

Raytheon

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SPOTLIGHT ON: INNOVATION FOR NEW MARKETS

ALSO IN THIS ISSUE:



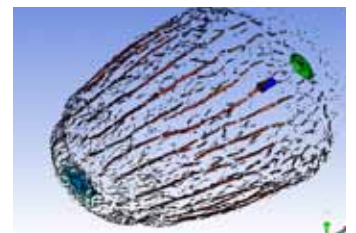
SME CYBER INNOVATION



HYPER-HEMISPHERIC DOMES



LANDSHIELD™



HYDROCODE MODELLING

Message from the Chief Executive



At Raytheon UK, we do not believe in setting boundaries when it comes to innovation.

As an engineering company, we naturally see innovation as being vital to our success. The ability we have to develop new technologies and produce some of the world's most advanced defence and aerospace systems stems from our ability to innovate and rise to the challenge set by our customers. Much of this success is owed to the fact that we consciously invest in indigenous research and development. One good example of this is our silicon carbide foundry which opened in January 2013 and was made possible by our partnerships with British universities as well as through support from the UK government's Technology Strategy Board.

More recently, Raytheon UK launched an Innovation Champions Network, an initiative aimed at fostering our innovation strategy and culture. Employees with imagination and determination from a broad cross section of our functions have come together to act as 'Innovation Champions' who will provide guidance and inspiration to others.

The innovation vision for Raytheon UK is to be recognised as having a culture that inspires, supports and delivers world leading customer solutions. To that end, I am proud to be a member of Raytheon where creativity, innovation and collaboration are intrinsic to our culture and operations.

Engineering & Innovation At Raytheon's Core



Raytheon Chief Executive Bob Delorge was the guest speaker at the British American Business Association's HR and Employment Forum roundtable discussion on aerospace on 4 February

2014. The discussion, themed 'The Importance of STEM (Science, Technology, Engineering & Mathematics) and other technical skills in securing our economic future', was led by Chair Keith Corkan, a partner at Laytons law firm. Delorge touched on Raytheon initiatives such as its apprenticeship and diversity programmes, as well as stressing the importance of STEM and skills investment to retain Raytheon's competitiveness: "Ensuring the future pipeline of programme managers and engineers is vital, not only for our company but for the health of the industry. We are investing in our workforce in the UK at all levels to ensure we have a globally competitive skills base, and support individuals to reach their potential."

Swanson Steps Down: Kennedy To Succeed As Raytheon CEO

Raytheon Company announced on 15 January 2014 that William H. Swanson, who has served as the Chief Executive Officer of Raytheon Company since 2003, is to retire from his position following his 65th birthday in February 2014. The company's board of directors has elected Thomas Kennedy to serve as the Chief Executive Officer of Raytheon Company, effective 31 March 2014.



William H. Swanson

Mr. Kennedy, a Raytheon employee for more than 30 years, has served as Executive Vice President and Chief Operating Officer of Raytheon since April 2013 where he led the recent consolidation of Raytheon's six businesses to four in order to enhance productivity, agility and affordability of the Company's operations. Prior to this, he served as Vice President of Raytheon Company and President of Raytheon Integrated Defense Systems (IDS), and Vice President at Raytheon Space and Airborne Systems (SAS).



Thomas Kennedy

Raytheon Reports Solid Q4 and Full-Year 2013 Results

Raytheon Company reported its fourth quarter and full-year 2013 financial results on 30 January. Chairman and CEO William H. Swanson praised the solid set of results achieved in what he described "a dynamic environment" and by continuing "to expand our international business while also winning significant new programmes with our advanced technologies and affordable solutions that position us well for the future."

2013 Financial Highlights:

Q4 2013 net sales of US\$5.9 billion (£3.5 billion) ; full-year net sales of US\$23.7 billion (£14.2 billion) bolstered by a three percent increase in international sales partially offsetting the decline in domestic sales, which included the impact of sequestration, the government shutdown, and a continuing resolution.

Q4 2013 operating cash flow was US\$1.1 billion (£0.6 billion); full-year operating cashflow of US\$2.4 billion (£ 1.4 billion) from continuing operations.

Raytheon Leads Industry Discourse On Emerging Markets



On 30 January 2014, Raytheon UK welcomed the EuroDefma group, to a two-day event hosted at Raytheon's facility in Glenrothes, Scotland. Twenty eight delegates from across the European defence industry gathered to discuss

shared issues, best practice and address the theme of the meeting: Approaches to Emerging Markets. Experts from trade organisation ADS, global information company IHS, global accounting firm Ernst & Young and business consulting firm Frost & Sullivan delivered presentations and were given a factory tour showcasing manufacturing and engineering excellence at Glenrothes. This included the silicon carbide facility which coincidentally marked its first anniversary of its opening the same day.

MARKET INNOVATION



Raytheon UK's MEA Solution

The aircraft industry's drive to reduce weight in order to improve fuel consumption – the More Electric Aircraft (MEA) initiative – has been the catalyst for the rising demand for electrical power systems solutions, favoured over hydraulic and pneumatic mechanical systems and sub-systems. Raytheon UK's technological innovation, advanced design and investment in the area of advanced power electronics at its Power and Control business based in Scotland, will be a key enabler in this market, including the MEA initiative which aims to distribute increasing electrical power across the airframe.

The company's leading innovation and growing capabilities in Silicon Carbide, particularly high temperature silicon carbide, uniquely positions it to offer the lowest risk and most economical solution in the burgeoning MEA market – half the size, half the weight, double the power.

New Radar Modification Deal To Mitigate Turbines

Raytheon technology is playing a key role in the modification of radar to mitigate the adverse affect of wind turbines.

UK air traffic services company NATS has signed an agreement with two wind turbine developers to make a technical modification to two radars manufactured by Raytheon, a world-leader in air traffic control radar.

The modification is a wind turbine mitigation solution developed from three years' collaboration between NATS, Aviation Investment Fund Company Limited Developers, DECC, Scottish Government and Raytheon.

NATS Chief Executive Richard Deakin said: "This is a landmark agreement that heralds a significant technical advance in mitigating the radar interference from wind turbines."

Raytheon's High-Tech Spy Plane Proves Vital In Flood Crisis

Raytheon UK's Airborne Standoff Radar (ASTOR) surveillance capability, which deployed on Sentinel R1 aircraft flown by the UK Royal Air Force (RAF), is being used to map the scale of the current flooding crisis across southern England for the first time. In a BBC news report, defence correspondent Jonathan Beale joined the RAF on a Sentinel flight over the Thames Valley, River Severn and Somerset Levels to assess the flood coverage using ASTOR's powerful, sophisticated onboard data processing and mission management systems. ASTOR has been cited by the UK Ministry of Defence as a "key component" of the UK's recent operational successes in Afghanistan, Libya and Mali. To watch a short video clip of the BBC report onboard Sentinel, please visit: <http://www.bbc.co.uk/news/uk-26183728>

Resolving Aircraft/Weapon GPS Jamming Susceptibility

Engineers in the Weapons and GPS (Global Positioning System) Anti-Jam (AJ) business areas at Raytheon UK's Harlow site are working to develop an anti-jam capability for the company's Paveway™ IV weapon system.

The widespread proliferation of GPS jamming technology in potential future theatres of operation has resulted in an increased end-user focus on understanding the susceptibility of aircraft/weapon systems to this emerging threat. While Paveway™ IV has the capability to operate in a GPS denied environment, it does reduce the flexibility of the weapon capability which varies depending on the platform.

In response, Raytheon UK's engineers have identified an opportunity to leverage the company's new Landshield™ technology to propose a rapid development of a Paveway™ IV GPS anti-jam capability. Landshield™ is Raytheon UK's next-generation GPS anti-jam product targeted at platforms requiring a small form factor but high performance anti-jam solution. (Turn to page 8-9 to read our special feature on Landshield™)

Following an initial private venture programme determining feasibility and technology selection, the team further developed the solution's system requirements and detailed design, prior to conducting a series of system-level bench demonstrations.

A key goal of the innovation programme is to provide Paveway™ IV with an advanced GPS anti-jam capability whilst minimising impact to the existing weapon system and to existing platform integration solutions. This is intended to provide the Ministry of Defence (MOD) with the capability to retrofit existing Paveway™ IV weapons and also provide the MOD with a modular option for future weapon orders.

With an eye to the future, Raytheon UK's engineering team is planning a follow-on programme in 2014 whereby the preliminary system would be subjected to formal qualification testing for flight clearance on fast-jets.



DEVELOPING SME PARTNERSHIPS IN CYBER SECURITY

Raytheon UK Leverages Its R&D investment Into Small and Medium-Sized (SME) Enterprises



Supporting the Future Talent Pipeline

From Left: Raytheon UK's Head of Cyber Security Vincent Blake; Stephen Teel, Vice President of International Business Development for Raytheon Intelligence Information and Services; and Rob Crook, Managing Director of National Security and Training for Raytheon UK pictured at the government Department for Business Innovation and Skills' Agile Innovation Cyber Security event.

Raytheon welcomes initiatives which support small and medium-sized Enterprises (SMEs) to export and to continue to innovate as, very often, niche capabilities that are critical to our technology portfolio are developed by smaller firms.

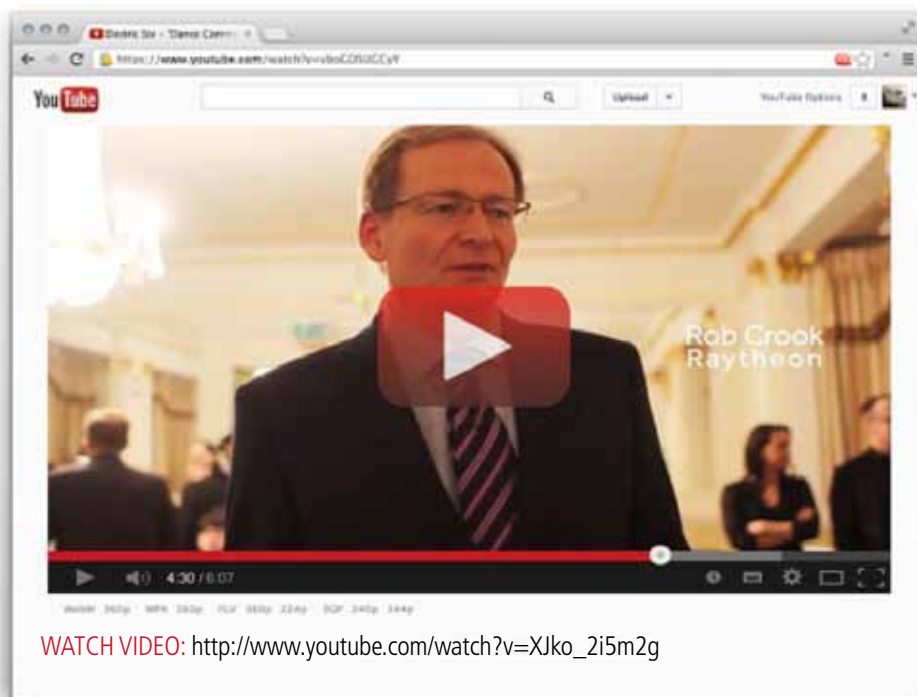
Raytheon's collaboration with SMEs is fundamentally aimed at having a mutually beneficial effect for all parties in terms of export opportunities, jointly developed solutions, improved tools and techniques and reduced time to market. The company believes that building a community of SMEs to work collaboratively is essential to delivering UK cyber projects. Raytheon UK specifically has been engaged with more than 700 suppliers to date across the full range of its 200 programmes.

Much of the talent behind new and exciting SMEs in the cyber arena are the result of R&D work in UK academic establishments. These businesses play a central role in the UK's growth and development of technology,

which often has considerable financial and security implications.

As part of Raytheon broad stakeholder engagement and to support its efforts to build a cyber eco community of SME businesses within the sector, the company held an SME day in late January 2014 at Level 39 – Europe's largest accelerator space for finance, retail and future cities technology companies located at One Canada Square Canary Wharf London.

Level 39, which is now looking to start an accelerator for cyber businesses, played host to 20 SMEs who took part in a number of workshops primarily focused on how such a community can work together cooperatively. Raytheon UK representatives were joined by Lynn Dugle, President of US-based Raytheon Intelligence, Information and Services (IIS) who addressed the audience stating Raytheon's commitment to building an SME eco community and cyber capability in the UK.



WATCH VIDEO: http://www.youtube.com/watch?v=XJko_2i5m2g

Innovation: Creating Gateways to New Markets

Raytheon UK is wholly supportive of the UK government's initiatives to support the development of SMEs and in 2014 the company will further its efforts to help SMEs develop their ideas in alignment with our technology and business strategies.

Under this collaborative approach, robust R&D investment is critical to ensuring the UK's leadership in science, technology and innovation, and this can only be achieved in partnership with business, academia and SMEs all operating at the local and national levels.

In late 2013, Raytheon UK announced an SME competition to fund a £40,000 technical research project designed to harness and foster innovation in UK SMEs, focused on cybersecurity.

This challenged a number of specialist cyber SMEs to propose research projects to address and solve known or emerging, cyber security risks/customer problems and to implement more agile methodologies for application development. A number of SME cyber businesses competed, resulting in three being shortlisted to present their proposals at a 'poster session' in mid-November 2013.

Proof of Concept

MWR InfoSecurity was announced as the £40,000 competition prizewinner in January 2014. The company's winning project for research into an analysis tool to detect rogue code in Android applications (apps) was presented at the 'Agile Innovation for Cyber Security Boot Camp', hosted by the

UK government's Department for Business, Innovation and Skills.

Organisations using enterprise-wide Android-based smartphones and tablet devices have a major challenge around the provisioning and ongoing security assurance of apps deployed.

MWR InfoSecurity will provide proof of concept for a new tool offering end-users or organisations greater confidence in the security of apps deployed on their devices. Currently, they can either trust the public internet app stores, restrict choice of apps to specific third-party stores, or ban their use outright, which is not conducive to leveraging mobile technologies and facilitating workforce connectivity.

The tool could be used to provide these assurances within a BYOD (Bring Your Own Device) initiative or for company deployed phones. Users or organisations could use the tool to decide a level of security that is appropriate for their own risk appetite.

Harnessing SME Innovation

Martyn Ruks, Chief Technology Officer for MWR InfoSecurity, remarked: "The resources and market access which larger primes can bring to bear are considerable particularly in systems integration and product development and when matched with the innovation and agility of SMEs, it's not hard to see that the scheme can benefit British business and international customers.

"We work with numerous organisations which face mobile security challenges on a daily basis and commonly find that solutions enabling them to work securely are not always easy to implement.

"With the proliferation of in-home working and use of Android as a business platform, a new approach is needed to support initiatives such as BYOD."

Enhancing Skills to Grow Business

Raytheon has a long history of supporting and growing talent in order to ensure business growth. An important part of this is working with schools through initiatives such as the organisation STEMNET and local colleges to inspire students to study STEM (Science, Technology, Engineering & Mathematics) and encourage related careers.

Not all cyber security professionals come from the same backgrounds; there is a great deal of variety within the talent pool. The best analysts can range from software developers to concert pianists and researchers, through to server engineers and helpdesk workers.

Each fresh mind brings a new dimension and potential and it is the responsibility of companies like Raytheon to steer and guide those careers. Every apprentice and graduate on a Raytheon UK development programme is supported by a senior mentor from the business, giving them access to the skills and advice of experienced leaders. In turn, we encourage reverse mentoring so that our senior leaders have the opportunity to hear the diverse views that this new population brings to our work environment.

Building the Future Talent Pipeline

Another way we are looking to inspire and raise an awareness of STEM careers among young students is through our involvement in career-related summer camps and challenges. Raytheon UK is a principal sponsor of the Cyber Security Challenge focused on inspiring students to consider cyber security engineering.

The company also supports UK universities with cyber capabilities and, in conjunction with Lancaster and Newcastle Universities, sponsored a four-day bootcamp event in late January 2014 at the Department for Business Innovation and Skills offices in London.

Designed to illustrate how the higher education sector can play a role in solving cyber security issues on a global scale, postgraduate research students, Raytheon challenged the students to build a tool that identifies unwanted activity jumping between devices within a corporate environment which pinpointed those transferring processes in near real-time.

The students competed in teams to develop the most functional, innovative and practical solution over two days using only what they had brought with them or what they could obtain. ■



HAUTE COUTURE DOME DESIGN

Canada-based optical solutions provider Raytheon ELCAN is at the forefront of design and manufacturing innovation when it comes to hyper-hemispherical dome optics.



Above: Reginald Jonas, Manager of Optical Design for Europe at Raytheon ELCAN demonstrates the very precise surface finishing process involved in designing Raytheon's hyper-hemispherical dome.

Opposite Page: ELCAN domes on display (top right) and an ELCAN technician performs in-house dome scooping (bottom right).

It might look like the world's most expensive goldfish bowl and haute couture statement jewel, but Raytheon ELCAN's hyper-hemispherical dome is expected to be the game changer in precision optical modules for military application.

One of the first in the market to qualify for military application, in this environment ELCAN's hyper-hemispherical dome enables the customer to see beyond 180 degrees, increasing their field of vision from a single system, and therefore decreasing the number of systems required to search and analyse a complete spherical field.

Reginald Jonas, Manager of Optical Design for Europe at Raytheon ELCAN explains: "A sphere has a common centre of curvature enabling the manufacture of traditional spherical optics very quickly in one, single, macroscopic operation covering the whole surface at one time."

Made from a solid sapphire billet, this robust, precious and valuable mineral is well suited to withstand high temperature, high pressure environments that include harsh military environments such as the sand erosion blasting caused by a supersonic missile in flight.

This wasn't always the case; historically the inherent robustness of sapphire actually made it difficult, time-consuming and expensive to manufacture as an optical substrate for missiles.

"Missile applications demand reliability, repeatability and extreme accuracy to withstand environments where large temperature swings, severe vibrations, intense shock and acute pressure swings may threaten mission success," says Jonas. "It is thanks to Raytheon ELCAN innovation that our company was able to apply its vertically integrated processes to overcome this previous disadvantage."

Advanced Processes

Raytheon ELCAN's highly-skilled optical engineers use state-of-the-art sub-aperture polishing machines and a computer-controlled precision magnetorheological surface finishing technology, generally known as MRF. The process – patented by QED Technologies of Rochester, New York – uses interferometrically controlled MR finishing slurry which forms the precisely controlled polishing tool. "This enables us to produce very

precise surface finishes for today's demanding applications in both military and commercial applications," says Jonas.

He adds: "We have also invested and developed the technique of Sapphire Dome Scooping whereby the number of individual domes from a single material rod can be increased and expensive sapphire waste reduced."

Next Generation Solutions

Raytheon ELCAN's capital equipment has been developed with optics in mind. As such, it has a flexibility that presents many more opportunities to meet the needs of customers and has enabled the company to utilise this unique capability in the defence, commercial and medical markets.

Currently, the company's engineers are working on next-generation requirements such as non-rotationally symmetric optics and conformal optics that blend with platform geometry and improve system aerodynamics. Raytheon ELCAN is also seeking additional opportunities to leverage its integrated capability as an application-engineering partner. ■



Discover the Technology...

Raytheon ELCAN's high-precision optics manufacturing expertise dates back more than 160 years and the company has been designing and manufacturing high-precision optical domes for defence applications for more than 20 years.

In-house optical fabrication – using the most advanced technologies and processes designed by Raytheon ELCAN engineers and skilled opticians – lies at the very heart of the company's operation and enables it to maintain its world leading position in this field.

Continual investment in innovating processes has enhanced Raytheon ELCAN's missile optics capabilities, namely with the addition of in-house Sapphire Dome Scooping.

Rather than purchasing pre-shaped dome blanks, the company purchases raw rods of sapphire crystal, or other materials, such as silicon. These blanks are 'scooped' from the rod in a nested fashion in order to reduce the amount of waste material.

Raytheon ELCAN says that this provides a cost-effective, highly accurate and controlled, improved process, which equates to significant value for its customers.



Missile applications have demanding needs and the company's highly-skilled opticians and engineers understand and design to these standards and specifications. Raytheon ELCAN opticians undergo a four-year intensive onsite apprenticeship programme and the company upholds rigorous in-house quality inspections and final inspections to ensure conformance.

MISSION:

INNOVATION IN ALL DOMAINS

IMAGING
AEROSPACE
DEFENCE
BIOPHOTONICS
INDUSTRIAL

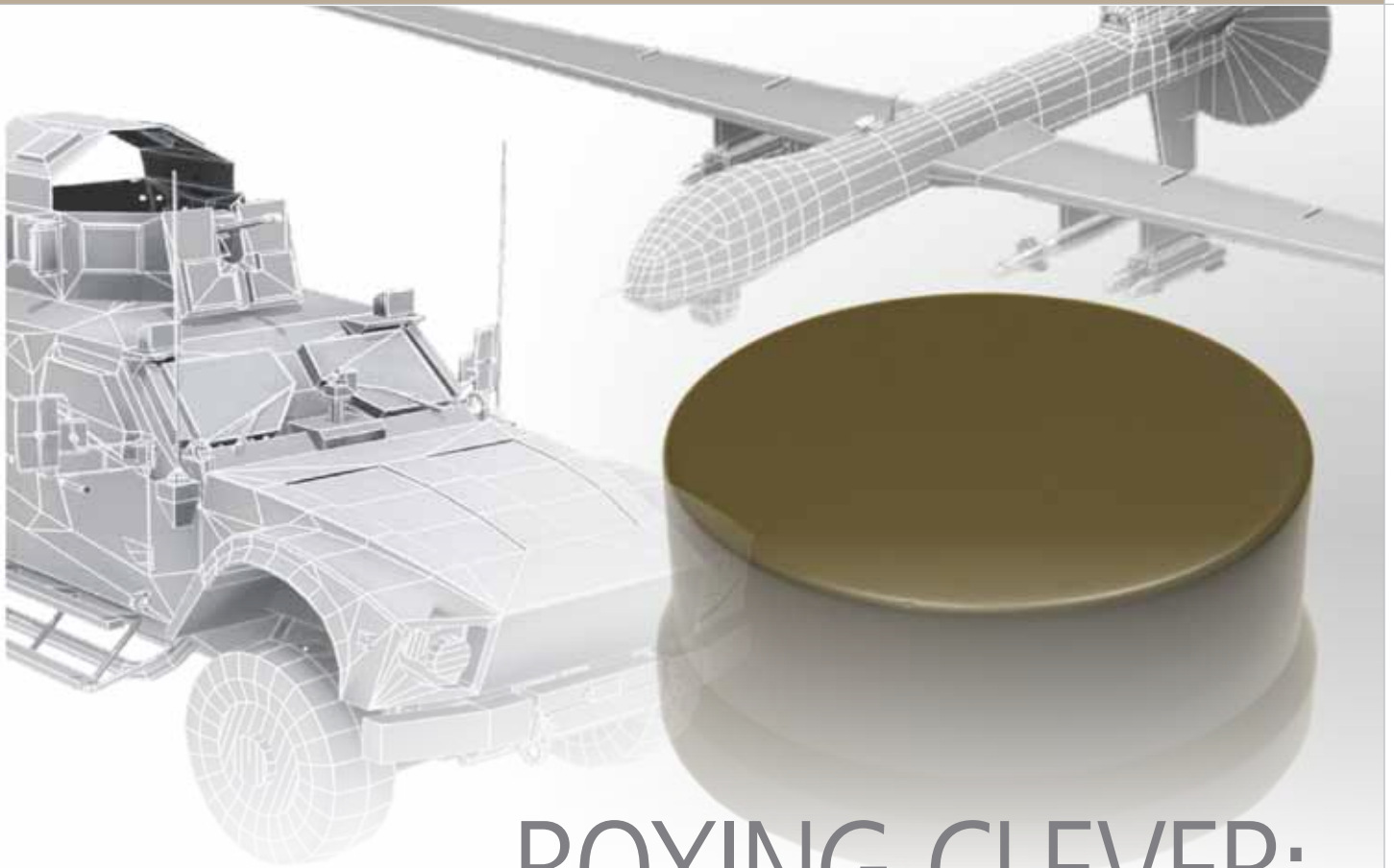
Raytheon
ELCAN Optical Technologies

RAYTHEON ELCAN OPTICAL DOME CAPABILITIES

- Spherical Domes
- Hyper-hemispherical Domes (exceeding 180 degrees)
- Conformal Domes
- Dome Mounting & Assembly
- Polycrystalline Optical Ceramics
- In-house Processes
- Traceability & In-Process Tracking

Discover the Technology...

Raytheon ELCAN manufactures many systems employing aspheric surfaces that have one unique rotational axis. This means that you can only really polish one part of that surface at a time, so the asphere will rotate around its unique axis and will be polished with a sub-aperture polisher moving across the surface, following the shape of the asphere. Similar techniques must be used in the manufacture of hyper-hemispherical domes.



BOXING CLEVER: LANDSHIELD™

Raytheon UK's new generation GPS Anti-Jam technology – a cost-efficient 'one-box' solution homed out of the UK primarily for the export market – will be disruptive in the marketplace... in a positive way of course



One-Box Solution:

Landshield™ is an affordable drop in extension for existing GPS navigation systems, providing anti-jam capability with enhanced situational awareness.

Such is inventive and innovative thinking inherent to solution development at Raytheon this often means that it gatecrashes its own party.

Derived from the company's proven digital technology currently in production, Landshield™, Raytheon UK's next-generation GPS anti-jam technology is one such example of innovative engineering.

Raytheon has more than 20 years' experience in the design and manufacture of GPS technology and has developed a whole range of products, primarily for the avionics and marine fields.

This new Landshield™ GPS anti-jam protection system is a step-changer in that it houses a multi-element antenna

and the anti-jam processing in a single small, cost-efficient, 'one-box' solution that interfaces simply at RF level to the GPS receiver, with minimal system modification required.

Historically, anti-jam technology has been rather large and bulky in terms of its size, weight and power requirements, so the real innovation challenge for Raytheon was how to minitaurise the existing tech and continue to deliver its operationally competent performance record.

Paul Bergqvist, Raytheon UK's Business Development Executive for Force Protection says: "We have achieved this by investing a large amount of money into developing a new ASIC (Application Specific Integrated Circuit) technology.

Pandora's Box

GPS is a key battlefield enabler, allowing the precise location of military assets in a real-time environment, however it is relatively easy to disrupt a GPS signal due to its extremely low power level. Commercial jamming gadgets have seen exponential growth in recent years but, in modern battlefield operations, Landshield™ protects this weak point while ensuring the continuing function of GPS and maintaining situation awareness in denied environments.

Primarily a military product, the main customer market areas for Landshield™ is the land military vehicle arena. Despite its title, it is not restricted to the land market and has also been developed for application in terms of missiles and UAV/UAS platforms.

"It also has a place in the critical national infrastructure market because we have the capability to put the anti-jam antenna on buildings that would then protect the systems in the building from jamming, so this is also an area of the market we are actively targeting," explains Bergqvist.

Asked about the challenges of innovation and investing in research and development into GPS anti-jam, whilst remaining competitive, Bergqvist responds: "A smaller unit delivers essentially the same base anti-jam performance as the large units. The anti-jam market has changed and when presented with the benefits of Landshield™ – in that the reduced size enables the tech to mount easily onto vehicles and UAVs/UASs, coupled with the knowledge that the global threat from the increased use of civil jamming devices is rising and there is a solution requirement – we've found that customers and a number of industry partners are satisfied that our smaller product exceeds base performance.

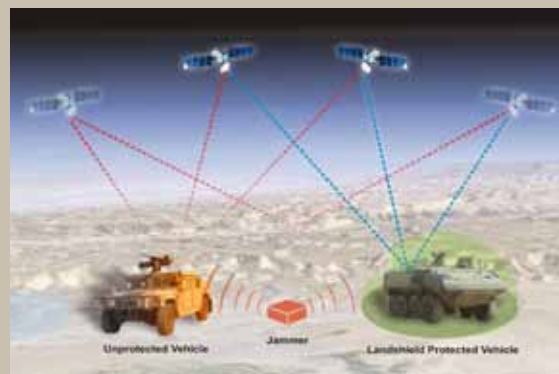
"Our job is to invite people to adopt a different approach and mindset to a small commodity anti-jamming product in the marketplace and ensure customers are aware that in Landshield™, Raytheon UK has developed a versatile, tactical and strategic solution to a global problem that is here today and has far-reaching consequences for both military and civilian operations.

"We firmly believe that once Landshield™ goes into full production it will be disruptive in the marketplace, in a positive way. And we think that the trend will then be for people to think differently on how they use GPS. Thereby anti-jam will become the integral part of a system that goes on to vehicles or UAVs and will be considered upfront, whereas now it is either thought of afterwards, or not at all."

Next Generation Landshield™

To ensure that innovation in Raytheon UK's GPS anti-jam product line keeps pace with the growing threat of commercial and military jamming, the company is already looking at taking Landshield™ to the next level, introducing a modular concept solution with even greater in-built capability. This could perhaps be a receiver, timing system, inertial navigation etc, within the single LRU itself, says Bergqvist: "It's a concept that we have been exploring and customers would be able to cherry-pick what goes into the box, thus providing them with specific advantages in many areas. We think this will be the next emerging trend.

"The civil and military anti-jam markets are rapidly moving forward and we are continually developing new products for land and critical national infrastructure customers in order to meet the ever changing needs of the global market." ■



The Tactical Advantage of Landshield™:

In unprotected systems, the power from the jammer could swamp all the satellite signals and the standard antenna, resulting in a complete loss of GPS navigation and/or timing. With Landshield™ GPS anti-jam protection, the antenna will null out the effect of the jammer by adjusting the gain profile of the antenna itself. This removes the unwanted signal allowing continued tracking of the remaining satellites.

Discover the Technology...

Raytheon UK's Landshield™ product offers proven performance in a compact solution. This cost-effective, small form factor and lightweight GPS anti-jam upgrade will simply replace existing unprotected/GPS antennas, as well as enhance original installations.

Landshield™ interfaces with standalone GPS receivers or those integrated within communication, inertial navigation, sighting, vehicle or weapon-aiming systems. The typical environments it is suitable for are: military, infrastructure, maritime, government and avionics.

During operations when it is necessary for friendly forces to deploy electronic counter measures, Landshield™ enables a vehicle or buildings' GPS equipment to function unimpaired against the full range of hostile jammer types including narrow band, broadband, continuous wave, pulse, swept and spectrally matched. This overcomes the limitations of simple electronic filtering systems that cannot mitigate broadband jamming.



Jammer Detection and Direction Finding:

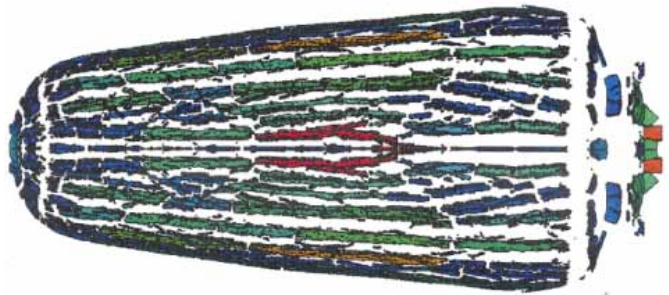
Landshield™ provides the user with an indication of the presence of jamming and its direction, so this information can be fed back into the tactical and strategic real-time awareness picture.

WARHEAD DEVELOPMENT

Using Hydrocode Modelling

For several years, Raytheon UK has been developing the concept of a low collateral warhead. This is a challenging proposition since although the warhead's purpose is to reduce collateral damage, it still has to remain effective in defeating a wide variety of very selective targets. Additionally, the warhead has to have the same physical characteristics as the original warhead to ensure there is no impact on the weapon's guidance or on the release aircraft.

Raytheon UK's engineers considered a wide variety of design possibilities to achieve these aims, but which features would be better and what effect would they produce?



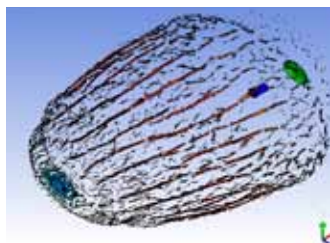
Historically, the only way to assess explosives is to simply build them and 'blow them up'. The drawback is that these tests are often complicated, time consuming and are always expensive. In order to assess multiple design features efficiently, another method had to be found. Raytheon UK identified hydrocode modelling as a potential method to solve this problem.

In the purest sense, Hydrocode modelling is the ability to model fluid flows at extremely high speeds. Explosive events lend themselves well to this type of modelling because the event occurs incredibly quickly (microseconds) and acts as a fluid during this time period.

Raytheon UK worked with the UK's Weapon Science and Technology Committee (WSTC) to identify hydrocode modelling as a necessity for complex weapons development. In 2012, Raytheon was awarded a contract to identify and develop the state of hydrocode modelling across the UK. Raytheon identified several companies and academic institutions that were able to perform this type of modelling and brought them all together for a programme that allowed them to demonstrate their modelling capability. To support these models, Raytheon conducted a series of live-fire trials to provide data that would validate and assess the accuracy of each of the models.

The results from the modelling and testing demonstrated that hydrocode modelling is a valuable tool in assessing warhead design options. The tools allow Raytheon designers to create concepts and determine their effects quickly. In the past, it would take six months to develop a concept, create a prototype and perform a trial. Thanks to hydrocode modelling, Raytheon is able to perform the same type of assessments in approximately two weeks and without the need for building expensive prototypes and performing extensive testing.

Raytheon UK has developed its latest low collateral warhead designs purely with hydrocode modelling. The UK Ministry of Defence has also been particularly interested in these modelling techniques. In 2014, Raytheon UK will be performing a much larger 'live fire' trial with the aim of further developing and validating the modelling capability and allow these models to be used across the defence industry. Raytheon UK has been at the forefront of introducing hydrocode modelling into weapon development and has demonstrated that it provides true added value, and will have a long future in supporting complex design and development tasks. ■



Images from top to bottom:
1. Fragmentation,
2. Low Collateral warhead,
3. Hydrocode Model,
4. Model Validation Trial.

Burns Celebration at House of Lords



Above: Raytheon UK's Chief Executive Officer Bob Delorge (fourth left) pictured with his Leadership Team at the event.

The Raytheon UK Leadership Team were joined by more than 80 senior customers, stakeholders and industry partners at the 9th annual Raytheon Burns Supper, held in London's House of Lords on 22 January 2014.

The event celebrating the life and poetry of the famous Scotsman Robert Burns and Raytheon UK's strong ties with Scotland, is a key date in the company's calendar. The event highlights included a memorable Haggis ceremony and address by Group Captain Mark Gilligan (Chief Air Engineer HQ 1 Group) and an impressive Immortal Memory rendition by Bob Garmory, Director of The Purvis Group. Raytheon UK's John Craib, C4ISR Business Development Executive, delivered a highly entertaining 'Toast to the Lassies', with Dr Andie Johnson-Mitchell, Head of Business Development for the Power and Control business, reciting a fantastic 'Reply Fae the Lassies'.

DGI 2014

The geospatial intelligence community gathered in London for the 10th annual DGI conference (22-23 January 2014). More than 800 defence and security professionals attended the event covering the future of data, geospatial intelligence and cyber security. The key themes for DGI 2014 were the return to contingency in defence and homeland security, cyber and the big data challenge.

Raytheon UK's Martyn Dawkes, Technical Director and Engineering Fellow, gave a topical presentation at the Conference entitled 'Seek and Ye Shall Find?' which explored the opportunities and challenges of big data and the implications for coherent decision making.

Raytheon Sponsors London Cyber Summit

Raytheon UK's Head of Cyber Security, lead a seminar on insider threat and behaviour monitoring during a Raytheon-sponsored Cyber Summit held in London on 26 November 2013. Attended by more than 500 governmental delegates, Deputy Director at the UK Government's Office of Cyber Security and Information Assurance gave an insightful address on the progress the government is making with regards to the National Cyber Security Strategy.

Danish Defence and Aerospace Conference 2014



More than 250 industry and government representatives from across Europe, including Danish Minister of Defence Nicolai Wammen, attended the second annual Danish Defence and Aerospace Conference in Copenhagen (5-6 February 2014). The conference, sponsored by Raytheon, explored the future of the European defence industry, Danish defence acquisitions and the critical need for joint cooperation between industry and the Danish Ministry of Defence. Mr. Wammen delivered a keynote speech at the main conference dinner which was sponsored by Raytheon.

UPCOMING EVENTS

Feb 25-27	Airborne ISR & C2 Battle Management, London
Mar 4-6	World ATM Congress, Madrid
Mar 5-6	IA Practitioners' Event, York
Mar 31	Soldier Systems 2014, Berlin

Raytheon

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CYBER RESILIENCY



ANTICIPATE



WITHSTAND



RECOVER



EVOLVE

RAYTHEON MEANS RESILIENCE.

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