SHEPHARD

THE CONCISE GLOBAL INDUSTRY GUIDE

NIGHT VISION AND OPTICS HANDBOOK

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COVER: A soldier using Safran's multifunction IR binoculars JIM COMPACT. (Photo: Safran)
ABOVE: Commando Royal Marines conducting strikes during Exercise *Green Dragon*. (Photo: Crown Copyright)

OWN THE NIGHT

Target. Engage. Neutralize.

The L3Harris ENVG-B is today's most-advanced Situational Awareness Night Vision goggle. This dual-wave solution fuses white phosphor and thermal technologies, giving soldiers what they need—unmatched clarity in all battlefield and light conditions. They can bring weapon sight images into the goggle and see around corners without risk of exposure—speeding operations while increasing effectiveness, and most importantly, soldier safety.

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Night Vision and Optics Handbook

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SHEPHARD

Welcome

Night vision and optics have never been more important to the warfighter – a fact which has been clearly illustrated over the course of Russia's invasion of Ukraine in Q1 2022.

As *Shephard*'s *Night Vision and Optics Handbook* goes to press, the Ukrainian armed forces have continued to successfully repel their Russian adversaries, benefitting from an extensive suite of Western-provided EO technologies to find, fix and destroy enemy personnel and materiel.

Open-source intelligence streams on social media in particular highlighted the deployment of state-of-the-art MOTS night vision devices as well as COTS solutions as provided by a wide variety of government and private donors.

This expansive inventory of technology allowed the Ukrainian armed forces to 'own the night' in the planning and successful execution of a wide variety of mission sets at night and in low light conditions. Examples include Ground Panoramic Night Vision Goggles (GPNVGs) which are currently in service with a select number of SOF around the world, including the Ukrainian Special Operations Command.

Undisclosed Ukrainian SOF units are using GPNVGs as well as other monocular and binocular NVGs to roam behind Russian lines at night to identify and attack armoured and non-armoured columns of vehicles, dismounted infantry and SOF, as well as critical infrastructure and supply lines.

Similarly, night vision and optics equipment has been critical in facilitating successful precision strike fire missions using Western-donated anti-armour munitions and missiles. EO/IR cameras allow antitank guided munitions to accurately detect, identify and target enemy platforms and infrastructure both in daylight and low light conditions.

However, it is not just SOF units on the ground that have benefitted from game-changing night vision and optics technologies. Fixed- and rotary-wing aircraft, tactical ground vehicles, surface and subsurface platforms and even satellites are all operating EO/IR and image-intensified solutions that enable them to gather as much intelligence across even the most complex of battlespaces to generate situational awareness and maximise operational effectiveness.

The successful deployment of night vision and optics technologies in Ukraine is only the tip of the iceberg though. As the market continues to evolve at rapid pace, industry is responding to emerging demand signals from end-users, which call for the fusion of image-intensified and IR pictures into a single field of view, a capability that continues to proliferate across the most modern armed forces.

Examples include the US Army's Enhanced Night Vision Goggles-Binocular (ENVG-B) which also includes the added integration of AR technology, a capability that further enhances the advantage of armed forces operating at the tactical edge.

According to the US Army Futures Command, ENVG-B offers 'improved depth perception and rapid target acquisition, providing dismounted soldiers with unparalleled vision day or night, including in low or no light, fog, smoke and inclement weather'.

In 2022, ENVG-B continues to be further developed and fielded by the US Army's Maneuver Capabilities Development and Integration Directorate's Soldier Readiness Division as it continues to improve visual aids available to soldiers operating in low-visibility environments.

ENVG-Bs allow soldiers to conduct thermal scanning during daytime and nighttime operations as well as the capability to see around corners or other obstacles. (Photo: US Army)

The US Army Futures Command is also responsible for advancing another potentially game-changing capability for forward-deployed warfighters – the Integrated Visual Augmentation System which allows the warfighter to benefit from AR iconography in both day and night conditions.

Working alongside Microsoft, the army is exploring how such a capability will enable the warfighter to view a wide range of tactically critical information on the battlefield, including friendly and enemy force positions, target designation, bearings, chatrooms and orders.

This will not only streamline decision-making processes, where it is needed most, but also reduce targeting loops and ensure those operating next-generation night vision and optics gain tactical overmatch, no matter where they are operating.

Elsewhere in the market, industry continues to work hard to reduce SWaP and cost of night vision and optics as technologies continue to proliferate around the world.

We hope you enjoy this latest edition of the *Night Vision and Optics Handbook* which collates all the night vision and optics devices currently available to armed forces worldwide as they seek to maintain the tactical overmatch over adversaries across the full extent of the modern battlespace.

Andrew White,
Editorial Consultant

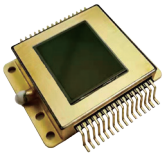
TECHNOLOGY FOR DISPLAY

OLiGHTEK
Technology for display

AMOLED MICRODISPLAY

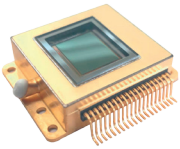
Display Size	Resolution	Pixel Size(μm²)
0.38″	800x600	9.6x9.6
0.39″	1280x768	7.8x7.8
0.41″	800x480	11.1x11.1
0.5″	800x600	12.6x12.6
0.6″	800x600	15x15
	1280x1024	9.3x9.3
0.61″	1280x768	12x12
0.97″	800x600	24.6x24.6
0.98″	2048x2048	8.64x8.64

DETECTOR



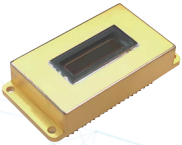
640×512/15μm Uncooled VOx Long Wave Infared FPA Detector

Spectral response range	8μm-12μm
NETD	≤28mK@1/f , 300K , 50Hz



640×512/15μm InGaAs Short Wave Infared FPA Detector

Spectral response range	0.9μm-1.7μm(optional extended waveband = 0.4μm to 1.7μm)
Maximum FR at full window	≥300Hz@8 outputs



1024×1/12.5μm InGaAs Short Wave Infared LineScan Detector

Spectral response range	0.9μm-1.7μm(optional extended waveband = 0.4μm to 1.7μm)
Maximum Line rate	≥30KHz@2 outputs

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EQUIPMENT

AIRBORNE SYSTEMS

This section contains basic data on a selection of NV and EO systems used to aid pilotage, navigation, surveillance, targeting and fire control in fixed-wing aircraft and helicopters.

- NVGs
- integrated helmets

The equipment is listed alphabetically by manufacturer within the above subsections.

If you think your product should be listed, please contact the team at insight@shephardmedia.com to ensure it appears in the *Shephard Defence Insight* online database (plus.shephardmedia.com) and is included in the next handbook edition.

ABOVE: An AH-64 Apache pilot equipped with the Integrated Helmet and Display Sight System during Advanced Aerial Gunnery Tables in August 2020 at Pōhakuloa Training Area, Hawaii. (Photo: US Army)

NVGs

AERO DYNAMIX

NVG for Aircrew

Aero Dynamix is an approved repair/service centre for L3 and ITT NVGs. Its technicians are certified to provide maintenance and inspections and adhere to all necessary requirements to test, inspect and evaluate NVGs in accordance with the manufacturer's procedures. Aero Dynamix offers 180-day NVG recertification and repair for L3 M949 AN/AVS-9 and ITT's F4210 and F949 series.

AEROTEC GROUP

Hela Mk2

The Hela Mk2 is an NVG for helicopter and transport aircraft pilots, featuring a wide-aperture objective lens. Constant resolution of the image is kept even when a polluting bright light source enters the FOV, according to Aerotec. This feature is useful when flying over urban environments or landing in brightly lit areas. The Hela Mk2 NVGs are compatible with Aviator's Night Vision Imaging System-type helmets.

AVIATION SPECIALTIES UNLIMITED

AN/AVS-9 White Phosphor

Aviation Specialties Unlimited's third-generation White Phosphor NVGs provide high image quality with high resolution and diminished halo. White Phosphor provides a black-and-white moving image to the user as opposed to the black-and-green images generated by green phosphor-based NVGs. Designed for enhanced image clarity and depth perception, the AN/AVS-9 White Phosphor provides high-light performance due to autogating, improved low-light performance and an increased figure of merit.

ELBIT SYSTEMS OF AMERICA

AN/AVS-6 (F4210 series)

The AN/AVS-6 (F4210 series) NVGs are used by US Army helicopter aircrew and have been sold to allied nations. The lightweight binoculars can be mounted to a variety of aviator helmets, including the Alpha, HGU-56/P and SPH-4B. A clip-on power source is available as an optional accessory, enabling handheld operation. Gen 3 gated pinnacle tubes provide performance under various light levels encountered during night flying operations.

AN/AVS-9 (F4949 series)

The AN/AVS-9 (F4949 series) is the standard night flying system for USAF and USN aircrew. Over 26,000 F4949 systems are in service in 34 nations. The F4949 series of aviator's NV systems is available in over 40 different configurations, determined by the type of aircraft and type of helmet being used. Rotary-wing versions of the F4949 feature a rear-mounted, low-profile battery pack, which provides more than 50h of operation. Weight: 550g

FENN NIGHT VISION

NG700+ System

The Fenn NG700+ System includes a lightweight NVG and a helmet-mounted power pack. Its features include: lightweight design, fast F/1 objective lens, integrated low-level battery warning light, no single point of power failure, can be fitted with Gen 2 or Gen 3 I2 tubes, available with class A, B, C and UK645 Blue filters and no ITAR. The system is DNVG-compatible and has been ergonomically designed for rotary-wing aircraft. It has been designed and manufactured within the EU. Weight: 600g

NG2000A

The NG2000A lightweight, low-profile NVGs are designed for use by fixed- and rotary-wing pilots during extended mission profiles. Weight: 590g

HOFFMAN ENGINEERING

ANV-126A-001

The ANV-126A-001 is a computerised digital NV device test set. It offers an increased FOV and better resolution levels than the previous ANV-126 model. The ANV-126A adds a microprocessor to the system's electronics, replacing a variety of analogue components in the ANV-126. Menus guide the user through test sequences and provide preset test levels in addition to allowing for manual settings.

L3HARRIS TECHNOLOGIES

AN/AVS-6 and AN/AVS-9 (M949)

The AN/AVS-6 and AN/AVS-9 (M949), with Gen 3 NV, provide situational awareness with 25mm eyepieces and binocular viewing with depth perception to improve the FOV. Interface controls include interpupillary, vertical, fore/aft and tilt adjustments. The power pack attaches to flight helmets and has multiple mount options. Options include Class A and C ('Leaky Green') filters and a clip-on power supply for preflight or dismounted operations. Weight: 550g

LEONARDO ELECTRONICS

VigilX

The VigilX system provides situational awareness by the real-time stitching of multiple IR and visible EO sensors, delivering a panoramic 'through-the-hull' vision. VigilX allows operations in the day, night, all-weather and zero-light conditions, including low-level flight, troop or logistic insertion, extraction, airdrop and SAR.

NEWCON OPTIK

NVS 6/NVS 9

The NVS 6 and NVS 9 Aviator's Night Vision Imaging System goggles allow pilots to navigate in nap-of-the-earth flight, take off, land and perform other operations that are otherwise impossible at night without the use of a light source. Adjustable 25mm eyepieces provide eye relief, enabling viewing regardless of positioning. Interface controls, including interpupillary adjustments and vertical, fore/aft and tilt adjustments, allow improved viewing of the system FOV.

The Night Vision Aviator Goggle (NVAG) consists of lightweight binoculars, which can be fitted on a variety of helmets using the mounting adapter. (Photo: Nivisys)

NIGHT FLIGHT CONCEPTS

NVIO NVG CBT

NVIO NVG Computer-Based Training (CBT) is a blended training system, allowing operators and maintainers of NVGs to use 3D virtual equipment to 'learn by doing' in context. The NVIO NVG CBT integrates Federal Aviation Administration-approved, self-paced courseware and practice in synthetic environments to deliver interactive instruction on NVG system capabilities and limitations, operational concepts, equipment parts familiarisation and NVG operation and maintenance procedures.

NIGHTLINE

NL949B

The NL949B NVGs are based on the US military model AN/AVS-9 and are designed to provide situational awareness and aid depth perception. The device is available with Class A, B and C objective lenses, filtered to be compatible with aircraft lighting. Adjustments for interpupillary, vertical, fore/aft and tilt can be controlled using the interface controls. Weight: 534g

NIVISYS

NVAG

The Night Vision Aviator Goggle (NVAG) consists of lightweight binoculars, which can be fitted on a variety of helmets using the mounting adapter. Powered by a dual-battery power pack that provides the pilot with immediate reserve power, NVAG-9 goggles are available with a range of I2 tube performance levels and lens coatings. Weight: 524g

OIP SENSOR SYSTEMS

Helimun Mk 6

The Helimun Mk 6 is an NVG for helicopter pilots, featuring an XD-4 or XR-5 I2 and Aviator's Night Vision Imaging System-type bracket. Both the 40° and 60° FOV versions have a focal range of 25cm to infinity. Weight: 610g

PCO

PNL-3 BIELK

The PNL-3 aviator's NVGs allow stereoscopic twin-eye observation, retaining the feeling of natural shapes and sizes of observed objects and scenery, according to the company. The NVGs are adapted to mount on the aviator's helmet and can be adjusted for individual users (pupil distance and position). The battery pack for the NVGs is a separate unit fixed to the back of the helmet for weight balancing and reduction. Weight: 1,050g

PNL-3M Orlik

PNL-3M are high-performance, lightweight, passive stereoscopic NVGs for helicopter crew members. Certification by European Aviation Safety Agency also enables civilian use. The device can be powered from one of two alternative power supply sources, from the aircraft's onboard power supply network or from the battery pack that comprises two independent AA-size battery compartments. Weight: 840g

SAFRAN ELECTRONICS & DEFENSE

CN2H

CN2H NVGs are designed for use by helicopter or transport aircraft pilots and can fit a variety of helmets (Alpha, Gentex SPH4 and SPH5, Gueneau 459, Mk IV). A power supply module is mounted to the rear of the helmet to balance the goggles. The performance of the NVGs depends on tubes. Weight: 190g

CN2H-AA Mk II

CN2H-AA Mk II NVGs are the latest version of the CN2H, designed for use by helicopter and fixed-wing pilots. They can fit a variety of helmets (OS 458 and 459, Gallet LH 250, Alpha, Gentex HGU-55, SPH5, ZSh-5) and have a quick, manual, disconnecting system. A power supply module is mounted at the rear of the helmet to balance the goggles. Weight: 150g

THALES ANGENIEUX

HELIE

The Helicopter Light Intensifier Equipment (HELIE) NVGs are designed for airborne operations at low-light levels. HELIE is said to collect 60% more light than traditional goggles, and its optical performance allows Level 5 (very dark) night flying. The compact, lightweight design is based on aspherical lenses, which boost the I2 tube performance. Weight: 560g

TROYA TECH DEFENSE

Strix

The Strix Aviator's Night Vision Imaging System is designed to be compatible with existing AV/AVS-9 or AV/AVS-6 adapters and accessories and with most aviation helmets. In order to facilitate depth perception and comfortable viewing, the Strix is equipped with dual optical channels (objective lens and eyepiece) and adjustable focus. The Strix is fitted with an 18mm I2 tube and features a low-battery indicator. Weight: 650g

VISION SYSTEMS INTERNATIONAL

NVCD ANVIS

Vision Systems International has developed NV options to provide cueing symbology for night missions. NV Cueing and Display (NVCD) expands the capability of the Joint Helmet-Mounted Cueing System by providing the user with image-intensified NV merged with standard helmet-mounted display (HMD) symbology and line-of-sight tracking. NVCD Aviator's Night Vision Imaging System (ANVIS) inserts cueing symbology into standard 40° FOV ANVIS-9/F4949 NVGs. Company HMD users who already own ANVIS-9/F4949 goggles can modify their existing NVGs in less than one hour with a kit.

INTEGRATED HELMETS

BAE SYSTEMS

Q-Sight

The Q-Sight is a helmet-mounted display device designed for 'plug-and-play' integration, which makes use of patented holographic waveguide technology. It projects digital video and data onto a monochrome, see-through display located within the user's line of sight. This provides the ability to superimpose georeferenced situational awareness data and imagery onto the user's real-world vision.

Striker

Striker is a visor-projected 24h helmet-mounted display (HMD) for fixed- and rotary-wing applications. The fixed-wing variant is in service on Eurofighter Typhoon and Saab Gripen aircraft, while the rotary-wing variant has generic applications across a range of platforms. The Striker HMD aids situational awareness by providing a wide FOV, visor-projected display of both symbolic information and cues and high-resolution video. Picture-in-picture capability allows pilots to identify targets, potential landing zones and other information.

Striker is a visor-projected 24h helmet-mounted display for fixed- and rotary-wing applications. (Photo: BAE Systems)

Striker II

The platform-agnostic Striker II helmet-mounted display (HMD) builds upon BAE Systems' current Striker HMD (see separate entry). It is a digital solution based on a two-part helmet design with an integrated NV camera in a 'cyclops' configuration for increased comfort in g-level manoeuvres. Day/night situational awareness is delivered through visor-projected imagery augmented with symbology.

ELBIT SYSTEMS

Brightnite

The Brightnite 'any night, all night' DVE/LVL system is an NV pilotage solution designed for low, stealth and operational night flights in degraded visual environments, extreme weather, harsh environments, hostile territory and total darkness. The system comprises a radome containing eight uncooled FLIR sensors housed in a turret carried beneath the helicopter's nose.

ELBIT SYSTEMS INTELLIGENCE AND ELECTRO-OPTICS – ELOP

ANVIS/HUD 24T (AN/AVS-7, AN/AVS-503, DNVG)

The ANVIS/HUD 24, also known as the Helmet Display and Tracker System (HDTS), is a 'round-the-clock' system with day and night display capabilities. It aids situational awareness by reducing the pilot's head motion for cockpit scanning and enhances survivability in bad weather, degraded visibility environments, low altitudes and during night operations.

IHADSS-21

The Integrated Helmet and Display Sight System (IHADSS)-21, designed by Elbit Systems and Elbit Systems of America, allows AH-64 Apache helicopter crews to access the capabilities of the legacy IHADSS, with improved video performance, EMI operation, maintainability and reliability and accurate NV capabilities. No mechanical or wiring changes are necessary. The IHADSS-21 slaves turreted weapons, missile seekers and gimballed NV sensors to the pilot's line of sight.

Jedeye

The Jedeye is designed to improve situational awareness for combat helicopter pilots, particularly during nap-of-the-earth operations. The wide horizontal FOV and resolution of the display aid understanding of peripheral cues and perception of terrain flow. The system can display hostile fire zones and provide head-up guidance via secure waypoints to ensure that the flight path passes outside the area of the threat.

ELBIT SYSTEMS OF AMERICA/VISION SYSTEMS INTERNATIONAL

F-35 Gen III HMDS

The F-35 Gen III helmet-mounted display system (HMDS) is provided by a JV between Elbit Systems of America and Rockwell Collins, developed for the F-35 Lightning II. The system has a biocular, wide FOV, visor-projected display, providing flight information in the form of video and calligraphic imagery to the pilot. Using opto-

magnetic tracking and low-latency graphics processing, the HMD provides pilots with a virtual head-up display.

FN HERSTAL

FN D-HUD

The FN Digital Head-Up Display (D-HUD) is a sighting system designed to improve the accuracy of axial-mounted rockets and machine guns on rotary-wing aircraft. It incorporates advanced digital electronics and EO systems that can be integrated on new platforms or retrofitted on in-service helicopters. Unveiled at Eurosatory in June 2014 as a standalone system, the D-HUD is also an integral component of the FN Airborne Digital Suite. Weight: 9,500g

HENSOLDT OPTRONICS GMBH

Archer Z-150

The Archer Z-150 helmet-mounted display (HMD) features conformal (stabilised) symbols and/or imagery. The HMD uses holographic optical waveguide technology to deliver display performance and NVG compatibility. Turreted weapons and sensors are slaved to the user's line of sight via an optical head tracker integrated on the HMD. The Archer Z-150 consists of a two-part helmet system: the inner part contains audio and life-support equipment, while the outer part contains the optical head tracker, cathode ray tubes, optical modules, NV cameras and electronics.

KRET

NSTsI-V

KRET is developing the NSTsI-V helmet-mounted targeting and display system for pilots. The system projects an image onto the transparent screen in front of the pilot's eyes, enabling them to fly and aim without looking down at indicators in the cabin.

OPTIX

Diana A

Diana A NVGs allow helicopter pilots to navigate in nap-of-the-earth operations, taking off, landing and carrying out other tasks that are otherwise impossible or dangerous in night conditions without the use of illuminating resources. Diana A NVGs are designed to extend the operational mission capability of helicopter crews, allowing surveillance of the earth's surface at heights of not more than 200ft and velocity of not more than 145kt with a wide FOV.

The Archer Z-150 helmet-mounted display features conformal (stabilised) symbols and/or imagery. (Photo: Hensoldt Optronics)

THALES AVIONICS

Scorpion

Claimed to be the world's first full-colour helmet-mounted display, the Scorpion provides dynamic flight and mission data into the aircrew line of sight, allowing the user to remain head-up and eyes-out with real-time situational awareness. Full colour allows matching to colour multifunction display schemes for lower pilot workload and higher safety. The Scorpion uses a Hybrid Optical-based Inertial Tracker for accuracy, zero latency and jitter-free symbology. Weight: 2,100g

TopOwl

The TopOwl binocular helmet-mounted sight and display has been chosen by 16 countries for their army, navy and/or air force attack and transport helicopters. It is operational on six major helicopter programmes – Tiger, NH90, Rooivalk, AH-1Z, UH-1Y and T129. TopOwl is combat-proven in Afghanistan, Libya and Mali, where it demonstrated operational efficiency and the ability to increase mission success rates, according to Thales. Weight: 2,200g

TopSight-E

The TopSight-E helmet-mounted display system for fighter pilots projects a conformal display of sensor information directly in front of the pilot's eyes. It is described as a multirole system designed to improve capability in both air-to-air and air-to-surface missions. Off-boresight designation to sensors (pilot to radar, pilot to missile, pilot to inertial navigation system and pilot to targeting pod) aims to save time and offer more opportunities for missile firing.

VISION SYSTEMS INTERNATIONAL

JHMCS II

The Joint Helmet-Mounted Cueing System (JHMCS) is a joint USAF/USN programme that has fielded over 5,000 systems. The JHMCS is qualified on F-15, F-16 and F/A-18 fighter aircraft and is operational on air force platforms around the world. The JHMCS enables a pilot to cue onboard weapons and sensors against enemy targets while performing high-g aircraft manoeuvres.

Targo HMD

The Targo helmet-mounted display (HMD) is a low-cost, low-integration solution for light attack, airlift and trainer aircraft. The system is designed for any required level of integration, from an autonomous training system to a full-up integrated HMD. It enables pilots to plan, rehearse, fly and debrief using their personal helmets. The Targo day module provides visor-projected imagery and symbology, as well as head tracking and cueing via an opto-inertial tracker.

EQUIPMENT

GROUND SYSTEMS

This section contains data on a selection of NV and EO systems in the following categories:

- handheld day observation, surveillance and targeting
- handheld NV devices
- infantry weapon sights for day use
- infantry weapon sights for night use (image intensifiers)
- infantry weapon sights for night use (thermal imagers)
- long-range observation, surveillance and targeting
- NVGs
- unattended ground sensors
- vehicle driver aids
- vehicle surveillance and target acquisition

The equipment is listed alphabetically by manufacturer within the above subsections.

If you think your product should be listed, please contact the team at insight@shephardmedia.com to ensure it appears in the *Shephard Defence Insight* online database (plus.shephardmedia.com) and is included in the next handbook edition.

ABOVE: The General Dynamics Ajax AFV equipped with Thales' Orion Primary Sight. (Photo: Crown Copyright)

HANDHELD DAY OBSERVATION, SURVEILLANCE AND TARGETING

ASELSAN

Scout

The Scout handheld integrated EO sensor system incorporates a thermal camera, laser rangefinder, DMC, GPS receiver and laser pointer. The system provides target acquisition at extended ranges. The rugged and lightweight design provides TI for day/night observation. Target coordinates can be determined and transferred via communication devices to fire support units. The Scout can either be used handheld or mounted on a tripod. Additionally, the Scout has a functions menu, binocular eyepiece and shuttered eyecups.

Viper

The Viper is a lightweight, ground laser target designator and locator. It can be carried and used on a tripod, stationary or mobile. Remote-control capability and a thermal camera interface are provided for stationary and day/night usage. Besides designation, the Viper can also measure the range of the target, automatically calculate target location and capture digital photographs. It includes built-in GPS, DMC and a digital still camera. Length: 28.2cm Width: 26.8cm Height: 11.7cm Weight: 6kg

DEFENCE VISION SYSTEMS

STAS24

The Surveillance Target Acquisition System Multi-Spectral 24 (STAS24) can be used in handheld mode or mounted on a tripod to provide 24h surveillance capability from daylight down to starlight. A 1,550nm laser rangefinder allows the user to view the laser spot on the designated target. The STAS24 offers vision over a range from 400-1,700nm and includes range data, GPS data and heading using an electronic compass. Length: 34cm Width: 27cm Height: 14cm Weight: 3.5kg

ELBIT SYSTEMS INTELLIGENCE AND ELECTRO-OPTICS – ELOP

PLDR-II

The Portable Lightweight Designator/Rangefinder (PLDR) II incorporates a built-in laser 'see-spot' camera and video display. The system has a built-in electronic compass, GPS and a tactical computer for target location calculations. An optional add-on thermal camera with laser see-spot is available for night-time observation. The main modules of the PLDR-II are a designator head, pan and tilt head, tripod, battery pack, remote firing switch and remote tactical computer. Weight: 6.7kg

PLDR-III

The Portable Lightweight Designator/Rangefinder (PLDR) III is intended for use with laser-guided munitions. Main features include: being based on diode-pumped technology, built-in electronic compass/GPS/tactical computer for target location, 'single soldier'-portable system, extended duty cycle capability and data link to thermal sight/remote data transmission/test equipment.

LINX Long Range is a multifunctional handheld target acquisition system. (Photo: Leonardo Electronics)

Rattler GX

The Rattler GX is a dismounted, handheld, miniature coded designator/marker equipped with a built-in laser rangefinder and DMC. The low SWaP makes it body-wearable (in a pouch) and accessible for use during close air support missions. Its internal direct-view optic, integrated IR pointer and laser beam make this configuration suitable for troops in contact, JFOs and JTACs. Weight: 3.1kg

Rattler-H

The Rattler-H is a dismounted miniature code designator/marker used for close air support target engagement and surface-to-surface laser-guided munitions target engagement. The lightweight Rattler-H is body-wearable (with a pouch attachment) or can be weapon- and tripod-mounted, so it is suitable for troops in contact and JTACs. The designator has a visible pointer and the designation codes are selectable. Weight: 1.3kg

GTD

Sentinel S30 and S40

Sentinel S30 and S40 are handheld counter-surveillance tools that determine the location, distance and position of opposing optical devices. This includes riflescopes, binoculars, spotting scopes, camera lenses, NV devices and other optical reflectors. Sentinel emits a controlled pattern of IR radiation and reflected light from targets within range. They are then captured and shown on the connected display.

L3HARRIS TECHNOLOGIES

MTM-PI

The Mini Thermal Monocular – Product Improvement (MTM-PI) is a handheld thermal imaging device with an integrated laser pointer and digital camera. The digital camera enables the acquisition, storage, download,

recall and viewing of thermal images and videos. Length: 12.7cm Width: 7.11cm Height: 5.59cm Weight: 368.54g Range: 900m

LEONARDO ELECTRONICS

LINX

LINX is a multifunctional, day/night, handheld target locator housed in a lightweight unit designed for use by dismounted soldiers and SF. It includes an uncooled thermal imager for all-weather observation and detection, two FOV colour TV channels for HD observation and detection during daylight conditions, an eye-safe laser rangefinder, GPS and a digital compass.

LINX LR

LINX Long Range is a multifunctional handheld target acquisition system that includes a zoom cooled thermal imager, a high-definition colour TV channel for all-weather observation and detection, an eye-safe Laser Range Finder, a Digital Magnetic Compass, a GPS receiver, BT and Wi-Fi.

LINX MR

LINX Medium Range is a multifunctional handheld target acquisition system that includes an uncooled thermal imager, two high-definition colour TV channels for all-weather observation and detection, an eye-safe Laser Range Finder, a Digital Magnetic Compass, a Global Positioning System receiver, BT and Wi-Fi.

MEPROLIGHT

Mepro LHP 2000

The Mepro LHP 2000 is a lightweight, handheld periscope designed for observation, surveillance and

Linx Medium Range features two high-definition colour TV channels for all-weather observation and detection. (Photo: Leonardo)

reconnaissance from concealed positions. The Mepro LHP 2000 can be rapidly deployed from its folded position in tactical situations. The device is used for over-the-wall and around-the-corner sighting with a wide FOV and 3x magnification zoom for long-distance observation in varying tactical environments. Length: 23cm Width: 18cm Height: 6cm Weight: 1.2kg

NEWCON OPTIK

AN Series Binoculars

AN-series binoculars incorporate BAK-4 roof prisms and multi-coated lenses for light transmission and resolution. Non-slip, UV-resistant rubber armouring makes these binoculars comfortable to operate even in cold weather, claims the company. AN binoculars are waterproof, shockproof and nitrogen-filled. The binoculars have a military reticle and adhere to current military standards.

LAS 1000

The LAS 1000 is designed to detect snipers and other forward observers before they fire a shot. This system is suitable for border and perimeter security as well as VIP protection details. The LAS 1000 functions on optical principles with the aim of pinpointing the location of a threat before it has a chance to act.

LRB 12K

The LRB 12K is a handheld laser rangefinder binocular. The unit has a 12,000m (NATO target) measuring range, a built-in digital magnetic compass, a built-in GPS receiver and an LED display. Through USB and RS232 interfaces, the LRB 12K can be operated remotely, have its stored data exported and communicate with external GPS systems and ballistic computers. Range: 12,000m

LRB 20,000C

The LRB 20,000C is a laser rangefinder binocular designed for ground surveillance, target observation and distance measurement out to 20,000m. It employs a TFDA algorithm for accuracy and a single strong impulse to minimise exposure time. With an optional angular mount, it can measure horizontal angles and magnetic azimuth as well as vertical angles. The result of distance measurements is displayed through the eyepiece and can be transferred for processing via computer output. Range: 20,000m

LRB 3000PRO

The LRB 3000PRO combines 7x40 binocular optics with a 3,000m (NATO target) ranging capability. A built-in DMC provides azimuth, inclination and target speed readings. With a matte black housing, rubberised body and scratch-resistant optical surfaces, the LRB 3000PRO is built to perform in harsh environments. The LRB 3000PRO is also available with an optional HD OLED display.

LRB 4000CI/6000CI

LRB 4000CI and LRB 6000CI 7x50 binoculars provide distance, azimuth, inclination and speed measurements out to maximum distances of 4,000m and 6,000m respectively (NATO standard target). Both are tripod-mountable, compatible with NV monocular systems and built to stand up to conditions on the battlefield. They are equipped with a computer output that allows data acquisition by any system with an RS232 interface, including various GPS models and ballistic computers.

LRM 1500M/1800S/2200SI

Laser rangefinder monoculars combine laser measurement, optics and controls. The LRM 1500M is for users requiring basic functionality. It has a measurement range of 1,500m (NATO target) and can recall ten measurements from device memory. The LRM 1800S has a measurement range of 1,800m (NATO standard target) and performs speed measurement. The LRM 2200SI also has a measurement range of 2,200m (NATO standard target) and can be used in most weather conditions.

LRM 3500M

Like the LRB 12K series (see separate entries), the LRM 3500M laser rangefinder has an in-built GPS receiver, allowing users to acquire their own and the target's GPS coordinates. The company claims its eye-safe 1,550nm laser cannot be detected by enemy NV devices, and it can measure the distance to a NATO-standard target up to 3,500m. The LRM 3500M has a Mil-Spec design and a DMC, inclinometer and OLED display.

SIB 16x40WP

SIB 16x40WP binoculars incorporate coated optics and gyroscopic image stabilisation technology that enables the user to observe distant objects from moving platforms without image resolution degradation caused by mechanical vibration or natural hand tremors, claims the company.

Spotter M

The Spotter M is a lightweight, tactical spotting scope that brings targets into focus at short, medium and long ranges. The Spotter M has an M22 ranging reticle and 8x42 optics and is nitrogen-filled, waterproof and dustproof.

NOVOSIBIRSK INSTRUMENT-MAKING PLANT

1N10

The 1N10 is a monocular device for observation at up to six kilometres with 4-20x zoom magnification. There is a removable light filter for contrast increasing in reduced illumination or fog conditions. The reticle

also has range and angle-measure scales. Additionally, the 1N10 is equipped with a holder for mounting on a suitable support. Exit pupil: 1.4-7mm Dimensions: 190x265x42mm Length: 25.5cm Width: 4.2cm Height: 19cm Weight: 0.45kg

1N11

The 1N11 is an artillery reconnaissance device intended for area surveillance, reconnaissance and artillery fire spotting. The tripod-mounted device is built as a binocular periscope with two magnifications (ten and 20x). There are laying mechanisms, angular scales for azimuth and elevation, level, diopter and interpupillary adjustments. The device is equipped with a set of light filters for contrast increasing and protection against laser irradiation 1.06µm. Periscope height: 385mm Dimensions: 300x210x690mm Length: 30cm Width: 1cm Height: 9cm Weight: 23kg

SAFRAN VECTRONIX

PLRF25C

The PLRF25C is a pocket laser rangefinder for snipers/spotters, marksmen and forward observers. Ranging measurements up to 6,000m, as well as angle measurements, can be undertaken by this unit, weighing 500g and measuring 131x88x55mm. The PLRF25C fits in a pocket and is water-resistant up to one metre depth (optional ten metres) for 60min. The design allows one-handed use of the device. Length: 13.1cm Width: 8.8cm Height: 5.5cm Weight: 0.5kg Range: 4,000m

Sterna

The Sterna system combines non-magnetic north finding and an eye-safe long-distance laser rangefinder with day, night or thermal observation capabilities based on the operated payload (for instance, PLRF25C, Moskito, Vector family, JIM family). Sterna provides true north capabilities in virtually any environment and works in virtually all weather conditions. It does not require GPS signal, celestial bodies or surveyed points and can operate indoors or near heavily armoured vehicles without disturbance. Weight: 3kg

SENOP OPTRONICS

Senop Lilly

Unveiled at the September 2017 DSEI exhibition, Lilly is a handheld multipurpose observation, surveillance and targeting system developed on the basis of Senop's proven Lisa system. Weighing less than 1.5kg, Lilly is designed for urban operations and for use by SF and reconnaissance units. Length: 21cm Width: 18cm Height: 8cm Weight: 1.5kg

STEINER DEFENSE

Cyclops

Cyclops is a lightweight, handheld near-infrared laser pointer/illuminator for frontline troops and JTACs to mark targets for air or ground fire support, with 1.5W of optical power. The beam is adjustable from a collimated spot size divergence from <0.5MRAD to a 6.3° flood and can be operated in CW and pulse modes.

TELEDYNE FLIR

Armasight 8x36/8x30c/7x50

The Armasight Daytime Binocular series, consisting of the 8x36, 8x30c and 7x50, offers magnification, waterproof construction and a built-in rangefinder reticle. The multicoated optics are designed to enhance the resolution and contrast of an image in bright conditions. A built-in universal rangefinder allows for accurate target measurements and range estimates, with the 8x30c model including a compass.

HANDHELD NV DEVICES

ADVANCED DEFENSE SYSTEMS, INC (ADS)

ARES-L

The Azimuth and Ranging Engagement Systems – Longwave (ARES-L) is a lightweight, handheld targeting system. It has a high-definition colour day camera with digital zoom, an LWIR night camera, an eye-safe laser rangefinder, GPS and DMC. Weight: 1,600g

ARES-S

The ARES-S is ADS's latest lightweight, handheld targeting system. Weighing less than 1.4kg, ARES-S provides a rugged day and night solution for targeting, reconnaissance, surveillance, force protection and law enforcement. The system has cameras for day and night viewing, an eye-safe laser rangefinder, a digital magnetic compass and GPS. It is powered by either L91 or CR123 batteries, with a full-colour OLED display. Weight: 1,400g

ARMASIGHT

Discovery

The Discovery is a long-range handheld NV observation device available in 3x, 5x and 8x models. It can be equipped with Gen 2+ and Gen 3 I2 tubes, including Green phosphor or Armasight's Quick Silver and Ghost, which provide users with natural B&W NV displays. The Discovery is equipped with automatic brightness control which automatically adjusts the brightness of the image tube to achieve the best image resolution under varying light conditions. Weight: 1,500g

Prime

Prime is a handheld Gen I NV monocular available in 3x or 5x magnification. It has a built-in IR illuminator and is water-resistant and lightweight. Weight: 490g

ASELSAN

Eye-Mobile

The Eye-Mobile handheld thermal camera comprises a high-resolution microwave sensor and continuous zoom. It provides day and night observation with automatic image optimisation and enhancement. The Eye-Mobile also has shuttered eyecups and motorised focus, FOV and zoom adjustment. The Eye-Mobile is in Turkish military service. Length: 20.5cm Width: 25cm Height: 10cm Weight: 2,700g

Guard
The Guard handheld thermal camera provides high-resolution thermal images and is used for situational awareness by observing the battlefield by day or night and in adverse weather conditions. The Guard offers automatic image optimisation and image enhancement, which is calibrated dynamically, depending on the scenery. The battery is designed to be replaced easily and the shuttered eyecup prevents stray light emission from the eyepiece. Length: 20cm Width: 16cm Height: 9cm Weight: 1,500g

Mini-Guard
The Mini-Guard handheld thermal camera provides high-resolution thermal imaging and long-range detection. It has a rugged design and is designed to minimise weight and maximise ease of use. The battery is designed to be replaced easily and the shuttered eyecup prevents stray light emission from the eyepiece. Additionally, it has automatic image optimisation and image enhancement, gain/level and focus adjustment, dioptre adjustment and a power level indicator. Weight: 400g

Sharpeye
The Sharpeye handheld EO system comprises a thermal imaging sensor, colour day camera, laser rangefinder, laser pointer, GPS receiver and DMC. The system displays target coordinates and performs calculations by its embedded software without user intervention. The Sharpeye includes motorised focus and zoom adjustment, shuttered eyecups and automatic image optimisation/enhancement. Length: 27.5cm Width: 27cm Height: 12.5cm Weight: 3,900g

AVIATION SPECIALTIES UNLIMITED

Ecliptus
The Ecliptus is a portable NV camera that integrates the functionality of the GoPro Hero4 camera with military-tested NV light intensification to capture and stream video in extremely low-light scenarios. The camera stores images using a 32GB SD card. Images and video can be viewed in real-time using Wi-Fi-enabled smart devices. Length: 10.8cm Width: 8.9cm Height: 7.6cm Weight: 388g

BAE SYSTEMS OASYS

UTBx
The Universal Thermal Binocular (UTBx) is a true 17mm (640x480) uncooled thermal binocular. With narrow, medium or wide FOV lenses and an operational runtime of more than 5.5h using three CR123 batteries, the UTBx sight offers operational awareness on longer missions. It utilises a basic menu function with a single button press, eliminating the need to remember locations on the device for different functions while operating the system in darkness. Length: 17.8cm Width: 14cm Height: 7.4cm Weight: 1,060g

UTBx-LRF
The Universal Thermal Binocular – Laser Range Finder (UTBx-LRF) is a small uncooled thermal binocular with true 640x480 resolution and LRF capability. The UTBx-LRF sight offers narrow, medium or wide FOV lenses and has an operational runtime of 5h using four L91 batteries. It has a basic menu function with a single button press, eliminating the need to remember locations on the device for different functions while operating the system in darkness. Length: 20.6cm Width: 14cm Height: 7.4cm Weight: 1,380g

BERTIN TECHNOLOGIES

CamSight
CamSight is a family of lightweight, compact core cameras to be integrated into complex optronic systems equipping UAV, UGV, and UGS systems. The CamSight optronic modules are available in four versions: CamSight IR HD equipped with LYNRED's ATTO 1280 infrared sensor, CamSight IR for IR vision; CamSight LP with IR imaging and low power; and CamSight LL with a colour, visible, low-light sensor. Weight: 330g

FusionSight
FusionSight is a digital night and day vision enhancer, combining colour low light and thermal sensors to be used separately or in smart fusion. Developed for detection, recognition and identification applications, its embedded real-time image processor automatically selects key information from each sensor, allowing users to see in the dark and to record and save images as digital files. Weight: 990g

ELBIT SYSTEMS INTELLIGENCE AND ELECTRO-OPTICS – ELOP

Coral
The Coral handheld thermal imaging binocular camera was selected by the USMC. It is lightweight and has continuous electronic zoom, an OLED display and a fully adjustable binocular viewer. The Coral NV device can be used as a night sight for target acquisition systems, ground laser designators and weapon systems. Weight: 2,900g

Coral-CR
The Coral-CR is a handheld, lightweight thermal imaging camera with continuous IR optical and digital zoom. It includes target image and data storage memory, a colour OLED display and an adjustable binocular viewer. The Coral-CR has a high-resolution detector, an integral eye-safe laser rangefinder, day charge-coupled device cameras, DMC and integral GPS. It provides real-time target acquisition and target coordinate calculation and real-time data transmission of coordinates to an external device. Weight: 3,700g

Coral-LS
The Coral-LS is a handheld thermal imaging camera/sight for ground laser designators, featuring long-range 'see-spot' capability. The unit matches Elop GLD models (PAL, PLLD, PLDR, Serpent) and is adaptable to other legacy GLDs. It enables 24/7 GLD operational capability and GLD data appears on the Coral-LS display. The Coral-LS is lightweight with low acoustic noise. Weight: 3,600g

Coral-Z
The Coral-Z handheld, lightweight thermal imaging camera includes continuous IR optical and digital

zoom. It incorporates a high-resolution detector, colour OLED display and adjustable binocular viewer. Weight: 2,500g

Mini Coral

The Mini Coral is an uncooled handheld thermal imager with target acquisition capabilities. It is lightweight and designed for urban warfare scenarios and widespread battle deployment. The system incorporates GPS, day and night channels, an integral eye-safe laser rangefinder, DMC and GPS. Main features include: dual FOV, continuous e-zoom, built-in real-time video recorder (MPEG compression), real-time target acquisition and coordinate calculation, image and target data storage memory and a low-power OLED display. Weight: 2,100g

ELBIT SYSTEMS OF AMERICA

Lightweight Night Vision Binocular (F5032)

The F5032 image-intensified, dual-tube NV binoculars can be head-mounted or handheld. Harris worked with Theon Sensors to develop the F5032, which was launched at AUSA in 2016. The NV device is designed to offer improved situational awareness and includes an IR illuminator. The F5032 has been made to be easily fixed, with parts easily accessible and in-field repair possible by a standard technician.

HENSOLDT OPTRONICS GMBH

Nestor

Nestor is a day/night long-range observation system with target location capability. It has an optical day channel and a cooled IR camera for day and night observation, a laser rangefinder and a digital magnetic compass. Integrated GPS provides own and target location coordinates and is used for mortar and artillery fire correction.

Opus-H

Opus-H is a day and night medium-range observation system with target location capability. It has an optical day channel and an uncooled IR camera for day and night observation, a laser rangefinder (LRF) and DMC. Integrated GPS provides own and target location coordinates and is used for mortar and artillery fire

Nestor is a day/night long-range observation system with target location capability. (Photo: Hensoldt Optronics)

correction. Features: uncooled TI (640x480) visual day channel with 7x magnification, eye-safe LRF, digital magnetic compass and integrated GPS for target localisation.

TLS40

TLS40 is a long-range day observation system with target location capability. It has an optical binocular day channel for day observation, a digital camera, digital voice recording, a laser rangefinder and DMC. Integrated GPS provides own and target location coordinates and is used for mortar and artillery fire correction. All features are integrated into a lightweight package.

TLS40i

The TLS40i, a derivative of the TLS40, provides a long-range day observation and short-range night observation system with target location capability. The TLS40i has an optical channel for day observation, I2 for short-range night observation, a digital camera, digital voice recording, a laser rangefinder and DMC. Integrated GPS provides own and target location coordinates and is used for mortar and artillery fire correction. All features are integrated into a lightweight package.

VIS-IR

The VIS-IR handheld system is equipped with two viewing channels for day and night vision. The image from the NV channel is displayed on an internal OLED; false colour superimposition is possible. The IR image can also be displayed on an external monitor via the device's video output. Length: 25cm Width: 18.2cm Height: 9.6cm Weight: 1,540g

JENOPTIK ADVANCED SYSTEMS

NYXUS BIRD

The NYXUS BIRD is a multifunctional thermal imager with day/night observation and target location capability developed for the German Army's Future Soldier programme. The NYXUS BIRD gyro adds non-magnetic north-finding and azimuth measurement capabilities for target location and target coordinates under different environmental conditions as well as over long ranges. Length: 18cm Width: 15cm Height: 7cm Weight: 1,600g Range: 7,000m

L3 EOTECH

X320

The X320 is a handheld TI camera with 320x240 resolution, utilising 17µm amorphous silicon (a-Si) FPA technology. This camera is designed to be easy to stow and can be used for search and rescue and surveillance. The thermal imager has a rugged design with an integral rubber eyecup and a fully dimmable microdisplay. It has programmable electronic zoom and a video port for simultaneous recording. Length: 13.4cm Width: 11.4cm Height: 5.1cm Weight: 369g

L3HARRIS TECHNOLOGIES

BNVD-1531

L3 Warrior System's BNVD-1531 is a new binocular night vision device (BNVD). It brings together the capabilities

of two existing products – the AN/PVS-15 and the AN/PVS-31. The BNVD-1531 can also be operated as a helmet-mounted, head-mounted or handheld system.

MTM

The Mini Thermal Monocular (MTM) is a handheld thermal imaging (TI) device with an integrated IR laser pointer and digital camera. The MTM is based on the military AN/PAS-23 and is tripod-mountable. The TI capability of the MTM allows for observation and target identification under adverse conditions, including light rain, smoke, light snow and low light to total darkness. Additionally, its laser pointer allows for active target designation.

MTM-PI

The Mini Thermal Monocular – Product Improvement (MTM-PI) is a handheld thermal imaging device with an integrated laser pointer and digital camera. The digital camera enables the acquisition, storage, download, recall and viewing of thermal images and videos. Length: 12.7cm Width: 7.11cm Height: 5.59cm Weight: 368.54g Range: 900m

LEONARDO DRS

Mini See Spot

The Mini See Spot (MSS) thermal imager can be handheld, mounted to a laser designator source or tripod-mounted. The MSS employs micro-cooler midwave infrared technology to create a large-format (640x480px) image with a marker/designator laser see spot inherent in the sensor.

MX-2A

The MX-2A is a multi-use miniature thermal imaging handheld camera that utilises DRS's 320x240, 25µ VOx technology. It allows users to see long ranges and provides a thermal image through dust, smoke, light fog or darkness. Designed for combat environments, the MX-2A is packaged ruggedly and equipped with a removable display eyepiece for remote and covert viewing over and around obstacles and hazards. It can also be used as a handheld thermal imager, tripod-mounted or weapon-mounted.

LEONARDO ELECTRONICS

Alice HH

The Alice HH is an uncooled handheld thermal imaging camera based on a high-resolution focal plane, using uncooled IR technology with no need for cryo-cooling devices. This results in a reduction in SWaP consumption.

Erica MP

The Erica MP is a low-consumption thermal imaging device based on a Gen III staring focal plane array that provides high-resolution passive IR imaging for day, night and poor visibility land applications. The design of the Erica MP allows it to be integrated onto most antitank missile launcher applications, and it can operate in severe environmental conditions, according to the company. Its lightweight eases transportability. Weight: 6,000g

LHERITIER ALCEN

Cat Eye

Cat Eye is a day/night handheld camera that uses gated active imagery technology. It allows observation missions to be conducted from long range at safe distances and the surveillance of critical sites. In passive mode, the camera provides visibility for daytime observation, down to low-light level (night level 3), but also during rain, fog or polluted conditions. Length: 17cm Width: 26cm Height: 27cm

MEPROLIGHT

Mepro Rantel

The Mepro Rantel is a multifunctional, passive NV mini-monocular. The design of this modular, handheld device uses a single 18mm ANVIS Gen II or Gen III I2 tube, based on the concept that the independent use of each eye maximises the user's ability to operate under a range of low-light conditions. The user retains peripheral vision in the unaided eye in conjunction with the 40° FOV.

MILLOG

LISA

The LISA is a thermal imaging monocular with range measurement and target acquisition capabilities. The handheld system is designed for use by forward observation squads, infantry and special units. It is a lightweight device with low power consumption that can be modified for a variety of uses. The LISA monocular can be connected to different combat and command systems, using either a cable or wireless connection. Length: 25cm Width: 20.5cm Height: 10cm Weight: 3,000g

MKU

Jaguar

MKU's Jaguar 14 monoculars and Jaguar 7 binoculars have Gen III technology with military-grade Schott lenses. An automatic bright light cut-off sensor provides protection from sudden bursts of bright light.

N-VISION OPTICS

GT-14

The GT-14 is an NV monocular with ergonomics and power control, developed as an alternative to the US military-issue PVS-14. Submersible and lightweight, the GT-14 uses Gen III I2 tubes and comes standard with an IR illuminator beam that is invisible to the human eye. The device has in-ocular low-battery IR indicators and automatic brightness control for varying light conditions. Length: 12cm Width: 5cm Height: 6cm Weight: 320g

LRS

The LRS is a Gen III NV system designed for night-time observation, photography and video recording. It offers image clarity while being adaptable with interchangeable-lens Nikon and Canon SLR cameras (professional and consumer-grade). All adjustments to the LRS and matching photo and video adapters are done in the laboratory prior to shipment. The LRS

provides a bright image and high resolution across the frame with minimal light roll-off and distortion. Length: 13.7cm Width: 7.6cm Height: 5.7cm Weight: 3,400g

NVPR

The NVPR NV binocular offers reduced size, weight and profile over the fielded AN/PVS-15. It improves the user's situational awareness through an ergonomically balanced NV system with optimised weight distribution. The NVPR design corrects the 'antler effect' of current systems. Each monocular stows along the contour of the helmet with nothing protruding above the top, eliminating 'NOD-smack' damage from door frames of vehicles and buildings.

NEWCON OPTIK

LRB 12Knight

LRB 12Knight is a long-range laser rangefinder binocular unit with GPS and night capability. It includes a 12,000m (NATO target) measuring range, built-in DMC, built-in GPS receiver, LED display and a Gen 3 NV channel with minimum exportable FOM of >1,600. Through USB and RS232 interfaces, it can be operated remotely, have its stored data exported and communicate with external GPS systems and ballistic computers.

NVS 7 Binocular Series

Based on the NVS 7-3AG NVG, the NVS 7 Binocular Series uses Gen III auto-gated NV technology and is suitable for defence, marine and SAR operations. Available in 4x, 5x and 8x magnification configurations, all models are available with Gen III I2 tubes with a minimum fully exportable FOM of 1,600.

Sentinel

The Sentinel (640-759Hz) is a high-resolution thermal imaging binocular with a variety of tactical, law enforcement, border security and SF applications. It uses a large-diameter germanium lens to extend its observation range beyond 2,500m. This device can detect objects at remote distances 24h a day, through smoke, fog or camouflage. The Sentinel does not produce any audible sounds while in operation.

Sentinel LRF

The high-resolution Sentinel is a thermal laser rangefinder (LRF) binocular. It serves a variety of tactical, law enforcement, border security and SF applications. Sentinel LRF (640-9Hz) binoculars use a high-resolution uncooled thermal sensor to perceive differences in the thermal signature of objects within the FOV. The unit can detect objects at remote distances 24h a day, through smoke, fog or camouflage.

TVS 11M

The TVS 11M is a tactical thermal monocular. A lightweight, handheld, helmet- or weapon-mounted device, TVS 11M is suited to a variety of tactical, law enforcement, SAR and industrial applications.

TVS 12C

TVS 12C is a thermal handheld monocular with an extended detection, recognition and identification range versus other products in its class, claims the company. The device is suited to security, search and rescue and industrial applications. It utilises passive IR sensing technology, allowing users to detect small differences in the temperature of objects, people and other heat sources within the FOV.

NIVISYS

TAG Series

The TAG series of handheld thermal binoculars are designed to increase the combat effectiveness of forward observers by enhancing the ability to detect, recognise and identify threats. Available in different optical configurations, the TAG incorporates 320x240 (25µm) VOx detector technology. The series is intended for low-visibility observation at different ranges. TAG models include image capture to internal memory and review of still images on the internal microdisplay.

UTAM Series

The UTAM Universal Thermal Monocular sight series is designed to be handheld but can be attached to a light machine gun with a MIL-STD-1913 Picatinny rail system. User selectable reticles, digital windage and elevation adjustments are readily available through the onboard software. The monocular can also be easily bore-sighted to any weapon. Additionally, an included remote-control switch provides increased flexibility for the user, integrating the sight and the weapon.

OIP SENSOR SYSTEMS

Agilis-LR

The Agilis-LR is a thermal imaging (TI) camera with continuous optical zoom for long-range day/night observation, reconnaissance and target acquisition. It is suited for mobile operations and can be used handheld or mounted on a tripod or platform. The Agilis-LR comprises a cooled TI, an eye-safe laser rangefinder, two charge-coupled device day cameras, a digital compass/inclinometer, GPS, high-resolution binocular OLED viewer and real-time target acquisition software.

Maris

The Maris is a lightweight day/night system for observation and target acquisition. The main components comprise an 8-12µm dual-FOV uncooled thermal imaging (TI) device, two charge-coupled device cameras, an eye-safe laser rangefinder and a high-resolution OLED display and viewer. The two FOVs of the TI, combined with low power consumption, make the Maris suitable for a range of applications, including security and perimeter defence, infantry, scouts, special units and target acquisition for infantry commanders. Length: 20cm Width: 18cm Height: 9cm Weight: 2,000g

OPTIX

Diana 3x/5x/6x/10x Series

The Diana series is designed for observation and reconnaissance in natural starlight, moonlight or total darkness. The handheld NV binoculars are high-resolution with a wide FOV and are capable of detecting low-light objects at distances of up to 3,000m. The Diana series can be used as handheld devices or mounted on a tripod. The binoculars can also be configured with a variety of I2 tubes ranging from Gen II+ to Gen III.

Diana IR 25/35/50

The Diana IR is a thermal imaging monocular device designed to be used by SF, regardless of environmental conditions such as storms, fog, smoke, dust, snow or darkness. The detector consists of a microbolometer matrix made of amorphous silicon with a temperature sensitivity of <0.05°C. The optical elements of the objective are germanium lenses with an anti-reflex coating to withstand harsh conditions.

PCO

NPL-1M BROM

The NPL-1M binocular is a lightweight NV device designed for the observation of land in poor visibility and at night. The NPL-1M includes a wide FOV and XD4/XR5 light amplifiers. This device is in use in the Polish Land Forces. Weight: 860g

POLY TECHNOLOGIES

CM3240FDi

The CM3240FDi is a handheld thermal binocular which can be used for 24/7 surveillance, image capture and evidence gathering. The cooled thermal imaging camera has shock- and vibration-resistant features allowing it to operate in harsh environments. The CM3240FDi has a HgCdTe cooled FPA detector. Wavelength: 3-5µm. Resolution: 320x256 Length: 32.4cm Width: 24.8cm Height: 8.8cm Weight: 3,000g

U3061i

The U3061i is an uncooled thermal imaging camera used for individual soldier observation. Its detection range is 2.5km for personnel and up to 14km for ships. The detector is amorphous silicon uncooled FPA. Features: wavelength 8-14µm, resolution 384x288, pixel size 25µm. Length: 26cm Width: 20.9cm Height: 10cm Weight: 2,500g

QIOPTIQ

Phoenix-H

The Phoenix-H is a handheld sighting device designed to assist with surveillance and the acquisition of targets in day and night conditions. Combining a day sight thermal imager and a laser rangefinder into a single system, it allows the user to detect, recognise and identify targets at long ranges in conditions of poor visibility. It can also be connected to external C4I systems and battle management systems to share data across a wider network. Length: 22.5cm Width: 21cm Height: 9.5cm Weight: 2,200g Range: 6,250m

Vipir-2S

Designed to withstand harsh military environments, the lightweight, handheld Vipir-2S thermal sight delivers medium-range surveillance and target observation capabilities. It can detect human and vehicle targets 24h a day.

Vipir-2S+

Vipir-2S+ is a lightweight, military-standard, handheld thermal sight designed for medium-range surveillance and target observation. Vipir-2S+ utilises uncooled thermal imaging technology.

Designed for fatigue-free observation, the BIG35 night binocular can be used for long-duration observation over greater distances. (Photo: Safran Vectronix)

RAYTHEON EO INNOVATIONS

Phantom IRxr (AN/PAS-28)

Phantom IRxr is a rugged, lightweight IR binocular system that uses low-power, uncooled thermal technology. Phantom IRxr's TI allows observation through darkness, smoke, dust and fog. Uncooled microbolometer technology generates images for detection and surveillance.

RHEINMETALL NORDIC

KDN250

The KDN250 night and day observation binoculars have two channels that can be separated, allowing the night channel to be utilised on additional optical systems if necessary. The device is compatible with Gen II or III 18mm I2 tubes and is submersible to 20m. The KDN250 has a dovetail quick-release mechanism to the night channel, adjustable interocular distance and a focusing wheel. Length: 26cm Width: 15.5cm Height: 16.5cm

RICOH AMERICAS

NV-10A

The NV-10A digital binoculars with an image stabiliser can penetrate fog, smoke and darkness. Equipped with an integrated anti-vibration mechanism, water and dust proofing, the NV device allows target viewing under harsh environments and can be used with gloves. Images can be clarified, brightened and sharpened at the push of a button. Pentax Atmospheric Interference Reduction technology also reintroduces colour that would otherwise be obscured. Length: 22.5cm Width: 16.6cm Height: 8.3cm

SAFRAN ELECTRONICS & DEFENSE

JIM Compact

The Safran JIM Compact is a multifunctional, long-range binocular system that provides operators with situational awareness and connectivity. Lightweight and robust, JIM Compact has three observation channels, visualisation of laser pointers and designators and multimedia connectivity. Weight: 2,000g

JIM LR

The JIM Long-Range multifunction, cooled IR binoculars are designed for threat detection, target acquisition and intelligence gathering and are part of the FELIN French Army integrated soldier programme. The binoculars combine night imaging, laser rangefinding, laser pointing and DMC. Features of the JIM LR include image fusion between IR and visible channels, all-weather vision (through smoke, etc) and image/video recording via a USB port. Weight: 2,800g

JIM UC

The JIM UC uncooled, multifunction IR binoculars combine day and thermal imaging, a laser rangefinder, laser pointer, DMC, GPS and data transmission in a noiseless tactical package. The binoculars have integrated photo/video recording and optional image fusion. The JIM UC is suited to military and security operations, including infantry section and SF missions, intelligence gathering for contact units, infrastructure and border surveillance.

Matis Handheld

Matis Handheld is a biocular thermal camera with an optional laser rangefinder, intended for day and night long-range observation and forward reconnaissance by infantry. Detector: 3-5µm staring array. Endurance: 3h at ambient temperature with Li-ion accumulator. Length: 33.5cm Width: 20cm Height: 10.3cm Weight: 2,500g

SAFRAN VECTRONIX

BIG35

Designed for fatigue-free observation, the BIG35 night binocular can be used for long-duration observation over greater distances. As a member of the BIG family of NV devices, the interchangeability of common components and accessories is ensured, providing interoperability and simpler logistics. Gen II and Gen III I2 tubes can be integrated with BIG35 as required and a tripod adapter is available. Length: 20.5cm Width: 15.3cm Height: 9.6cm

Moskito

The Moskito multifunction handheld device includes an optical day viewing channel and a quickly activated night channel for rapidly varying light conditions. It can detect, recognise, identify and locate targets. Featuring a built-in C/A code GPS receiver, the compact device utilises geolocation functions and measures range, azimuth and vertical angle. Length: 18.5cm Width: 13cm Height: 8cm Weight: 1,200g

Vector IV Nite/Vector 21 Nite

The Vector IV Nite/Vector 21 Nite rangefinder binoculars are multifunction devices that incorporate an eye-safe laser rangefinder, DMC and an integrated I2 tube for night use. The binoculars have automatic brightness control and bright point protection. The NV devices measure and display slope distance, azimuth, inclination, horizontal distance, height difference and the distance between two points. Length: 20.5cm Width: 17.8cm Height: 8.2cm Weight: 2,000g

SHIBLI

Skua

The Skua has an uncooled thermal core and is available in short-range (SR) and long-range (LR) variants. The lightweight Skua is designed to operate during the day and at night in a range of environmental conditions. It has silent operation, ergonomic controls and electronic zoom. The handheld binocular can also be mounted on a tripod. Following trials in 2016, the Skua is production-ready. Weight: 1,500g

TELEDYNE FLIR

Armasight Avenger

The Armasight Avenger is an NV monocular that can be handheld or mounted in front of a camera or weapon for night use. It can be equipped with Gen 2+ including Armasight's Quick Silver White Phosphor which provides users with a B&W NV display. Weight: 670g

Armasight Dark Strider

The Armasight Dark Strider Gen 1 is a 5x NV binocular that is equipped with a pair of Gen 1 image tubes, multi-coated glass lenses and a built-in adjustable IR illuminator inside an armoured, rubber-coated aluminium housing. Weight: 1,400g

Armasight Eagle

The Armasight Eagle NV binoculars have manual brightness control, bright light shut-off circuitry and a built-in IR illuminator. Eagle can be equipped with Green phosphor Gen 2+ I2 tubes or Armasight's Gen 2+ Quick Silver and Gen 3 Ghost, which provides users with natural B&W NV displays. Length: 23.5cm Width: 12cm Height: 7.5cm Weight: 1,520g

Armasight Sirius

The Armasight Sirius NV monocular can be handheld, head/helmet-mounted, mounted onto a rifle or used for night photography. Optional 3x, 5x or 8x lenses can turn it into a long-range night viewing device. Sirius can be equipped with Gen 2+ and Gen 3 I2 tubes, including Green phosphor or Armasight's Quick Silver and Ghost, which provide users with natural B&W NV displays. Weight: 460g

Armasight Spark Core

The Armasight Spark Core is a rugged, lightweight, multipurpose NV monocular. With optional accessories, it can be handheld or helmet-mounted. Spark Core is able to work with Armasight's hybrid-type Ceramic Optical Ruggedised Engine (CORE) I2 tubes. Weight: 370g

Armasight Spark-B

The Armasight Spark-B is a 4x magnification NV binocular built around Ceramic Optical Ruggedised Engine I2 tubes. It is designed to be rugged and lightweight, with a built-in, focusable short-range IR illuminator. An optional long-range IR illuminator is available. Length: 22cm Width: 14.7cm Height: 6.3cm

BHS

The BHS binocular is designed to extend the performance and tactical capabilities of security forces.

Users can see in darkness, through smoke, dust and light fog, as well as through light camouflage and foliage in any lighting conditions and at greater ranges than before.

H-Series

H-Series handheld, thermal imaging cameras are designed to give security forces a tactical advantage by allowing them to see clearly in total darkness. H-Series uses a 320x240 TI core providing four times the image clarity and detail of earlier systems. H-Series cameras can detect camouflaged individuals and see into light foliage night or day.

LS-Series

The LS-Series thermal NV monoculars are designed for everyday use. The LS-Series, equipped with a 17µm pitch 336x256 or 640x512 resolution thermal cores and an embedded positioning laser, is tactical in size, covert in design and easy to use. The LS-Series provides 30Hz thermal video, allowing users to stand off and pinpoint targets in darkness and through dust, smoke, light fog and camouflage. Length: 18cm Weight: 340g

MilCAM Recon B2

The MilCAM Recon B2 is a handheld, binocular-type EO/IR system that provides high-contrast imagery independent of lighting conditions and obscurants such as smoke, light fog and haze. This multi-sensor system is designed for target geolocation applications and forward observers where portability and long standoff range are required. Operators can toggle between daylight and thermal imaging or display the IR and TV images in a split-screen mode. Length: 22.2cm Width: 24.9cm Height: 22.2cm Weight: 2,950g

MilCAM Recon B9-FO

MilCAM Recon B9-FO is a dual-channel, long-range imager for reconnaissance and target geolocation. Features include a high-resolution, large-format uncooled longwave sensor for long-range detection and 10:1 continuous zoom colour charge-coupled device channel for situational awareness and a variety of automatic features. This includes Digital Detail Enhancement and autofocus. It also has an internal laser rangefinder (LRF), DMC and GPS sensor which provides geolocation of objects in view.

Recon V

Recon V is a rugged, lightweight, multi-sensor thermal binocular designed for field operations that require endurance imagery and standoff range 24/7. Recon V has internal GPS, DMC and a long-range laser rangefinder. It has a new, more simple interface that eliminates multiple buttons and multi-layer menus. Weight: 1,810g

Seespot III+

Seespot III+ is a long-range thermal spotter scope designed for standalone operation or with a 1.06µm laser target designator. It detects man-sized targets beyond 5,500m and has a recognition range of more than 2,500m. Its display is a high-resolution miniature LCD viewed through an eyepiece, and it is sealed and ruggedised. The device has a closed-cycle Stirling cooler. Noise equivalent temperature: 0.02°C at 23°C ambient Optics: f/4.0, min focus distance 10m Spectral band: 4.5-4.8µm and 1.06µm T TI FPA resolution: 320x240 IR pixels, InSb

THALES OPTRONIQUE

Sophie LITE

The Sophie LITE is a handheld, integrated multifunction system that allows the user to detect, recognise, identify and locate targets. It can be used standalone to provide target location data or integrated into a battlefield management system. The lightweight device incorporates a visual/near-infrared TV camera and thermal imaging camera that provide 24h capability and target discrimination, combined with GPS, DMC (gyrocompass 0.5°:1σ), a laser rangefinder and an optional eye-safe laser pointer. Length: 18.1cm Width: 19cm Height: 8.7cm Weight: 1,580g

Sophie Ultima

The Sophie Ultima is the new version of the company's popular Sophie thermal imager. Weight: 2,500g

Sophie-LR

The Sophie-LR is a long-range handheld thermal imaging (TI) binocular that is suitable for day and night passive operation. Including image stabilisation, it is capable 'of image capture and mission reporting and can detect camouflaged targets. According to the company, the Sophie-LR is insensitive to solar dazzle and battlefield obscurants. Additionally, the TI is combat-proven and in service worldwide. Length: 25cm Width: 25cm Height: 11cm Weight: 2,400g

Sophie-MF

The Sophie-MF is a handheld surveillance and target localisation system, comprising a thermal imager, colour daylight camera, DMC (0.2° elevation, 0.5° azimuth), internal GPS, an eye-safe laser rangefinder and eye-safe laser pointer. This multifunction binocular system is capable of image capture and mission reporting and is able to detect camouflaged targets. According to the company, it is insensitive to solar dazzle and battlefield obscurants. Length: 31cm Width: 25cm Height: 11cm Weight: 3,500g

Sophie-XF

The Sophie-XF is a Gen III MWIR thermal imager with continuous optical zoom and a target locator suitable for day and night passive operation. With image stabilisation, it is capable of image storage and video capture. The device has an integrated laser rangefinder, GPS and DMC (0.2° elevation, 0.5° azimuth). Length: 31cm Width: 25cm Height: 11cm Weight: 3,500g

Sophie-ZS

The Sophie-ZS is a handheld thermal imager that is suitable for day and night passive operation. With integrated image stabilisation, human-machine interface and communications, it is capable of image and video capture and mission reporting. The Sophie-ZS is designed for long-range surveillance, featuring continuous optical zoom that provides a wide FOV and image continuity. Length: 31cm Width: 25cm Height: 11cm Weight: 2,400g

THERMOTEKNIX SYSTEMS

FuseIR

The FuseIR is a technology demonstrator that was launched in December 2015. It is based on a 16mm I2 tube combined with the MicroCAM 3 (see separate entry) thermal imaging core. The FuseIR utilises shutterless XTI technology, so it has no moving parts and is silent in operation. According to the company, the FuseIR's 40° FOV matches the optimum for goggle usage with real-time updates that avoid image lag. Weight: 550g

TiCAM 90

TiCAM 90 is a lightweight thermal imaging monocular with a scroll wheel for easy operation even when wearing gloves. The device can be handheld, left- or right-mounted or in a binocular configuration. According to the company, it is compatible with all major helmet-mounting systems including Spuhr. TiCAM 90 includes shutterless XTi Technology, making it silent. Reliability is also increased as it has no moving parts. Weight: 150g

TiCAM 600

The TiCAM 600 thermal imaging monocular has optional GPS, DMC, in-camera video/still image storage, 2x and 4x zoom. 384x288 and 640x480 17µ resolution models are also available. Designed to be handheld or tripod-mounted, up to 60,000 still images or 8h of video can be recorded and downloaded from the TiCAM 600 via USB to PC or memory stick. Connections allow external power and video output options. Weight: 450g

TiCAM 750

TiCAM 750 is a lightweight, Mil-Spec, handheld thermal imaging binocular device, using a MicroCAM engine and operating on four AA batteries without the need for external battery packs. Optional features include GPS, DMC, laser pointer, video recording facility and 2x telephoto (150mm) optics. 384x288 and 640x480 resolution versions are available.

TiCAM 1000

The TiCAM 1000 target location and surveillance system is a handheld NV device. The system includes a high-resolution thermal imager, direct view visible channel with colour charge-coupled device, GPS, DMC, a laser rangefinder and digital storage. It has reporting capabilities with wired and wireless interfaces to battle management systems. The device also has a small form factor, low power consumption and has Thermoteknix' XTi shutterless technology.

INFANTRY WEAPON SIGHTS FOR DAY USE

AIMPOINT AB

3XMag-1

The 3XMag-1 magnifying module is designed for use with Aimpoint sights and offers the shooter the ability to engage targets at extended ranges. Combined with a TwistMount, the 3XMag-1 gives the shooter the ability to switch from CQB to semi-sniping and back. The 3XMag-1 is also suitable for perimeter security and sniper support missions. Additionally, it can be used as a handheld magnifying monocular for discreet observation and target identification. Length: 11cm Width: 4.4cm Height: 4.1cm Weight: 0.2kg

6XMag-1

The 6XMag-1 magnifying module is designed for use with the Micro T-2 red dot sight. This module allows users to engage targets at extended ranges while using a red dot sight and has a variable (-/+3) dioptric setting. Combined with a TwistMount or FlipMount, the 6XMag-1 gives the shooter the ability to switch from close-quarters battle to semi-sniping and back quickly. Length: 15.1cm Weight: 0.25kg

CEU

The Concealed Engagement Unit (CEU) is incorporated into Aimpoint's system-of-systems approach. It gives the user the ability to observe and/or engage a threat from a concealed or covered position. The CEU rotates from side to side, so an operator can look around either right- or left-hand corners, over barricades and under vehicles. It can also be removed in order to return to direct engagement. Length: 9cm Width: 11.5cm Height: 4cm Weight: 0.13kg

CompM3

The CompM3 allows five years of constant-on power from one battery, NV device (NVD) compatibility and ruggedness. It utilises a standard 30mm ring mount. The CompM3 is compatible with all generations of NVDs and comes with a replaceable outer black rubber armour cover, which protects the sight during transport and operations. This cover is also available as an accessory in a dark earth brown colour. Length: 11.5cm Width: 6.2cm Height: 5.5cm Weight: 0.22kg

CompM4/M4s

The US DoD has bought over one million Aimpoint sights since 1997. The US Army is now fielding the CompM4s as the latest version of its M68 Close-Combat Optic. The CompM4 has a top-mounted battery compartment, whereas the CompM4s has a low battery compartment allowing a more streamlined profile. Both are non-magnifying sights with unlimited eye relief. Length: 12cm Width: 7.2cm Height: 6cm Weight: 0.27kg

CompM5

Aimpoint unveiled the CompM5 red dot sight, developed to meet the requirements of an unspecified customer, at the September 2017 DSEI exhibition. It features a 2 MOA dot for close combat and long-distance engagement, four NV device settings and six daylight settings. Powered by a single AAA battery and weighing 147g, the CompM5 is the most compact optic in the Comp series. A version with a lower battery compartment, the CompM5s, was displayed for the first time in the US at AUSA 2018. Length: 8.5cm Width: 4cm Height: 7.1cm Weight: 0.24kg

FCS12

The FCS12 is a fire control system designed for use with crew-served weapons such as the Carl-Gustaf, MK19 and GMG. It consists of an eye-safe 1,550nm laser rangefinder, a ballistic computer with the capability to store more

than 50 different ballistic algorithms and a parallax-free optical channel with unlimited eye relief. The FCS12 compensates for the ballistic drop of projectiles at measured distances, factoring in variables such as rotational drift, propellant temperature and terrain angle.

Micro T-1

Launched in 2007, the Micro T-1 is an aiming system that can perform under extreme conditions. It is designed as a standalone sight, and due to its light weight, it can be 'piggybacked' on top of larger magnifying scopes, NV or thermal imaging optics. The standard configuration of the Micro T-1 contains the sight, a MIL-STD-1913 Picatinny mount and rubber bikini lens covers. It has four NV-compatible settings and eight daylight settings. Length: 6.2cm Width: 4.1cm Height: 3.6cm Weight: 0.1kg

Micro T-2

In 2014, Aimpoint began producing its Micro T-2 red dot sight which incorporates a number of enhancements identified by military and law enforcement users. A redesigned front lens provides an increase in clarity and performance properties. Other changes include a sight housing which allows the addition of front and rear protective flip covers and an anti-reflective device, additional physical protection for the sight's adjustment turrets and increased ruggedness for the sight's internal electronic components. Length: 6.8cm Width: 4.1cm Height: 3.6cm Weight: 0.13kg

MPS3

The Aimpoint MPS3 is a passive electronic reflex collimator sight designed for medium or heavy weapons. Developed primarily for mounted operations, MPS3 can be used on land vehicles, helicopters or fast attack boats and ships. It uses the one-function principle, allowing the user to concentrate on the target, aim the weapon with a single red dot and operate the sight controls as when using a standard sight. Length: 17.5cm Width: 8.4cm Height: 8.1cm Weight: 0.74kg

PRO

The Patrol Rifle Optic (PRO) is sold as a 'ready-to-go' kit. A hard-anodised 30mm tube is utilised, enclosing a circuit that allows the sight to be turned on and left on for up to three years using a single battery. The sight can be used with all generations of NV devices. Length: 11.5cm Width: 5.5cm Height: 5.5cm Weight: 0.22kg

L3Harris' G33 magnifier is shorter and lighter than its previous models. (Photo: L3Harris Technologies)

System-of-Systems

In Aimpoint's System-of-Systems, the TwistMount enables accessories such as the 3XMag and CEU to be fixed behind weapon sights – NV devices of different types and generations can be added. Since the accessories are placed behind the red dot sight, they do not affect the point of impact.

ELBIT SYSTEMS – ITL

MARS

The MARS (Multi-purpose Aiming Reflex Sight) family combines a reflex sight with a single or dual-wavelength laser pointer (visible red and/or IR). It has several modes of indication, such as a red reflex pattern or a centre aiming dot, to meet operational requirements. An automatic brightness control mechanism enables the user to change combat scenes without the need to manually adjust the system. Length: 48cm Width: 7.5cm Height: 13.2cm

Trisight

The Trisight is a lightweight 3x telescopic sight designed to extend shooting ranges under daylight conditions. The device supports reticle patterns and non-reticle configurations. As a reticle pattern aiming sight, it is used in a standalone configuration. When mounted in series with reflex sights, the Trisight magnifies the target scene without the need to boresight. Length: 11cm Width: 3.3cm Height: 6.5cm Weight: 0.18kg

HARTMAN

MH1

The MH1 is an advanced tactical red dot reflex sight with a large FOV. It features an ambidextrous wireless IR push-to-transmit button that controls the activation and brightness of the reticle. Its dual 30° motion sensors only activate the sight from sleep mode when a shooting movement takes place. The activation buttons can be used even when an NV device or magnifier are mounted behind the reflex sight. Weight: 0.37kg

HENSOLDT OPTRONICS GMBH

Hensoldt 3-12x56

Hensoldt developed the 3-12x56 long-range telescopic sight to deliver performance while maintaining a short optical system, to allow the attachment of an NV device. Length: 32.5cm Width: 9.4cm Height: 7.7cm Weight: 0.8kg

Hensoldt 3.5-26x56 FF

The 3.5-26x56 long-range telescopic sight has a wide magnification range for use at short and long ranges. The adjustment range, which also enables ballistic compensation at maximum range, is 'unique', according to Hensoldt. The elevation turret provides 18mrad (180 clicks) over two noticeable rotations. To simplify use in all climate zones, the turret does not stop at 0, but

continues to -5, resulting in a total of 365 clicks. Length: 36cm Width: 11cm Height: 9.5cm Weight: 1.3kg

Hensoldt 4-16x56 FF LT

The 4-16x56 FF LT is an improved version of the 4-16x56 FF long-range telescopic sight. The LT variant maintains the compact and short design but has redesigned self-locking turrets. The elevation turret provides ballistic compensation of 14.5mrad (145 clicks) in one revolution. With a total adjustment range of 22mrad, the user has sufficient reserves for zeroing. Length: 33.4cm Width: 9.4cm Height: 7.7cm Weight: 0.9kg

Hensoldt 4x30i

The Hensoldt 4x30i is an intermediate-range scope with an illuminated reticle, suited for use at twilight. Combined with the Hensoldt NSV 600, the 4x30i provides users with an FOV of 140m at 1,000m, including at night. It has six day- and three night-brightness levels. This scope is available in a 4x30 variant without reticle illumination and a 4x30rd variant with an illuminated red dot. Length: 13.9cm Width: 6.5cm Height: 7.65cm Weight: 0.6kg

Hensoldt 6-24x72 SAM

The 6-24x72 SAM is a long-range telescopic scope in the Hensoldt product line. It allows the user to see the click values of the top and side turrets, as well as relevant environmental conditions such as air pressure and temperature, digitally displayed in the FOV. The integrated ballistic calculator determines the required elevation and azimuth correction based on the given ammunition, range to the target and current environmental data. Length: 38cm Width: 9.4cm Height: 9.4cm Weight: 1.1kg

Hensoldt 6x36i

The 6x36i is an enhancement of the Hensoldt 4x30, optimised for intermediate range. The targeting optic features higher magnification and longer ranges. It also sits low on the weapon and is possible to use with a red dot sight on the close-quarters battle rail. Length: 18cm Width: 6.7cm Height: 7.65cm Weight: 697kg

Hensoldt RSA-S Reflex Sight

The RSA-S is a compact collimator reflex sight designed for fast reaction and close-quarters combat at short ranges. It is watertight and resistant to jolts and vibrations. The RSA-S is designed for two-eye operation and is controlled via one button. The hybrid power supply incorporates a solar panel and automatically switches to battery operation if there is insufficient light to power the sight. Length: 6.35cm Weight: 0.1kg

Hensoldt Spotter 45/60

The Spotter 60 has a Mil-dot reticle with continuously adjustable illumination, which is congruent with the high magnification level. The Spotter 45 has a lower variable magnification range for a wider range of applications. The Hensoldt line of spotting scopes has rubber armouring and a compact design for concealed observation. The automatic brightness memory permits fast selection of the already stored reticle brightness level. Length: 35cm Width: 9cm Height: 16.5cm Weight: 1.77kg

L3HARRIS TECHNOLOGIES

G33.STS Magnifier

The G33 magnifier is shorter and lighter than previous models. The mount provides faster transitioning from 3X to 1X and the optic offers tool-free vertical and horizontal adjustments, a larger FOV and an adjustable diopter for improved, precise focusing. Length: 9.91cm Width: 5.59cm Height: 8.38cm Weight: 0.32kg

SU-277/PSQ BSM

The SU-277/PSQ BSM (Ballistic Sighting Module) is a weapon-mounted sight designed for use with under-barrel grenade launchers and other low- to medium-velocity, large-calibre weapon systems. It consists of an integrated red dot sight, an IR laser and an illumination laser for increased accuracy in any light or weather condition. Length: 10.92cm Width: 5.59cm Height: 8.89cm Weight: 0.33kg

LEUPOLD & STEVENS

Mark 4 ER/T

The Mark 4 Extended Range/Tactical (ER/T) series is built for sharpshooters, designed to provide accuracy at long distances. The M1 and M5 front focal riflescopes provide a range of windage and elevation adjustments and are waterproof. The Mark 4 ER/T 6.5-20x50mm M5A2 (M5 Autolocking Adjustment) riflescope includes locking turret knobs for adjustment, a 34mm main tube for elevation and windage travel and 0.1mrad adjustments for shot correction. Length: 36.8cm Weight: 0.62kg

Mark 4 HAMR

The Mark 4 4x42mm High Accuracy Multi-Range Riflescope (HAMR) is a compact sight designed for mid-range distance marksmanship and fast target acquisition in bright daylight, low light and at night. The Mark 4 HAMR uses the Xtended Twilight Lens System for transmission of the blue/violet spectrum, DiamondCoat for abrasion resistance and light transmission, and a lockable fast-focus eyepiece. Leupold tactical scopes are waterproof, fogproof and shockproof. Length: 14.5cm Weight: 0.38kg

Mark 4 LR/T M2

The Mark 4 3.5-10x40mm Long Range/Tactical (LR/T) M2 front-focal line of riflescopes is part of the M110 Semi-Automatic Sniper System in service with the US Army and the US Special Operations Command. With clear images to 1,000m, this riflescope features a choice of finger-adjustable knurled knobs for windage and elevation. The scope includes turret-mounted parallax adjustment control and eight intensity levels for the illuminated reticles. Length: 34.3cm Weight: 0.55kg

Mark 4 LR/T M3

Designed for the US Army, the Mark 4 10x40mm Long Range/Tactical (LR/T) M3 riflescope is part of the M24 Sniper Weapon System. The scope features interchangeable bullet drop compensation elevation adjustment dials, which are calibrated and interchangeable to allow for .223 Rem (55g, 3,200fps), .308 Win (16g, 2,650fps) and .300 Win Mag (190g, 2,900fps) rounds. Length: 33.3cm Weight: 0.59kg

Mark 6 Front Focal Riflescope

The Mark 6 3-18x44mm Front Focal Riflescope is designed to provide a compact package for military and law enforcement operators. It was selected in 2013 by the USN to be the optic used in the Enhanced Combat Optic System – Optimized. The Mark 6's 6x zoom range offers a wide FOV and target acquisition at lower magnifications and long-range target engagement at higher powers. Length: 30.2cm Height: 30.5cm Weight: 0.67kg

Mark 8 CQBSS

In service with US forces, the Mark 8 1.1-8x24mm Close Quarters Battle Sniper Scope (CQBSS) has an illuminated front focal reticle. Eight illumination settings provide dot contrast with or without NV, and an 'off' position between intensity settings makes returning to the desired illumination level 'nearly immediate'. The focal plane is described as accurate at all magnification settings and is combined with a five-MOA holographic half-circle. Length: 30.5cm Weight: 0.67kg

LITEYE SYSTEMS

LZAD

The LZAD thermal overlay display is an augmented sight that allows the user to overlay a video or computer signal over the real-world view. It can be set in front of such products as a Trijicon, EOtech or any other scope. The LZAD allows the end-user to access data or an image from a thermal camera while utilising the red dot sight or scope, or other types of devices. It can be used in various configurations.

MEPROLIGHT

Mepro 4X

The Mepro 4X is a fixed-magnification, compact, lightweight telescopic day sight, designed to meet the requirements of sharpshooters. The sight features optics for distortion-free aiming in tactical conditions, a large FOV and long eye relief. The sight's reticle has ballistic compensation markings for bullet drop offset. For low-light and night operations, the Mepro 4X reticle has battery-powered red-colour illumination with user-selectable brightness levels.

Mepro GLS

The Mepro GLS is a self-illuminated optical sight for 40mm grenade launchers mounted on assault rifles. It provides a 'both-eyes-open' capability and operates in all lighting and weather conditions for five to eight years without batteries or an external source of power. The lightweight, compact unit fits with three different mounting adapters to standard top and side rails. The sight is adjustable for windage and elevation. Length: 6.2cm

Mepro M5

The Mepro M5 red dot sight is a compact sight with an integral Picatinny rail adapter and low-battery indicator. Featuring LED technology and a MIL-STD design, the sight is intended to be reliable under harsh environmental conditions. With its large display window and clearly defined red dot, the M5 allows target acquisition with both eyes open. It has four switchable reticule brightness intensities for different tactical scenarios.

Mepro M21

The Mepro M21 dual-illuminated, red dot reflex sight allows the user to select various optional reticles – dot, triangle, an open-x shape and bullseye. The sight provides a 'both-eyes-open' capability for targeting and shooting. Originally developed for the Israel Defense Forces (IDF), the Mepro M21 provides all-light aiming without batteries.

Mepro Meslas

The Mepro Meslas is a 10x40 fire control riflescope aimed at automating part of snipers' tasks. It is designed to withstand shock, vibration and harsh environmental conditions. The device incorporates a single-pulse eye-safe laser rangefinder, a telescope and a fire control computer. Additionally, when measuring distance, the Mepro Meslas automatically calculates the ranged target and displays the aiming point in the scope's FOV.

Mepro MOR

The Mepro MOR is a multipurpose red dot reflex sight with two laser pointers, described as an 'all-in-one' sight by Meprolight. It was designed according to the requirements of the Israel Defense Forces (IDF) and includes four options: passive reflex sight; active reflex sight; and two laser pointers, visible and IR. The Mepro MOR is a passive self-illuminated system which saves energy and enables storage for long periods, while being able to be used when needed. Weight: 0.45kg

Mepro MX3

The Mepro MX3 is a lightweight, compact magnifying scope. It is designed to be operated in tandem with a reflex sight, attaching behind the sight by means of a quick-release adapter. The scope extends the shooting range of reflex sights without re-zeroing and its wide FOV allows the user to get into the firing position quickly.

NEWCON OPTIK

HDS 3AA

The HDS 3AA is a red dot sight for tactical law enforcement and military close-quarters battle applications. The sight allows target acquisition and enables operators to maintain situational awareness with both eyes open. The HDS 3AA is built with a durable single-piece frame. Compatible with NV devices, the HDS 3AA can also be used with optional attachment lenses that provide flip-away 3x or 5x magnification for longer-range engagement.

NC 1x21

The NC 1x21 red dot sight is designed for tactical law enforcement and military applications. It allows target acquisition for close-quarters battle (CQB) and is built with durable single-piece frames. The NC 1x21 is intended for short-range CQB engagements. It also has a range of brightness settings and is compatible with NV devices.

NC 3-12x56

The NC 3-12x56 is a daytime riflescope with variable magnification, designed for use on a variety of weapon platforms. The riflescope has a Mil-dot reticle positioned in the second focal plane of the eyepiece, ensuring permanent sizing of the reticle regardless of the variable magnification setting being utilised.

Additionally, the reticle is LED-lit with seven adjustable brightness levels.

NC 4x32/NC 6x50

The NC 4x32 and NC 6x50 weapon-mounted tactical day optics have 4x and 6x fixed magnification respectively for short- to medium-range target acquisition. Both have an LED-lit Mil-dot ranging reticle with multiple green and red brightness settings. These units can be used in conjunction with NV devices and are compatible with many assault rifles. The NC 4x32 and NC 6x50 are ruggedised and have been battle-tested in a variety of environmental conditions.

NOVOSIBIRSK INSTRUMENT-MAKING PLANT

1P29

The 1P29 is a universal sight designed for use with the AK-74 assault rifle and RPK74 and PKM machine guns in daylight and at night against illuminated targets. It features aiming angle, elevation and windage adjustment. Power supply for aiming mark illumination includes tritium. Dimensions: 203x80x178mm Weight: 0.8kg

1P63

The 1P63 is a collimator sight for small arms intended for aimed fire in daylight, twilight conditions and at night at illuminated targets. The sight is used within the temperature range of -50/+50°C and relative humidity up to 100% at 25°C. Dimensions: 133x152x68mm Weight: 0.6kg

1P76

The 1P76 is a rakurs optical sight designed for use in daylight, twilight conditions and at night at illuminated targets. The sight is used within the temperature range of -50/+50°C and relative humidity up to 100% at the ambient temperature of 25°C. Power supply for aiming mark illumination: tritium. Dimensions: 110x68x165mm Weight: 0.5kg

1P77

The 1P77 is a rifle sight designed for use with Russian-built machine guns in daylight, twilight conditions and at night at illuminated targets. The sight is used within the temperature range of -50/+50°C and relative humidity up to 100% at the ambient temperature of 25°C. Dimensions: 205x95x171mm Weight: 0.95kg

1PN101

The 1PN101 night sight is designed for use with the SVDK sniper rifle. The sight operates in an ambient temperature range of -50/+50°C and relative humidity up to 100% at 25°C. Recognition range of a man-sized target: 600m. Weight: 3kg

PSO-1M2/1M2-1

The PSO-1M2 optical sight is designed for the 7.62mm SVD Dragunov sniper rifle. The reticle is graduated up to 1,300m and is illuminated for use in twilight and overcast conditions. Additionally, the PSO-1M2-1 is designed for use with the VSS silenced sniper rifle and AS 9mm silenced sniper rifle, and it is graduated up to 400m. Length: 37.5cm Width: 7cm Height: 13.2cm

SPP

The SSP is a machine gun optical sight designed to allow accurate use of the NSV 12.7mm HMG out to 2,000m by daylight and at dusk with the reticle illumination. The sight can operate within the temperature range of -50/+50°C and relative humidity of 93-97%. Dimensions: 365x96x178mm Length: 36.5cm Width: 9.6cm Height: 17.8cm Weight: 1.7kg

PYSER SGI

PDS4.5 Optical Day Sight

The PDS4.5 combat optical day sight has a rubber-armoured aluminium body suitable for mounting on an assault rifle or submachine gun fitted with a Picatinny rail. The large-diameter coated optics, for both the objective and eyepiece lens, give a bright, sharp image with long eye relief. The 4.5x magnification is used for longer-distance sharpshooting as well as close-quarters battle burst fire. Length: 14.3cm Width: 6.3cm Height: 7cm Weight: 0.74kg

RAYTHEON ELCAN OPTICAL TECHNOLOGIES

Specter DR 1.5-6x Sight

The Specter DR 1.5-6x dual-role, dual-FOV weapon sight provides close-quarters and ranged capability. The sight switches instantly between 1.5x magnification in red dot mode and 6x magnification with a range-compensating reticle, allowing the user to transition from a sweeping view for target acquisition to long-range precision fire and suppression without changing sights. Eye relief and boresighting remain constant between magnifications. Additionally, the wide viewing angle provides a 'both-eyes-open' target acquisition capability. Length: 18.4cm Width: 7.6cm Height: 7.6cm Weight: 0.7kg

Specter OS 4x

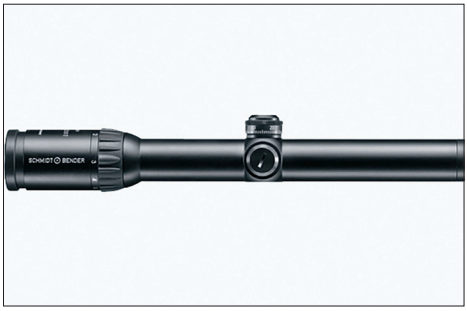
The Specter OS 4x optical sight is a simplified version of the Specter DR 1-4x dual-role sight, which provides fixed 4x magnification and mounts on a MIL-STD-1913 Picatinny rail. The external adjustment mount, lens size and illumination system of the main optic are the same as the Specter DR. The UK acquired the Specter OS 4x as the ELCAN Lightweight Day Sight (LDS) in 2009 to replace the original SUSAT sight on the 5.56mm L85A2 Individual Weapon. Length: 15.3cm Width: 6.2cm Height: 6.9cm Weight: 0.53kg

SpecterDR 1-6x Sight

The SpecterDR 1-6x dual-role weapon sight is a dual-FOV sight providing both close-quarter and precision fire ranged capability in a single package. Whether utilising the red dot in 1x magnification or the ranging reticle in 6x mode, the SpecterDR provides ultra-wide viewing angles for improved situational awareness and low-light performance. It also allows the user to safely and effectively transition in and out of buildings for close-quarter to extended range without changing sights.

SpecterHR

The SpecterHR crew-served weapon sight, designated the Enhanced Combat Optical Sight – Heavy in US service, is a sealed, rugged, large-window biocular



The 1.5-6x20 PM II sight is a combination of a red dot sight and a scope. The 1.5x magnification permits the shooter to keep both eyes open when aiming. (Photo: Schmidt & Bender)

weapon sight with fast near-target performance (suitable for use against pop-up threats) and an uncluttered 1MOA accurate two-dot reticle for both near and far target engagements.

SpecterOZ

The SpecterOZ variable optical zoom combat sighting system consists of two subsystems – a combat scope with a 5-20x variable zoom magnification and an integrated and enclosed close-quarters battle (CQB) 1x unity sight. The SpecterOZ sighting system aids CQB target engagement while enhancing long-range target engagement and observation capabilities. Each of the two subsystems can be used as standalone devices or integrated onto the host weapon system.

SpecterTR

In January 2014, ELCAN introduced the Specter TR 1-3-9x tri-FOV military combat weapon sight which it claims is 'the world's first' three-FOV optical weapon sight. The design is intended to provide close-quarter, mid-range and long-range engagement capability. The 1x FOV provides a wide viewing angle for a 'both-eyes-open' target acquisition capability maximised by a red aiming dot. Length: 26.4cm Weight: 0.83kg

RIPPEL EFFECT SYSTEMS

CRAR-32

The CRAR-32 lightweight, compact, all-weather reflex sighting system was developed for close-quarters battle. This sight, fitted with a universal elevation mechanism, can be used on platforms from assault rifles (with or without under-barrel grenade launchers) to machine guns and 40mm multi-shot grenade launchers. The parallax-free, reflex collimator system features an illuminated reticle. Length: 11cm Width: 5.9cm Height: 7.1cm Weight: 0.28kg

GR40 Reflex Sight

The GR40 is a lightweight reflex sight developed for use with Rippel Effect's XRGL40 extended-range 40mm multi-shot grenade launcher. This all-weather, multi-velocity programmable sight enables the soldier to use 40mm ammunition with up to 16 ballistic profiles from the same weapon. The GR40 allows for target acquisition and shot correction. Its elevation mechanism automatically compensates for the drift caused by the yaw of the projectile. Length: 11cm Width: 7cm Height: 9.5cm Weight: 0.46kg

SCHMIDT & BENDER

1-8x24 PM II ShortDot

The 1-8x24 PM ShortDot is a development of the 1.1-4x20 PM II ShortDot sight. The high magnification range has expanded the scope's range of applications. The fine reticle in the first focal plane permits firing up to 800m. The new CC mode provides for parallax-free use of the scope like a red dot sight at short distances/with a 1x magnification. When turned off, the illuminated dot vanishes, leaving the user with a normal reticle. Length: 29.3cm Weight: 0.62kg

1.1-4x20 PM II ShortDot

The 1.1-4x20 PM II ShortDot is a combination of a red dot sight and a scope developed for use at short and medium distances. With a low magnification, the ShortDot may be used like a red dot sight. The red dot is mirrored in the centre of the reticle. Turned off, the illuminated dot vanishes, leaving the user with a normal reticle. The illuminating unit offers five illumination stages for use in broad daylight. Length: 26.9cm Weight: 0.57kg

1.1-8x24 PM II High Power

The 1.1-8x24 PM II High Power is a member of the High Power line of scopes with large zoom factors. With a ballistic horseshoe reticle in the first focal plane, the scope is optimised for use on assault rifles and fast shooting at a close distance. The small lower magnification enables a target to be acquired with both eyes open, while the 8x magnification allows target identification and shooting at longer ranges. Length: 29.3cm Weight: 0.65kg

1.5-6x20 PM II ShortDot

The 1.5-6x20 PM II sight is a combination of a red dot sight and a scope. The 1.5x magnification permits the shooter to keep both eyes open when aiming. Length: 31.6cm Weight: 0.57kg

1.5-8x26 PM II ShortDot

The 1.5-8x26 PM II ShortDot is the newest scope in the ShortDot range and the first to be equipped with a 34mm tube. It was developed to equip the German Army's G28 Designated Marksman Rifle. This configuration was selected with the objective of providing a good elevation and side adjustment range even with 8x magnification. Length: 31.6cm Weight: 0.65kg

3-12x50 PM II

The 3-12x50 PM II is a scope for engaging targets up to 1,500m. The reticle is located in the first focal plane, permitting a distance evaluation in all magnifications. It has been in use on the German Army's G28 since 2011. The 3-12x50 PM II P model has parallax compensation. The parallax can be adjusted from 50m up to infinity, while the 3-12x50 PM II LP model has parallax compensation and illumination. Length: 34.3cm Weight: 0.86kg

3-12x54 PM II Ultra Bright

The 3-12x54 PM II Ultra Bright is the first scope within Schmidt & Bender's new PM II Ultra Bright line. With a transmission of 96%, the scope allows shooting particularly under low-light conditions at medium and long distances. The Ultra Bright line has a revised design with more rounded shapes and flat turrets. The sight is available with various illuminated reticles. Length: 35.1cm Weight: 0.92kg

3-20x50 PM II LP

The variable magnification from 3x to 20x of the 3-20x50 PM II LP permits the scope to be used on a multitude of rifles, with many different calibres and at very large distances. On request, the reticle may be included in the first or second focal plane. The scope also has parallax compensation from 25m to infinity. Reticle illumination ranges from NVG through dusk to broad daylight. Length: 38.5cm Weight: 0.93kg

3-20x50 PM II Ultra Short

The 3-20x50 PM II Ultra Short is a shortened version of the standard 3-20x50 PM developed for use with attachments on short rifles. It can be used with a front-mounted NV device. The elevation turret is designed as a double turn and can be used with a red dot sight that is installed on the back mounting ring to bridge close distances. The side turret has a cap to prevent unintentional adjustment. Length: 34cm Weight: 0.9kg

3-27x56 PM II High Power

The 9x zoom factor 3-27x56 PM II High Power day scope is the first model of Schmidt & Bender's PM II High Power series. It was developed as part of a US Special Operations Command request for shooting at extreme ranges and is suitable for ultra-long distances and five reticles are available. Weight: 1.13kg

3-27x56 PM II High Power Digital

The PM II Digital line of scopes have a modified scope head and can be used with or without compatible devices. The information from compatible external devices such as laser distance measuring units and ballistics calculators can be displayed in the FOV of the marksman. It is possible to exchange data via a cable or Bluetooth interface. Development of the digital scopes was funded by the US Special Operations Command. Length: 40.7cm Weight: 1.24kg

4-16x42 PM II LP

To meet US military requirements, the 4-16x42 PM II LP was developed with 4x to 16x magnification and a 42mm lens on the basis of the 4-16x50 PM II LP model. The lower lens diameter enables the scope to be mounted at a lower height on the weapon. The reticle is located in the first focal plane permitting a distance evaluation in all magnifications. Length: 39.3cm Weight: 0.88kg

4-16x50 PM II

With magnification of up to 16x, the 4-16x50 PM II P scope can be used from short ranges to up to 1,000m. The 50mm lens is designed to provide imaging features even under poor lighting conditions. The 4-16x50 PM II P includes a parallax compensation function from 50m to infinity. The 4-16x50 PM II LP model has parallax compensation and an illuminated graticule. Additionally, the parallax compensation and illumination adjusting turrets are clearly separated. Length: 39.4cm

4-16x56 PM II Ultra Bright

The 4-16x56 PM II Ultra Bright is the second scope within Schmidt & Bender's new PM II Ultra Bright line. With a transmission of 96%, the scope allows precise shooting particularly under low-light conditions at medium and long distances. The Ultra Bright line has a revised design with more rounded shapes and flat turrets. The sight is available with various illuminated reticles. Length: 38.6cm Weight: 0.96kg

5-20x50 PM II Ultra Short

The 5-20x50 PM II Ultra Short, measuring less than 300mm in length, is optimised for use with short and light weapon systems and can be combined with a front-mounted NV device. The compact elevation turret – available as single or double turn – can be used with a red dot sight that is installed on the back mounting ring to bridge close distances. The 5-20x50 PM II Ultra Short riflescope is available with three reticles and the illumination of the reticle in the first focal plane is optional. Length: 29.9cm Height: 5.95cm Weight: 0.83kg

5-25x56 PM II Digital

The PM II Digital line of scopes have a modified scope head and can be used with or without compatible devices. The information from compatible external devices, such as laser distance measuring units and ballistics calculators, can be displayed in the FOV. It is also possible to exchange data via a cable or Bluetooth interface. Length: 42.5cm Weight: 0.13kg

5-25x56 PM II/LP

The 5-25x56 PM II LP scope is designed for use at ranges of up to 2,000m. It is equipped with an illuminated reticle and parallax compensation from 10m to infinity. The scope can be supplied with the reticle in the first or second focal plane. The 'more tactile clicks' function (MTC) is also available to make it easier for the shooter to count the necessary clicks during reticle adjustment. Length: 41.7cm Weight: 1.13kg

5-45x56 PM II High Power

The 5-45x56 PM II High Power scope is the latest addition to Schmidt & Bender's High Power range and was developed at the request of the US Special Operations Command, which was seeking a new riflescope for shooting at long range. It has 'ultra-slim' and functional turrets. Length: 43.4cm Weight: 1.11kg

12-50x56 PM II

The 12-50x56 PM II scope is designed for engaging targets at longer distances. The parallax compensation permits the user to focus on targets at a distance between 10m and infinity. The large reticle adjustment range, either as double turn or in the new multi-turn version, enables the firer to perform a trajectory compensation for longer ranges without any problems. Optionally, the scope is available with reticles in the first or second focal plane. Length: 41.7cm Weight: 1.11kg

SIG SAUER

Bravo4 Battle Sight

The 4x30mm Bravo4 prism-powered battle sight has a MegaView aspherical lens eyepiece for a large FoV and enhanced awareness of objects in the shooter's periphery. The sight has motion activated illumination to provide operational safety and enhanced battery life. It also has an integrated MIL-STD-1913 Picatinny top rail for additional accessories.

CP2 MIL Prismatic

The CP2 MIL Prismatic Rifle Scope is a lightweight sight for target acquisition. It has a 3x fixed magnification, duplex crosshair ranging reticle. It has three reticle modes – non-illuminated black, illuminated green and illuminated red – with each illuminated mode offering five brightness settings. The CP2 MIL Prismatic has anodised aluminium construction.

Romeo Red Dot Sights

The Romeo line of red dot sights are parallax-free and feature (MOTAC) motion-activated illuminated glass reticles. The dual reticle option, on select models, toggles between 2 MOA red dot or circle dot. The 1x20mm Romeo4 red dot sight is available in four models: Romeo4A; Romeo4B; Romeo4C with a solar power system; and Romeo4M. The 1x20mm Romeo5 is a compact version of the red dot sight. Length: 6.7cm Width: 4.1cm Height: 410cm Weight: 0.14kg

Romeo Reflex Sights

The open reflex Romeo sight features TruHold twin adjustment springs, which provide a lockless zeroing system. The moulded aspherical lens is bright and distortion free. The sight features manual brightness controls and a MOTAC motion-activated illumination system for operational safety and enhanced battery life. The sight is powered by a top-loading battery. There are two models: 1x30mm Romeo1 and 1x25mm Romeo3.

STS-081 MIL Mini Red Dot Sight

The STS-081 MIL Mini Red Dot Sight is a lightweight sight for handguns, rifles and shotguns. It has a parallax-free 1x red dot with a 4 MOA reticle, coated glass lenses and anodised aluminium construction. A removable honeycomb filter reduces glare and prevents lens reflection during bright sunlight applications.

Tango4 Tactical Riflescopes

Tango4 riflescopes are suitable for mid- to long-range tactical engagements. They feature a 4:1 zoom first focal plane design and motion-activated illuminated glass reticles. The LockDown Zero system is a stop-locking turret that allows a rapid return to zero. The Tango4 riflescope is available in four models with varying magnification levels: 1-4x24mm; 3-12x42mm; 4-16x44mm; and 6-24x50mm. Length: 39.7cm Weight: 0.76kg

Tango6 Tactical Riflescopes

Tango6 riflescopes are suitable for both close-quarters battle operations and long-range shooting. The scopes have HellFire fibre-optic and glass-etched illuminated reticles with varied light intensity of the central aiming point from IR dim to daylight bright. The HDX optical system comprises high-definition and high-transmittance glass for optical performance and light transmission. Length: 39cm Weight: 1.2kg

TELEDYNE FLIR

Armasight MCS

The Armasight MCS (Miniature Collimating Sight) is a micro LED collimating sight for both-eyes-open rapid target acquisition. The MCS is rugged, lightweight and designed to mount onto many existing optics as well as MIL-STD-1913 Picatinny and Weaver-style rails. The Armasight MCS features a dual reticle pattern: a 3.5 MOA Dot reticle or 20 MOA Ring reticle. Length: 4.8cm Width: 4.4cm Height: 5.2cm Weight: 0.07kg

TRANSVARO ELEKTRON

TV/KND Series

The TV/KND Series of compact day sights have an illuminated reticle with dimensional ballistic correction scale for use on a range of weapons. Reticules with pre-defined ballistic parameters can be integrated on customer request.

TRIJICON

AccuPoint

The AccuPoint riflescope line has an all-weather, hard-anodised aluminium body, dual illumination through the use of fibre optics and tritium phosphor lamps, battery-free operation, waterproofing up to 3m and a choice of several post and crosshair reticle options. AccuPoint riflescopes include multi-layer coated lenses for light transmission with no distortion, a quick-focus eyepiece, extensive eye relief and windage and elevation adjustments. Length: 26.2cm Width: 5cm Height: 5cm Weight: 0.76kg

AccuPower

In 2015, Trijicon introduced the AccuPower riflescope series, designed for versatility with power offerings of 1-4x24 (RS24 series), 2.5-10x56 (RS22 series), 3-9x40 (RS20 series) and 4-16x50 (RS29 series). The line has anti-reflective multi-coated lenses for clarity and light gathering. Adjustable reticle brightness settings offer eleven adjustments with an 'Off' feature between each setting. The AccuPower series incorporates a hybrid black chrome/etch and fill illuminated-reticle system available in red or green, with four reticle options. All reticles are located in the second focal plane, meaning their size and appearance remain constant as magnification increases. This provides a more exact aiming point at higher magnifications and is faster to use in low light situations, claims the company.

ACOG

The Advanced Combat Optical Gunsight (ACOG) is a fixed-power, compact riflescope with an illuminated reticle pattern for use in bright to low/no light. The ACOG is designed to be durable and reliable. It is waterproof, shock-resistant and dry-nitrogen filled to eliminate fogging. The sight features adjustable brightness control with six settings. Some variants include a bullet drop-compensated reticle. The ACOG can be used as a close-quarters battle sight when shooting with both

eyes open. Length: 30.5cm Width: 7.4cm Height: 8.6cm Weight: 0.14kg

MGRS

Trijicon's Machine Gun Reflex Sight (MGRS), developed to compete for the US Army's Mounted Machine Gun Optic (MMO) project, was launched in October 2016 at AUSA. It is designed to give gunners better accuracy and reliability when operating pintle-mounted weapons, such as the M2 50cal and M240 7.62mm machine guns, on armoured vehicles, patrol boats and other platforms. Length: 22.4cm Width: 10.7cm Height: 13.2cm Weight: 1.9kg

MRO

The Miniature Rifle Optic (MRO), launched in August 2015, is a sealed miniature red dot reflex sight intended for use on rifles, carbines and shotguns to provide fast target acquisition. The large aperture and tapered light path maximises the viewing area and allow for better situational awareness and fast target engagement, especially from non-standard shooting positions. The 2-MOA dot is also sized for fast target acquisition from CQB distance to extended ranges. Length: 6.6cm Width: 4.3cm Height: 5.1cm Weight: 0.12kg

Night Sights

Bright & Tough and HD night sights are intended as a self-luminous three-dot alternative to conventional iron sights. The HD night sights have a front sight that features a photoluminescent paint outline. The rear sight is angled and serrated to reduce glare and aid front-sight focus.

Reflex

The Reflex is a robust, battery-free, illuminated sight intended for close-quarters battle use. With both eyes open, it allows shooters to maintain situational awareness. Several adapters are available to enable the sight to be mounted on rifles, carbines and shotguns.

RMR

The Ruggedized Miniature Reflex (RMR) sight has multiple applications, including rifle, carbine, pistol and shotgun. Optionally, it can be used as a secondary sight with a magnified optic. It is made from 7075-T6 aluminium to Mil-Spec standards and has a patented shape designed to absorb impacts and divert stresses away from the lens. The RMR is available in LED, adjustable LED or dual-illuminated (fibre-optic/tritium) versions and with dot sizes ranging from 3.25 to 13 MOA.

RMR Type 2

The Ruggedised Miniature Reflex (RMR) Type 2 is a red dot weapon sight intended for mounting on pistols, rifles, carbines and shotguns. It is available in three configurations: a basic LED, an adjustable LED and a dual-illuminated version. Compared to the original RMR, the Type 2 introduces a button lock mode and battery-saving features. In September 2018, this sight was selected by the Naval Surface Warfare Centre Crane Division. Length: 4.6cm Width: 3cm Height: 2.5cm Weight: 0.03kg

SRS

The Sealed Reflex Sight (SRS) is a rugged, parallax-free sight that incorporates a large aperture for better situational awareness in a short body. The illuminated 1.75 MOA red dot with ten brightness settings – three NVG-compatible – is powered by a solar cell plus one AA battery. Button pads are also designed to make brightness adjustments easier, especially when the user is wearing gloves.

TARS

The Tactical Advanced Riflescope (TARS) is a variable-power riflescope designed for long-range shooting. It features a first focal plane reticle with ten illumination settings, including two for NV. Target adjusters feature a large adjustment range as well as a mechanism to prevent unintentional rotation, combined with an elevation return-to-zero feature. Length: 35.3cm Width: 9.7cm Height: 8.9cm Weight: 1.33kg

VCOG

The Variable Combat Optical Gunsight (VCOG) is a rugged, variable-power riflescope with an LED-illuminated, first focal plane, bullet drop-compensated reticle. The VCOG is designed for durability and has six brightness settings powered by one AA battery. Additionally, an integrated dial fin allows rotation through the entire magnification range.

INFANTRY WEAPON SIGHTS FOR NIGHT USE (IMAGE INTENSIFIERS)

ASELSAN

A341/A361

The A341 and A361 NV weapon sights are lightweight and compact, functioning at low-light levels. Various available reticle and reticle adjustment system options include duplex/Mil-dot and custom design reticles. Weight: 1,350g

A600

The A600 NV attachment clips onto the objective of a day sight, with no effect on daylight zeroing. The lightweight device is compatible with 3-12x magnification day sights and standard mounting adapters, but can also be used with a custom mounting solution. Weight: 700g

BROLIS PHOTONICS SOLUTIONS

S100U

Brolis Photonis unveiled its new S100U SWIR sight at DSEI 2017 in London. The S100U is a rugged long range SWIR weapon sight providing day and night imagery through various obscurants like dust, smoke, haze and fog. The system incorporates the latest InGaAs sensor and InP laser diode technology providing covertness to conventional night vision technology.

HENSOLDT OPTRONICS GMBH

Hensoldt NSV 600

The NSV 600 medium-range NV scope is a light intensifier used together with day optics. These

do not have to be removed when vision is limited. This clip-on attachment includes an integrated maintenance management system to enable the export of information such as service hours, on/off cycles or installation date. Length: 20.5cm Width: 9.1cm Height: 7.8cm Weight: 870,000g Range: 590m

Hensoldt NSV 1000

The NSV 1000 NV scope is a light intensifier used together with day optics, which do not have to be removed when vision is limited. This clip-on attachment includes an integrated maintenance management system to enable the export of information such as service hours, on/off cycles or installation date. The NSV 1000 features gain control, manual brightness control and optional remote control. Length: 20.5cm Width: 11.2cm Height: 9.9cm Weight: 1,200g Range: 750m

NSV LL

The NSV LL (Low Light) is a clip-on long-range night sight optimised for use with sniper rifles up to 50cal. The adjustment to even low-mounted scopes allows it to be attached to a large variety of weapons. Positioning of elements such as the on/off knob and focus enables right- and left-hand use. Length: 23.5cm Width: 11.3cm Height: 11.5cm Weight: 1,450g Range: 1,050m

L3HARRIS TECHNOLOGIES

AN/PAS-13G(V)1 LWTS

The AN/PAS-13G(V)1 Light Weapon Thermal Sight (LWTS) is a handheld or weapon-mounted thermal sight. The TI capability of the LWTS allows for longwave infrared observation and target identification under adverse conditions including light rain, smoke, light snow and low light to total darkness. Length: 23.37cm Width: 9.25cm Height: 11.43cm Weight: 1,134g

AN/PVS-24

The AN/PVS-24 is a rugged, clip-on NVD and is used by US Special Operations Command. The design of the PVS-24 eliminates the typical requirement of removing a primary (day) sighting system since the device mounts in line with a standard day optical sight. Combining day and NV sights eliminates the need to re-zero since the primary sight remains undisturbed. The locking quick-disconnect, single-throw lever mounting system provided is also able to attach to a MIL-STD-1913 rail interface system. Length: 13.7cm Width: 9.7cm Height: 7.7cm Weight: 771g Range: 500m

MEPROLIGHT

Mepro Hunter 4X/6X

Mepro Hunter NV weapon sights are based on Gen II or Gen III I2 tubes. Developed for SF, the Mepro Hunter 4X is designed for short to medium ranges, while the 6X variant is intended for longer ranges and sniper operations. Additionally, both models have illuminated reticles and adjustable brightness for contrast against light and dark targets. Length: 33cm Width: 11.2cm Height: 11cm Weight: 2,000g

Mepro LI-OR 4X/7X

The Mepro LI-OR 4X/7X sight is mountable on a range of weaponry. It has a lightweight construction and uses an illuminated red open cross reticle or Mil-dot reticle, with five brightness level positions. The sight also incorporates two boresight knobs (azimuth and elevation) as well as an adjustable focus objective lens. The Mepro LI-OR has a low-battery indicator and an optional remote paddle switch that enables power-on without letting go of the weapon. Length: 28cm Width: 7.6cm Height: 8.5cm Weight: 1,100g

Mepro Minimon -L

The Mepro Minimon (L) is a multifunctional lightweight mini-monocular designed for the diverse requirements characterising night operations in harsh tactical and environmental conditions. This includes special naval operations requiring submersion to a depth of up to 20m. The Mepro Minimon (L) is equipped with a 40˚ FOV and a large eye-relief and utilises a standard high-quality 18mm image intensifying tube featuring a modular design. It can be used in head-mounted, helmet-mounted, weapon-mounted or handheld configurations and is compatible with all IR illumination and laser pointers. Length: 12cm Width: 4.3cm Height: 6.6cm Weight: 245g

NEWCON OPTIK

DN 463

The DN 463 is a military-grade NV riflescope designed for tactical operators, requiring a night-time close-quarters battle and/or medium-range target engagement capability. The fully weatherproofed DN 463, with a nitrogen-filled optical channel, can be used in a range of combat environments. The unit is available with XT, AG and AGBW series Gen III I2 tubes with automatic brightness control, bright source protection and minimum exportable FOM >1,600. Length: 31cm Width: 9.5cm Height: 10.3cm Weight: 1,000g

DN 493_6x Series

The DN 493_6x NV riflescope has manual gain control adjustment. It has an adjustable brightness reticle and a Gen III I2 tube with a minimum FOM >1600 (fully exportable). The scope is designed to be easy to service and maintain. With 6x magnification, the DN 493_6x is suitable for medium- to long-range target engagement,

The AN/PVS-24 is a rugged, clip-on NVD and is used by US Special Operations Command. (Photo: L3Harris Technologies)

for deployment in combat, peacekeeping, public and private infrastructure security. Length: 31cm Width: 9.8cm Height: 9cm Weight: 1,050g

NVS 27 Series

The NVS 27 high-resolution NV clip-on is designed to mount in front of most daytime riflescopes. It enables NV imaging on magnifications between 1x and 20x, has an extra-wide FoV, extended target detection range, as well as an in-built IR illuminator and manual gain control. The unit uses a Gen III I2 tube with minimum exportable FOM >1,600.

NIVISYS

Night Hawk

The Night Hawk NV weapon sight is designed for long-range medium and heavy weapon applications, using Gen III I2 technology. The sight can be mounted on a variety of individual and crew-served weapons. It has a variable-brightness reticle that can be boresighted to the weapon using the independent windage and elevation adjusters. The Night Hawk is available in 4x and 6x magnification configurations. Length: 42cm Width: 13cm Height: 14cm Weight: 2,100g

NOVOSIBIRSK INSTRUMENT-MAKING PLANT

1PN93-1

The 1PN93-1 is a modular Gen II+ night sight designed for use with VSS, AS (1PN93-1AS version), AK-74M and AN-94 (1PN93-1AK-74 version) assault rifles. The sight operates in a temperature range from -50/+50°C and relative humidity up to 100% at 25°C. Dimensions: 207x79x176mm. Weight: 1,000g

1PN93-2

The 1PN93-2 modular Gen II+ night sight is designed for use with AK-47 and AKM (1PN93-2 AK) assault rifles or RPG-7V grenade launchers. The sight operates in an ambient temperature range from -50/+50°C and relative humidity up to 100% at 25°C. Dimensions: 250x81x182mm. Length: 25cm Width: 8.1cm Height: 18.2cm Weight: 1,500g

1PN93-3

The 1PN93-3 modular Gen II+ night sight is designed for use with SVD and SVDS sniper rifles and the PKM light machine gun. The sight operates in an ambient temperature range from -50/+50°C and relative humidity up to 100% at 25°C. Dimensions: 226x100x198mm. Length: 22.6cm Width: 10cm Height: 19.8cm Weight: 1,500g

1PN114/1PN100

The 1PN114/1PN100 Gen III day/night sight is designed for use with SVD and SVDS sniper and AK-series assault rifles. Switching the sights from day to night position can be performed without shifting the sightline. The 1PN114/1PN100 operates at ambient temperatures from +50/-50°C and relative humidity up to 100% at 25°C. Identification range of man-sized target: 450m. Length: 32.1cm Width: 9.1cm Height: 20cm Weight: 1,700g

OIP SENSOR SYSTEMS

Irbis 4x/6x

The Irbis night weapon sight is rugged and lightweight, featuring 4x or 6x magnification for medium- and long-range applications. Both models have an integrated weapon adapter, rubber cover and red electronically adjustable reticle. Weight: 1,270g Range: 25m

OPTIX

NVA-10/75

NVA-10 and NVA-75 are attachment devices that enable snipers to effectively use their rifles at night. They may become part of an existing riflescope system, which enables the equipment to be used in a range of tactical applications, from standard assault rifles to long-range, large-calibre rifles. Each device can also be configured with different Gen II or Gen III I2 tubes.

ONS-3/-6

ONS-3 and -6 NV weapon sights are engineered in accordance with MIL standards. They are configurable with different reticles and 18mm Gen II or Gen III I2 tubes. The sights can be mounted on a Picatinny rail on various types of assault or sniper rifles and are suitable for different military and law enforcement applications.

ONS-4V

The ONS-4V sight is used for observation, sighting and distance-measuring during the night, and at dusk and dawn. The design makes it suitable for night combat operations. The sight is configurable with different reticles and 18mm Gen II or Gen III I2 tubes. It is compatible with various assault rifles, sniper rifles, light machine guns and submachine guns equipped with a Picatinny rail.

PCO

PCS-5/5M GABRO

The PCS-5/PCS-5M passive NVD is a lightweight telescopic sight designed for use on portable weapons. It can be used for battlefield observation, detection and target recognition in natural night-light conditions. The PCS-5 can be used on various types of guns and grenade launchers with a side-mounting dovetail system. The PCS-5M version is also designed for weapons with a MIL-STD-1913 Picatinny rail.

PYSER SGI

PNP-M

Designed and built in the UK, the PNP-M lightweight I2 monocular can be handheld, helmet- and head-mounted or weapon-mounted on a MIL-STD-1913 rail using an interface kit. The PNP-M works with a range of day sights, offering NV capability in conjunction with existing sighting systems. The device can also be removed with one hand from the weapon and used in surveillance mode. Length: 10.7cm Width: 4.2cm Height: 6.7cm Weight: 288g

PNP-MS

The PNP-MS standalone miniature I2 NV weapon sight is based on the PNP-M monocular. It incorporates an

illuminated red-dot aiming mark for target acquisition with an on/off switch for the choice of low and high red-dot brightness levels. The superimposition of the red dot on the green or white I2 picture is intended to aid the speed and clarity of aiming as a result of the colour difference.

PNP-MUNS Universal Night Sights

The PNP-MUNS Universal Night Sights are in-line I2 lightweight, compact weapon sights designed to be used in front of day scopes from 1-16x magnification and higher with front lenses up to 60mm diameter. The in-line optical design, with no prisms, does not affect the zero of the weapon or the user's normal firing position. It also does not create parallax errors. Length: 20.8cm Width: 9cm Height: 8.7cm Weight: 1,006g

QIOPTIQ

Kite

Kite is a lightweight night sight designed to meet military specifications for weapon aiming. More than 65,000 have been sold to over 56 countries. Additionally, the UK MoD has selected Kite as its standard night sight. From the basic design, a family of equipment can be fitted to light support weapons or heavy machine guns (MaxiKite-2) or used for surveillance (BinoKite and MaxbinoKite) purposes.

Merlin

Merlin SR, MR and LR inline sights are aimed at the assault rifle, sharpshooter rifle and sniper rifle end user. They provide different size/weight/performance trade-offs with a man-machine interface, common accessories and a power supply of one standard AA battery.

RAYTHEON ELCAN OPTICAL TECHNOLOGIES

Sighting Systems

Raytheon Elcan Optical Technologies offers a range of sighting systems, including thermal imaging (IR), digital and multirole optical rifle sights. Hundreds of thousands of optical sights by Elcan are also deployed with forces around the world as a standard-issue sight for small arms.

RHEINMETALL

KN200/250

Rheinmetall's clip-on I2 units provide night capability to optical day sights. The NV image is viewed through the eyepiece of the day sight, allowing the user to retain the same eye position, aiming reticle and magnification. Both sights can be used on sniper rifles, anti-tank weapons and binoculars, while the KN200 adds a laser rangefinder for use with medium-range infantry weapons. The KN250 is also suitable for assault rifles. Length: 22cm Width: 12.7cm Height: 19.2cm Weight: 1,560g Range: 25,000m

SAFRAN VECTRONIX

NiteSpotMR

The NiteSpotMR medium-range clip-on night sight adds NV capability to a variety of rifles. It attaches to the front of a day sight objective and can be removed when not in use. The NiteSpotMR does not affect the optical alignment of the day sight, eliminating the need for re-adjustment/boresighting when changing between daytime and night-time operations. The sight can also be used with any rifle up to .50cal. Length: 27cm Width: 8cm Height: 8cm Weight: 920g

TELEDYNE FLIR

Armasight Drone Pro 10x/15x

The high-performance charge-coupled device imaging system of the Armasight Drone Pro 10x and 15x digital night vision riflescopes is sensitive to both near-IR and visible light and provides round-the-clock and all-weather target detection and discrimination. Length: 29cm Width: 9.1cm Height: 10.7cm Weight: 1,300g

Armasight Nemesis

The Armasight Nemesis 4X and 6X night vision rifle scopes can be equipped with high-performance Green phosphor Gen 2+ image intensification tubes or Armasight's Gen 2 Quick Silver. This provides users with natural B&W displays. The scopes have internal windage and elevation adjustments and simple push-button controls. According to Armasight, no other night vision riflescope on the market provides such well-defined crosshairs. Length: 30.5cm Width: 10.2cm Height: 7.1cm Weight: 1,200g

MilSight S135 MUNS

The MilSight S135 Magnum Universal Night Sight (MUNS) AN/PVS-27 is a high-resolution clip-on weapon sight that mounts forward of an existing scope, adding NV capabilities to daytime target acquisition platforms. The S135 has patented permanent boresight alignment technology; it is installed, operated and removed without tools and without affecting boresight. The unit can be mounted on a spotting scope for long-range reconnaissance or handheld. The sight includes FLIR's shock mitigation system. Length: 22cm Height: 9.5cm

MilSight S140-D

The MilSight S140-D Advanced Dual-Band Universal Night Sight (ADUNS) in an image-intensified thermal weapon sight. It works by fusing black and white IR images with either green or white I2 images, allowing the user to see through obscurants or identify targets in greater detail. In addition to being mounted on a MIL-STD-1913 rail, the MilSight S140-D can be used as a spotting scope or handheld observation device.

MilSight T90 TaNS

The MilSight T90 Tactical Night Sight (TaNS) is a high-resolution clip-on NVD that mounts forward of an existing scope, adding night vision capabilities to daytime target acquisition systems. The T90 features patent-permanent boresight alignment technology. It is installed, operated and removed without tools and without affecting boresight. The sight includes FLIR's shock mitigation system and the Modular Utilitarian Power-Pack System (MUPPS), a detachable, field-replaceable battery compartment. Length: 14.2cm Weight: 680g

T105 UNS AN/PVS-22

The FLIR T105 Universal Night Sight (UNS) AN/PVS-22 is a mid-range I2 weapon sight designed to mount on a MIL-STD-1913 rail interface forward of an existing scope. This adds NV capabilities to target acquisition platforms. This also presents the shooter with the same FOV while preserving reticle calibration and foresight. The T105 UNS includes a proprietary Shock Mitigation System allowing the unit to be used on weapons up to and including 50cal bolt-action rifles. Length: 18.5cm Height: 7.8cm

THEON SENSORS

Artemis

The Artemis family of standalone NV sights provide 3x, 4x, and 6x magnification for infantry weapons. According to the company, the small, lightweight sights are designed to have good boresight retention and use US or European I2 tubes for performance in all light conditions. The kinematic bracket assembly allows direct mounting of the sights on MIL-STD-1913 Picatinny rails, adjustment in elevation and azimuth and retention of boresighting under harsh conditions. Length: 30.4cm Width: 11.4cm Height: 14.7cm Weight: 1,500g

DamΩn

The DamΩn night sight is designed to be mounted in front of magnified day optical sights to provide NV capabilities and target acquisition. It can also be used as a handheld observation device. Its optical design was optimised for close-combat weapon applications with a claimed best performance/weight ratio available on the market. Weight: 700g

Erebus

The Erebus NV clip-on afocal sight with a large objective lens is designed for mounting on top of optical day sights and Laser Range Finders (LRF) without affecting their boresighting settings. Its FOV is closer to the narrow FOV of most large magnification sights and matches the FOV of most LRFs. Reticle readings, eye relief distances and shooting/observation practices remain the same as in the daytime. Length: 22cm Width: 11.6cm Height: 20.7cm Weight: 1,850g

TRANSVARO ELEKTRON

TV/NWS-3

The single-tube TV/Night Vision Weapon Sight (TV/NWS)-3 is designed for medium- to long-range surveillance and targeting. It has an integrated power supply that provides automatic brightness control and bright source protection to guard against exposure to high levels of light. The NWS-3 is lightweight and incorporates an illuminated reticule with windage and elevation adjustments. Length: 19cm Width: 7.7cm Height: 9.1cm

TROYA TECH DEFENSE

Falco

Designed for use with marksman and sniper rifles, the Falco sight is available in 2x, 4x and 6x magnifications and has an I2 tube. The Falco is equipped with a cross-hair aiming reticle and has a low battery indicator. Additionally, the sight comes with a soft carrying pouch, weapon mount, batteries, user manual and cleaning microfibre cloth. Length: 36cm Width: 12cm Height: 14cm Weight: 2.4g

INFANTRY WEAPON SIGHTS FOR NIGHT USE (THERMAL IMAGERS)

AIM INFRAROT-MODULE

HuntIR Mk 2

The HuntIR Mk 2 thermal weapon and reconnaissance sight is designed for clip-on use on mid- and long-range small arms. The standalone weapon sight has an optional biocular eyepiece. Length: 18cm Weight: 2,000g

ASELSAN

Boa

The Boa thermal weapon sight is compatible with sniper weapons and heavy machine guns. It can operate in darkness and does not shut down or bloom in case of a direct light hit. Additionally, the Boa has reticles developed for long-range weapons and provides target detection at long ranges. Weight: 2,100g

Mini-TWS

The Mini-Thermal Weapon Sight (TWS) family provides imaging during day/night and adverse weather and environment conditions such as fog, haze, smoke, sand and dust. Imaging capabilities include automatic optimisation, image freeze, polarity selection, brightness/contrast and focus adjustment. The Mini-TWS supports image transfer to a HUD and has a shuttered eyecup and battery level indicator. It can be used handheld or weapon-mounted. The Mini-TWS is available in multiple configurations with varying FOVs, magnification and weights. Weight: 1,030g

Python

The Python thermal sight enables the user to detect threats beyond the weapon's effective range. The unit can be mounted on different types of weapons or used as a handheld system for surveillance. It does not shut down or bloom in case of a direct light hit and can also operate in total darkness, as well as daytime. Weight: 1,700g

BAE SYSTEMS OASYS

SkeetIRx

The SkeetIRx thermal weapon sight is a credit card-sized thermal monocular that displays a 640x480 (detector) resolution using a CR 123 battery. It is described as optically and electronically optimised, with an operational runtime of more than two hours. The SkeetIRx sight is operated by a menu function featuring a single button press, eliminating the need to remember locations on the device for different functions while operating the system in darkness. Features such as inherent weapon use and user-selectable electronic

reticles support a range of missions. Length: 10.2cm Width: 6.1cm Height: 4.4cm

UTCx

The UTCx (Universal Thermal Clip-on) sight is a universal thermal clip-on to existing weapon sights, currently fielded by the US military and supporting long-range sniper and surveillance missions. The UTCx sight complements existing day sights and unity systems, as well as day sights in excess of 10x magnification when used as a pass-through sighting device. Length: 17.3cm Width: 8.4cm Height: 8.4cm

UTCxii

The UTCxii sight is a universal thermal clip-on to existing optical scopes, supporting long-range sniper and surveillance missions. It complements existing unity day sight systems, as well as day sights in excess of 10x magnification when used as a pass-through sighting device. Length: 15.8cm Width: 8.2cm Height: 7.9cm Weight: 580g

UTMx

The UTMx thermal weapon sight is claimed to be the first palm-sized 640x480 hybrid thermal mono-sight. It has dual-band pointing/aiming lasers and thermal sensitivity. The UTMx utilises a simple menu function featuring a single button press, eliminating the need to remember locations on the device for different functions while operating the system in darkness. Length: 14.8cm Width: 8.2cm Height: 5.4cm Weight: 520g

BERTIN TECHNOLOGIES

VitelSight

The VitelSight uncooled IR thermal sight is designed for use on sniper rifles. It is equipped with an electronic level and a fire control system that automatically corrects the backsight according to the environment. The VitelSight can be controlled remotely by cable and is capable of image and video recording. The sight features libraries of ten firing tables, five sniper profiles and four reticles.

BRITANNIA 2000

Firefly

Britannia's Firefly thermal weapon sights utilise FLIR Systems' Tau-2 thermal camera to provide imaging at extended ranges. The sights enable target identification in environments including fog, smoke and darkness. The all-weather Firefly sights also have integrated video and image capture capability and can be used on weapons up to and including 7.62mm calibre.

ELBIT SYSTEMS INTELLIGENCE AND ELECTRO-OPTICS – ELOP

A-Tim

A-TIM is an advanced clip-on thermal imaging sight for ATGM launchers. Main features: full operability in day/night and poor visibility conditions; boresight free – quick installation on standard launcher day sight; uses existing eyepiece for both standard and thermal sight; lightweight compact system, including battery. Applications: applicable for any ATGM launcher; already operational with Fagot, Flame and Konkurs/AT-5 Spandrel. Weight: 7,700g

Artim-LR

The Artim-LR is a battery-operated 8-12µm TI camera/sight. Features: high image quality; dual FOV; integral CRT display and eyepiece; remote-control operation capability; communication interfaces to external LRF and angulation head; external video output; designed and qualified in accordance with MIL-STD-810; field proven.

Lily-L

The Lily-L clip-on thermal sight for long-range sniper weapons can be mounted on a Picatinny rail in front of a day scope. It is designed for weapons of 0.308in, 0.338in and 0.5in calibre and n o re-zeroing or realignment of the weapon is required. The Lily-L sight also has day/night operational capability and dual FOV, enabling surveillance of the target area (wide) and the engagement of targets to effective weapon range (narrow).

LIZ

The LIZ, or ELOP LIZ, is a multi-sensor day/night EO sight for remote operations. Manufactured by Elbit Systems, the thermal imaging system features grounded thermal imaging technology, a high-resolution detector, an IR optical zoom, a telescope magnifier, a colour day camera with continuous zoom and an integral eye-safe LRF. The sight is lightweight and ruggedised to allow it to be used in harsh environments. It can be operated from any remote console vis standard communication and video transmission. Weight: 9,000g

ELBIT SYSTEMS

XACT th family

The XACT thermal weapon sight product family includes: the XACT th64 short/medium-range weapon-mounted or handheld sight; the XACT th65 clip-on marksman sight; and the XACT th100 heavy machine gun sight. The products also allow engagement from short ranges up to 2km. Weight: 450g Range: 1,500m

HENSOLDT OPTRONICS GMBH

Hensoldt IRV 600

The IRV 600 long-range TI NVD was developed for use with assault rifles and light machine guns. The attachment can be added and removed without adjustment and delivers an image that can be magnified by the targeting optics on the weapon. The IRV 600 has an external video port, central control panel and additional Picatinny rail for optional accessories. It is also noiseless and ready to use in five seconds, according to the company. Length: 17cm Width: 10.3cm Height: 13.25cm Weight: 1,100g

KNIGHT'S ARMAMENT COMPANY

AN/PVS-30

The AN/PVS-30 is a long-range thermal clip-on sniper night sight. The sight is able to extend the range of engagement by up to 1,000m and has an integrated adapter that interfaces directly to the MIL-STD-1913 rail

The ASPIS is a multifunctional integrated rifle-mounted sight that can also be used as a handheld thermal imager. (Photo: Leonardo Electronics)

for mounting/dismounting from the weapon. The AN/PVS-30 operates on a single AA or DL123 battery.

L3HARRIS TECHNOLOGIES

CNVD-T

The Clip-On Night Vision Device-Thermal (CNVD-T) is a handheld or weapon-mounted thermal sight based on the military SU-232/PAS. Length: 15.24cm Width: 6.86cm Height: 8.38cm Weight: 595g

CRATOS

The Clip-On Ruggedized Advanced Thermal Optical Sight (CRATOS) is a miniaturised all-in-one thermal weapon sight designed for handheld, clip-on or stand-alone use. Length: 11.56cm Width: 7.62cm Height: 6.6cm Weight: 595g

WTM

The Weapon Thermal Monocular (WTM) is a weapon-mountable TI device with an integrated laser designator and digital camera. It is available with either an IR or visible laser pointer. The WTM features a MIL-STD-1913 rail interface and is hardened to withstand the sustained recoil of 5.56mm tactical loads. The TI capability of the WTM also allows for observation and target identification under adverse conditions including light rain, smoke, light snow, and low light to total darkness. Length: 12.7cm Width: 7.1cm Height: 5.6cm Weight: 419g Range: 900m

LEONARDO DRS

IWS

DRS's family of Individual Weapon Sights (IWS) are clip-on IR sights based on equipment developed by DRS for the US Army. With a lightweight and modular construction, the IWS provides a thermal image of target information during day and night and through dust, smoke, light fog and darkness. The IR FPA requires no visible light to operate and will not shut down or bloom when hit by direct light. Length: 25.5cm Width: 8.1cm Height: 9.6cm Weight: 837g

SPARTN

The Sniper Precision Acquisition Rifle Thermal Night Sight (SPARTN) provides day/night and degraded battlefield or weather condition visibility. Its clip-on configuration allows the operator to maintain the existing day scope zero. It also provides bullet trajectory observation. The SPARTN has a hot-swap battery capability and external power feature. The rear-facing focus knob and control are optimised for sniper use. Length: 24.5cm Width: 8.9cm Height: 10.5cm Weight: 1,586g Range: 20m

LEONARDO ELECTRONICS

ASPIS

The ASPIS is a multifunctional integrated rifle-mounted sight that can also be used as a handheld thermal imager. Compact and lightweight (1kg), it is self-powered with a Li-ion military rechargeable battery or auxiliary power connector. Weight: 1,000g

MEPROLIGHT

Mepro NOA 4x

The Mepro NOA 4X is an uncooled thermal weapon sight designed for shooting at ranges between 50 and 800m by sharpshooters or snipers. The lightweight sight provides medium- to long-range detection and firing capabilities with the operational features of the NOA series: digital zoom, FCS, LRF, automatic ballistic compensation, image capturing and storing and level indication

Mepro NOA 7x

The Mepro NOA 7X is designed for snipers who need to detect and engage targets at ranges beyond 1,000m in variable weather conditions and limited light or darkness. Mepro NOA sights, with high resolution and digital zoom, detect targets in urban or densely vegetated areas, including camouflaged people or targets behind camouflage nets. The Mepro NOA 7X features an electronic level indicator and is able to withstand heavy weapon recoil.

Mepro NOA Dual Field

The Mepro NOA Dual Field is an uncooled thermal weapon sight, designed for long-range sniper rifles operating in harsh environments. The sight functions as a target acquisition system, incorporating an integrated ballistic computer. Its configuration allows transition from a wide FOV for observation to a narrow FOV for target recognition and engagement. The sight is also effective at over 1,000m in all weather conditions and in limited or no light.

Mepro NOA NYX 2X/3X

The Mepro NOA NYX 2X/3X uncooled thermal weapon sights are designed for use with 5.56mm and 7.62mm weapons. Featuring high-resolution microbolometer technology, they provide vision in various scenarios: day, night, fog, snow and low-contrast situations. With its wide FOV and image quality, the Mepro NOA NYX is intended for short and medium ranges, used mainly by sharpshooters or small-calibre snipers. The sight also meets Mil-Spec requirements and has power-saving capabilities based on a motion sensor.

Mepro NOA XT4

The Mepro NOA XT4 is an uncooled thermal dual-use weapon/surveillance device. It clips in-line on a 4x magnifier scope, thus enhancing observation capability and target engagement. Featuring a high-resolution microbolometer, the MIL-STD NOA XT4 enables day and night operations in low-light conditions, dust and smoke scenarios and in darkness. The sight also functions as a handheld thermal viewer for surveillance and covert operations. Weight: 700g

N-VISION OPTICS

TWS-13 Thermal Weapon Sights

The TWS-13 thermal weapon sight provides soldiers with the ability to detect, observe and engage targets in all conditions, day or night. Combining a lightweight housing made out of aircraft-grade 6061-T6 aluminium, with thermal imaging technology the TWS-13 generates IR images and ensures target acquisition at the maximum possible range. The TWS-13 is also designed to be easy to operate with clearly marked digital controls.

NEWCON OPTIK

TVC 60

The TVC 60 is a clip-on thermal weapon sight designed to be used in conjunction with a magnified day optic. The shooter relies on the zeroing of the day optic and does not need to re-zero when attaching or detaching the unit. The TVC 60 utilises an uncooled thermal sensor that allows for the detection of camouflaged targets at long range.

TVS 13M Series

The TVS 13M thermal sight functions in close-quarters battle, medium- and long-range target engagement applications. In-built ballistics software allows for firing on various weapon platforms, and a video output port and internal storage capability enable capture of video and still images. The TVS 13M also has a MIL-STD-1913 quick-release mount and can also be used as a handheld observation tool.

NIGHTLINE

NLT-WS(H)

The heavy variant of NLT's thermal weapon sight family (NLT-WS(H)) is built to US military specifications for use with medium machine guns and high-calibre rifles. It is composed of a FLIR sensor located behind a 100mm lens. The NLT-WS(H) features VOx detection, video output, digital imaging and a digital reticle system. Images are displayed in eight colour modes and an icon-based menu. The system is also fixed in place using an ARMS weapon mount. Length: 26.2cm Width: 9.4cm Height: 7cm Weight: 1,420g

NLT-WS(L)

The NLT-WS(L) thermal sight is designed for use on small-calibre weapons and can also be used handheld. It includes digital imaging and brightness control, black/white polarity and an 800x600 OLED display. Further features include an adjustable digital reticle, display colours and patterns and integral VOx detectors. The compact and lightweight device is mounted on quick-release attachments. Additionally, the battery compartment and six-button keypad are designed for easy use. Length: 17.2cm Width: 7.4cm Height: 7cm Weight: 785g

NLT-WS(M)

The NLT-WS(M) is a large-calibre weapon TI sight and can be used as a handheld system. It includes digital imaging and brightness control, black/white polarity and an 800x600 OLED display. The compact lightweight device also has an adjustable digital reticle, display colours and patterns and integral VOx detectors. Length: 19.8cm Width: 7.6cm Height: 7cm Weight: 926g

NIVISYS

Scorpion

The Scorpion thermal sight combines the attributes of a handheld unit and a weapon mounting. The Scorpion has withstood drop and environmental testing to include immersion tests to 3m. The 12° FOV provides mid-range detection. The Scorpion has been discontinued. However, Nivisys will support the product in the field until December 2016. Length: 28cm Width: 6.9cm Height: 6.9cm Weight: 964g

TACS-M

The miniature Thermal Acquisition Clip-On System (TACS-M) is rugged and waterproof for use in harsh environments and features a red display for visual security. When added to a standard I2 system, TACS-M provides a second channel with LWIR capability, extending engagement capabilities through obscurants. Length: 3.8cm Width: 6.4cm Height: 8.9cm Weight: 166g

TAWS Series

The Nivisys Thermal Acquisition Weapon Sights (TAWS) series provides LW uncooled imaging for surveillance and targeting capabilities during the night and adverse weather conditions. The TAWS Series is lightweight and ergonomically designed. Each sight can be used as a handheld unit or mounted and detached from a Picatinny rail system using the double throw lever mount.

UTAC Series

The Nivisys Universal Thermal Acquisition Clip-on Sights (UTAC) family of longwave uncooled weapon sights provide surveillance and targeting capability during the night and adverse weather conditions. They are available in 160x120, 320x240 and 640x480 VOx formats for use with magnified day optics and sniper scopes. Additionally, the UTAC series, with remote switching capability, allows the operator to control functions from a variety of positions.

UTAM Series

The UTAM Universal Thermal Monocular sight series is designed to be handheld but can be attached to a light machine gun with a MIL-STD-1913 Picatinny rail system. User selectable reticles, digital windage and elevation adjustments are readily available through the onboard software. The monocular can also be easily bore-sighted to any weapon. Additionally, an included remote-control switch provides increased flexibility for the user, integrating the sight and the weapon.

NOVOSIBIRSK INSTRUMENT-MAKING PLANT

1PN93-4

The 1PN93-4 is a modular Gen III night sight designed for use with SVD or SVDS sniper rifles. The sight operates in an ambient temperature range from -50/+50°C and relative humidity up to 100% at 25°C. Dimensions: 250x81x182mm. Weight: 1,500g

OPTIX

IdentifieR-60/100+LRF

IdentifieR scopes are based on uncooled microbolometer thermal imaging technology and offer various features for ballistic correction, exchangeable reticle patterns, Wi-Fi video transmission and range-finding. IdentifieR-60/100 thermal sights operate in rain, fog and darkness in a passive mode without additional backlight. The design of the sights allows them to be used as portable cameras. Manipulation is made through buttons and a graphical interface organised as an onscreen display.

PAGOT

The PAGOT is an all-weather thermal sight designed for use with RPG launchers such as the RPG-7 series. It is based on microbolometer uncooled TI technology. Enclosed in a durable magnesium housing, the thermal sight features up to 4x digital magnification, several built-in software ballistic reticles to be used with a variety of rocket types and picture enhancement settings for different weather conditions.

ZiR-60

The ZiR-60 thermal imaging attachment is designed to be used with day optical sights mounted on sniper weapons, to convert them into functional thermal sights without the need for further adjustments. Based on uncooled microbolometer TI technology, this attachment allows variable-distance targeting by using just the optical magnification of the day sight and keeps its zeroing centre.

PCO

SCT Rubin

The SCT thermal sight is designed for observation and firing using small arms. The thermal image is displayed in the embedded eyepiece, which automatically shuts off after the shooter takes their eye away, eliminating face illumination. The SCT sight is equipped with an external on-helmet display giving the shooter flexibility in operating the sight at a certain distance from the eyes, for observation and shooting around corners. Additionally, the sight has an energy-saving function. Length: 30.9cm Width: 8.7cm Height: 11.1cm Weight: 1,300g

PYSER SGI

MUNSTI

The MUNSTI uncooled thermal imaging clip-on sight is compact and lightweight, designed for use in front of a day optical sight. It is suitable for sniper weapons, anti-materiel weapons and any weapon where the user wishes to leave the day sight in place. With detection ranges up to 2,760m (man) and 7,000m (vehicle), it attaches by its over-centre throw lever shock absorber base onto a MIL-STD-1913 rail, without affecting the zero of the day sight.

PNP-MTHDS

The PNP-MTHDS Miniature Thermal Imaging Weapon Sight is lightweight and designed in the UK to ISO-9001 quality levels. Available in three models, the PNP-MTHDS offers high-resolution 640x480 images (non-ITAR) with a choice of three lenses, 17mm, 25mm and 35mm, 7 reticules (or no reticule), 2x and 4x electronic zoom. It has a detection distance of over 1,200m. It also attaches via a small MIL-STD-1913 rail adapter with over-centre throw lever. Weight: 335g

TISI

The TISI lightweight uncooled thermal weapon sight is designed for assault and sharpshooter rifles, SMGs and machine guns. It is available with thermal detectors of either 640x480 or 384x288 resolutions and with a choice of optics giving either 3x or 5x basic magnification, horizontal angles of view of either 7° or 12° and detection ranges of up to 2,760m (man) and 7,000m (vehicle).

TISI-M

Designed for assault and sharpshooter rifles, SMGs and machine guns, the TISI-M is a lightweight uncooled thermal day and night weapon sight which can be used in standalone mode with reticule on and in-line with reticule off. The TISI-M is available with thermal detectors of either 640x480 HD or 384x288 SD resolution with 25 or 45mm optics. This gives detection ranges of up to 1,650m (man) and 4,200m (vehicle) depending on the required choice of model.

QIOPTIQ

Dragon-C 640

The Dragon-C 640 is a lightweight multi-purpose thermal weapon sight developed for military small arms. As an inline scope, it can be attached to Picatinny or NATO-standard rails in front of other sights with a 1x-4x optical magnification. It is also possible to use the scope for surveillance and as a stand-alone device. Length: 15cm Width: 7.5cm Height: 9cm Weight: 453g Range: 1,900m

Dragon-C/SR/MR/LR

Dragon C (Compact), SR (Short Range), MR (Medium Range) and LR (Long Range) thermal weapon sights can be adapted for use on a variety of weapons, mounting to a number of rails. Dragon sights deliver 24/7 man and vehicle detection capability, even in poor visibility, in darkness and through battlefield obscurants. Designed to be low power and rugged, all variants feature an uncooled thermal camera with electronics and optical technologies.

Dragon-S

The Dragon-S (Sniper) thermal weapon sight attachment is designed for use with a range of optical day scopes and provides snipers with a 24hr surveillance and target engagement capability. The Dragon-S is factory-set to eliminate the need for re-zeroing when

used in conjunction with a dayscope, and can be adapted for use on a variety of weapons, mounting to a variety of rails. Length: 23.8cm Width: 8.5cm Height: 8.7cm Weight: 930g

Saker

Saker is an ITAR-free fused weapon sight that incorporates both an uncooled thermal imager and an image intensifier. Designed for medium-range surveillance and target engagement, it allows dismounted soldiers to detect, recognise and identify targets in all light conditions, including low light. As an in-line sight, the Saker can be attached to a Picatinny or NATO-standard rail in front of an existing daysight without the need to remove or re-zero it. Length: 18.9cm Width: 8.4cm Height: 7.5cm Weight: 890g Range: 1,500m

RAYTHEON

AN/PAS-13

Currently under contract with the US Army, Raytheon introduced the AN/PAS-13 clip-on thermal weapon sight at the 2013 IDEX event. The AN/PAS-13 family combines rugged lightweight modular construction with thermal imaging technology. They require no visible light to operate and will not shut down or 'bloom' when hit by direct light. The company claims their use cannot be detected since they operate silently and emit no heat or RF energy. Weight: 2,500g

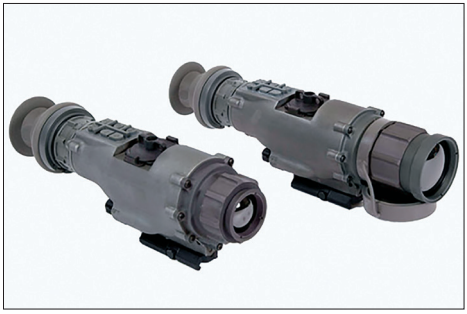
TOW ITAS

The Improved Target Acquisition System (ITAS) for the TOW long-range anti-tank missile provides mobile capability for early-entry forces to destroy advanced threat armour at stand-off ranges in adverse weather, day and night. The ITAS increases target detection, acquisition, recognition and engagement ranges. It also fires all versions of the TOW missile from the M41 ground launcher (dismount mode) and M1121 HMMWV platform. Weight: 113,000g

W1000-9

Compatible with a broad range of weapons, the W1000-9 uncooled thermal weapon sight uses IR technology to sense differences in heat emitted by objects in its FOV. It is also able to separate people and objects from cluttered backgrounds, either in daylight or at night, and can cut through dust, smoke, fog and haze. Additionally, it can detect a man at 1km and a vehicle at 2.4km. Magnification: 3.1x Detector: 320x240 staring BST FPA (76,800px) Weight: 1,700g

The AN/PAS-13 family combines rugged lightweight modular construction with thermal imaging technology. (Photo: Raytheon)



SAFRAN ELECTRONICS & DEFENSE

IR Sight for Eryx

Safran produces an uncooled IR technology for the Eryx ATGM. It is compact, light and silent – since it does not require cooling – and is attached directly to the firing station's day sight. The sight was developed through advances in optronics achieved in the FELIN soldier system programme for the French Army.

Matis Man-Portable

Developed for integration with antitank or anti-aircraft guns and missile systems, this biocular thermal imager can have a micro-scanning device to boost detection and identification performance. Claimed to detect a tank at 10km, a fast jet at 13km and a warship at 22km. Respective recognition ranges are 4.5, 5.9 and 22km. Detector: 3-5µm staring array, inaudible at 50m. Focus range: 50m to infinity. Weight: 6,500g

Milis

Based on the Matis thermal imager, Milis has been designed in cooperation with Euromissile for the MILAN antitank missile system. Detector type: cooled FPA working in the 3-5µm waveband

Odin

Odin is a modular, day/night, round-the-corner, all-thermal sighting system for 12.7mm machine guns and 20mm cannons. Odin capitalises on the advanced technologies in the FELIN soldier modernisation system. It provides better protection for gunners operating crewed weapons from light vehicles or helicopters. Additionally, it enhances firing accuracy, which makes ammunition management more efficient. Weight: 1,300g

Sword Light/Medium

Sword thermal weapon sights are lightweight, compact and designed for use on rifles and machine guns. They have an uncooled IR sensor and an IR channel with digital zoom and an optional red dot sight. Functions of the Sword sight include digital boresighting, optional remote control and optional multimedia functions for use as a portable IR observation system. Weight: 1,000g

Sword T&D

The Sword Thermal and Day weapon sight (Sword T&D;) is designed for use on assault rifles, machine guns and rocket launchers. It has digital day and thermal channels with uncooled IR technology. The Sword T&D; sight has digital boresighting and a choice of reticles. Additionally options include a control handle and communications capabilities, including remote observation/firing and image/video capture. Weight: 1,500g

SAFRAN VECTRONIX

TACS-M/-LR

The Thermal Acquisition Clip-on System (TACS)-M attaches to existing NVDs to add additional capabilities. The TACS-LR attaches to the Moskito (see separate entry). The devices are designed to have low power

consumption and thus extended operation time. Since TACS-M mounts on currently existing devices with a bracket, the clip-on technology allows increased capabilities without the need to refit helmets for special equipment. Length: 14cm Width: 3.8cm Height: 7.6cm Weight: 150g

SENOP OPTRONICS

Husky Fire Control Thermal Sight

Unveiled at the September 2017 DSEI exhibition, the Husky Fire Control Thermal Sight (FCTS) is designed for use on automatic grenade launchers but can also be used on remote weapon stations, and as a reconnaissance and observation system. The Husky FCTS incorporates an integrated uncooled thermal imager, laser range finder, GPS, inertial measurement unit, digital magnetic compass (optional), a laser pointer (optional) and a ballistic computer which enables airburst ammunition programming. Length: 20cm Width: 12.5cm Height: 15.2cm Weight: 3kg

SHIBLI

Tarsier

The Tarsier thermal weapon sight is designed to enhance operational awareness through surveillance and target acquisition in day and night conditions. It has an uncooled thermal core and is mountable on a range of weapons. The lightweight sight has ergonomic controls, digital boresighting and a built-in inclinometer. Weight: 1,700g

SIG SAUER

Echo1 Reflex Sight

The Echo1 digital thermal imaging reflex sight features precision-moulded aspheric lens technology, which virtually eliminates aberration and helps to focus the projected image for low-distortion optical performance, according to the company. The sight also features five default reticles and the ability to design new reticles. Length: 11cm Width: 6.5cm Height: 6.8cm Weight: 417g

TELEDYNE FLIR

Armasight Vampire

The Armasight Vampire rifle scope is built with a CORE (Ceramic Optical Ruggedized Engine) image tube, doubling the resolution of Gen I devices. The body of the unit is made from aluminium, with the O-ring sealed and rubber-coated. The Vampire has multicoated all-glass lenses and a manually-adjustable fine reticle for shot placement. It is also water, dust and sand-proof. It comes with tactical rails for lasers or illuminators and has an IR illuminator. Length: 27.5cm Width: 8.7cm Height: 9.5cm Weight: 1,300g

MilSight S140-D

The MilSight S140-D Advanced Dual-Band Universal Night Sight (ADUNS) in an image-intensified thermal weapon sight. It works by fusing black and white IR images with either green or white I2 images, allowing the user to see through obscurants or identify targets in greater detail. In addition to being mounted on a MIL-STD-1913 rail, the MilSight S140-D can be used as a spotting scope or handheld observation device.

ThermoSight HISS

The ThermoSight HISS S100 and S150 are detachable thermal weapon sights that mount in line with standard optical scopes, which serve as the eyepiece. The HISS provides imaging in darkness and through smoke, fog and other obscurants. The long-range sights have also been successfully tested on weapons including 50cal sniper rifles. Length: 29cm Width: 10.7cm Height: 9.1cm Weight: 1,700g

ThermoSight HISS-XLR

The HISS extended long-range (XLR) clip-on thermal weapon sight allows snipers to detect and recognise man-sized targets at up to 2,000m, offering a 25% increase compared to previous models. The sight has been tested on weapons up to 50cal. The HISS-XLR also has a built-in ballistics mode that is designed to give an instantaneous target solution when integrated with an LRF and ballistics computer. Length: 29.2cm Width: 11cm Height: 7.6cm Weight: 1,800g

ThermoSight T50 ACTS

The ThermoSight T50 Advanced Combat Thermal Sight (ACTS) is a longwave thermal imaging weapon sight designed to interface with standard day optics. This provides the shooter with the same FOV while preserving reticle calibration and boresight. The periscope unit clears the fixed iron sight to prevent image distortion during sustained fire. Length: 13.5cm Width: 8.9cm Height: 10.2cm Weight: 680g

ThermoSight T70 SU-271/PAS

The T70 SU-271/PAS is a longwave thermal imaging weapon sight that can be clipped on or rail-mounted in front of day optics. The T70 is rugged, small and lightweight, designed for challenging operating environments and tested to withstand 'thousands of rounds' of rapid-fire gun shock. The T70 provides imagery through darkness, fog, smoke, dust and other obscurants. Its low profile allows in-line configuration, minimising height above the rail and reducing interference with other devices. Length: 17.3cm Width: 8.6cm Height: 8.1cm Weight: 700g

ThermoSight T75

The Thermosight T75 is a longwave thermal imaging weapon sight that can be clipped on or rail-mounted in front of day optics. The T75 is rugged, small and lightweight, designed for challenging operating environments and tested to withstand 'thousands of rounds' of rapid-fire gun shock. The T75 provides imagery through the darkness, fog, smoke, dust and other obscurants. Its low profile also allows in-line configuration, minimising the height above the rail and reducing interference with other devices. Length: 18.8cm Width: 8.6cm Height: 8.1cm Weight: 800g

THEON SENSORS

Thermis

The Thermis family of uncooled thermal sights comprise three variants – a light sight intended for use on 5.56mm and 7.62mm assault rifles, a medium sight designed

for 5.56mm and 7.62mm MGs and a heavy sight for .50cal/12.7mm MGs and 40mm automatic grenade launchers. The clip on in-line afocal is designed for use in tandem with medium-range day sights to provide a night vision capability while maintaining the day optic's ballistic zeroing.

TRANSVARO ELEKTRON

Engerek-3

The Engerek-3 thermal weapon sight utilises low-power uncooled IR camera technology and is designed for medium-range surveillance and target engagement. The sight has a low battery indicator, auto and manual image optimisation and electronic aiming mark selection and adjustment. Weight: 1,700g

MULTI

The multi-role MULTI TI device from Transvaro is designed for clip-on use on light weapons, and can also be helmet- or head-mounted. The MULTI includes an 850nm IR laser. Weight: 450g

TROYA TECH DEFENSE

Condor

The Condor uncooled thermal sight series is designed for use on marksman and sniper rifles. Lightweight and compact, the Condor utilises an IR detector with high-resolution output. The sight is equipped with a soft carrying pouch, weapon mount, rechargeable batteries, user manual and cleaning microfibre cloth. Weight: 900g Range: 0.15m

LONG-RANGE OBSERVATION, SURVEILLANCE AND TARGETING

AIM INFRAROT-MODULE

HuntIR/RangIR

HuntIR sight was designed to combine day/night surveillance and targeting. With two FOVs, 2.3x3.0° for range performance and 6.8x9.1° for panoramic view, it provides an identification range of 1,700m as required for long-range sniper rifles or crew-served support weapons like the 40mm automatic grenade launcher. Since 2004, HuntIR has been in German Army service. Weight: 3kg

ASELSAN

Falconeye MW

The Falconeye MW EO sensor system comprises a mid-wave IR thermal imaging, day TV sensor, laser rangefinder, DMC and GPS. Discrimination of threats, by using detection, recognition and identification criteria, is the major function of this system. It provides users with target coordinates and the location of the threat. The system is operated via an ergonomically designed control unit. The Falconeye MW can be utilised stationary on a tripod or mounted on different platforms such as a vehicle.

CHESS DYNAMICS

Hawkeye DS

Part of the Chess family of Hawkeye land surveillance systems (see separate entry), the Hawkeye Deployable System (DS) is a transportable surveillance system that can be mounted on a tripod or quad-pod. Using a rugged laptop for the interface, it can be used for local or remote surveillance and observation. The system consists of a Piranha TV (see separate entry) and Piranha IR camera fitted onto the Hawkeye SR platform, designed for 24/7 surveillance. Weight: 10kg

Hawkeye FS

Part of the Chess family of Hawkeye land surveillance systems (see separate entry), the Hawkeye Fixed System (FS) is a static, long-range surveillance system that can be configured using either Chess's Cobra or Zeta pan and tilt head, depending on the application. The system consists of a Piranha LRTV colour camera (see separate entry) and a cooled thermal imaging camera. Weight: 50kg

DAT CON DEFENCE

Portable Border Patrol System (BOPAS)

BOPAS is a long-range surveillance system for day/night use and is man-portable. The system is designed for surveillance requirements in normal and extreme conditions and provides short- and long-range observation. It can be used as a handheld unit with an internal battery or integrated with a tripod, pan/tilt unit and remote operating console. Pan/tilt has a high dynamic response and repeatability. TFT high-resolution monitor allows camera control and an on-screen status report. Height: 1.8m Weight: 11kg

ELBIT SYSTEMS INTELLIGENCE AND ELECTRO-OPTICS – ELOP

Long View CR

The Long View CR is a night/day surveillance and targeting system for long-range observation and target acquisition, for use by forward observers, intelligence and surveillance units, SF and reconnaissance vehicles. The lightweight system includes a long-range continuous optical zoom FLIR, long-range day cameras, an integral eye-safe laser rangefinder, GPS and a magnetic compass. For dismounted operations, the Long View CR is also operated on a miniature electronic goniometer for azimuth and elevation accuracy. Weight: 12.5kg

Long View CR-D

Launched at Eurosatory 2014, the Long View CR-D (LVCR-D) is based on the combat-proven LVCR. The upgraded LVCR-D adds a diode-pumped laser designator to the legacy LVCR, reducing the risk of collateral damage. The device can also be used for guidance of munitions with a laser spot on the target while incorporating automatic laser beam spillover detection and analysis.

Long View GL

The Long View GL is a ruggedised, long-range thermal imaging featuring a digital detector and 18x continuous optical zoom. It is configured as a single unit containing optics and signal-processing electronics. The Long View GL has remote-control operation by console and provides a standard analogue composite video output signal in either CCIR or RS-170. Additionally, it is available in 6in and 10in configurations.

SupervisIR

The SupervisIR is a persistent wide-area ISTAR system for medium- to short-range coastal and border applications. It provides real-time IR panoramic situational awareness, including simultaneous surveillance and automatic tracking capabilities. It is based on patent-pending IR technology, which enables the user to visually monitor a large area. It can also be integrated with any existing system, according to the company.

ELBIT SYSTEMS

GroundEye

Elbit Systems has developed a new line of ground surveillance systems for security and law enforcement requirements called GroundEye. The system can be operated by one or more people and can be used as a standalone system or integrated into a C2 network. It comprises a panoramic mast-mounted/tripod-mounted sensor head for the system's cameras and front-end electronics, a computer processing unit, high-speed image analysis applications and a user control station.

GENERAL DYNAMICS MISSION SYSTEMS

VZ-250 LRTI

With narrow to wide FOV options, the VZ-250 Long-Range Thermal Imager (LRTI) meets mission requirements from long-range targeting to wide-area perimeter surveillance. The triple-FOV cooled TI sensor is mounted on a 360° Vector-50 pan/tilt system and features an optional laser rangefinder and laser illuminator. The two-axis gyrostabilised unit can be integrated into existing systems and provides push-button interaction. Weight: 27kg

VZ-750

The VZ-750 EO/IR multi-sensor system is designed for surveillance, reconnaissance and targeting in ground-based defence and homeland security missions requiring long-range detection. The system's IR sensor offers 5x continuous zoom and user-defined presets for flexibility. With an integrated 60x zoom visible camera and Vector-100 pan/tilt system, the VZ-750 offers plug-and-play integration with perimeter surveillance systems. The sensors and pan-tilt systems are sealed in a ruggedised housing to allow targeting and stability in harsh conditions. Weight: 87kg

VZ-1000

Capable of recognising man-sized targets at over 20km, the VZ-1000 long-range multi-sensor system can be used for target acquisition in ground-based defence and homeland security missions. The ruggedised, cooled IR VZ-1000 offers up to four FOVs for long-range detection and identification. The VZ-1000 has an integrated 55x zoom visible camera and positioning system and offers plug-and-play integration with perimeter surveillance systems. Weight: 77kg

HENSOLDT OPTRONICS GMBH

Z: NightOwl M

The Z: NightOwl M is a long-range surveillance system for the protection of critical infrastructures, borders and coastlines. It offers a 360° panoramic view with a long-range colour zoom camera with up to 330x continuous zoom and a thermal imager with up to 200x continuous zoom. Its 15° wide FOV also offers visuals for detection while the 0.3° narrow FOV captures details necessary for identification. Width: 51.7cm Height: 103.9cm Diameter: 95.1cm Weight: 88kg

Z: NightOwl M-ER

The Z: NightOwl M-ER is a long-range surveillance system. The unit's thermal imager has 50x optical zoom. Its 15° wide FOV (WFOV) offers visuals for detection while the 0.3° narrow FOV captures details for identification. The optical lens can zoom in and out continuously so that the observer 'never' loses sight of the detected object. The TI can be upgraded to an HD version with a 1,280x1,024px detector that doubles the WFOV from 15° to 30°, improving detection capabilities.

Z: NightOwl Z

The Z: NightOwl Z terrain surveillance system consists of a multi-sensor platform featuring a pan-tilt head with a thermal imaging device, charge-coupled device camera and laser rangefinder, all mounted on one tripod. Designed for remote-controlled, standalone operation, the unit offers mobility, flexibility and 360° observation range. The multi-sensor platform is operated via the control console (BSAE). Transmitted images are displayed on a monitor. Additionally, an electronic map with detected targets may be viewed on a second optional monitor.

Z: NightOwl ZM/ZM-ER

The Z: NightOwl ZM is an ITAR-free surveillance system developed for long-range observation. The combination of a large FOV for wide-area observation as well as a small FOV for target spotting provides situational awareness. It fulfils the requirements of land and coastal border surveillance and is also suited for the protection of critical infrastructure.

IAI TAMAM

GTAS

Ground Target Acquisition System (GTAS) is a self-contained, tripod-mounted, gyrostabilised EO/IR laser pointer/rangefinder system that is based on IAI Tamam's MiniPOP and integrated with a tablet tactical computer, an eyepiece/joystick hand control and display grip, a north-finding module and a power pack. It also uses a single, gyrostabilised, pre-calibrated and hermetically sealed unit for sensors and laser. GTAS supports remote-control operation, enabling the operator to control the system from a protected location.

POP-300 family

The Plug-in Optronic Payload (POP-300) is a small EO/IR/laser payload for manned and unmanned

airborne, land or maritime platforms and for coastal surveillance applications. The POP-300 carries sensors in interchangeable 'slices' mounted on a gyrostabilised turret. The system's electronics are contained within the turret. Available configurations include a 640x480 thermal imager with the POP-300, a colour charge-coupled device with a near-IR capability and a laser pointer. An eye-safe laser rangefinder is optional. Height: 43cm Diameter: 26cm Weight: 20kg

JENOPTIK ADVANCED SYSTEMS

NYXUS Rangechecker

A handheld rangefinder for SF and infantry use (intermediate to long-range ballistic arms aiming, particularly for snipers). It is lightweight, robust and shockproof and can be used in all weather conditions. Eye safe, it can be operated with one gloved hand due to its ergonomic design. It can also be used when wearing NVGs. The device has a six-digit LED display with an aiming reticle. Additionally, it is water-resistant for 30min at 1m, operates at -33 to +63°C and is MIL-STD-810F compliant. Length: 0.14m Width: 0.09m Height: 0.04m Weight: 0.45kg

L3 ADVANCED LASER SYSTEMS TECHNOLOGY

SCARAB-TILD-A

The Scarab-TILD-A is a ground laser target designator/rangefinder capable of terminal guidance missions with energies greater than 80mJ. Direct-view optics and optional thermal imaging/see-spot capability give the user real-time feedback of laser-to-target illumination and eliminate the need for boresighting procedures. Additionally, the Scarab-TILD-A is designed as a portable system for 24/7 long-range stand-off laser target designation and rangefinding. Length: 0.24m Width: 0.27m Height: 0.07m Weight: 12kg

LEONARDO DRS

WatchMaster Pro

WatchMaster Pro uses thermal technology to meet security and force protection requirements in hostile environments. It employs an uncooled 640x480 VOx detector to sense IR emissions in the long-wave spectrum. The system pairs this thermal camera – which can display images with thermal sensitivity and resolution through dust, smoke, light fog and darkness – with a colour charge-coupled device camera that, in daylight conditions, can be used to identify specific surveillance targets.

WatchMaster Pro+

WatchMaster Pro+ applies TI technology to a variety of force protection and security missions. The system uses cooled mercury cadmium telluride, 12µm pitch mid-wave (MW) detector technology. Effective at a detection range of over four times that of its uncooled sister, the WatchMaster Pro, the Pro+ operates in the MWIR spectrum and generates an image of 640x480px. It also offers 12.5x continuous zoom with 6x digital zoom for intruder detection.

LEONARDO ELECTRONICS

ATTILA-D

ATTILA D is a Multispectral Optronic System designed for day/night panoramic observation, detection, identification and designation of stationary and moving ground and aerial targets. Three-axis gyro-stabilization allows a true "fire-on-the-move" capability, with the same first-round hit probability of a Gunner Sight, whether on static or moving targets. ATTILA D is compatible with all Fire Control Systems and provides a full hunter-killer capability. It incorporates the latest thermal imaging modules, MWIR proprietary detectors, a high-performance colour HDTV, and an eye-safe Laser Range Finder.

Observer

The Observer is a trailer-borne land situational awareness system for 360° day and night surveillance. It is designed to be quick to deploy and recover, to meet changing operational needs such as border management, critical infrastructure protection, FOB security, major high-profile event safety, and oil and gas exploration.

NEWCON OPTIK

Big Eye 28x100 ED

The Big Eye 28x100 ED is designed to be capable of withstanding maritime weather. It is useful as a marine binocular, a border guarding instrument or for other applications where long-range viewing is required. The Big Eye 28x100 ED has large objective lenses, BAK-6 prisms and multi-coated optics. According to the company, it also provides edge-to-edge optical image clarity. Oversized, individually focusing ocular lenses are set at an angle for viewing and have foldable eyecups.

Seeker Series

The Seeker S and Seeker M are mountable laser rangefinders that can be boresighted to any optical system. The lightweight Seeker devices can be mounted on a rifle, spotting scope, binoculars or thermal imager to add long rangefinding capability. Used in tandem with an Android-based application that runs on smartphones and tablets, the Seeker S and Seeker M provide real-time distance, azimuth, inclination and GPS target data and allow for real-time mapping and friendly force communication. Length: 0.12m Width: 0.07m Height: 0.06m Weight: 0.3kg

Spotter LRF/Spotter LRF Pro

The Spotter LRF and Spotter LRF Pro combine spotting scope/laser rangefinder systems for acquiring range, inclination and azimuth data on long-distance targets. Both models are built to MIL-STD-810G standards and are ruggedised. The Spotter LRF and LRF Pro have 15-45x variable magnification, multi-coated optics, an etched Mil-dot reticle, USB output and an LED display. Additionally, both are compatible with an Android-based application and other peripheral devices.

NORTHROP GRUMMAN MISSION SYSTEMS

LLDR 2

The LLDR 2 (Lightweight Laser Designator RangeFinder 2) is an enhancement that is fitted onto the Venom

The Scarab-TILD-A is a ground laser target designator/rangefinder capable of terminal guidance missions with energies greater than 80mJ. (Photo: L3 Advanced Laser Systems Technology)

vehicle-mounted targeting system. Able to designate stationary or moving targets at extended ranges, the LLDR 2 has been used by the US Army during operations in Afghanistan and Iraq. Features include: target location, digital interconnectivity and the ability to operate in both day/night and adverse weather conditions. Operating temperature: -37/+49°C

NOVOSIBIRSK INSTRUMENT-MAKING PLANT

1N20 PNB

The 1N20 PNB is an observation binocular intended for area surveillance, reconnaissance and artillery fire spotting. The device includes features laying mechanisms, angular scales for azimuth and elevation, level, angular position stopper, dioptre and interpupillary adjustments. The reticle is equipped with angular and range scales. The light filter set consists of blue/green for eye protection against laser irradiation, neutral for bright light conditions, light orange for contrast boost in reduced illumination or fog conditions. Additionally, the device can be mounted on a tripod or stand. Length: 0.4m Width: 0.4m Height: 0.58m Weight: 30kg

1PN91-2

The 1PN91-2 tripod-mounted, long-range night reconnaissance device features a Gen 2+ I2 and is intended for area surveillance, reconnaissance and artillery fire spotting. It is also equipped with the elevation mechanisms and scales, compass, level and carrying handle containing the illuminator for reciprocal orientation of the devices. Weight: 3kg

1PN92-2

The 1PN92-2 is a long-range night observation device equipped with a Gen II I2 tube and intended for area surveillance, reconnaissance and artillery fire spotting. The tripod-mounted device is also equipped with elevation mechanisms and scales, compass, level, holder for a 1D13 laser rangefinder and carrying handle containing the illuminator for the reciprocal survey of spotters by triangulation. Length: 0.47m Width: 0.26m Height: 0.36m Weight: 11kg

TPB-2

The TPB-2 has been designed for ground and air target observation. It features laying mechanisms, angular scales for azimuth and elevation, level, angular position stopper, dioptre and interpupillary adjustments. The reticle is equipped with angular and range scales. The light filter set consists of blue/green for eye protection against laser irradiation, neutral for bright light conditions, light orange for contrast boost in reduced illumination or fog conditions. The device can also be mounted on a tripod or stand. Length: 0.45m Width: 0.32m Height: 0.32m Weight: 35kg

TZK

Designed for air target detection, surveillance, anti-aircraft fire spotting and determination of angular deflection of rounds from a target. It consists of 10x binocular and commander's 8x monocular. It has blue/green filters for eye protection against laser irradiation, neutral filters for bright light conditions, light orange filters for contrast boost in reduced illumination or fog conditions. The TZK can be mounted on a tripod or stand. Length: 0.4m Width: 0.42m Height: 0.44m Weight: 16.5kg

OBZERV

ARGC-750

The ARGC-750 long-range camera is intended for perimeter and border surveillance. Features include: a patent-pending laser illuminator operating in near-IR that matches the FOV; a range-gated ICCD camera incorporating a Gen III I2 tube and an achromatic high-magnification continuous zoom telescope. The ARGC-750 can also be deployed as a standalone system or integrated with radars, vessel traffic management systems, vehicles or thermal imagers.

ARGC-2400

The ARGC-2400 long-range camera is designed for coastal and border surveillance as well as critical infrastructure protection. With a range-gated intensified camera for night surveillance and two colour sensors (narrow and wide FOV) for day operation, the ARGC-2400 can be used for identification tasks such as reading vessel names and detecting pointed optics or camouflage nets. Length: 0.56m Width: 0.52m Height: 0.52m Weight: 55kg

OPTIX

OPTIX GUARD Series

OPTIX GUARD Series is a family of long-range, extremely reliable and super durable multi-sensor systems available in each range and performance class. The series includes various systems providing surveillance at short (up to 3km), middle-range (up to 10km) and long-range (up to 20km) distances, based on included cooled/uncooled thermal imaging and colour cameras.

TERMA/TEROMA

TERMA and TEROMA are autonomous mobile thermal vision systems for the surveillance and security of terrestrial, river and coastal areas. They are able to measure distances of up to 20km and feature automatic visualisation over a digital map of the marked target and automatic target acquisition.

RAYTHEON

LRAS3

The Long-Range Advanced Scout Surveillance System (LRAS3) is a multi-sensor system providing the capability for 24h reconnaissance and surveillance missions to detect, identify and pinpoint far-target locations while remaining outside engagement ranges. The LRAS3 is mounted on an HMMWV but can be used on a tripod for dismounted missions.

SAFRAN ELECTRONICS & DEFENSE

Joint Fires Support System

Safran Electronics and Defence unveiled the Joint Fires Support System at DSEI 2017 in London. Against the backdrop of an increasingly digital battlefield, the ISTAR resources deployed by units on the ground must be integrated in the command chain. This digital-aided close air support is vital for ensuring interoperability between services and with allies. Weight: 4.8kg

Matis Long Range

The standard Matis TI is married to long-range optics and a 2x2 microscanning system to provide high resolution at long range. It is able to detect a fast jet at 25km and a warship at 40km. Respective recognition ranges are 12 and 26km. Length: 0.39m Width: 0.15m Height: 0.15m

TEOS

TEOS is a day and night long-range observation system for homeland security and military applications. Integrated on vehicles or fixed stations, TEOS is described as safe and discreet. Combining optronic sensors with modularity, TEOS can be used for border control, coastal surveillance, protection of sensitive sites and peacekeeping missions. With hundreds of systems already ordered, TEOS is in service with the security and military forces of several countries.

THALES OPTRONIQUE

Margot 3000

The Margot 3000 is a lightweight, remote-controlled, man-portable system designed for long-range surveillance, observation and target location. The Margot 3000 includes a handheld thermal imager from the Sophie family, a POP6 integrated handheld display remote-control box, a pan/tilt platform and an interface to C2 systems. It can be operated handheld or mounted on a tripod and is remotely controlled via a cable or optical fibre.

Margot 3000 V

The Margot 3000 V is an 'all-in-one' optronic surveillance system based on the ASTAR (Automatic, Search, Track, Analyse and Report) middleware toolbox and the Sophie multifunction handheld thermal imager. Sophie configurations feature mid-wave IR (3-5µm, XF) and long-wave IR (8-12µm, MF) TIs and both models include a colour TV channel, eye-safe laser rangefinder, electronic video stabilisation, embedded GPS and continuous IR zoom.

Sophie TAS/C

Sophie Target Acquisition Solution Compact (TAS/C) is designed for forward air controllers and FOBs. It is a compact and lightweight man-portable system. Day/night operations, integrated single sensor head, artillery goniometer, handheld target location possible (with Sophie MF or XF standalone), laser rangefinder (single-shot), real-time connection with C2 capabilities. Includes: Sophie MF or XF, goniometer, interface to C2 system for FAC/FOB coordination, tripod, carrying bag and containers.

Suzie

The Suzie TI has been designed to offer a mid-wave IR capability with a wide zoom range for 24/7 homeland security applications. The system is ITAR-free and can be vehicle-mounted. Length: 0.5m Width: 0.25m Height: 0.25m Weight: 10kg

NVGs

ASELSAN

A100

The A100 NV monocular offers high-resolution, I2 NV in a compact and lightweight design. It has a single-tube/single-eyepiece configuration and can be handheld, helmet-, NBC mask- or weapon-mounted. The A100 has ergonomically located on/off and IR switches, textured focus and dioptre adjustment rings. It also features a built-in IR illuminator. Weight: 320g

BAE SYSTEMS

BAE Systems ENVG III/FWS-I

The US Army tasked industry teams with meeting its Enhanced Night Vision Goggle III and Family of Weapon Sight-Individual (ENVG III/FWS-I) programme goals of providing a smaller, lighter, tightly integrated and cost-effective night vision and targeting solution. Under a May 2015 contract, BAE Systems was selected to fulfil this requirement by offering an integrated solution capable of fusing I2 and IR capabilities.

Digitally Enhanced NVG

Designed as part of the US Army's Enhanced NVG programme, this goggle uses digital imagery to assist soldier mobility and situational awareness under a range of lighting conditions and in the presence of battlefield obscurants. The helmet-mounted goggle digitally combines video imagery from an LLL visible sensor and an uncooled longwave infrared sensor on a colour display located in front of the soldier's eye. This technology enables imagery to be shared among soldiers.

BAE SYSTEMS OASYS

RED-I

RED-I is a remote eyepiece display-imager that supports a range of missions and weapon systems. The display-imager pairs with electronic sights that provide RS-170 video input, allowing the user to see around corners unexposed.

ELBIT SYSTEMS OF AMERICA

AN/PVS-7D (F5001)

The F5001-series AN/PVS-7D Gen III NVG can be handheld, helmet- or head harness-mounted for hands-free operation. This NVG features a quick-release lever that permits one-handed attachment/detachment from helmet or harness, automatic highlight cut-off to protect the I2, an 'IR-on' indicator and a low-voltage indicator. Weight: 680g

AN/PVS-14 (F6015)

The F6015-series AN/PVS-14 is a monocular NV device fitted with a Gen III image tube. Designed for the individual soldier to use in a variety of ground-based night operations including weapon aiming. It also features the MX-11769 (F9815) I2 tube (see separate entry), which is available with a range of performance levels to meet customer requirements. Weight: 355g

AN/PVS-23 (F5050)

The AN/PVS-23 (F5050) is a rugged NV binocular. It uses high-resolution Gen III F9800 I2 tubes (see separate entry) and an IR illuminator with wide or narrow beam capacity. The AN/PVS-23 can be handheld, head- or helmet-mounted. When handheld or head-mounted, it is powered by a single AA battery integral to the binocular. Weight: 350g

i-Aware TM-NVG Fusion

The F6045 Series i-Aware Tactical Mobility Night Vision Goggle Fusion provides optical overlay fusion of I2 and IR imagery, integrated colour video, colour imagery display and camera capture export capabilities, offered in a monocular or binocular configuration. Designed to improve soldier mobility and situational awareness in day and night operations, the NVG enables viewing GPS, mapping, command text messages and target information along with thermal video input from weapon sights to 'shoot around the corner'. Weight: 1,000g

JAKEL DEFENCE SYSTEMS

NVLS-AM-NVM

The NVLS-AM-NVM is a lightweight, ruggedised multifunction NV monocular which can be head- or helmet-mounted, or mounted on a weapon with the same interface. It is supplied with FOM >1,600 B&W autogated XR-5 I2 tube and is self-collimated for dual use by combining two randomly selected monoculars. Additionally, it is submersible to 30m in operational mode with a diving mask. A range of accessories is also available.

L3HARRIS TECHNOLOGIES

AN/PSQ-20B ENVG

The AN/PSQ-20B ENVG (Enhanced Night Vision Goggle) is a helmet-mounted dual-waveband monocular night vision system. As a fusion system that combines image intensification technology with a thermal imaging system, the ENVG provides improved situational awareness and identification capability in all battlefield conditions and light levels. Weight: 907.19g

The F6045 Series i-Aware Tactical Mobility Night Vision Goggle Fusion provides optical overlay fusion of I2 and IR imagery, integrated colour video, colour imagery display and camera capture export capabilities. (Photo: Elbit Systems of America)

AN/PSQ-36 FGE

The AN/PSQ-36 Fusion Goggle Enhanced (FGE) NVG combines the image intensification function of night vision systems with the thermal-sensing capabilities of thermal imagers. As a result, I2 and IR images can be fused together, with adjustable controls enabling the user to adjust the balance between 100% I2 and 100% IR. This facilitates detection, observation and identification of targets in adverse weather and light conditions, including total darkness.

AN/PVS-7 (M963)

The AN/PVS-7 is a single-tube NVG typically worn either head- or helmet-mounted. When used with an optional helmet mount, the goggle will automatically shut off in the up position. An active projected IR LED provides short-range illumination, allowing such activities as map-reading, night repairs or maintenance tasks. The self-contained system also operates on two AA batteries and has a low-battery indicator in the eyepiece. Weight: 680g

AN/PVS-14 (M914A)

The AN/PVS-14 is an NV system that can be used as a handheld pocket scope, a helmet-mounted monocular or a weapon sight when mounted in tandem with an IR laser aimer or other NV-compatible primary optics. Features include a low battery indicator in the eyepiece and an active projected IR LED that provides short-range illumination for activities such as map-reading. Weight: 355g

AN/PVS-15 (M953)

The AN/PVS-15 is a submersible binocular NV system. It is a lightweight, self-contained, twin-tube system, equipped with Gen III I2, which can be stowed and transported in submerged conditions to a depth of 20m. If operated by one AA battery, it can be handheld, worn on a head strap or mounted on a helmet. The performance depends on the tube fitted. Weight: 690g

AN/PVS-18 (M983)

The AN/PVS-18 can be combined with an SLR camera, CCTV or camcorder system. It offers the capabilities of a handheld pocket scope, a right or left eye-mounted monocular and a weapon sight when mounted in conjunction with an IR laser aimer or other NV-compatible primary optic. An active projected IR LED provides short-range illumination,

allowing such activities as map-reading. The self-contained lightweight monocular also operates on one AA battery and has a low-battery indicator in the eyepiece. Weight: 350g

AN/PVS-31 BNVD

The Binocular Night Vision Device (BNVD) is a compact, lightweight, Gen III dual-tube goggle. It has a low-profile design and offers better situational awareness than a single-tube goggle. Working with input from SOF operators, the BNVD was designed to increase system resolution, reduce headborne weight, improve the system's centre of gravity, as well as provide additional operational utility and improve overall situational awareness compared to currently fielded dual-tube goggles. The BNVD is a follow-on to L3's AN/PVS-15. Weight: 449g

BNVD-1531

L3 Warrior System's BNVD-1531 is a new binocular night vision device (BNVD). It brings together the capabilities of two existing products – the AN/PVS-15 and the AN/PVS-31. The BNVD-1531 can also be operated as a helmet-mounted, head-mounted or handheld system.

GPNVG

The Ground Panoramic Night Vision Goggle (GPNVG) is a helmet-mounted NV device. It features a wide 97° horizontal FOV that allows for observation and/or target identification in low-light conditions and is ruggedised for ground applications. Weight: 800g

SENVG AN/PSQ-20A (F6024)

The F6024-series Spiral Enhanced Night Vision Goggle (SENVG) system (AN/PSQ-20A) combines an I2 tube and IR microbolometer into a monocular, to provide situational awareness and threat detection in battlefield environments. It also provides viewing capability from high-light conditions to darkness (no light) and through battlefield obscurants. The AN/PSQ-20A has controls that are similar to those on the AN/PVS-14. Weight: 907g

The Mepro Boxer is an NV binocular that offers a wide FoV and high-resolution image in a lightweight single-tube configuration. (Photo: Meprolight)

LEONARDO DRS

Leonardo DRS ENVG III/FWS-I

The US Army has selected industry teams to meet its Enhanced Night Vision Goggle III and Family of Weapon Sight-Individual (ENVG III/FWS-I) programme goals of providing a smaller, lighter, tightly integrated and cost-effective NV and targeting solution. Future production will be competitive between BAE Systems and DRS, which are both qualified manufacturers.

LEONARDO ELECTRONICS

NIMOS

The NIght MObility Sub-system (NIMOS) is a modular lightweight head-mounted display integrated with a low-light-level digital TV. It can receive and display the ASPIS rifle sight (see separate entry) IR or TV video channels by wireless data link for 'shooting-around-the-corner' capability. NIMOS can also be integrated with C2/C4I systems to directly display digital maps, coded messages and alarms.

LITEYE SYSTEMS

HmTi

The HmTi head-mounted TI features a VOx uncooled 17µm pitch, 320x240 microbolometer and OLED display that slide into the helmet rail system. It provides the user with hands-free operation, displayed on an LE-720A head-mounted display. The display features an 800x600 image. The HmTi is also stowable with a fast disconnect system and a display that automatically turns off when pushed out of the way.

MEPROLIGHT

Mepro Boxer

The Mepro Boxer is an NV binocular that offers a wide FoV and high-resolution image in a lightweight single-tube configuration. It enables hands-free observation, automatic switching-off in flip-up position and automatic switching-off when illumination is more than 1Lux.

N-VISION OPTICS

Dual Mount for AN/PVS-14

The Dual Mount combines two AN/PVS-14 systems to form a dual-tube binocular. It is available in PVS-7/14 and PVS-15/21 mount configurations.

NEWCON OPTIK

NVS 7 series

The NVS 7 series of NVGs have been proven in deployments around the world. All models use Gen III I2 tubes, with minimum, exportable FOM >1,600, and have a built-in IR illuminator and auto shut-off mechanism. Additionally, the NVS 7-3AG and NVS 7-3AGBW are autogated units, while the latter produces a B&W image rather than the traditional green. Fitted with an optional 3, 4, 5 or 8x lens, this goggle can be converted to a long-range NV binocular.

NVS 14

The NVS 14 series of NV monoculars have been proven in deployments around the world. All models use Gen III I2 tubes, with minimum, exportable FOM >1,600, and have a manual gain control system, built-in IR illuminator and auto shut-off mechanism. The NVS 14-3AG and NVS 14-3AGBW models are both autogated, while the latter produces a B&W image rather than the traditional green. Weight: 300g

NVS 15

The NVS 15-series NVGs have been proven in deployments around the world. All models use two Gen III I2 tubes, with minimum exportable FOM >1,600, and feature a manual gain control system, built-in IR illuminator and auto shut-off mechanism. The NVS 15-3AG and NVS 15-3AGBW are lightweight dual-tube goggles. Both are autogated, while the latter produces a B&W image rather than the traditional green.

NIGHT VISION DEVICES

BNVD

The Binocular Night Vision Device (BNVD) is a dual-tube NV goggle/monocular. It can be used as a monocular by choosing one side as the NV eye and rotating the other side/arm of the binocular up and out of the way. Each arm is tight enough so that the rotated arm will not fall down and stays in its user-adjusted position. Additionally, the BNVD has Gen III Pinnacle tubes and utilises Mil-Spec accessories and optics.

BNVD-SG UL

NVD's lightweight BNVD-SG UL is a dual-tube goggle with single gain control. The company reports that this is the lightest fully-functional dual-tube goggle in the world. The system incorporates high-performance optics. Where many other products rely on green P43 phosphor image tubes alone, the BNVD-SG UL has been designed to be optimised for white P45 and green P43 image tubes.

Mini BNVD AAA

The Mini BNVD AAA is a dual-tube NVG designed to be as light as possible. It features Photonis image intensifiers, a fully focusing eyepiece and a focusable IR illuminator, which can be optimised for either white or green images. Unlike some other NVGs, the operator does not need to dismount the device in order to sight a rifle – the user simply rotates one monocular up and out of the way. Weight: 415g

NVD-PVS-7A

The NVD-PVS-7 is a field-proven Gen III NVG system. It includes an IR LED (for use in darkness and to assist in reading maps), LED warning light (built into the unit to remind the user that the IR LED can be seen by others who are using NV devices), low-battery warning light (built into the unit) and high light cut-off (which will turn the unit off if it is left on during daylight conditions).

NVD-PVS-14

The NVD-PVS-14 is a single-battery monocular that can be head- and helmet-mounted or used as a short-range weapon sight mounted behind collimated daylight aimers and reflex sights. The NVD-PVS-14 uses a battery housing that cuts off power when the unit is flipped up in a head or helmet mount. It will turn back on once the unit is flipped back down into the viewing position.

NIGHTLINE

NL914A

The NL914A is based on the US military AN/PVS-14-A NV monocular. The handheld device can be used on left and right mountings as a monocular, as well as change mountings on weapon sights in conjunction with IR laser aiming devices. The NL914A will also mount or interface with AN/PVS-7B or AN/PVS-7D helmet mounts or face masks. The monocular also features variable gain, automatic brightness control and a built-in IR illuminator. Weight: 330g

NL963B

The NL963B NVG is based on the US military AN/PVS-7 design and is intended for land use including vehicle driving and typically head- or helmet-mounted. The goggles and adapter are removable from the helmet as two separate pieces. The goggles automatically turn off when flicked into the 'up' position when helmet-mounted. A single knob, which can be operated whilst wearing gloves, controls all features.

OIP SENSOR SYSTEMS

Felis

The Felis NV binocular is a lightweight, intelligent, passive NVG featuring a 51° FOV, an integrated light sensor and programmable logic. Optics offer a high-resolution FOV contributing to user comfort vision and reducing the tunnel effect. The on/off/IR controls are integrated push buttons. A light sensor switches off the goggles automatically when submitted to high light levels. They are switched back on when the light returns to acceptable levels. Weight: 505g

Loris

Loris is a family of monocular NV devices, used as handheld observation systems, mono or stereo goggles on a face mask or helmet mount, or as a weapon sight on light weapons. Loris is available with a 40° (standard) or 60° FOV. An integrated light sensor switches off the system automatically in the event of overloading light levels. Additionally, when the light returns to acceptable levels, the sight switches on again automatically. Weight: 345g

LUNOS

The Lightweight Universal Night Observation System (LUNOS) is a set of equipment designed to match specific logistic requirements. The LUNOS passive NV family consists of a binocular body, several objective lenses with different magnification factors (1, 4 and 6x) and options. LUNOS allows the exchange of objectives in the field – switching from one to another is described as comparable with changing the lens of a camera. Weight: 2,100g

OPTIX

Diana M40

The Diana M40 monocular is a universal NV device. It can be used for individual night observation with 1x

magnification and an FOV wider than 43°. The device can be mounted on the Picatinny rail of a weapon via a rail adapter and can be used in combination with NV-compatible reflex sights. The Diana M40 can be handheld, weapon-, helmet- or head-mounted.

Diana NVG

The Diana single-tube NVG is designed for individual night observation with no magnification. The goggles operate in conditions of natural night illumination. The illumination source for the object is the emission of the night sky and is in the visible and close IR range of the spectrum. The goggles can be mounted on a face mask or helmet, or used manually.

Diana TT

The Diana TT twin-tube NVG is a universal NV device designed for individual night observation with no magnification and a full FOV wider than 50°. The goggles operate in natural night illumination in the visible and near-IR range of the spectrum. The device can also be used with a face mask, helmet or handheld.

OPTRONICS ENGINEERING

OE-7

The OE-7 is a mono-tube biocular NVG that provides hands-free operation in low-light conditions. It has lightweight injection-moulded plastic housing and the I2+ tube features automatic brightness control. Additional features include 'IR on' and low-battery indicators. Image clarity is achieved by focusing the front objective lens, while each eyepiece can be independently adjusted for eyesight correction. The adjustable headgear also allows quick detachment from the mask. Weight: 550g

OE-14

The OE-14 is a lightweight NV monocular that can be mounted on a helmet, headgear, rifle or hand-carried. Its design includes a built-in longer-life low battery offering up to 40h of use and IR illuminator with LED indicators. According to the company, the monocular is reliable and compatible with both Gen II and III I2 tubes. The OE-14 also has durable housing and a light overload sensor and flip-up off magnetic feature switch. Weight: 355g

PCO

MU-3 KOS

The MU-3 KOS is a helmet-mounted NV device with a built-in IR illuminator for use in total darkness. The system's design allows cooperation with a collimator and holographic sights. It can be equipped with an autogating system. The monocular can be weapon-mounted. It is also possible to fix two devices on the bridge for use as an NVG for vehicle drivers. Magnification clip-on adapters of 3x and 5x zoom are optional. Weight: 1,000g

MU-3M Koliber

The MU-3M Koliber is a miniature helmet-mounted NV monocular that can be used in cooperation with a collimator and holographic sights. The monocular design is based on 16mm XR5 I2 with an autogating system. The MU-3M NV device can work with an IR attachment ClipIR, thus allowing observations of the scenery in fusion mode.

PYSER SGI

PNG-M

The PNG-M NVG system is a compact and lightweight, high-resolution twin-eyepiece device. The unit is supplied with a head mount with auto-off/on flip-up capability and runs on one AA-size battery. The PNG-M is available with tubes including FC (export licence-exempt) as well as standard licence HD, XD-4 and XR5. The latter two models can also be supplied with autogating. A range of accessories is also available. Weight: 425g

QIOPTIQ

Kestrel

The Kestrel is an image-intensified binocular NVG developed for ground-based operations. It is designed to offer enhanced visibility in low-light conditions without over encumbering the user. The adjustable device can be attached to a wide range of helmet mounts and is available in two configurations differing in weight and sensitivity: the Kestrel LW (Light Weight) and Kestrel HP (High Performance). Weight: 640g

RHEINMETALL NORDIC

GN NVGS

Applications include: vehicle driving/commanding, patrol, surveillance, weapon handling, parachuting, reconnaissance, logistics, search and rescue and map reading. IR source: LED. Weight: 390g

SAFRAN ELECTRONICS & DEFENSE

Clara

Clara goggles, with an FOV greater than 50°, are designed for ground uses, including vehicle driving, short- and medium-range observation and surveillance. Adjustable focus allows close work such as map reading, equipment maintenance, etc. Additionally, an IR light adds covert illumination. Weight: 445g

SAFRAN VECTRONIX

BIG25

The BIG25 NVG is a lightweight, self-contained, head- or helmet-mounted binocular night vision system. The BIG25 NVG consists of a single objective lens, an I2 tube and two eyepieces. An integrated IR light provides illumination for close-range viewing (such as map reading) in a dark environment. The BIG25 NVG can also convert from a head-mounted to handheld system with one hand.

STEINER DEFENSE

AN/PVS-21

The AN/PVS-21 Low Profile NVG (LPNVG) utilises a patented folded-optics design to create a low profile,

which provides reduced centre-of-gravity changes to helmet, depth perception and field of regard. It includes a 'see-through' capability and integrated HUD capability for sensor fusion/overlay.

CEHUD

The Conformal Enhanced HUD (CEHUD) provides sensor integration for night and day operations when used with the LPNVG, LPNVM and Dayviewer. The CEHUD displays overlay colour or monochromatic video images directly into the operator's view, enabling them to integrate and display sensor technologies. This includes communications, navigation, threat assessment and targeting information into their night or day vision.

Model 2740 LPNVM

The Model 2740 Low Profile Night Vision Monocular (LPNVM) is a direct adaptation of the AN/PVS-21 Low Profile NVG and provides the same capabilities – low profile (less than 8cm depth), see-through optics and HUD capability.

Model 2758 Dayviewer

The Model 2758 Dayviewer is a see-through optical viewer for use with the Conformal Enhanced HUD (CEHUD) system during daylight operations. The Dayviewer is designed to optimise the viewing quality of the HUD image in bright light environments. The see-through capability enables the user to simultaneously view both the displayed image and the eye's natural direct scene. Attachment of the CEHUD Display Module involves securing two captive screws, resulting in a waterproof fit.

Refocus Lens

NV refocus lenses give operators the ability to refocus from infinity to 450-600mm. This allows an operator to perform close-in tasks such as map reading or weapon clearing. The operator can then return the NVG to infinity by flipping the lens back to its storage position. NV refocus lenses are designed for use with many currently fielded NVGs, including AN/AVS-6/7/9/14/15/18/21/23 and others.

TELEDYNE FLIR

Armasight N-15

The N-15 is a dual-channel NVG system. It can withstand saltwater, rain, humidity and temperature extremes. It can also be worn on the included flip-up head mount or optional universal helmet mount, both of which have a built-in mechanism that will automatically turn the unit off when it is flipped up. Additionally, the N-15 NVG is equipped with automatic brightness control, bright light shut-off circuitry and a spot/flood built-in IR illuminator. Weight: 700g

Armasight Nyx-7

The Armasight Nyx-7 biocular NVG system includes a built-in IR light source for reading maps or basic, short-range illumination in the darkness. Like other Armasight models, it is available with accessories such as 3x, 5x and 7x magnification lenses for mid/long-range viewing, head or helmet mounts for hands-free operation and additional IR illuminators for long-range use. The Nyx-7 is also water/fog-resistant, lightweight and compact. Weight: 450g

Armasight Nyx-14

The Nyx-14 NV mini-monocular can be head/helmet- and weapon-mounted or handheld. It can withstand salt water, humidity and temperature extremes. The Nyx-14 is equipped with manual variable gain control and can be fitted with 3x, 5x and 8x magnification lenses. Weight: 400g

Armasight PVS-14

The AN/PVS-14 multipurpose NV monocular was commissioned by the US military in the late 1990s and is currently deployed in NATO armies. It is compatible with various accessories, allowing it to be handheld, head/helmet-mounted and weapon- or camera-mounted. The PVS-14 can also be equipped with Gen II and Gen III I2s, including Green phosphor or Quick Silver and Ghost tubes, which provide users with natural B&W NV displays. Weight: 0g

Armasight Spark-G

The Armasight Spark-G NVG system is built around CORE (Ceramic Optical Ruggedised Engine) I2 tubes. It is a ruggedised lightweight NV device that comes with headgear, which allows the unit to be mounted for hands-free operation. Weight: 370g

Armasight Vega and Vega Mini

The Gen 1 Armasight Vega NV monocular has all-glass optics and reinforced composite housing with an integrated short-range IR illuminator, allowing it to work in complete darkness. It comes with headgear, allowing the unit to be mounted for hands-free operation. An optional long-range IR illuminator is available to boost the viewing range. The Armasight Vega Mini also comes without headgear. Weight: 250g

MilCAM Recon B9

The MilCAM Recon B9 is a compact, dual-channel, long-range imager for reconnaissance and forward observation, law enforcement and border security. Features include a high-resolution, large-format uncooled sensor, colour CCD channel for situational awareness and automatic functions. This includes digital detail enhancement and autofocus. The device can be optionally configured with a laser pointer. Additionally, the system is lightweight and provides a standoff range to target, internal image storage and USB download. Weight: 1,600g

THALES ANGENIEUX

Lucie

The Lucie unit is compact, lightweight and designed to decrease torque of the helmet-mounted equipment. This allows for long-wearing comfort. It has a built-in IR illuminator with 'IR-on' indicator, low-battery indicator and automatic cut-off in high light conditions and stowed position. Thales has produced more than 50,000 patented low-profile Lucie NVG binoculars. Weight: 435g

Minie-D

The Minie-D is an I2 NVG including a video display, capable of superimposing data or video over the intensified image. The functionality offers an augmented reality display of position, orientation and tactical information and remote aiming from a weapon-

mounted camera. The Minie-D can also be mounted on infantry soldier systems or coupled with a camera via a multi-standard electrical interface. Weight: 370g

Minie-D/IR

The Minie-D/IR is an I2 NVG associated with an uncooled thermal IR imaging module for thermal/optical image fusion. The IR image can be displayed in three modes: full IR, threshold and contours, with distinct colours for IR and I2 to enable accurate interpretation of the fused image. The Minie-D/IR features a built-in IR illuminator with an 'IR-on' indicator, a low-battery indicator as well as an automatic cut-off in high light conditions and stowed position. Weight: 500g

Monie

The Monie low-profile I2 NVG is lightweight and compact. It can be used in monocular configuration (left or right eye) or in a binocular Bi-Monie configuration for stereoscopic vision. The Monie and Bi-Monie units can be used in hands-free configuration (with a helmet adapter or face mask) for tasks including foot patrols, observation or driving, or weapon-mounted with 3.8 and 5x magnifiers, associated with a red dot sight or laser pointer. Weight: 280g

THEON SENSORS

Argus

Argus is a family of Mil-Spec I2 multipurpose monocular systems that can be operated handheld or head-, helmet- or weapon-mounted. Argus systems are designed to be lightweight and robust, utilising standard AA batteries (rechargeable, alkaline or lithium) for operation. Argus allows the individual soldier to perform observation, short-range surveillance, weapon-aiming, map-reading and medical aid operations during all night conditions.

Argus Panoptes

Argus Panoptes is a family of Mil-Spec I2 twin-tube binoculars that can be operated helmet-mounted, head-mounted or handheld. It is designed to be lightweight and robust. Through its modularity, the user can decide on the system configuration (monocular, binocular, weapon-mounted) depending on the mission profile and individual preferences.

Nyx

Nyx is a Mil-Spec I2 dual-tube binocular that is able to be operated helmet-mounted, head-mounted or handheld. It offers better depth perception than single-tube systems, making it easier to judge distances and relative motion, says the company. For momentary configuration changes, the user can flip away each monocular separately.

THERMOTEKNIX SYSTEMS

ClipIR - Fused Night Vision

The ClipIR small clip-on thermal imager is an add-on to standard NV devices to extend their capability into a fused device in situations such as cloudy nights, under heavy cover or inside buildings. ClipIR is lightweight, rugged, waterproof and functions for up to 4.5h from one internal AA battery in ambient temperature extremes. Operating at 50Hz, it also has an optical design for 40° fused FOV.

NiCAM-14

Thermoteknix launched its miniature, lightweight monocular NiCAM-14 NVG I2, developed for military and civilian applications, in September 2016. NiCAM-14 models have an integrated bracket for compatibility with the Thermoteknix ClipIR (see separate entry) for fused NV. NiCAM-14 also supports a range of 18mm Gen II+ or III tubes for different applications and budgets. Weight: 265,000g

TRANSVARO ELEKTRON

TV/MON-3/7

The TV/MON-3 and TV/MON-7 handheld NV devices can be head-, helmet- or weapon-mounted. The NV monoculars are single-tube, passive I2 devices which do not require additional illumination. Both models feature automatic brightness protection, automatic switch-off in the stowed position and low-battery indicators. The TV/MON-7 also has main gain control.

TROYA TECH DEFENSE

ASIO

The ASIO is an NVG with an 18mm I2 tube. It is equipped with a single objective lens and two eyepieces. The ASIO features a low-battery indicator and comes with a soft carrying pouch, helmet and/or head mount, batteries, user manual, neck cord and a microfibre cleaning cloth. Weight: 500g

Lory

The Lory TI monocular can be helmet-, head- or weapon-mounted. It is equipped with a single objective lens and one eyepiece. The Lory also comes with a soft carrying pouch, rechargeable batteries, user manual and microfibre cleaning cloth. Weight: 400g

Ninox

The Ninox Commander's NV binocular (CNVB) is equipped with adjustable focus and dual optical channels (objective lens and eyepiece) for comfortable viewing and to facilitate depth perception. The Ninox also has a low-battery indicator and is equipped with a soft carrying pouch, helmet and/or head mount, batteries, user manual, neck cord and microfibre cleaning cloth. Weight: 650,000g

TYTO

The TYTO is an NV monocular with an I2 tube for night and low-light conditions. It is equipped with an objective lens and one eyepiece. It has a low-battery indicator and comes with a soft carrying pouch, battery, user manual, neck cord and microfibre cleaning cloth. Additionally, the TYTO can be helmet-, head- or weapon-mounted. Weight: 350g

VTQ VIDEOTRONIK

Dual Helmet Camera

The Dual Helmet Camera is an IP67 weatherproof helmet-mounted dual-camera system (colour and

The Stabilised Panoramic Automatic Intruder Detection and Recognition System is a long-range EO/IR gyro-stabilised panoramic automatic intruder detection and recognition system. (Photo: Controp Precision Technologies)

thermal). It is a compact, lightweight mount in magnetic quick-release material. It can be connected via a spiral cable. Weight: 280g

UNATTENDED GROUND SENSORS

CONTROP PRECISION TECHNOLOGIES

DANIS

The Day and Night Integrated System (DANIS) is a short-range (up to 1,000m) day and night observation camera system for security applications. The mechanical two-axis system also consists of a remote-controlled pan/tilt gimbal enabling LoS control in elevation and azimuth. Length: 35cm Width: 18cm Height: 17.7cm Weight: 10kg

MEOS

The MEOS is a wide-area, passive, real-time EO stabilised intruder detection system that automatically detects motion in a panoramic view and may be installed on a mobile platform and/or high mast. It is designed for long-range missions. The MEOS pan/tilt modular system can incorporate an IR camera, a colour daylight TV camera and an optional eye-safe laser rangefinder.

SPEED-A

SPEED-A is an EO/IR observation system designed for mounting on aerostats and has been in service since 2008. SPEED-A features four sensors that include a thermal imaging camera with a 600mm continuous optical zoom lens, a day TV charge-coupled device with a 300mm continuous optical zoom lens, a laser rangefinder for target position and a laser pointer for marking targets. It also has three-axis stabilisation. Weight: 22.5kg

SPEED-LR

The Stabilised Panoramic Automatic Intruder Detection and Recognition – Long Range (SPEED-LR) EO/IR gyro-stabilised system provides automatic intruder detection and recognition. Sensors include an IR camera, charge-coupled device (CCD) camera, B&W CCD camera (spotter), laser rangefinder and laser pointer for target marking. The SPEED-LR is a passive system with no RF radiation. Additionally, it provides a 'virtual fence' on a mobile ground vehicle, with long and variable ranges of several kilometres. Width: 62cm Weight: 36kg

SPEED-V

The Stabilised Panoramic Automatic Intruder Detection and Recognition System, designed for manned and UGV platforms using tall mast mounting, is a long-range EO/IR gyro-stabilised panoramic automatic intruder detection and recognition system. Sensors include an IR camera for observation and scanning, a charge-coupled device camera for observation and scanning, a charge-coupled device TV Spotter camera for long-range observation or high resolution, a laser rangefinder for target location coordinates and a laser pointer for target marking.

SPIDER

The Stabilised Panoramic Automatic Intruder Detection and Recognition (SPIDER) system is a wide-area, passive, real-time EO system that automatically detects motion in a panoramic view and may be installed on a mobile platform and/or high mast. This EO/IR system incorporates a thermal imaging camera with a 22.5x zoom lens, a daylight TV camera and an eye-safe laser rangefinder. The scanning sector is up to 360°. Width: 61.7cm Weight: 28kg

ELBIT SYSTEMS INTELLIGENCE AND ELECTRO-OPTICS – ELOP

Engager

The Engager is a covert, unattended, multi-task, remote reconnaissance and targeting system. It integrates day and night sensors and a Rattler laser designator, providing long-range intelligence-gathering, targeting and laser-guided weapon capabilities. The Engager enables simultaneous multi-sensor operation from one C2 station and features integral 3D pre-mission planning and C2 mission capabilities. It is also supported by Wi-Fi and other optional remote radio controls. Length: 22cm Width: 22cm Height: 44cm Weight: 10.4kg

LORROS

The Long-Range Reconnaissance and Observation System (LORROS) features net-centric interoperability but can be used in standalone operations. There is a choice of imaging sensors and cameras that can be installed on the pedestal-mounted LORROS platform, including a day camera, thermal camera and eye-safe laser rangefinder. The system can also be controlled and operated from remote C2 centres.

HGH SYSTÈMES INFRAROUGES

Spynel-C

Spynel-C is a panoramic IR surveillance unit for 24/7 all-weather operation. Intruders are automatically detected and tracked through a 360° horizontal FOV. Spynel-C is a passive day/night system designed to be resilient against camouflage and jamming attempts. Applications

include ground infrastructure protection and automated ship security. Width: 0.3m Height: 0.62m Weight: 29kg

Spynel-M

Spynel-M is the latest in the Spynel series from HGH's automatic intrusion detection and tracking systems for wide-area surveillance applications. It is a high-resolution panoramic thermal camera, acting as an IR radar. Designed to be robust, lightweight and transportable, Spynel-M can also be carried in a backpack.

Spynel-S

Spynel-S is a wide-area surveillance system acquiring real-time panoramic images with automatic intrusion detection and tracking capabilities. It provides situational awareness through 360° visualisation of the surroundings and has a resolution of up to 30MP. With real-time imagery, Spynel-S is a passive system that is 'invisible' to intruders, not vulnerable to jamming and operates 24/7, claims the company. Weight: 40kg Detection range: 21km

Spynel-U

Spynel-U is the uncooled IR version of the Spynel series. It can detect a human at up to 2.5km, in darkness or through smoke or inclement weather conditions. It provides situational awareness through 360° visualisation of the surroundings. Additionally, Spynel-U is a completely passive system that is invisible to intruders, not vulnerable to jamming and operates 24/7, according to the company. Height: 0.6m Weight: 20kg

Spynel-X

Spynel-X is a passive wide-area surveillance system with automatic intrusion detection and tracking capabilities. The sensor can perform 24/7 early human intrusion alerts over a 16km diameter area. It has a 120MP panoramic view and provides situational awareness over 360°. It is able to detect threats such as crawling men, RIBs, low-altitude air targets, UAVs and stealth targets. There are also three versions of Spynel-X – Spynel-X 3500, Spynel-X 6000 and Spynel-X 8000. Height: 58cm

L3 SPACE & SENSORS

NightHawk HP

The NightHawk HP modular EO/IR multi-sensor suite is a plug-and-play, open-architecture, mission-configurable, day/night surveillance system. Available with various long-range sensor and lens combinations, the system can meet different range capabilities. The system is network-enabled – it can be operated as a standalone system or configured into a network. It may also be cued by radar or other ground sensors. The NightHawk HP includes an internally mounted boresight assembly designed to facilitate simple field sensor exchange.

LEONARDO DRS

MX-3A

The MX-3A delivers imaging through dust, smoke, light fog or darkness. The imager is rugged and portable for surveillance and security applications. Featuring a removable display eyepiece, the system can also be mounted on a weapon or tripod for remote viewing.

LITEYE SYSTEMS

Aquila PTZ

The Aquila PTZ is a low-profile pan-tilt-zoom thermal surveillance system with a three-camera arrangement, comprising thermal imaging and day- and low-light cameras. Designed for use in various climates, the system is available in black, white, desert tan and forest green. The camera system can be combined with a B202 ground surveillance radar package to form a mobile site protection system.

SENTRYX

MP-4K-936 D/N PTZ

The MP-4K-936 D/N PTZ is a day and night camera designed for detection and surveillance. It is marketed as both a standalone product and as part of the SentryX 3D perimeter protection solution, which integrates this camera with the SX-8000 counter-UAS system and the SX-500 radar system to provide comprehensive protection to a fixed installation from ground-based and airborne threats. Length: 41.1cm Width: 21cm Height: 26.9cm Weight: 9,500g Detection range: 1km

TELEDYNE FLIR

Ranger HRC

Ranger HRC is a high-resolution, mid-wave thermal imaging system built around a large-format 640x480 array and a choice of continuous zoom telescopes. While the HRC is available in a standalone hardened enclosure, it can also include an optional charge-coupled device TV camera, laser rangefinder, DMC and an integrated, gyrostabilised, pan/tilt mechanism for target geolocation. Operators can field Ranger HRC as a portable standalone system or integrate it into a network of fixed-site sensors via plug-and-play interface options. Length: 47.4cm Width: 19.4cm Height: 22.5cm Weight: 8.5kg

Ranger II/III

The large-format Ranger III is a medium- to long-range portable thermal imaging system. The dual-FOV telescope allows the system to track vehicles at ranges exceeding 20km. The system features automatic image optimisation, polarity, colour palettes and image freeze. Length: 56cm Height: 22.9cm Weight: 9kg

Sentinel

The Sentinel is a dual-FOV long-wave sensor for situational awareness with long-range imaging. It can be integrated into existing networks, used portably or attached to an existing pan/tilt. The Sentinel can be integrated into OEM packages or used as a vehicle viewer. Automatic features include autofocus, Digital Detail Enhancement, colour palettes and a built-in defrosting system. The device also features a remote control, automatic heater, BIT and Pelco D compliance. Length: 23cm Width: 18cm Weight: 6kg

Sentry II

Sentry II is a military-qualified, long-wave thermal and visible light imaging system integrated into a sealed pan/tilt enclosure with a continuous 360° azimuth FOV. It is

designed for wide-area surveillance and 24h monitoring. Image processing is STACE (digital image enhancement) with histogram equalisation. Palettes are black, white, rainbow and iron (+inverted). Automatic features include focus, image optimisation, temperature-compensated focus and a defrosting system. Length: 39.7cm Width: 30cm Height: 22.6cm Weight: 21kg

ThermoVision 2000/3000

The ThermoVision 3000 integrates a long-range, long-wave thermal imaging system with a daylight sensor, GPS, mapping software and an optional laser rangefinder for target geolocation. The ThermoVision 3000 MS provides detection ranges in excess of 20km and images through battlefield smoke and dust. The system also features geo-positioning through internal GPS and a programmable search with multiple preset locations. The standard package includes Windows-based mapping software – turret control, mapping, geo-pointing, motion detection, alarming and digital recording. Weight: 25kg

THALES OPTRONIQUE

Margot 8000

Margot 8000 is an automatic intruder detection system operating in a panoramic view. It features two modes of operation: panoramic programmable scan to provide intruder detection; and observation to provide intruder recognition, identification and tracking. The IR and TV sensors have continuous zoom lenses. The system is remote-controlled from an operator workstation through an Ethernet network architecture. Additionally, it features electronic stabilisation, target geolocation on digital maps, digital video recording and day and night border surveillance.

XENICS

Meerkat-Fix

Using video compression and ONVIF, the Meerkat-Fix thermal long-wave IR (LWIR) camera is designed for security applications. It is a lightweight surveillance and monitoring system with an uncooled LWIR camera in an environmentally sealed enclosure. Using a generic Ethernet connection, the system can be installed in a LAN. Meerkat-Fix can also be used in an analogue security camera network over video. Length: 13.6cm Width: 13.6cm Height: 14cm

VEHICLE DRIVER AIDS

AEROTEC GROUP

ECJIL for Vehicles

ECJIL for vehicles is an NV lighting system that enables a vehicle to be identified by friendly forces using NVGs. It can be fitted on existing vehicle lamps without any modifications. The original bulbs used for the blackout function are replaced by IR bulbs. The front headlamp and the searchlight are also fitted with an additional IR function.

ASELSAN

ADiS

The ADiS Driver's Sight System is a compact vision system designed for tanks and other armoured vehicles. It provides the driver with 24h manoeuvring capability in poor weather and battlefield conditions such as fog, haze, dust, smoke, fire or camouflage. The ADiS is composed of IR and CCD cameras for front and/or rear views. With an optional embedded GPS module, the driver can see the speed of the vehicle from the system's display. Weight: 4,000g

BERTIN TECHNOLOGIES

PeriSight

PeriSight is a scalable optronic solution for vehicles, specially designed for night and day surveillance up to two kilometres. Compliant with military standards, this ruggedized solution can adapt to any type of armoured vehicle, to give the crew a panoramic view over the platform. The PeriSight optronic equipment is based on two or more camera modules distributed over the platform according to an optimized configuration adapted to the user needs, be it Driver Vision Enhancement or Local Situational Awareness. Weight: 3,000g

ELBIT SYSTEMS INTELLIGENCE AND ELECTRO-OPTICS – ELOP

DTV

The Driver Thermal Viewer (DTV) is a vehicle-mounted night driving system including an uncooled thermal imaging sensor and a display/control unit. It enables night driving for military vehicles including tanks, armoured fighting vehicles, trucks and light tactical platforms under various weather and battlefield conditions, including complete darkness. The DTV can also be operated hands-free, does not require any ambient light and is not susceptible to dazzle and blooming.

FOTONA

CODRIS-55

CODRIS-55 is a combined day/night driver's periscope. It has a passive I2 night channel with large-aperture binocular and integrated, independent day and night channels. Additionally, the system provides eye protection against lasers.

CODRIS-E

CODRIS-E is a combined day/night driver periscope with a wide day-channel FOV and passive, I2 night channel. The system has a detachable upper prism for maintenance and repair. It provides eye protection against lasers.

HENSOLDT OPTRONICS GMBH

SPECTUS/DVE/Peri-53

SPECTUS is a multispectral armoured fighting vehicle driver's sight system that combines an uncooled thermal imager with a residual light camera and, for extreme dark

conditions, two IR illuminators that enable two images to be merged to provide a sharper view when visibility is low. The two optronic sensors work in different spectral ranges and complement each other with image data.

HOFFMAN ENGINEERING

725-1013-XXX

The 725-1013-XXX LED-based forward lighting system meets the lighting equipment requirements of MIL-STD-1180 and MIL-STD-1179. The 725-1013 series is designed to fulfil the requirements of low/high beam, parking lamps, turn signal and clearance lights. Blackout marker and blackout driving lights can be modularly added to the assembly to complete the lighting suite.

LEONARDO DRS

DVE

The Driver's Vision Enhancer (DVE) provides combat and tactical wheeled vehicle operators with the ability to conduct day/night operations or manoeuvre in degraded visual conditions caused by smoke, fog, dust or other battlefield obscurants.

DVE Wide

The Driver's Vision Enhancer (DVE) Wide provides operators with situational awareness for combat and tactical wheeled vehicles. It provides drivers with wider FOVs, as well as the elimination of blind spots to navigate through dust, sand, haze, smoke, light fog and darkness. Additionally, the front-facing DVE Wide integrates three 640x480, 17µm uncooled IR sensors.

OPGAL OPTRONIC INDUSTRIES

Tavor

The Tavor night-time driving system has been designed to provide vision in darkness, rain, fog, smoke and dust. The system has proprietary algorithms for poor visibility conditions. The system has a ruggedised housing and hard carbon-coated optics. The LCD display, connecting cable and camera-mounting kit are packed into a carrying case. The system has an anti-blooming mechanism to prevent dazzle and a high-resolution LCD.

OPTIX

Minion DE Series Ruggedized thermal imaging driver enhancer

OPTIX Minion DE is a specially designed thermal imaging camera allowing the control of all types of vehicles in all kinds of environmental conditions like smoke, dust, snow or total darkness. An advantage of the camera is the hard carbon-coated protective window with an integrated defroster. There is an option to overlay the vehicle dimensions to provide a perspective of a movement for superior situational awareness.

PCO

PNK RADOMKA

The PNK night driver's periscope is a dual-eyepiece observation device that enables the driver to see road or terrain features in darkness. The PNK is designed for T-72 tanks and specialist vehicles based on the same basic chassis. It may also be used in T-55 tanks, BWP-1/BWP-2 infantry fighting vehicles and their derivatives.

RAYTHEON

DVE AN/VAS-5

The Driver's Vision Enhancer (DVE) is designed to adapt to various combat vehicles and tactical wheeled vehicles. It enables drivers to see through obscurants such as dust, smoke, haze and darkness. The only unique item for each vehicle is the integration bracket. The thermal system also operates in darkness without the need for illuminators and will not shut down or 'bloom' in bright light conditions. Weight: 1,270g

SAFRAN ELECTRONICS & DEFENSE

Lukeos

Lukeos is a multi-sensor system with uncooled IR detectors that provides drivers with panoramic vision and crew with an image of their immediate surroundings for self-defence by day or night, in adverse weather conditions. The system's design satisfies the 'see-and-avoid' function for helicopters and drones, while providing navigation aid and protection for merchant ships.

THEON SENSORS

Family of Night Driver's Viewers

Theon offers a family of passive I2 systems for night driving of armoured vehicles. The viewer is mounted either on the driver's hatch or by removing a day periscope. The I2 is projected onto a large binocular lens allowing the driver to view from a safe distance. Depending on the vehicle, the viewer can be rotated up to ±45° from its centre position.

Titans

Theon Sensors offers a family of I2 Night Driver Viewers for several types of armoured vehicles. With specific-to-vehicle mounting bracket assemblies, the basic design can be fitted to various platforms. The mounting bracket assembly allows the viewers to rotate left and right with

The 725-1013-XXX LED-based forward lighting system meets the lighting equipment requirements of MIL-STD-1180 and MIL-STD-1179. (Photo: Hoffman Engineering)

respect to a central detent position for surveillance when the vehicle is stopped.

WÄRTSILÄ JOVYATLAS EUROATLAS

AN/VSS-502

The AN/VSS-502 is a digital day and night periscope system designed to assist the drivers of main battle tanks, infantry fighting vehicles, armoured personnel carriers and special-purpose vehicles. Its modular design allows up to four different sensors to be incorporated onto the platform, all of which can be integrated into wider C4I networks. Developed to replace older image-intensifying night sights and conventional periscopes, this sight has been ruggedised to suit military requirements.

VEHICLE SURVEILLANCE AND TARGET ACQUISITION

ADVANCED DEFENSE SYSTEMS, INC (ADS)

DNRS

The ADS Day/Night Range Sight (DNRS) was developed as a modular and low-cost thermal sight replacement for the M36/M32 series I2 day/night sights in armoured fighting vehicles. The system's thermal camera enables the gunner to acquire targets at night or under obscured battlefield conditions beyond the effective range of the main weapon.

ELIP

ADS have developed the Eyesafe Laser Integrated Periscope (ELIP) to provide the commander and gunner with target distance information and magnified optical day vision as part of the armoured vehicle turret fire-control systems. ELIP is comprised of a high-repetition laser transmitter assembly, integrated with a sensitive laser receiver assembly. The four-digit range data is displayed on the gunner's/commander's displays. Length: 21.9cm Width: 13cm Height: 19.2cm Weight: 6kg

PDFCS

The Primary Direct Fire Control System (PDFCS) was developed by ADS as a derivative of the Day/Night Range Sight (DNRS) series of sights (see separate entry) for medium- and large-calibre cannon turret applications. A ballistic computer is designed to ensure a high first-round hit probability for stationary and fire-on-the-move target engagements. The computer also provides super-elevation and azimuth lead angle based upon ammunition ballistics, target range and inputs from various sensors.

TIFICS

The TOW Integrated Fire Control System (TIFCS) has been developed by ADS to provide support to armoured vehicles which can accurately fire main guns with a high first-round hit probability, as well as fire long-range antitank missiles. The gun targeting system includes a ballistic computer, eyesafe laser range finder, HD low-light-level charge-coupled device camera, and thermal sight.

AEROTEC GROUP

EpiNyx

EpiNyx is an add-on sight system based on the light intensification principle. The modular design of the NV sight provides observation and night shooting capabilities for M262, M370, M494 and M112 episcopes equipping Panhard armoured vehicles. EpiNyx is integrated inside the vehicle and does not require structural modification.

ASELSAN

ATS-10/-20

The ATS-10 and ATS-20 belong to Aselsan's family of Armoured Vehicle Thermal Sighting Systems and can be integrated on various types of armoured vehicles. The panoramic weapon sighting system has a modular structure, comprising a ballistic armour-protected thermal sight unit, operator control unit, LCD display, integration kit, cable kit and system electronics. Weight: 2kg

ATS-30

The ATS-30 Armoured Vehicle Thermal Sighting System was developed for armoured fighting vehicles and remote-controlled weapon stations. It uses uncooled IR technology. With its compact structure, the ATS-30 can be integrated on various types of armoured vehicles and weapon stations. The system features freezing capability, polarity change, automatic/manual contrast and brightness adjustment, motorised focus adjustment and two FOV options. Weight: 3.5kg

ATS-40

The ATS-40 is a sighting system primarily designed for remote-controlled weapon systems mounted on tanks and other AFVs. It comprises an uncooled thermal camera, charge-coupled device camera and LRF, providing sighting and targeting capability in poor weather and battlefield conditions. The ATS-40 can also be integrated on multiple weapon systems due to its compact structure and integration interfaces.

ATS-60

The ATS-60 is a compact NV system primarily designed for remote-controlled weapon systems mounted on tanks and other AFVs. The ATS-60 comprises a cooled thermal camera, charge-coupled device camera and laser range-finder, providing sighting and targeting capability in bad weather and battlefield conditions. It includes an optional control and display unit, and can be controlled by a user interface designed for the platform.

CP-T

The Compact Commander's Periscope (CP-T) is a sighting system for armoured fighting vehicles that provides high-resolution, two-axis stabilised 360° panoramic images to the commander under day, night and poor weather conditions. CP-T consists of a thermal camera, charge-coupled device camera, laser range finder and stabilised head mirror sub-units. The CP-T provides ballistic calculation, LOS stabilisation, image processing, automatic target tracking, ranging and fire-control functions, plus the necessary infrastructure for line-of-fire stabilisation.

Eagle Eye
The Eagle Eye fire-control sighting system comprises daylight charge-coupled device TV camera, thermal imager, laser range finder, gunner's and commander's video displays, stabilised head mirror, stabilisation and ballistic computer, gun elevation sensor, turret traverse sensor, muzzle reference collimator and meteorological sensor. The system is available with an automatic target tracker and gun and turret stabilisation as optional features.

GP-T
The Compact Gunner's Periscope (GP-T) is a sighting system that provides high-resolution, two-axis stabilised images to the gunner under day, night and poor weather conditions. GP-T consists of a thermal camera, charge-coupled device camera, laser range finder and stabilised head mirror sub-units. Additionally, it provides ballistic calculation, LOS stabilisation, image processing, automatic target tracking, ranging and fire control functions, plus the necessary infrastructure for line-of-fire stabilisation.

NG FCS
The Next Generation Fire Control System (NG FCS) is based on two independent FCS – one for the gunner and the other for the commander – which can each perform all tank fire-control functions and also take over each other's role. Two independent EO periscopes provide gunner and commander with target engagement in day, night and bad weather conditions.

Peri Eye
The Peri Eye-series cameras are compact thermal vision systems, primarily designed for sighting systems integrated on tanks and other armoured fighting vehicles. The cameras enable target detection, recognition and identification from long ranges under day, night, severe weather and harsh battlefield conditions. Features include: image processing algorithms, focus adjustment, reticle adjustment, automatic and manual gain adjustment, automatic brightness adjustment, polarity change, flexible language structure, symbology generation and image freezing. Weight: 5.5kg

CHESS DYNAMICS

Hawkeye Land Surveillance Systems
Launched at DSEI 2015, the Chess Dynamics Hawkeye family of multi-sensor surveillance systems is designed to provide short- to extended-range optical surveillance and target acquisition for a variety of operational scenarios and tactical applications. Hawkeye systems offer multiple moving-target detection and tracking, with combination modes to suit complex acquisition situations and cluttered background scenarios.

Hawkeye VS
Part of the Chess family of Hawkeye land surveillance systems (see separate entry), the Hawkeye Vehicle System (VS) is a mast-mounted, independent surveillance system that can be integrated with ground surveillance radars and networked as part of a wider battle/security management system. The system consists of a Piranha TV colour camera (see separate entry) and an uncooled thermal imaging camera for 24/7 surveillance, usually fitted to the Chess Cobra pan and tilt head. Weight: 45kg

Mamba
Part of the Hawkeye family of land surveillance systems, the Mamba (Hawkeye Combat System) is a dual-axis platform for land and maritime applications, including manned and unmanned vehicles/vessels. The gyro-stabilised system features a cooled or uncooled thermal imaging camera and a daylight TV colour camera. This panoramic sight features common connectors and an open architecture, allowing it to be fitted to a variety of armoured fighting vehicles, and it can be located anywhere on the turret. Weight: 39kg

CONTROP PRECISION TECHNOLOGIES

L-VIEW
The L-VIEW is an EO/IR gyro-stabilised sensor installed on vehicles for night (and optionally day) safety, security and observation purposes. L-VIEW incorporates an IR continuous zoom lens and operates in observation mode, providing real-time IR video. Its structure enables integration with a variety of vehicle options. Additionally, it includes three gimbals and a coated Germanium window for improved performance in various environmental conditions.

Sight-HD
Controp unveiled its new Sight-HD targeting EO/IR payload at Eurosatory 2018. Designed for remote weapons stations, armoured fighting vehicles, air defence systems and smaller maritime vessels, the Sight-HD has been designed to maintain boresight in conditions of shocks and vibrations. Diameter: 22cm Weight: 13kg

T-VIEW-Land
The T-VIEW-Land is a lightweight EO/IR, gyro-stabilised sensor, installed on vehicles for day/night observation. It incorporates two cameras: a thermal imager and a colour charge-coupled device camera, both featuring a continuous zoom lens. The T-VIEW operates in observation mode, providing real-time IR video. Its lightweight and compact structure enables integration with a variety of vehicles, including land and maritime platforms.

DAT CON DEFENCE

DC-LRF-OEM Laser Rangefinder
The DC-LRF-OEM Laser rangefinder is intended for integration in vehicles and is available in two models – one with 50-8,000m range and a longer-range variant (50-20,000m). It features an eyesafe Erbium glass laser transmitter, receiver, detector, power supply board, processing and detector boards and is designed for installation within several different EO systems. Length: 17.3cm Width: 14.6cm Height: 9.4cm

ELBIT SYSTEMS INTELLIGENCE AND ELECTRO-OPTICS – ELOP

Integrated Thermal Vehicle Sights
Elbit offers turnkey and tailor-made integrated gunner/commander sight systems for main-battle tanks and

armoured-fighting vehicles. The integrated sights' modular design combines direct-view observation, TV channels, eyesafe laser range finder and a range of NV technologies with LoS stabilisation and hunter-killer solutions. The sights have modular upgradable designs, tailored to customers' requirements. They offer all-weather 24/7 observation and aiming, image processing and target acquisition.

ELBIT SYSTEMS

Common Open Architecture Panoramic Sight

COAPS is a modular, dual-axis stabilised sight for MBTs and AFVs. Based on an open architecture design, the system is able to integrate additional sensors as required. Detection range: 10.5km

ELECTRO OPTIC SYSTEMS (EOS)

EFCS-T

The EO Fire Control System-Thermal (EFCS-T) is a compact day/night indirect-view EO device which provides fire control for direct-fire weapons fitted to armed platforms. It is capable of providing fire control for a variety of weapons and has been configured for and used with the following on CROWS: M2HB 12.7mm MG, MK19 40mm AGL, M249 5.56mm SAW, M240 7.62mm MG, ATK M230LF 30mm cannon, ATK .50cal Bushmaster, GD XM312 (ICSW) and GD XM307 (ACSW).

FOTONA

COMTOS-55

COMTOS-55 is a day- and night-capable commander's takeover set for the T-55 tank. The commander observes through the gunner's sights and can override all the gunner's controls (turret/gun movement, laser triggering, main gun and machine gun firing etc). Features include a bi-ocular monitor for comfortable observation, output to video broadcast system and simple installation.

EFCS3 to 55B

EFCS3 to 55B is a day- and night-capable FCS for T-55 and T-62 tanks. Features include firing on the move with a stabilised view and gun-independent aiming. Installation, maintenance and repairs are possible with the fire control equipment remaining in place. It can also be adapted to other T-series tanks due to its modular design.

GTD

Beam 200

Beam 200 is a pole- or vehicle-mounted optical detection and counter-surveillance pod which automatically scans for snipers, video or photography equipment and locates optical devices working within a point of interest. The 360° FOV allows panoramic coverage. Geo-location of targets is also determined with GPS data and multi-spectral imaging for target verification. Length: 15.2cm Width: 15.2cm Height: 27.9cm

LightSpeed

LightSpeed is intended as a secure alternative to radio communication, point-to-point data and voice transmitter, incorporating eyesafe IR LED (no laser) for non-visible communications. It can be used as an extension to a vehicle intercom system throughout a convoy for two-way linking in radio-jammed or radio-silent scenarios. LightSpeed works on the move or whilst stationary and is all-weather operational. It is also EMCON-compliant with anti-glare and anti-glint.

Watcher VSS-BC

Watcher VSS-BC is a pedestal-mounted observation and targeting suite that can be fitted with GPS, radar, thermal and visible cameras, digital compasses and laser rangefinders/designators/pointers. Watcher can be integrated into the SERT artillery forward-observation system developed by GTD Sistemas and Navantia Systems.

HENSOLDT OPTRONICS GMBH

BAA II

The BAA II is an ISTAR system that can be integrated in a vehicle or mounted on a tripod. The sensor head combines four sensors: a Gen III thermal image; a high-resolution charge-coupled device camera; a laser range finder; and a laser target illuminator. An automatic movement detection function is on board to support the crew. The image fusion function also combines data from the TI and the CCD camera to create a single image.

ELRF M1/LRFD M1

The ELRF M1 eyesafe laser range finder (LRF) and the LRFD M1 LRF/designator both bolt onto the gunner's primary sight on the M1 Abrams MBT. Both devices project a visible, collimated reticle into the sight to provide an aiming point for the main weapon. The LRF uses a Raman-shifted, solid-state laser transmitter. The rangefinder/designator employs an OPO-shifted, diode-pumped, solid-state laser transmitter.

EOTS

The EO Targeting System (EOTS) is a stabilised, ruggedised, 24h day/night observation and targeting system that enables armoured-fighting vehicle crew to gauge the vehicle's surroundings and detect and engage targets on the move. It features a gyroscope-based stabilising mechanism that compensates for movements and vibrations to keep images steady at all speeds on paved roads and in rugged terrain. Length: 50cm Width: 50cm Height: 40cm Weight: 65kg

KLP TW

The KLP TW is a small gun mount periscope with an optical day-vision telescope and thermal imaging channel. It was engineered to make the most of limited space on gun mounts and small turrets, and improve aiming capabilities. It can also serve as an optical aiming device for tank-mounted machine guns and as an IR sensor box, and may be linked with FCS.

LDM 38 / LDM 43 / LDM 46

Originally designed for hard use in vehicle-mounted observation platforms, the LDM line of LRFs can also be integrated in aircraft and seagoing vessels. LDM products gauge distances by means of an OPO-shifted, eyesafe, solid-state laser. Airbus DS Optronics has

developed a range of accessories for the LDM line for easy integration and operation.

Video Boresight

The Video Boresight is designed as a more affordable alternative to aligning guns and sights than using live ammunition. With accuracy in the 0.1mrad range, it permits slow-moving and flying targets to be tracked and compared with a second system image. The video boresight consists of the TFT HR monitor with control unit, the video boresight camera, a power source and booster box and the cable set.

KURGANMASHZAVOD

TKN-AI

TKN-AI is a commander's periscope intended for guiding a vehicle, and battlefield observation and target acquisition by day and night. It is compatible with T-62, 64 and 72 main-battle tanks, BMD airborne and BMP infantry-fighting vehicles, BTR armoured personnel carrier, self-propelled artillery systems and other armoured vehicles. The periscope incorporates Gen II plus I2 and a laser pulse illuminator. The night channel has passive, passive flare-immune and active gated modes of operation. Length: 37cm Width: 21.3cm Height: 40.7cm

L3 WESCAM

MX-10GS

The MX-10GS is a mast-mounted small multi-sensor, multi-spectral imaging system in single-LRU configuration. It is designed for installation in ground combat vehicles and for force protection missions. The system currently supports up to six sensors simultaneously, including IR, colour and electron-multiplied charge-coupled device imaging sensors. It also includes a laser range finder and narrow illuminator. IMU-inside technology aids in the target location. Additionally, the MX-series shares common operator interfaces and hand controllers for interchangeability. Height: 35.6cm

MX-GCS

The MX-GCS is an above-armour gunner or commander sight that enables armoured vehicles to detect, identify, track and engage targets when either stationary or on the move. Incorporating an HD EO sensor, thermal imager and laser rangefinder, the MX-GCS allows for increased standoff distance and provides a hunter-killer capability when employed as a commander's sight. Length: 30.2cm Width: 41.3cm Height: 51.7cm Weight: 47kg

MX-RSTA

The MX-RSTA is a multi-sensor, multi-spectral imaging system that can be fixed-mounted in vehicles or hard-mounted to a mast for increased stand-off range. MX-RSTA can be configured as a commander independent viewer, a primary gunner sighting system or a mast-mounted vehicle reconnaissance and surveillance system. Additionally, It has four-axis stabilisation that provides steady imagery while the vehicle is on the move and removes the visual effects of sway and vibration caused by windy environments. Width: 31cm Height: 38.9cm Weight: 19.5kg

L3HARRIS TECHNOLOGIES

IRTAS 640

IRTAS 640 is designed as a replacement for the legacy DIM 36 sighting system. The high-resolution, MW InSb sensor improves the ability to detect, identify and destroy threats from longer ranges. Additionally, auto-focus and two FOVs coupled with e-zoom enable warfighters to detect, target and destroy targets.

MLRF

The Miniature Diode-Pumped Laser Range Finder (MLRF) is designed for users requiring eyesafe performance in a lightweight, compact package. The output energy, low-beam divergence and sensitive APD receiver provide a capability for multiple system options. Weight: 0.46kg

LEONARDO DRS

IBAS

The Improved Bradley Acquisition Subsystem's (IBAS) target acquisition and missile control subsystems include the integration of HTI-SGF with day TV and direct-view optics, aided dual tracking, an eyesafe laser range finder and a two-axis stabilised head mirror.

LEONARDO ELECTRONICS

Colibri

The Colibri day/night FCS offers a modular and scalable architecture integrated into mobile (light armoured vehicles, towed/AA guns, missile launchers), fixed or battlefield management systems and is available in a naval version. The Colibri system also features an ERICA Gen III Thermal Imager based on a focal plan array detector, a TV charge-couple device camera, an eyesafe laser range finder and local processing and computation. The console is in a rugged enclosure. Weight: 15kg

JANUS D

JANUS Digital is a modular dual-axis gyro-stabilized sight for MBTs and armoured fighting vehicles, designed for day/night panoramic surveillance and target tracking in a rugged and compact suite. Being able to aim up to +70°, the sight is suitable also for urban scenarios against high elevation targets. JANUS D incorporates the company's high-performance infrared, staring, focal plane array sensor technology for high-resolution night vision and an over high-performance colour FHD TV with a laser rangefinder.

Janus/Janus RSTA

The Janus RSTA is a multi-sensor EO platform with two-axis stabilisation for land applications. Designed for all-weather operation in day and night conditions, the Janus RSTA delivers combined medium- and long-range panoramic sight in a rugged, self-contained, compact package. The Janus RSTA also incorporates Leonardo's IR staring focal plane array sensor technology for high-resolution night vision, a colour charge-coupled device TV and an eye-safe laser range finder.

LOTHAR D

LOTHAR Digital is a stabilised two-axis gyro-stabilized gunner sight designed for high-accuracy target

The Commander's Independent Thermal Viewer (CITV) used on the US Army's M1A2 SEP Abrams tank allows the commander to seek additional targets while the gunner engages previously identified ones. (Photo: Raytheon)

engagement and fire on-the-move during day and night at all combat scenarios and all-weather conditions. Being able to aim up to +60°, the sight is suitable also for urban scenarios against high elevation targets. As a key component of a Fire Control System, LOTHAR D can be

Mini Colibri D

Mini Colibri-D is an indirect view Electro-Optic FCS for use in short to medium-range applications. It is capable of target engagement under all weather conditions during both day and night. Target engagement is carried out remotely from within the turret.

STAWS

The Surveillance Target Acquisition and Weapon Aiming Sight (STAWS) provides 24-hour all-weather surveillance and target acquisition. It is an integrated, passive, multispectral sighting system utilising uncooled thermal imaging technology for use with remote-controlled weapon station.

TURMS

TURMS (Tank Universal Reconfigurable Modular System) is a completely digital system - designed in compliance with the most modern NVGA architecture - that can be integrated on multiple vehicle platforms existing on the market. It incorporates the latest technologies in the fields of optics, mechatronics and mission computers (HW&SW). The modular design of the highly reconfigurable system (TURMS) can be integrated with existing functionalities on a wide variety of armoured fighting vehicles and MBTs.

TURMS-D

The TURMS-D is a digital tank fire-control system integrating gunner and commander hunter-killer capabilities. It is designed on the basis of the previous TURMS (Tank Universal Reconfigurable Modular System) and TURMS-T family. The TURMS-D design is fully modular and able to integrate with existing capabilities on a wide variety of armoured fighting vehicles and MBT.

NOVOSIBIRSK INSTRUMENT-MAKING PLANT

TKN-3MK

The TKN-3MK is a commander's periscope intended for guiding a vehicle and battlefield observation and target acquisition by day and night. It is compatible with T-62, T-64 and T-72 main-battle tanks, BMD airborne and BMP IFVs, BTR APCs, self-propelled artillery systems and other armoured vehicles. The periscope allows passive and active observation modes with an IR illuminator. Length: 37cm Width: 21.3cm Height: 40.7cm Weight: 12.5kg

PCO

POD LISWARTA

The Passive Observation Device (POD) is a binocular day/night commander's periscope designed for use in armoured vehicles, including T-72, T-72M, T-55 and T-55A tanks, BWP-1/-2 IFVs, Gozdzik self-propelled howitzers and WZT-2/-3 support vehicles as a replacement for original Russian equipment. Two independent viewing channels are equipped with an

objective lens system and eyepiece. The night channel contains one 18mm I2 tube with automatic gain control and a stabilised power supply.

SKO RADEW

The SKO RADEW is a TI FCS designed for the T-72M1 tank, for use when firing either stationary or on the move during daylight, at night and in poor visibility. The FCS can also be mounted in the T-72M1 without extensive modification of the turret.

PRO OPTICA

Artemis

The Artemis system is designed for surveillance and target acquisition during day and night, installed on a surveillance vehicle. It is a multi-sensor observation system comprising a thermal imaging camera, charge-coupled device camera, LRF and telescopic mast. The Artemis features an orientation system and pan-and-tilt platform for sensor block movement in azimuth and elevation with optional stabilisation. Additionally, the workstation includes a computer and displays, a digital video recorder and an operator command unit.

RAYTHEON

CITV

The Commander's Independent Thermal Viewer (CITV) used on the US Army's M1A2 SEP Abrams tank allows the commander to seek additional targets while the gunner engages previously identified ones. Independent 360° rotation allows search without turret movement. Weight: 113kg

CIV

For use on the Bradley M2A3 Fighting Vehicle, the Commander's Independent Viewer (CIV) provides a 360° view of the battlefield.

CPS-1

The Commander's Panoramic Sight – 1 (CPS-1) can be installed on a variety of armoured vehicles, and is a lightweight thermal imaging system with direct-view visible optics, using FPA detector technology for increased standoff range. The stabilised 360° panoramic sight can be operated independently from the turret or slaved to the main gun and supplies fire-on-the-move capability. Two-axis stabilisation: elevation <100µrad, azimuth <100µrad.

The Artemis system is designed for surveillance and target acquisition during day and night, installed on a surveillance vehicle. (Photo: Pro Optica)

DNTSS

The Day Night Thermal Sight System (DNTSS) provides LoS directing, thermal sensor, visible sensor and active target ranging, allowing gunners and commanders to view the battlefield with a two-FOV direct-view optics telescope, a two-FOV visible imaging sensor or a two-FOV thermal imaging sensor. The LRF estimates target range. Additionally, DNTSS generates and displays ballistic solutions for the selected weapon, ammunition and target range.

GPTTS

Deployed on the Korean K1 MBT, the Gunner's Primary Tank Thermal Sight (GPTTS) is an integrated FCS that combines direct-view optics, a Gen I 120-channel IR thermal imager, a dual-axis stabilised head mirror unit and an eyesafe CO2 laser range finder. System options include a charge-coupled device standard (RS-170) TV format camera with through-sight video recording capability and remote viewing using data compression and transmission.

HIRE

High-Performance IR Equipment (HIRE) is a lightweight, modular fire-control sight and thermal imaging system. It includes a sensor unit, telescope electronics unit, gunner's display and commander's remote display and provides vision through darkness, smoke, dust and adverse weather. Used in conjunction with fire-control and TOW missile systems, it is in production for a variety of armoured vehicles.

SGIS

With a 240x4 detector element FPA, Second Generation IR Systems (SGIS) TI and fire-control sights provide light armoured vehicles and maint-battle tanks with vision through the darkness, smoke, dust and adverse weather, claims the company. The SGIS is intended to provide a standalone thermal imaging capability and can be configured for use in conjunction with TOW missile subsystems and other FCS.

RIPPEL EFFECT SYSTEMS

IGS-4S Indirect Gunner Sight

The IGS-4S is a video sighting system utilised in conjunction with vehicle-mounted weapons with calibres ranging from 7.62 to 125mm. It was designed for cost, mass and space constraints of smaller vehicles. The system also provides the operator with a claimed 24/7 below-armour observation and ranging capability. The IGS-4S accommodates multiple sensors that can be tailored to a user's requirements and weapon choice. Length: 17cm Width: 12cm Height: 25cm

SAAB

UTAAS

The UTAAS is a universal sight and FCS for tanks and combat vehicles. Its modular design offers a variety of

performance options and upgrading possibilities. It features a silent search mode, a low-hazard LRF with variable repetition frequency and a range of Gen III thermal imagers for night and all-weather operation.

SAFRAN ELECTRONICS & DEFENSE

CM3

CM3 cameras are designed for remote-controlled turrets, land and naval applications, combining a dual-FOV IR channel and a day colour video channel. They have a continuous zoom and laser telemeter. Two versions are available: CM3 MR (medium-range) with uncooled IR channel; and CM3 LR (long-range) with cooled IR channel.

Iris

The Iris is a thermal imager designed for multiple applications, including ship optronic masts. The Iris has claimed detection/recognition ranges with two FOVs of 13/5km (soldier), 16/6.7km (tank), 18.5/8.5km (helicopter) and 26/14km (fast jet). Resolution: 576x746px. NETP (sensitivity): <0.02°C. Cooldown: <5min. Synchronisation: internal or external. Weight: 10kg

MVS 580

The MVS 580 is a tank commander's stabilised panoramic day/night sight. It allows the commander to perform all-round observation, detect and assess threats and hand targets over to the gunner under armour. Options include a micro-monitor for the thermal channel and data, a relaxed view monitor and automatic tracking.

Paseo

The Safran Paseo is a surveillance and detection device for armoured vehicles that can be used to allow a gunner to safely fire their weapon. The Paseo has a panoramic sight and can perform day and night. The Paseo can also be used not only for gunners but for commanders' applications, as well as forward observation for artillery. Detection range: 15.4km

SAPS

The Advanced Panoramic Sight (SAPS) is a gyro-stabilised optronic system combining surveillance and land/air engagement functions, from short- to long-range. Its suite of video, IR and laser sensors supports continuous, instantaneous and simultaneous surveillance of several threats, day or night. SAPS is also connected to a Sigma 10 navigation system and incorporates a single- or multi-operator station.

Savan 7

Savan 7 is an integrated gunnery sight for surveillance, target recognition, identification and engagement at long range by day and night. The display is via standard or 'relaxed view' TV monitors for the commander and gunner.

Savan 11

Savan 11 is an AFV gunner's sight with dual-FOV day TV channel, thermal camera and eyesafe telemetry channel, with full range of movement in sight, allowing it to deal with elevated targets in urban or rural combat.

Savan 15

Savan 15 is an FCS for tanks and other AFVs designed to provide fire-on-the-move capability. The system includes a day/night gunner's sight; fire-control computer; gun stabilisation and lead angle computation sensors; gunner's and commander's controls and displays; and integrated GPS/INS.

Wasp Observer

Wasp Observer is a day/night optronic surveillance system for observation and self-protection needs of light armoured vehicles. Operated via a terminal, Wasp Observer can detect hostile elements using its integrated CM3 MR or LR imager (see separate entry).

STARA TECHNOLOGIES

VMSS

The Vehicle Mounted Surveillance System (VMSS) is a multi-sensor, mast-mounted, persistent surveillance platform which can be installed on a range of military and commercial vehicles. The system can combine an EO/IR camera and GMTI radar for long-range visual identification and wide-area 360° surveillance. The VMSS can also detect vehicles up to 30km away and personnel up to 12km away. Height: 1,000cm

TELEDYNE FLIR

TacFLIR 230

The TacFLIR 230 is a long-range, gyro-stabilised RSTA system for vehicle operations. It is designed to be easily deployed in extendable masts for on-the-move operation and can be used in rugged environments. The TacFLIR 230 includes an MW InSb TI with an 18:1 zoom ratio telescope, a colour daylight/LLL TV camera and a laser pointer for indicating specific targets to friendly forces equipped with NVDs. Width: 22.9cm Height: 36.1cm Weight: 12.7kg

TacFLIR 280-HD

The TacFLIR 280-HD is claimed to be the world's first stabilised compact HD multi-sensor imaging system for tactical vehicles. The ISR system is tailored for mobile applications in day, night and harsh conditions. It can deploy up to four cameras simultaneously, plus up to three laser payloads, along with an IMU. Weight: 25kg

TacFLIR 380-HD

The TacFLIR 380-HD is an all-digital ISTAR sensor designed for land vehicle applications; the ground operations version of the Star SAFIRE 380-HD (see separate entry). The sensor includes up to seven simultaneous payloads, including a mediumwave infrared camera, HD charge-coupled device cameras, a HD shortwave infrared camera, laser range finder and laser pointer. The TacFLIR 380-HD has a single-LRU configuration and an embedded digital IMU/GPS. Weight: 45kg

Talon

The Talon is a gyro-stabilised 23cm turret that can be housed in a range of mounting positions. Designed to meet mid-range reconnaissance, surveillance and target acquisition mission requirements, it contains

up to six payloads simultaneously, including IR, colour charge-coupled device (CCD), electron-multiplying CCD, laser pointer or illuminator, laser rangefinder and embedded inertial measurement unit/GPS. The Talon is available in a multi- or single-line replaceable unit configuration, with workload reduction features such as scan mode, video auto-tracking and automatic gain/level. Weight: 14.5kg

THALES OPTRONIQUE

Catherine-FC

The Catherine family allows armoured-fighting vehicle gunners and commanders or reconnaissance vehicle crew members to see at long range by night or day, in adverse conditions and through barriers, vegetation or camouflage netting. Length: 25cm Width: 18cm Height: 12cm Weight: 5.5kg

Catherine-GFC

The Catherine family allows armoured-fighting vehicle gunners and commanders or reconnaissance vehicle crew members to see at long range by night or day, in adverse conditions and through barriers, vegetation or camouflage netting.

Catherine-WS/LR

The Catherine family allows armoured-fighting vehicle gunners and commanders or reconnaissance vehicle crew members to see at long range by night or day, in adverse conditions and through barriers, vegetation or camouflage netting. Catherine-WS has been designed as an alternative to uncooled and traditional cooled TIs for RCWS. The long-range MWIR TI can identify a tank at a range of >3.3km and a soldier at >1.5km. Length: 25cm Width: 18cm Height: 12cm Weight: 5kg

Catherine-XP

The Catherine family allows armoured-fighting vehicle gunners and commanders or reconnaissance vehicle crew members to see at long range by night or day, in adverse conditions and through barriers vegetation, or camouflage netting. Length: 25.8cm Width: 17.2cm Height: 10cm Weight: 3kg

THALES UK

DNGS-B

Day/Night Gunner Sight (DNGS) I2 variants give the user the ability to perform general surveillance and target recognition, identification and engagement at extended ranges. Head mirror drive from different positions means that the DNGS is adaptable for most turrets. The incorporation of a Class 1 eyesafe laser range finder as an option provides range to target.

DNGS-T1

The Day/Night Gunner Sight-T1 thermal imaging sight gives the user the ability to perform surveillance and target recognition, identification and engagement at extended ranges by day and night. Head mirror drive is available from different positions, providing flexibility of fit for a range of turrets. The addition of an eyesafe laser range finder and fire-control computer provides a full gunnery system.

DNGS-T2

DNGS-T2 is designed for long-range surveillance, recognition and identification with capabilities such as fire-on-the-move. The system features a unity vision channel and narrow and wide FOV video. A ballistic computer is mechanically linked to the gun and the CANbus interface can be integrated with a stabilised weapon system. LRUs are replaceable at first line by the customer. The sight head size is also compatible with DNGS-T3 (see separate entry).

DNGS-T3

DNGS-T3 is a single or dual-axis stabilised Day/Night Gunner Sight. It entered service with the UK MoD in 2004 on tracked AFVs. There are more than 600 sights in service. The system features a third-generation TI, eyesafe laser range finder, day and video channel and a modular design for installation and customisation.

Orion

Orion provides vehicle commanders with a stabilised panoramic sight for long-range surveillance and target identification independent of turret orientation. Stabilisation enables on-the-move surveillance and weapon engagement and wide-area surveillance mode provides an overview of surroundings. Additional options include automated target detection, tracking and a laser target designator.

THALES

Antares 360 sensor

The Antares is a 360° sensor that provides early detection of potential threats such as mines, IEDs and antitank weaponry. The company claims the sensor can be used for a variety of applications such as protection against approaching threats, local situational awareness, rearview driving aid, or an external viewer that can be used before exiting the vehicle. Length: 35cm Width: 35cm Height: 30cm Detection range: 0.5km

THEON SENSORS

Urania

Urania is a digital day and night military camera for observation and targeting. The system uses an ICMOS sensor for night vision that includes an I2 tube coupled to a global shutter CMOS sensor. Video is sent over Ethernet, while control is implemented over CAN bus. The customisable design, including video protocol and overlays, also allows service on a variety of platforms. Weight: 3.3kg

EQUIPMENT

MARITIME SYSTEMS

This section contains basic data on a selection of NV and EO systems used in surface vessels and submarines:

- optronic masts and periscopes
- ship surveillance and fire control systems

The equipment is listed alphabetically by manufacturer within the above subsections.

If you think your product should be listed, please contact the team at insight@shephardmedia.com to ensure it appears in the *Shephard Defence Insight* online database (plus.shephardmedia.com) and is included in the next handbook edition.

ABOVE: The *Virginia*-class fast-attack submarine USS *New Hampshire* equipped with the AN/BVS-1 photonics mast system. (Photo: USN)

OPTRONIC MASTS AND PERISCOPES

ASELSAN

Depetek

Depetek is a thermal imager with the two-dimensional 640x512 staring array detector, for the 3-5µm waveband, which is designed to be used inside submarine periscope systems. It features continuous zoom and autofocus functionality. Depetek is MIL-STD-810G-qualified and has CCIR, low-voltage differential signalling and controller area network bus external communication capability. Width: 16.5cm Height: 34.3cm

HENSOLDT OPTRONICS GMBH

OMS 100

The OMS 100 is a non-hull-penetrating optronic mast designed to offer shipbuilders more freedom in positioning the operations centre. A rotating sensor head is housed inside the tower on a hoisting device. Fast sequences run automatically, relieving and supporting the user.

OMS 110

The OMS 110 features prominently in our line of successful submarine periscope systems. The rotatable sensor head of the OMS 110 can be raised above the bridge fin of a submarine using a streamlined, hoistable mast. The periscope system breaks the water's surface in just a few seconds, enabling an initial topside sweep, including the airspace. The system automatically scans the entire surroundings in a single panoramic image, which takes just 3 seconds.

OMS 200

Airbus DS Optronics unveiled the OMS 200 at the September 2013 DSEI exhibition. It combines the capabilities of the OMS 110 with intelligent target acquisition and tracking functions, enabling it to be used in a search and an attack role. The paired optical and IR sensors automatically acquire targets and track their trajectory.

SERO 14/15

SERO 14/15 periscopes were developed on behalf of Germany's Federal Office for Defence Technology and Procurement. Used in Norwegian ULA plus German and Italian Type 212A submarines. Main features: two-axis LOS stabilisation, data display in oculars, optical rangefinder, laser range finder, heated head window (daylight sight), various optical filters, binocular observation, magnification changer (1.5/6x or 1.5/6/12x zoom), IR camera, azimuth motor drive, microphone, digital interfaces, monitor, video recorder, hoisting device with fairing.

SERO 40/40 STAB/400

The SERO 40/40 STAB/400 system comprises one attack and one observation scope with a high component commonality but independent operation. The optical quality of the periscopes enables observation and recognition of objects by means of high-contrast images under difficult lighting conditions. Main features: two-axis LoS stabilisation, data display in oculars, optical rangefinder, heated head window, various optical filters, binocular observation, magnification changer (1.5/6x), azimuth motor drive, digital interfaces.

SERO 250

The SERO 250 is a compact submarine periscope that can be installed in both new-build and upgraded boats. Little or no structural modifications are required for installation. It makes use of existing hoisting mechanisms, bearings and seals. The SERO 250 can be used for observation during the day and is equipped with an IR camera for night vision. It serves to monitor surface and air activity, collect navigational data and detect and identify targets. Height: 1,100cm Diameter: 19.05cm

SERO 400

The SERO 400 submarine periscope provides a panoramic view of the surroundings on the water's surface and in the airspace above without exposing or comprising the vessel. Integrated optics, optical cameras, Gen III thermal imager and laser rangefinder enable the user to determine the heading and distance to observed objects. The cameras also take pictures for documentation and subsequent analysis. The system is able to conduct a 360° quick look round in 3 seconds. Diameter: 19.05cm

KENT PERISCOPES

Sabre Ti

The Sabre Thermal Image (Ti) was developed as a gunner and/or commander's sight for small to medium turret systems with an optional laser range finder, allowing the user enhanced surveillance and target acquisition by night and day. The system was unveiled at DSEI 2013. The sight employs a 640x480 Thermoteknix MicroCAM 2 longwave thermal imaging core with XTi Shutterless Technology capable of detecting a tank at 5.4km.

L3 KEO

AN/BVS-1 Photonics Mast Programme

The AN/BVS-1 is the sensor mast system for USN Virginia-class attack submarines, the first of which entered service in 2004. It is the first class of US submarines to be equipped with photonic masts. Features: colour TV, monochrome HDTV, thermal imager, eyesafe laser range finder, ESM, omni-directional direction finder (monopulse), comms/GPS, 'patch' antenna, VPA (receive), sleeve antenna.

Model 76

The Model 76 system consists of an attack and a search periscope with many components in common, which can interface with a variety of combat systems. Operational flexibility is provided through local visual and remote TV display and control units.

Model 86

The Model 86 is described as the first series of non-hull-penetrating submarine masts which is capable of

The Series 30 AOM is a discreet non-penetrating attack optronic mast suited to all types of submarines. (Photo: Safran Electronics & Defense)

combining viewing sensors, as well as electronic support measures, GPS and communication antennas.

Model 90

The major functions of the Model 90 submarine periscope include direct visual observation, thermal imaging, TV, photography, rangefinding (optical, video, laser) and data transmission. Features: split-beam binocular viewing with eyepiece data display, operable from remote control console or through combat system, 'quick look' and programmed automatic modes, capability for adding e-zoom and image enhancement, data recording and retrieval functionality, choice of electronic support measures/comms/GPS capabilities. Ranging: stadimetric (optical and video). Film photography: 35mm.

Type 8 Mod 3

The Type 8 Mod 3 is an updated version of the Type 8-series periscopes. The Type 8B/J Mod 3 provides extremely high-frequency low-data-rate communications capability for USN Los Angeles- and Seawolf-class SSNs and Trident-armed SSBNs. The systems are currently being fitted with a thermal imaging capability. The operationally proven system features multiple levels of optical magnification, power-assisted train operation and day and night viewing. It can be integrated into a submarine's combat system. Communications: EHF SATCOM. Staring detector array: 640x512 with closed-cycle cooling. Wide FOV: 8° Narrow FOV: 2.3° Elevation: -10°/+45°

Type 18

The Type 18 periscope was designed to provide USN Los Angeles- and Seawolf-class submarines with a broad spectrum of optical, EO, RF intercept and targeting capabilities. Features: multiple levels of optical magnification, power-assisted train operation, single-axis stabilisation, digital photography, low-light level image intensification, colour TV. Perivu: Sony XC999 colour TV camera, Nikon D1 digital frame camera, workstation with image processing and 20in flat panel display.

L3 SPACE & SENSORS

Optronic masts and periscopes

The company's MWIR imagers have been selected to provide new thermal imaging modules for the non-hull-penetrating Model 90 Universal Modular (optronic) masts for USN Virginia-class SSNs. L3 has also been specified to retrofit the Type 8 periscopes of last-generation USN Los Angeles-class SSNs with modern IR technology. The same modules will be installed on the optronic masts of the UK RN's Astute-class SSNs.

SAFRAN ELECTRONICS & DEFENSE

Iris

The Iris is a thermal imager designed for multiple applications, including ship optronic masts. The Iris has claimed detection/recognition ranges with two FOVs of 13/5km (soldier), 16/6.7km (tank), 18.5/8.5km (helicopter) and 26/14km (fast jet). Resolution: 576x746px. NETP (sensitivity): <0.02°C. Cooldown: <5min. Synchronisation: internal or external. Weight: 10kg

Series 20 APS

The Series 20 APS (Attack Periscope System) has been designed by Safran for all types of modern submarines. It is capable of carrying out above-water surveillance and attack tasks. These include navigation safety, intelligence gathering and EW self-protection. The system combines a direct optical channel with four magnifications, optronic sensors including low-light-level TV anti-blooming camera and HDTV colour camera. It also supports GPS and early warning electronic support measure antennas.

Series 30 AOM

The Series 30 AOM's design is based on the Series 30 SOM. It is a discreet non-penetrating attack optronic mast suited to all types of submarines and integrates optronic sensors and EW in a single compact unit. The system can simultaneously combine up to four optronic sensors and an electronic support measure/GPS antenna. The Series 30 AOM has a small volume above surface water to provide it with a low signature.

Series 30 SMS

The Series 30 Search Mast System (SMS) is a gyro-stabilised, RAM-coated optronic search mast with TV and thermal sensors, which does not penetrate the submarine's pressure hull. The standard system includes a control and display console and associated electronics unit, but it can be operated from a multi-function common console. Modes include manual, auto look-around, surveillance and passive range estimation. Height: 180cm Weight: 220kg

THALES OPTRONIQUE

CM010

The CM010 optronic mast is a non-hull-penetrating imaging system that incorporates a thermal imaging sensor, HD monochrome TV sensor, colour TV sensor, support for high-sensitivity broadband RF sensors and signal and image processing. The CM010 can be controlled and operated from a dedicated remote-

control console equipped with high-resolution displays or from a command system multi-function console. The UK RN's seven Astute-class submarines are each equipped with two CM010 masts.

Compact Periscopes

Thales offers a family of seven periscope models, based on in-service technologies, optimised for small submarine platforms and minisubs. These periscopes have many features normally associated with full-sized systems such as rangefinding, stabilisation and night vision.

Electronic Periscopes

Suitable for new-build or retrofit applications, Thales' electronically controlled periscopes can be fitted with thermal imaging or image intensifier sensors and are compatible with a range of modern diesel-electric submarines, including the HDW Type 209, Kockums A19/T96, RDM Moray and DCNI Agosta. The CH088 attack periscope shares over 90% commonality of design with the CK038 search periscope and either may be configured with an optronic mast.

Optronic Periscopes

Thales produces optronic periscopes suitable for medium to large submarine platforms, which are fitted with a suite of EO and surveillance sensors and can be operated either locally or by remote control from dedicated or multi-function consoles. Forming an integral part of the combat system, tactical data can be viewed by eyepiece injection or on the remote console.

SHIP SURVEILLANCE AND FIRE CONTROL SYSTEMS

BALL AEROSPACE

Mk 20 ALLMC

The Mk 20 All-Light-Level Marine Camera (ALLMC) is a component of the shipboard Mk 86 Gunfire Control System and is used for search, surveillance, target identification, fire control and navigation. The camera has a charge-coupled device sensor developed for military applications. A sealed and pressurised marine housing protects the camera and its zoom lens.

CHESS DYNAMICS

Sea Eagle EOSS

The Sea Eagle Electro-Optical Surveillance System (EOSS) is optimised for automated maritime surveillance on all classes of vessels. It comprises a cooled mediumwave IR camera, a daylight TV camera with an integrated IR cut filter to provide low-light functionality for dusk and dawn imagery and an optional low-repetition-rate laser rangefinder. It is designed to operate as a fully integrated element of a multifunction console-based combat system. Length: 0.37m Width: 0.11m Height: 0.1m Weight: 4.5kg

Sea Eagle FCCT

The Sea Eagle Fire Control Compact Turret (FCCT) is a gimbal-mounted EO FCS designed for deployment on small, fast vessels and the control of weapons (up to 40mm) against surface and air targets. The system includes a cooled or uncooled thermal imaging camera, daylight TV camera and optional high-repetition-rate laser rangefinder. Weight: 24kg

Sea Eagle FCEO

The Sea Eagle Fire Control Electro-Optical (FCEO) system is designed for naval gunfire against air, surface and shore targets. According to the OEM, the system is capable of controlling any in-service naval gun. The system comprises a long-range thermal imager, daylight TV camera and high-repetition-rate laser rangefinder. It is designed to be operated as an integrated element of a multifunction console-based combat system or through a dedicated standalone console. Length: 0.37m Width: 0.11m Height: 0.1m Weight: 85kg

Sea Eagle FCRO

The Sea Eagle Fire Control Radar Optic (FCRO) system provides 24h long-range detection, acquisition, tracking and engagement of air and surface targets using frequency modulation, continuous-wave Doppler radar, with target identification provided by Chess Dynamics thermal imaging and TV cameras. Weight: 150kg

CONTROP PRECISION TECHNOLOGIES

C-View

C-View is a lightweight EO/IR gyro-stabilised payload that can be installed on manned boats or unmanned surface vessels for night or day observation and safety purposes. C-View incorporates a TV charge-coupled device or uncooled IR camera with a continuous zoom lens. It operates in observation mode, providing real-time IR video on patrol boats, ships and various maritime vessels. Length: 23cm Width: 17.7cm Weight: 3.2kg

iSea-10U

The iSea-10U is a dual-sensor EO gyro-stabilised payload, installed on maritime vessels (manned boats or unmanned surface vessels) for night and day observation and safety purposes. Length: 19cm Height: 23.3cm Weight: 4.6kg

iSea-20HD

The iSea-20HD is a compact day/night observation system designed for marine patrol boat applications. It offers a range of communication interfaces to the host vehicle, including RS-422. The system is operated by a ruggedised control unit, which can be either attached to a fixed location or use a flexible cable, with a thumb control stick. Width: 24cm Weight: 10.7kg Detection range: 13.89km

iSea-30/30HD

The iSea-30/30HD is a day/night surveillance system, which is part of the iSea family. It has been configured for patrol boat and ship applications (including SAR, observation and law enforcement) and can be integrated onto a variety of maritime vessels. The system is operated by a ruggedised control unit that can be attached to a fixed location or used with a

flexible cable, enabling it to be movable. Length: 30.5cm Height: 43cm Weight: 21kg

iSea-40HD

The iSea-40 is part of a family of surveillance systems designed for day and night operations in harsh maritime environments. It has been installed on a range of platforms, including coast guard and naval ships and manned and unmanned vessels. The four-gimbal system is gyro-stabilised and has 22.5x continuous zoom, an optional eye-safe laser rangefinder, an optional laser pointer and an automatic target tracker. Height: 48.3cm Weight: 22kg

iSea-50HD

The iSea-50HD is part of a family of surveillance systems designed for day and night operations in harsh maritime environments. iSea variants have been installed on a range of platforms, including coast guard and naval ships and manned and unmanned vessels. The four-gimbal system is gyro-stabilised and has 22.5x continuous zoom, an optional eye-safe laser rangefinder, an optional laser pointer and an automatic target tracker. Diameter: 35.4cm Weight: 29kg Detection range: 27.78km

iSky-20HD (SHAPO-HD)

The iSky-20HD, previously marketed as Shapo-HD, is a multi-sensor, gyrostabilised observation payload intended for various platforms such as UAVs, light aircraft and helicopters. Sensors include a colour TV camera and optional laser rangefinder, thermal imager and laser pointer. It features an automatic video tracker and video processing software, with image enhancement, correlation, centroid and prediction. Diameter: 24cm Weight: 10.7kg Detection range: 15km

iSky-50HD (DSP-HD)

The iSky-50HD is a medium- to long-range EO/IR camera payload. The compact dual-sensor day/night observation system is designed for use on helicopters, light aircraft, UAVs and patrol boats. Sensors include a thermal imager, HD zoom camera, HD daylight spotter channel, as well as an optional laser rangefinder and laser pointer. The four-gimbal system is gyrostabilised in azimuth and elevation for the entire field of regard, including at the nadir/zenith point. Height: 50cm Diameter: 35cm Weight: 29kg Detection range: 32km

MSSP-3

The Multi-Sensor Stabilised Payload-3 (MSSP-3) is a three-sensor day/night observation system designed for maritime patrol applications on boats, fixed-wing aircraft and helicopters. Four gimbals are used to stabilise the LoS. Height: 57cm Weight: 38kg

Quad-HD

The Quad-HD is a compact day/night observation system configured for UAV, light aircraft, helicopter and marine patrol boat applications. The lightweight system comprises three gyro-stabilised gimbals. Sensors include a thermal imager, HD charge-coupled device camera, optional laser rangefinder, laser illuminator and optional laser pointer. The Quad-HD also features an automatic target tracker, built-in image enhancement and local AGC capabilities. Weight: 21.5kg

Shapo

Shapo is a multi-sensor, gyro-stabilised observation payload. It is intended for platforms including UAVs, helicopters, light aircraft, patrol boats, aerostats, airships, armoured vehicles and masts. It is used in day, night and adverse weather missions including observation, surveillance, law enforcement, SAR, homeland security, force protection and as a gunsight. Sensors include a thermal imaging, colour TV camera and laser pointer. Length: 21cm Width: 21cm Height: 16cm Diameter: 24cm Weight: 10kg

Speed-ER

Speed-ER is a three-sensor day/night system with a range of 30-40km. The sensors allow for three channels: visible, thermal and shortwave IR. This combination allows the operator to penetrate haze, fog and pollution. Sensors include a thermal imager, with 250mm focal length and a 12.5x continuous zoom lens, and an HD camera with a 20x zoom lens. The four-axis, gyro-stabilised system features a laser rangefinder and laser pointer for target marking.

T-View

T-View is a lightweight EO/IR gyro-stabilised sensor for day/night observation. It incorporates two cameras – a thermal imager with continuous optical zoom lens and a colour charge-coupled device camera with continuous zoom. T-View operates in observation mode, providing real-time IR video. Its structure allows integration on vehicles including 'most' land and maritime platforms, according to the OEM.

ELBIT SYSTEMS INTELLIGENCE AND ELECTRO-OPTICS – ELOP

DCoMPASS

The Digital Compact Multi-Purpose Advanced Stabilised System (DCoMPASS) is one of the newest members of Elbit Systems' stabilised EO CoMPASS family. It is currently in service with customers across the world and was selected for the UK Watchkeeper UAV programme. DCoMPASS is a stabilised EO payload that has a digital open architecture with day and night ISTAR capabilities in harsh weather conditions. Diameter: 38cm Weight: 38kg

MicroCoMPASS

MicroCoMPASS is a 20cm EO payload system for small UAVs and other platforms, including airborne, ground and maritime vehicles. The system provides day and night intelligence with surveillance capabilities, including in harsh weather conditions. The three-gimbal configuration provides line-of-sight stabilisation. The turret includes four major sensors: continuous zoom thermal imager, colour TV camera, eye-safe laser rangefinder and laser target illuminator. These are integrated into one line-replaceable unit. Diameter: 21cm Weight: 9kg

HENSOLDT OPTRONICS GMBH

Argos-II HD/ HDT

The ARGOS-II HD airborne multi-sensor observation system's main features include a continuous zoom HD multi-spectral camera and an HD Gen III TI for situational

awareness day and night. It also has an internal IMU and GPS for geo functions, real-time onboard image processing and a multiple video and communication interface with onboard ancillary equipment. Argos-II HD can be installed on fixed- and rotary-wing aircraft as well as UAVs and aerostats. Length: 49.5cm Width: 41cm Weight: 50kg

MEOS II S/N

The stabilised 24/7 Maritime Electro-Optical System (MEOS) II is available as a naval surveillance system (MEOS II S) and as a naval observation and targeting system (MEOS II N). The ruggedised platform incorporates a Gen III TI, a day charge-coupled device zoom camera and an eye-safe laser rangefinder. MEOS can also be equipped with a video tracking capability. A control console with monitors and a video recorder may be integrated into the ship's bridge.

MOLEM 6Hz

The MOLEM 6Hz is optimised to acquire small, fast targets. It can detect small targets to 20km and beyond. It is installed on ships, ground vehicles and aircraft. The device uses a Raman-shifted, solid-state laser as a transmitter. A maintenance-free cooling unit facilitates the pulse repetition rate of 6Hz. Several housing variants are available to enable easy integration into different platforms.

IAI TAMAM

MiniPOP/MiniPOP-D

The Miniature Plug-In Optronic Payload (MiniPOP) is a dual-axis, gyro-stabilised payload designed for a variety of airborne, manned, unmanned, maritime and ground applications. The system is built on a single-line replaceable unit open architecture and carries up to four sensors. An automatic TV tracker is also installed. The MiniPOP-D (Designator) model is available, which provides the additional capability of target designation and eye-safe rangefinding. Additionally, it is compatible with NATO and US laser-guided munitions. Width: 21cm Height: 34cm Weight: 7.5kg

The MX-10MS is a small, multi-sensor, multispectral imaging system in a single-LRU configuration. (Photo: L3 Wescam)

MOSP3000 HD

The Multi-Mission Optronic Stabilised Payload (MOSP) 3000 HD is an optimised family of four-gimbal stabilised EO payloads for various platforms. These include UAVs, helicopters, fixed-wing aircraft, vessels and ground applications. MOSP3000 HD is equipped with a true HD thermal imaging detector (1,280x1,024px) with continuous zoom for the night channel and full HD TV detector (1,920x1,080px) with continuous zoom for the day channel. Width: 350cm Height: 55.5cm Weight: 33kg

POP-300 family

The Plug-in Optronic Payload (POP-300) is a small EO/IR/laser payload for manned and unmanned airborne, land or maritime platforms and for coastal surveillance applications. The POP-300 carries sensors in interchangeable 'slices' mounted on a gyrostabilised turret. The system's electronics are contained within the turret. Available configurations include a 640x480 thermal imager with the POP-300, a colour charge-coupled device with a near-IR capability and a laser pointer. An eye-safe laser rangefinder is optional. Height: 43cm Diameter: 26cm Weight: 20kg

L3 BRASHEAR

LSEOS Mk IIA/IIB

Lightweight Shipboard Electro-Optical System (LSEOS) is a family of EO fire control and surveillance systems for small ships or integration into combat systems of larger vessels. The system's basic components comprise an EO director and operator control console. Additional modules can include weapon control, pedestal electronics cabinet and a bridge surveillance display unit. Sensors generally include a thermal imaging camera and eye-safe laser rangefinder. Weight: 584kg

Phalanx EOSS

The Electro-Optical Stabilization System (EOSS) for the Phalanx close-in weapon system can be installed on a variety of vessels and weapon platforms, offering close-in fire control in a lightweight system. The open architecture permits the mounting of different sensor types. USN qualified and field-proven, the Mk IV can withstand continuous gun shock in a full naval environment.

L3 KEO

Mk 46 Mod 1

The Mk 46 Mod 1 is an EO observation and fire control system is installed on USN Arleigh Burke-class destroyers. It has a high-resolution three-chip colour camera for daylight imaging, a thermal imager and an eye-safe laser rangefinder.

L3 SPACE & SENSORS

Ship Surveillance and Fire Control

L3 produces a range of IR systems with thermal sensitivity that meet naval specifications for surveillance, reconnaissance and target acquisition. They can be installed in gyro-stabilised turrets on high-speed patrol boats and other vessels. L3's medium-wave IR thermal imaging modules, which may be installed in vibration-isolated stabilised gimbals, can be used for high-

resolution night surveillance. Imagers are compatible with a range of other maritime mission equipment.

L3 WESCAM

MX-10MS

The MX-10MS is a small, multi-sensor, multispectral imaging system in a single-LRU configuration. It has been designed to support a range of missions, including ship surveillance, coastal surveillance, maritime interception and SAR. The MX-10MS can be installed on manned and unmanned vessels and has already been installed on a Piranha, and an Austal Cape-class patrol boat. It can also support up to six sensors simultaneously. Length: 23.3cm Width: 8.5cm Weight: 2.2kg

LEONARDO ELECTRONICS

DSS-IRST

The Distributed Static Staring InfraRed Search and Tracking System (DSS-IRST) is a real 360° full coverage naval search & track system, designed as a passive early warning system it is able to minimise the false alarm rate, reduce reaction time and provide very wide elevation coverage. DSS-IRST provides protection against simultaneous, at long or short-range, fast threats, increasing the ship survivability.

Janus-N

Janus-N is designed as a combined medium- and long-range panoramic sight, operating by day or night in all weather, in a rugged, self-contained package. Janus incorporates IR staring focal-plane array sensor technology for high-resolution night vision and a colour charge-coupled device TV with an optional laser rangefinder. The system can be used for a range of tasks, including surveillance, SAR, situational awareness, maritime navigation and patrol and harbour surveillance and protection.

Medusa Mk 4/B

The Medusa Mk 4/B is a lightweight EO fire control system (FCS). It can be used as the main FCS for remote control of medium- and small-calibre guns, as well as a secondary FCS. The system is designed to minimise space and weight requirements and for ease of operation. It can be controlled by an operator at a control desk located in a sheltered area.

SASS

The Silent Acquisition and Surveillance System (SASS) is a long-range, passive IR search and track system for naval applications, operating simultaneously in medium-wavelength IR (3-5µm) and long-wavelength IR (8-12µm) spectral bands. It is able to detect and track air and surface targets with 360° horizontal coverage and provide IR maps of the scene around the ship. Width: 0.56m Height: 0.51m Diameter: 0.6m Weight: 253kg

NAVAL GROUP

CTA/CTD/CTM

The CTA, CTD and CTM are EO gunfire control systems developed for French warships to control weapons from 40-127mm. Optical, TV and IR trackers are normally cued by radar.

OP3A/SARA

OP3A/SARA is an EO and radar integrated ship self-defence system that employs a variety of EO trackers, TV cameras and thermal imaging systems to perform threat surveillance and weapon-direction functions.

NEWCON OPTIK

LRF Mod 15HF

The LRF Mod 15HF high-frequency laser range finding module is designed to provide range acquisition of low-reflection targets at ranges up to 30km. The module can be used for maritime navigation, long-range reconnaissance, naval and coast guard patrol and other professional applications requiring long-distance measurements. The Mod 15HF is air-cooled for a smaller system footprint and weight profile. The unit is supplied with a day scope (4x default) for initial boresight. Length: 10cm Width: 11cm Height: 25cm Weight: 3kg

SAFRAN ELECTRONICS & DEFENSE

EOMS NG

The naval EO Multifunction System (EOMS) combines long-range IR search and tracker and gunfire direction to detect and engage shore, surface or airborne targets, particularly sea-skimming anti-ship missiles. In early 2014, France's DGA procurement agency contracted Safran to retrofit the EOMS – New Generation (NG) on two French Navy Horizon-class frigates and two Cassard-class frigates.

Paseo XLR

The Paseo XLR (Extra Long Range) is the latest member of Safran Electronics & Defense's shipborne sighting system, which joins the Vigy Observer/Engage and the Paseo NS. Designed for operation in extreme naval environments, the system features a stabilised turret from the DALAS NG (deck-landing aid device for the Charles de Gaulle aircraft carrier), developed from 2014-17 for Naval Group and French defence procurement agency DGA, as well as cameras with high magnification.

Vampir

The Vampir is a long-range, bispectral IR search and track system that can operate alone or as a low-altitude gap filler to complement air search radars and electronic support measures. It provides naval ships with passive panoramic surveillance functions, including automatic detection, tracking and reporting of symmetric or asymmetric threats, from sea-skimming anti-ship missiles to fast attack craft.

Vigy 20

Vigy 20 is a modular day/night surveillance and fire control system on a two-axis stabilised platform for any kind of ship. Sensors: up to two thermal imagers operating in the 3-5 and 8-12µm bands, black and white, colour and low-light-level TV cameras. Video tracker: software in servo electronic unit uses centroid or correlation algorithms. The system can operate alone or be integrated with a combat management system. Length: 110cm Width: 80cm Height: 110cm Weight: 150kg

Vigy MM
The Vigy MM is an EO fire control system designed for surface vessels. Over 300 sights in the Vigy MM range (formerly Najir Mk 1, Mk 2, 2000, etc) are operated by navies around the world. France and Morocco's FREMM-class frigates are equipped with the Vigy MM. Width: 0.5m Height: 0.36m Weight: 35kg

Vigy Observer
The Vigy Observer is a panoramic, stabilised shipborne observation system. With a compact, modular design, it can be installed on different types of ships, from merchant marine freighters to coast guard interceptors or fast patrol boats, as well as warships. Weight: 23kg

TELEDYNE FLIR

SeaFLIR 230
The lightweight SeaFLIR 230 is a gyrostabilised RSTA system with a 9in turret, featuring a thermal imaging and a daylight camera with day and low-light capabilities. The SeaFLIR 230 is designed for situational awareness and mid-range surveillance for offshore and fast patrol vessels. This multi-sensor system has a 640x480 cooled MWIR camera with up to 18x continuous zoom and high-resolution 30x colour/low-light camera, plus laser rangefinder and laser pointer payload options. It can be integrated with C2 systems such as GPS, INS, radar, moving map and searchlights. Height: 0.36m Diameter: 40.6m Weight: 18.5kg

SeaFLIR 280-HD
The SeaFLIR 280-HD is a maritime imaging system designed to identify and track smugglers, terrorists or other threats. It is a stabilised, compact, HD, multi-sensor, marinised system with 20x HD IR optical zoom, HD daylight/lowlight and SWIR cameras, multiple NIR laser pointer and NIR and SWIR illuminator options and an eye-safe laser rangefinder. The RSTA system is designed to give long-range performance in extreme conditions and can be integrated into small craft for a range of missions. Height: 0.41m Diameter: 0.35m Weight: 25kg Range: 30km

SeaFLIR 380-HD
The SeaFLIR® 380-HD is a long-range, shipboard HD multi-spectral surveillance system that is fully seaworthy and hardened for military vessels. The system has 120x high magnification optics and laser payloads to covertly illuminate, point out targets and determine distance and location. The system also combines important HD IR, colour or shortwave IR spectral information and has true metadata embedded in the digital video. It is in use with the USN and Royal Danish Navy. It is integrated as a node on a network and requires no additional junction boxes. Height: 0.47m Diameter: 0.38m Weight: 48kg

Talon
The Talon is a gyro-stabilised 23cm turret that can be housed in a range of mounting positions. Designed to meet mid-range reconnaissance, surveillance and target acquisition mission requirements, it contains up to six payloads simultaneously, including IR, colour charge-coupled device (CCD), electron-multiplying CCD, laser pointer or illuminator, laser rangefinder and embedded inertial measurement unit/GPS. The Talon is available in a multi- or single-line replaceable unit configuration, with workload reduction features such as scan mode, video auto-tracking and automatic gain/level. Weight: 14.5kg

The SeaFLIR 380-HD is a long-range, shipboard HD multi-spectral surveillance system that is fully seaworthy and hardened for military vessels. (Photo: Teledyne FLIR)

THALES OPTRONIQUE

AGILE
Airborne Gyro-stabilised IR Light Equipment (AGILE) is a dual/tri/quad sensor system for day and night surveillance, observation, border and maritime patrol, law enforcement, and SAR missions. It can be installed on fixed-wing aircraft, helicopters, UAVs and naval vessels. Sensors include high-resolution 3-5µm TI (8-12µm option), high-resolution colour charge-coupled device TV, eye-safe 1.54µm LRF and near-IR laser pointer. Width: 30cm Height: 45cm Weight: 17kg

Artemis
The Artemis naval infrared search and track passive surveillance system is able to automatically detect, track and classify air and surface targets simultaneously, including manoeuvring and stealthy as well as surface asymmetric threats. Its distributed sensor architecture allows the system to provide panoramic and wide elevation coverage without any blind sectors. The system consists of a set of independent sensor heads directly mounted on the vessel's masts or superstructure.

EQUIPMENT

EO/IR SYSTEMS

This section contains basic data on a selection of EO/IR systems:

- pod and turret systems
- cameras and IR detectors
- image intensifiers

If your company produces sensors which you believe should be listed in this section, please contact the team at insight@shephardmedia.com to ensure it appears in the *Shephafrd Defence Insight* online database (plus.shephardmedia.com) and is included in the next handbook edition.

ABOVE: The MQ-1 Predator carries the Raytheon AN/AAS-52, a multi-spectral targeting system that combines EO/IR, laser designation and laser illumination in a single sensor package. (Photo: 455th Air Expeditionary Wing)

POD AND TURRET SYSTEMS

ADSYS CONTROLS

Arrow 600-G2

The Arrow 600-G2 is a multi-sensor precision stabilised gimbal payload for UAVs, manned aircraft, ground vehicles or fixed installations. It is a 2-axis gimbal with fibre-optic gyroscopes and provides <80µrad LoS stability. Configurable payloads include HD visible, longwave-IR, mediumwave-IR, and shortwave-IR cameras. It has optical and fixed zoom options, while available laser payloads include illuminator, laser rangefinder and laser marker. Height: 30.48cm Diameter: 16cm Weight: 3.3kg

Arrow 600-G4

The Arrow 600-G4 is a multi-sensor precision stabilised gimbal payload for UAVs, manned aircraft, ground vehicles or fixed installations. A 4-axis gimbal with fibre-optic gyroscopes provides <40µrad LoS stability. Configurable payloads include HD visible, longwave-IR, mediumwave-IR and shortwave-IR cameras. Available laser payloads include illuminator, laser rangefinder and laser marker. Additionally, there are optical and fixed zoom options. Height: 30.48cm Diameter: 16cm Weight: 3.6kg

ADVANCED COHERENT TECHNOLOGIES

EYE-510

The EYE-510 is a series of gimbals designed for use on small aerial platforms. Features include four high-sensitivity spectral charge-coupled device cameras with interchangeable narrow bandpass filters, 8-100mm focal lengths available and a Sony video camera with variable zoom. Additionally, the modular design enables customisation based on mission requirements. Data transmitted via a single GigE line and gimbal controlled via Cloud Cap ViewPoint are also incorporated. Length: 17.8cm Width: 17.8cm Height: 25.9cm Diameter: 17.8cm Weight: 3.67kg

EYE-530

The EYE-530 is a short-wave IR (SWIR) camera gimbal for visible/near-IR multispectral imaging. The system is flexible for use over land or water. It is Tier 2 UAV capable and has a fixed-focus video camera. It can be combined with ACT PPM-100 to create a system with real-time target detection using visible and/or SWIR spectral match filters. Field of view: 10.7nm, 75 bands. Frame rate: 75Hz. Length: 17.8cm Width: 19.02cm Height: 27.2cm Diameter: 19.02cm Weight: 4.08kg

EYE-550

Advanced Coherent Technologies' (ACT's) EYE-550 aerial mapping system uses a Cloud Cap TASE 400 turret equipped with an Allied Vision GT6600 29MP large-format camera with an 85mm FL Nikkor lens, a Vectronix LRF 5020 laser rangefinder and a Sony Block camera. The EYE-550 also includes ACT's Power Processing Module, system control, visualisation and mapping software. Length: 17.8cm Width: 17.8cm Height: 25.9cm Diameter: 17.8cm Weight: 3.63kg

AERIALTRONICS

Pensar

The Pensar is a commercial EO/IR sensor developed by Aerialtronics for use on their proprietary Altura Zenith ATX8 commercial UAS, as well as the Dronevolt Hercules 5 and 10 series. In essence, the sensor combines a daylight camera and a thermal imager into one unit, both of which feed data to a single screen held by the operator. These sensors can be programmed by Aerialtronics according to user requirements, making them suitable for performing a variety of commercial applications. Length: 9.8cm Width: 11.2cm Height: 6.7cm Weight: 0.67kg

AERO SURVEILLANCE

ARDENT

The Airborne Real-time Detection and Notification Sensor Suite (ARDENT) is a multi-sensor payload for small mission aircraft and UAS platforms. Applications include oil & gas pipeline monitoring, power grid inspections, aerial gas leak detection, maritime surveillance, forest fire prevention, mission flight tracking for manned aircraft solutions and ISR. Available optional sensors include magnetometers, direction finders, 3D lidar/independent meta-data generation/open-software architecture based on public standards for API, protocols and data formats.

MPL 30

The Multi-purpose Payload Launcher (MPL 30) system can be adapted onto Aero Surveillance's VTOL line ASV 100 or ASV 150 to launch multiple types of effectors and/or ammunition that are commonly used in law enforcement inventories. This includes CM6 gas grenades, hygroscopic torches and explosives. The system can be deployed from a few hundred metres of altitude to provide real-time imagery of the situation while being positioned to launch supported munitions. Length: 70cm Width: 50cm Height: 50cm Weight: 14.8kg

Mantis i23

AeroVironment's Mantis i23 is a lightweight, compact EO/IR gimbal sensor suite, designed for its fleet of RQ-11B Raven UAS. The Mantis i23 is water-resistant and is able to operate in temperature ranges of –20C to 50C. Features of the gimbal system include a five megapixel camera, a thermal IR 640 x 480 camera, an MPEG video and a laser pointer. Diameter: 7.87cm Weight: 0.39kg

Mantis i45

AeroVironment's Mantis i45 EO/IR gimbal sensor suite is designed for the AeroVironment Puma AE small UAS, providing it with additional intelligence, surveillance and reconnaissance capabilities. Use of the Mantis i45 with the Puma AE reduces the likelihood of detection by increasing the distance between the vehicle and areas of interest while still providing clear images. Higher resolution imagery assists with target analysis, positive identification and enables operators to identify potential threats. Diameter: 10.6cm Weight: 0.85kg

The ASELFLIR-135 is a multi-sensor thermal imaging system that consists of a high-resolution third-generation 3-5µm IR camera, colour day TV camera, laser rangefinder and laser pointer. (Photo: Aselsan)

AIRBORNE TECHNOLOGIES

S.C.A.R. Pod

The S.C.A.R. Pod (Self-Contained Aerial Reconnaissance Pod) is a completely self-contained surveillance pod designed to be easily attached to aircraft. The pod allows for wireless operation and requires no cable connection or airframe modification.

AIRBUS DEFENCE & SPACE (GERMANY)

Reconnaissance Pod

Airbus Defence and Space's fast-jet reconnaissance pod system is in service on German and Italian Tornado aircraft. Length: 410cm Width: 58cm Weight: 380kg

Tactical Reconnaissance Pod System

The Tactical Reconnaissance Pod System was developed as part of an upgrade to keep German Air Force Tornados in service until at least 2025.

ASCENT VISION TECHNOLOGIES

CM62

The CM62 is a lightweight multi-sensor payload for integration into small UAVs. It combines an EO core with 50x optical zoom and a custom long-wave infrared (LWIR) sensor with 8x zoom for improved BLoS situational awareness day and night. Height: 10.3cm Diameter: 6.5cm Weight: 0.22kg

CM142

The CM142 optical payload includes a high definition EO sensor with 30x continuous optical zoom, longwave IR sensor with 3x continuous optical zoom and a laser pointer. Designed to meet UAS payload size and weight constraints, the CM142 is compact and weighs 2.8lb / 1270g. Width: 13.5cm Height: 16.7cm Weight: 1.27kg

CM262

The CM262 is a gyro-stabilised portable optic that includes four sensor configurations, which enables it to operate effectively in a range of harsh environments and in various lighting conditions. It has a 60x optical zoom, HD mediumwave IR with 20x continuous optical zoom, shortwave IR and a laser range finder. The system is optimised with C-UAS Operator Assist software for greater autonomy in C-UAS operations. The CM262 is enhanced for on-the-move operations. Ascent Vision also provides a maritime variant, the CM262M. Length: 39.5cm Width: 26cm Weight: 12kg

ASCENT VISION TECHNOLOGIES/UAV VISION

CM202A

The CM202 is an ITAR-free, gyro-stabilised, multi-sensor camera payload. The low SWaP-C gimbal is suitable for integration onto aerostats, fixed- and rotary-wing aircraft and UAVs. A wide range of sensor configurations, including EO, IR and laser designators, can be accommodated within this gimbal. Width: 19cm Height: 29.5cm Weight: 3.5kg

CM202G

The CM202G 'Gas Hound' is a multi-sensor, gyro-stabilised gimbal for gas leak detection and infrastructure integrity patrols. The optical gas imaging sensor detects hydrocarbon leaks in refineries, pipelines, storage facilities and other installations. Weighing up to 3.5kg and using less than 100W in power, the CM202G can be integrated into manned aircraft and UAVs, as well as other fixed and mobile platforms. Width: 19cm Height: 29.5cm Weight: 3.5kg

CM202U

The CM202U is a multi-sensor, gyro-stabilised gimbal for counter UAS operations. The system is man-portable for transportation in rough terrain. The CM202U has an FOV down to 0.5°, giving operators high levels of zoom for the detection of targets at greater distances. The gimbal is stabilised and incorporates a global shutter sensor for steady and clear imagery. Length: 32cm Height: 32cm Diameter: 20.3cm Weight: 5.5kg

ASELSAN

ASELFLIR-135

The ASELFLIR-135 is a multi-sensor thermal imaging system that consists of a high-resolution third-generation 3-5µm IR camera, colour day TV camera, laser rangefinder and laser pointer. Additionally, all sensors and electronics are mounted on stabilised gimbals housed in a single 38cm turret unit. The ASELFLIR-135 is designed for a range of platforms, including tactical UAVs, helicopters and maritime patrol boats. Width: 37.2cm Height: 41.5cm Diameter: 30.2cm Weight: 35kg

ASELFLIR-200

The ASELFLIR-200 airborne EO system is a multi-purpose IR sensor designed for navigation, surveillance, search and rescue, automatic tracking, target classification and targeting. It uses open architecture with a flexible hardware/software unit, which can be adapted to various naval, ground and air platforms, the latter including fixed- and rotary-wing and unmanned aircraft. ASELFLIR-200 is available in two different configurations: FLIR-only and FLIR+ colour day TV

camera with eye-safe laser rangefinder. Height: 42.3cm Diameter: 33cm Weight: 41kg

ASELFLIR-235

The ASELFLIR-235 is an enhanced multi-sensor targeting and surveillance system. It consists of a high-resolution, third-generation 3-5 µm IR camera, high-resolution day TV camera, spotter camera, laser rangefinder/designator, laser spot tracker and laser pointer. All sensors are mounted onto four-axis stabilised gimbals housed in the 43.2 cm turret unit. The system has multiple target tracking capabilities over all images. Additionally, the eye-safe laser rangefinder/designator is in the turret. Diameter: 43.2cm

ASELFLIR-300D

The ASELFLIR-300 is a multi-sensor EO targeting and surveillance system available in two models: the ASELFLIR-300D for maritime platforms and the ASELFLIR-300T for airborne platforms. Both models consist of a long-wave IR scanning, high-resolution IR camera, laser rangefinder/laser designator, laser spot tracker, colour day TV camera and colour spotter TV camera. A laser pointer can be included as a replacement for the day camera. All sensors are mounted onto four-axis stabilised gimbals housed in a 51cm turret. Height: 63.3cm Diameter: 53.4cm Weight: 95kg

ASELFLIR-300T

The ASELFLIR-300T advanced targeting system is a multi-sensor EO targeting and surveillance system for airborne platforms, including UAS and other fixed- and rotary-wing aircraft. The ASELFLIR-300T consists of an 8-12µm scanning high-resolution IR camera, laser rangefinder/designator, laser spot tracker, colour TV camera and colour spotter camera. The system has multiple target tracking capabilities over all three thermal, TV and spotter sensors. The laser rangefinder/laser detector can designate targets with desired PRF codes. Height: 63.3cm Diameter: 53.4cm Weight: 95kg

ASELPOD

The ASELPOD is a long-range precision targeting system designed for fighter jets. The system provides high-resolution medium-wave IR and day images in two FOVs, automatic target tracking on IR and day videos, and inertial tracking. The IR camera has a third wide FOV for situational awareness and navigation. It includes a dual-band laser designator/rangefinder for delivering laser-guided munitions and eye-safe range measurements. Length: 235cm Width: 43cm Weight: 240kg

CATS

The Common Aperture Targeting System (CATS) is designed for EO targeting and surveillance. The multi-sensor system consists of a high-resolution, Gen III IR camera, high-resolution day TV camera, low-light camera (EMCCD), laser rangefinder/designator, laser spot tracker (optional), laser illuminator and laser pointer. All sensors are mounted onto four-axis stabilised gimbals housed in a 43cm turret. The system has a multiple target tracking capability on IR and day video. It can provide target coordinates, attitude and velocity information. Width: 43.7cm Height: 52cm Weight: 61kg Detection range: 25km

Mini Gimbal

Aselsan's family of Mini Gimbal Electro-Optical Reconnaissance and Surveillance Systems is designed for use on fixed-wing, rotary-wing, mini and micro UAVs. Features of the Mini Gimbal EO system include IR or TV sensors, optional target tracking, optional continuous rotation in azimuth axis and a gyroscope. The sensor used in the gimbal can be replaced in the field without dismounting the payload. Different sensor options are also available for different missions. Height: 18cm Diameter: 12cm Weight: 1.02kg

ATMOLAB

Rex Mini

Rex Mini is a medium-zoom day and thermal camera developed for small UAVs. Rex Mini has been designed for various military and civil applications, including SAR, surveillance, facility inspection and law enforcement. The gimbal system has a wide temperature range and can be used in low visibility, dry and wet weather conditions, and harsh environments. It is available in two variants, standard or retractable (RG). Width: 9.6cm Weight: 0.75kg

Rex Mk II

The Rex Mk II is a high-zoom day and thermal camera developed for small UAVs. Rex Mk II has been designed for various military and civil applications, including SAR, surveillance, facility inspection and law enforcement. The gimbal system has a wide temperature range and can be used in low visibility, dry and wet weather conditions, and harsh environments. The day camera is fitted with a defog option for hazy environments and an IR sensor for up to 0.01 Lux light operation. Width: 12cm Height: 15.5cm Weight: 1,000kg

AVIATION SPECIALTIES UNLIMITED

OWLS

Observation Wide-area Low-altitude Sensor (OWLS), demonstrated at Heli-Expo 2015, is a two-axis micro gimbal imager that combines a night vision sensor and an image-stabilised enclosure. Adapted for small UAVs, the new sensor is lightweight and also has the potential for use on manned aircraft. Functions include airborne target tracking, surveillance and reconnaissance. It can be used in demanding mission environments, including AES and fire-fighting activities. Diameter: 11.43cm Weight: 2kg

AVIC – AVIATION INDUSTRY CORPORATION OF CHINA

Loong Eye LE380

The Loong Eye (Dragon's Eye) LE380 is a two-axis stabilised gimbal incorporating EO/IR sensors in addition to laser designators and laser rangefinders. Originally developed by the Luoyang Opto-Electro Technology Development Centre (LOEC), the LE380 has been fitted to the People's Liberation Army Air Force (PLAAF) Wing Loong I fixed-wing MALE drones. Height: 55.5cm Diameter: 38cm Weight: 39kg

BAE SYSTEMS ELECTRONIC SYSTEMS

AWAPSS

Airborne Wide-Area Persistent Surveillance Sensor (AWAPSS) is a day/night system in a 532mm turret. It can be integrated on multiple aircraft types, including fixed-wing, rotary-wing and unmanned platforms. The system is able to support a wide range of missions, including border surveillance, port surveillance and urban surveillance. AWAPSS simultaneously images an 8km swath in both EO and IR with enough resolution to track both vehicles and dismounts. Noise Equivalent Temperature Difference: 40mK. Height: 68.58cm Diameter: 53.34cm Weight: 96kg

BAE SYSTEMS

Digitally Fused Sensor System

BAE Systems launched the Digitally Fused Sensor System (DFSS) for UAVs at the 2013 AUVSI exhibition in Washington. According to the company, the DFSS is the smallest day/night fused camera available. It dynamically adjusts to operating from full sun to full dark and identifies objects that would otherwise be missed. It highlights people and vehicles while providing high levels of detail. Length: 7cm Width: 5cm Height: 5cm Weight: 0.17kg

BCB INTERNATIONAL

UXG-100

The UXG-100 is a three-axis high-speed gyro-stabilised brushless gimbal mount. It is designed to accommodate any generic video and photo camera weighing up to 1.5kg. This system can be mounted as a payload on the SQ-4 and W-201 UAS, both of which are also developed by BCB International. Weight: 1.25kg

UXG-300

The UXG-300 is a two-axis high-speed gyro-stabilised gimbal. Incorporating a daylight charge-coupled device camera manufactured by Sony, this gimbal can pan through 360° and tilt from -105° to +105°. It can be fitted as a payload to either the SQ-7 or the W-201 UAS, which are also both designed by BCB International. Weight: 1.6kg

UXG-350

The UXG-350 is a two-axis high-speed gyro-stabilised gimbal. Incorporating both a charge-coupled device daylight camera manufactured by Sony and a thermal IR camera. This gimbal can pan through 360° and tilt between -105° and +105°. It can be mounted as a payload on the SQ-7 and the W-201 UAS, both of which are also manufactured by BCB International. Weight: 1.6kg

UXG-350-NIR

The UXG-350-NIR is a two-axis high-speed gyro-stabilised gimbal. Incorporating both a CCD daylight camera manufactured by Sony and a thermal IR camera, it can pan 360° and tilt from -105° to +105°. This system can be differentiated from the base UXG-350 by its higher resolution thermal IR camera. It can be mounted as a payload on the SQ-7 and W-201 UAS, both of which are also manufactured by BCB International. Weight: 1.6kg

CANON

5D

The Canon 5D EO camera is a lightweight sensor that has been designed for small UAVs. Additionally, it has been installed on Versa X6 hexacopter UAVs. Length: 7.6cm Width: 15cm Height: 12cm Diameter: 3.5cm Weight: 0.8kg

S110

The Canon S110 NIR and S110 RE cameras are small lightweight payloads that can be used on mini-/micro-UAVs, and are installed on the senseFly eBee fixed-wing UAV. Length: 27.94cm Width: 9.91cm Height: 5.84cm Diameter: 1.5cm Weight: 0.17kg

SL1

Canon SL1 camera (also known as EOS 100D, Rebel SL1 and EOS Kiss X7) is a commercial sensor which is light enough for use on small UAVs. Length: 7cm Width: 12cm Height: 9cm Weight: 0.41kg

CHEMRING TECHNOLOGY SOLUTIONS

Miniature Vibration Data Logger

The Miniature Vibration Data Logger is fully self-contained, small, lightweight, robust and programmable for various data-gathering scenarios. It is certified for airborne applications (F100A) and is proven on various aircraft, including fast jets, helicopters, heavy aircraft and UAVs. The vibration data loggers are an unobtrusive and time-efficient means of data gathering.

VTA

The Visual Target Analysis (VTA) is claimed to be the first moving target indicator system that immediately tracks and maps vehicle and personnel movement within real-time UAV surveillance footage. This provides support to an operator when reviewing UAV video data, both in real-time and offline scenarios. The system helps to filter and classify ground movement, reducing the burden when reviewing aerial video footage.

CHESS DYNAMICS

Hawkeye AD

Hawkeye Air Defence (AD) is an integrated sensor suite optimised for acquisition, tracking, classification and engagement of air targets from fixed and mobile platforms. The system's combination of frequency-modulated, continuous-wave Doppler radar and EO sensors enables operation against a wide range of targets 24h a day in all weather conditions. It is derived from the Sea Eagle naval fire control system for the land domain. Length: 62.3cm Width: 60.6cm Height: 85.6cm Diameter: 93.5cm Weight: 100kg Detection range: 15,000m

COLLINS AEROSPACE

MS-177

The MS-177 is an EO/IR sensor designed to enhance the strategic ISR capabilities of the US military's RQ-4 Global Hawk UAS over land and maritime environments. Development of the SYERS-2 sensor, fitted to the U-2S fixed-wing aircraft, the MS-177

adds the ability to pivot the sensor unit forwards and backwards, as well as side to side. According to the manufacturer, UTC Aerospace, the MS-177 will offer the best long-range image resolution and greatest coverage per hour than any other ISR sensor in the US military inventory. Weight: 227kg

CONTROP PRECISION TECHNOLOGIES

A-View

The A-View is a lightweight EO/IR gyro-stabilised payload installed on helicopters and fixed-wing aircraft for night mission support purposes. It was designed for observation and surveillance at close ranges. The A-View incorporates an IR continuous-zoom lens that operates in observation mode, providing real-time IR video and an optional day TV charge-coupled device. It also has an optional navigation capability with point-to-coordinate and hold-to-coordinate modes.

D-STAMP-HD

The D-STAMP-HD payloads are miniature, lightweight, EO, stabilised, airborne sensors which are designed to be carried by a miniature UAV, for tactical "Over-the-Hill" reconnaissance in daylight. The D-STAMP-HD has a 1/3" CMOS and x9 / x20 continuous optical zoom. Diameter: 13cm Weight: 0.86kg

DANIS

The Day and Night Integrated System (DANIS) is a short-range (up to 1,000m) day and night observation camera system for security applications. The mechanical two-axis system also consists of a remote-controlled pan/tilt gimbal enabling LoS control in elevation and azimuth. Length: 35cm Width: 18cm Height: 17.7cm Weight: 10kg

FOX

The FOX family, consisting of the FOX-250, FOX-450 and FOX-720, are thermal imaging cameras with a continuous zoom lens. The cameras can be supplied with an enclosure (ZE) or without (Z). Video from FOX family cameras can be seen on a remote monitor and operated by an external control panel or by means of an RS422A communication channel.

The iSea-25HD is a gyro-stabilised EO/IR sensor gimbal that has been specifically optimised for use in naval environments. (Photo: Controp Precision Technologies)

FOX-1400

The FOX-1400 thermal imaging camera has a continuous optical zoom lens, image enhancement capabilities and auto-focus through zoom. This long-range observation IR camera includes local automatic gain control (AGC) algorithms, remotely controlled zoom and focus adjustment, as well as black or white hot polarity. Additionally, gain/level control is automatic, manual or local automatic gain control. Length: 40.7cm Width: 26.5cm Height: 28cm Weight: 11kg

iSea-25HD

The iSea-25HD is a gyro-stabilised EO/IR sensor gimbal that has been specifically optimised for use in naval environments. Incorporating a daylight camera, thermal imager and laser rangefinder, this system can provide surveillance capabilities for maritime vessels and naval remote weapon stations. It is, therefore, suitable for a wide range of civil and military applications, including search and rescue, border surveillance, exclusive economic zone protection, counter-piracy and special operations missions. Diameter: 22cm Weight: 13kg Detection range: 14.8km

iSea-50HD

The iSea-50HD is part of a family of surveillance systems designed for day and night operations in harsh maritime environments. iSea variants have been installed on a range of platforms, including coast guard and naval ships and manned and unmanned vessels. The four-gimbal system is gyro-stabilised and has 22.5x continuous zoom, an optional eye-safe laser rangefinder, an optional laser pointer and an automatic target tracker. Diameter: 35.4cm Weight: 29kg Detection range: 27.78km

iSky-30HD (QUAD-HD)

The iSky-30HD is a compact day/night observation system configured for helicopter, light aircraft, marine patrol boat and UAV applications. The system comprises three gyro-stabilised gimbals. Sensors include a thermal imager, charge-coupled device camera, optional laser rangefinder and optional laser pointer. The QUAD-Air also has an automatic target tracker, built-in image enhancement and local automatic gain control capabilities. The QUAD-Air is operated by a ruggedised control unit with a thumb line-of-sight control stick, designed for rough environment conditions. Width: 30.5cm Height: 43cm Weight: 21kg Detection range: 18km

LDP

The LDP stabilised payload is a day and night designator/observation system for targeting missions configured for use on helicopters, marine patrol boats and UAVs. The four-gimbal system is gyro-stabilised in azimuth and elevation. This allows the EO sensors' line of sight to be aimed and maintained, stabilised in any orientation in the field of regard while independent of the platform's attitude and motion. Sensors include a thermal imager, charge-coupled device or full HD camera, laser rangefinder/laser designator and optional laser pointer. Height: 57cm Diameter: 35cm Weight: 3.5kg

M-STAMP

The Multi-Sensor Stabilised Miniature Payload (M-STAMP) is designed for use onboard small and VTOL

UAVs, small manned aircraft, aerostats and balloons, as well as manned and unmanned ground and maritime vehicles. Payload configuration includes gyro-mechanical stabilisation subsystems, a charge-coupled device with continuous zoom lens, uncooled forward-looking IR with a dual-FOV lens and an optional laser pointer. A variety of mounting options are also available. Height: 17.8cm Diameter: 15.2cm Weight: 1.3kg

MEOS-720/1200

Wide-area, passive, real-time, EO stabilised intruder detection system which automatically detects motion in a wide panoramic view and may be installed on a mobile platform and/or high mast. It is designed for long-range missions, such as coastal surveillance and border control, as well as security of high-value sensitive installations. The MEOS pan-and-tilt modular system can incorporate an IR camera with a 22.5x zoom lens, a colour daylight TV camera and an optional eye-safe laser rangefinder.

SPEED-A

SPEED-A is an EO/IR observation system designed for mounting on aerostats and has been in service since 2008. SPEED-A features four sensors that include a thermal imaging camera with a 600mm continuous optical zoom lens, a day TV charge-coupled device with a 300mm continuous optical zoom lens, a laser rangefinder for target position and a laser pointer for marking targets. It also has three-axis stabilisation. Weight: 22.5kg

SPEED-LR

The Stabilised Panoramic Automatic Intruder Detection and Recognition – Long Range (SPEED-LR) EO/IR gyro-stabilised system provides automatic intruder detection and recognition. Sensors include an IR camera, charge-coupled device (CCD) camera, B&W; CCD camera (spotter), laser rangefinder and laser pointer for target marking. The SPEED-LR is a passive system with no RF radiation. Additionally, it provides a 'virtual fence' on a mobile ground vehicle, with long and variable ranges of several kilometres. Width: 62cm Weight: 36kg

SPEED-V

The Stabilised Panoramic Automatic Intruder Detection and Recognition System, designed for manned and UGV platforms using tall mast mounting, is a long-range EO/IR gyro-stabilised panoramic automatic intruder detection and recognition system. Sensors include an IR camera for observation and scanning, a charge-coupled device camera for observation and scanning, a charge-coupled device TV Spotter camera for long-range observation or high resolution, a laser rangefinder for target location coordinates and a laser pointer for target marking.

SPIDER

The Stabilised Panoramic Automatic Intruder Detection and Recognition (SPIDER) system is a wide-area, passive, real-time EO system that automatically detects motion in a panoramic view and may be installed on a mobile platform and/or high mast. This EO/IR system incorporates a thermal imaging camera with a 22.5x zoom lens, a daylight TV camera and an eye-safe laser rangefinder. The scanning sector is up to 360°. Width: 61.7cm Weight: 28kg

T-STAMP-XD

The T-STAMP-XD is an EO gyro-stabilised airborne system. It is designed to be carried by UAVs, small civil or military helicopters and fixed-wing aircraft for tactical 'over-the-hill' day/night reconnaissance. The IR camera uses cooled or uncooled technology and is operated by a portable control and display unit. The system has a ruggedised built-in inertial navigation system on LoS. The GPS feature is also integrated with INS and a laser pointer. Diameter: 22cm Weight: 5.75kg Detection range: 15km

T-STAMP-XR

The Triple-sensor Stabilised XR (T-STAMP-XR) is a variant of Controp's STAMP stabilised miniature payload family. The T-STAMP-XR is a small, lightweight, EO gyro-stabilised airborne system, designed to be carried by a UAV or aircraft for tactical 'over-the-hill' day/night reconnaissance. Additionally, the gimbal system can be used for various other missions, including real-time situational awareness, force protection, SAR, and maritime patrol. Diameter: 17.8cm Weight: 3.5kg Detection range: 12km

U-STAMP

Controp provides stabilised miniature payloads for use onboard small UAVs, VTOL UAVs, small manned aircraft, aerostats and balloons, manned and unmanned ground and maritime vehicles. Payload configurations include a gyro-mechanical stabilisation subsystem, charge-coupled device (CCD) camera for daytime use or uncooled IR camera with a continuous zoom lens for night-time operation: D-STAMP with CCD, HD-STAMP with HD CCD, U-STAMP with uncooled IR. There are a variety of mounting options for this compact, lightweight mini-payload. Height: 14cm Weight: 1.25kg

CONTROP USA

Tornado-ER

The Tornado-ER is an EO panoramic scanning and automatic maritime target detection system that can automatically detect a range of land and maritime targets, including swimmers and vessels of all sizes. Able to operate in all weather conditions, the Tornado-ER has been designed for a range of applications, including port security, vessel traffic system, coastal surveillance and maritime traffic control in coastal areas. Weight: 75kg Detection range: 12km

DASSAULT AVIATION

Harold

Harold is an oblique-view strategic reconnaissance pod for fast jets, used on the Mirage F1 and Mirage 2000.

DEFENCE VISION SYSTEMS

Camera Systems

Defence Vision Systems' standard camera and custom-built systems range from visible to near-IR and are designed to provide a 24h capability, working from full sunlight down to starlight. Systems include intensified charge-coupled device sensors, indium gallium arsenide sensors, short-wave IR offering low- and high-resolution types and scientific complementary metal-oxide

semiconductor (currently available as 2MP but shortly also a 4MP version). The systems offered are plug-and-play devices with camera optimisation of the image carried out in real time.

DJI

Zenmuse X5R

DJI's Zenmuse X5R is an aerial camera equipped with Micro Four Thirds sensors. The X5R, which is able to operate in temperate ranges of 0°- 40°C, was designed to be compatible with the Phantom 1 UAS, can accommodate systems such as Skybox's gimballed camera system. Length: 13.6cm Width: 12.5cm Height: 13.1cm Weight: 0.58kg

Zenmuse Z30

DJI's Zenmuse Z30 is an integrated gimbal camera with a detachable mount. The Zenmuse Z30, which is able to operate in temperate ranges of -10° to 45° C, is compatible with DJI's Matrice 100 (M100) and Matrice 600 (M600) unmanned platforms. The camera can be used for various applications including cell tower inspection, wind turbine inspection and firefighting. Length: 15.2cm Width: 13.7cm Height: 6.1cm Weight: 0.56kg

DST CONTROL

OTUS-L170

The OTUS-L170 is a gyro-stabilised micro gimbal that can fit up to two daylight or thermal imagers (payload option according to customer-specific requirements). All electronics are also embedded in the unit. Optional features include geo-positioning, geolocation, laser rangefinder and video auto-tracker. Height: 24cm Diameter: 17cm Weight: 1.7kg

OTUS-L205

The OTUS L205 is a high-performance gyro-stabilised micro gimbal with a multi-sensor capability, which can fit a combination of daylight or thermal imagers according to customer-specific requirements. All electronics are embedded in the unit. Height: 27cm Diameter: 21cm Weight: 2kg

OTUS-U135

OTUS-U135 is claimed to be one of the smallest and lightest gimbals on the market. It is a two-axis gyro-stabilised micro gimbal with all electronics embedded in the unit. According to customer-specific requirements, payload options include daylight or thermal imager. Height: 19cm Diameter: 14cm Weight: 0.9kg

OTUS-U250

The OTUS-U250 is a four-axis gyro-stabilised multi-sensor gimbal that can be equipped with a combination of daylight, uncooled or cooled thermal sensors (payload option according to customer-specific requirements). All electronics are embedded in the unit. Height: 34.2cm Diameter: 25.4cm Weight: 12kg

Saitis 640

The Saitis 640 is claimed to be one of the smallest thermal long-wave IR cameras on the market. It is a Swedish-manufactured IR imager with low power requirements and a range of interfaces and high exportability. The system is based upon an uncooled microbolometer focal plane array with 640x480px resolution. The camera is ready to use without any training. Additionally, all image processing is executed on board and no external units are required. Length: 3cm Width: 3cm Height: 3cm Weight: 0.02kg

ELBIT SYSTEMS INTELLIGENCE AND ELECTRO-OPTICS – ELOP

AMPS

The Advanced Multi-sensor Payload System (AMPS) is a long-range target detection and recognition system. It is capable of operating in day/night and adverse weather conditions. The AMPS sensor array is adapted to customer requirements and typically includes two day TV charge-coupled device cameras, a forward-looking infrared sensorand an intensified charge-coupled device sensor. The airborne EO payload features autonomous navigation with an inertial system and GPS, geolocation and geo-pointing capabilities. Weight: 85kg

Condor 2

The Condor 2 is an EO/IR long-range oblique photography (LOROP) system for aerial reconnaissance. It provides simultaneous high-resolution visible and IR images, covering wide areas in a 'short' time span. The Condor 2 includes the pod itself, a wideband data link transmitter, fixed and transportable image exploitation stations, environmental control units and power supply. Incorporating a long focal-length EO camera, the autonomous system can operate from a variety of platforms at altitudes of up to 50,000ft.

Condor TAC

The Condor TAC is a dual-band, tactical, aerial reconnaissance photography system. Designed for day and night use, it provides high-resolution wide-area coverage, visible and IR mono and stereo imaging from low to high altitudes. Georeferencing capability is provided by the INS/GPS embedded in the camera. Mounted in an aerodynamically shaped pod, the Condor TAC contains a system management and video processing unit, wideband data link for real-time image transmission and solid-state data recorder.

DCoMPASS

The Digital Compact Multi-Purpose Advanced Stabilised System (DCoMPASS) is one of the newest members of Elbit Systems' stabilised EO CoMPASS family. It is currently in service with customers across the world and was selected for the UK Watchkeeper UAV programme. DCoMPASS is a stabilised EO payload that has a digital open architecture with day and night ISTAR capabilities in harsh weather conditions. Diameter: 38cm Weight: 38kg

SWORD

Surveillance and Warning Obstacle Ranging and Display (SWORD) is an eye-safe laser radar designed for helicopters. It is used for the detection of man-made and natural obstacles with a warning time greater than 8s at a flying speed of 170kt. With a 100° field of regard, the system 'looks into the turn' and can provide an alert

at least 8s before collision even in a sharp turn. The system provides alerts only for obstacles that endanger the helicopter.

ELBIT SYSTEMS

Spectro XR

Spectro XR is a day/night ultra-long-range ISTAR system that provides a 20in payload performance in a 15in payload. Designed for land, naval, fixed- and rotary-wing platforms, the Spectro XR can operate during the day and night and in adverse weather conditions. Additionally, it is equipped with a wide range of digital imaging, high definition sensors and lasers. Height: 50cm Diameter: 41.5cm Weight: 52kg

GEM ELETTRONICA

EOFCS-115A

Electro-optical fire control system (OEFCS) 115A is a compact, precision target tracking system designed for naval environments. The system provides tracking, elevation and range data to a fire control or command system for target indication and weapon control purposes. It can be used as a remote observation and tracking sensor for navigation and surveillance. Width: 450cm Height: 98.7cm Diameter: 40cm Weight: 0.07kg Detection range: 20,000km

GENERAL DYNAMICS MISSION SYSTEMS

V14-HS

The V-Series offers gyro-stabilised EO/IR and HD gimbal systems, providing real-time, day and night situational awareness and long-range threat detection. With searchlight controls, laser illuminating and geo-pointing functions, the V-Series camera systems can help detect and identify entities, as well as determine if a threat is hostile. The V14-HS camera system includes a high-sensitivity 3CMOS sensor for high-contrast colour imagery in dark, misty and foggy conditions. The gimbal incorporates noise reduction, de-haze and IR-pass functions. Length: 50.8cm Width: 33cm Height: 12.7cm

V-14-LRx

The V-Series offers gyro-stabilised EO/IR and HD gimbal systems while providing real-time, day and night situational awareness and long-range threat detection. With searchlight controls, laser illuminating and geo-pointing functions, V-Series camera systems help detect and identify entities and determine if a threat is hostile. The V14-LRx is a dedicated 'Spot Ball' imaging system, which has high magnification, continuous zoom optics for the IR and daylight video channels.

V-14HD

With a five-axis gyro-stabilised gimbal assembly, the V-14HD is designed to provide 1080p HD imagery with high stability. The system's capture device, the Sony HDC-1500, provides high-colour clarity and resolution for improved target identification at long ranges. It Includes five-axis stabilisation, HD imagery, interchangeable lens options and is easily integrated into existing systems.

GLOBAL INDUSTRIAL & DEFENCE SOLUTIONS (GIDS)

Zumr

Zumr is a series of airborne imaging equipment, housing an EO/IR multi-sensor suite for surveillance and targeting. The Zumr-I is equipped with a thermal imager, colour low-light/near-IR TV camera and an eye-safe laser rangefinder. The Zumr series (I/II) are mission-specific systems that can be integrated on both fixed- and rotary-wing platforms for medium- and high-altitude operations. Zumr-I/II series includes a gimbal-mounted inertial measurement unit for accurate geo-pointing/location during a mission.

GOPRO

GoPro Hero

The GoPro Hero is a family of small, lightweight, commercial cameras introduced in 2004 with mostly sport and recreational applications but which have also been installed on small rotary- and fixed-wing UAVs. Length: 2.1cm Width: 5.9cm Height: 4.1cm Diameter: 1.27cm Weight: 0.07kg

HANWHA SYSTEMS

EOTS-31

EOTS-31 is an EO tracking system for fixed-wing aircraft, helicopters and UAVs. Sensors include mediumwave thermal imager (TI) and TV camera. TI include 640x480 element, 3-5µm (actually 3.7-4.8) and cooled HgCdTe detector. TV camera feature charge-coupled device with >480 lines resolution and FOV 20.4x15.6-2.2x1.60°. Additionally, stabilisation accuracy includes <50µrad with environmental standards being MIL-STD-810E and 461D. Width: 35.4cm Height: 51cm Weight: 37kg

HELIATICA

Geodetic photomapping and monitoring payload and blind zone cameras

Heliatica unveiled a geodetic mapping and monitoring payload with Geoscan at Heli-Expo 2017. The system is designed to fit two Sony DSC-RX1 (24MP resolution) cameras or one Phase One iXU (50-100MP resolution) camera. It is supplied with GPS/GLONASS geodetic receiver for geotagging accuracy (up to 5-10cm) and a kneeboard tablet PC for mission planning and execution control.

HENSOLDT OPTRONICS GMBH

Argos-II HD/ HDT

The ARGOS-II HD airborne multi-sensor observation system's main features include a continuous zoom HD multi-spectral camera and an HD Gen III TI for situational awareness day and night. It also has an internal IMU and GPS for geo functions, real-time onboard image processing and a multiple video and communication interface with onboard ancillary equipment. Argos-II HD can be installed on fixed- and rotary-wing aircraft as well as UAVs and aerostats. Length: 49.5cm Width: 41cm Weight: 50kg

Goshawk-II HD/HDT

The Goshawk-II HD/HDT airborne observation and targeting system consists of an integrated stabilised turret assembly that houses all sensors and electronics in a single unit. It is designed for medium- to low-altitude smaller-dimension, low-mass applications such as small fixed-wing aircraft, helicopters and UAVs. The sensor pack contains the Attica third-generation mediumwave infrared thermal imager, HDTV zoom camera, laser rangefinder or laser designator. The Goshawk-II has digital image enhancement, laser designator and optional GEO functions and GPS. Length: 45cm Weight: 14kg

LEO-II-A5 EP

The LEO-II-A5 EP airborne observation system is a COTS, gyro-stabilised platform containing a multi-sensor payload and a laser pointer which is available simultaneously in the turret. Equipped with up to three long focal-length optical sensors, the LEO-II-A5 EP enables surveillance from high altitudes and large slant distances. It provides extended video downlink coverage and covert surveillance capabilities. According to Hensoldt, this system provides the operator with high picture performance during all operational conditions, enhancing safety and covert surveillance.

LEO-III-HD

The LEO-III-HD is an airborne observation system with HD sensors and video outputs. It is a COTS, gyro-stabilised platform containing a multi-sensor HD payload that can be equipped with up to nine sensors simultaneously. The LEO-III-HD is designed for airborne law enforcement and homeland security observation.

SERO 250

The SERO 250 is a compact submarine periscope that can be installed in both new-build and upgraded boats. Little or no structural modifications are required for installation. It makes use of existing hoisting mechanisms, bearings and seals. The SERO 250 can be used for observation during the day and is equipped with an IR camera for night vision. It serves to monitor surface and air activity, collect navigational data and detect and identify targets. Height: 1,100cm Diameter: 19.05cm

SERO 400

The SERO 400 submarine periscope provides a panoramic view of the surroundings on the water's surface and in the airspace above without exposing or comprising the vessel. Integrated optics, optical cameras, Gen III thermal imager and laser rangefinder enable the user to determine the heading and distance to observed objects. The cameras also take pictures for documentation and subsequent analysis. The system is able to conduct a 360° quick look round in 3 seconds. Diameter: 19.05cm

VOS 40/500

The VOS 40/500 is an ITAR-free VOS EO zoom camera that integrates into stabilised sensor compartments of reconnaissance and surveillance systems. The camera provides HD images across its full field from the centre to the edges using Zeiss optics. The VOS camera delivers NIIRS 6 imagery at a 14km slant range in its narrow field of view at a 500mm focal length with a frame rate of up to 39Hz. Weight: 8kg

Z: NightOwl M

The Z: NightOwl M is a long-range surveillance system for the protection of critical infrastructures, borders and coastlines. It offers a 360° panoramic view with a long-range colour zoom camera with up to 330x continuous zoom and a thermal imager with up to 200x continuous zoom. Its 15° wide FOV also offers visuals for detection while the 0.3° narrow FOV captures details necessary for identification. Width: 51.7cm Height: 103.9cm Diameter: 95.1cm Weight: 88kg

Z: NightOwl ZM/ZM-ER

The Z: NightOwl ZM is an ITAR-free surveillance system developed for long-range observation. The combination of a large FOV for wide-area observation as well as a small FOV for target spotting provides situational awareness. It fulfils the requirements of land and coastal border surveillance and is also suited for the protection of critical infrastructure.

HOODTECH VISION

AC-5O HD

The AC-5O is a 4-axis, gyro-stabilised gimbal system, which features coordinate hold mode, as well as embedded video stabilisation and tracking. It includes pan-over-tilt imaging suitable for small UAVs that require lower power. The system has a 1280x720HD daylight embedded video server, network interface, dual-mode operation, network/serial and analogue video, as well as an onboard SD card for video recording. Weight: 0.75kg

Alticam 05EO5

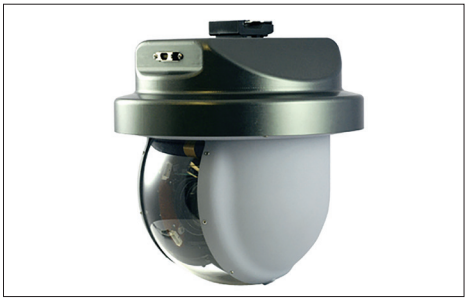
The Alticam 05EO5 EO payload features pan-over-tilt imaging for small UAS requiring video that uses lower power. This leaves extra space and power for multiple intelligence sensor configurations on the same platforms. The four-axis, gyro-stabilised gimbal system includes co-ordinate hold mode, embedded video stabilisation and tracking with embedded video server and network interface (optional). Its dual mode operations include 05EO1 network/serial or analogue video and 05EO2 network/serial and analogue video. Weight: 0.75kg

Alticam 09 EO2

The Alticam 09 EO2 provides EO capability in a lightweight and compact form for small UAVs, piloted planes, blimps, ground vehicles and unmanned surface vehicles. Multi-INT capability is provided by the system's low weight and power requirements. The turret provides onboard Alticam video processing which enhances the system's performance with stabilisation, tracking and de-jitter. Weight: 2.9kg

Alticam 09MWIR3.5

The Alticam 09MWIR3.5 provides day and night EO capability in a small, lightweight, low gimbal system. The 09MWIR3.5 is designed to free up the power and weight needed to add multi-INT capability to a platform. The unit articulates roll-over-tilt and provides pneumatic and static signals. This turret also provides onboard Alticam Video Processing which enhances the capability of the



The AC-5O is a 4-axis, gyro-stabilised gimbal system, which features coordinate hold mode, as well as embedded video stabilisation and tracking. (Photo: HoodTech Vision)

turret by providing stabilisation, tracking and de-jitter. Weight: 3.3kg

Alticam 11EOIR4

The HoodTech 11EOIR4 EO payload provides day/night capability in a small, lightweight, low-power gimbal system. The low weight and power requirements allow users to add multi-INT capability to platforms. The system features mid-wave infrared and EO imaging housed in a gyro-stabilised gimbal system as well as a laser pointer and rangefinder. Weight: 4kg

Alticam AC-5 EO5

The Alticam AC-5 EO5 EO system features pan-over-tilt imaging for small UAS requiring EO video that uses lower power. This leaves extra space and power for multiple intelligence sensor configurations on the same platforms. The four-axis, gyro-stabilised gimbal system includes co-ordinate hold mode as well as embedded video stabilisation and tracking. The AC-5 EO5 provides a variety of different mounting solutions. Weight: 0.75kg

Alticam AC-9 EO2

The AC-9 EO2 is HoodTech's second-generation telescopic EO payload. Housed in a small, lightweight, low power solution, the AC-9 EO2 frees up the power and weight needed to add multi-INT capability to a platform. The system features telescopic EO imaging, a gyro-stabilised gimbal system, onboard video processing and an articulated nose enclosure. Weight: 2.9kg

Alticam AC-9 EOIR2

The AC-9 EOIR2 gyro-stabilised imaging system is designed for use on UAVs and can also be used on USVs, blimps, piloted fixed-wing aircraft and ground vehicles. It includes a mediumwave infrared (MWIR) imager and EO imager. An optional laser pointer that operates at 830nm, 150mW and 1.0mrad is available. HoodTech's onboard Alticam video processor permits picture-in-picture display for both MWIR and EO imagers. Other video functions include de-jitter, auto-tracking, sharpness, de-noise, equalisation and contrast enhancement. Weight: 3.3kg

Alticam AC-10

The AC-10 has MWIR and EO imaging. It is designed for small UAVs, piloted aircraft and is adaptable to blimps, ground vehicles and unmanned surface vehicles. The system uses gyros and IMU with long-range day/night optics, including 1.6° min FOV cooled mediumwave infrared thermal, and 1.1° min HD charge-coupled device for daylight. Both images are also aligned with continuous zoom. Weight: 5.7kg

Alticam SAR Pod

The Alticam SAR Pod is a combination of iMSAR NanoSAR and the Alticam AC-9 EOIR2 payload. The system is designed to be mounted on manned or unmanned aircraft. It provides the real-time capability to aim the day or night cameras to a point of interest that has been identified by the iMSAR NanoSAR.

Hood Tech 07EO1

The Hood Tech 07EO1 gyro-stabilised gimbal system includes an EO imaging component that operates in the visible spectrum from 400-900nm. The imager's horizontal field of view is 1.7-57° with a 36x continuous zoom. Additionally, the gimbal sequence is pan-over-tilt. The 720x480px sensor system has multiple operating modes. HoodTech's proprietary Alticam Video System is included and provides composite NTSC video output. The 07EO1 stabilisation system also permits full 36x continuous zoom operations in rough air or turbulence.

Hood Tech 09EO1

The new HoodTech 09EO1 gyro-stabilised imaging system is designed for small UAVs and other long-range stabilised imaging from unstable platforms. It features a continuous high-zoom (160x, 0.3° horizontal field of view (HFOV)) EO imager with 1.7-48.7° HFOV and an EO telescope imager with 0.1-0.6° HFOV. Both the EO imager and telescope have 640x480px and feature onboard video processing to accommodate de-jitter, auto-tracking, sharpness, noise cancellation, equalisation and contrast enhancement, as well as making the 09EO1 suitable for airborne ISR applications. Length: 30cm Diameter: 20cm Weight: 3.47kg

Hood Tech 11EOIR1

The HoodTech 11EOIR1 is a four-axis, gyro-stabilised imaging system that includes continuous-zoom EO and MWIR imagers, a laser pointer and an eye-safe laser rangefinder. The rangefinder operates at greater than 2,000m on NATO target, and the laser pointer operates at 830nm, 150mW and 1.0mrad. Weight: 5.7kg

HoodTech 09MWIR2

The HoodTech 09MWIR2 features mediumwave IR imaging in the gyro-stabilised gimbal system with multiple operating modes. It is designed for use on UAVs and unmanned surface vessels as well as piloted, fixed-wing aircraft, blimps and ground vehicles. It is available with an articulated nose enclosure and compatible with HoodTech Vision's Alticam video processing board that provides composite NTSC video output. Length: 30cm Width: 20cm Weight: 3.4kg

HOODTECH VISION/INSITU

Alticam 14

The Alticam 14 is an EO/IR sensor designed to be used on the Integrator UAS. Based on the EO900 sensor integrated on the ScanEagle drone, the Alticam 14 features a telescope to provide enhanced zoom and a

wider FOV for the EO and medium wave infrared (MWIR) cameras. These features result in higher resolution images for ISR. The Alticam 14 has been developed in conjunction with HoodTech Vision.

IAI TAMAM

LOROS

Long-Range Observation System (LOROS) is a gyro-stabilised turret with four sensors, designed for surveillance and intelligence missions. Sensors include Gen III 3-5µm thermal imager, colour charge-coupled device (CCD) with zoom lens, black-and-white CCD with spotter lens, intensified CCD camera and laser rangefinder. LOROS features automatic target tracking, image processing and long-range video and data downlinks. Weight: 85kg

M-19 HD

The M-19 HD multi-sensor, multispectral, HD observation and targeting payload was unveiled at the Paris Air Show in June 2015. It can incorporate up to seven sensors simultaneously and enables continuous day/night surveillance in all weather conditions. Length: 57.6cm Width: 57.6cm Height: 69.4cm Diameter: 57.6cm Weight: 85kg

MicroPOP

IAI has upgraded the Micro Plug-In Optronic Payload (Micropop). It is an observation payload designed for integration on small UAVs and UGVs, including the IAI BirdEye 650/650D/400 and loitering munitions such as IAI's Green Dragon. The MicroPOP is built on a one LRU carrying a single sensor that can be switched in minutes. Sensors contain either a continuous zoom colour camera or an uncooled thermal imaging camera. Height: 19cm Diameter: 11.43cm Weight: 1.2kg

MOSP3000

The Multi-Mission Optronic Stabilised Payload (MOSP) 3000 HD is an optimised family of four-gimbal stabilised EO payloads for various platforms. This includes UAVs, helicopters, fixed-wing aircraft, vessels and ground applications. Height: 55cm Diameter: 38cm Weight: 32kg

NanoPOP

NanoPOP is a miniature stabilised day/night payload incorporating an uncooled longwave IR thermal imager and HD day EO camera. NanoPOP provides mechanical image quality stabilisation for mini and micro fixed-wing and VTOL UAS. Height: 9cm Diameter: 5.8cm Weight: 200g

POP-300 family

The Plug-in Optronic Payload (POP-300) is a small EO/IR/laser payload for manned and unmanned airborne, land or maritime platforms and for coastal surveillance applications. The POP-300 carries sensors in interchangeable 'slices' mounted on a gyrostabilised turret. The system's electronics are contained within the turret. Available configurations include a 640x480 thermal imager with the POP-300, a colour charge-coupled device with a near-IR capability and a laser pointer. An eye-safe laser rangefinder is optional. Height: 43cm Diameter: 26cm Weight: 20kg

INDRA SISTEMAS

INTACT

The INTACT (Intelligence and Surveillance Tactical Vehicles) system combines EO/IR sensors, GIS consoles and a long-range surveillance radar into a single integrated package. It is small enough to be transported by a single 4x4 military vehicle. Designed to perform a whole range of different surveillance and reconnaissance missions, INTACT is a modular platform that can be adapted and reconfigured multiple times in order to suit its particular mission.

L3 SONOMA EO

Sonoma 333

The Sonoma 333 offers a choice of five sensors, providing high-accuracy geolocation and stabilisation using inertial measurement unit technology. The system incorporates mounting and cable adaptors to facilitate the replacement of legacy mid-sized turrets. Master control unit (½ ATR MCU) – 124x229x356mm; hand controller unit – 108x228x76mm. Turret performance: stabilisation and steering two-axis inner (pitch/yaw), two-axis outer (azimuth/elevation); vibration isolation six-axis passive (x/y/z/pitch/roll/yaw); azimuth/elevation slew rate 0-60°/s; LoS pan range continuous 360°; LoS tilt range +90° to -120° Length: 32cm Width: 38cm Weight: 25kg

Sonoma M11

The step-stare turret is a digital tri-sensor gimbal, developed with high-speed capability. Introduced to the market for tactical unmanned aerial systems, it is intended for small aircraft requiring long-range reconnaissance, surveillance and targeting. Offering a three-FOV long-range optic, the system captures more than eight overlapping digital still images per second, which are then tiled together to create a high-resolution digital image. Length: 28cm Width: 37cm Weight: 2.3kg

L3 SPACE & SENSORS

Large Format Megapixel Sensors

L3 Cincinnati produces 2x2 and 4x4K high-resolution IR imagers for high- and medium-altitude reconnaissance. The system is able to operate in rigorous aviation environments and possesses high spatial resolution, allowing for target detection, recognition and identification. Sensors provide situational awareness through the wide field of view and are suitable for monitoring large areas with sufficiently high resolution for distinguishing and tracking persons and vehicles, aiding in IED detection, homeland security and wide-area event surveillance.

L3 UNMANNED SYSTEMS

Pan-Tilt-Zoom Camera with Laser Rangefinder

Pan-Tilt-Zoom Camera with Laser Rangefinder is a surveillance system with a laser rangefinder. Performance includes 1/3in charge-coupled device colour sensor, NTSC or PAL format. Resolution feature NTSC, 380 lines (horizontal) x 350 lines (vertical); PAL, 380 lines (horizontal) x 400 lines (vertical). Length: 22.9cm Width: 40.6cm Height: 27.9cm Weight: 5.3kg

L3 WESCAM

MX-8

The MX-8 is a compact, multi-sensor and multi-spectral imaging system in a single LRU configuration. It is the smallest of Wescam's MX-Series, and is suitable for manned or unmanned airborne platforms. The MX-8 was developed in response to demands from military users across Africa, the Middle East and South America for a light sensor with high-performance imaging. It was also unveiled at AUSA in October 2016. Diameter: 21cm Weight: 6.8kg

MX-10

The MX-10 is a multi-sensor, multispectral imaging system suitable for low-altitude tactical surveillance and search and rescue missions requiring low-weight installation. Customers can specify up to six sensors. This includes a four-field of view thermal imager, daylight continuous zoom TV, low-light continuous zoom TV, laser rangefinder and laser illuminator (narrow or wide). Features also include active four-axis stabilisation, inertial measurement unit-inside technology and MX-GEO software suite for tracking. Length: 22.8cm Weight: 16.8kg

MX-10D

The MX-10D is a multi-sensor, multispectral targeting system in a single-line replaceable unit configuration. It is designed to be mounted on fixed- and rotary-wing aircraft, UAVs and aerostats for low-altitude tactical surveillance and target designation. The 38cm turret supports up to six sensors simultaneously, such as IR, colour HD and electron-multiplied charge-coupled device imaging. The MX-10D also features real-time image enhancement with high-performance haze penetration, feature recognition, ID and automated video tracking. Width: 26.9cm Height: 37.3cm

MX-12D

The MX-12D is a multi-sensor, multispectral targeting system suitable for low-altitude target designation missions requiring low-weight installation. Up to three sensors can be fitted: a four-field of view thermal imager, daylight continuous zoom TV, laser illuminator, laser designator/rangefinder. Key features: inertial measurement unit-inside technology and range performance.

MX-15

The MX-15 is an HD multi-sensor, multispectral imaging system suitable for medium-altitude, covert ISR, armed reconnaissance and SAR missions. Up to six sensors can be supported simultaneously: a four-FOVs thermal imager, daylight continuous zoom TV (one or three charge-coupled device offerings available), daylight spotter TV (with dual-channel spotter lens option), low-light spotter TV, laser rangefinder and laser illuminator. The MX-15 includes real-time image enhancement with haze penetration, feature recognition and image blending. Height: 48cm Diameter: 39cm Weight: 45kg

MX-15D

The MX-15D is a multi-sensor, multispectral targeting system. It is suitable for medium-altitude, covert ISR, armed reconnaissance, CSAR and target designation. Up to ten sensors can be fitted. This includes a four-FOVs thermal imager, daylight continuous zoom TV, low-light continuous zoom TV, laser designator/rangefinder, laser illuminator, daylight spotter TV with triple-channel spotter lens, low-light spotter TV, short-wave IR spotter TV and laser spot tracker. Height: 50.17cm Diameter: 41.91cm Weight: 51.26kg

MX-15Di

The MX-15Di is an extreme multi-sensor, multispectral targeting system suitable for medium-altitude covert ISR; armed reconnaissance; CSAR; and target designation. Up to ten sensors can be fitted: four-FOV thermal imager, daylight continuous zoom TV, low-light continuous zoom TV, laser designator/rangefinder, laser illuminator, daylight spotter TV with triple-channel spotter lens, low-light spotter TV, shortwave IR spotter TV, laser spot tracker. Features: weight-optimised, interface flexibility, digital cameras, IMU-Inside technology, MX-GEO Gen 3 software suite for precision tracking.

MX-15HDi

The MX-15HDi is a true HD multi-sensor, multispectral imaging system suitable for medium-altitude covert ISR, armed reconnaissance and SAR missions. Up to six sensors can be fitted: four-FOV thermal imager, daylight continuous zoom TV (one- or three-charge-coupled device offerings available), daylight spotter TV (with dual-channel spotter lens option), low-light spotter TV, laser rangefinder, laser illuminator.

MX-15i

The MX-15i is an extreme multi-sensor, multispectral imaging system designed for medium-altitude covert ISR; armed reconnaissance; and SAR missions. Up to six sensors can be fitted: four-FOV thermal imager, daylight continuous zoom TV (one- or three-charge-coupled device offerings available), daylight spotter TV with dual-channel spotter lens, low-light spotter TV, laser rangefinder, laser illuminator. Features: local area processing, IMU-inside technology, integrated MCU, MX-GEO Gen 3 software suite for precision tracking.

MX-20

The MX-20 is a long-range, multi-sensor, multispectral imaging system suitable for high-altitude, long-range maritime patrol aircraft and persistent surveillance. It supports up to seven sensors, such as a thermal imager, daylight continuous zoom TV (two 2MP colour HD sensor types available), daylight spotter TV (with dual-channel spotter lens option), low-light spotter TV, laser rangefinder and laser illuminator. Enhanced local area processing enables real-time image enhancement for EO day/night and IR for increased standoff range, feature detection/recognition and haze penetration.

MX-20D

The MX-20D is a long-range, multi-sensor, multispectral imaging system. It is suitable for high-altitude, covert intelligence, SAR, armed reconnaissance, CSAR and target designation. It supports up to six sensors (including those of the MX-20): a daylight continuous zoom TV (two 2MP colour HD sensor types available), thermal imager, daylight spotter TV (with dual-channel spotter lens option), low-light spotter TV, laser rangefinder and laser illuminator. Length: 42.4cm Width: 19.1cm Height: 30.8cm Weight: 9kg

MX-20HD

The MX-20HD is a long-range multi-sensor, multispectral imaging system suitable for high-altitude long-range maritime patrol and persistent surveillance. Up to seven sensors can be fitted: thermal imager, daylight continuous zoom TV (two 2MP colour HD sensor types available), daylight spotter TV (with dual-channel spotter lens option), low-light spotter TV, laser rangefinder, laser illuminator. HD IR, navigation-grade IMU. Features: 1080p HD EO imaging resolution, enhanced local area processing, MX-GEO Gen 3 software suite. Length: 42.4cm Width: 19.1cm Height: 30.8cm Weight: 90.7kg Detection range: 30km

LEICA GEOSYSTEMS

RCD30

The Leica RCD30 is described by the company as the 'first medium format single head camera which collects perfectly co-registered 80MP RGBN multispectral imagery'. It features configuration flexibility to support photogrammetric and remote sensing applications, offering 'performance otherwise only known from large format airborne sensors'. Length: 31cm Width: 31cm Height: 50cm Diameter: 31cm Weight: 10kg

LEONARDO DRS

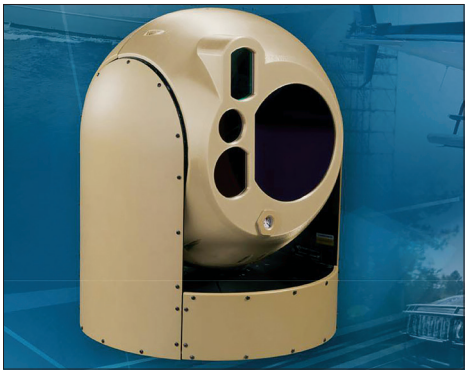
Arrowhead M-TADS/PNVS IR Receivers

DRS provides the integrated forward-looking-IR receivers for the Modernized Target Acquisition Designation Sight (M-TADS) and the Modernized Pilot Night Vision Sensor (M-PNVS) for Lockheed Martin's Arrowhead. Additionally, it will provide the AH-64 Apache's EO fire control system, which is used for target acquisition/designation and safe flight in day, night and adverse weather conditions.

GS205 Targeting System

The GS205 Targeting System is a two-axis, gyro-stabilised targeting system. It features a 640x480 cooled mediumwave IR thermal sensor or a 640x480 uncooled longwave IR thermal sensor, a zoom colour EO sensor and a dual-mode eye-safe laser rangefinder/

Gyrocam 15DHD is a 15in dual system that delivers HD and mid-wave thermal optics, in a modular payload that supports ISR missions. (Photo: Lockheed Martin Missiles and Fire Control)



laser designator. This combination of capabilities in a small and lightweight system makes it suitable for small SWaP-constrained airborne platforms that need long-range day/night imagery coupled with the capability to range and designate targets for laser-guided weapons. Width: 14cm Weight: 3.17kg

GS410 Stabilised Multi-Sensor Targeting System

The GS410 Stabilised Multi-Sensor Targeting System is adaptable to a wide variety of airborne platforms. It is a single-unit gimbal with four-axis stabilisation. Sensors: forward-looking infrared (FLIR), TV, laser pointer, eye-safe laser rangefinder and optional laser designator, all integrated with an automatic video tracker. The FLIR is a three-FOV, 640x480 mid-wave HgCdTe IR sensor with 12µm pixel pitch. Width: 26.2cm Weight: 20.41kg

MMS

The Mast-Mounted Sight (MMS) is an integrated multi-sensor EO sighting system offering a visible and IR capability. The MMS is equipped with a thermal imaging (TI) sensor, a high-resolution TV camera and a laser rangefinder/designator, along with a system processor, power supply, protective shrouds and other components. The TI camera enables pilots and crews to acquire, identify and target potential threats at a distance by day or night.

LEONARDO ELECTRONICS

EOST-46

The EOST-46 is a multi-sensor turret system based on a modular payload, containing up to four sensors. It uses the proprietary ERICA Plus thermal imager, operating in the medium wavelength spectrum (3-5µm) and based on the Leonardo focal plane array Hawk detector. For day operations, including low-light conditions, EOST-46 uses a 20x zoom TV colour and black-and-white camera for target acquisition. Height: 54cm Diameter: 35cm

EOST-380HD

The EOST-380HD is the latest optronics surveillance and targeting system designed by Leonardo for demanding airborne surveillance environments. The system is a single LRU 15in four-axis gyro-stabilised turret that integrates sensors in multiple configurations, IMU/GPS and electronics for control and processing. The EOST-380HD is based on a modular payload, containing up to six optronics sensors, and is available in two configurations, surveillance or targeting.

FLIR 111

The FLIR 111 is a compact, lightweight navigation system for attack and utility helicopters. It features integration, low power consumption, a mechanical interface and a standard electrical interface with a minimal number of interconnections. The FLIR 111 makes use of a Gen II thermal camera mounted onto a two-axis steering platform.

Janus-N

Janus-N is designed as a combined medium- and long-range panoramic sight, operating by day or night in all weather, in a rugged, self-contained package. Janus incorporates IR staring focal-plane array sensor technology for high-resolution night vision and a

colour charge-coupled device TV with an optional laser rangefinder. The system can be used for a range of tasks, including surveillance, SAR, situational awareness, maritime navigation and patrol and harbour surveillance and protection.

LEOSS-S

LEOSS-S is a multi-sensor, high accuracy, four-axis gyro-stabilised turret system designed for airborne surveillance applications. LEOSS-S turret is a 15" system based on a modular payload containing up to six Electro-Optical (EO) sensors. LEOSS-S features a single LRU turret with an embedded computer and IMU/GPS for state-of-the-art performance. It is designed to be integrated onto both helicopters and turboprop aircraft for surveillance, patrol, Search & Rescue (SAR), environmental control and law enforcement operations.

LEOSS-T

LEOSS-T is a multi-sensor, high accuracy, four-axis gyro-stabilised turret system designed for airborne surveillance applications. LEOSS-T turret is a 15" system based on a modular payload containing up to eight Electro-Optical (EO) sensors. The system consists of a single LRU turret with an embedded computer and an integrated Laser Code Management Unit (LCMU). It is designed to be integrated onto helicopters, turboprop aircraft or land vehicles to provide a multi-role capability where management of laser-guided effectors is required.

NERIO ULR

NERIO ULR is a state of the art modular Electro-Optical (EO) Surveillance, Threat Acquisition (STA) and Reconnaissance system designed to satisfy a broad range of current and emerging customer requirements. NERIO-ULR integrates world-class EO sensors as part of a fully flexible payload configuration together with a gyro-stabilised director mechanism enabling capability, cost and performance to be optimised according to specific customer needs. Utilising the Horizon Thermal Imaging (TI) camera for provision of a 24hr operational capability.

Skyward

The SkyWard is an Infrared Search and Track (IRST) system, and it is a product suitable in the field of IRST for airborne and naval systems.

Skyward IRST

The SkyWard system offers state-of-the-art capabilities in Infrared Search and Track (IRST). Skyward is an airborne world-leading IRST product. SkyWard is a product suitable in the field of IRST for airborne and naval systems. Weight: 40kg

Skyward-F

Skyward-F is an Infrared Search and Track (IRST) specifically designed to fit POD installation. This enables achievement of IRST technology advantages in "Plug&Ply," manner. Skyward is an airborne world-leading IRST product. SkyWard-F is a product suitable in the field of IRST for airborne and naval systems.

Titan 385ES-HD

The Titan 385ES-HD is an airborne multi-sensor turret system that offers a high-resolution night vision capability in the medium-wave IR (MWIR) wavebands. The MWIR camera is supplemented as standard with an uncooled long-wave IR camera for instant availability, as well as a solid-state low-light-level TV camera. A number of IR optic configurations are available, dependent on the operational application. Additionally, optional sensor configurations include an eye-safe laser rangefinder, colour/low-light monochrome spotter scope and laser illuminator/pointer.

VigilX

The VigilX system provides situational awareness by the real-time stitching of multiple IR and visible EO sensors, delivering a panoramic 'through-the-hull' vision. VigilX allows operations in the day, night, all-weather and zero-light conditions, including low-level flight, troop or logistic insertion, extraction, airdrop and SAR.

LOCKHEED MARTIN MISSILES AND FIRE CONTROL

F-35 Lightning II Advanced EOTS

The F-35 Lightning II Electro-Optical Targeting System (EOTS) is a sensor that combines targeting forward-looking IR (FLIR) and IR search and track (IRST) capabilities for air-to-ground and air-to-air utility in a lightweight package. The low-drag, stealthy EOTS is integrated into the aircraft's fuselage with a durable sapphire window. A staring, medium-wave Gen III FLIR provides target detection and identification at standoff ranges. The EOTS gives pilots access to high-resolution imagery, automatic tracking, wide-area IRST, laser designation/rangefinding and laser spot tracking.

Gyrocam 9 Series

The Gyrocam 9 Series provides all the functionality of a larger unit in half the weight and one third the volume. It is available in mediumwave cooled (9M) or long-wave uncooled (9L) thermal imaging configurations. Optional capabilities include HD colour, laser pointing, geolocation and an eye-safe laser rangefinder capable of ranging up to 20km from the observer.

Gyrocam 15DHD

Gyrocam 15DHD is a 15in dual system that delivers HD and mid-wave thermal optics, in a modular payload that supports ISR missions. The 15DHD features four-axis active stabilization and high image quality while moving. Other features include 56:1 continuous optical zoom for colour camera, 30:1 continuous optical zoom for thermal camera, matched FoV, autofocus, autotrack, as well as a modular design for two-level maintenance and IR colour pallets for improved situation awareness.

Gyrocam 15DS

The 38cm Gyrocam 15DS (Dual Sensor) integrates a medium-wave cooled thermal imager with a high-resolution and three-chip colour charge-coupled device camera into a gyro-stabilised system. Along with a day/night mission capability, the dual sensor offers 360°, 20:1 continuous zoom functionality and four-axis gyro-stabilisation for image clarity. A stable platform for aerial surveillance missions is also offered. The Gyrocam 15DS interfaces with other sensor systems, including remote weapons, moving maps and digital video recorder.

Gyrocam 15HDIR

The 38cm (15in) Gyrocam 15HDIR (HD IR) sensor is designed as a multi-mission surveillance system that allows law enforcement and military personnel to perform long-distance aerial surveillance. It integrates a high-resolution, HD, three-chip colour CCD camera and continuous zoom, midwave cooled thermal imaging capabilities. This four-axis, gyro-stabilised hybrid system produces a straight HD signal and an NTSC system signal.

Gyrocam 15HDIR

The 38cm Gyrocam HD IR sensor (15HDIR) is designed as a multi-mission surveillance system that allows law enforcement and military personnel to perform long-distance aerial surveillance by integrating a high-resolution, HD, three-chip colour charge-coupled device camera and continuous zoom, medium-wave cooled thermal imaging capabilities. This four-axis, gyro-stabilised, hybrid system produces a straight HD signal and an NTSC system signal. Weight: 31kg

Gyrocam 15TS

The 38cm Gyrocam 15TS (Triple Sensor) integrates four-axis gyro-stabilisation, advanced medium-wave cooled thermal imaging, a three-chip colour charge-coupled device camera and next-generation night vision capabilities into one system. This configuration incorporates an auto-gated night vision camera: Gen IV intensifier (2000ma/lumen sensitivity). Options include remote viewing capabilities, geolocation, auto-tracking and scene lock.

INFIRNO

INFIRNO is a targeting and ISR sensor system. It introduces modular two-level maintenance, designed with nine light replaceable units. Customers are able to swap and reconfigure sensor payloads to meet specific mission requirements without moving the turret from the host platform. INFIRNO is applicable across ground, airborne and maritime platforms. It includes high-definition sensors, advanced image processing and multi-target track capabilities proven in Lockheed Martin's Sniper ATP and Apache M-TADS/PNVS.

IRST

IRST is a passive, long-range IR search and track (IRST) sensor system that detects and tracks airborne threats in electronic attack and heavy countermeasure environments. The IRST system provides the aircraft with target track data, while simultaneously providing IR imagery to the cockpit display. The IRST system gives aircrews onboard situation awareness while extending the engagement range of weapons.

LANTIRN

The Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) system increases the combat effectiveness of fighter aircraft, allowing them to fly at low altitudes, at night and under-the-weather to attack ground targets with a variety of precision-guided and unguided weapons. The LANTIRN system consists of an AAQ-13 navigation pod and an AAQ-14 targeting pod. Both are integrated and mounted externally beneath the aircraft. The original system has been in service since 1987, and Lockheed Martin currently offers LANTIRN-ER, an upgraded version of the system, either as new or as an upgrade to the original version.

M-DSA

M-DSA is the next step in the sensor modernisation of the M-TADS/PNVS system. Upgraded capabilities support more rapid target identification and coordination, as well as improve mission success and system reliability for Apache aircrews. M-DSA incorporates a laser rangefinder designator, an inertial measuring unit (IMU) and extended range algorithms to increase M-TADS/PNVS designation and ranging possibilities. The upgraded sensor enables Apache pilots to see high-resolution, high-definition, near-infrared and colour imagery on cockpit displays.

M-TADS/PNVS

The Modernized Target Acquisition Designation Sight/Pilot Night Vision Sensor (M-TADS/PNVS) is the EO fire control system that US Army AH-64D/E Apache helicopter pilots use for flight during day, night or bad weather missions. M-TADS/PNVS technology improves legacy TADS/PNVS system performance by over 150%. Reliability increases by more than 150% while maintenance actions decrease by approximately 60%.

Q-39

The AN/AAQ-39 is the EO/IR fire control system operational on Air Force Special Operations Command AC-130U gunships. The Q-39 targeting system consists of a large-aperture medium-wave IR sensor, two image-intensified TV cameras, a near-IR laser pointer and a laser designator/rangefinder (with an eye-safe mode). These components are integrated into a stabilised 53cm turret to provide image quality and line-of-sight pointing for gunfire control. The Q-39 features image blending for passive situational awareness during night operations.

Sniper ATP-SE

The Sniper Advanced Targeting Pod (ATP) incorporates a 1K medium-wave forward-looking infrared, 1K TV, dual-mode laser, laser spot tracker and laser marker to improve target detection and identification. Further features include image processing algorithms, sensors, NET-T data link and automated non-traditional ISR modes. Compatible with in-service standoff weaponry, the Sniper ATP provides automatic tracking, including a maritime mode, and laser target designation via real-time imagery presented on cockpit displays. Length: 249.43cm Diameter: 30.23cm Weight: 202kg

TEDAC

The TADS Electronic Display and Control Assembly (TEDAC) presents the co-pilot/gunner (CPG) with high-resolution sensor video from the M-TADS. The TEDAC is located in the CPG crew station of the AH-64D/E Apache helicopter and is the modernised replacement for the Optical Relay Tube. The TEDAC provides a 5x5in flat-panel cockpit display that utilises active-matrix liquid crystal display technology.

TSS

The Target Sight System (TSS) is the multi-sensor EO/IR fire control system (AN/AAQ-30) for the USMC AH-1Z attack helicopter. It has a large-aperture medium-wave forward-looking IR sensor, a colour TV, a laser designator/

rangefinder (with eye-safe mode) and an on-gimbal inertial measurement unit integrated into a 15µrad stabilised turret. The turret mounts on the nose of the aircraft via a Lockheed Martin-developed interface structure. The TSS also provides the capability to identify and laser-designate targets at maximum weapon range.

LOCKHEED MARTIN UNMANNED INTEGRATED SYSTEMS

SkyShark Gimbal

SkyShark Gimbal is a camera payload for small UAVs, providing an HD, EO, high-resolution, long-wave IR and low-light EO video capability that yields 24h imagery. SkyShark Gimbal offers a high-resolution drive system, onboard video processing, target tracking and GPS pointing capability.

LOCKHEED MARTIN

AN/AAQ-13

The AN/AAQ-13 is a navigation pod that provides a high-speed precision attack on tactical targets at night and in adverse weather conditions. The AN/AAQ-13 is integrated with the Low Altitude Navigation and Targeting Infrared for Night (LANTIRN) system and AN/AAQ-14 targeting pod and mounted externally beneath the aircraft it is fitted on. Types of aircraft that the AN/AAQ-13 has been integrated with include the F-15E, F-16C/D and F-14. Length: 199cm Diameter: 30cm Weight: 0.2kg

AN/AAQ-14

The AN/AAQ-14 is a targeting pod that provides a high-speed precision attack on tactical targets at night and in adverse weather conditions. The AN/AAQ-14 is integrated with the Low Altitude Navigation and Targeting Infrared for Night (LANTIRN) system and AN/AAQ-13 navigation pod and mounted externally beneath the aircraft it is fitted on. Length: 250.19cm Diameter: 38.1cm Weight: 213kg

LOGOS TECHNOLOGIES

Kestrel Block II

The Kestrel Aerostat-Based Wide-Area Persistent Surveillance Sensor continuously collects and records a 360° view of an expansive area, both day and night, providing real-time and archived digital imagery. All imagery recorded is stored indefinitely and is accessible for further analysis. The system is currently configured for aerostat-based deployment for the protection of FOBs and is adaptable to ground and maritime applications. Length: 46cm Width: 46cm Height: 69cm Weight: 40kg

Redkite

Redkite is a wide-area motion imagery sensor with a resolution greater than 50MP. Housed in a small platform-agnostic pod, Redkite can detect and track multiple targets within a 4km coverage area. Redkite can be mounted on a variety of civilian and military aircraft, including light aeroplanes, helicopters and small- to medium-sized UAVs. Additionally, it can be incorporated into multi-sensor systems. Length: 105cm Width: 31cm Height: 23cm Weight: 11kg Detection range: 4km

Serenity dual sensor system

Serenity combines two sensors, an EO flash detection sensor and an onboard acoustic sensor. These sensors precisely locate and identify the geolocations of the launch and detonation of a variety of explosive and incendiary devices. Length: 51cm Width: 29cm Height: 16cm Weight: 23kg Detection range: 10km

Simera

Simera is a lightweight wide-area persistent surveillance system designed for mounting in an aerostat, which images and records activity within a 95km² area for days or weeks. Operators using Simera can access, on handheld devices, live and archived video imagery from geographically dispersed areas within the sensor's coverage zone. They can pan, tilt and zoom as well as cue a high-resolution full-motion video camera for a closer look at a target. Length: 56cm Width: 48cm Height: 64cm Weight: 18kg

METEKSAN SAVUNMA

MILSAR UAV SAR/GMTI Radar

Developed by Turkish defence manufacturer Meteksan Savunma Sanayi; the MILSAR is a multimode airborne surveillance radar for Unmanned Aerial Vehicles (UAVs), helicopters and fixed-wing aircraft. It is designed for ISR, deterrence and attack operations. At the core of this radar is an EO and IR sensor system that maximizes the surveillance area of the UAV and increases the attack capability of an Unmanned Combat Aerial Vehicle (UCAV).

MICASENSE

RedEdge-MX

The MicaSense RedEdge is a multi-spectral sensor designed for agricultural applications to measure the health of crops. The sensor uses five narrow spectral bands captured during flight and provides high image resolution at 8cm/pixel at an altitude of 120m. Length: 4.5cm Width: 9.7cm Height: 5.9cm Weight: 0.23kg Detection range: 0.01km

NEWCON OPTIK

LRF Micro Series

Designed for OEM integration, Newcon Optik's laser rangefinder module series provides accurate measurements for countless other applications, some of which include unmanned vehicles, FCS, industrial machinery and border surveillance stations. The newly improved Micro series consists of four modules, each of which is approximately the size of a deck of cards. The modules have a ranging capability of 3km to a NATO standard target and a maximum ranging capability of 5.5km.

LRF Mod 4EC/6EC

The Mod 4EC and Mod 6EC were designed specifically for remotely operated small platforms. The modules can be attached to Mini-Typhoon, CLAWS and other systems with a quick-release mount. The units are designed to endure harsh operating conditions and the models can withstand high vibration, a wide temperature range,

dust, rain and RF jammers. The LRF Mod 4EC and LRF Mod 6EC provide distance, speed, azimuth and elevation measurements. Weight: 3kg

NORTHROP GRUMMAN MISSION SYSTEMS

Night Hunter II

The Night Hunter II is an EO/IR system for ISR and targeting. Performance: 11in aperture, gimbal supports six sensors. Length: 53cm Width: 53cm Height: 65cm Weight: 70kg

Raven Eye II

The Raven Eye II is a family of off-the-shelf EO payloads designed for day and night operation, including surveillance and targeting functions. Operating modes include manual or remote payload control. The system can be slaved to other designating sources, such as navigation and radar. Basic configuration: day channel – TV camera (monochrome or colour charge-coupled device); night channel – forward-looking infrared (third-generation 3-5μ FPA), laser designator and rangefinder, automatic video tracker.

NORTHROP GRUMMAN

AN/AAQ-37 DAS

Although not electronic warfare apparatus in the purest sense, Northrop Grumman/Raytheon's AN/AAQ-37 optronic distributed aperture system is still tactically relevant to this mission. The AN/AAQ-37 forms part of the Lockheed Martin F-35A/B/C Lightning-II's self-protection system. While intended to provide overarching optronic enhancement to the aircraft and pilot, one of the functions the system performs is the detection and tracking of surface-to-air and air-to-air missiles. The AN/AAQ-37 provides 360 degrees surveillance around the aircraft, provides information regarding a missile's launch point and can be used to trigger aircraft countermeasures. Field of View - Azimuth: 20,626.48° Detection range: 800km

COBRA

The Coastal Battlefield Reconnaissance and Analysis (COBRA) system is part of Northrop Grumman's airborne mine countermeasures (AMCM) product line. It is designed to detect minefields along with other obstacles on the beach and in littoral waters prior to an amphibious assault. This thereby enhances the battlefield intelligence of friendly forces. This system has been adopted as the AN/DVS-1 by the USN for use on the MQ-8B Fire Scout UAS and as part of the mine countermeasures (MCM) mission payload (MP) for the Littoral Combat Ship (LCS).

OCTOPUS ISR SYSTEMS

Epsilon 135 HD EO

The Epsilon 135 HD (Day) is a fully stabilised micro gimbal with EO sensor for long-range surveillance. It employs global shutter sensor for high image clarity. The onboard processor provides electronic video stabilisation with roll correction, target tracking, scene steering and moving target indication. Onboard image processing reduces required bandwidth significantly and enables single data link usage for both image and aircraft control functions. Length: 15.03cm Diameter: 13.5cm Weight: 0.9kg

Epsilon 140 Dual Sensor

The Epsilon 140 is a dual-sensor micro gimbal for long-range surveillance. It employs an EO global shutter sensor for better daytime image clarity and is equipped with a 60mm fixed field-of-view IR lens. The system has a 2km tested human target detection range. The onboard processor provides electronic video stabilisation with roll correction, target tracking, scene steering and moving target indication. Height: 18.9cm Diameter: 14cm Weight: 1.57kg

Epsilon 140Z Four Sensor

The Epsilon 140Z is a four-sensor micro gimbal for long-range surveillance. It employs an EO global shutter sensor for better daytime image clarity and is equipped with 3.3x continuous optical zoom IR lens on a longwave IR sensor with 7.7° to 25.4° FOV, laser range finder and laser illuminator. Height: 18.9cm Diameter: 14cm Weight: 1.77kg

Epsilon 175 Four Sensor

The Epsilon 175 is a four-sensor micro gimbal for long-range surveillance. It employs an EO global shutter sensor for better daytime image clarity and is equipped with 15x continuous optical zoom mediumwave IR sensor with 1.5° to 24.5° FOV laser range finder and laser illuminator. Additionally, the Epsilon 175 is the smallest four-sensor MWIR gimbal with long-range continuous zoom capability. Height: 20.8cm Diameter: 17.5cm Weight: 2.6kg

PANASONIC USA

DMC-TZ71

The Panasonic Lumix DMC-TZ71 has a 30x optical zoom with 60x intelligent zoom. It is a lightweight, compact sensor suitable for small UAVs. The sensor weighs 217g without battery and SD memory card, and 243g with battery and SD memory card. Length: 3.4cm Width: 11cm Height: 6.4cm Diameter: 3.5cm Weight: 0.24kg

PARROT

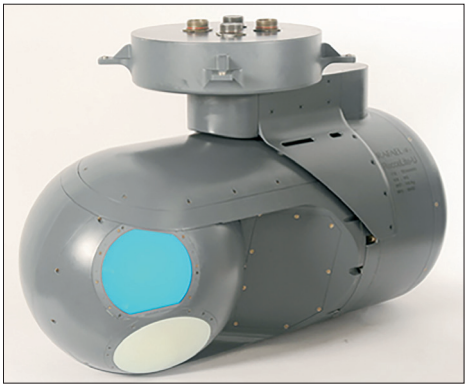
Parrot Sequoia+

The Parrot Sequoia+ multispectral sensor offers a comprehensive, adaptable solution that is compatible with all types of drones. With its two sensors, multispectral and sunshine, Sequoia+ analyses plants' vitality by capturing the amount of light they absorb and reflect. It was released onto the market in April 2018. Length: 3cm Width: 4cm Height: 6cm Weight: 0.07kg

PHOENIX LIDAR

Alpha Series AL3-16/32

Phoenix LiDAR's Alpha series features the AL3-16 and the AL3-32 surveying systems. The AL3-16 utilises fibre-optic gyro-IMU technology, providing an accuracy of 34/45mm RMSE to create a georeferenced point cloud. The system can also easily be upgraded for future LIDAR sensors, according to the company. The AL3-32 is a 3D 32-laser mapping system designed for professional



Recce-U is a multirole theatre reconnaissance system for UAVs and special mission aircraft. (Photo: Rafael Advanced Defense Systems)

surveying applications. It features survey-grade accuracy at 25/35mm, with a 105m laser range and intensity calibration. Length: 15cm Width: 14cm Height: 24cm Weight: 2.5kg

Ranger - RL1

Phoenix LiDAR's Ranger - RL1 system is designed for mapping applications. It has a laser range of 1,350m, producing photorealistic 3D point clouds of large regions. It also hosts IMU and dual-UPS upgrade options for increased accuracy and is fully autonomous. Length: 30.8cm Width: 18cm Height: 12.9cm Weight: 5.3kg

Scout Series SL1

Phoenix LiDAR's Scout Series SL1 system contains modular components, enabling it to perform a range of tasks, including lidar mapping, multi/hyperspectral sensing, hybrid-SLAM and photogrammetry. It includes multiple options for higher density and/or more accurate point clouds. The SL1 features real-time point cloud transmission via 4G or long-range Wi-Fi. It is also fully autonomous and can be mounted on any drone, working in multiple orientations. Length: 16cm Width: 11.6cm Height: 11.6cm Weight: 1.6kg

RAFAEL ADVANCED DEFENSE SYSTEMS

Recce-U

Recce-U is a multirole theatre reconnaissance system for UAVs and special mission aircraft. The airborne ISR system is based on the RecceLite tactical reconnaissance pod. The system comprises a ground data link station and a ground exploitation station. Recce-U simultaneously collects high-resolution IR and visual digital images, day and night, within a wide field of regard in a variety of operational modes, including persistent wide-area scanning.

Toplite

Toplite is a stabilised, multirole, multi-sensor optronic payload. The Toplite day/night observation and targeting payload is configured for air, ground and naval surveillance and targeting systems. It is designed for a range of missions, from law enforcement observation to surveying and fire control to missile targeting. Toplite can be installed and maintained on manned and unmanned aircraft and helicopters, naval vessels and vehicles, and is fully integrated with SPIKE missile family on helicopters and other platforms. Height: 66.2cm Diameter: 59.4cm Weight: 65kg

RAYTHEON SPACE & AIRBORNE SYSTEMS

AN/AAQ-27A

In production for USMC MV-22 Osprey tiltrotors, the AAQ-27A allows pilots to see through darkness, smoke, haze and adverse weather. The third-generation medium-wave IR system shares similarities with the AAQ-16B. An AAQ-27A retrofit kit allows the upgrade of fielded first-generation long-wavelength AAQ-16B systems. The AAQ-27A (three-field of view) system is in production for the Royal Australian Navy's Seahawk helicopters. Width: 30cm Height: 36cm Weight: 41kg

AN/AAQ-29A

In production for USMC CH-53E and USAF HH-60G platforms, the medium-wave IR AAQ-29A is similar to the AN/AAQ-27A, the difference being its incorporation of an additional third field of view (1.3x1.73°). Options include e-zoom and a dual-mode tracker.

AN/AAS-44(V)

The AN/AAS-44(V) is a multi-purpose thermal imaging sensor, providing long-range surveillance, target acquisition, tracking, rangefinding and laser designation for Hellfire and tri-service/NATO laser-guided munitions. The AAS-44(V) is deployed on USN HH-60H and SH-60B helicopters and supports a variety of fixed- and rotary-wing platforms.

AN/AAS-52

The AN/AAS-52 is a multi-spectral EO/IR turreted system that provides long-range surveillance, target acquisition, tracking, rangefinding and laser designation for Hellfire as well as tri-service/NATO laser-guided munitions. The AAS-52 is in production for the USAF MQ-1 Predator and US Army MQ-1C Gray Eagle UAVs.

AN/ZSQ-2

The AN/ZSQ-2 is a multi-sensor EO/IR turreted system that contains three imaging sensors. A day colour TV, IR camera with 3-5µm, InSb, 480x640px and staring array detector and an image-intensified TV. The sensors are coaxially mounted on a four-field of view telescope. The 'Assault' version of the ZSQ-2 has a laser pointer and eye-safe laser rangefinder, while the 'Attack' variant has a laser pointer, laser spot tracker and laser designator/rangefinder.

ASQ-228 ATFLIR

The ASQ-228 Advanced Targeting Forward-Looking IR (ATFLIR) is a targeting pod for the F/A-18 family, used in Operations Southern Watch, Enduring Freedom and Iraqi Freedom, and deployed with US fleet squadrons. The ASQ-228 ATFLIR provides accuracy and real-time target assessment from long standoff ranges. Length: 183cm Width: 34cm Weight: 191kg

TI FLIR 49

The TI FLIR 49 is a lightweight, multi-purpose, thermal imaging sensor for navigation, surveillance, maritime,

search and rescue, and troop transport missions. Features: second-generation focal plane array, electronic image stabilisation, local area processing, adaptable interface, dual-mode video tracker. Gimbal acceleration: head steering compatible at fixed-wing airspeeds. Gimbal angle resolution: <100µrad. Environmental: MIL-E-5400, Class 1A. Cooling: self-contained. TU size: 320(d)x370(h)mm. EU size: 310(w)x410(l)mm. Power: standard aircraft. Weight: 20kg

RAYTHEON

Air Reconnaissance Low System

Air Reconnaissance Low is a lightweight podded minefield detection and reconnaissance system for fixed-wing aircraft, helicopters and UAVs. The sensor includes an IR line scanner with an eight-channel HgCdTe SPRITE detector and split-cycle Sterling cooler. Spectral band: 8-12µm. Field of view: 0-120°. Length: 48cm Width: 30cm Height: 30cm Weight: 16kg

CSP

The Common Sensor Payload (CSP) joins Raytheon's family of targeting systems that provide ISTAR mission capabilities to the warfighter. CSP will benefit from, and contribute to synergies in common technology, capabilities and mission support.

DB-110

The DB-110 is a modular, lightweight, dual-band reconnaissance system for fast jets. Modularity allows configuration as day-only, night-only or dual-band. Wide-area search mode can cover 233,000km² in an hour. Visible light sensor: silicon charge-coupled device array with 280cm focal length (f/10 lens). IR sensor: 512x484 or 640x480 element indium antimonide focal plane array.

RAPTOR

The Reconnaissance Airborne Pod for Tornado (RAPTOR), based on Raytheon's DB-110, was developed for the UK RAF Tornado GR4s. RAF specifications required target recognition with a visible light sensor at 72km and 36km with an IR sensor.

RS 700 Series

The RS 700 Series is a long-wave IR line scanner with video output for image transfer to 70mm film. Detector: 8-14µm mercury cadmium telluride array with Sterling cycle cooler. FOV: 120°. Film capacity: 70m max. Weight: 42kg

RHEINMETALL DEFENCE ELECTRONICS

MEES

Developed by Rheinmetall, the Mobile Eagle Eye System (MEES) is an air space and ground surveillance unit with its own command post. It combines the two operational components FIRST and MSP600. It is capable of detecting all live forms, flying objects and vehicles.

MSP600

Modular Sensor Platform MSP600 is a lightweight, four-axis stabilised EO system, which can be used in land-based applications (eg border or coastal surveillance and air defence), airborne (e.g. helicopters) and shipborne as a stand-alone sensor or as part of a command and fire control system.

UMIT

Universal Multispectral Information and Tracking (UMIT) system, developed by Rheinmetall, is a multi-sensor platform for airspace surveillance missions. The UMIT is modular and provides flexibility to install on various vehicles. It is capable of detecting small UAVs.

RHEINMETALL

TMEO Mk2

The TMEO Mk2 is an EO tracking system developed by Rheinmetall. According to the manufacturer, it can be integrated easily with a wide range of fire control radars. Currently, the Malaysian Navy is the only customer of the system, having ordered the TMEO Mk2 for its new Maharaja Lelu-class surface vessels.

RIEGL USA

miniVUX-1DL

The Riegl miniVUX-1DL is a sister device to the miniVUX-1UAV lightweight laser scanning system. The additional indicator DL in the product name means downward looking, referring to its design that is tailored to meet the needs of corridor mapping tasks. Additional applications that the system has been designed for include pipeline and power line monitoring and highway and rail track inspection. The miniVUX-1DL uses RIEGL's Waveform-LIDAR technology, allowing echo digitisation and online waveform processing. Length: 23cm Width: 11cm Height: 12cm Weight: 2.4kg Detection range: 0km

miniVUX-SYS

The Riegl miniVUX-SYS is a lightweight laser scanning system, designed for various applications on UAS/RPAS platforms. Applications that the system has been designed for include agriculture and forestry, glacier and snowfield mapping and construction site monitoring. The system comprises a RIEGL miniVUX-1UAV LIDAR engine, an IMU/GNSS system, a dedicated control unit (available for the AP20 solution) and an optional RGB camera system. Length: 26.4cm Width: 11cm Height: 8.5cm Weight: 3.6kg Detection range: 0.25km

miniVUX-1UAV

The miniVUX-1UAV is a lightweight, airborne laser scanner which is designed for commercial and civilian uses such as agriculture and forestry surveying, glacier and snowfield mapping, archaeology and cultural heritage documentation, and construction-site and landslide monitoring. Length: 24cm Width: 11cm Height: 8.5cm Weight: 1.55kg Detection range: 0.25km

VUX-1

The Riegl VUX-1 is a lightweight laser scanner for UAS. It is designed to be mounted in any orientation and in limited weight and space conditions. The system's energy consumption is low, requiring only a single power supply. The entire data set of an acquisition campaign is stored on an internal 240GB SSD and/or provided as real-time line scan data via the integrated LAN-TCP/IP interface. Length: 22.7cm Width: 18cm Height: 12.5cm Weight: 3.5kg

SAAB

Helios/HeliTOW

A stabilised direct view optical system for surveillance and targeting, HeliTOW includes TOW missile tracking and guidance systems. The sight unit provides the gunner with a high-resolution image day and night, enabling detection, identification and tracking of targets at long range. Large FOV and high resolution give a high target-detection probability in short search times. Transmission: greater than 27%. Dioptre settings: -5.25/+4.

MRPS

The Modular Reconnaissance Pod System (MRPS) is designed for aerial reconnaissance on fighter aircraft. The MRPS has three main subsystems: the sensor fit, the digital mass memory and the reconnaissance management system. The system, which has provision for a day and night capability, can be carried on various aircraft platforms. The pod has a 360° rotating window section attached directly to the strongback structure. The modular design provides flexibility when selecting the sensor suite.

SEOS

The Stabilised EO System (SEOS) is designed for surveillance and targeting. It has been developed using experience from Helios and HeliTOW programmes. The basic system features a thermal imager, TV cameras and a laser rangefinder. Options include laser designator, missile tracker/beam rider unit, low-light-level TV camera and 3-5µm thermal imager. Image processing provides automatic target detection and tracking, image freeze/store, area tracking, thermal cueing, electronic magnification, image integration, graphics generation and overlay. Additionally, built-in tests (BIT) include a power-up test, function monitoring and integrated BITs. Width: 50cm Height: 70cm

SAFRAN ELECTRONICS & DEFENSE

Euroflir 350

The Euroflir 350 is a gyro-stabilised optronic payload within a turret. According to the company, it is effective at long ranges and can track mobile targets, designate important areas for the pilot, generate an automatic terrain scanning for SAR missions and provide information on sighted targets. The system comprises thermal imaging and HD TV colour cameras, both with continuous optical zoom, a laser rangefinder and a laser pointer. Width: 35.6cm

Euroflir 410

Unveiled at the Paris Air Show 2017, the modular Euroflir 410 gyro-stabilised optronic payload is designed for a variety of military and security air vehicles to provide all-weather, long-range observation and precision targeting for air-to-ground munitions. It can incorporate a variety of sensors that include HD TV colour camera, multi-channel spotter with short-wave IR sensor, low-light-level TV and laser designator. Additionally, a laser pointer, laser rangefinder, an optional laser illuminator and thermal imager are also incorporated. Width: 41cm

Euroflir 410 SP

The Euroflir 410 SP optronic payload incorporates up to seven sensors to enable fixed-wing aircraft, helicopters and UAVs to conduct ISR and precision targeting missions. Width: 40.6cm

Front Sector Optronics

Safran provides the multifunction front sector EO system for Rafale fighters used for air-to-air and air-to-surface missions. Functions: detection, tracking, 2D/3D localisation, identification. Sensors: infrared search and track thermal imager, long-range TV/charge-coupled device imager, eyesafe laser rangefinder (LRF). IR channel is bispectral, has a large field of regard, automatic multi-target processing and low false alarm rate. TV/laser channel has optimised bandwidth, high-resolution image processing plus aiming and automatic boresighting of LRF.

Odin

Based on the around-the-corner sighting product developed for the French Army's FELIN digital soldier systems, Odin provides personnel in combat with a protective firing capability. The system is designed to allow Odin-equipped machine gunners to provide highly effective fire without exposing themselves or forcing the aircraft to carry out specific manoeuvres. Odin also provides collective weapons with firing accuracy, thus optimising ammunition management.

Olosp

The Olosp is a steerable IR and visible dual-sensor platform designed for airborne surveillance. It comprises an electronic control unit and a hand controller or laptop. Its main features include steerable, hardened, watertight, four-axis stabilised turret. Azimuth coverage: 360°. Elevation coverage: +20/-120°. Can be offered in two versions: Iris and Matis. Width: 41cm Height: 50cm

Osiris

Osiris is a mast-mounted, gyro-stabilised sight for Tiger antitank helicopters, part of the long-range TRIGAT anti-armour missile system. It is used for terrain observation, target acquisition and fire control. Thermal imager: Iris 8-12µm, Gen II. Field of view (FOV): 40x30°, 8x3.5°, 4.7x3.5°, 1.5x1.1° and 0.75x0.56°. TV camera: charge-coupled device, visible, near-IR bands; FOV 8x6°, 2.5x1.9° and 0.75x0.56°. Laser rangefinder: eye-safe. Localiser: IR goniometer for HOT missiles.

Paseo

The Safran Paseo is a surveillance and detection device for armoured vehicles that can be used to allow a gunner to safely fire their weapon. The Paseo has a panoramic sight and can perform day and night. The Paseo can also be used not only for gunners but for commanders' applications, as well as forward observation for artillery. Detection range: 15.4km

Strix/Nightowl

Strix/Nightowl is a roof- or nose-mounted reconnaissance and weapon-aiming sight for helicopters. Strix is designed for terrain observation, target acquisition (detection, recognition, identification and localisation) and aiming guns, rockets, air-to-air missiles, laser-guided weapons

and fire-and-forget missiles. Nightowl has antitank capabilities, including a designation for laser-homing missiles. Both systems include an eye-safe laser rangefinder or rangefinder/designator.

Vampir MB

Vampir MB is a long-range bispectral IR search and track system that can operate alone or as a low-altitude gap filler to complement air search radars and electronic support measures. Refresh rate: 1.5Hz. Sensors: second-generation IR 288x4-element focal plane array working in 3-5 and 8-12µm bands.

Viviane

Viviane is a gyro-stabilised night and adverse weather observation system with missile sight. It is fitted to French Army Gazelles and contains a direct-view optical sight, a thermal imager (TI) as well as a laser rangefinder and a localiser/goniometer for HOT missiles. Viviane is combat-proven in several theatres of operations. Direct-view optics: two selectable FOVs – 17° (3.3x) and 5° (11x). TI: 8-12µm camera, three selectable FOVs – 30x20° (1.5x), 6x4° (7.5x) and 2.4x1.6° (19x). Missile localiser: HOT 3 anti-jamming goniometer. Weight: 99kg

SENSEFLY

SODA

The senseFly SODA (Sensor Optimised for Drone Applications) is described by the company as 'the first camera built for professional drone photogrammetry work' and is designed to 'produce orthomosaics and 3D digital surface models'. The sensor is supplied as standard with the company's eBee UAVs and became available in late 2016. Length: 6cm Width: 4cm Height: 4cm Diameter: 1cm Weight: 0.11kg

SHILAT OPTRONICS

Light Eye

Light Eye is a lightweight unmanned aerostat-mounted EO system designed for standoff, wide-coverage air observation. It is optimised for altitudes of up to 2,600ft with a coverage of 360°. Its payload incorporates stabilisation capabilities which enable imaging in narrow FOV (high magnification). Target recognition: 5km man-size. Target identification: 3km man-size. Elevation: 110°. Azimuth: 360°. Operation time: 6h.

The Jaegar is a pan and tilt mounting system for EO/IR sensors. (Photo: Silent Sentinel)

SILENT SENTINEL

Jaegar

The Jaegar is a pan and tilt mounting system for EO/IR sensors. It is distinguished from other systems by a built-in through shaft, which allows a fixed-payload to be attached directly above the cameras. In addition to being offered as a standalone sensor in a variety of configurations, the Jaegar has also been integrated into the Odin C-UAS system. Length: 65cm Height: 39.1cm Weight: 40kg Detection range: 50km

SONY

A7

The Sony A7 (Alpha 7 or α7) is a lightweight camera, weighing less than 500g, and is suitable for small UAVs such as Versa X6 rotary-wing platform. Length: 5.5cm Width: 12.7cm Height: 9.5cm Diameter: 3.5cm Weight: 0.47kg

A7R

The Sony A7R (or Alpha 7R) is a small lightweight sensor, which weighs less than half a kilogram and is already in service on a number of small UAVs. Length: 5.5cm Width: 12.7cm Height: 9.5cm Diameter: 8cm Weight: 0.47kg

A5100

The Sony A5100 is a small, lightweight EO/IR camera that is suitable for small UAVs, and has been installed on NINOX and Xential fixed-wing platforms. Length: 3.5cm Width: 11cm Height: 6.2cm Diameter: 6.2cm Weight: 0.5kg

A6000

The Sony A6000 is used on a range of UAVs and has a Fast Hybrid AF which is designed to combine the strengths of both phase- and contrast-detection autofocus. It has 179 phase detection points (covering almost the entire image) and a high-speed contrast-detection function. Length: 4.5cm Width: 12cm Height: 6.7cm Diameter: 6cm Weight: 0.34kg

HDR-PJ810E

The Sony HDR-PJ810E is a small, lightweight camcorder-style EO camera which has been used on Falcon 8 and G4 Eagle UAVs, Length: 13cm Width: 6.7cm Height: 7cm Diameter: 4.6cm Weight: 0.46kg

QX1

The Sony ILCE-QX1 is described by the company as a lens-style camera, a format which allows it to weigh less than 250g, and suitable for very small UAVs. The sensor has a large APS-C size Exmor CMOS image sensor which works with a Bionz X processor to produce high-precision 20.1MP images. Length: 5.25cm Width: 7.4cm Height: 6.95cm Diameter: 6.5cm Weight: 0.22kg

RX1R

The Sony RX1R is a compact, lightweight EO sensor designed for use with small UAVs and is commercially available and ITAR free. It is an entry-level sensor for low-cost systems, particularly for short-range platoon-level operations. Length: 7cm Width: 1,130cm Height: 6.5cm Diameter: 6.5cm Weight: 0.48kg

RX100

The Sony RX100 is a small, lightweight COTS camera that has been installed on mini-Draganflyer UAVs. Length: 3.6cm Width: 10cm Height: 6cm Weight: 0.21kg

STARK AEROSPACE

POP300

The POP300 is a lightweight Plug-in Optronic Payload (POP) EO sensor system. The multi-sensor gyro-stabilised system is used for observation, surveillance, tracking and targeting applications on a range of platforms. These include light reconnaissance aircraft, UAVs, military and police helicopters, naval vessels and ground vehicles. Width: 25.4cm Height: 38.1cm Weight: 16kg

SURVEY COPTER

T120

The T120 is a stabilised turret with daylight and IR sensors, which can be integrated on fixed- and rotary-wing platforms, including helicopters and mini UAVs. The T120 has been designed to provide aerial images in the civilian, paramilitary and military fields. Height: 20.57cm Diameter: 10.92cm Weight: 1.04kg

TELEDYNE FLIR

UltraForce 275-HD

The UltraForce 275-HD is a compact, multi-sensor, gyro-stabilised surveillance system that delivers high-quality, real-time full-motion video (FMV). The UltraForce 275-HD has been optimised to support lightweight manned and unmanned airborne platforms for a range of applications. This including homeland security, airborne, combat, patrol, surveillance, reconnaissance and SAR. It is a non-ITAR system built in Europe with no U.S. sourced components. The system is fully gyro stabilised with a 360° continuous azimuth and +20° / -120° elevation range of gimbal movement. Height: 38.6cm Diameter: 27.5cm Weight: 16.1kg

UltraForce 350-HD

The UltraForce 350-HD is a gyro-stabilised multi-sensor gimbal produced by FLIR Systems UK. Equipped with a mediumwave IR thermal imager and an HD colour camera featuring 20x digital zoom, as well as laser and spotter systems, this gimbal is suitable for carrying out ISR and SAR missions at high standoff ranges. As it does not use any US-sourced components and is manufactured in Europe, the UltraForce 350-HD is ITAR-free and able to be equipped on many types of rotary-wing, fixed-wing and unmanned platforms. Length: 35cm Width: 35cm Height: 48.3cm Diameter: 35cm Weight: 30kg

Sea Star Safire III

Sea Star Safire III is a naval variant of FLIR Systems' EO/IR system. Its key capabilities include gyro-stabilisation, high-resolution thermal imaging and an eye-safe laser range finder. The only known export customer of the system is the Danish Navy as the system has been procured for its Iver Huitfeldt-class frigates. Length: 38cm Width: 48cm Weight: 50kg

Star SAFIRE 230-HD

The Star SAFIRE 230-HD provides up to seven simultaneous payloads in a single-line replaceable unit 22.9cm package. This includes an IR, HD colour charge-coupled device (CCD), electron multiplying CCD, laser pointer, laser illuminator, laser rangefinder and embedded inertial measurement unit/GPS. The system features an integrated control module and can be repositioned between aircraft without the need to change a separate electronics box or reroute main sensor cables throughout the fuselage.

Star SAFIRE 380-HD

The Star SAFIRE 380-HD is a digital HD, gyro-stabilised, single line-replaceable unit imaging system. It has six-axis stabilisation with 120x magnification optics for extended detection range and laser payloads to covertly illuminate and point out targets and determine distance and location. Sensor and geospatial data are embedded within the digital video stream, eliminating the need for separate dedicated ports. The system has internal navigation for precise targeting across a variety of missions, a mediumwave IR thermal imager, optional HD colour and low-light cameras, and multiple payload options. The system is fully hardened for military fixed-wing and helicopter operations and can operate continuously in all conditions – even while sitting on the tarmac with no airflow. Height: 45.4cm Diameter: 38.1cm Weight: 45kg

Star SAFIRE 380-HDc

The Star SAFIRE 380-HDc is a stabilised HD imaging system designed to maximise ground clearance on rotary-wing aircraft. The image processor core provides image quality with automatic gain control, auto-focus, filtering, edge enhancement and optional real-time image blending. 1,000mm optics extend detection, recognition and identification range and the short-wave IR sensor expands imaging capability in degraded visual conditions, penetrating through smoke, haze and pollutants. It is optimised for airborne reconnaissance, patrol, and SAR missions. Height: 35.6cm Diameter: 38.1cm Weight: 29.5kg

Star SAFIRE 380-HLD

The FLIR Star SAFIRE 380-HLD is a full-HD multi-spectral targeting system with image stabilisation, ultra-long-range imaging performance, and metadata embedded in digital video. The system comprises an HD thermal imager with a zoom ratio of 120x, up to seven simultaneous payloads, all-digital HD 1080P/720P for all video channels, embedded digital IMU/GPS, laser designation (LD) and rangefinder. Flexible integration options allow an operator to choose a federated approach or a fully integrated approach that enables cross cueing, drives cursor on target, and allows full mission computer integration. Height: 47.3cm Diameter: 38.1cm Weight: 49.9kg

Star SAFIRE 380X

FLIR is upgrading the 380 series gimbal hardware, firmware and software to support the implementation of advanced image aiding features. The upgrade replaces the single line replaceable unit electronics package with a new set of processors that enable multi-tile image management, an icon-based Graphical User Interface, a Multiple Moving Target indicator, an augmented reality overlay and an Asynchronous Laser

Pulse Detection functionality in laser designating systems with augmented reality correlation to friendly positions and "no fire areas" or "restricted fire areas". The upgrade will be launched in 2020.

Star SAFIRE HD

The Star SAFIRE HD is an all-digital, HD, gyro-stabilised imaging system. It is military-qualified and has six-axis stabilisation. The system includes megapixel thermal, daylight and low-light cameras with high-magnification optics, laser payloads and an integrated inertial measurement unit for target location. The Star SAFIRE HD has high-bandwidth HD-SDI video channels with symbology overlays and multiple laser payloads. The image processor core provides automatic gain control, auto-focus, filtering, edge enhancement and optional real-time image blending.

Star SAFIRE III

The Star SAFIRE III is a military-qualified COTS multipurpose and gyro-stabilised airborne platform carrying seven payloads.

Talon

The Talon is a gyro-stabilised 23cm turret that can be housed in a range of mounting positions. Designed to meet mid-range reconnaissance, surveillance and target acquisition mission requirements, it contains up to six payloads simultaneously, including IR, colour charge-coupled device (CCD), electron-multiplying CCD, laser pointer or illuminator, laser rangefinder and embedded inertial measurement unit/GPS. The Talon is available in a multi- or single-line replaceable unit configuration, with workload reduction features such as scan mode, video auto-tracking and automatic gain/level. Weight: 14.5kg

Vue Pro

The Vue Pro is a thermal camera designed for professional use, providing a thermal measurement instrument and a data recorder. The system also includes full data recording of thermal video and 14-bit still imagery. When connected to a compatible flight control system, the Vue Pro will automatically insert aircraft geolocation and flight data information into each captured image, enabling image stitching as required for mapping, survey and precision agriculture applications. Length: 5.7cm Width: 4.5cm Weight: 0.11kg

TETRACAM

ADC Lite camera

Tetracam ADC Lite camera is designed for agricultural surveying and operates in visible and near-IR spectrums. It is a lightweight version of the company's ADC Air camera. This model's lightweight design solution functions for applications in which weight is a critical factor, particularly UAVs. Length: 2cm Width: 11cm Height: 8cm Diameter: 4cm Weight: 0.2kg

THALES OPTRONIQUE

AREOS

AREOS (Airborne Recce Observation System) is a standoff reconnaissance system designed for tactical and strategic missions. The pod integrates digital technology in its sensor and detector solutions and its real/deferred-time transmission capability. The system is composed of an airborne pod and a ground/shipboard station and also features imaging technologies and high-performance data links.

Damocles

Damocles is a multi-function pod designed to be compatible with existing and future weapon systems. It features a staring array detector, tracking systems, image processing, 3D location and laser spot detection. Its laser and high-resolution imagery provide the aircraft with a long standoff range and tactical ground/air defence system survivability. Length: 250cm Weight: 265kg

THALES UK

DJRP

The Digital Joint Reconnaissance Pod (DJRP) is a tactical EO/IR reconnaissance system. It provides simultaneous high resolution and wide field-of-view EO imagery and horizon-to-horizon day/night IR coverage. The lightweight, low-drag pod is configurable for fighter platforms, light aircraft and helicopters involved in reconnaissance or surveillance. A ground-based Networked Image Exploitation System is available to manage and exploit the acquired imagery. Length: 230cm Diameter: 45.7cm Weight: 270kg

THREOD SYSTEMS

Orca

Orca is a gimbal solution developed by Threod to provide modular systems that can be integrated into fixed-wing and multi-rotor UAS, UGVs and other observation platforms. Its cooled midwave IR sensor detects vehicles at 15km and humans at 9km. Length: 22cm Width: 22cm Height: 30cm Weight: 4kg Detection range: 15km

Shark

Developed by Threod, Shark is an EO/IR gimbal solution designed to meet customer requirements for ISR tasks. It can be integrated into any fixed-wing UAV, multirotor UAV, UGV or any other observation platform. Length: 13.6cm Width: 17cm Height: 16.5cm Weight: 1kg

TOP I VISION

LEV 2 Day

The LEV 2 Day is a lightweight stabilised payload with a 25x zoom high-resolution charge-coupled device day sensor. Weight: 0.95kg

LEV 2 Night

The LEV 2 Night is a lightweight stabilised payload incorporating an uncooled thermal sensor. Weight: 1kg

LEV 4

The LEV 4 is a lightweight stabilised payload with day 40x zoom high-resolution charge-coupled device sensor. Weight: 3.5kg

LEV 6 Dual

The LEV 6 Dual is a lightweight stabilised payload that incorporates a day and night thermal uncooled sensor with digital continuous zoom. Weight: 1.5kg

LEV 6 Dual-Z

The LEV 6 Dual-Z is a lightweight stabilised payload that incorporates a day and night thermal uncooled sensor with continuous zoom capability. Weight: 1.6kg

TRAKKA SYSTEMS USA

SWE-200 LE

The Trakka Systems SWE-200 LE is a compact and lightweight dual-line replaceable unit multi-sensor surveillance system offering day and night mission capabilities. With a diameter of only 200mm, the SWE-200 LE provides a fully digital four-axis gyro-stabilised platform designed for installation on small aircraft, rotorcraft, UAVs and land vehicles where size, weight and cost are challenging factors. The SWE-200 LE can accommodate various payload options, including uncooled and cooled thermal imagers, HD TV cameras as well as a laser rangefinder. Video target tracking, geolocation and various remote interface options are available. Diameter: 19.81cm Weight: 8kg

SWE-300 HDIR

The SWE-300 HDIR is a dual-sensor system containing a high-resolution, radiometric IR camera and HDTV zoom camera. The 300mm fully digital four-axis gyro-stabilised platform houses the HD, IR camera that provides accurate, non-contact temperature measurements in real-time, while the HDTV provides colour images in full high-definition detail. The SWE-300 HDIR can be equipped with an IMU/INS and laser rangefinder option that provides the geographical location of targets on the ground. Height: 42cm Diameter: 30cm Weight: 17kg

SWE-300 LE

The Trakka Systems SWE-300 LE offers a compact, dual-line replaceable unit, long-range, multi-sensor surveillance capabilities in a lightweight package. The 300mm fully digital four-axis gyro-stabilised platform can accommodate various payload options, including cooled thermal imagers for increased stand-off ranges, as well as HDTV and laser systems. Video target tracking, geolocation and various laser rangefinders, illuminators and pointers are also available. Diameter: 30cm Weight: 18kg Detection range: 15.5km

SWE-300 Triple

The Trakka Systems SWE-300 Triple is a tri-sensor system that contains the same radiometric IR and HDTV zoom sensors as the SWE-300 HDIR, but is also equipped with a UV Corona detection camera. The radiometric IR camera can be used to identify power line problems by detecting a change in temperature, which is often caused by internal defects. Height: 42cm Diameter: 30cm Weight: 18kg

SWE-400 LE

The Trakka Systems SWE-400 LE is a dual-line replaceable unit system designed to accommodate a wide array of sensor packages. The 400mm, fully digital four-axis gyro-stabilised platform has the most flexibility in terms of sensor and lens combinations of all the company's offerings. Various payload options, including cooled thermal imaging sensors, HDTV, colour spotter scope and laser sensors, can be housed within the gimbal. Diameter: 40cm Weight: 30kg Detection range: 16.6km

SWE-400 QUAD

The Trakka Systems SWE-400 QUAD multi-sensor imaging system combines all of the sensors and features found in the SWE-300 series, with the addition of a megapixel digital frame camera in a 400mm fully digital four-axis gyro-stabilised platform. The photo camera offers fast auto-focusing and fast image storage for high-resolution fault reference capture. All stored photos are georeferenced with location information. Height: 52cm Diameter: 40cm Weight: 31kg

TC-300

The TrakkaCam TC-300 is a multi-sensor surveillance system in a single-line replaceable unit configuration. The payload suite comprises six sensor channels, namely a laser rangefinder, laser pointer, laser illuminator and medium-wave IR thermal imager and colour HDTV, both with continuous zoom. The TC-300 includes an integrated inertial measurement unit/GPS that provides geolocation and moving map integration. KLV metadata, via gigabyte Ethernet, interfaces to Trakka Systems' augmented reality moving map and video management system, as well as to third-party mapping systems. Width: 30cm Diameter: 30cm Weight: 19kg

TRILLIUM ENGINEERING

Orion HD25

The Orion HD25 is a high-performance 2.5-inch stabilized EO/IR camera system for small unmanned vehicles. It has been installed on Pulse Aerospace Vapor 15/35/55 UAVs. Length: 6.4cm Width: 6.4cm Height: 10cm Diameter: 6.4cm Weight: 0.33kg

TYLER CAMERA SYSTEMS

Tyler MiniGyro

The Tyler MiniGyro is claimed to be one of the first stabilising camera mounts to go from one shooting platform, i.e. helicopter, to another, such as car, motorcycle or ATV, in one step. Its compact size and weight of 13.6kg (with the complete camera package) is designed to make it suitable for working in tight spaces. Weight: 13.61kg

UAV SOLUTIONS

Dragon View

Dragon View sensors provide thermal imagery, video recordings, object tracking and geolocation data. They are mechanically and digitally stabilised gimbals with EO/IR cameras. They can also be integrated on antenna towers, other structures, UAVs offered by UAV Solutions as well as those from other manufacturers. Weight: 0.45kg

ULTRA ELECTRONICS COMMAND & SONAR SYSTEMS

Series 2500 EOS

The Series 2500 EOS is a tracking and fire control radar for small- and medium-calibre guns as well as short-range missiles. Manufactured by Ultra Electronics, the Series 2500 is deployed by both the British and Australian navies. Width: 106cm Height: 91.5cm Weight: 285kg

URALS OPTICAL AND MECHANICAL PLANT UOMZ

GOES-337M

The GOES-337M is a targeting and search system designed for integration into Mi-8/17 combat helicopters and their derivatives. It is capable of detection, recognition, acquisition and auto-tracking of targets. Additionally, it is capable of measuring angle distance to objects and performance of sighting functions when using unguided armaments and bombs. Height: 61.9cm Weight: 82kg

GOES-342

The GOES-342 is an observation and sighting system for the Ka-50 combat helicopter and its derivatives. Its capabilities include day and night target acquisition, recognition of ground and surface targets, laser ranging and sighting of machine guns, as well as the guidance of guns and guided missiles. Length: 61.3cm Width: 46cm

GOES-451M

The GOES-451M is a day and night observation and sighting system designed for installation on the Russian Army's fleet of Mi-28NM helicopters. The system is a follow-on from the GOES-451—a payload used on the Ka-52—with the same functionality.

GOES-520

The GOES-520 is a day and night observation system for the Ka-50 combat helicopter and its derivatives. Length: 50cm Width: 35cm

OEPS-27/29

The OEPS-27/29 is a day and night optronic sighting system for Su-27SK/MiG-29 fighters. It is capable of search, acquisition and tracking of air targets, setting of coordinates and measurement of range to air and ground targets. Weight: 174kg

SON-730

SON-730 is a gyro-stabilised optical surveillance system, used for commercial applications such a traffic control, forest and underground fires and monitoring oil and gas power lines. The SON-730 has been integrated on the Ansat light twin helicopter. The surveillance system features a gyro-stabilised TV and thermal imaging cameras for day/night operations, working together with downlink equipment for sending the gathered images to a ground-based command post at a distance of up to 2.7nm (5km). Diameter: 25cm Weight: 30kg Detection range: 8km

SON-820/SON-MR-02

The SON-820 and SON-MR-02 are day and night optical surveillance systems for UAVs. Both are mounted on gyro-stabilised platforms, but the latter is distinguished from the former by its modular construction. Weight: 7kg

UTC AEROSPACE SYSTEMS – ISR SYSTEMS

CA-270

The CA-270 medium-altitude digital reconnaissance camera uses a 25MP charge-coupled device and a HiQE IR detector to capture digital framing imagery in the visible band, the medium-wave IR band or both simultaneously. The camera provides a horizon-to-horizon field of regard, a wide single-frame field of view and stereo imagery for imagery analysis and targeting.

CA-295

The CA-295 high-altitude digital reconnaissance camera provides high-resolution imagery at standoff ranges. It uses a 25MP charge-coupled device and a HiQE IR detector to capture digital framing imagery in the visible band, the medium-wave IR band or both simultaneously. The camera provides a horizon-to-horizon field of regard, a wide single-frame FOV and stereo imagery for imagery analysis and targeting.

DB/MS-110

The DB-110 is a long-range oblique photography (LOROP) EO/IR dual-band sensor that combines visible and IR imaging. It offers three optical fields of view: long-range, medium-range and low-altitude direct overflight. Additionally, multiple operational modes include wide-area and line search, pinpoint target, stereo and opportunity targets. The DB-110 was first sold to the UK RAF as the RAPTOR pod.

UTC AEROSPACE SYSTEMS- TASE IMAGING SYSTEMS

TASE150

The TASE150 single-camera, two-axis stabilised gimbal is designed for UAVs that have space and weight restrictions. The baseline gimbal is available with all Sony FCB-EX block cameras, thermal imagers or 5MP still cameras. Additionally, the image processing board is external to the gimbal. Length: 12.2cm Width: 11.2cm Height: 17.8cm Diameter: 11.2cm Weight: 0.9kg

TASE200

The TASE200 gimbal provides a dual-camera solution for UAVs that need a multi-camera turret in a small package. The image processing board is also external to the gimbal. Length: 12.2cm Width: 11.5cm Height: 19.2cm Diameter: 11.5cm Weight: 1.06kg

TASE250 LWIR

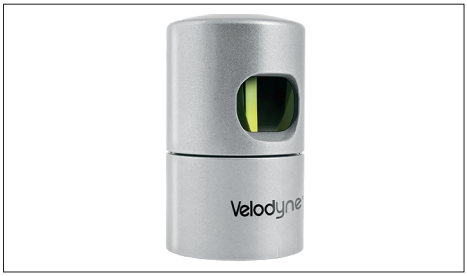
The TASE250 LWIR is a dual-axis fully stabilised gimbal that incorporates both a daylight and an IR camera. Such as all members of the TASE family of sensor gimbals, the TASE250 longwave infrared is optimised for low SWaP. As the lightest and most compact member of the series, it is particularly suited for mounting on small UAS with limited payload capacity. However, it can also be installed on fixed-wing aircraft, helicopters, and aerostats. Height: 19.05cm Diameter: 13.97cm Weight: 1.95kg

TASE250HD

The TASE250HD utilises the existing TASE400 SWaP and stability architecture. The long-wave IR imaging payload was designed to satisfy the demand for image quality and stability in a compact package. The TASE250HD includes ViewPoint software interfaces for C2, including an integrated moving map, Path-Track and video recording. Height: 19.1cm Diameter: 14cm Weight: 1.95kg

TASE310

The TASE310 is an HD daylight imaging payload designed to meet demands towards HD imagery for



The Velodyne HDL-32E LiDAR sensor was described by the company as a smaller, lighter and less expensive product for autonomous vehicles and mobile mapping applications. (Photo: Velodyne LIDAR)

applications that require installation flexibility. The payload has SWaP, software interfaces and stabilisation. Length: 17.8cm Width: 17.8cm Height: 26.7cm Diameter: 17.8cm Weight: 3kg

TASE350
The TASE350 is an EO/IR imager that includes SWaP, software interfaces and stabilisation. Additionally, it has continuous zoom EO optics with laser options. Length: 17.8cm Width: 17.8cm Height: 26.7cm Diameter: 17.8cm Weight: 3.2kg

TASE400
The TASE400 has a medium-wave IR camera with continuous optical zoom down to 2° FOV, as well as a daylight camera. The payload is designed to provide day and night surveillance imaging and has 14µrad pointing resolution. Length: 17.8cm Width: 17.8cm Height: 26cm Diameter: 17.8cm Weight: 3.4kg

TASE400DXR
The TASE400DXR is a stabilised gimbal mount designed to accommodate two daylight cameras. It is intended to provide extended range daylight imaging capabilities. Length: 17,800cm Width: 17,800cm Height: 26,700cm Diameter: 17,800cm Weight: 3.5kg

TASE400HD
The TASE400HD has a medium-wave IR camera with continuous optical zoom down to 2.2° FOV. The daylight camera also provides HD imagery in a range of conditions. Length: 17.8cm Width: 17.8cm Height: 26.7cm Diameter: 17.8cm Weight: 3.5kg

TASE400L
The TASE400L imaging system has a medium-wave IR camera with continuous optical zoom down to 2° FOV and a daylight camera. A third payload bay can also be configured to host an illuminator as well as other options. Height: 26.7cm Diameter: 17.8cm Weight: 3.8kg

TASE400LRS
The TASE400LRS is a long-range day and night imaging system. It has a medium-wave IR camera with continuous optical zoom down to 2.2° FOV and a dual daylight imager with a long-range spotter camera capable of 1.06° (SD) or 2.2° (HD) optical FOV. Length: 17.8cm Width: 17.8cm Height: 26.7cm Diameter: 17.8cm Weight: 3.5kg

TASE500HD
The TASE500HD is a multispectral imaging system incorporating medium-wave IR, short-wave IR and daylight cameras with continuous optical zoom and digital zoom. The TASE500HD, designed for fixed-wing, helicopter, manned and unmanned applications, has multiple laser options, including a pointer and rangefinder. Height: 37.5cm Diameter: 26cm Weight: 17kg

VELODYNE LIDAR

HDL32E
The Velodyne HDL-32E LiDAR sensor was unveiled in August 2010 at the AUVSI conference in Denver, Colorado. It was described by the company as a smaller, lighter and less expensive product for autonomous vehicles and mobile mapping applications. Length: 8.5cm Width: 8.5cm Height: 14.5cm Diameter: 8.5cm Weight: 1kg Detection range: 0.1km

VLP-16
Velodyne's VLP-16 Puck is a small and compact lidar that is power and performance optimised for usage across a variety of applications. This ranges from automotive, mapping, robotics, security, smart cities and more. It provides real-time, surround view, 3D distance and calibrated reflectivity measurements. Length: 9cm Width: 9cm Height: 7.1cm Diameter: 9cm Weight: 0.83kg Detection range: 0.1km

VERTIVUE

Skybox
The Skybox allows gimballed camera systems developed for small UAVs to be integrated on the nose of manned helicopters. It accommodates cameras such as DJI's X5R and Z30 and has a heavy-duty gyro that eliminates the vibration from the helicopter, allowing the onboard operator to capture clear images. The lower window section of the Skybox employs optically neutral anti-reflective lens glass and rotates in sync with the gimbal for 360° panning and tilting. Weight: 20.4kg

VTUL A PVO PRAHA

S120
The S120 is a two-axis gyro-stabilised EO gimbal head with a daylight or IR camera with a laser pointer and ground moving target tracker. Height: 21.4cm Weight: 1kg

S250
The S250 is a four-axis gyro-stabilised EO gimbal head with a daylight and IR camera, laser rangefinder, laser pointer and ground moving target tracker. Height: 36cm Diameter: 25cm Weight: 12.6kg

WALKERA

iLook+
The Walkera iLook+ is a small and lightweight EO camera designed for aerial use, particularly for installation on small UAVs. Length: 2cm Width: 5.8cm Height: 4cm Weight: 0.07kg

ZALA AERO GROUP

421-G3 HD/IR

The 421-G3 HD/IR is a combined gimballed EO and IR sensor developed by Zala Aero Group for use on its fixed-wing 421-16 and 421-16E UAVs. Whereas the previous 421-G3 HD only carried an HD video camera, the 421-G3 HD/IR adds a thermal imager. This increases its utility in night-time operations and adverse weather conditions. Length: 17cm Width: 13cm Height: 13cm Weight: 0.89kg

Z-08IK

The Z-08IK is a thermal imager developed by the Zala Aero Group for use on its 421-08M micro UAS. Unlike the Z-08MIK/VK EO/IR sensor offered by the Zala Aero Group, the Z-08IK is fixed in place and lacks the ability to automatically track designated targets. Weight: 0.3kg

Z-08MF/VK

The Z-08MF/VK is a camera system developed by the Zala Aero Group for its 421-08M drone. Incorporating both a conventional camera and a camcorder, the Z-08MF/VK can be used to take photographs and record videos. Unlike many of the other Z-08 series systems, the Z-08MF/VK sensors are housed within a fixed mounting and lack the ability to integrate an automatic target tracking module. Weight: 0.3kg

Z-08MIK/VC

The Z-08MIK/VC is a two-axis gyro-stabilised mount for a video camera and a thermal imager developed for use on the 421-08M micro UAS. If equipped with an optional integrated target tracking module, this system can also automatically recognise and observe targets without requiring substantial input from the operator. Weight: 0.3kg

Z-08MVK/VC

The Z-08MVK/VC is a two-axis gyro-stabilised video camera developed by the Zala Aero Group for use on its 421-08M micro-UAS. If equipped with an optional integrated target tracking module, this system can also automatically recognise and observe targets without requiring substantial input from the operator. Weight: 0.3kg

Z-08VK

The Z-08VK is a two-axis gyro-stabilised gimbal mount designed to accommodate a camcorder. It is intended for use on the 421-08M micro UAS. Weight: 0.3kg

Z-16E5-V1

The Z-16E5-V1 is a three-axis gyro-stabilised gimbal mount equipped with both a video camera and a thermal imager. Designed by the Zala Aero Group for the 421-16E5 drone, it can be used for a variety of civil and military roles.

Z-16EIK18/60

The Z-16EIK18/60 is a three-axis gyro-stabilised gimbal mount for an IR camera. Developed by the Zala Aero Group, this sensor is designed for installation on their 421-16E, 421-16E5 and 421-22 UAVs. In addition to simply providing thermal images of a given area, the Z-16EIK18/60 incorporates an 'isotherm' mode that helps to isolate specific targets. Once identified, these targets can be tracked automatically if an optional target tracking module is integrated into the system. Length: 16.5cm Width: 13cm Height: 13cm Weight: 1.5kg

Z-16EIK60

The Z-16EIK60 is a three-axis gyro-stabilised gimbal mount for an IR camera. Developed by the Zala Aero Group, this sensor is designed for installation on their 421-16E and 421-16E5 UAVs, as well as the smaller 421-08M micro UAS. In addition to simply providing thermal images of a given area, the Z-16EIK60 incorporates an 'isotherm' mode that helps to isolate specific targets. Once identified, these targets can be tracked automatically if an optional target tracking module is integrated into the system. Length: 16.5cm Width: 13cm Height: 13cm Weight: 1.5kg

Z-16F2/VK

The Z-16F2/VK is a gyro-stabilised mount for both a camera and a video camera. Developed by the Zala Aero Group, this sensor is designed for installation on their 421-16E, 421-16E5, 421-16EM and 421-22 UAVs. According to the manufacturer, photos from this camera are of sufficient quality that can be used for tasks such as creating accurate 3D models of terrain features. Length: 16.5cm Width: 13cm Height: 13cm Weight: 1kg

Z-16F3/VK

The Z-16F3/VK is a two-axis gyro-stabilised mount for both a camera and a video camera. Developed by the Zala Aero Group, this sensor is designed for installation on their 421-16E, 421-16E5, 421-16EM and 421-22 UAVs. Length: 16.5cm Width: 12.5cm Height: 12.5cm Weight: 1kg

Z-16FM/VK

The Z-16FM/VK is a detachable camera system designed to be mounted on both fixed-wing and rotary-wing UAVs. Combining a 42 MP digital camera with a PAL video camera, the Z-16FM/VK can be used to gather images and video for a variety of military and civil applications. This includes surveillance and reconnaissance. Length: 17cm Width: 13cm Height: 13cm Weight: 0.99kg

Z-16IR35/VKL

The Z-16IR35/VKL is a three-axis stabilised gimbal that can be mounted on both fixed-wing and rotary-wing UAVs. Housed within this gimbal is a video camera, thermal imager and laser target designator. These sensors are used to transmit images and video to the operators, thereby enhancing the surveillance capabilities and situational awareness of its users. Length: 17cm Width: 13cm Height: 13cm Weight: 0.99kg

Z-16IR35/VI

The Z-16IR35/VI is a combined gimballed EO/IR sensor developed by Zala Aero Group for installation on their range of UAVs. Incorporating both a video camera and a thermal imager, the system can perform surveillance and reconnaissance tasks during both the day and the night. The Z-16IR35/VI is a compact colour PAL block camera stabilised platform that is able to carry out surveys with HD-quality resolution. It has 20x optical zoom in combination with optional 4x digital. It is also equipped with a TAU 640 thermal imaging camera which provides NTSC video stream at 30fps with 640x480 resolution. Length: 17cm Width: 13cm Height: 13cm Weight: 0.99kg

Z-16O/VK Alarm-1

The Z-16O/VK 'Alarm-1' is a combined broadcasting and video surveillance system that incorporates a loudspeaker and video camera into a single package. It can be used to spread pre-recorded notifications and messages over a vast area, whilst simultaneously monitoring the situation on the ground. Developed by the Zala Aero Group, this system can be installed on their 421-16E, 421-16E5, 421-16EM and 421-22 UAVs. Length: 16.5cm Width: 13cm Height: 13cm Weight: 1kg

Z-16VKHD

The Z-16VKHD is a three-axis gyro-stabilised gimbal that can be mounted on both fixed-wing and rotary-wing UAVs. In addition to an HD video camera, the system incorporates a tracking module that can automatically observe and monitor targets. Length: 17cm Width: 13cm Height: 13cm Weight: 0.99kg

Z-21IK

The Z-21IK is a two-axis gyro-stabilised mount for a thermal imager. Designed for use on the Zala Aero Group's 421-21 rotary-wing UAV, it can perform a wide range of military and civil applications. Weight: 0.3kg

Z-21IK/VC

The Z-21IK/VC is a two-axis gyro-stabilised mount for both a video camera and a thermal imager. Designed for use on the Zala Aero Group's 421-21 rotary-wing UAV, it can be used for a variety of civil and military applications. Weight: 0.3kg

Z-21VKHD

The Z-21VKHD is a two-axis gyro-stabilised mount for a camcorder. Designed for use on the Zala Aero Group's 421-21 rotary-wing UAV, the Z-21VKHD can be used for a variety of civil and military applications. Weight: 0.3kg

Z-21VKHDS

The Z-21VKHDS is a two-axis gyro-stabilised mount for an HD camera. Designed by the Zala Aero Group for use on its rotary-wing 421-21 UAV, it can be used for a wide variety of civil and military applications. Length: 6cm Width: 4.4cm Height: 3.2cm Weight: 0.3kg

CAMERAS AND IR DETECTORS

ASELSAN

ASIR

The ASIR 288x4 FPA thermal surveillance system operates in the longwave infrared band. The ASIR thermal camera has a high sensitivity that enables long-range target detection with a low-temperature difference to its environment. In addition to accuracy in good weather conditions by day and night, ASIR discriminates targets in adverse weather with limited atmospheric energy transmission due to natural effects like fog, haze, smoke, dust, fire and other battlefield conditions. Weight: 15,000g

BAE SYSTEMS

MIM500 Series

Developed to meet the performance requirements of military programmes, the MIM500 series of uncooled IR camera cores is based on BAE Systems' 640x480 MicroIR technology. It is designed for applications requiring high resolution to meet range and/or pixel-on-target requirements. For less demanding applications, the company offers the MIM500H with 320x240 resolution. Features such as gen-lock synchronisation and support of customisation boards mean that the MIM500 series can be configured for specific applications.

PMC300

Based on BAE Systems' 640x480 MicroIR technology, the PMC300 fixed-mount IR camera generates high-resolution thermal imagery claimed to meet mission detection requirements at stand-off distances once limited to cooled IR cameras. It is based on an environmentally qualified, modular design providing the end-user with the flexibility to tailor the unit to meet specific performance requirements and be deployed in operational environments.

SCC500 Series

The SCC500 series are uncooled IR camera cores aimed at the commercial and military OEM markets. Based on BAE Systems' MicroIR technology, SCC500 series cores are designed to generate image quality over an extended operating temperature range with a wide dynamic range (14bit) and real-time 60Hz frame rate in a small package.

TIM1500

Designed for RWS and weapon targeting systems, TIM1500 is an uncooled thermal imager used for long-range surveillance and target acquisition. TIM1500 is designed around a modular common MicroIR sensor architecture. It does not require cryocoolers or optical scanners, thus reducing SWaP. Features: silent image in less than 30s; dual optical FOV; user-specific adjustable reticules and alphanumerics to simplify platform- and weapon-specific integration.

CHELTEK DEFENCE

Cylindrical Camera

Cheltek Defence unveiled its thermal helmet camera, the Cylindrical Camera, at DSEI 2017. The miniature camera is fitted with a forward-looking IR thermal core and is designed for surveillance applications. It is compact and lightweight, housed in anodised aluminium, and outputs composite video. Enclosed within a 26mm diameter housing, the Cylindrical Camera is ideally suited to helmet mounting, allowing for hands-free operation. Various mounts can be supplied, including Picatinny rail mounts.

CHESS DYNAMICS

Piranha LRTV

The Piranha LRTV is a long-range colour charge-coupled device camera designed for long-term external deployment in exposed environments, suitable for land and maritime applications. The camera is able to

withstand dust, heat and moisture due to its rugged design. Weight: 14,000g

Piranha MRTV

The Piranha MRTV is a medium-range 1/3in colour charge-coupled device camera designed for surveillance on land or sea, day and night. It features auto-focus and pre-aligned boresighting with a typical deviation of ±0.2mil, to maintain the view of a 20cm target at a distance of 1km. Weight: 12,000g

Piranha TV

The Piranha family of daylight colour TV cameras are suitable for land and maritime applications and has also been used on low-altitude airborne systems. For low-temperature environments, the camera can be supplied with an optional heater. The integrated IR cut filter provides low-light functionality for dusk and dawn imagery. Piranha TV cameras feature universal dovetail mounting with boresight alignment and can also be mounted in integrated sensor heads. Weight: 1,200g

Piranha ZTI

The Piranha ZTI is an uncooled thermal imaging camera. The lens features anti-reflective coatings throughout and a diamond-line carbon coating on the external surface. Weight: 5,000g

CONTROP PRECISION TECHNOLOGIES

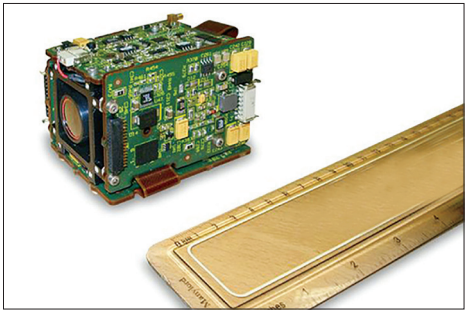
FOX-250Z/ZE

The FOX-250Z and ZE are thermal imaging cameras with a continuous optical zoom lens. They have IR picture for night and day use, auto-focus through zoom and the capability to operate with high-power continuous optical zoom lenses. The cameras include software for image enhancement, optional fixed CG through zoom and micro-scanning for improved resolution. Weight: 5,500g

FOX-450Z/ZE

The FOX-450Z and ZE thermal imaging cameras have continuous optical and IR zoom, IR picture for night and day use, auto-focus through zoom and software for image enhancement. Options include fixed gain control through zoom, micro-scanning for improved resolution, and other focal plane array formats. Video from FOX family cameras can be seen on a remote monitor and they are operated by an external control panel or by means of an RS-422A channel. Weight: 10,500g

The lightweight Juniper thermal imaging camera has small dimensions and low power consumption. (Photo: Elbit Systems Intelligence and Electro-optics – Elop)



FOX-720Z/ZE

The FOX-720Z and ZE thermal imaging cameras have continuous optical and IR zoom, IR picture for night and day use, auto-focus through zoom and software for image enhancement. Options include fixed gain control through zoom, micro-scanning for improved resolution, and other focal plane array formats. Video from FOX family cameras can be seen on a remote monitor and they are operated by an external control panel or by means of an RS-422A channel. Weight: 10,500g

FOX-1400

The FOX-1400 thermal imaging camera has a continuous optical zoom lens, image enhancement capabilities and auto-focus through zoom. This long-range observation IR camera includes local automatic gain control (AGC) algorithms, remotely controlled zoom and focus adjustment, as well as black or white hot polarity. Additionally, gain/level control is automatic, manual or local automatic gain control. Length: 40.7cm Width: 26.5cm Height: 28cm Weight: 11kg

Tornado

The Tornado is a passive lightweight scanning IR camera that provides a 360° panoramic image that is updated every 1-2s. It is suitable for the detection and tracking of flying objects – from small UAVs to larger aircraft flying at low levels and various speeds.

DAT CON DEFENCE

DC-LRMCS-OEM

The DC-LRMCS-OEM long-range observation camera is an integrated unit based on a megapixel camera module and zoom lens. It is designed for day/night surveillance/protection of encampments, homeland security and infrastructure protection applications. It can operate in conditions between -32°C and +65°C. The system is able to penetrate fog and haze, as well as smoke with its filter turned on. Pictures are stabilised so that even on a tower/pole, image wobble is minimised. Graphical overlays and serial interface or network configurations are possible.

DEFENCE VISION SYSTEMS

SWIR Cameras

Defence Vision Systems' shortwave IR cameras operate in the 900-1,700nm wavelength and offer 24h operation combined with eyesafe laser illumination at 1,064-1,550nm. The cameras are suitable for turret-mounted operation in UAVs, border surveillance and as an armoured vehicle driver's aid with the DVS panoramic driving system offering 120° FOV.

ELBIT SYSTEMS INTELLIGENCE AND ELECTRO-OPTICS – ELOP

Crystal

The Crystal is a thermal imaging sensor with dual-axis microscan which can be mast/tower- or weapon-mounted, used in EO sensor clusters, or used for

stabilised EO payloads for airborne, heliborne and shipborne applications. The lightweight Crystal sensor has an open frame with small-capacity construction in a one-unit configuration. It features three FOVs (including super-wide) and dual-axis, and can integrate with a host system.

Crystal-P

The Crystal-P is a high-resolution thermal imaging (TI) sensor in a sealed, ruggedised housing. It can be used for long-range observation, as a night sensor for EO surveillance systems, as a TI sensor for target acquisition and fire direction systems, as an add-on TI sensor for ground and naval radar systems, as a night sight for air defence systems, or as a TI sensor for maritime/coastal EO sensor clusters.

Ivory-Z

The Ivory-Z is a thermal imaging camera and sight for remote operation applications with dual FOV or continuous optical zoom. It can be used for border and coastal surveillance, air defence systems, security and perimeter defence, target acquisition systems, armoured fighting vehicle weapon stations, radar systems and naval EO clusters. Weight: 4,800g

Juniper

The Juniper is a miniature, uncooled, wide-FOV thermal imaging camera which can be integrated into miniature UAVs, small robotic vehicles, small maritime EO payloads and thermal driving systems, or used in fence monitoring and general security surveillance applications. The lightweight Juniper has small dimensions and low power consumption. It features an uncooled detector and standard video output. Weight: 250g

Lotus-G

The Lotus-G is a man-portable, long-range thermal imaging camera for ground applications including observation, border and coastal surveillance, and as a long-range night sight for laser designators, target acquisition systems, ground-to-ground weapon systems and air defence systems. The Lotus-G camera has three FOVs, local and remote control and low power consumption. It is housed in a ruggedised sealed case including display, controls and battery compartment.

FJW OPTICAL SYSTEMS

Find-R-Scope IR Cameras

FJW manufactures two visual/near-IR/shorwave IR cameras. One model is sensitive from 400-1,800nm and the second is sensitive from 400-2,200nm.

Find-R-Scope IR Viewers

FJW Optical Systems provides a range of handheld IR and UV viewers. These are used by maintenance personnel to confirm the operation of external aircraft IR LEDs, formation lights and other identification elements along with IR sources within the cockpit. IR viewers are sensitive from 350-1,550nm. UV viewers from 180-1,550nm. visual/near-IR/shortwave IR cameras from 400-2,200nm. Thermal viewers from 8-14µm.

HENSOLDT OPTRONICS GMBH

ATTICA M-ER

The ATTICA (Advanced Thermal imager with Two-dimensional IR CMOS Array) M-ER was developed specifically for observation at long range. It has a seamless 50x pure optical zoom (0.3-15°), where the 15° wide FOV offers a panoramic view for detection purposes, while the 0.3° extra-narrow FOV provides a detailed view for identification with 'seamless' range capability due to a focal length of 1,800mm.

ATTICA Z/P/K

The Advanced Thermal imager with Two-dimensional IR CMOS Array (ATTICA) series can be integrated on vehicles or deployed on a tripod. The series operates in wavelength ranges of 3-5µm (mediumwave) and 8-12µm (longwave). These thermal imagers provide analogue and digital video signals that comply with the CCIR and RS-170 standards for image display on TV monitors, as well as various VESA standards (up to SXGA and 1280x1024).

ATTICA-M

ATTICA-M (Advanced Thermal imager with Two-dimensional IR CMOS Array) is an IR 3-5µm 1Mpx sensor for stabilised applications for surveillance and observation missions. Optical continuous zoom, various image processing functions. Dimensions adapted to 16in gimbals. Weight: 4,800g

BlackKite

The BlackKite 1.5/30 HD VN camera, engineered for long-range observation, delivers 'upscale' image quality in a 1,920x1,080px resolution. Compact, ruggedised and lightweight, BlackKite cameras are engineered to withstand extreme temperatures. The 20x optical zoom in HD configuration reaches across 'great' distances. The BlackKite has dual interfaces – one delivers an uncompressed stream of high-resolution image data, the other provides compressed data to enable networking via Ethernet.

Kenis

The Kenis imaging IR camera is a thermal imager that employs a 384x288 CMT focal plane array. The standalone camera provides thermal images in the 3-5µm band and is suitable for long-range imaging in hot and humid conditions. The system has been developed for target acquisition in EO observation platforms, as well as terminal guidance requirements in stand-off weapon systems.

RedKite

The RedKite shortwave IR camera was launched in May 2015 and is designed to give a clear view in low-visibility settings, such as mist, fog or heat haze. The RedKite can process frequencies from the visible to IR range for a high-contrast image. According to the company, the camera has the capability to look through windows and can detect Planck spectrum thermal radiation and hot spots like a jet engine exhaust trail.

UCM 17um/25um

The UCM (Un-Cooled Module) is a ruggedised miniature thermal camera for real-time imaging in the

7-14µm waveband (LWIR). Equipped with uncooled microbolometer technology, it delivers images of quality at low power consumption. The UCM can be used for standalone applications or integrated multi-sensor systems. Individual front lenses, housings and system features provide flexibility for a range of applications.

VOS 40/500

The VOS 40/500 is an ITAR-free VOS EO zoom camera that integrates into stabilised sensor compartments of reconnaissance and surveillance systems. The camera provides HD images across its full field from the centre to the edges courtesy of Zeiss optics. The VOS camera delivers NIIRS 6 imagery at a 14km slant range in its narrow FOV at 500mm focal length with a frame rate of up to 39Hz. Weight: 8,000g

HITACHI AMERICA

DI-SC120R HD

DI-SC120R HD is a 30x optical zoom camera with a 1/3in charge-coupled device (CCD) sensor providing a 1,280x720px HD video stream. Hitachi has combined a proprietary digital signal processor , high-sensitivity CCD sensor and 30x lens to achieve a minimum subject illumination of 0.5lx in colour mode. The defog feature enables the camera to process in real-time each pixel for fog thickness and applies contrast to the image to offer an enhanced picture.

IAI TAMAM

NanoPOP

NanoPOP is a miniature stabilised day/night payload incorporating an uncooled longwave IR thermal imager and HD day EO camera. NanoPOP provides mechanical image quality stabilisation for mini and micro fixed-wing and VTOL UAS. Height: 9cm Diameter: 5.8cm Weight: 200g

INO

HRXCAM-16K

HRXCAM-16K is a compact thermal IR, high-resolution, microscanned 16,348x12,288px camera core module. It uses a microbolometer detector for high-resolution/sensitivity imaging in the longwave IR range. The 1,024x768 sensor is combined with a patented microscanned lightweight catadioptric lens. Weight: 1,600g

IRNOVA

QWIP IDCA

QWIP (Quantum Well IR Photodetector) integrated dewar cooler assembly (IDCA), longwave IR, integral and split cooler solutions are intended for use in tough environments for stationary, handheld and vehicle-based systems/cameras. QWIPs are narrow-banded and peak spectral response can be tailored to meet specific application requirements. Both 640x680 (25µm pitch) and 320x256 (30µm pitch) versions are available. The spectral range is typically 7-9µm but models with a peak wavelength at 10.55µm for detection of SF6 gas are available.

T2SL IDCA

The T2SL (Type II Super Lattice) IDCA is an integral cooler detector for MWIR. Both 640x512 (15µm pitch) and 320x256 (30µm pitch) versions are available. Products are intended for use in tough environments for stationary, handheld and vehicle-based systems/cameras. Spectral range is typically 3.5-5µm but also models optimised for detection of volatile organic compounds at 3.3µm are available (cold filter-equipped).

ISP OPTICS

7010-1-D-01

The 7010-1-D-01 is an athermal longwave infrared fixed-focal-length assembly, 35mm F/1.2. It supports multiple detectors with a pitch from 15-50µm and is designed for general thermal imaging applications.

7020-1-D-01

The 7020-1-D-01 is an athermal longwave infrared fixed-focal-length assembly, 25mm F/1.0. It supports multiple detectors with pitch from 15-50µm and designed for general thermal imaging applications.

7020-2-D-03

The 7020-2-D-03 is a longwave infrared fixed-focal-length assembly, 25mm F/1.0. It offers high sensitivity and is compact and lightweight. The system is designed for defence and commercial applications.

7040-1-M-03

The 7040-1-M-03 is a moulded, low-cost, athermal longwave infrared fixed-focal-length assembly, 19mm F/1.1. It supports multiple detectors with a pitch from 12-38µm and is designed for NV automotive applications.

7050-1-M-03

The 7050-1-M-03 is a moulded, low-cost, athermal longwave infrared fixed-focal-length assembly, 14.9mm F/1.3. It supports multiple detectors with a pitch from 12-38µm and is designed for general thermal imaging and security applications.

7060-1-M-03

The 7060-1-M-03 is a moulded, low-cost, athermal, longwave infrared fixed-focal-length assembly, 16.74mm F/1.2. Supports multiple detectors with a pitch from 12-38µm and is designed for general thermal imaging and security applications.

7070-1-M-03

The 7070-1-M-03 is a moulded, low-cost, athermal, longwave infrared fixed-focal-length assembly, 10.65mm F/1.0. It supports multiple detectors with a pitch from 12-38µm and is designed for general thermal imaging and security applications.

7080-1-M-03

The 7080-1-M-03 is a moulded, low-cost, athermal, longwave infrared fixed-focal-length assembly, 7.7mm F/1.3. It supports multiple detectors with a pitch from 12-38µm and is designed for wide FOV thermal imaging, including security and handheld thermographs.

7090-1-M-03
The 7090-1-M-03 is a moulded, low-cost, athermal, longwave infrared fixed-focal-length assembly, 5.0mm F/1.2. It supports multiple detectors with a pitch from 12-38µm. It is designed for fire-fighting, security and handheld thermographs.

7100-2-D-03
The 7100-2-D-03 is a dual-band, shortwave/mediumwave IR fixed-focal-length assembly, 23mm F/4, optimised for defence and homeland security applications. It is compact and lightweight and is compatible with SCD SNIR detector.

7110-1-M-03
The 7110-1-M-03 is a moulded, low-cost, athermal longwave IR fixed-focal-length assembly, 10.15mm F/1.3. It supports multiple detectors with a pitch from 12-38µm and is designed for general thermal imaging and security applications.

7111-1-M-03
The 7111-1-M-03 is a moulded, low-cost, athermal longwave infrared, fixed-focal-length assembly, 8.6mm F/1.0. It supports multiple detectors with a pitch from 12-38µm and is designed for general thermal imaging and security applications. The system is compatible with the FLIR Quark.

7113-1-M-03
The 7113-1-M-03 is a moulded, low-cost, athermal longwave infrared, fixed-focal-length assembly, 8.6mm F/1.0. It supports multiple detectors with a pitch from 12-38µm and is designed for general thermal imaging and security applications. The system is compatible with the FLIR Tau and DRS Tamarisk 320.

Kingfisher
The Kingfisher charge-coupled camera uses a Sony ICX674 chip, with 2.8MP resolution and 4.54µm pixel pitch, enabling sharp image resolution and QE of up to 77%. The camera is available COTS and board-level, the latter offering a range of cooling options and resolutions.

LWIR-19-0.9-A-THERMAL
The LWIR-19-0.9-A-THERMAL is an athermal longwave IR 19mm F/0.9 lens for large uncooled detectors. It is optimised for driver vision enhancers and other remote driving applications. Weight: 280g

LWIR-CZ-18-60-1.4
The LWIR-CZ-18-60-1.4 is a compact 18-60mm longwave IR continuous zoom lens compatible with 4in payloads. Its rugged design makes it suitable for defence and homeland security applications.

LWIR-DFOV-45-135-1.6
The LWIR-DFOV-45-135-1.6 is a longwave IR 45-135mm dual-FOV lens with a digital signal processor controller for 25µm and 17µm detectors. It is designed for medium- to long-range surveillance systems.

MWIR-CZ-18-250-4.0
The MWIR-CZ-18-250-4.0 is a compact, lightweight, mediunmwave IR lens assembly designed for 640x512x16µm and 15µm pitch detectors. Weight: 265g

MWIR-CZ-18-330-4.0
The MWIR-CZ-18-330-4.0 is a mediumwave IR 18-330mm, F/4 continuous zoom lens with a digital signal processor controller for compact cooled detectors. With a rugged, lightweight design, it is optimised for defence and homeland security applications. It maintains focus over the entire zoom range. Weight: 830g

L3HARRIS TECHNOLOGIES

WALRSS
The Wide-Area Long Range Surveillance Sensor (WALRSS) is a cooled, sensitive mediumwave IR camera designed for long-range surveillance and security applications. WALRSS is offered in three motorised continuous zoom configurations (70-700, 143-1,000 and 200-1,200mm) to provide scalability to meet varying mission requirements. Patented sensor technology, mated with a continuous zoom lens and image processing features, allows the user to achieve man detection capability at ranges beyond 20km.

WALRSS HD
WALRSS HD, an HD variant of the Wide-Area Long Range Surveillance Sensor (WALRSS), is a cooled, sensitive mediumwave IR camera with four times the number of pixels as the standard-definition 640x512. It is designed for long-range surveillance and security applications. A 1,280x1,024 reticulated InSb mediumwave IR sensor, mated with a continuous-zoom 200-1,200mm lens and image-processing features, allows the user to achieve man-detection capability at ranges beyond 30km.

LEONARDO DRS

Tamarisk
The Tamarisk family of uncooled thermal imaging camera modules produce imagery during day, night and challenging environmental conditions such as smoke, dust, haze and fog. The two cameras (Tamarisk320 and Tamarisk640) have differing resolutions, but both feature image contrast enhancement, an integrated shutter for flat field correction and DRS's patented absorber superstructure. User-selectable options include zoom, polarity and shutter notification. Applications include security, unmanned vehicles, analytics, man-portable imaging devices and unmanned sensor applications. Weight: 640g

LEONARDO ELECTRONICS

Eagle LWIR
The Eagle longwave infrared detector uses the Leonardo mercury cadmium telluride material process. It is a focal plane array detector with 640x512px on a 24µm pitch and integrated detector cooler assembly for thermal imaging in the 8-10µm waveband.

Eagle MW
The Eagle mediumwave infrared detector uses the Leonardo mercury cadmium telluride material process. It is a focal plane array detector with 640x512px on a 24µm pitch and integrated detector cooler assembly for thermal imaging in the 3-5µm waveband. It benefits from a higher operating temperature than InSb, offering

longer cooler life, less in-service support and lower through-life cost, according to the company.

Erica FF

The Erica FF is a full-format thermal imager that uses a cooled staring focal plane array step-zoom core to provide high-resolution passive IR imaging for day and night scenarios, in low visibility conditions for land, air and sea operations. The imager uses a Leonardo Hawk mediumwave infrared detector coupled with processing electronics and two-FOV step-zoom objectives.

ERICA Plus

The Enhanced Reconnaissance IR Camera (ERICA) Plus is a long-range compact unit that operates in the MWIR band (3-5µm) and provides high-resolution passive IR imaging for day and night scenarios, in low visibility conditions for land, air and sea operations. The imager uses a Leonardo mediumwave infrared mercury cadmium telluride Hawk detector coupled with processing electronics and a very narrow-FOV step-zoom objective.

ERICA Plus HD

ERICA Plus HD is an advanced thermal imager providing high definition passive infrared imaging for day and night scenarios, in low visibility conditions for land, air and sea operations. The imager uses an MWIR Mercury Cadmium Telluride FALCON detector with a 12µm pitch coupled with processing electronics and an optical continuous zoom whit a very narrow FOV.

Harrier LWIR

The Harrier LWIR detector is a 640x512px mercury cadmium telluride integrated detector cooler assembly. It is designed for imaging in the 8-10µm waveband.

Hawk LWIR

The Harrier LWIR detector is a compact lightweight 640x512px mercury cadmium telluride integrated detector cooler assembly. It is designed for imaging in the 8-10µm waveband.

Hawk MWIR

The Hawk MWIR detector is a compact lightweight 640x512px mercury cadmium telluride Integrated Detector Cooler Assembly (IDCA). It is designed for thermal imaging in the 3-5µm waveband.

HORIZON

The Horizon Medium Wave Infra-Red (MWIR) thermal imaging camera employs the focal plane array technology to meet long-range surveillance and target identification for early warning of threats and detection of illegal activities. The camera is fitted with a high definition detector array and is qualified to operate in the most stringent land and maritime environments. The system can detect vehicles at up to 50km and personnel at ranges of up to 30km.

LEOSS-S

LEOSS-S is a multi-sensor, high accuracy, four-axis gyro-stabilised turret system designed for airborne surveillance applications. LEOSS-S turret is a 15" system based on a modular payload containing up to six Electro-Optical (EO) sensors. LEOSS-S features a single LRU turret with an embedded computer and IMU/GPS for state-of-the-art performance. It is designed to be integrated onto both helicopters and turboprop aircraft for surveillance, patrol, Search & Rescue (SAR), environmental control and law enforcement operations.

LEOSS-T

LEOSS-T is a multi-sensor, high accuracy, four-axis gyro-stabilised turret system designed for airborne surveillance applications. LEOSS-T turret is a 15" system based on a modular payload containing up to eight Electro-Optical (EO) sensors. The system consists of a single LRU turret with an embedded computer and an integrated Laser Code Management Unit (LCMU). It is designed to be integrated onto helicopters, turboprop aircraft or land vehicles to provide a multi-role capability where management of laser-guided effectors is required.

Merlin LW

The Merlin LWIR detector is a 1024x768px mercury cadmium telluride integrated dewar cooler assembly. It is designed for thermal imaging in the 8-10µm waveband.

Merlin MW

The Merlin MWIR detector is a 1024x768px mercury cadmium telluride integrated dewar cooler assembly. It is designed for thermal imaging in the 3-5µm waveband.

NERIO ULR

NERIO ULR is a state of the art modular Electro-Optical (EO) Surveillance, Threat Acquisition (STA) and Reconnaissance system designed to satisfy a broad range of current and emerging customer requirements. NERIO-ULR integrates world-class EO sensors as part of a fully flexible payload configuration together with a gyro-stabilised director mechanism enabling capability, cost and performance to be optimised according to specific customer needs. Utilising the Horizon Thermal Imaging (TI) camera for provision of a 24hr operational capability.

SLX Condor II

The SLX Condor II thermal imaging camera uses dual-waveband IR (DWIR) Gen III detector technology to provide high-resolution passive thermal imaging irrespective of environmental conditions in land, sea and airborne operations. The DWIR camera uses the standard TV resolution mercury cadmium telluride detector array developed by Leonardo. The detector operates in two different spectral wavebands, 3-5 and 8-10µm.

SLX Harrier

The SLX Harrier is a Gen III thermal imaging camera that uses a high-resolution longwave IR mercury cadmium telluride detector array. The detector is manufactured using Leonardo's proprietary MOVPE on GaAs process to achieve performance and image uniformity with short stare times. An integrated microscan module is optional, to provide 1.3MP resolution and better range performance using digital zoom technology.

SLX Hawk

The SLX Hawk is a thermal imaging camera with a continuous zoom lens. It uses the SDTV resolution Hawk mercury cadmium telluride detector array, manufactured using Leonardo's proprietary MOVPE on GaAs process. The continuous zoom lens has been

The Mohoc Elite Ops Camera is designed for use in combat or tactical environments. (Photo: MOHOC)

specifically developed for the system and offers a very wide FOV for rapid surveillance while enabling long identification ranges by zooming in to a narrower FOV.

SLX Merlin

The SLX Merlin is a mediumwave IR thermal imaging (TI) camera. It uses a high-resolution Gen III mercury cadmium telluride detector array to achieve image uniformity in the day, night and poor visibility for land, sea and airborne operations. The SLX Merlin has been designed as a compact unit that can be applied to a range of TI applications by system integrators and OEMs.

Tilde

Tilde is a lightweight thermal imager operating in the longwave IR spectral band (8-12µm) with a focal plane array 288x4 time delay integration detector. Tilde has been designed and qualified to operate in harsh environments (temperature, vibration) and is self-contained in a rugged, sealed enclosure. Typically equipped with a double-FOV objective, the optical surfaces have an anti-reflective coating to maximise transmission. Leonardo has produced over 1,500 Tilde imagers currently in operations supporting a wide range of systems.

Tilde S

Tilde S is a compact thermal imager operating in the longwave IR spectral band (8-12µm) with a staring focal plane array 640x512px Leonardo detector. Tilde S has been designed and qualified to operate in harsh environments (temperature, vibration) and is self-contained in a rugged, sealed enclosure. A selection of optical objectives customises detection ranges. Typically equipped with a double-FOV objective, the optical surfaces have an anti-reflective coating to maximise transmission.

MOHOC

Mohoc Elite Ops Camera

The Mohoc Elite Ops Camera is a military-optimised POV camera. It is designed for use in combat or tactical environments. The camera features a CurveLock base design. It matches the shape of a tactical helmet to create a close fit and low profile, eliminating snag hazards. It also uses a velcro attachment to secure to the user's helmet.

NOXANT

NoxCam

NoxCam is a series of high-performance radiometric cameras, based on the NoxEngine technology platform. NoxCam includes the features required for industrial and measurement applications including range measurements, non-destructive testing, advanced thermography, research and process control.

NoxCore

NoxCore Vision are compact, lightweight, IR vision modules (<1,100g, 18-275mm zoom lens). Based on Noxant's NoxEngine technology, Noxcore has the features required for surveillance applications, including site monitoring, traffic surveillance, pollutant search as well as advanced video processing.

NoxCore HD

The NoxCore HD is a compact, high-definition IR camera core that is based on the latest-generation NoxEngine technology. NoxCore HD provides extreme performance and enhanced situation awareness. Equipped with 1280x720px detectors, with 10µm pitch, NoxCore HD shares the same protocols interfaces as NoxCore, for maximum-integration work reuse.

OBZERV

Core Modules

The PIC-75 Intensified CCD Camera is a compact and lightweight NV core. The PIC-75 will amplify low light in a range of wavelengths, revealing details of the scene of interest in total darkness. This core module comprises an I2 coupled to a charge-coupled device sensor. It includes high-voltage power supplies for fast gating. The image intensifier is an EO component based on a microchannel plate.

Modular Active Range-Gated Camera

The Modular Active Range-Gated Camera enables the deployment of active range-gated imaging capability in existing multi-spectral imaging turrets (MSITs). Obzerv provides a small payload to enable integration in MSITs without sacrificing other capabilities. Integrating this sensor into an MSIT benefits airborne applications such as ISR, SAR, law enforcement, fishery control and monitoring of environmental compliance, which can be conducted at stand-off ranges. Another element of Obzerv's technology is the ability to clearly see camouflage nets.

OPGAL OPTRONIC INDUSTRIES

Arbel

The Arbel TI offers a dual FOV that provides operators with situational awareness in a variety of defence and security applications. Combining a v640px, 17µm sensor with a DSP-based platform allows detection of man-sized targets at 3.5km and NATO objects at 9km. Arbel can be fixed, mounted or integrated onto pan/tilt devices or built into a weapon sight system.

Eye-Lite

Eye-Lite is a continuous-zoom thermal imaging camera based on Opgal's Eye-Z cooled IR engine. Using a

modular design, Eye-Lite can be tailored to meet specific requirements, ranging from a standalone sealed camera to an open-frame configuration. There are two basic versions: 320x240 InSb focal plane array (FPA); and large-format 640x480 InSb FPA for higher resolutions.

EyeR Core VA

The EyeR Core VA is a longwave infrared (LWIR) platform which is equipped with Opgal's imagine-processing capabilities. The thermal imaging core supports advanced algorithms, allowing TECless and shutterless operations. The full-featured VGA 17µm thermal core can be fitted with small optical lenses and has specifically been designed for OEM thermal imaging solutions. The EyeR Core is suitable for Driver Vision Enhancement systems and Situational Awareness kits. The EyeR Core VA features an uncooled microbolometer 17µm FPA, a resolution of 640x480, <50mK NETD, a shutterless shutter and power consumption of 7-14VDC; ~2W.

EyeSec

The EyeSec 15-100mm continuous zoom thermal imaging camera has been designed to interface with standard security/CCTV systems. EyeSec is a 24/7 outdoor security thermal camera for observing and monitoring sensitive sites over long distances. It works with video analytics and video motion detection software. Featuring continuous zoom and autofocus, EyeSec is intended to give the same feel and ease of use as a standard CCTV camera.

OPHIR OPTRONICS SOLUTIONS

Ophir 26-105mm f/1.6 LWIR continuous zoom

Ophir's plethora of IR optics includes a wide range of long-range zoom lenses for every application. Ophir's budget range has been extended to include a 26-105mm continuous zoom lens.

Ophir IR optics optimised for 10-12µm LWIR detectors

Ophir, addressing the new market shift in the direction of 10-12µm detectors, is offering a wide collection of lenses, optimised to meet the needs of these new detectors.

Ophir Lightweight IR Zoom Lenses

The LightIR thermal imaging zoom lenses include the 20-275mm f/5.5 mediumwave IR(264gr) and the 15-75mm f/1.2 longwave IR (320gr). Both lenses are lightweight and high-performance, designed specifically for use in UAS, payloads, drones and handheld devices.

Ophir Long Range IR Zoom Lenses

Ophir long-range zoom lenses for various FPA formats, including high-definition XGA and SXGA formats, provides a crisp, clean image over full zoom range, and MTF close to the diffraction limit.

OPTICOELECTRON

SWIRECON 14, 25 and 50

SWIRECON is a series of shortwave IR lenses for perimeter surveillance, border and port security, low-light-level imaging through fog/dust etc. Designed for 24h use and including hostile fire and forest fire detection systems. Can be fitted to UAVs and ground vehicles. The lenses have a thermalised design for harsh environments. They are coated, compact and lightweight, operating in an extended spectral band. Weight: 318g

OPTIX

Goliath Series-Uncooled thermal imaging cameras

Goliath Series are uncooled thermal imaging cameras suitable for integration into security and surveillance systems. The cameras are based on an uncooled 640x480 detector and combine the distance observation with the advantage of a lack of cryogenic cooler and flawless continuous operation. The series have options for dual FOV and continuous zoom.

HeatseekIR Series– Cooled thermal imaging cameras

HeatseekIR series are represented by six highly sensitive cooled thermal imaging cameras that are able to detect the temperature differences between the object and the environment less than 20 mK. The staring high resolution 640x512 pixels detector delivers high-range performance and image quality. The cameras are available with different continuous zoom lens systems which offer different focal length and field of view for a variety of applications.

Minion Series – Uncooled thermal imaging cameras

Minion is a portable uncooled thermal imaging camera suitable for integration into security and observation systems. The innovative optical system and digital enhancement of the video signal provide high contrast, detailed and sharp picture at any time in a completely passive mode. Along with its accessories Minion includes operational software for remote control and setup of the main functions.

X-Core thermal imaging engine

X-Core is the latest-generation thermal imaging engine, based on cutting-edge hardware solutions and dedicated video processing algorithms. X-Core is ready to be combined with a variety of objective lenses (including Optix Lenses) for a wide range of applications as surveillance and radiometric systems, thermal weapon sights and various handheld devices.

RAPTOR PHOTONICS

Hawk 252

The Hawk 252 is a lightweight, rugged, low-power electron-multiplying charge-coupled device (EMCCD) camera that can be integrated within airborne or ground-based EO systems. The camera has a resolution of 1280x1024 (1in sensor) and is available in 12-bit digital video formats. The camera is TE cooled and operates over a temperature range of -40/+70°C. Hawk EMCCD camera cores are suited for applications including NV, laser line detection (1.06µm), border control or long-range day/night surveillance.

Hawk 1920

The Hawk 1920 is based on the latest generation HD Global Shutter CMOS technology for low light day and night vision applications. The camera has a

resolution of 1920 x 1080 (2/3" sensor) and is available in 12-bit digital video formats. The camera is uncooled operates over a temperature range of -40/+70°C. The camera core is perfect for Ground Based Surveillance, airborne surveillance, situational awareness, driver vision enhancement (DVE), digital night visions and low light spotter. Weight: 95g

Owl SWIR 320

The Owl SWIR 320 camera can be integrated within airborne or ground-based EO systems. The camera enables high-speed digital video with automated gain control for clear imaging in all light conditions. Owl SWIR camera cores are suited for applications including laser line detection (1.06 and 1.55µm), active imaging and vision enhancement. Weight: 282g

Owl SWIR 1280/640/Mini

The Owl SWIR series cameras can be integrated within airborne or ground-based EO systems. The cameras enable high-speed digital video with automated gain control for clear imaging in all light conditions. Owl SWIR camera cores are suited for applications including laser line detection (1.06 and 1.55µm) and vision enhancement. The Owl Mini camera is the TEC-less version of the Owl 640. Weight: 282g

RAYTHEON VISION SYSTEMS

Custom Detection and Imaging Solutions

Raytheon Vision Systems develops and produces detection and imaging devices for applications in the X-ray, visible, IR, terahertz and millimetre-wave regions of the EM spectrum. Over 450,000 devices have been delivered to date, for use in military, scientific and commercial sensing systems. This includes over 25,000 Javelin ATGW detector assembly devices.

Owl IR-640-25

The Owl IR-640-25 camera core uses uncooled VOx microbolometer technology to obtain clear images for detection, navigation and surveillance needs. It is a large-format camera engine designed for use in longwave IR imaging applications and comprises a Raytheon 640x480 uncooled focal plane array, a heat sink and mixed-signal electronics. It comes calibrated for a wide environmental temperature range and, at an ambient temperature of 20°C, can achieve an intra-scene dynamic range of greater than 100°C.

U320-25

The U320-25 is a quarter-VGA format, 25µm uncooled detector designed for longwave IR imaging applications. Two models are currently available: a commercial version and a military-grade version that is Mil-Spec conforming. The detector consists of a high-transmission germanium window, a 320x240 VOx microbolometer array and a thermal electric cooler (TEC), sealed in a long-life metal-ceramic vacuum enclosure. The U320-25 is designed to be small, lightweight and low-power, with the use of the TEC being optional.

U640-25

The U640-25 is a VGA-format, 25µm uncooled detector designed for high-resolution LWIR imaging applications. Two models are currently available: a commercial version and a military-grade version that is Mil-Spec conforming. The detector consists of a high-transmission germanium window, a 640x480 VOx microbolometer array and a thermal electric cooler (TEC), sealed in a long-life metal-ceramic vacuum enclosure. The U640-25 is designed to be small, lightweight and low-power, with use of the TEC being optional.

SAFRAN ELECTRONICS & DEFENSE

Matis XM

Matis Extended Magnification (XM) is a cooled, long-range IR imager, featuring an 18x continuous optical zoom. It is intended for zone surveillance networks and high-performance weapon systems.

Paseo

The Safran Paseo is a surveillance and detection device for armoured vehicles that can be used to allow a gunner to safely fire their weapon. The Paseo has a panoramic sight and can perform day and night. The Paseo can also be used not only for gunners but for commanders' applications, as well as forward observation for artillery. Detection range: 15.4km

SOFRADIR

Cactus 320 SW

The Cactus 320 SW is a compact, high-sensitivity focal plane array assembly designed for low-flux imaging applications from 0.9-1.7µm. It can be used for a range of applications such as NV, surveillance, airborne gimbals and various industrial and scientific tasks.

Cactus 640 SW

Cactus 640 SW is a high-sensitivity, high-resolution focal plane array assembly designed for low-flux imaging applications from 0.9-1.7µm. Cactus 640 SW can be used for a range of applications such as NV, surveillance, airborne gimbals and various industrial and scientific tasks.

Jupiter MW

Jupiter MW is a mediumwave IR, super-XGA, integrated dewar cooler assembly.

Leo MW

Leo MW is a compact detector designed for optimised SWaP mediumwave IR (3-5µm) applications. It features a digital output camera link.

Mars LW

Mars LW, which has been manufactured in large quantities, is a longwave IR (8-10µm) staring array.

Mars MW

Sofradir has produced the Mars mediumwave IR 320x256 detector for over ten years. This IDCA is battlefield-proven and in operational systems all over the world, and is also used for commercial and space applications.

Mercury LW

Mercury LW, manufactured in large quantities, is a high-resolution longwave IR (8-12µm) scanning array. This integrated dewar cooler assembly is battlefield-proven and has been chosen by several armies around

the world. It features a 480-line format with TDI on six elements, 49.8x25.4µm detector pitch (cross-scan/inscan), and 38x28µm detector size (cross-scan/inscan).

Neptune SW

Neptune SW is an integrated dewar cooler assembly that enables imaging from 0.9-2.5µm. It is adapted to low flux in this wavelength range and the line-by-line gain selection function makes it suitable for hyperspectral imaging.

Pluton LW

Sofradir has produced more than 25,000 Pluton LWIR (8-12µm) scanning arrays. Array features: format 288 lines with time delay integration on four elements, detector pitch (cross-scan/inscan) 28x43µm, detector size (cross-scan/inscan) 28x25µm.

Saturn SW

Saturn SW is a high-resolution integrated dewar cooler assembly that enables imaging from 0.8-2.5µm. It is adapted to low flux in this wavelength range and the line-by-line gain selection function makes it suitable for hyperspectral imaging. Format: 1,000x256px.

Scorpio LW

Scorpio LW is a compact, high-resolution, longwave IR, integrated dewar cooler assembly with low power consumption. It offers high-speed operation for detecting fast-moving targets or improving sensitivity. It is optimised for long-range applications. Weight: 550g

Scorpio MW

Scorpio MW is a VGA 15µm-pitch mediumwave IR (MWIR) integrated dewar cooler assembly detector that has been developed to replace the MWIR QVGA format in military systems. Scorpio MW is also ruggedised for harsh environments.

Snake SW

The Snake SW is a VGA InGaAs focal plane array sensor. It is a high-sensitivity and high-resolution assembly designed for low-flux imaging applications from 0.9-1.7µm. It can be used for a range of applications such as NV, surveillance, airborne gimbals and various industrial and scientific tasks.

Uranus MW

Uranus MW is a high-sensitivity VGA mediumwave format. This product is optimised for applications including harsh environments.

Venus LW

Venus LW is designed for high-sensitivity longwave IR applications. It is optimised for operations in harsh environments.

SOFRADIR EC

AstroScope

AstroScope NV modules enhance the night-time performance of digital SLR cameras and HD video camcorders. In SLR configuration, the AstroScope fits between the camera body and lens, so electrical connections are maintained and lens features such as optical image stabilisation remain functional even in NV mode. Models are available with variable gain control, enabling the photographer to increase the brightness of the images when ambient lighting is such that it is otherwise too dark to photograph.

Atom

Atom is a high-resolution IR camera core, available based on uncooled microbolometer IR detectors of either 1,024x768 or 640x480px. The cores can be integrated into thermal imaging systems including unmanned platforms and have several digital/analogue output options.

Cooled IR Engine

Sofradir EC offers a variety of IR imaging engines for different applications. Models available include shortwave (800nm-2.5µm), mediumwave (3-5µm) and longwave (8-12µm). These engines are designed for integration into a range of EO systems, delivering sensitivity and resolution performance with high frame rates and adjustable integration times.

TELEDYNE FLIR

Apache 1K

The Apache 1K is a compact, low-power, integrated camera core designed for space-constrained airborne or ground applications. This commercially developed, military-qualified camera core is based on a cooled 1,024x1,024 MWIR InSb FPA and consists of a DDCA with camera electronics.

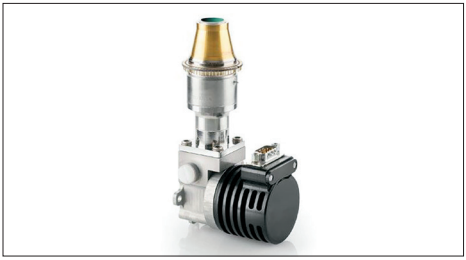
MicroCore

The MicroCore integrates a compact zoom lens and a TV-format mediumwave, Mercury Cadmium Telluride, integrated dewar cooler assembly in a 1.4kg, <200mm long core. Analogue and optional digital outputs are available. MicroCore can be integrated in light UAV gimbal and mobile sensor suites. Weight: 1,400g

MiniCore

MiniCore is a line of MW cooled camera core assemblies built around TV format Mercury Cadmium Telluride, integrated dewar cooler assembly. The product is available with continuous zoom (1.8-34°), triple FOV (1.2, 5, 17°) or without a lens for flexibility. All versions include a video processing suite. Standard video output is analogue RS-170 or CCIR. Optional Camlink or GigE format 14-bit digital video give

The Mars LW longwave IR (8-10µm) staring array has been manufactured in large quantities. (Photo: Sofradir)



access to FLIR's ALTAIR software suite or to user-defined processing.

MWIR Components – FPAs and DDCAs

FLIR COTS staring focal plane arrays (FPAs) and Detector Dewar Cooler Assemblies (DDCAs) are based on InSb detectors and readout integrated circuit technology. These cores are available in mid, large and mega-pixel format, including 320x256, 640x512 and 1x1K pixel arrays. Midwave InSb FPAs are hybrid assemblies mounted on 84-pin leadless chip carriers, customer-supplied substrates or integrated into packaged Dewar cooler assemblies.

Quark 2

Quark 2 is a small thermal camera with a design enabled by the wafer-level packaging of the microbolometer sensor. Available in 336 and 640 resolutions with 17µm pixels, its low volume and mass enable applications in smaller packages. Quark 2 has no moving parts for shock and vibration tolerance and offers built-in temperature measurement for radiometry, analytics and telemetry. Users can set isotherm thresholds in the greyscale to colourise temperatures of interest.

ROICs

Read-out Integrated Circuits (ROICs) are used in imaging systems for IR, visible, UV, X-ray or gamma-ray detection. These products provide an off-the-shelf solution for applications requiring low noise, variable charge storage capacitance, selectable integration times, adjustable gain and power settings and a simple user interface. A range of 2D, linear and X-ray ROICs are available.

SWIR Components – FPAs and Sensor Assemblies

FLIR Systems produces COTS staring focal plane arrays (FPAs) and sensor assemblies based on the company's InGaAs detectors and integrated circuit technology. FLIR FPAs and sensor assemblies are available in mid- and large-format designs, including 320x256 and 640x512px arrays. Shortwave InGaAs FPAs cover the 0.9-1.7µm range. FPAs are hybrid assemblies mounted on 84-pin leadless chip carriers, customer-supplied substrates or integrated into packaged sensor assemblies.

Tau 2

Tau 2 is a family of VOx uncooled thermal imagers that operate in the 8-12µm range, designed for integration into subassemblies and finished products by OEM customers. Sample applications include unmanned aerial and robotic vehicles, unattended ground systems, thermal sights, situation awareness, fire-fighting and security systems. Four resolution options are offered: 640x512, 336x256, 324x256 and 160x128. These are based on a common mechanical and electrical interface and share the same accessories.

Tau CNV

The Tau Colour NV (CNV) camera incorporates low-noise CMOS image sensor technology, with low-light camera performance at <0.005lux (colour model). With 720p resolution, Tau CNV is a day/night camera for EO system developers that can operate in either global or rolling shutter mode, features 80dB dynamic range and is available with colour or monochrome image sensors. The camera can operate in multiple video modes, including 720p (60Hz) or NTSC/PAL.

Tau SWIR

Tau SWIR is a miniature shortwave camera designed for military OEM applications, including EO payloads, dismounted soldier NV systems and UAV/UGV sensor sockets. Tau SWIR delivers SW imaging across the 900nm/1.7µm spectrum and incorporates a high-resolution (640x480) InGaAs 25- or 15µm pixel pitch focal plane array that features variable exposure rates (in sub-windowing mode), zero image lag, low read noise and dark current.

TELEDYNE IMAGING SENSORS

Anacapa SWIR 640B

The Anacapa is a compact shortwave infrared imager. Specifications: 640x512 InGaAs, 25µm pitch, 0.9-1.7µm, 300K.

Cruz Line

Cameras in the Cruz Line of mediumwave infrared systems are integrated around compact electronics, optimised for SWaP and designed for architectural adaptation to customer form, fit and function. Spectral filtering options are available. On-camera capabilities include high-speed windowing, local area contrast enhancement, automatic camera exposure, minimising noise-equivalent differential temperature over a large background temperature range and pseudo-colour.

TELOPS

FAST-IR

FAST-IR cameras offer high-speed thermal imaging with a temporal resolution to analyse dynamic events. The FAST-IR is sensitive for difficult-to-detect targets. It self-adjusts to temperature changes and offers identification capability using spectral characteristics. It can be used for muzzle flash or ballistic impact analysis, surveillance and signature acquisition of targets. Real-time processing allows images to be provided in non-uniformity correction format, eliminating the need for external black bodies and calibration.

HD-IR

HD-IR high-resolution cameras have high sensitivity for surveillance and airborne mapping applications. The camera features a four-position filter wheel, 1.3MP spatial resolution and an IP67-certified sealed enclosure.

HDR-IR

HDR-IR cameras are equipped with a fast-switching attenuation filter mechanism, maximising the dynamic range of the cameras during image acquisition by automatically selecting an attenuation filter with a transition of less then 50ms. The HDR-IR is available in mediumwave IR and longwave IR models and can measure highly contrasted scenes up to 2,500°C.

Hyper-Cam

The Hyper-Cam is a passive IR hyperspectral imaging system that combines high spatial and spectral resolution. It provides real-time radiometrically calibrated data for gas and solid detection and identification. The dual-use sensor, available in airborne or in ground

versions, can be used for stand-off chemical detection and identification of chemical warfare agents, detection of buried IEDs, rocket, missile and flare characterisation and military target signatures.

MS-IR

MS-IR cameras are equipped with an eight-position, fast-rotating filter wheel, which allows the scene signal to be split into different spectral bands. The filter wheel mechanism is designed to maximise the cameras' frame rate and can be used in either fixed or rotating mode. Rotating speed is adjustable up to 100rps (800fps). The MS-IR camera is available in mediumwave and longwave IR models.

Reveal D&I

Reveal D&I; is a real-time gas detection and identification chemical imaging software for hyperspectral data. This software allows the real-time detection of a large portfolio of gases simultaneously. It is designed for use with the Telops Hyper-Cam. It can be used for monitoring chemical warfare agents, toxic industrial chemicals and volatile organic compounds.

TS-IR

TS-IR cameras are available in VGA and Mpx formats to cover mediumwave IR and longwave IR. The camera has an IP67-certified sealed enclosure and four-position filter wheel. It is available in many spectral bands and image formats.

THALES OPTRONIQUE

Catherine MP

The Catherine MP is a high-resolution, long-range thermal imager that provides SXGA and standard TV video format outputs. It is suitable for land, sea and air platforms. It offers recognition and identification with a Gen III QWIP large staring array in a compact modular configuration. Weight: 7,900g

Catherine MP MW

Catherine MP MW exploits technology from the existing LW product, combined with an MW detector and image processing algorithms to give extended range and better situational awareness in extreme environments. Catherine MP MW's 1.3MP resolution provides images in standardised analogue and digital video formats. This offers flexibility above and below armour with integration based on using the same form factor as Catherine MP LW. Weight: 8,500g

THERMOTEKNIX SYSTEMS

MicroCAM 3

MicroCAM 3 is a range of miniature, light, low-power, longwave, thermal imaging modules. MicroCAM 3 weighs 30g, draws <0.5W of power and is available in 384x288 17µm and 640x480 17µm formats. It uses shutterless XTi technology to prevent interruption to viewing and contains no moving parts. With a cylindrical design, the product can be integrated into third-party OEM devices for aerospace/defence, police/security/border patrol, SAR, wildlife monitoring, scientific and R&D; applications. Weight: 30g

MicroCAM irGO

The MicroCAM irGO is a shock-resistant, sealed and waterproof miniature thermal imaging (TI) camera designed for low-powered cost-sensitive OEM applications such as UAVs, unattended ground sensors and helmet-mounted cameras. The MicroCAM irGO offers TI capability in a cylindrical package that can easily be integrated due to the industry-standard composite video output.

ULIS

Pico1024E GenII

Pico1024E GenII is a large megapixel thermal imaging sensor with panoramic FOV and low power consumption. It is suitable for air or ground use in weather conditions including smoke or fog. Certifications: MIL-STD-810 and -883 Weight: 30g

XENICS

Custom ROIC Design

Xenics designs analogue and digital custom CMOS integrated circuits. Custom designs can be used for applications that require low noise, low dark current or low power operation; high speed; short or long exposure times; complex windowing capability; specific pixel layouts; chip dimensions adapted to overall system requirements; integration of analogue to digital conversion and complex signal treatment. The company's experience includes designs for 1D and 2D, cooled as well as uncooled sensors.

Raven

Raven is a thermal IR imaging camera designed for the protection of borders, ports, airports and strategic infrastructure, with a high operating temperature range. The camera has a resolution of 384x288px or 640x480px. Raven achieves an increased level of image detail with the Xenics Image Enhancement (XIE) algorithm that has been rolled out on the company's bolometer cameras. Raven can be configured with various lenses for short-, medium- and long-range observation.

Rufus-640

The Rufus-640 camera can operate day and night and in varying conditions. Rufus-640 detects shortwave IR radiation between 0.9 and 1.7µm with a wide dynamic range and operating temperature. Thermo-electric stabilisation reduces dark current and noise levels. Together with onboard image processing, such as auto-exposure and auto-gain, Rufus-640 provides contrast and image quality for situation awareness in fog, haze or high humidity and during bright daylight or moonless nights utilising the night glow.

XCO

Xenics developed the Stirling-cooled XCO-640F for stable medium- to long-range imaging application. The IR module is based on a cooled MWIR engine with a low 20mK NETD detector and configured with a zoom lens. The zoom control over Serial Protocol together with on-board image processing for contrast performance, makes the XCO-640 module suitable for flexible and mobile observation platforms for law enforcement, homeland security and perimeter surveillance.

XSW
The XSW OEM module is compact and designed for integration in SWIR imaging applications. Typical OEM applications include IR imaging for man-portable and unmanned (airborne and land-based) vehicle payloads, NV, border security and SAR. The XSW detects SWIR radiation between 0.9 (optionally 0.4) and 1.7µm with a wide dynamic range and operating temperature. Thermo-electric stabilisation reduces the dark current and noise levels. Together with onboard image processing, the XSW provides contrast and image quality.

XTM
The Xenics Thermal Module (XTM) is a compact camera with image quality and stability for a range of OEM applications, such as security, NV, fire-fighting, airborne and land-based reconnaissance and surveillance. The XTM provides onboard image processing and shutter control. It utilises the Xenics Image Enhancement (XIE) algorithm introduced for the company's bolometer cameras. XIE exists of a number of image enhancement filters, which are used in combination with histogram equalisation.

IMAGE INTENSIFIERS

DEFENCE VISION SYSTEMS
ICCD Cameras
Defence Vision Systems' high-resolution HD Intensified charge-coupled device (ICCD) cameras feature automatic scene-setting and removal of fixed I2 blemishes and lens shading artefacts. Digital and analogue operation is user-switchable and control via an on-screen menu that offers functions including video mode, exposure control mode, intensifier gain level and uniformity correction. The ICCD cameras can be modified to fit user space and are available with Gen II and Gen III intensifiers.

sCMOS Cameras
The high-resolution sCMOS HDTV camera replaces the electron-multiplying charge-coupled device camera. It offers full HD vision from day to night with sensitivity under low-light conditions, better dynamic range without saturation artefacts and faster frame rates. The camera integrates automatic exposure/gain control for 24-hour operation at 36fps, built-in image enhancement and gating capability with 980nm illuminators. The small factor/remote head fits into turrets/periscopes and other handheld viewers.

ELBIT SYSTEMS OF AMERICA
MX-10130
The F9810 series Gen III MX-10130 18mm I2 tube consists of a GaAs photocathode bonded to a glass input window, a microchannel plate (MCP) current amplifier, and a P-43 phosphor screen deposited on a non-inverting fibre-optic output window. The Gen III photocathode is sensitive to near-IR and provides a high signal-to-noise ratio for extended detection ranges in low light levels. Weight: 98g

MX-10160
F9800 series Gen III MX-10160 18mm I2 tubes are used in the AN/AVS-6 ANVIS and AN/AVS-9 (F4949) aviator NVG, as well as ground systems including the F5050 NV binocular. The MX-10160 consists of a GaAs photocathode bonded to a glass input window, a microchannel plate (MCP) current amplifier, and a P-43 phosphor screen deposited on a non-inverting fibre-optic output window. Weight: 85g

MX-11769
The F9815 series MX-11769 Gen III 18mm I2 tubes are designed for use in the AN/PVS-14 monocular NVD. Harris offers a selection of tubes, providing different performance levels, to satisfy a range of customer specifications and comply with US guidelines for Gen III export (F9815P has 1,600 FOM; F9815J has 1,250 Figure of Merit).

L3HARRIS TECHNOLOGIES
BNVD-1531
L3 Warrior System's BNVD-1531 is a new binocular night vision device (BNVD). It brings together the capabilities of two existing products – the AN/PVS-15 and the AN/PVS-31. The BNVD-1531 can also be operated as a helmet-mounted, head-mounted or handheld system.

LHERITIER ALCEN
Artemis
The Artemis series of LLL cameras embeds a 'scientific CMOS' sensor (Fairchild CIS1910F) within an uncooled camera design. The camera features simultaneous strong and weak gain imaging, full HD, binning/dynamic blemish correction, dynamic range computation and recursive noise filtering. Weight: 350g

NEW IMAGING TECHNOLOGIES (NIT)
CMOS Imaging Sensors
NIT offers high-dynamic-range complementary metal-oxide semiconductor (CMOS) imaging sensors designed to be coupled with I2 tubes, transforming direct vision into digital vision.

NEWCON OPTIK
3631 Series
3631-series I2 tubes feature gallium arsenide (Gen III) photocathodes, high gain and sensitivity and signal-to-noise ratio of 24 with exportable figure of merit available exceeding 1,800. Members of this series are compatible with Newcon Optik's NVS-14, NVS-6 and NVS-9 as well as AN/PVS-14, AN/AVS-6, AN/AVS-9 and a variety of NV monoculars, riflescopes and observation devices.

4331 Series
Newcon Optik's 4331-series I2 tubes feature gallium arsenide (Gen III) photocathodes, high gain and sensitivity and signal-to-noise ratio of 24 with exportable figure of merit available exceeding 1,800. Members of this series are compatible with AN/PVS-7B and -7D as well as a variety of other NV observation devices. Members of the 4331 series include: N3XT4331SC –

straight, concave, green image; 3AG4331SC – auto-gated, straight, concave, green image; and N3AG4331SCBW – auto-gated, straight, concave, black and white image.

NC107663IF

The NC107663IF is a drop-in replacement for a variety of NV systems, including AN/PVS-4, M-32/M36 PNVE and AN/TVS-5. This I2 tube is also used in a variety of commercial and industrial applications. The tube comprises a fibre-optic faceplate, a microchannel plate (MCP) current amplifier, and a phosphor screen. Its automatic brightness control covers over five orders of magnitude of input illumination and manual brightness adjustment is also available.

PHOTONIS NETHERLANDS

16mm I2 Tubes

Photonis' 16mm I2 tube has been designed to meet low SWaP requirements. The weight of a 16mm I2 tube is reduced by 35g compared to standard ANVIS 18mm tubes, while its volume has been reduced by 40%. NV monoculars incorporating the 16mm tube can weigh approximately 130g less than a standard AN/PVS-14, improving comfort and reducing neck strain. The 16mm I2 tube is available with an integrated auto-gated power supply. Weight: 45g

INTENS

The INTENS tube, launched at Eurosatory 2014, is a multi-mission intensifier suitable for use in dark environments, including deep mountain valleys and jungle terrain. According to the company, INTENS provides 40% extra range of detection, recognition and identification.

Inverter Tubes MX-9644

The MX-9644 is a Gen II 25mm I2 based on MIL-I-49040, allowing upgrades and repairs of current systems, including the AN/PVS-4 weapon sight, AN/TVS-5 crew weapon sight and driver periscope systems like AN/VVS-2. Applications match form/fit/function requirements for drop-in replacement.

Lynx

Lynx CMOS is a solid-state, low-light-level complementary metal-oxide-semiconductor (CMOS) sensor with SXGA 1,280x1,024 resolution (1.3MP) designed to perform in low light conditions. Lynx CMOS is claimed to be the first operational homeland security sensor operating in both daylight and low-light-level (equivalent to Level 3, 4mLux on scene, also known as Quarter Moon).

Nocturn Camera

Nocturn is claimed to be the first low-light-level digital camera for 24/7 surveillance under varying lighting conditions. Powered by the Lynx complementary metal-oxide semiconductor (CMOS) 1.3MP low-light imaging chip with less than 4e read noise, Nocturn provides monochrome real-time imaging capabilities – from daylight to bright starlight (4mlux on scene) – in the visible and NIR spectrum (400-1,100nm spectral sensitivity). Optimised for SWaP requirements, the module is suitable for integration into aerial, mobile and handheld surveillance systems.

Onyx B&W I2 Tube

Onyx provides black and white (B&W;) vision, available as an option on XR5 and XD-4 I2 tubes (see separate entries). A B&W; phosphor screen provides higher image quality and level of contrast. Onyx is suitable for missions in desert, rocky and sandy environments, where the level of detail of the image is claimed to be enhanced compared to green phosphor tubes of equivalent performance. Weight: 95g

Supergen Technology I2

Supergen Technology I2 combines sensitivity and resolution, signal-to-noise ratio and modulation transfer function. It features a minimum signal-to-noise ratio of 18 at 108lx and a minimum limiting resolution of 45lp/mm. Weight: 95g

XD-4 I2 Tube

XD-4 tubes are available for US DoD NV devices such as the AN/PVS-5, 7, 14, 15, 17 and 18, the AN/AVS-6 and 9 and European NV devices. The technology has a broad spectral sensitivity range. The XD-4 is also available with an auto-gated power supply. Weight: 95g

XR5 I2 Tube

XR5 tubes are available for US DoD NV devices such as the AN/PVS-5, 7, 14, 15, 17 and 18, the AN/AVS-6 and 9 and European NV devices. The XR5 I2 reveals details at night and offers extended range capabilities, not only during day-night-day transitions, but also under dynamic lighting conditions such as military operations on urbanized terrain, according to the company. Weight: 95g

PRODUCTS

GUIDE TO SUPPLIERS

This section lists key companies supplying goods, services and equipment to the night vision and optics sector worldwide.

The section is separated into two listings, by product then by supplier.

Products are listed alphabetically with suppliers and their location under each.

Supplier listings from p122 are shown alphabetically and include:

- Company address
- Email and website addresses
- Telephone numbers

Highlighted listings also include the company's logo and a summary of activity.

To update a listing or submit new information, please contact the team at insight@shephardmedia.com.

ABOVE: Safran's JIM LR multifunction IR binocular provides operators with top-end situational awareness. (Photo: Safran)

PRODUCTS

Airborne EOS

Advanced Coherent Technologies (USA)
Advanced Defense Systems, Inc (ADS) (USA)
Aero Optical (UK)
Airbus Defence & Space (Germany) (GERMANY)
Astronics Max-Viz (USA)
BAE Systems (UK)
BAE Systems Electronic Systems (USA)
Ball Aerospace (USA)
BE Meyers (USA)
Bodkin Design & Engineering (USA)
Canon (JAPAN)
CANVS (USA)
CMC Electronics (CANADA)
CohuHD Costar (USA)
Collins Aerospace (USA)
Controp Precision Technologies (ISRAEL)
Dassault Aviation (FRANCE)
Defence Vision Systems (UK)
DO Systems (UK)
e2v (UK)
Elbit Systems EW & SIGINT – Elisra (ISRAEL)
Elbit Systems Intelligence and Electro-optics – Elop (ISRAEL)
EMX (USA)
Field Aviation (CANADA)
GoPro (USA)
Hanwha Systems (SOUTH KOREA)
Headwall Photonics (USA)
HeliMedia (UK)
Hensoldt Optronics (Pty) Ltd (SOUTH AFRICA)
Hensoldt Sensors (GERMANY)
IAI North America (USA)
IAI Tamam (ISRAEL)
IMEC Integration (SOUTH AFRICA)
ING Robotic Aviation (CANADA)
Intevac Photonics (USA)
ISP Optics (USA)
ISP Optics Europe (LATVIA)
JAI (USA)
L3 Wescam (CANADA)
Leonardo (ITALY)
Leonardo DRS Electro-Optical Infrared Systems (USA)
Leonardo UK (UK)
LFD (UK)
LightPath Technologies (USA)
LKD Aerospace (USA)
Lockheed Martin Missiles and Fire Control (USA)
Lockheed Martin UK (UK)
Logos Technologies (USA)
Miltrade Technologies (SINGAPORE)
NSE (FRANCE)
Obzerv (CANADA)
OIP Sensor Systems (BELGIUM)
Opgal Optronic Industries (ISRAEL)
Ophir Optronics Solutions (ISRAEL)
Optikos (USA)
Own the Night (Lceo LLC) (USA)
Page Aerospace (UK)
QinetiQ (UK)
Rafael Advanced Defense Systems (ISRAEL)
Raytheon Space & Airborne Systems (USA)
Rheinmetall Defence Electronics (GERMANY)
S.M. Engineering (SOUTH KOREA)
Saab (SWEDEN)
Safran Electronics & Defense (FRANCE)
SCD - SemiConductor Devices (ISRAEL)
Shilat Optronics (ISRAEL)
Sofradir (FRANCE)
Sony (JAPAN)
Teledyne FLIR (USA)
Teledyne FLIR (UK) (UK)
Teledyne Imaging Sensors (USA)
Terma (DENMARK)
Tetracam (USA)
Thales (FRANCE)
Thermal Beacon (ISRAEL)
TNO (NETHERLANDS)
Top I Vision (ISRAEL)
Trillium Engineering (USA)
UAV Vision (AUSTRALIA)
UTC Aerospace Systems - ISR Systems USA (USA)
Vision Systems International (USA)
Xenics (BELGIUM)
Yunnan Olightek Opto-Electronic Technology (CHINA)

Associations

AFCEA International (USA)
National Defense Industrial Association (USA)

Aviator goggles

Adams Industries (USA)
Aero Dynamix (USA)
AM Vision (UK)
AMST Systemtechnik (AUSTRIA)
Aselsan (TURKEY)
Aspect Technology & Equipment (USA)
Atlas Telecom (UAE)
ATN (USA)
Aviation Specialties Unlimited (USA)
BAE Systems (UK)
BAE Systems Electronic Systems (USA)
BCB International (UK)
Beck Optronic Solutions (UK)
Britannia 2000 (UK)
CAE Burgess Hill (UK)
CANVS (USA)
Consolite Technology (UK)
DO Systems (UK)
Elbit Systems (ISRAEL)
Elbit Systems of America (USA)
eMagin (USA)
Everett Aviation (KENYA)
Fenn Night Vision (UK)
Flight Helmets Australia (AUSTRALIA)
Forth Dimension Displays (UK)
Glomex Military Supplies (CZECH REPUBLIC)
Headset Services (UK)
IMEC Integration (SOUTH AFRICA)
Jenoptec (FRANCE)
Kanematsu Aerospace (JAPAN)
Luminator Aerospace (USA)
Nakao Internarional (USA)
NAVAIR Expeditionary Airfield Team (USA)
Night Flight Concepts (USA)
Night Optics USA (USA)
Night Vision (Australia) (AUSTRALIA)
Night Vision Experts (USA)
Nightline (USA)
Nivisys (USA)
Northrop Grumman (USA)
Northrop Grumman UK (UK)
OIP Sensor Systems (BELGIUM)
Ophir Optronics Solutions (ISRAEL)
Optikos (USA)
Optix (BULGARIA)
Own the Night (Lceo LLC) (USA)
PCO (POLAND)
Photonis France (FRANCE)
Photonis Netherlands (NETHERLANDS)
Photonis USA (USA)
REB Technologies (USA)
Rheinmetall Defence Electronics (GERMANY)
Safran Electronics & Defense (FRANCE)
Scandinavian Avionics (DENMARK)
SCHOTT AG (GERMANY)
SGB Enterprises (USA)
Thales (FRANCE)
Thales Angenieux (FRANCE)
Thales InterSense (USA)
Thales Optronique (FRANCE)
TNO (NETHERLANDS)
Transaero (USA)
Troya Tech Defense (ISRAEL)
United Rotorcraft (USA)
US Cavalry (USA)
US Night Vision (USA)
Valpak (GREECE)
Viriyakit (THAILAND)
Vision Systems International (USA)
Wilco International (FRANCE)

Components, accessories

AeroComputers (USA)
AGM Container Controls (USA)
Akzo Nobel Aerospace Coatings (USA)
Andor Technology (UK)
Applied Infrared Sensing (AUSTRALIA)
Armstrong Optical (UK)
BAE Systems Rokar (ISRAEL)
Barco Fredrikstad (NORWAY)
Barum & Dewar (UK)
Brandywine Photonics (USA)
Brownell (UK)
Cubic Global Defense (USA)
Curtiss-Wright Avionics & Electronics UK (UK)
Curtiss-Wright Defense Solutions (USA)
Edmund Optics (UK)
Elbit Systems Intelligence and Electro-optics – Elop (ISRAEL)
Eltek USA, Inc. (USA)
Emergency Beacon (USA)
ER Precision Optical (USA)
Gentex (USA)
GMK Tactical Products (UK)
Gooch & Housego (UK)
Hardin Optical (USA)
Headwall Photonics (USA)
Helmet Integrated Systems (UK)
II-VI Infrared (USA)
II-VI Optical System (USA)
Instro Precision (UK)
IRCAM (GERMANY)
IRnova (SWEDEN)
Janos Technology (USA)
Jenoptik Advanced Systems (USA)
Jenoptik Optical Systems (GERMANY)
Laser Lines (UK)
Leonardo DRS (USA)
Liteye Systems (USA)

Materion Precision Optics (USA)
Measuring Instruments Technology (SOUTH AFRICA)
Metax (UK)
Militram (ISRAEL)
Millog (FINLAND)
MSA France (FRANCE)
New Imaging Technologies (NIT) (FRANCE)
North Guangwei Technology Inc (CHINA)
Noxant (FRANCE)
Obzerv (CANADA)
Ophir Optronics Solutions (ISRAEL)
OptoCom Group (MALAYSIA)
Oshino Lamps (UK)
Photonis France (FRANCE)
Photonis Netherlands (NETHERLANDS)
Photonis USA (USA)
Power Technology (USA)
PRP Optoelectronics (UK)
QWIP Technologies (USA)
Rafael Advanced Defense Systems (ISRAEL)
Raytheon Vision Systems (USA)
Sandel Avionics (USA)
Sofradir EC (USA)
Stemmer Imaging (UK)
Target Group (TURKEY)
Techno Sourcing (BRAZIL)
Teledyne Imaging Sensors (USA)
Trex Enterprises (USA)
Vincent Associates (USA)
Wilcox Industries (USA)
Xactra Technologies (USA)
Xenics (BELGIUM)
Yunnan Olightek Opto-Electronic Technology (CHINA)

Ground EOS

Adams Industries (USA)
Adimec Advanced Image Systems (NETHERLANDS)
AM Vision (UK)
Applied Infrared Sensing (AUSTRALIA)
Aselsan (TURKEY)
Aspect Technology & Equipment (USA)
Atlas Telecom (UAE)
ATN (USA)
Aurora Tactical (USA)
BAE Systems (UK)
BAE Systems Electronic Systems (USA)
Ball Aerospace (USA)
BCB International (UK)
BE Meyers (USA)
Beck Optronic Solutions (UK)
Beechwood Equipment (UK)
Bharat Electronics (INDIA)
Bodkin Design & Engineering (USA)
Britannia 2000 (UK)
Cantronic Systems (CANADA)
CANVS (USA)
Chess Dynamics (UK)
CohuHD Costar (USA)
Collins Aerospace (USA)
Consolite Technology (UK)
Controp Precision Technologies (ISRAEL)
CSIR (SOUTH AFRICA)
CVI Melles Griot (USA)
Defence Vision Systems (UK)
DO Systems (UK)
e2v (UK)
Elbit Security Systems (ELSEC) (ISRAEL)
Elbit Systems (ISRAEL)
Elbit Systems Intelligence and Electro-optics – Elop (ISRAEL)
Elbit Systems of America (USA)
Elbit Systems – ITL (ISRAEL)
eMagin (USA)
EMX (USA)
FJW Optical Systems (USA)
Forth Dimension Displays (UK)
Fotona (SLOVENIA)
Fraser Optics (USA)
GE Intelligent Platforms UK (UK)
GE-HA-TEC Optronics (GERMANY)
General Dynamics Mission Systems (USA)
Glomex Military Supplies (CZECH REPUBLIC)
GoPro (USA)
Graflex (USA)
Harsh Environmental Applied Technologies (USA)
Helylux Industries (FRANCE)
Hensoldt Sensors (GERMANY)
HGH Systèmes Infrarouges (FRANCE)
IAI North America (USA)
IAI Tamam (ISRAEL)
IMEC Integration (SOUTH AFRICA)
ING Robotic Aviation (CANADA)
INO (CANADA)
Intevac Photonics (USA)
IRCAM (GERMANY)
JAI (USA)
Jenoptik Advanced Systems (USA)
Jenoptik Optical Systems (GERMANY)
Kalinka Optics (USA)
KiloLambda Technologies (ISRAEL)
Kongsberg Maritime (NORWAY)
L3 Advanced Laser Systems Technology (USA)
L3 Brashear (USA)
L3 Sonoma EO (USA)
L3 Space & Sensors (USA)
L3 Wescam (CANADA)
Laser Lines (UK)
Leonardo Land & Naval Defence Electronics (ITALY)
Leonardo UK (UK)
LFD (UK)
LightPath Technologies (USA)
Liteye Systems (USA)
LKD Aerospace (USA)
Meopta - optika (CZECH REPUBLIC)
Military & Law Enforcement Technologies (AUSTRALIA)
Militram (ISRAEL)
Miltrade Technologies (SINGAPORE)
N-Vision Optics (USA)
Newcon Optik (CANADA)
Night Optics USA (USA)
Night Vision Experts (USA)
Nightline (USA)
Nivisys (USA)
Northrop Grumman (USA)
Novosibirsk Instrument-Making Plant (RUSSIA)
Obzerv (CANADA)
OIP Sensor Systems (BELGIUM)
Opgal Optronic Industries (ISRAEL)
Ophir Optronics Solutions (ISRAEL)
Optikos (USA)
Optix (BULGARIA)
Opto-Knowledge (USA)
Own the Night (Lceo LLC) (USA)
Oxley Group (UK)
Page Aerospace (UK)
PCO (POLAND)
Photonic Optische Geräte (AUSTRIA)
Photonis France (FRANCE)
Photonis Netherlands (NETHERLANDS)
Photonis USA (USA)
Pleora Technologies (CANADA)
POG Precision Optics Gera (USA)
Premier Electronics (UK)
Pro Optica (ROMANIA)
QinetiQ (UK)
Qioptiq Singapore (SINGAPORE)
Rafael Advanced Defense Systems (ISRAEL)
Raptor Photonics (UK)
Raytheon UK (UK)
Remote Ocean Systems (USA)
Rheinmetall Defence Electronics (GERMANY)
Rheinmetall Nordic (NORWAY)
Safran Electronics & Defense (FRANCE)
Safran Vectronix (SWITZERLAND)
Scandinavian Avionics (DENMARK)
SCD - SemiConductor Devices (ISRAEL)
SCHOTT AG (GERMANY)
Seraphim Optonics (ISRAEL)
sInfraRed (SINGAPORE)
SRI International (USA)
Steiner Defense (USA)
Synectics (UK)
Target Group (TURKEY)
Technical Consultants International (ISRAEL)
Teledyne FLIR (USA)
Teledyne Imaging Sensors (USA)
Telops (CANADA)
Thales InterSense (USA)
Theon Sensors (GREECE)
Thermal Beacon (ISRAEL)
TNO (NETHERLANDS)
Vector Developments (UK)
Vistar Night Vision (UK)
Wärtsilä Jovyatlas Euroatlas (GERMANY)
Wilco International (FRANCE)
Xenics (BELGIUM)
Yunnan Olightek Opto-Electronic Technology (CHINA)

Ground vehicle driver goggles

Adams Industries (USA)
Allen-Vanguard UK (UK)
Aselsan (TURKEY)
Aspect Technology & Equipment (USA)
ATN (USA)
Aurora Tactical (USA)
BAE Systems Electronic Systems (USA)
Beck Optronic Solutions (UK)
Bharat Electronics (INDIA)
Britannia 2000 (UK)
CANVS (USA)
Collins Aerospace (USA)
Consolite Technology (UK)
DO Systems (UK)
Elbit Systems (ISRAEL)
Elbit Systems Intelligence and Electro-optics – Elop (ISRAEL)
eMagin (USA)
Fraser Optics (USA)

GE-HA-TEC Optronics (GERMANY)
General Starlight (CANADA)
Glomex Military Supplies (CZECH REPUBLIC)
GMK Tactical Products (UK)
Harsh Environmental Applied Technologies (USA)
IMEC Integration (SOUTH AFRICA)
Jenoptec (FRANCE)
Kalinka Optics (USA)
Kanematsu Aerospace (JAPAN)
KiloLambda Technologies (ISRAEL)
Luminator Aerospace (USA)
Meopta - optika (CZECH REPUBLIC)
N-Vision Optics (USA)
Newcon Optik (CANADA)
Night Optics USA (USA)
Night Vision (Australia) (AUSTRALIA)
Night Vision Experts (USA)
Nightline (USA)
Nivisys (USA)
Northrop Grumman (USA)
Novosibirsk Instrument-Making Plant (RUSSIA)
OIP Sensor Systems (BELGIUM)
Ophir Optronics Solutions (ISRAEL)
Optikos (USA)
Optix (BULGARIA)
Own the Night (Lceo LLC) (USA)
Photonic Optische Geräte (AUSTRIA)
Photonis France (FRANCE)
Photonis Netherlands (NETHERLANDS)
Photonis USA (USA)
Pro Optica (ROMANIA)
Qioptiq Singapore (SINGAPORE)
Rheinmetall Defence Electronics (GERMANY)
Rheinmetall Nordic (NORWAY)
Scandinavian Avionics (DENMARK)
SCHOTT AG (GERMANY)
SRI International (USA)
Starlight NV (UK)
Thales Angenieux (FRANCE)
Theon Sensors (GREECE)
TNO (NETHERLANDS)
Transaero (USA)
Troya Tech Defense (ISRAEL)
US Night Vision (USA)
Valpak (GREECE)
Viriyakit (THAILAND)
Wilco International (FRANCE)

Handheld devices

Acal BFi UK (UK)
Adams Industries (USA)
AIM Infrarot-Module (GERMANY)
Airbus Defence & Space (Germany) (GERMANY)
Allen-Vanguard UK (UK)
American Innovations (USA)
Aselsan (TURKEY)
Aspect Technology & Equipment (USA)
Astronautics Corporation of America (USA)
ATN (USA)
Aurora Tactical (USA)
Aviation Specialties Unlimited (USA)
BAE Systems (UK)
BAE Systems Electronic Systems (USA)
BCB International (UK)
BE Meyers (USA)
Beck Optronic Solutions (UK)
Bertin Technologies (FRANCE)
Bharat Electronics (INDIA)
Bodkin Design & Engineering (USA)
Britannia 2000 (UK)
Cantronic Systems (CANADA)
CANVS (USA)
Civil Defence Supply (UK)
Collins Aerospace (USA)
CSIR (SOUTH AFRICA)
Current Corp (CANADA)
Dat Con Defence (SLOVENIA)
DO Systems (UK)
Elbit Systems Intelligence and Electro-optics – Elop (ISRAEL)
Elbit Systems of America (USA)
Elbit Systems – ITL (ISRAEL)
eMagin (USA)
EMX (USA)
FJW Optical Systems (USA)
Forth Dimension Displays (UK)
Fraser Optics (USA)
GE-HA-TEC Optronics (GERMANY)
General Dynamics Mission Systems (USA)
General Starlight (CANADA)
Glomex Military Supplies (CZECH REPUBLIC)
GMK Tactical Products (UK)
GTD (SPAIN)
Harsh Environmental Applied Technologies (USA)
Hensoldt Optronics (Pty) Ltd (SOUTH AFRICA)
IMEC Integration (SOUTH AFRICA)
Infrared Cameras (USA)
ING Robotic Aviation (CANADA)
Intevac Photonics (USA)
Jenoptec (FRANCE)
Kalinka Optics (USA)
Kanematsu Aerospace (JAPAN)
Laser Detect System (LDS) (ISRAEL)
Laser Lines (UK)
Leonardo Land & Naval Defence Electronics (ITALY)
LFD (UK)
LightPath Technologies (USA)
LKD Aerospace (USA)
LOT-QuantumDesign UK (UK)
Metax (UK)
Military & Law Enforcement Technologies (AUSTRALIA)
Millog (FINLAND)
N-Vision Optics (USA)
NAVAIR Expeditionary Airfield Team (USA)
Newcon Optik (CANADA)
Night Optics USA (USA)
Night Vision (Australia) (AUSTRALIA)
Night Vision Devices (USA)
Night Vision Experts (USA)
Night Vision Store (USA)
Nightline (USA)
Nivisys (USA)
Northrop Grumman (USA)
Novosibirsk Instrument-Making Plant (RUSSIA)
OIP Sensor Systems (BELGIUM)
Ophir Optronics Solutions (ISRAEL)
Optikos (USA)
Optix (BULGARIA)
Opto-Knowledge (USA)
Own the Night (Lceo LLC) (USA)
Photonic Optische Geräte (AUSTRIA)
Photonis France (FRANCE)
Photonis Netherlands (NETHERLANDS)
Photonis USA (USA)
Poly Technologies (CHINA)
Power Technology (USA)
Pro Optica (ROMANIA)
PRP Optoelectronics (UK)
Qioptiq (UK)
Qioptiq Singapore (SINGAPORE)
Raytheon UK (UK)
Safran Electronics & Defense (FRANCE)
Safran Vectronix (SWITZERLAND)
SAFT (FRANCE)
Scandinavian Avionics (DENMARK)
SCD - SemiConductor Devices (ISRAEL)
SCHOTT AG (GERMANY)
Seiler Instrument & Manufacturing (USA)
Starlight NV (UK)
Steiner Defense (USA)
Target Group (TURKEY)
Technical Consultants International (ISRAEL)
Teledyne FLIR (USA)
Teledyne FLIR (UK) (UK)
Tenebraex (CANADA)
Thales Angenieux (FRANCE)
Thales InterSense (USA)
Theon Sensors (GREECE)
Thermal Beacon (ISRAEL)
Thermoteknix Systems (UK)
Thomas Jacks (UK)
TNO (NETHERLANDS)
Transaero (USA)
Transvaro Elektron (TURKEY)
Troya Tech Defense (ISRAEL)
Urals Optical and Mechanical Plant UOMZ (RUSSIA)
US Cavalry (USA)
US Night Vision (USA)
Valpak (GREECE)
Viriyakit (THAILAND)
Wilco International (FRANCE)

Infantry weapon sights, scopes

Acal BFi UK (UK)
Adams Industries (USA)
AIM Infrarot-Module (GERMANY)
Aimpoint AB (SWEDEN)
Allen-Vanguard UK (UK)
Armasight (USA)
Aselsan (TURKEY)
Atlas Telecom (UAE)
ATN (USA)
Aurora Tactical (USA)
BAE Systems (UK)
BAE Systems Electronic Systems (USA)
BAE Systems Oasys (USA)
BCB International (UK)
BE Meyers (USA)
Beechwood Equipment (UK)
Bharat Electronics (INDIA)
Britannia 2000 (UK)
Brolis Photonics Solutions (IRELAND)
CANVS (USA)
Collins Aerospace (USA)
CSIR (SOUTH AFRICA)
Current Corp (CANADA)
DO Systems (UK)
Elbit Systems (ISRAEL)
Elbit Systems Intelligence and Electro-optics – Elop (ISRAEL)

Elbit Systems – ITL (ISRAEL)
eMagin (USA)
EMX (USA)
Fraser Optics (USA)
GE-HA-TEC Optronics (GERMANY)
General Starlight (CANADA)
Glomex Military Supplies (CZECH REPUBLIC)
GMK Tactical Products (UK)
Harsh Environmental Applied Technologies (USA)
Hartman (ISRAEL)
Hensoldt Optronics GmbH (GERMANY)
IMEC Integration (SOUTH AFRICA)
ING Robotic Aviation (CANADA)
INO (CANADA)
Jenoptec (FRANCE)
Kalinka Optics (USA)
Kanematsu Aerospace (JAPAN)
Kent Periscopes (UK)
KiloLambda Technologies (ISRAEL)
L3Harris Technologies (USA)
Leupold & Stevens (USA)
LightPath Technologies (USA)
LKD Aerospace (USA)
Meopta - optika (CZECH REPUBLIC)
Meprolight (ISRAEL)
Millog (FINLAND)
Miltrade Technologies (SINGAPORE)
N-Vision Optics (USA)
Newcon Optik (CANADA)
Night Optics USA (USA)
Night Vision (Australia) (AUSTRALIA)
Night Vision Devices (USA)
Night Vision Experts (USA)
Night Vision Store (USA)
Nightline (USA)
Nivisys (USA)
Northrop Grumman (USA)
Novosibirsk Instrument-Making Plant (RUSSIA)
OIP Sensor Systems (BELGIUM)
Ophir Optronics Solutions (ISRAEL)
Optikos (USA)
Optix (BULGARIA)
Own the Night (Lceo LLC) (USA)
PCO (POLAND)
Photonic Optische Geräte (AUSTRIA)
Photonis France (FRANCE)
Photonis Netherlands (NETHERLANDS)
Photonis USA (USA)
POG Precision Optics Gera (USA)
Pro Optica (ROMANIA)
PRP Optoelectronics (UK)
Qioptiq (UK)
Qioptiq Singapore (SINGAPORE)
Raytheon ELCAN Optical Technologies (CANADA)
Raytheon UK (UK)
Raytheon Vision Systems (USA)
Ring Sights (UK)
Rippel Effect Systems (SOUTH AFRICA)
Safran Electronics & Defense (FRANCE)
SAFT (FRANCE)
Scandinavian Avionics (DENMARK)
Seiler Instrument & Manufacturing (USA)
Senop Optronics (FINLAND)
Shibli (PAKISTAN)
Shield Sights (UK)
SIG Sauer (USA)
Smart Shooter (ISRAEL)
SRI International (USA)
Starlight NV (UK)
Steiner eOptics (USA)
Target Group (TURKEY)
Technical Consultants International (ISRAEL)
Theon Sensors (GREECE)
Thermal Beacon (ISRAEL)
Thomas Jacks (UK)
TNO (NETHERLANDS)
Transaero (USA)
Transvaro Elektron (TURKEY)
Trijicon (USA)
Trijicon (USA)
Troya Tech Defense (ISRAEL)
US Night Vision (USA)
Valpak (GREECE)
Viriyakit (THAILAND)
Wilco International (FRANCE)
Xactra Technologies (USA)

Integration, upgrades

4FRONT Robotics (CANADA)
Aero Dynamix (USA)
ASU Baltija (LITHUANIA)
Aviation Specialties Unlimited (USA)
BAE Systems (UK)
BAE Systems Rokar (ISRAEL)
BECKER AVIONICS, Inc. (USA)
Elbit Systems (ISRAEL)
Elbit Systems Intelligence and Electro-optics – Elop (ISRAEL)
Glomex Military Supplies (CZECH REPUBLIC)
GMK Tactical Products (UK)
IAI Lahav (ISRAEL)
Logos Technologies (USA)
Militram (ISRAEL)
Miltrade Technologies (SINGAPORE)
NSE (FRANCE)
Optix (BULGARIA)
Photonis France (FRANCE)
Photonis Netherlands (NETHERLANDS)
Photonis USA (USA)
Sierra-Olympic Technologies (USA)
Teledyne Imaging Sensors (USA)
Transaero (USA)
United Rotorcraft (USA)
Xenics (BELGIUM)

Long-range observation EOS

Acal BFi UK (UK)
Adams Industries (USA)
Aero Optical (UK)
AIM Infrarot-Module (GERMANY)
Airbus Defence & Space (Germany) (GERMANY)
Airbus Defence & Space (UK) (UK)
Allen-Vanguard UK (UK)
American Innovations (USA)
Aselsan (TURKEY)
Asisguard ()
ATN (USA)
Aurora Tactical (USA)
BAE Systems (UK)
BAE Systems Electronic Systems (USA)
BCB International (UK)
BE Meyers (USA)
Beck Optronic Solutions (UK)
Bharat Electronics (INDIA)
Bodkin Design & Engineering (USA)
Britannia 2000 (UK)
Cantronic Systems (CANADA)
CANVS (USA)
Chess Dynamics (UK)
CohuHD Costar (USA)
Collins Aerospace (USA)
Controp Precision Technologies (ISRAEL)
CSIR (SOUTH AFRICA)
Current Corp (CANADA)
Dat Con Defence (SLOVENIA)
Elbit Systems EW & SIGINT – Elisra (ISRAEL)
Elbit Systems Intelligence and Electro-optics – Elop (ISRAEL)
Elbit Systems of America (USA)
Elbit Systems – ITL (ISRAEL)
eMagin (USA)
GE Intelligent Platforms UK (UK)
GE-HA-TEC Optronics (GERMANY)
Glomex Military Supplies (CZECH REPUBLIC)
Graflex (USA)
Harsh Environmental Applied Technologies (USA)
HeliMedia (UK)
Hensoldt Optronics (Pty) Ltd (SOUTH AFRICA)
HGH Systèmes Infrarouges (FRANCE)
IAI North America (USA)
IAI Tamam (ISRAEL)
IMEC Integration (SOUTH AFRICA)
ING Robotic Aviation (CANADA)
INO (CANADA)
Intevac Photonics (USA)
Kalinka Optics (USA)
KiloLambda Technologies (ISRAEL)
Kongsberg Maritime (NORWAY)
L3 Electrodynamics (USA)
L3 Sonoma EO (USA)
L3 Space & Sensors (USA)
L3 Wescam (CANADA)
LightPath Technologies (USA)
LKD Aerospace (USA)
Lockheed Martin Missiles and Fire Control (USA)
Military & Law Enforcement Technologies (AUSTRALIA)
N-Vision Optics (USA)
Newcon Optik (CANADA)
Night Optics USA (USA)
Night Vision Experts (USA)
Nightline (USA)
Nivisys (USA)
Northrop Grumman (USA)
Northrop Grumman UK (UK)
Novosibirsk Instrument-Making Plant (RUSSIA)
OIP Sensor Systems (BELGIUM)
Ophir Optronics Solutions (ISRAEL)
Optikos (USA)
Optix (BULGARIA)
Own the Night (Lceo LLC) (USA)
Photonis France (FRANCE)
Photonis Netherlands (NETHERLANDS)
Photonis USA (USA)
Pleora Technologies (CANADA)
Pro Optica (ROMANIA)
QinetiQ (UK)
Qioptiq (UK)
Qioptiq Singapore (SINGAPORE)
Raptor Photonics (UK)
Rheinmetall Defence Electronics (GERMANY)

RICOR - Cryogenic & Vacuum Systems (ISRAEL)
Safran Electronics & Defense (FRANCE)
Scandinavian Aerospace & Industry (SWEDEN)
Scandinavian Avionics (DENMARK)
SCD - SemiConductor Devices (ISRAEL)
Starlight NV (UK)
Synectics (UK)
Technical Consultants International (ISRAEL)
Teledyne FLIR (USA)
Thales InterSense (USA)
Thales UK (UK)
Theon Sensors (GREECE)
Thermal Beacon (ISRAEL)
TNO (NETHERLANDS)
Vistar Night Vision (UK)
Wilco International (FRANCE)
Xenics (BELGIUM)

Marine EOS

Adams Industries (USA)
Aero Optical (UK)
AIRT Academy of Infrared Training (USA)
ATN (USA)
BAE Systems (UK)
BAE Systems Electronic Systems (USA)
Ball Aerospace (USA)
BE Meyers (USA)
Beck Optronic Solutions (UK)
Britannia 2000 (UK)
Cantronic Systems (CANADA)
CANVS (USA)
Chess Dynamics (UK)
CohuHD Costar (USA)
Controp Precision Technologies (ISRAEL)
CSIR (SOUTH AFRICA)
Current Corp (CANADA)
Defence Vision Systems (UK)
DO Systems (UK)
Elbit Systems (ISRAEL)
Elbit Systems Intelligence and Electro-optics – Elop (ISRAEL)
eMagin (USA)
EMX (USA)
GE Intelligent Platforms UK (UK)
Graflex (USA)
Harsh Environmental Applied Technologies (USA)
HGH Systèmes Infrarouges (FRANCE)
IAI North America (USA)
IAI Tamam (ISRAEL)
IMEC Integration (SOUTH AFRICA)
ING Robotic Aviation (CANADA)
JAI (USA)
Kongsberg Maritime (NORWAY)
L3 Advanced Laser Systems Technology (USA)
L3 KEO (USA)
L3 Space & Sensors (USA)
L3 Wescam (CANADA)
Leonardo (ITALY)
Leonardo Land & Naval Defence Electronics (ITALY)
Leonardo UK (UK)
LightPath Technologies (USA)
LKD Aerospace (USA)
Lockheed Martin Missiles and Fire Control (USA)
Miltrade Technologies (SINGAPORE)
Naval Group (FRANCE)
Newcon Optik (CANADA)
Night Optics USA (USA)
Night Vision Experts (USA)
Nightline (USA)
Nivisys (USA)
Northrop Grumman (USA)
Northrop Grumman UK (UK)
Ophir Optronics Solutions (ISRAEL)
Optikos (USA)
Opto-Knowledge (USA)
Own the Night (Lceo LLC) (USA)
Oxley Group (UK)
Pleora Technologies (CANADA)
Pro Optica (ROMANIA)
QinetiQ (UK)
Rafael Advanced Defense Systems (ISRAEL)
Raptor Photonics (UK)
Remote Ocean Systems (USA)
Rheinmetall Defence Electronics (GERMANY)
Safran Electronics & Defense (FRANCE)
Scandinavian Aerospace & Industry (SWEDEN)
Scandinavian Avionics (DENMARK)
SCHOTT AG (GERMANY)
Technical Consultants International (ISRAEL)
Teledyne Bowtech (UK)
Teledyne FLIR (USA)
TNO (NETHERLANDS)
Vistar Night Vision (UK)

NV-compatible lighting

Adams Industries (USA)
Aero Dynamix (USA)
Aeromaoz (ISRAEL)
Aeronautical & General Instruments (UK)
Aerospace & Defence Products (AUSTRALIA)
AMST Systemtechnik (AUSTRIA)
Applied Avionics (USA)
Artemis Optical (UK)
Aselsan (TURKEY)
Astronics Luminescent Systems (USA)
ASU Baltija (LITHUANIA)
Aviation Specialties Unlimited (USA)
BAE Systems (UK)
BAE Systems Electronic Systems (USA)
Becker Avionics GmbH (GERMANY)
CANVS (USA)
Civil Defence Supply (UK)
Comtronic (GERMANY)
Consolite Technology (UK)
Control Products (USA)
Cyalume Technologies Inc (USA)
Cyalume Technologies SAS (FRANCE)
D&R Electro-optics (UK)
Dallas Avionics (USA)
DO Systems (UK)
Ducommun Technologies (USA)
Elbit Systems (ISRAEL)
eMagin (USA)
Emteq (USA)
Everett Aviation (KENYA)
Executive Instruments (USA)
GeoSim Technologies (AUSTRALIA)
Glomex Military Supplies (CZECH REPUBLIC)
GMK Tactical Products (UK)
Helylux Industries (FRANCE)
Hoffman Engineering (USA)
IAI Lahav (ISRAEL)
IAI North America (USA)
IMEC Integration (SOUTH AFRICA)
Instrument Systems (GERMANY)
Kalinka Optics (USA)
LFD (UK)
Luma Technologies (USA)
Luminator Aerospace (USA)
Lumitron Aerospace Lighting Components (USA)
Meprolight (ISRAEL)
Merit Apparel (USA)
Metalite Aviation Lighting (UK)
Military & Law Enforcement Technologies (AUSTRALIA)
NAVAIR Expeditionary Airfield Team (USA)
Night Flight Concepts (USA)
Night Optics USA (USA)
Night Vision (Australia) (AUSTRALIA)
Night Vision Experts (USA)
Nightline (USA)
NSE (FRANCE)
Opto Diode (USA)
Oshino Lamps (UK)
Oxley Group (UK)
Oxley Inc (USA)
Page Aerospace (UK)
Paramount Panels (UK)
Phantom Products (USA)
Photonic Optische Geräte (AUSTRIA)
PRP Optoelectronics (UK)
REB Technologies (USA)
Rheinmetall Defence Electronics (GERMANY)
Scandinavian Avionics (DENMARK)
Seitz Scientific Industries (USA)
Soderberg Manufacturing (USA)
Spectrolab (USA)
Starlight NV (UK)
Thales Angenieux (FRANCE)
Thomas Jacks (UK)
TNO (NETHERLANDS)
United Rotorcraft (USA)
US Night Vision (USA)
UTC Aerospace Systems - Interiors, Lighting Systems (GERMANY)
Wamco (USA)
Wilco International (FRANCE)

Optical coatings

Artemis Optical (UK)
Deposition Sciences (USA)
Fosta-Tek Optics (USA)
GMK Tactical Products (UK)
Gooch & Housego (UK)
Hardin Optical (USA)
II-VI Infrared (USA)
II-VI Optical System (USA)
Iridian Spectral Technologies (CANADA)
Janos Technology (USA)
Jenoptik Advanced Systems (USA)
Jenoptik Optical Systems (GERMANY)
Materion Precision Optics (USA)
Millog (FINLAND)

Power supplies/ batteries

Emergency Beacon (USA)
Energizer (USA)
GMK Tactical Products (UK)
Leonardo DRS Pivotal Power (CANADA)
Page Aerospace (UK)

Simulation/training

Aechelon Technology (USA)

Bell Training Academy (USA)
CI Systems (ISRAEL)
Cyalume Technologies Inc (USA)
Cyalume Technologies SAS (FRANCE)
Delta P (USA)
domeprojection.com (GERMANY)
DTM Global (UK)
Electric Picture Display Systems (USA)
ETC (Environmental Tectonics) (USA)
Gladstone Aerospace (CANADA)
Glomex Military Supplies (CZECH REPUBLIC)
Infrared Cameras (USA)
Insta DefSec (FINLAND)
Lunsford Air Consulting (USA)
Miltrade Technologies (SINGAPORE)
National Test Pilot School (USA)
Night Flight Concepts (USA)
Night Readiness (USA)
NVIS (USA)
Quantum 3D (USA)
RCAF International Training Programs (ITP) (CANADA)
S.M. Engineering (SOUTH KOREA)
Target Group (TURKEY)
Thales InterSense (USA)
XPI Simulation (UK)

Testing, research, analysis

Applied Infrared Sensing (AUSTRALIA)
Brandywine Photonics (USA)
CI Systems (ISRAEL)
DTM Global (UK)
Elbit Systems Intelligence and Electro-optics – Elop (ISRAEL)
Fraunhofer IOSB (GERMANY)
Gamma Scientific (USA)
Glomex Military Supplies (CZECH REPUBLIC)
GMK Tactical Products (UK)
Harris Geospatial Solutions (USA)
Instro Precision (UK)
IR Systems (JAPAN)
IRCAM (GERMANY)
L3 Brashear (USA)
Lambda Research (USA)
Laser Lines (UK)
Measuring Instruments Technology (SOUTH AFRICA)
Metax (UK)
OptoCom Group (MALAYSIA)
S.M. Engineering (SOUTH KOREA)
Santa Barbara Infrared (USA)
Target Group (TURKEY)
Techno Sourcing (BRAZIL)
Troya Tech Defense (ISRAEL)
Zetatek Industries (INDIA)

Lockheed Martin's Electro-Optical Targeting System under the nose of an Italian Air Force F-35B. (Photo: Italian Air Force)

SUPPLIERS

4FRONT Robotics
177 Tuscany Glen Place N.W.,
Calgary, AB, T3L 2Z3, CANADA
aramirez@4frontrobotics.com
www.4FrontRobotics.com
Tel: +1 403 400 2991

Acal BFi
Oppelner Straße 5, 82194
Gröbenzell, GERMANY
sales-de@acalbfi.de
www.acalbfi.com/de
Tel: +49 8142 6520 0

Acal BFi UK
3 The Business Centre,
Molly Millars Lane, Wokingham,
Berkshire, RG41 2EY, UK
sales-uk@acalbfi.co.uk
www.acalbfi.com/uk
Tel: +44 1189 788 878

Adams Industries
P.O. Box 641413,
Los Angeles, CA 90064, USA
sales@adamsindustries.com
www.adamsindustries.com
Tel: +1 310 472 3017

Adimec Advanced Image Systems
P.O. Box 7909, 5605 SH Eindhoven,
NETHERLANDS
Strategy@adimec.com
www.adimec.com
Tel: +31 40 2353 900

ADS
Lynnwood Plaza, 621 Lynnhaven
Parkway, Suite 400, Virginia
Beach, VA 23452, USA
https://adsinc.com
Tel: +1 866 845 3012

ADS Group
Salamanca Square,
9 Albert Embankment,
London, SE1 7SP, UK
www.adsgroup.org.uk
Tel: +44 20 7091 4500

Advanced Coherent Technologies
4022 Liggett Drive,
San Diego, CA 92106, USA
sales@advanced-coherent.com
www.advanced-coherent.com
Tel: +1 619.838.1218

Advanced Defense Systems, Inc (ADS)
220 Daniel Webster Highway,
Merrimack, NH 03054, USA
gadamakos@ads-inc.com
www.ads-inc.com
Tel: +1 603 595 5169

Aechelon Technology
888 Brannan St., Suite 210,
San Francisco, CA 94103, USA
http://aechelon.com
Tel: +1 415 255 0120

Aero Dynamix
3227 West Euless Boulevard,
Euless, TX 76040, USA
https://aerodynamix.com
Tel: +1 817 571 0729

Aero Innovations
PO Box 80223,
Davao City, 8000, PHILIPPINES
info@aero-innovations.com
http://aero-innovations.com
Tel: +63 927 660 1530

Aero Optical
Sterling House, 7 Ashford Road,
Maidstone, Kent, ME14 5BJ, UK
info@aero-optical.com
www.aero-optical.com
Tel: +44 1622 682 553

AeroComputers
2889 W 5th St, Suite 111,
Oxnard, CA 93030, USA
sales@aerocomputers.com
www.aerocomputers.com
Tel: +1 805 985 3390

Aeromaoz
Main Office Bldg.,
Kibbutz Yavne, 79233, ISRAEL
info@aeromaoz.com
www.aeromaoz.com
Tel: +972 3 609 5003

Aeronautical & General Instruments
Fleets Point, Willis Way,
Poole, Dorset, BH15 3SS, UK
sales@agiltd.co.uk
www.agiltd.co.uk
Tel: +44 1202 685 661

Aerospace & Defence Products
PO Box 411, Mona Vale,
NSW 1660, AUSTRALIA
adp@aerospacedefenceproducts.com.au
www.aerospacedefenceproducts.com.au
Tel: +61 2 9979 9001

Aerotec Group
Aéroport de Valence,
26120 Chabeuil, FRANCE
www.aerotecgroup.com
Tel: +33 4 75 852 992

AFCEA International
4400 Fair Lakes Court,
Fairfax, VA 22033-3899, USA
www.afcea.org
Tel: +1 703 631 6100

AGM Container Controls
3526 East Fort Lowell Road,
Tucson, AZ 85716, USA
agmwebsales@agmcontainer.com
www.agmcontainer.com
Tel: +1 520 881 2130

AIM Infrarot-Module
Theresienstraße 2, 74072
Heilbronn, GERMANY
info@aim-ir.com
www.aim-ir.com
Tel: +49 7131 6212 0

Aimpoint AB
Jägershillgatan 15,
213 75 Malmö, SWEDEN
info@aimpoint.se
www.aimpoint.com
Tel: +46 40 671 5020

Airbus Defence & Space (Germany)
Landshuter Strasse 26, 85716
Unterschleissheim, GERMANY
lothar.belz@airbus.com
http://airbusdefenceandspace.com
Tel: +49 89 3179 0

AIRT Academy of Infrared Training
720-702 Kentucky St,
Bellingham, WA, 98225, USA
airt@infraredtraining.net
www.infraredtraining.net
Tel: +1-360-676-1915

Akzo Nobel Aerospace Coatings
1 E Water St,
Waukegan, IL 60085, USA
https://aerospace.akzonobel.com
Tel: +1 847 623 4200

Allen-Vanguard UK
Allen House (Unit 100 A & B),
Alexandra Way, Ashchurch
Business Centre, Tewkesbury,
Gloucestershire, GL20 8TD, UK
es.sales@allenvanguard.com
www.allenvanguard.com
Tel: +44 1684 851 100

AM Vision
The Old School House,
Wilberfoss, York, YO4 15NA, UK
alan@amvision.ndo.co.uk
Tel: +44 1759 388 235

American Innovations
383 West Route 59,
Spring Valley, NY 10977, USA
www.spysite.com
Tel: +1 845 371 0000

AMST Systemtechnik
Lamprechtshausener Straße 63,
5282 Ranshofen, AUSTRIA
office@amst-visual-systems.com
www.amst.co.at
Tel: +43 7722 892 0

Andor Technology
7 Millennium Way,
Springvale Business Park,
Belfast, BT12 7AL, UK
marketing@andor.com
www.andor.com
Tel: +44 28 9023 7126

Applied Avionics
3201 Sandy Lane,
Fort Worth, TX 76112, USA
www.appliedavionics.com
Tel: +1 888 848 4786

Applied Infrared Sensing
10 Uralla Road, Port Macquarie,
NSW, 2444, AUSTRALIA
https://applied-infrared.com.au
Tel: +61 1300 557 205

Arab International Optronics
P.O. Box 8182, Nasr City,
Cairo, 11371, EGYPT
info@aioegy.com
https://aioegy.com
Tel: (202) 22806076

Ares Aerospacial e Defesa
Estrada Sao Mateus, 293 Jardim
Primavera, Duque de Caxias,
Rio de Janeiro, 25215-283, BRAZIL
marketing@ares.ind.br
www.ares.ind.br
Tel: +55 21 2677 5350

Armasight
815 Dubuque Avenue, South
San Francisco, CA 94080, USA
OTS-Export@flir.com
www.armasight.com
Tel: +1 650 492 7755

Armstrong Optical
Unit 31, Caxton House,
Northampton Science Park,
Kings Park Road,
Northampton, NN3 6LG, UK
elr@armstrongoptical.co.uk
www.armstrongoptical.co.uk
Tel: +44 1604 654 220

Artemis Optical
1 Western Wood Way,
Langage Science Park,
Plympton, Plymouth, PL7 5BG, UK
jamie.pindard@artemis-optical.
co.uk
www.artemis-optical.co.uk
Tel: +44 1752 341 943

ASAS
Via Barberini, 3, 00187 Roma, ITALY
asas@asaspazio.it
www.asaspazio.it
Tel: +39 06 421 401

Aselsan
Mehmet Akif Ersoy Mahallesi 296,
Cadde No: 16, 06370 Yenimahalle-
Ankara, TURKEY
marketing@aselsan.com.tr
www.aselsan.com
Tel: +90 312 592 10 00

Asisguard
Building No: 280 / GA Block
Floor 4, Mustafa Kemal Mah.
Dumlupınar Bulv. ODTÜ MET BİM,
Çankaya, Ankara
info@asisguard.com
www.asisguard.com
Tel: +90 850 577 27 47

Aspect Technology & Equipment
P.O. Box 278,
Prosper, TX 75078, USA
aspect@airmail.net
www.aspecttechnology.com
Tel: +1 972 423 6008

Astronautics Corporation of America
4115 North Teutonia Avenue,
Milwaukee, WI 53209-6731, USA
http://astronautics.com
Tel: +1 414 449 4000

Astronics Luminescent Systems
130 Commerce Way,
East Aurora, NY 14052, USA
LSINYsales@astronics.com
www.astronics.com
Tel: +1 716 655 0800

Astronics Max-Viz
11241 SE Hwy 212,
Clackamas, OR 97015 USA, USA
salesMV@astronics.com
www.astronics.com
Tel: +1 503 968 3036

ASU Baltija
Kaunas Intl. Airport,
Karmelava, Kaunas District,
LT-54460, LITHUANIA
asubaltija@asubaltija.lt
www.asubaltija.com
Tel: +370 37 760 112

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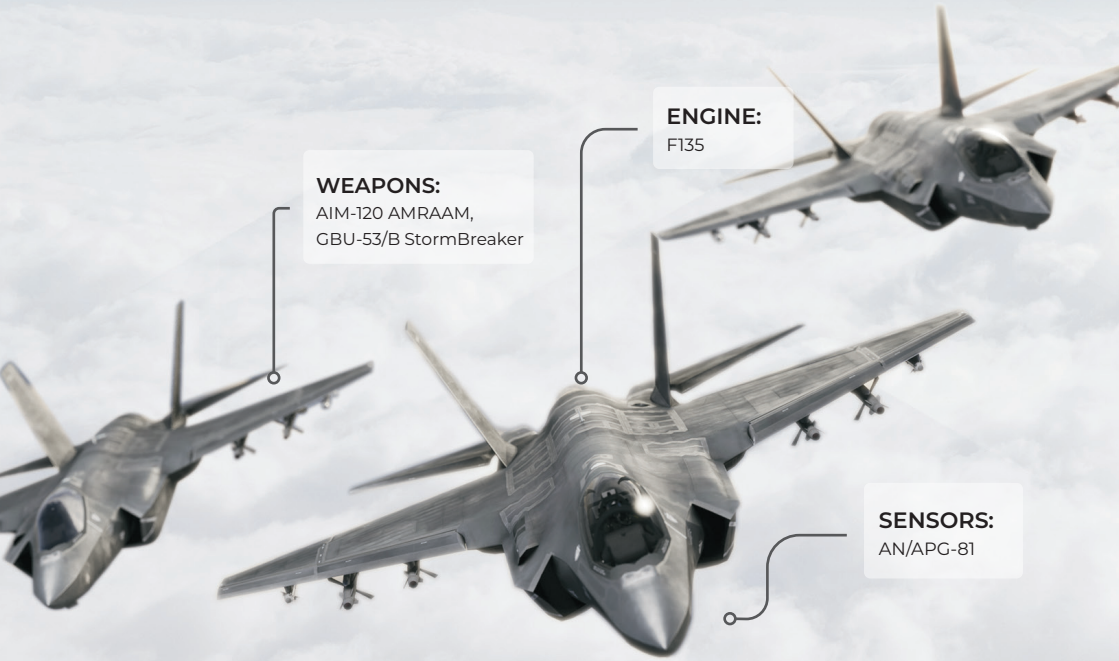

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An F-35 pilot wearing the Gen III helmet-mounted display system. (Photo: Collins Aerospace)

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A Tiger helicopter pilot wearing the Thales TopOwl helmet-mounted sight and binocular display. (Photo: Thales)

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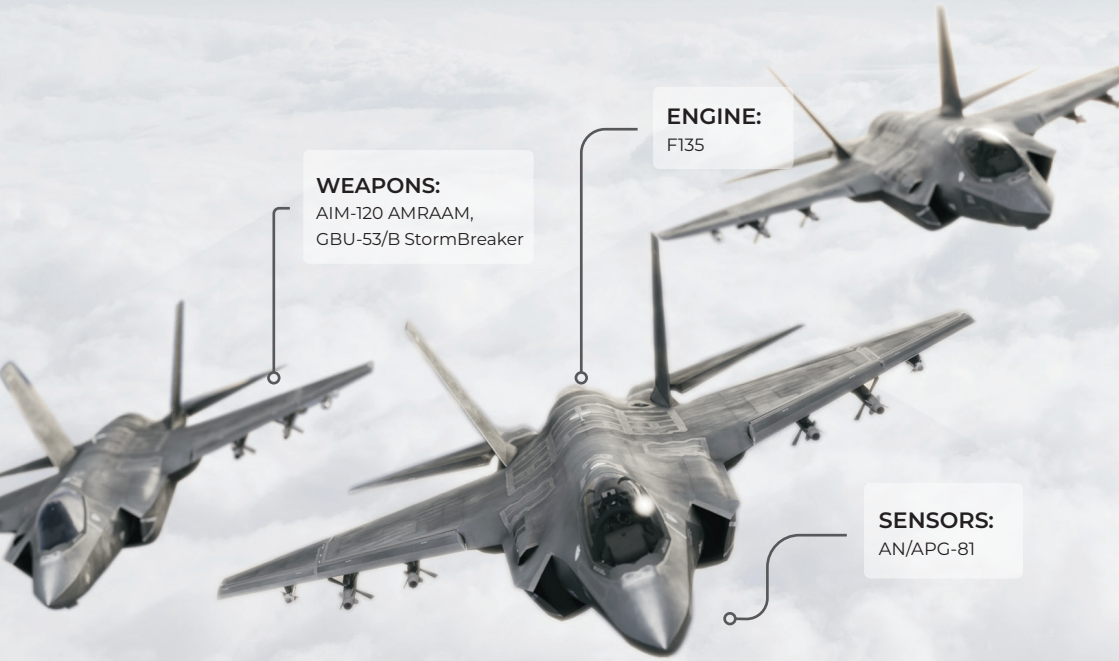

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