Ministry of Defence de&s

SUSTAINABILITY ISSUE 160 | DECEMBER 2021

# DESIDER

AN INSIDE LOOK INTO LIFE AT **DEFENCE EQUIPMENT & SUPPORT**

## A CLIMATE-CONSCIOUS DEFENCE | SUSTAINABLE SOLUTIONS | ENVIRONMENTAL STRATEGY LAUNCHED

Proudly delivering for the UK's Armed Forces

# In this issue






*Cover: the Zephyr, Unmanned Aerial Vehicle (UAV) Crown copyright*



# Foreword

**BY SIR SIMON BOLLOM**

**Global focus has recently been on the environment, climate change and sustainability, with COP26 highlighting that these issues are of the highest priority and that major and immediate action needs to be taken.**

It is evident that we need to re-evaluate the relationship we have with the natural environment; to fully respect and protect it today in order to preserve and restore it for future generations. DE&S has a role to play here in terms of our estate, the way we work and the equipment we procure.

The Defence Command Paper, released earlier this year, highlighted the global challenge that climate change and biodiversity loss represents. With the potential to increase global instability, threaten global security, and require our armed forces operating in more extreme environments, we are required to anticipate and address these threats.

The new DE&S Environmental Strategy sets out how DE&S will positively champion environmental protection and environmental sustainability in everything we do, through the dedication and professionalism of our people, underpinned by strong leadership and culture.

DE&S is fully committed to playing our part in achieving net zero carbon emissions and environmental sustainability. The environmental targets set out in the DE&S Strategy 2025 and our new Environmental Strategy outlines how we will play our part in meeting Defence's strategic 2050 ambition.

Ultimately, the UK will be stronger and safer with a climate-prepared and adapted armed forces. It is important that we continue to lean into our partnerships and work alongside our allies to achieve a climate-ready Defence.

Last month, I was able to meet my NATO and Industry colleagues face-to-face in Washington, Brussels and Rome. Our role and our standing in NATO and the EU remains strong and these engagements gave us the opportunity to review our many collaborative programmes and future opportunities ahead. There is a strong desire to collaborate with the UK on military and procurement matters and our allies expect us to continue to lead the way in many areas. My impression has been that EU exit has heightened awareness of these critical defence relationships – positively - and there are opportunities to deepen and broaden our collaboration.

Moving to a people theme and hearty congratulations to both Eluned Lewis and Holli Kimble who were finalists at the esteemed Women in Defence Awards - an annual celebration of the fantastic work and value women bring to the defence enterprise. It is hugely satisfying to see both Eluned and Holli recognised, with Holli ultimately winning the Inspirational Award – a brilliant achievement by both. Well done.

And finally, as 2021 comes to a close, I would like to say thank you to everyone across DE&S and Defence for the way you have responded to the varied challenges over the course of the year and for playing such a critical role in the delivery of government priorities. While most of the 'shock impact' of COVID was felt in 2020, 2021 was the year that we had to figure out how to cope with an extended period of lock down and restrictions, the realities of post-EU Exit Britain the impact on our supply chains and adapt to this as a new norm. Our people have been flexible and responsive and taken to 'smart working' readily – this is not only about working from home, this is also about adapting to the new workspace in the office, warehouse or repair facility. The work of DE&S is vital to our nation and I am proud to be leading such an important organisation.

SENIOR LEADER COMMENT

# DE&S Director Engineering & Safety, Stephen Wilcock

## Talks to Desider about DE&S' role in meeting the Government's commitments to achieve net zero

**While climate change has long been seen as a 'tomorrow' problem, we are all seeing the creeping effects on the weather, glaciers and our environment, with the data now increasingly irrefutable. In the words of President Biden, "The climate crisis is here".**

The UK hosted the 26th UN Climate Change Conference of the Parties (COP26) in Glasgow that brought leaders and environment experts together to accelerate action towards the goals of the Paris Agreement and the UN Framework Convention on Climate Change. The conference was tabled as a pivotal opportunity for the world to agree on the substantial actions and pace needed to limit global temperature increase to less than 1.5 degrees by accelerating the phase out of coal, curtailing deforestation, accelerating the switch to electric vehicles and encouraging investment in renewables.

As the MOD accounts for 50% of all government department emissions, we at DE&S have a major role to play as the supplier and supporter of the UK's defence equipment in helping meet the Government's commitments to achieve net zero by 2050. This is an immense challenge that we will meet by reducing our own carbon footprint and by rapidly adopting low carbon technology that is being developed in the commercial sector for our defence equipment.

Climate change has the potential to increase global instability and threaten global security through increased competition over resources, migration, economic destruction and civil unrest to name just a few possibilities. This will place additional demands on our armed forces and on the use of their equipment in the more extreme climatic conditions that are now inevitable.

In our DE&S Strategy 2025, we committed to having net zero operations and infrastructure carbon emissions across all of our sites by 2040 and enable defence to achieve net zero defence equipment emissions by 2050. Our new Environment Strategy will set out how we are going to achieve these commitments, how we will improve our sustainability and how we will reduce our environmental impact. Three work strands will map out our journey and the targets we need to achieve. Firstly, we will reduce our carbon footprint. Secondly, we will transition to the generation and use of renewable energy across the majority of our sites. And thirdly, we will invest in carbon offsets that will contribute to the wider challenge the MOD is tackling. As well as focusing on our own actions, we are working with our supply chains, industry and clients to increase sustainability and decrease emissions throughout every aspect of delivery and support. Every one of us has a role to play and every positive change we can make in our work or home lives, large or small, will help.

While we all talk about "lower emissions" and "reducing our footprint", there is an inference that we will be eroding capability. On the contrary, our armed forces and DE&S see this as an opportunity to enhance our capability, to increase resilience, and to speed up our acquisition processes. This will be done by adopting rapidly evolving commercial technology and embracing different ways of delivering the capability our armed forces will need. Net zero and environmental sustainability offers substantial opportunities to enhance operational resilience, independence, and capability. While we need to fund our equipment programme, we will increasingly take a whole life approach to our equipment and infrastructure decisions to secure the necessary environmental improvements and in the process, we will help to deliver social value through cleaner air and water, and larger, healthier habitats we can all enjoy. By thinking environmentally, acting sustainably, and delivering innovatively, we will make a positive difference to the armed forces, our environment and society.

Our intent is to involve everyone in DE&S. We are investing in communications around our environment initiatives and in the way we empower our people to demand and implement changes that are needed in every aspect of our lives.

Net zero and environmental sustainability offers substantial opportunities to enhance operational resilience, independence, and capability

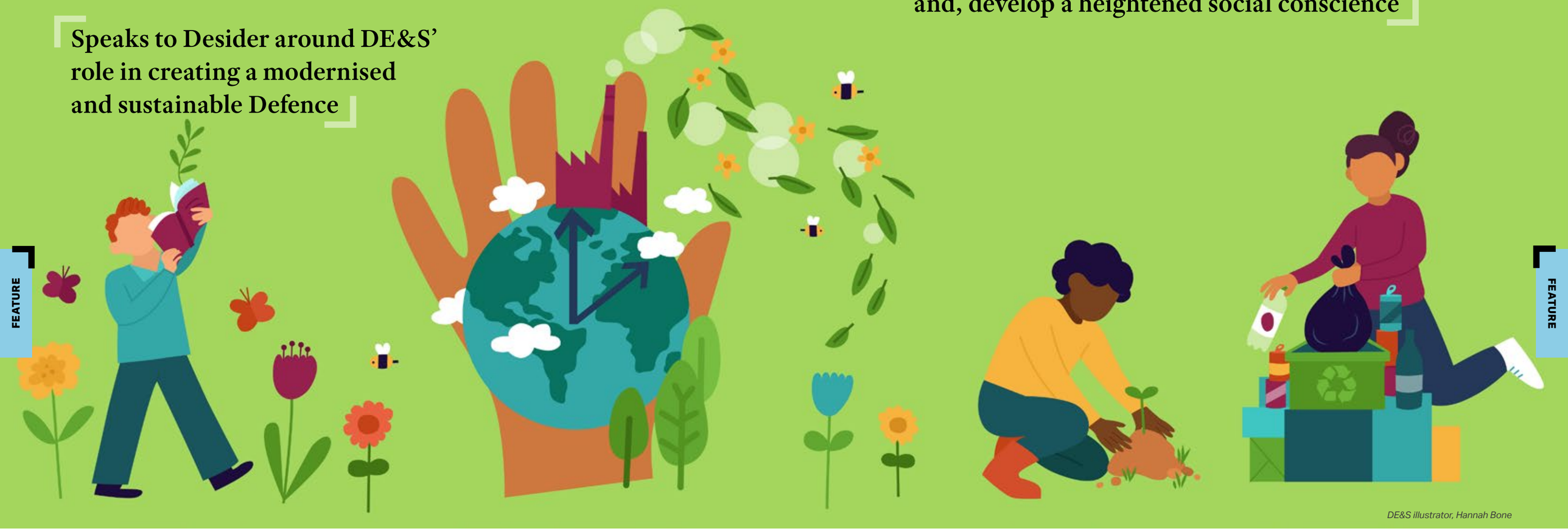
SENIOR LEADER COMMENT

FEATURE

# DE&S Non-executive Director and Strategy and Sustainability consultant Claire Hawkings

Speaks to Desider around DE&S' role in creating a modernised and sustainable Defence

Sustainability-minded organisations are often highly collaborative, more open-minded, inclusive and, develop a heightened social conscience



*DE&S illustrator, Hannah Bone*

**To modernise and create a sustainable Defence it's crucial that DE&S develops its own sustainability strategy and uses its influence in the wider Defence community.** As a fundamental party in the defence sector, DE&S must align to UK government Net Zero through the delivery of equipment and support. When driving a reduction in its own carbon footprint and supporting the military in its endeavour to reduce carbon, traditional mindsets will need to be challenged and new approaches developed.

DE&S have a major role to play in evolving the Defence landscape sustainably and the MOD's publication in March of its road-map to becoming more resilient and sustainable is a first great step. These strategies and plans need to be further developed in detail and become part of a different way of working as executing business with sustainability considerations needs to be embedded in decision making.

Carbon offset will no doubt be necessary to achieve Net Zero initially, but this should not be relied on as the pathway to net zero. Relentless focus should be on elimination and reduction of carbon emissions. DE&S – like any business – needs to understand its climate impact and develop a reduction plan.

As we have seen at COP26, Government and businesses globally are signing up to net zero and are committing to targets, and greater transparency of climate reporting. Understanding the impact of climate change, be it physical, societal or regulatory is fundamental to these commitments and to making positive changes. As a part if its work on climate impact, DE&S will need to consider climate resilience and actions that need to be taken to prepare for the impacts of climate change and be thoughtful and transparent in its reporting.

It's true that some actions will be significantly easier than others. For example, switching to renewable energy suppliers for some sites may be straightforward, whereas options for low carbon fuels for some of the major equipment may not be technologically possible for some time.

Biodiversity is also increasingly recognised as fundamental in the fight against global warming and the loss of biodiversity over recent decades will have far reaching consequences. Not least given the estate ownership of DE&S, there is responsibility to understand biodiversity and enhance, protect, and value the importance of biodiversity.

Defence will need to be implementing and evolving its sustainability ambitions plans now as a fundamental part of strategic delivery. To ensure focus and improved performance, like safety, sustainable solutions should be integrated and embedded into business performance processes, and not managed as a "side project".

Key to making a meaningful, long-term impact is promoting a sustainably-minded culture. There is a collective responsibility - we all need to play our part. As individuals, our personal impact is clearly not on the scale of impact as big organisations, but every bit counts, and a shift in mindset will flow through to how we think about challenges at work and decisions we make about our work place and the projects we work on.

Sustainability comprises a broad range of issues, and this can be hugely positive as we are all are motivated and passionate about different issues. This breadth of interest can be hugely impactful – especially when trying to address the scale and complexity of the challenges inherent in sustainability and specifically, climate change.

In my experience, sustainability-minded organisations are often highly collaborative, more open-minded, inclusive and, develop a heightened social conscience. Several of these attributes are already explicitly stated in DE&S' values which is a fantastic starting point and good foundation for developing an organisation with bold sustainability ambitions.

FEATURE

# DE&S launches new Environmental Strategy

**The recently launched DE&S Environmental Strategy describes DE&S' vision: to be an organisation with engrained sustainable behaviours that instinctively delivers sustainable solutions.**

By achieving this vision, it will enable DE&S to offer Front-Line Commands enhanced capabilities by adopting rapidly evolving commercial technology and embracing different ways of delivering the capability the UK's armed forces need.

The newly launched strategy outlines how DE&S will reduce its environmental footprint, adapt to climate change, safeguard the environment, and achieve financial and efficiency savings. It also highlights how DE&S' operations and infrastructure will be efficient and sustainable, supporting cost effective delivery, environmental protection, and staff wellbeing.

In support of the MOD Climate Change and sustainability strategic approach, DE&S' environment strategy describes how DE&S will positively champion environmental protection and environmental sustainability through the dedication and professionalism of DE&S people, underpinned by strong leadership and culture.

John Allan, DE&S Head of Quality, Safety and Environmental Protection, said: "Our new Environmental Strategy is something, I believe, that will make a big difference – not only to DE&S but to the wider Defence community and society. We have set specific, realistic but challenging targets and deadlines to meet, and we can only achieve them by working together. I'm looking forward to helping make our industry more sustainable, while taking the opportunities and innovations that approach brings to enhance the capability and support for our armed forces."

The strategic goals include improving DE&S' environmental culture and sustainable behaviours, achieving ISO 14001 (an internationally agreed standard that sets out the requirements for an environmental management system), exceeding the Greening Government Commitments, and ensuring DE&S people have the training, skills, knowledge, and resources necessary to contribute to making the organisation more sustainable.

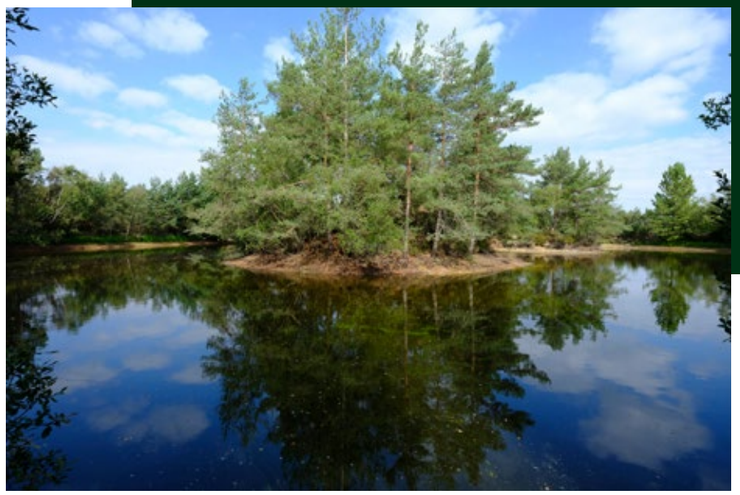
The operational and infrastructure goals include DE&S' net zero objectives, which are stated in the DE&S Strategy 2025: "DE&S will achieve net zero greenhouse gas emissions across our operations and infrastructure by 2040" and "DE&S will use our carbon negative estate to offset the residual carbon footprint from equipment by 2050". Examples of the operational and infrastructure focused goals also include transitioning DE&S' existing estate to sustainable utilities and building management practices, protecting and enhancing habitats and biodiversity across estates and facilitating the reduction of transportation emissions and the transition to sustainable transport across the organisation.

Support and acquisition focused goals include DE&S working with partners to set out a shared ambition for environmental protection and sustainability commitments. DE&S will work closely with its clients, recognising that a shared ambition will allow DE&S to effectively respond to clients' environmental protection and sustainability priorities through clear and tangible requirements. This shared ambition will set the foundation for all acquisition activities and will become part of the delivery success criteria. For support and procurement arrangements, DE&S will work with suppliers to encourage sustainable behaviours and ensure proactive environmental management practices are integrated.

Through the new DE&S Environmental Strategy, DE&S will create long term value for DE&S clients, partners, DE&S people, the public and the environment.

> DE&S will use our carbon negative estate to offset the residual carbon footprint from equipment by 2050

> DE&S will achieve net zero greenhouse gas emissions across our operations and infrastructure by 2040



# Path to net zero

## Today

Exceeding the Greening Government Commitments 2021 – 2025

## 2025

Completing our net zero pilot site by 2025


Endeavouring to achieve our stretch objective of net negative emissions across our operations and infrastructure by 2035

## 2035

## 2030

Being 'carbon capture ready' by 2030, to achieve 100Kt carbon sequestration by 2040, equivalent to 600,000 trees


Reduce our buildings' energy use by 50% by 2032

## 2032

70MW of renewable energy generation capacity by 2035

## 2037

Stretch target of 100% sustainable fuel use across our infrastructure by 2037

## 2040

DE&S NET ZERO

DE&S will achieve net zero greenhouse gas emissions across our operations and infrastructure by 2040

Stretch target to produce enough renewable energy to power our operations and infrastructure by 2040

## 2050

DE&S will use our carbon negative estate to offset the residual carbon footprint from equipment by 2050

**Changing behaviours** → **Working with our clients** → **Influencing our supply chain**

*DE&S illustrator, Hannah Bone*



FEATURE

FEATURE

# DE&S' path to Net Zero

**Achieving net zero carbon emissions is central to DE&S' environmental strategy. DE&S has committed to achieving net zero greenhouse gas emissions across all operations and infrastructure by 2040 and will use carbon negative estates to offset the residual carbon footprint from equipment by 2050.**

You can see the key steps DE&S will be taking to achieve net zero carbon emissions in the 'Path to net zero' illustration on pages 10 + 11. This includes having a net zero pilot site by 2025.

Owain Redfern, DE&S Environmental Protection Policy, explained: "We have now baselined the carbon footprint of our operations and infrastructure and will endeavour to reduce our greenhouse gas emissions through the implementation of the Greenhouse Gas Emissions Management Hierarchy. Emissions reductions will be considered in all facets of business decision making. This will be supported by a comprehensive and consistent emissions reporting system and culture, which will inform the Annual Net Zero Review."

Work to reduce DE&S emissions has already begun with DE&S and Defence Infrastructure Organisation (DIO) having initiated multiple small projects that will reduce the organisations reliance on fossil fuels.

Across DE&S sites, installation of Electric Vehicle Charging Points (EVCP) has begun alongside replacing Internal Combustion Engine (ICE) vehicles with Ultra Low Emission Vehicles (ULEV) in the MOD white fleet to help reduce the organisations carbon footprint. Additionally, some car park lighting has begun being replaced with solar lighting.

Additionally, the recently formed Net Zero 2050 Team along with Subject Matter Expert support has identified three potential DE&S net zero pilot sites. Currently the sites identified are Logistic Service West Moors Station, Defence Munitions (DM) Crombie and DM Plymouth. A full range of site surveys – including energy consumption, waste generation and disposal, water usage and wider environmental reports for each site – will now be conducted. Once evaluated, a recommendation will go forward for a final decision by the DE&S Executive Committee for the selected DE&S pilot site to be chosen.

Iain Mcleod, Head of the newly formed DE&S Net Zero 2050 Team, said: "Achieving net zero carbon emissions is a long journey but the DE&S Environmental Strategy and our net zero plan is a big step forward. The opportunities this work brings are vast, not only to how we operate, but also to the capability we procure and support for the armed forces. Another aspect which is particularly exciting to me is making DE&S 'carbon capture ready' by 2030. Completing this work includes restoring peatlands, planting trees, and other carbon capturing schemes. When these habitats and schemes have fully matured – by 2040 – they will help offset DE&S' operational and infrastructure emissions each year. So, coupling that with the work we're doing to reduce emissions, increase efficiency and move away from fossil fuels, DE&S will be in a great position to offset any residual emissions from our equipment programmes and still be net carbon neutral, or perhaps even net negative by 2050."

> Achieving net zero carbon emissions is a long journey but the DE&S Environmental Strategy and our net zero plan is a big step forward



NEWS

# DE&S drives investment for maritime electronic warfare capabilities

**DE&S has awarded a £100-million contract to a Babcock-led partnership to deliver cutting-edge electronic warfare (EW) systems to the Royal Navy.**

Alongside Elbit Systems UK and QinetiQ, Babcock will develop the EW technology. The technology will allow more simultaneous detection and identification of radio signals over a greater frequency range than current capabilities. This will aid faster operational decision-making, enhanced situational awareness and anti-ship missile defence capability.

Senior Responsible Owner for the programme, Royal Navy Commodore Steve Prest, said: "The ability to understand and exploit the increasingly complex electro-magnetic environment is critical for the operational success of the Royal Navy.

"This technology will deliver a generational leap in our electronic warfare capabilities to ensure we maintain the operational advantage we need well into the 21st century."

Around 170 jobs are expected to be created and sustained across the UK by the 13-year contract, mainly in the South West of England, ranging from manufacturing to software development roles.

Rear Admiral Jim Higham, DE&S Director Ship Support, said: "I am delighted to have achieved contract award and look forward to working with Babcock, Elbit and QinetiQ. Now the real work begins - delivering this crucial capability to the front line to time and cost and supporting the men and women of the Royal Navy in what they deliver for our nation."

Maritime Electronic Warfare Systems Integrated Capability (MEWSIC) Increment 1 is the first phase of a £500-million Maritime Electronics Warfare Programme (MEWP) to deliver battle-winning operational advantage on Type 45, 26 and 31 frigates, as well as the Queen Elizabeth class aircraft carriers.

Defence Secretary of State, Ben Wallace, said: "In a world of rapidly evolving threats, these enhancements will upgrade the Royal Navy with pioneering radar detection capabilities maintaining the UK's operational advantage at sea.

The £100-million investment with key industry partners will underpin vital defence outputs while supporting jobs and investment in the South-West of England."

Babcock, Elbit and QinetiQ will work as one team with DE&S, the Navy and Dstl (Defence Science and Technology Laboratories) to design, manufacture, deliver and integrate the capability before providing in-service support for the duration of the contract.

Strengthening maritime capabilities ensures the Royal Navy are spearheading innovation and are prepared for new and emerging threats. This ambition, outlined in the Defence Command Paper, is reinforced by the £24-billion increase in defence spending over the next four years.

NEWS

# Upgrade for RAF Shadow fleet

**DE&S has negotiated a £110-million upgrade to increase and enhance the RAF's Shadow surveillance aircraft fleet with the latest defensive technology.**

Awarded to Raytheon UK, the contract will see the current fleet of six aircraft increased to eight, and the integration of the latest UK Sovereign Defensive Aids Systems, ensuring this vital capability continues to provide battle-winning intelligence gathering for years to come.

Supporting 150 highly-skilled jobs at Broughton, including specialist aerospace skills and apprentices as well as roles at Raytheon's sites at RAF Waddington and Harlow, the contract will sustain approximately 350 further jobs across the UK supply chain.

Shadow Programme Senior Responsible Owner, Group Captain Shaun Gee, RAF, said: "This investment will enable the Shadow fleet to be increased in size and equipped with the latest technology providing a key capability as part of the RAF's next generation Air Force."

Based at RAF Waddington and flown by 14 Squadron, Shadow forms a key part of the RAF's Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) force by gathering intelligence via its high-definition electro-optical and electronic sensors.

Once the data is gathered, satellite communication links enable the information to be assessed while the aircraft is airborne during a mission. To protect the aircraft from possible attack, the aircraft will be fitted with an improved state-of-the-art Defensive Aids System (DAS).

James Gray, managing director, Cyber, Space and Training, Raytheon UK, said: "We are invested in the British workforce and developing sovereign UK capability. This announcement has not only secured 150 jobs at our Broughton facility but will also support additional jobs across the Welsh supply chain, particularly in small businesses in the region.

"We will work with an ecosystem of UK suppliers to ensure the programme benefits from the latest technology and that suppliers across the region have the opportunity to contribute to the upgrade."

As part of the contract, the latest DAS will be installed across the fleet of 8 aircraft, increasing its ability to defend itself and operate in unfriendly airspace.

It is expected the first upgraded aircraft will be delivered to the RAF in June 2023, with delivery of the eighth Shadow R Mk2 aircraft before the end of 2025.

The investment for an upgraded Shadow fleet forms part of the vision laid out in the Defence Command Paper, which is ensuring that the armed forces are prepared for new and emerging threats. This ambition is underpinned by a £24-billion increase in defence spending over next four years.

DE&S CEO, Sir Simon Bollom, said: "This contract is the result of collaborative working between DE&S and industry and ensures the RAF has the world-class capability needed to protect the UK's interests against ever-evolving threats."

> This investment will enable the Shadow fleet to be increased in size and equipped with the latest technology

FEATURE

# Greening the Royal Navy: How DE&S will contribute

DE&S Ships engineer, Stuart McQuillan talks to Desider about meeting the challenges of greening Royal Navy ships

**The Royal Navy is committed to "greening" its operations and assets for many different reasons.** Alongside DE&S, The Royal Navy must respond to both national and international imperatives to meet Net Zero 2050 Green House Gas emissions while supporting action on wider sustainability challenges. Both the Royal Navy and DE&S recognise the moral case for action, the need to be a responsible employer and the changing support landscape.

Beyond these drivers there is a fundamental operational benefit to greening the RN fleet. Environmentally sustainable shipping has the potential to deliver savings including through-life maintenance and upgrade, reduced fuel and material use while increasing supply chain resilience. Most importantly though, environmentally sustainable ships will be able to operate independently around the world as they will meet host nations expectations and associated compliance obligations.

The Royal Navy is hard at work to meet the greening challenge which has been incorporated into Navy transformation principles while current levels of sustainability are being established. This was outlined recently at DESI, where Mike Gannon, Programme Director, Navy Ships Acquisition outlined Navy activity in this area.

Mike, said: "We are actively baselining the current levels of sustainability, addressing sustainability for in service and in production ships, and fast-following technological innovations."

DE&S teams in the ships domain are working closely with industry to support the Royal Navy in meeting the greening challenges.

Vice Admiral Chris Gardner, Director General Ships, said: "We want to be part of the solution, by considering what we can do with our operational fleet, now and in the future, to make it more sustainable".

A number of positive steps have already been taken by DE&S delivery teams in both the acquisition and in-service operating centres with the pace set to ramp up as Sustainability becomes an integral consideration of RN operations.

The Tide class ship is the first double-skinned oil tanker the Royal Navy has operated. Onboard are oily water separators processing bilge water to a standard beyond legal compliance. In addition, Tide is the first Royal Navy or Royal Fleet Auxiliary ship to have LED lighting fitted throughout the ship which reduce energy consumption through lower thermal loads, reduce maintenance time while having longer lifecycles with consumption costs savings.

These features are also included in the Type 26 and Type 31 frigates, along with new innovations such as end of exhaust pipe technology that allows compliance with the highest air emissions standards required by international maritime law. They include aeronautical hull designs, bow domes and the latest antifouling paints to maximise energy efficiency while minimising harm to aquatic life.

These technologies are examples of the strategy followed in Ships Acquisition used to swiftly exploit advances in the civil shipping sector and adapt them for military application.

Dr Matt Darkin, DE&S Ship Acquisition portfolio manager, said: "We intend to be a fast follower, and to exploit the technologies and advancements made within the commercial sector."

This approach of using the latest Civil Shipping technologies is not limited to Ships Acquisition Operating Centre. In the capability area of Naval Ships support engineers are always on the lookout for opportunities to improve the environmental sustainability of the in-service fleet. This can be simple but effective changes such as installing LED lighting to reduce cooling energy demand and changing shower heads so that they use 23% less water. These small changes add up across the in-service fleet.

This can also involve more significant changes, with trials ongoing to change propeller design to improve hydrodynamics and reduce fuel use. This also has other benefits by making the ships quieter, which benefits both marine mammals and provides operational benefits.



We intend to be a fast follower, and to exploit the technologies and advancements made within the commercial sector


Further hydrodynamic benefits under evaluation including toed-in rudders which reduce drag while providing crisper steering. Propeller Boss Caps currently being trialled on Type 31 reduces engine loading and increases thrust thus increasing propeller efficiency. Anti-fouling coatings and ultrasonic antifouling technologies which not only reduce drag from marine growth, but also offer great biofouling management in an increasingly regulated area.

Additional areas of evaluation in the evolving sustainability space include cold metal spray techniques where a thin layer of metal is applied to other materials to reduce the amount of steel required to maintain in service ships. Paints with lower solar absorbing properties and therefore heat loading, as well as radar absorbing paint with operational benefits are also under consideration.

These are the first positive steps on the journey to make the Royal Navy an environmentally sustainable operation. Through establishing a baseline, working with industry, and identifying and implementing technology, the sustainability of the fleet will be developed for current and future generations.

NEWS

# DE&S accelerates development of emerging technology through agile procurement

**The initial stages of an agile procurement approach aimed at accelerating the development of emerging technology have been hailed a success.**

The 'Heavy Lift Challenge' procurement framework was created to accelerate the development of a range of unmanned aircraft systems and reduce the time it takes to deliver to the customer.

When mature, suitably developed systems could be used for autonomously transporting light cargo between ships at sea and critical supplies like ammunition and sustenance to troops on the front line, as well as a range of other operations to supplement and enhance existing capability. This would lead to a significant reduction in the operating costs of crewed aviation as well as protecting life by sending un-crewed systems into conflict zones.

As part of this challenge, the DE&S Future Capability Group (FCG) has worked collaboratively with the Royal Navy's Unmanned Air System Test & Evaluation Centre of Expertise – 700X Squadron – to test the efficacy of the commercial framework known as the Rapid Agile Prototyping, Scaled for Operations.

James Gavin, head of DE&S FCG, said: "This project is about exploring emerging technology which could be of future use to the Royal Navy and other front line commands and new acquisition approaches like RAPSO to ensure any operational advantage can be delivered to our UK armed forces at pace."

Combining FCG's engineering, commercial and programme management expertise with 700X's expertise to deliver, the challenge required industry partners to demonstrate their Remotely Piloted Air Systems (RPAS) in a 'Fly-Off'. This competition examined their ability to carry payload in excess of 100kg, testing speed and endurance as well as accuracy of payload delivery.

Suppliers were also required to present their plans for further product development to meet multiple performance stretch targets to provide a dual-use system offering military capability.

The suppliers who were able to demonstrate their market leading capability and present credible development plans were awarded funding to support iterative development of their RPAS systems.

As a result of the trials, two companies, Malloy Aeronautics and W Autonomous Systems, have been awarded £300,000 contracts by DE&S to rapidly develop their RPAS, to include the ability to lift beyond 200kg, with the potential to win further funding for supply of such systems in future within the same framework.

Royal Navy Chief Technology Officer, Brigadier Dan Cheesman, Royal Marines, said: "This challenge is a dynamic collaboration between DE&S, industry and ourselves. Our co-creation of a ground-breaking commercial mechanism means we are able to investigate cutting-edge technology at pace and explore solutions for the Future Maritime Aviation Force and the wider armed forces. It's exciting times for defence and the market."

The demonstration was hosted by 700X Naval Air Squadron, the Royal Navy's RPAS T&E specialists, and held at Predannack Airfield on the Lizard Peninsula in Cornwall. The site is used as a training airfield by the squadrons at nearby Royal Naval Air Station Culdrose and is being developed as a centre of excellence in RPAS research.

The commanding officer of 700X Naval Air Squadron, Lieutenant Commander Martin Howard, said: "It has been great to be involved in this exciting project which is pushing the boundaries of technology as well as the method by which defence procures equipment. Heavy Lift Challenge has showcased, Predannack's utility as an RPAS trials location with opportunities for defence and the Commercial sector."

NEWS

# News in Brief

## DM Gosport helping biodiversity

DE&S Defence Munitions (DM) Gosport is a 208-hectare site in Hampshire. The site has a County Wildlife Site status with a Site of Nature Conservation Interest designation across areas of grassland, wetlands, classified ancient woodland and more.

Due to the site's location, restricted access, and security fence around the perimeter it creates an environment for biodiversity to flourish. Residents and visitors to the site include nightingales, pipistrelle bats, cuckoos, owls and a variety of plants, insects, and amphibians.

On the site, work has been undertaken to help various species that visit and reside at DM Gosport including the establishment of butterfly meadows, installing bird boxes, and adapted mowing regimes to help a range of wildflowers to thrive.

DM Gosport have worked with the Ponds Conservation Trust, on a project to excavate seven ponds in a venture to further improve conservation on site. A group of people wearing safety vests standing in an excavated pond.These ponds attract varied wildlife and provide freshwater habitats for a range of amphibians and aquatic invertebrates including frogspawn, toadspawn, common toads, newts and more.

The ponds are also a source of food for Herons, and the site now has a new heronry that has over 74 breeding pairs of Herons as well as Little Egrets.

Additionally, metal corrugated sheeting – that was previously used for bike sheds on the site – was recommended to improve on-site reptile conservation to allow locations for grass snakes, adders, common lizards, to bask on and under the hot surface after the sun has radiated onto it.

Raff Turk, Compliance Manager Environment at DM Gosport says: "Having the opportunity to support the protection and development of local biodiversity is something I feel very privileged to undertake. With biodiversity loss a key global sustainability issue, I am proud of the commitments made by Defence and to be able to play my part in helping achieve local and wider objectives".

## Saving time, money and energy

**Over the last ten months the DE&S Typhoon delivery team have been working closely with 41 TES, 3(F) Sqn and BAE Systems at RAF Coningsby, Lincolnshire, to trial the use of electric Ground Power Units (eGPU) that supply power to aircraft while parked on runways or in hangars.**

Typhoon aircraft have previously used diesel-powered GPU's that have a high carbon footprint, are noisy to operate and expensive to maintain.

Max Waldron, BAE Systems Air Ground Equipment team, said: "We have been working with the RAF to find ways to reduce the impact we make on our environment when we are readying Typhoons for maintenance and to go on Quick Reaction Alert, and we recognised the noise and NOx fumes which are generated by our diesel-powered GPUs are not a good environment for the air and ground crews."

The DE&S Tyhpoon delivery team conducted a series of trials to find an eGPU that met Typhoon's stringent electrical specifications and provided a cleaner, safer, warmer and quieter operating environment.

Having analysed the AxA 7400 eGPU's, DE&S attributed a 90% reduction in scheduled maintenance activity, an 80% reduction in running costs, improved operating environment for technicians, support to infrastructure for powering outside of peak times, and a saving overall by a reduced amount of support required while meeting the deployable requirements.

Since the trials concluded, BAE Systems have agreed to undertake the funding of this initiative - replacing a number of diesel GPUs with AxA 7400 electric GPUs.

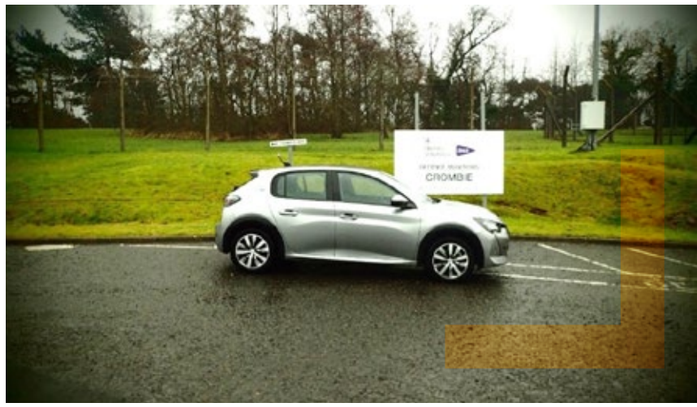

## Ultra- Low Emissions Vehicles at DM Crombie

**In keeping with DE&S' goal to have Net Zero Carbon emissions from Operations and Infrastructure by 2040, the Head of Establishment and staff at Defence Munitions (DM) Crombie are always keen to embrace changes which have positive benefits for the environment.**

Earlier this year, DE&S white fleet cars were due to be replaced. Instead of replacing these with petrol or diesel vehicles, the site opted for ULEV (ultra-low emission vehicle's). DM Crombie duly received three Hybrid 'Mini Clubman' cars and a fully electric Peugeot 'e-208' car. The MOD Guard Service (MGS) at Crombie also acquired two ULEVs as well as three 'eVolve Smart T' double charging points. One of the new units has been installed at the Main gate for use by MGS and visitors.

With the cars and charging points up and running, it's estimated that at DM Crombie alone the ULEVs will save approximately 6833 kilograms of carbon per year, and approx. 2150 litres of fuel, which at today's prices equals around £3,030.

DE&S Head of Establishment at DM Crombie, said: "I had some initial concerns about the ULEVs, mainly 'range anxiety' – worrying about running out of charge before getting to a charging point. But having driven it, and as more charging points are installed across the country, this is less of a worry now. And you really do notice the difference in air quality when a ULEV drives passed compared to a petrol or diesel car."




## New code of practice measures emissions

The Defence Suppliers Forum is a pan MOD and industry group that works with suppliers at a strategic level to tackle some of the biggest challenges Defence faces.

The Climate Change and Sustainability (CC&S) Steering Group provides direction on a programme of activities focused on several key areas including identifying priority sources of emissions and developing a consistent approach to emissions measurement.

Through the steering group, the Defence Suppliers Forum recently created and published a new code of practice to provide Defence organisations with guidance for measuring carbon emissions and to encourage a consistent approach across the Defence supply chain.

The purpose of the code of practice is to pull together the different threads of greenhouse gas emissions measurement and explain how these principles apply to a broad range of Defence procurement activities including equipment and support, digital, estates and infrastructure. This also covers the need to understand emissions through the acquisition process from design and manufacturing through to operations and end of life. The guidance considers both direct and indirect emissions to and sets out recommendations for a common approach to make it easier for organisations to calculate their carbon footprint.

The code of practice is voluntary and is not be being used as a contracting requirement, although it is intended as a starting point in order to improve transparency.

FEATURE

# DE&S leads Hybrid Military Vehicle Programme

**The Technology Demonstrator 6 (TD6) project aims to identify all the capability benefits that hybrid electric drive (HED) vehicles may bring to the battlefield and to overall platform supportability.**

The HED programme commenced in January 2020 and is being managed by the DE&S Vehicle Support Team Futures, with support from UTAC Millbrook, Jacobs, Magtec, RBSL on behalf of RMMV, Supacat and General Dynamics UK (GDUK) on behalf of NP Aerospace.

The TD6 programme has two main strands of work. The first is to gather data on hybrid technologies from across UK industry. This includes investigating development paths for hybrid and electric vehicle technologies to inform future vehicle development by the MoD.

The TD6 Team have had direct contact with around 50 companies ranging from defence suppliers to the motorsport sector. The Team's focus is for the project to provide the MOD with a database of the UK industry's hybridisation capability and capacity both now and in the future.

The second strand of work is focused on demonstrating the potential benefits and challenges of vehicle hybridisation in a military context. The core element of this is a series of trials and tests currently being conducted at the Millbrook Proving Ground. The aim of this work is to benchmark a sample build of hybridised in service military vehicles against their current Internal Combustion Engine (ICE)capabilities. The sample platforms built represents a cross section of military vehicle applications and configurations of hybrid drivelines.

By testing a cross section of hybridised military vehicles, TD6 aims to provide evidence to support previous studies and address potential user perceptions. The Testing and Trials programme is centered upon identifying the benefits and issues while also benchmarking how easy it may be to apply existing and commercially available HED technologies into the military environment.

The electrification of the sample vehicles was designed and integrated by Magtec. The vehicles have been built and are now being comprehensively tested to identify the effects of hybridisation on fuel economy, emissions, mobility and driveability, as well as factors such as noise, electromagnetic compliance and infrared signatures. Through the different vehicle configurations, this work will investigate the potential for wider platform HED adaptation.

There will also be exploration of the other aspects of hybrid drive such as the platforms ability for in field power generation: for example the HED Man SV vehicle has the potential to be used as a power source for a field hospital or headquarters as it currently has up to 400KW of exportable power on board.

Colonel Simon Ridgeway OBE, Assistant Head Plans, Ground Manoeuvre, said: "TD6 is a key part of the Army's plan for electrification of the battlefield, which seeks to gain operational advantage through using novel solutions for power, performance and support while also reducing carbon emissions. The programme will provide evidence to support the benefits, both direct and indirect, that hybridisation of some or all of our vehicle fleet may bring to inform our roadmap towards a more capable and sustainable future"

The TD6 programme is scheduled to produce a final report, which will provide much anticipated evidence on the benefits and constraints of hybridisation within the military environment. In addition to potentially platform capability enhancing silent stealth movement, on platform mission systems charging, overall lower fuel consumption, lower emissions and greater platform range, it has also been recognised that the additional capabilities such as the ability to export large amounts of reliable off-board power in the field have now created much wider cross Defence interest in the TD6 Programme.

> TD6 is a key part of the Army's plan for electrification of the battlefield



FEATURE

# Graduates propose Net Zero plans

**The DE&S two-year Engineering graduate scheme attracts engineers and scientists from across the UK and is designed to develop graduates' technical knowledge, skills and professional competence.**

Graduates spend their first two years working on exciting placements in the MOD and with DE&S' industry partners. Each year, graduates are also encouraged to gain experience in project management tasks in order to supplement their engineering placements.

This year, the Graduate group were invited to be part of a project that has the potential to change the way DE&S/SDA works and were tasked with proposing solutions for DE&S/SDA to achieve Net Zero carbon dioxide emissions by 2050.

Graduates presented their Final DE&S Net Zero proposals to DE&S CEO Simon Bollom and a panel of senior leaders, outlining the steps DE&S and SDA can take to lead environmental improvements across the organisation.

The topics they focused on were energy, waste, water, travel, and flourinated-Gases. The panel gave feedback to the graduates focusing on the viability of the proposals and offered guidance on how to progress before reproposing their plans later this year.

Engineering Graduate Scheme Leader, Sarah Hopkins, said: "The panel unanimously agreed that all eight groups were astonishing in their depth of research and presentation skills, made even more remarkable by most of the graduates having worked remotely from each other."

Alex Dyson, a graduate in one of the 'Travel' teams, explained their team's proposal: "Our idea is to install electric car charging points in the site car parks to make the use of electric vehicles an easier option for daily commuters.

"However, we recognise it would be more environmentally friendly not to commute. So, we worked closely with the SDA's Go Green Network to produce a tool which calculates the carbon saved by not using a car at all. If our tool was used by DE&S/ SDA staff, it would help people to weigh up the need to meet face to face with the impact their travel will have on the environment."

The 'Energy' teams also targeted commuters and worked together to develop a proposal for a solar carport array and battery storage system. The team hope to organise a trial with support from the DE&S Net Zero 2050 team and use any energy generated during the trial to charge electric vehicles. Their proposed solution would use a system provided by Bristol-based company SolarSense UK.

The 'Water' team researched rainwater capture and visited Imperial Tobacco in Bristol to learn about the system in use on their premises with a view to installing a similar system at DE&S Abbey Wood. They learned how rainwater is collected from the roofs and used to flush toilets. The graduates discovered that the benefit is a significant reduction in the volume of mains water used in non-potable uses and the potential water saving at Abbey Wood would be approximately 65,000 litres a day.

Rebecca Green from the 'Water' team, said: "We observed the solar panels and the water collection point on the roof for the rainwater system. Following this visit, a current research avenue of particular interest is applying this recommendation to the irrigation system at Abbey Wood."

The panel of assessors, which included DE&S CEO, Sir Simon Bollom, Adrian Bagley, chair John Allan, Matthew Allan, Sue Snowball and Dr Simon Dakin were unanimously impressed by all the innovative ideas and in-depth presentations which will now be considered for further discussion and application.

NEWS

# Cost effective and environmentally friendly aircraft



NEWS

**September saw the conclusion of a test flight campaign in Arizona USA, where Airbus flew their Zephyr aircraft: an unmanned, solar-powered High-Altitude Platform System (HAPS).** Zephyr is an example of MOD's ambition to not only be a world leader in innovation but to also achieve it sustainably. Airbus' platform is "Carbon Neutral", using sunlight to fly and recharge its batteries, using no fuel and producing no carbon emissions.

The 2021 flight campaign had a clear customer focus - to demonstrate how Zephyr could be used for future operations, flying outside of restricted airspace and over airspace shared with commercial air traffic. Carrying an Optical Advanced Earth Observation system for Zephyr (OPAZ) payload, Zephyr proved its operational value to provide instant, persistent, and improved situational awareness.

This year's campaign saw the successful launch and recovery of two stratospheric flights totalling 36 days of stratospheric flying in 2021, setting a new world record for altitude in its class of UAS at 76,100 ft and for endurance at just over 18 days in the process. This adds a further 887 flight hours to the 2,435 stratospheric flight hours for Zephyr to date, which marks significant progress for fixed wing HAPS and is a step towards making the stratosphere an operational reality for its customers.

With a wingspan of 25-metres and weighing less than 75Kg, Zephyr is designed to fly in the stratosphere for months at a time, and with its ability to be payload agnostic, Zephyr will bring new see, sense and connect capabilities to both commercial and military customers. The Zephyr platform will provide the potential to revolutionise disaster management, including monitoring the spread of wildfires or oil spills. It provides persistent surveillance, tracing the world's changing environmental landscape and will be able to provide communications to the most unconnected parts of the world.

HAPS technology has the potential to provide a more cost effective and environmentally friendly accompaniment to satellites. The ability to tailor the payload depending on the users needs can provide adaptability for the user and allow for the technology to stay at the cutting edge of development. As well as a fixed wing solar powered UAS like the Airbus Zephyr, there are different alternatives also in development which are exploring the use of different fuels, for instance hydrogen which also provides a more environmentally friendly option. Together with fuel, different platform frames are also in development, such as balloons and airships which are all keeping this novel field competitive and driving innovation.

DE&S Future Capability Group Head, James Gavin, said: "Working with Airbus and the Zephyr team during the 2021 flight campaign, significant progress has been made towards demonstrating HAPS as a sustainable capability. This summer's activities represent an important step towards operationalising the stratosphere."

Major General Rob Anderton-Brown, Director Capability and MDI Change Programme at Strategic Command, said: "Defence investment in cutting edge technology is key to the development of world-leading military capabilities. Zephyr is an important programme within UK Strategic Command and the recent successful flight has required many innovative technical solutions. This represents a significant milestone for Zephyr which is informing the development of new concepts and ways of enabling military operations, particularly in the context of Multi-Domain Integration."

Jana Rosenmann, Head of Unmanned Aerial Systems at Airbus, said: "Credible and proven ultra-persistence, stratospheric agility, and payload interoperability underscore why Zephyr is the leader in its sector. It is a sustainable, solar powered, ISR and network extending solution that can provide vital future connectivity and earth observation to where it is needed."

FEATURE

# Eluned and Holli recognised at prestigious Women in Defence Awards

**The Women in Defence awards are an annual celebration of the value women bring to the defence sector, be it the Army, Royal Navy, Royal Air Force, MOD, MI5, industry or academia.**

In its sixth year, the awards celebrate the contributions of women across the defence sector with this year's ceremony recognising DE&S' Dr Eluned Lewis and Holli Kimble.

Holli Kimble, DE&S Chief Engineer and Specialist Fellow in Directed Energy Weapons was announced as this year's Women in Defence 'Inspirational Award' winner.

It was Holli's visionary approach to prepare Defence for the adoption of Directed Energy Weapons, while simultaneously developing and inspiring others through her humanitarian and STEM endeavours that saw her win the award.

On Holli's award, Krishna Dhanak, DE&S Director Strategy and Corporate Operations, said: "Huge congratulations Holli. An inspiration to us all. We are all so proud and absolutely thrilled for you. A brilliant personal success. As one woman in Defence to another, don't underestimate the magnitude of your achievement. The girls are watching. And cheering you every step of the way!"

Dr Eluned Lewis, DE&S Senior Fellow Personal Ballistic Protection, was among the finalists for the 'Outstanding contribution' award and recognised for her continued efforts to improve personal protection for our armed forces, particularly for women, and for leading and instigating a new tri-service anthropometric survey that measures the size and proportions of the human body.

Both their achievements were celebrated by Director General Ships Vice Admiral Chris Gardner, Krishna Dhanak, DE&S Director of Strategy and Corporate Operations, and Jo Osburn-Hughes, DE&S Gender Champion, who attended the awards ceremony in London with Holli and Eluned.

Jo Osburn-Hughes, DE&S Land Chief Operating Officer, said: "I am completely blown away to hear the nominations – what fantastic role models for women across the defence sector driving diversity of thought and challenge into our organisation. Not just blazing your own trail but breaking down barriers and inspiring others – what an amazing achievement."

DE&S is a signatory of the Women in Defence Charter working to ensure women represent 30% of our workforce by 2030 at all levels. DE&S are committed to drive inclusion and diversity in the organisation and provide opportunities for women to succeed at all levels.

> What fantastic role models for women across the defence sector driving diversity of thought and challenge into our organisation

FEATURE

# Looking back at 2021

## It's been a busy year for DE&S equipping and supporting the UK's Armed Forces for operations now and into the future

**The vital work that has taken place at Bristol Abbey Wood for the last 25 years – as well as other DE&S sites across the country – has ensured the UK's security and prosperity. Here, Desider features just some of DE&S' highlights from 2021.**

The launch of the new DE&S strategy was a notable accomplishment. Published in response to the Government's Integrated Review of Security, Defence, Development and Foreign Policy, it outlined DE&S' ambitions for 2025 with a focus on delivering through people, technology and innovation. The strategy outlined five priority areas DE&S will focus on to ensure DE&S are best placed to help Defence deliver its future integrated force and support wider government priorities. The priority areas that DE&S will harness when delivering are pace and agility for our clients, value to the taxpayer and society, delivery through people, accelerated digital solutions and delivery through partners.

Throughout 2021, DE&S has focussed on these priorities and this can be seen through some of the successes highlighted below.

DE&S people have been recognised throughout 2021. Past and present personnel from across DE&S were among those recognised for exceptional achievements and service in both the New Year Honours and the Queen's Birthday Honours. As mentioned on p26, DE&S' Eluned Lewis and Holli Kimble were recognised in the prestigious Women in Defence awards. Another proud moment was the recognition DE&S received from Bristol City Council for its commitment to championing diversity and inclusion. The Stepping Up Diversity Champion Excellence Award was presented during DE&S' first Race Conference and recognised the vital role the business plays in supporting the council's Diversity Leadership programme since it began in 2018.

Elsewhere, DE&S delivered numerous equipment and support programmes. Notably, Boxer production started, steel was cut on both Type 26 and Type 31 frigates and DE&S proudly supported the Carrier Strike Group deployment. DE&S negotiated best value for the taxpayer when awarding the recent Protector and Future Combat Air Systems contract. And 2021 also saw the Martlet missile system achieving Initial Operating Capability. On top of that, the fifth, sixth, seventh and eighth P8 Maritime Patrol Aircraft, three F-35B Lightning II jets and another four Texan training aircraft were delivered – allowing the level of pilot training to expand.

Ian Craddock, Chief Operating Officer for the DE&S Air domain, said: "I'm really proud to work for DE&S. I've been working here for over 25 years and that pride is built on three core elements: what we do, how we do it and why we do it.

"We manage a fantastically complicated portfolio of projects and services that often have massive technical challenges. I'm really proud of what we achieve. We don't just focus on delivery today. We have huge amounts of effort going into building our capabilities for tomorrow and building a workforce that is ever more inclusive."

2021 also saw the launch of two Centres of Expertise (CoE). The Expeditionary Robotics CoE and the DE&S Digital Battlespace CoE were set up by the DE&S Future Capabilities Group in collaboration with defence customers across all Front-Line Commands.

James Gavin, Head of the DE&S FCG team, explained: "The Future Capability group accelerate capability into operations and encourage a more innovative DE&S."

The Digital Battlespace CoE will accelerate capability to deliver operational advantage at pace and will act as the focal point for defence. It has seen the team be able to respond more quickly, receiving positive responses from customers.

This year, DE&S also awarded contracts for the Future Maritime Support Programme. DE&S FMSP Head John Farrow said: "FMSP is the largest support contract ever attempted by the Ministry of Defence: £5.2-billion over a five-year period. Every single aspect of a naval base, including logistics and warehousing, all combined into one programme. To get FMSP over the line the team have been absolutely superb."

Over the past 18 months, DE&S Operations team leader, Mike Duff, has been co-ordinating DE&S' Covid-19 response as well as launching the organisation's Smarter Working commitments and policy.

Mike said: "Fundamentally, I think the big success has been the protection of our workforce. Over the past 18 months, we've had thousands of people come onto site and I think, in all that time, we've had two potential cases of on-site transmission. However, I'm most proud of our ability to work at speed, and in the face of conflicting elements."



FEATURE

PEOPLE

# Flavia Popescu

**Job title**
Benefits Manager in the UK Strategic Command Domain – Business Modernisation for Support Programme (BMfS)

**What does your role involve?**
My role involves daily interactions with multiple stakeholders across defence. As a Benefits Manager, I am accountable to provide assurance and investment justification to Senior Management to support their decision making. I am also responsible for the development of the programme governance and artefacts.

**What do you enjoy most about your job?**
I am proud to be part of the business modernisation for support programme and contributing to transform defence support core businesses. I'm proud to support information services to enable effective, efficient and resilient digital support capabilities to meet defence outputs. My role requires extensive stakeholder engagement across defence, and I enjoy the diversity and the complexity of the role that requires support to senior management by providing assurance, investment justification to complex projects and the ability to be creative, innovative and find solutions to overcome challenges.

**What is your greatest accomplishment to date?**
My greatest accomplishment this year was the successful accreditation as a Chartered Manager and the successful development of the programme governance and artefacts.

**What keeps you energised about working at DE&S/MOD?**
The diversity of the opportunities that DE&S/MOD are providing to personnel so that everyone can find their passion and work towards achieving their maximum potential of their career aspiration. I am a very driven and dedicated personnel who is always passionate about exceeding expectations, contributing to the implementation of an effective, efficient, accurate internal processes, policies, and tools to enable the organisation to overcome challenges and deliver objectives.

**Who or what has shaped who you are?**
Myself as I am a self-driven person who is always working towards improving and becoming the best version of myself. From childhood, I have been ambitious and motivated to succeed and achieve my goals.

**What do you enjoy doing in your spare time?**
I enjoy hiking, nature, finding solutions to overcome diverse challenges and helping others to succeed with their career goals.

**What might have surprise people about you?**
Although I was born in Romania (Transylvania Region)
I am not a real vampire

**What's the best advice you've ever been given?**
If the plan does not work, change the plan but never the goal.



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PEOPLE

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