

# PHOENIX rises to deliver long range engagement & enhanced target location

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**The potential for trained operators to engage targets accurately and effectively at greater ranges, at night and in adverse weather conditions is increasing. Driven by performance developments in weapons and emerging ammunition natures, the challenge once more reverts back to the Visual Augmentation Systems (VAS) to step up to the plate. VAS solutions need to ensure that the enhanced lethality capability can be exploited 24hrs a day under a range of demanding environmental conditions.**

## PHOENIX – The Evolution of Connected VAS Capability

Excelitas, through its rich Qioptiq heritage is a world leader in the design, development and deployment of Dismounted Warfighter Visual Augmentation System (VAS) solutions covering Night Vision, Thermal and more recently, Fused technologies.

In all cases, working closely with Government R&D communities and operators during the New Product Introduction (NPI) process ensures that an appropriate trade of SWaP-C (Size, Weight and Power v's Cost) can be carried out. Focusing on the Operator "Touch Points" ensures product solutions are integrated well with host weapon/sight systems, as well as being intuitive and easy to use. Thus they truly provide enhanced features and capabilities to support the warfighter.

For Excelitas, the MWIR HOT (Medium Wave Infra-Red – High Operating Temperature) Product journey started as HOT technology began to evolve and resulted in prototype systems being developed. With the emergence and maturation of a number of MWIR-HOT Thermal Sensors from suppliers worldwide, the potential to integrate the MWIR-HOT technology into a robust, reliable and SWaP-C traded Weapon Sight has become a reality.

Following the conclusion of a very successful Technology Demonstration Programme (TDP) led by the UK's Defence Science and Technology Laboratory (DSTL) which looked at the potential for HOT Technology to be ruggedized sufficiently for use on Sniper Weapons, the Excelitas team continued to develop the technology. Particular emphasis was placed on

the integration into the high shock environment of Sniper Weapons, to a point where it was time for PHOENIX to rise.

PHOENIX, is a suite of Dismounted VAS products that will provide the Warfighter with enhanced Observation, Surveillance, Target Location and Target Engagement capabilities. It is based upon a common HOT thermal core, operating architecture, enhanced connectivity and capability growth potential.

PHOENIX-S is our first MWIR HOT product, and was formally launched in 2019. With PHOENIX-S we have started with our core product line of In-Line Weapon Sights. PHOENIX-S provides target recognition, Identification and engagement capability that is well matched to the range capabilities of modern 0.338" and 0.5" Sniper Rifles and Ammunition, whilst still being sufficiently compact and lightweight to be utilised on 6.5 / 6.8 / 7.62 Sharpshooter / Support Weapon platforms.



The main challenge with PHOENIX-S was to engineer a solution that would prove robust and reliable when used with 0.338" and 0.5" Semi-Automatic and Bolt Action Weapons. Ensuring boresight retention, along with the ability to adapt the system for Extended Range Engagements (ERE) out past 2km was a key driver.

Extensive development work was conducted, analysing high speed shock data captured from a range of weapon



systems. Coupling this activity with proprietary shock analysis and modelling capability has resulted in a mechanical design construction that significantly reduces the amount of weapon shock that is transferred directly to the PHOENIX-S Thermal Core, Optics and Electronics. This in turn ensures that boresight retention is achieved, and overall system MTBF is improved over similar products using Cooled MWIR cores. The ERE capability is achieved by compensating the sight orientation via a simplistic Operator control.

Another challenge was to provide the Operator with a good balance of Field of View v's Range Performance, and we settled on an optical solution that provides 4 degrees Horizontal Field of View, therefore retaining a good level of Situational Awareness, even at longer ranges.

The PHOENIX NPI team spent a considerable amount of time looking at trade studies, design options and prototypes in order to get the launch variant optimised to make an impact and produce something that operators would find easy to use.

We have learned a lot about image processing and target image enhancement from our recent SAKER and TALON Fused weapon sight product developments, and associated operational deployment feedback, with that learning experience being applied directly to the PHOENIX systems. This provides Operators with enhanced imaging features, including the subtle use of colour and thresholding techniques which further assists the Detection, Recognition and Identification of targets at extended ranges and under challenging conditions.

PHOENIX-S made its debut outing at the SOFIC 2019 Event in Tampa where it attracted significant attention, and continued to be a centrepiece exhibit at Defence Trade shows throughout the rest of the year, including DSEi in London (September), and AUSA in Washington DC (October).

PHOENIX-S has secured its first production order for a NATO customer, selected following international competition, and is currently in volume manufacture with deliveries commencing later this year. PHOENIX-S is also being assessed by a number of customers looking for a Long Range, High Performance, and ITAR free VAS solution to enable high performance weapons, ammunition and Operators to fulfil their potential, irrespective of the operational conditions they face.

Recognising that the future of dismounted operations and enhanced effectiveness is very much focussed on connectivity and the ability to share and exploit data between operators, PHOENIX-H sees the launch of a hand held multifunction target locator utilising common elements with PHOENIX-S. Featuring additional capabilities in order to deliver a next generation multi-spectral Target Location Capability for Dismounted Operators such as Sniper Pairs, Mortar Fire Controllers and Forward Air Controllers, PHOENIX-H raises the bar.

PHOENIX-H shares the HOT Thermal Core and central processing with PHOENIX-S for commonality, but also features a digital day channel, Laser Range Finder, Laser Pointer, GPS and an advanced AHRS (Attitude and Reference Heading System) which provides accurate own and target location.

The thermal channel of PHOENIX-H is a true optical zoom providing the Operator with Field of View options from 16 degrees in Wide Field of View, to 2 degrees in Narrow Field of View, which results in man sized target detection at ranges in excess of 6km and vehicle sized target detection at ranges in excess of 11km. The digital optical channel is matched to the thermal channel, which provides fused imaging capability for enhanced target interrogation.

► One of the main focus areas for the development of PHOENIX-H has been the AHRS module, and the development of the core module to provide reliable and repeatable data in the harsh military environments. Concurrent activities on a combination of sensor technology development and algorithms have helped to achieve this.

Connectivity is a theme that flows through the PHOENIX system concept, with the ability to share images, targeting & ballistics information and other battlefield data between PHOENIX systems. Connectivity with battlefield management systems (BMS), is a key differentiator over existing / similar “Stand Alone” VAS products, as we enter the era of the Hyper Enabled Operator and enhanced connectivity amongst small operational teams.

Connectivity with Battlefield Management Systems such as the Android Tactical Assault Kit (ATAK) means that PHOENIX systems can become an effective sensor node in the connected battlespace, and offer far greater utility than stand-alone systems. The potential to integrate / Interface with UAS / UGS offers great potential, along with sufficient architecture / processing headroom to incorporate auto target detection / identification / tracking capabilities.

Collaborative Target Handoff (CTH) is a capability embedded within all PHOENIX product variants. CTH provides the PHOENIX Operators with the ability to share or “hand off” targeting location data between systems using a combination of image processing algorithms and Augmented Reality (AR). This allows clear and precise indication and identification of target locations and other critical battlefield information within the operator’s field of view. All achieved by intuitive MMI without the need for verbal or radio communications, which is seen as a

significant means of streamlining target identification & handoff, and therefore increasing operational tempo.

Alongside the numerous developments focussed on enhancing PHOENIX products from the Operator / Operational perspective, the NPI team has also embraced a range of new materials and manufacturing processes, including additive manufacturing (AM), in order to deliver lightweight & robust solutions offering excellent EMC screening, coupled with a simplistic maintenance and repair philosophy aimed at reducing system down time and through life cost.

PHOENIX-H is currently in final prototype development and testing, and will be making its production variant appearance at AUSA in Washington DC (October) where it will join its partner PHOENIX-S and the wider range of Excelitas products.

The PHOENIX System approach provides the foundations for development of further product variants to support enhanced VAS solutions over the coming years, as a number of customers worldwide seek to modernise enhance their Vision Solutions. Greater range performance and enhanced connectivity are achieved by taking advantage of the rapidly developing areas of sensor development, algorithm development and artificial intelligence to provide truly connected VAS capability.

Providing Hyper Enabled Operators with the ability to out think, out smart, and out fight our enemies, is what Excelitas is all about in the Dismounted Warfighter domain. As with all Excelitas VAS products, PHOENIX systems are ITAR free solutions, whilst utilising the latest in sensor and display technologies, without compromising performance. ■

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