

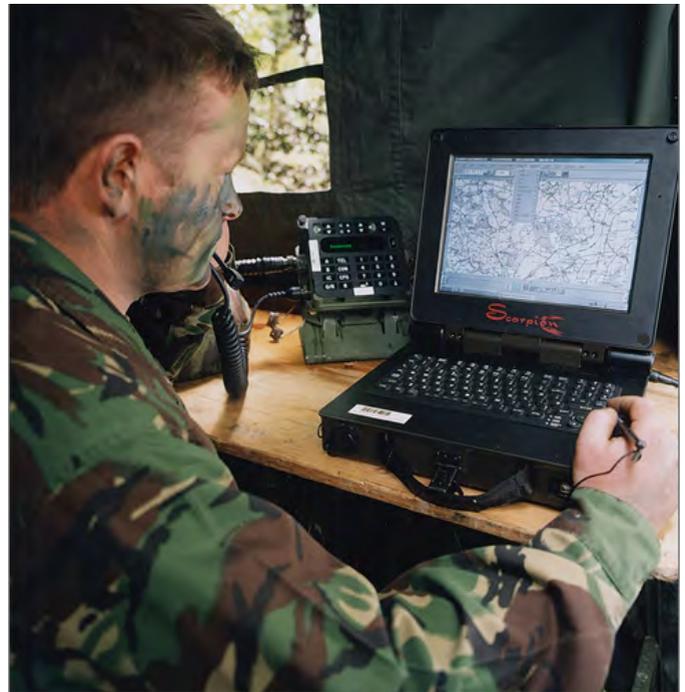
# Drawing Lessons From Years of Experience To Support The Evolution Of Land Tactical Systems

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For nearly 20 years, Leonardo DRS (DRS) has been involved in delivering cutting edge Tactical Computing and Networking solutions to customers around the globe. This rich heritage can be traced back to the inception of the UK Bowman project where DRS competed for and won a substantial contract for the vehicle-based tactical workstations in 2002. Key to the success of the programme was the high degree of commonality between the three different workstation variants: VUDT (Vehicle User Data Terminal), BMDT (Bowman Management Data Terminal), and PBPU (PBISA Processing Unit), leading to economies of scale and making software and through-life support economic and effective. This initial modular and upgradeable approach proved to have long-term benefits to not only Leonardo DRS, but also to the U.K. Ministry of Defence (MoD).

Leonardo DRS provided more than 14,000 tactical user data terminals to General Dynamics UK (GD UK) for the initial Bowman implementation. The User Data Terminals (UDTs) are installed in all tactical vehicles, wheeled, and tracked, with the BMDT and VUDT (now referred to as CT1 and CT2) being dismountable for use within command posts or autonomously off the vehicle platform.

Leveraging Leonardo DRS' position as the major supplier of tactical computing to the U.S. Army has been a core strategy of ours over several years. When we had the opportunity to re-compete for the Bowman UDTs in 2008, we took the approach that upgrading the delivered systems was the most competitive and impactful way to



*BOWMAN in the field, 2002*

provide the enhanced capability that the British Army required.

Key to this strategy was the high degree of re-use that could be made of vehicle infrastructure, including cabling and installation kits, which represented a significant savings to the customer. In winning the re-compete BCIP5.4/5.5 Bowman contract in 2008, we were able to draw together the product development roadmaps for both the US and UK Armies. We did so by leveraging technology drawn from the US Army Force XXI Battle Command Brigade and Below (FBCB2) contract that Leonardo DRS had won and delivered to the U.S. Army at the time.

## U.S. AND U.K. ALIGNMENT

In 2016, we were once again presented with an opportunity to compete for the next spiral of Bowman technology insertion in the form of Bowman 5.6. This was a key phase of development as 5.6 would provide the tactical computing infrastructure for a more open system as part of the evolution to the U.K. Morpheus program.

Maintaining our incumbent position on Bowman was, and is, of great importance to Leonardo DRS and the Bowman 5.6 project provided another opportunity to deliver a value-for-money solution (built on the principles discussed above). Leonardo DRS was pleased to be awarded the 5.6 contract continuing the highly successful partnership developed with both GD UK and the British Army.

On this occasion, we were able to exploit the U.S. Army Mounted Family of Computer Systems (MFoCS) contract that we had originally won in 2013, and again in 2018, in the form of MFoCS II. The U.S. Army MFoCS effectively replaced FBCB2 so this was a natural progression and once more allowed Leonardo DRS to align the primary U.S. and U.K. brigade and below C4I projects by providing a solution, which had a high degree of commonality across both programmes.

It also ensured that Leonardo DRS continued to deliver the benefits of ongoing technology insertion, underlying capability development and enhancement to both projects based on a significant degree of commonality in terms of the core computing, display, networking, and security architecture.

## NO COMPROMISE

Leonardo DRS' ultra-rugged tactical computers are designed to allow for ongoing technology insertion and upgrade. Over the course of a project the size of Bowman and MFoCS, we were able to use the same basic infrastructure to deliver ever-increasing amounts of capability as computing technology advanced. The Intel™ Core 2 Duo systems delivered back in 2002 have now been upgraded through two spirals to new Intel multi-core technology, maintaining legacy I/O and introducing new interfaces for future expansion. The ability to use the current infrastructure and upgrade the current systems is more cost-effective than buying lower-grade, rugged COTS systems and ensures that there is no compromise regarding the environmental performance of the system. Modern Battle Management Systems (BMS) are mission-critical, and Leonardo DRS believes that there should be no compromise in their ability to perform in the harshest of conditions.

Today, Leonardo DRS's tactical computing & networking products is the choice of wide range of demanding end-users ranging around the world.

Our systems are installed and operational in over 300,000 ground vehicles and command posts to-date and are delivering unparalleled performance in terms of reliability, availability, and resilience. In addition to the U.S. and U.K. installed bases, end-users in the Middle East, Europe, South East Asia, Australia, and Taiwan have all adopted a wide range of DRS products to build their tactical C4/5i systems and solutions.

As the nature of Land Tactical C4/5i architectures change so our hardware and software continue to evolve to meet new and emerging requirements.

## **EMERGING CAPABILITIES**

As a major Intel partner, Leonardo DRS is participating in Intel's Early Access Programme (EAP) for the 11th Generation Core Processing technology and is currently engaged in the development of computer mainboard's that provide a step function enhancement in both CPU and GPU performance. This leap in CPU (x4 improvement in core CPU Passmark benchmark) and graphics (x8) performance is essential to supporting fast emerging BMS, Enhanced Situational Awareness (ESA), and related graphics intensive tactical applications. New higher speed GbE interfaces are also being introduced which are better suited to handling high bandwidth video interfaces such as those found on OO-82 compatible cameras and video feeds. These significant CPU, GPU, and I/O enhancements are at the heart of Leonardo DRS's next generation tactical computing platforms.

These new enhanced computing platforms continue to be married with the Leonardo DRS suite of agnostic networking, communications, and platform management software such as the Voice Cross-banding, remote radio management and associated voice comms capabilities of our digital vehicle intercom system (VIS).

To continue, Leonardo DRS is also driving innovation and enhancing capabilities in the areas of Assured Position, Navigation and Timing (APNT) and Cybersecurity.

## **Leonardo DRS AC<sup>2</sup>ES Embedded APNT**

The Leonardo DRS modular and scalable APNT Converged Computer - Embedded & Scalable (AC<sup>2</sup>ES) solution can be readily integrated within widely used DRS Tactical Systems such as the Data Distribution Unit (DDU) and offers users with the ability to continue operations in GPS degraded environments.

AC<sup>2</sup>ES provides APNT capability by augmenting standard military GPS PNT source with technologies such as anti-jam, anti-spoof, M-code receivers, vehicle IR sensor vision navigation, wheel rotation, and inertial measurement units. A fusion engine merges and prioritizes all PNT sensor data to provide a reliable, GPS-denied navigation solution during real world jamming and spoofing attacks. AC<sup>2</sup>ES can operate standalone, or while hosting the vehicle's BMS and can be easily controlled via its GUI.

## **Cybersecurity**

Leonardo DRS has been at the forefront of building and delivering cyber secure tactical systems since 2007. In addition to attacks targeting operating system vulnerabilities, modern threats are aggressively targeting BIOS and firmware subsystems within the computers themselves. Successful exploits at this level are extremely difficult to detect and nearly impossible to remove. Establishment of a Hardware Root of Trust (HROT) and implementation of Transitive Trust Chains

are key technologies for protecting against these threats. In 2007, Leonardo DRS began embedment and provisioning of Trusted Platform Modules (TPMs) in fleet-base tactical computers. Since then, Leonardo DRS has continued to develop and expand its use of this technology and is now considered an industry leader in embedded cybersecurity. In 2011, Leonardo DRS began development of a dedicated secure TPM Provisioning Room containing the TPM Provisioning Server and the associated Hardware Security Module (HSM). This Server - Client provisioning system has become the cornerstone for verifying integrity, mitigating supply chain risks, and provisioning of tactical computers in a high volume-manufacturing environment. These technologies are critical for establishing a HRoT that can then be used as the basis for making integrity measurements of the computer's subsystems.

Leonardo DRS is in a unique position. We have derived a great deal of experience in delivering tactical systems content into the

two largest BMS/C4I projects conceived in the form of FBCB2 evolving to MFoCS in the US and Bowman evolving to Morpheus in the UK. We have built on this position by working closely with many other international customers such as the Australian ADF and UAE GHQ.

This experience has provided us with a wealth of knowledge and capability that goes into everything we do. The development of new tactical computing platforms based on next generation 11 Intel technology, network agnostic software services coupled with innovative technologies such as AC<sup>2</sup>ES and robust cybersecure solutions continues to make Leonardo DRS the natural partner for today's tactical system implementations.

Visit Leonardo DRS at DSEi in Hall 7, booth number 410 or at [LeonardoDRS.com/platform-computing](http://LeonardoDRS.com/platform-computing).

