



● ● Emlyn Taylor, Managing Director of Lockheed Martin UK System Solutions

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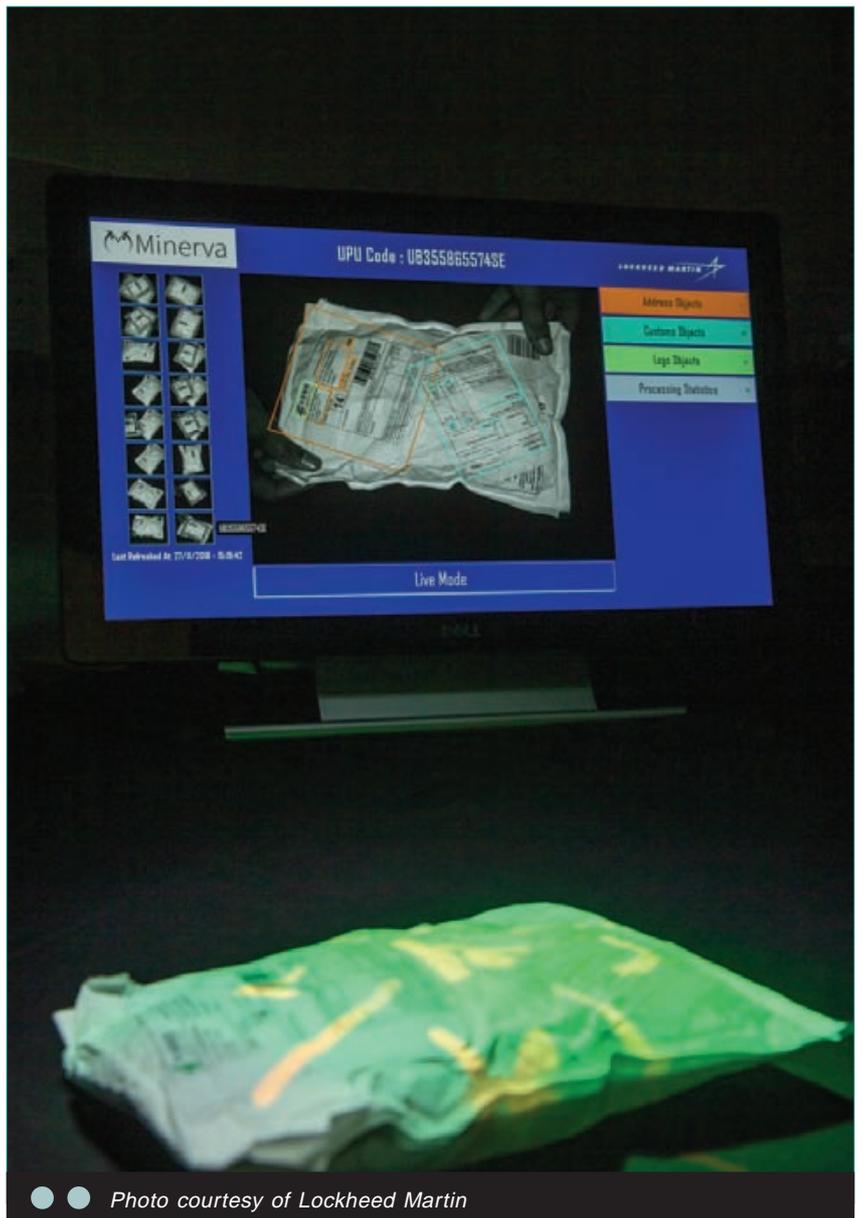
## Q&A

## Machine learning in the military ● ●

Lockheed Martin is a global security and aerospace company primarily concerned with research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services. With technologies becoming increasingly advanced, it's critical that companies like Lockheed Martin stay one step ahead of the game. Emlyn Taylor, Managing Director of Lockheed Martin UK System Solutions, comments on the roll-out of machine learning software throughout the government and military sectors.

**Question: Machine learning is playing an increasingly important role among a variety of sectors today. What can you tell us about its potential for battlefield applications?**

**Emlyn Taylor:** Advancements in technology products and Internet of Things (IoT) applications are rapidly changing the battlefield. It is transforming the military's ability to perform reconnaissance missions and quickly analyse mission critical data to gain a competitive edge. As military operations become increasingly reliant on technology, these applications will generate a significant amount of data that will need to be evaluated and analysed to help soldiers and support personnel make decisions based on real-time and historical data.



● ● Photo courtesy of Lockheed Martin

Lockheed Martin's Minerva technology allows the armed forces to identify the most remote and innocuous enemy positions, using Unmanned Aerial Vehicles (UAV), usually unnoticed by even the most highly-trained human eye. Images are captured by a UAV are then analysed by Minerva's image analytics capability which pinpoints potential threats in the environment. The type of each threat, along with their geographical location, is highlighted to the user in real time, offering enhanced levels of situational awareness and an increase in the tempo of operations.

**Question: The British Army is currently trialling Minerva, a machine learning-based software for reconnaissance and battlefield monitoring. What can you tell us about previous applications of this technology?**

**Emlyn Taylor:** The Minerva technology is used globally across several industry sectors. Perhaps most surprisingly is the use of the technology as an important catalyst in the postal industry. Lockheed Martin has over 40 years of experience working together with postal and logistics operators around the world.

The exponential growth in e-commerce activity over the last decade has had a significant impact on the postal and shipping industry. Lockheed Martin's Minerva technology applies integrated artificial intelligence to provide a more effective recognition performance for e-commerce packages. The technology is used by postal operators to identify key information on letters/packages including postal address and customs

information to ensure packages are delivered in a timely and accurate fashion. Minerva also improves the process of an increasingly diverse and complex mail stream which has posed problems for mail systems around the world.

Additionally, Minerva has also been utilised for civilian applications to conduct search and rescue activities on behalf of Trials conducted by the Royal National Lifeboat Institution (RNLI). Recent RNLI Trials used the image analytics capability of the Minerva technology to analyse and identify key objects such as boats, buoys and people in seas around the coasts of the United Kingdom. Once the specific locations for these objects are identified, the information is relayed back in real-time to provide critical information, reducing the time it takes for the emergency services to reach people in danger.

**Question: How will the Minerva technology be adapted for the British Army?**

**Emlyn Taylor:** Adapted from Minerva, Lockheed Martin's LARES technology will aid the British Army at the front line of battle. Exploiting real time video from UAVs, LARES analyses the battlefield to provide a clear risk assessment, highlighting enemy positions and other potential dangers. Using the images produced by the UAVs, LARES uses a complex mix of artificial intelligence, image analytics and machine learning to carry out a detailed evaluation of the landscape to detect multiple threats to life on the battlefield. LARES allows for a faster and more



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efficient and effective analysis of the battlefield, whilst the complementary use of UAVs ensures that our troops are able to achieve visibility of the battlefield from safer, stand-off, positions. All LARES missions are archived and can be replayed at a later time - this technology capability provides an additional source of intel for military support personnel which helps to inform strategic decisions. The reconnaissance capability of Minerva is another example of how Lockheed Martin is supporting the UK military and creating a safer environment on the battlefield.

**Question: What other applications could technologies like Minerva address in the government and military spheres?**

**Emlyn Taylor:** Minerva goes beyond battlefield applications and can have a profound effect on the military. In any environment where specialist human resources are scarce and relied upon in the most high-pressured conditions, machine learning technology can play a critical support role. Industries which require analysts to review data to identify changes and patterns to make important decisions, Minerva can provide a competitive advantage. For example, in Intelligence Surveillance & Reconnaissance (ISR) operations where highly skilled analysts review sensor data or terrain imagery from satellites or airborne assets for extended periods of time, the Minerva technology can learn to become that all seeing, never tiring, analyst. The technology is frequently used for monitoring CCTV or live streaming.

**Question: We understand that machine learning is expected to make a big impact on the future of emergency services across the world. Could you outline how?**

**Emlyn Taylor:** Machine learning has allowed emergency services to improve their humanitarian response times and

create a more strategic approach to the issues they face. This is mostly used by emergency services such as the fire brigade. For example, during brush fires in Western Australia, ground firefighters relied heavily on information about their terrain when tackling fires. They can use manned aircraft during daylight hours to provide aerial information however, this becomes more difficult during night hours. This leaves a gap in aerial information. To address this issue, the fire brigade utilised the image analytics capability of the Unmanned Aerial System (UAS) to enable firefighters to maximise the effectiveness of night time operations. Indago streamed live video from its thermal sensor to operators on the ground who used this data to identify fire hot spots, fire location and intensity. This provided valuable intel for fire fighters to use and as result Indago was estimated to save an estimated 100 homes, worth more than \$50 million, demonstrating the potential of this technology across multiple applications.

**Question: What are the challenges associated with rolling out machine learning software throughout different sectors, and how might they be addressed?**

**Emlyn Taylor:** The major scepticism surrounding the increased use in machine learning software in multiple sectors is the inertia that surrounds it. Not much is known about how this technology works, what its purpose is and its capability across multiple sectors. This is most pertinent for the defence sector. Words such as machine learning, artificial intelligence and image analytics in a military context create more anxiety amongst the public and policy makers. Issues such as security of imagery and automated decision making are ongoing sources of significant discussion by policy makers. We believe that it's our role to continuously demonstrate the multiple applications of machine learning, its safe and moral use, and its potential to drive greater efficiencies in industry sectors. **GMC**



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