solution.

Radway Green hosts the Indian Navy

A delegation from the Indian Navy has spent time at Land UK's Radway Green small arms manufacturing facility **for pre-delivery inspections.**

Land UK is due to supply the Indian Navy with 5.56mm Ball and 5.56mm Tracer ammunition with potential for further business.

As part of the visit, a member of the Indian High Commission was in attendance and received a tour of the facility as well as a front-row seat at Radway's proofing range where the very rounds being purchased were tested.

The delegation met key members of the Light Munitions team, following which they approved the ammunition for delivery.

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