Project 'MERCURY'

Embracing Digital Twins Lifecycle Management for Complex Weapons

TD-Info Digital Twin Community of Practice
(Asset Tracking Team)

Project 'Mercury' clearly and powerfully illustrates the potential of applying a Digital Twin approach to Complex Weapons, delivering annual savings of £31-42 million in the Air domain alone, with a further £21-28 million achievable across Maritime and Land. It also reduces the time spent on repetitive manual record-keeping and reporting by 30%, equivalent to an annual productivity saving of £2 million.

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TEAM DEFENCE INFORMATION

Table of Contents

1. Executive Summary

Context and Strategic Alignment

The Team Defence Information (TD-Info) Digital Twin Community of Practice has, through extensive collaboration with MOD stakeholders and industry partners, reached a pivotal point in the journey to transform Complex Weapons (CW) lifecycle management. The findings of the Discovery Phase clearly demonstrate alignment with the MOD's strategic priorities, including the new National Armaments Director (NAD) mandate to reform Defence procurement, accelerate capability delivery, and strengthen industrial partnerships.

This initiative sits at the heart of MOD's digital backbone and directly supports strategic outcomes of delivering capability faster, more efficiently, and with greater transparency. By aligning with the ongoing Munition Lifetime Extension (MuLE) programme on general munitions, this project capitalises on proven thinking and ensures scalability from general munitions to CWs. It represents a unique opportunity to establish a Defence-wide blueprint for digital asset lifecycle management.

Financial and Productivity Gains

Project 'MERCURY' embodies a compelling financial case, delivering measurable cost savings while enhancing the flow of critical information across Defence. Named after the Roman God of communication and financial gain, the project symbolises a dual promise: operational effectiveness and prudent stewardship of public resources. Risk-averse assumptions currently lead to premature disposal of CWs, driving avoidable procurement and sustainment costs. By digitising lifecycle management, we estimate annual savings of **£31-42 million** in the Air domain alone, with a further **£21-28 million** achievable across Maritime and Land. Over a 5-10 year horizon, these savings equate to hundreds of millions of pounds in avoidable expenditure. Alongside financial benefits, productivity gains are equally significant. Across four major Explosive Storage Areas (ESA), approximately 150 RAF armourers are engaged in CW management, with 30% of their time consumed by repetitive manual record-keeping and reporting. This equates to an annual productivity cost of around **£2 million**. Automation of these tasks will free skilled personnel to focus on mission-critical activity, improving both morale and retention, as well as overall battle readiness.

Data-Driven Transformation

Perhaps the most transformative aspect lies in the data. Section 6 of the main report demonstrates how automated data capture and digital reporting will provide senior stakeholders with unprecedented visibility of weapon condition, location, and availability. Access to trusted, real-time data will allow evidence-based decision making, improved forecasting, and faster operational readiness. Over time, this dataset will generate unforeseen benefits across manufacturing, sustainment, and wargaming – a true foundation for future Defence innovation.

This approach supports not only current readiness but also long-term strategic resilience. It reduces reliance on risk-averse assumptions, ensuring that every CW delivers its full operational potential while maximising taxpayer value.

Technology and Proven Solutions

Our proposal is grounded in technologies already proven in Defence. Babcock's SharpCloud platform is delivering today at SECRET classification in support of the submarine enterprise. Convert Technologies' MuLE Tags are already developed and trialled in partnership with BAE Systems on general munitions, providing accurate environmental and location data. Together, these provide a secure, resilient, and scalable architecture for CW management.

The Discovery Phase has validated feasibility and scoped options, while a demonstration planned for end of Q1 2026, will allow senior stakeholders to visualise the system in action. This demonstration represents a vital milestone to build confidence and accelerate sign-off.

Stakeholder Readiness and Momentum

One of the strongest indicators of success has been the enthusiasm of front-line RAF armament teams, who see immediate value in reducing their manual burden. Coal-face acceptance of this nature is limited within MOD programmes and provides a solid foundation for wider adoption. Substantial work has already been invested (253 man-days) by the Discovery Team to reach this point, underlining both momentum and commitment. This initiative aligns directly with MOD Capability Centres and sits at the core of the strategic imperative to 'do stuff faster'. It also supports wider MOD strategic outcomes, including improved platform availability, through-life asset management, and reduced material waste.

Strategic Imperative – Seizing the Opportunity

The cost of doing nothing is high. Current manual processes erode capability, drive unnecessary procurement, and place unsustainable burdens on highly trained personnel. Without change, Defence risks missing a once-in-a-generation opportunity to modernise weapons management.

The choice is clear: continue with inefficient legacy systems or seize this moment to grasp the nettle and deliver a transformative solution. The proposed Digital Twin approach is low-risk, high-return, and entirely consistent with MOD strategic direction. It provides an evidence-based blueprint that can be extended beyond the RAF to Maritime, Land, and other asset classes. We believe the case is compelling. This initiative delivers measurable financial savings, unlocks productivity, enhances readiness, and ensures Defence is prepared for the challenges of tomorrow. The time to act is now.

2. Anticipated Impacts of Implementation

The solution proposed in Section 5 will deliver substantial and far-reaching benefits across four key areas: financial savings, resource optimisation, stakeholder productivity, and strategic impact. Together, these outcomes present a compelling case for investment in a digital, data-driven approach to managing the lifecycle of CWs.

2.1 Financial Benefits

Defence expenditure on CWs is significant, with an average annual spend of **£647 million** over the past seven years, including forecasts through to 2025/26. Of this, **£388 million** relates to Air CWs, covering development, procurement, and support. Based on reasonable assumptions, average annual procurement costs are **£194 million**, with a further **£15 million** spent annually on operating costs.

Currently, risk-averse assumptions around SLED result in premature downgrading or disposal of assets. By introducing a Digital Twin solution that accurately reflects the true condition of each weapon, it is estimated that procurement and operating costs could be reduced by **15-20%**. This translates to an annual saving of **£31-42 million,** ongoing in the Air domain alone.

With increased CW investment anticipated under the Strategic Defence Review (SDR), the scale of these savings will only grow. Over time, this represents not only a significant reduction in avoidable expenditure but also a reinvestment opportunity to strengthen frontline capabilities.

Reference: Parallel Parliament 1, **Reference:** Parallel Parliament 2

2.2 RAF Armament Resources

Across the RAF, four key ESAs - Marham, Brize Norton, Lossiemouth, and Coningsby employ approximately **150 armament staff**. Analysis shows that **30% of their time** is currently consumed by manual, repetitive tasks such as record-keeping and physical inspections, representing an annual staff cost of around **£2 million**, ongoing.

A digitised solution would eliminate much of this inefficiency, freeing skilled personnel capacity for higher-value activities such as:

- **Enhanced staff retention**, by reducing frustration from repetitive manual work.
- **Improved Suitably Qualified and Experienced Personnel (SQEP)** numbers, strengthening technical expertise.
- **Cross-service training and skills transfer**, supporting Land and Maritime as well as operational RAF squadrons.
- **Faster overseas deployment**, with a projected reduction in preparation time of **20-30%**, ensuring CWs are operationally ready sooner and contributing directly to greater lethality in theatre.

2.3 Senior Stakeholder Operational Teams (WISM, DTs, RAF HQ Specialist Support)

Although direct engagement with these groups has not yet occurred within the Discovery Phase, their involvement will be a priority during the Elaboration Phase (see Section 7). Based on their roles and interfaces with armament teams, it is anticipated that access to real-time digital data will unlock significant productivity gains. Improved visibility of asset condition, utilisation, and location will allow these teams to shift from reactive to proactive management, streamlining workflows and decision-making across the MOD.

2.4 Wider MOD Stakeholders (NAD and Director of Strategic Programmes)

The digitisation of the CW and munitions landscape represents a transformative opportunity for Defence. Automated data capture will create a rich dataset describing the true life, condition, and exposure of every asset, from manufacture to deployment. This information, available on demand, will:

- **Increase battlefield lethality**, by ensuring weapons are available, reliable, and optimised for use.
- **Inform supply chain and manufacturing planning**, maximising availability at optimal cost levels.
- **Enhance productivity across all personnel** engaged in CW and munitions management.
- **Generate additional, unforeseen benefits** as the value of this unique dataset is realised over time.

The blueprint created for Air CWs can be scaled to Maritime and Land domains. Based on comparable assumptions, the combined potential annual savings across Maritime and Land CWs are estimated at **£21-28 million**. Beyond CWs, the same approach could be applied to any Defence asset requiring lifetime monitoring and reporting.

Summary

The case for action is compelling. A Digital Twin solution for CWs will not only deliver tangible financial savings but will also improve asset availability, personnel productivity, and combat effectiveness across Defence. By embracing digital lifecycle management, MOD will gain a decisive operational edge while demonstrating prudent stewardship of public resources.

Executive Impact Matrix: Benefits of a Digital Twin for Complex Weapons

Impact Area	Current Challenge	Benefit from Digital Twin Solution	Estimated Value / Outcome
Financial	Risk-averse SLED assumptions drive premature disposal and unnecessary procurement.	Accurate, data-driven lifing decisions reduce wastage and extend asset life.	£31-42m annual savings in Air CWs; £21-28m annual savings across Maritime and Land. Growing savings as SDR investment rises.
People and Resources	30% of 150 RAF armoury staff tied up in repetitive manual tasks (~£2m annual productivity cost). High staff turnover and slow training.	Automation of tracking and reporting eliminates low-value tasks, improves retention, increases SQEP capacity, and accelerates training.	20-30% faster overseas deployment; stronger workforce resilience and morale.
Operational Effectiveness	Manual processes delay deployment readiness; limited visibility of weapon condition.	Real-time data on weapon health and location enables faster, assured deployment and increased in-theatre lethality.	CWs ready and effective sooner, improving mission assurance and combat effectiveness.
Strategic / MOD-Wide	Fragmented, manual reporting and isolated pilots; no common digital backbone.	Enterprise-wide digital architecture, aligned with NAD and DE&S 2025 strategy, enabling scalable roll-out across Air, Maritime, and Land.	Integration with MOD digital backbone; blueprint for broader asset lifecycle management.

Key Takeaway

A Digital Twin solution for Complex Weapons will deliver measurable savings, unlock productivity, and provide a step-change in operational readiness. It is a scalable, future-proof approach that aligns directly with MOD's digital transformation strategy and the goals of the National Armaments Director.

TD-Info Digital Twin (Asset Tracking Team) - 15th September 2025.