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# OUR MISSION

Our mission is to **empower** our customers with the tools and technologies necessary to face the future with confidence. We build on our core competencies to tailor **total solutions** that meet our customers' specific needs. Drawing on our **multidisciplinary expertise**, we anticipate our customers' needs and help them realize their vision.

## Meeting the Challenge of Change

Today's growing worldwide defense, security and safety concerns have created the need for net-centric approaches to counter emerging, non-traditional threats. Forces, systems and platforms must be woven into an interoperable and joint network in order to succeed on the modern battlefield. Our systems provide customers with cost-effective capabilities to deploy all forces and responders on a networked basis, maximizing the potential for a powerful and coordinated reaction with speed, precision and intelligence.

## Maintaining a Tradition of Innovation

Our people are the key to our ability to deliver solutions that blend technology with creativity. Our team incorporates insight and skills gained from years of operational experience and applies them in every area of our expertise. The depth and breadth of our systems for aerospace, land, naval, homeland security, cyber and commercial aviation applications cover every link in the operations chain – from situational awareness to mission planning, from detection to mission execution, and from simulated training to the growing demand for unmanned systems. We have achieved worldwide recognition for our airborne, land and naval platform upgrades, both as a prime contractor and as a systems supplier. By innovating and integrating our technologically advanced systems, we extend the life cycle of a fleet and provide customers with affordable enhanced operational capabilities. The same systems and products are also installed and integrated onboard as original equipment in new defense and commercial platforms.

Our intelligence surveillance target acquisition and reconnaissance (ISTAR) solutions cover the full range of manned and unmanned systems. Our command, control, communications, computers and intelligence (C<sup>4</sup>I) activities cover an impressive portfolio of integrated solutions that link every echelon to real-time mission-critical information, from the headquarters all the way to the "digital soldier." Supporting our commitment to service, added value and full spectrum capabilities, we provide logistic support, maintenance and repair services for customers around the world. This includes sophisticated simulation systems, "power by the hour" flight training under private finance initiatives, and the establishment and operation of maintenance and repair centers. We also develop and supply a broad range of cyber-based systems. We also develop and supply a broad range of cyber-based systems and products, including for cyber-protection of commercial and governmental infrastructures.



**Michael Federmann**  
Board Chair

**Bezhael Machlis**  
President and CEO

## **Expanding Our Capabilities**

Over the past year, we enhanced our capabilities through acquisitions in Israel, as well as acquisition and the establishment and expansion of international joint ventures in various key markets. We also focused our portfolio through the divestiture of certain non-core assets.

## **Extending Our Reach**

The Company operates as a worldwide organization, focusing our efforts both globally and locally in order to more effectively meet the needs of our customers around the world. Our business philosophy encourages partnerships with local industries and the utilization of regional capabilities. The cooperative relationships we establish with other contractors and suppliers enhance our emphasis on our highest priority – our customers.



# AEROSPACE

No longer “up-in-the-air,” the pilot and aircrew are connected, situationally aware and capable of carrying out joint operations with forces on the ground or at sea.

**TARGO™** Helmet-Mounted Avionics (HMA™)



Focus on Fusion –

# UNIFYING FORCES TO WIN

Our high-performance aerospace systems are compatible with emerging net-centric concepts, ensuring enhanced situational awareness, faster decision making and optimal response.

Our unique airborne Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C<sup>4</sup>ISR) solutions provide pilots with data communications and real-time images derived from intelligence, surveillance and reconnaissance sources.

These solutions enable an air force to share mission-critical data with ground and naval platforms, driving joint, seamless operations between air-to-air, air-to-ground, manned and unmanned platforms.

This multidisciplinary concept extends to the design of training and simulation systems that accommodate evolving missions and combine air and ground systems within a single architecture.

## **From a Single Sensor to an Entire Cockpit Avionics Suite – Complete Solutions from a Single Source**

Our comprehensive airborne systems capabilities afford us the flexibility to provide a single sensor or an entire cockpit avionics suite. Designed to be net-centric, oriented, intelligent, fast and precise, our high-performance avionic products and systems incorporate a wide range of core technologies. We provide battle-proven electronic and electro-optic combat systems for air forces worldwide – from flight instrumentation to head-up displays (HUD), and from helmet-mounted displays (HMD) to guided weapons. Our systems are integrated on fixed and rotary-wing aircraft, whether they are new or mature, from both eastern and western manufacturers. Our airborne systems are installed as original equipment in new aircraft. We also supply unique commercial avionics systems and aerostructures for civilian aircraft.





## Enhanced Safety and Situational Awareness

HDTS (Helmet Display and Tracking System) combines innovative LOS (line-of-sight) technology and video display capabilities with the legacy ANVIS/ HUD™ system. Independent displays for each pilot present critical flight data and multiple symbols related to the specific mission, including 2D and 3D conformal and color symbology overlaid on a head-up display. By reducing the pilot's head motion for cockpit scanning, the system increases situational awareness, enhances flight safety and improves crew coordination.

Suitable for utility, maritime and multi-role helicopters, the HDTS is capable of weapon slaving by sight.

The HDTS Low Visibility Landing (LVL) solution enhances survivability in low visibility situations, inclement weather, low-level flight and during night operations. Using advanced LOS and intuitive 3D conformal symbology, the air crew can fly and hover the helicopter without outside visual references, while simultaneously recognizing dangerous lateral drift.

## BrightNite

Low-flying aircraft are especially vulnerable to threats such as difficult terrain, enemy fire and the intersection of utility wires in the flight path. Sorties must often be carried out in a DVE, adding to the already heavy workload and leaving flight crews to rely on NVGs to accomplish their mission. Factors limiting the pilots' FOV include complete darkness, poor weather conditions, brownouts, whiteouts and sandstorms.

BrightNite overcomes these visibility limitations and greatly improves mission effectiveness and flight safety. The system processes real-time panorama video enhanced by a 3D conformal symbology concept, and transmits high-resolution video to the HMD, enabling the pilot to fly in a head-up, eyes-out position. BrightNite utilizes unified location-based information culled from a wide FOV to display crystal clear images, regardless of visibility conditions.

Cost-effective, lightweight and compact, BrightNite can present information to multiple pilots simultaneously on an intuitive multi-functional display.



**BrightNite™**



**ANVIS/ HUD™**



**JHMCS II**



**JHMCS**



**BMS for helicopters:** The Apache helicopter is equipped with Elbit Systems' HeliC3om™, Integrated Helmet and Display Sight System (IHADSS) and mission computer. HeliC3om™ is a fully digital, integrated command, control, communications and mission management system for attack helicopters. This unique system includes accurate data communications and transmissions and real-time tactical pictures for enhanced situational awareness, making the mission management process easier, user-friendly and more accessible.

## A World Leader in Aircraft and Helicopter Upgrade Programs Enhancing Operational Capabilities

As a world leader in aircraft and helicopter upgrade programs, we integrate electro-optical and EW systems, advanced weapons, communications, and navigation to provide the advanced net-centric capabilities vital for today's fast-paced missions. In addition, by reducing logistic turnaround time, our systems provide greater fleet availability, and in turn, a greater number of missions per aircraft.

We have conducted comprehensive upgrade programs and supply advanced avionics systems as the prime contractor on numerous fixed-wing and rotary aircraft. In addition, we have supplied advanced avionics systems for the V-22 Osprey tilt rotorcraft, the F-15, F-16, F-18, M-2000, T-38, Tejas, C-130 and T-45 aircraft as well as for the UH-60 Black Hawk, AH-1 Cobra, AH-64 Apache, CH-47, CH-48, CH-53 Stallion, OH-58 Kiowa, Mi-17, Mi-24, Bell 212 and KMH helicopters.

## Light Enhanced Weapon Management System for Helicopters (LEAP)

LEAP, our new armament suite, converts helicopters into armed carriers with just a minimal increase in weight. LEAP addresses the need for versatility in operations for rotary-wing platforms demanded by low-intensity conflicts and asymmetric warfare.

LEAP responds to defense budget reduction requirements by enabling the armament of existing platforms rather than requiring the purchase of new helicopters to add operational functions such as attack, close support for ground forces, special combat search and rescue (CSAR) missions, as well as various intelligence missions.

LEAP is tailored to the customer's needs and may be equipped with an accurate Guided Advanced Tactical Rocket (GATR), 70/80mm laser-guided rocket, electro-optic payload, armament and ballistic computer and the ANVIS/HUD™-24T HMS, which includes tracking capabilities and LOS. The combination of the solutions offered by LEAP enables intuitive mission management of the armament, real-time ballistic accuracy and effective management and fire launch by the pilot. These solutions provide full display of the flight data both day and night, superimposed onto the NVGs, for enhanced operational capabilities. The LEAP system has already been integrated onboard several platforms.

## Tailored to the Customer's Needs – Smart Precision Guidance that Makes Sense

For decades, Elbit Systems has repeatedly proven its ability to develop and deliver increasingly advanced guided munitions systems and seekers that improve accuracy, enhance firepower, extend operational capabilities and boost safety. The systems are based on the latest-generation technologies, and are incorporated into solutions for both air and ground applications.





**Lizard™** – a modular guidance kit for precision strike capabilities.

Our guided munitions products comply with new doctrine demands for high-accuracy and low collateral damage, while reducing manpower and increasing firepower within the sensor-to-shooter concept.

We supply the Lizard family (2, 3 and 4) of laser-based and GPS precision guidance kits. These modular kits enable the ease of interchanging of seekers and warheads, allowing ordinary general purpose bombs (both western and eastern versions) to seek and destroy a variety of targets.

Our advanced seeker technology and tracking algorithm enables the Lizard to track the laser spot, even in the harshest conditions, while guiding the bomb to precisely strike even fast moving and maneuvering targets at extended ranges. Lizard's accuracy and reliability support mission success, using fewer sorties, pilots and aircraft.

The GPS/INS module provides all-weather capabilities, as well as a common aerodynamic configuration to enhance compatibility across aircraft.

For certain combat scenarios where small, affordable, accurate precision-guided weapons are required, we have developed the Mini Lizard – a compact, gliding, accurate weapon suitable for light attack or mission aircraft. Using its laser and GPS guidance technology, the Mini Lizard ensures a high first round hit probability on a wide range of targets.

For the tactical requirements of an urban environment, the cost-effective, laser-guided GATR (Guided Advanced Tactical Rocket) system offers a degree of precision strike capability unmatched by any other 70mm guided munitions system, especially when combined with our advanced launcher.

With cutting-edge warheads and variable fuzing solutions, the GATR provides combat flexibility to engage most target sets, including soft, lightly armored, stationary and moving/maneuvering, with a reduced collateral damage footprint.

In addition to the GATR system, our Smart Tactical Advanced Rocket (STAR) is laser-guided with high-precision strike capabilities. STAR is designed to greatly improve hit probability, engage targets at long range and significantly reduce collateral damage, especially in crowded urban warfare scenarios. STAR is compatible with eastern and western rocket systems of varying calibers. The system can be launched from combat vehicles, stationary launchers, helicopters and fighter aircraft.

The LG<sup>2</sup>MK (Laser and GPS-Guided Mortar Kit) converts existing 120mm standard mortars into pinpoint accuracy weapons. The LG<sup>2</sup>MK supports high first round hit probability and minimizes collateral damage. The LG<sup>2</sup>MK is an ideal guided munitions solution for front-line infantry, providing the capability for rapid and efficient sensor-to-shooter loop engagement.



**STAR™** – Smart Tactical Advanced Rocket is laser-guided with high-precision strike capabilities.



## EO Countermeasures Systems

Elbit Systems ISTAR division offers a family of advanced, highly effective Direct Infra Red Counter Measures (DIRCM) systems for military and commercial fixed and rotary-wing aircraft. Multi Spectral Infrared Countermeasure (MUSIC™) protects military and commercial aircraft from surface-to-air IR missiles (MANPADS) and is installed without derogating the platform's performance. C-MUSIC™ is a pod-mounted DIRCM system specially designed to defend large commercial jet aircraft or tankers, including the B777, B747, B737, A320 and KC-390. The pod integrates all of the elements of the protection system, including the Missile Warning System (MWS).

## EO for Close Air Support

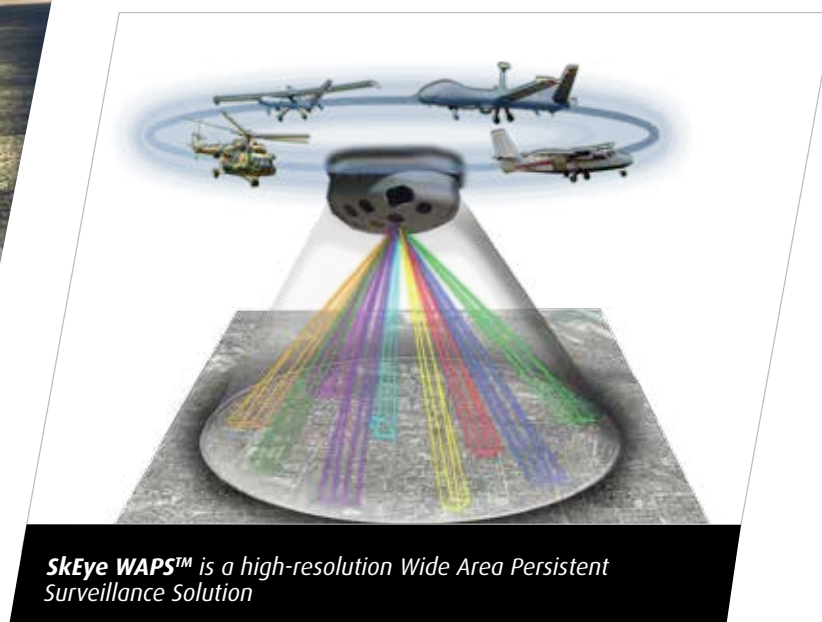
Our Electro-Optics (EO) - based laser-guided munitions for close air support (CAS) is a force multiplier on today's complex battlefield, significantly reducing the possibility of friendly fire and collateral damage. Laser designators for laser-guided munitions include the very compact Rattler GX, which is based on diode-pumped technology. The PLDR, a portable lightweight laser designator and rangefinder, facilitates laser designation for all types of laser-guided munitions. Rattler G is a dismounted, hand-held and man-portable short-range target designator system that enables warfighters to rapidly fire on hostile targets. Our close air support repertoire is rounded out by a family of man-portable hand-held thermal imagers, including the CORAL-LS and CORAL-CR, which offer continuous optical zoom and target acquisition capabilities.

## Airborne Reconnaissance Systems

Our airborne reconnaissance systems facilitate long-range visual intelligence (VISINT) gathering from high, medium and low altitudes. Our extensive product line includes: electro-optic infrared long-range oblique photography (EO/IR LOROP); the very long-range Advanced Multi-Sensor Payload System (AMPS) with full motion video (FMV); the Digital Compact Multi-Purpose Advanced Stabilized System (DCoMPASS™); and the highly-compact, highly-stabilized Micro CoMPASS™ for strategic airborne intelligence gathering. The Integrated Component-based Exploitation (ICE) system provides Intelligence Surveillance and Reconnaissance (ISR) centers with an end-to-end solution for the entire operational cycle of multi-sensor, digital imagery exploitation.

## EO Observation Systems

We develop and produce complex space-borne electro-optic observation systems. We invest heavily in advanced research, concentrating on space telescopes, space cameras in different wavelengths and hyper-spectral systems, for military, government and civilian space applications. We have developed and installed fully operational, advanced panchromatic and multi-spectral cameras for high-resolution remote sensing in space. Currently in the third decade of innovative space activity, our space systems provide the highest resolution in the most compact, cost-effective packages available today.



## Head-Up Displays

Over the past four decades, we have supplied thousands of head-up displays (HUD) for dozens of aircraft types: from large fighter cockpits to small cockpits. Our systems for commercial applications include digital HUDs featuring an LCD-based image source and a compact HUD with advanced optics. Our customers range from the U.S. Air Force, the Israeli Air Force and other major air forces worldwide, to aircraft of Lockheed Martin Aerospace and Boeing, to Embraer's KC-390 transporter and FedEx's MD-10/11 commercial cargo fleet. In response to specific user requirements, we offer an advanced HUD technology for medium-size business jets such as the Challenger 604 and others.

## Wide Area Airborne Persistent Surveillance Video Solution

SkEye is a high-resolution Wide Area Persistent Surveillance Solution (WAPSS) that continuously monitor, record and analyze large area footprints, intercepts events and maintains multiple regions of interest (ROI) under constant surveillance with high spatial resolution. Multiple, simultaneous and independent users on the ground can access both real-time and back-in-time (stored) video events retrieved from the airborne platform. Users can also access large video archives of ongoing and past SkEye aerial missions, with video queries stored by time, location and event. For panoramic ground surveillance our GroundEye™ can be installed on high masts,

towers or as a mobile configuration, providing operators with information and tools that were previously unavailable or difficult to obtain.

## IR Sensors for Missile Approach Warning Systems

Protecting aircraft against IR guided missiles depends both on reliable detection and warning sensors, as well as effective Electronic Counter Measure (ECM). Elbit Systems' warning and tracking sensors include cutting-edge architecture that delivers longer protection ranges and improved performance, ensuring mission success and a safe return of the aircraft and crew. The sensors can be integrated in a range of Electronic Warfare (EW) self-protection suites and installed on a wide variety of aircraft. The sensors offer both single and dual color sensors, as well as both warning and tracking sensors (as part of DIRCM systems). Elbit Systems' sensors are off-the-shelf products, and fully operational with customers worldwide

## Next Generation Avionics

Packed with technical innovations, Elbit Systems' Cockpit NG is the result of the Company's decades of experience and expertise in creating advanced avionics concepts for the cockpits of tomorrow. Elbit Systems' Cockpit NG integrates a wide variety of helmet-mounted, heads-up and panoramic displays with advanced algorithms, sensor and data fusion and development tools. It is a complete, fully customizable,





*Advanced combat training system for lead-in trainers as well as fighter aircraft.*

multi-mission cockpit that assures aircrews improved situational awareness, reduced workload and enhanced flight safety. Cockpit NG is designed to meet fighters, helicopters and transporter A/C future avionics demands.

### **C-130 Solutions – Mission capable for decades to come**

Backed by over 25 years of experience in developing and integrating complex aerospace systems, and with worldwide presence on C-130s, Elbit Systems' C-130 solutions offer a winning blend of advanced avionics with best-of-breed mission systems, sensors, defense capabilities and more. Suited explicitly for the C-130 flight deck, Elbit Systems' solutions offer effective performance in tactical environments, while enabling safer and more effective mission execution as well as greater situational awareness. Elbit Systems' C-130 avionic solutions fully comply with modern civil airspace regulations, including CNS/ATM\*, RNP and B-RNAV and D-GPS approach capabilities.

### **C-Suite Tactical – Enhanced mission and safety solution for the C-130**

Elbit Systems' C-Suite Tactical is a flexible, modular avionics solution for C-130 aircraft providing accurate, real-time

information projected on the head-up, head-down or helmet-mounted display. It enables safer and improved mission execution as well as greater situational awareness. C-Suite Tactical is made up of several unique systems based on a Digital Terrain Elevation Database (DTED) and real-time sensors, all aimed to enhance mission capabilities of low altitude tactical flights using Elbit Systems' head up display

### **Elbit Systems EW and SIGINT**

Elbit Systems EW and SIGINT – Elisra (Elisra) is a leading provider of advanced unified electronic warfare (EW) and signal intelligence (SIGINT) solutions for airborne and other applications. These solutions integrate and combine cutting-edge communications intelligence/direction finding (COMINT/DF), communications jamming (COMJAM), electronic support measures/electronic intelligence (ESM/ELINT) and electronic countermeasures (ECM) into a unified system-of-systems, delivering a new level of SIGINT and EW capabilities.

These solutions deliver a fast, complete and accurate intelligence picture and protect those operating in all threat environments, including onboard airborne and other platforms.



*Unique 600 gallon external fuel tank and pylons for the F-16, enhancing its range and endurance.*



*PAWS, the Passive IR Missile Approach Warning System, is a highly effective family of operationally deployed staring IR missile approach warning systems.*

## Airborne Self-Protection Solutions

**Complete self-protection against all threat types for all airborne platforms**

**ALL-in-SMALL™** – a next-generation unified suite for airborne self-protection, extremely small and lightweight, with a modular open architecture and multiple interface abilities, this complete cutting-edge integrated airborne EW Self-Protection Suite (SPS) in a single LRU includes: EW Controller (EWC), digital Radar Warning Receiver (RWR), IR Missile Warning System (MWS), advanced Laser Warning System (LWS) and Chaff/Flare Dispensing System (CFDS). Effectively integrated with Direct Infrared Countermeasures (DIRCM) systems it provides high range detection and DF accuracy and quick, efficient jamming and advanced capabilities: ESM, IR-Centric™ – a multi-spectral emitter that has geo-location and net-centric capabilities and net-centric EW applications.

Elisra's advanced **Unified Self-Protection Suite for Fighter Aircraft** includes the most advanced multi-spectral DAS, ESM, RWR and ECM self-protection jamming capabilities in a single LRU, delivering market leading DF accuracy, identification and location of received signals, very high Probability of Intercept (POI), and enabling swift response. The suite is operational and is deployed onboard fighter aircraft in the Israel Air Force and other modern air forces worldwide.

**Light SPEAR™ - An Electronic Attack (EA) and Self-Protection System (SPS)**, this compact, extremely lightweight ESM and ECM self-protection jamming system for UAS, improves the UAS' survivability and meets the growing need to operate and collect accurate intelligence in highly hostile environments. It is based on multiple DRFM channels working in parallel and covering a wide spectrum. The system allows simple integration with an array of transmitters and platforms, and its low Size, Weight and Power (SWaP) consumption makes it an ideal EW system for multiple operational platforms.

**IR-CENTRIC™** – a measurable self-protection force multiplier for airborne platforms, this unique IR-based full protection and situational awareness solution provides mission protection and safety enhancement from a single system while responding to the most modern airborne and ground operational requirements. Utilizing the Infra-Red-based Missile Warning System (IR MWS), IR-CENTRIC harnesses the data transmitted by its sensors to facilitate a multi-role, multi-function nexus that includes a panoramic view of the battlefield, creating situational awareness, collision alert that enhances aircraft safety, navigation support, battle damage assessment (including recording, analyzing and learning) and mission support.

**PAWS Family**, a cross-platform family of IR Passive Airborne Warning Systems, is a combat proven, comprehensive solution



*Elbit Systems is executing long-term Private Finance Initiative (PFI) and Power By Hour (PBH) projects for the Israel Air Force Flight Academy.*

significantly enhancing all airborne platforms survivability with early warning missiles threat detection and automatic management of all types of applicable countermeasures available onboard. PAWS delivers cutting-edge protection against the most challenging modern and future threats faced in battle arenas. Using sophisticated signal processing and algorithms, the systems detect and track incoming missiles, identify threatening ones, alert the aircrew with audio-visual warning signals, initiate timely flare dispensing, and precisely cue Directional IR Countermeasures (DIRCM) towards an approaching missile. Operating either as a stand-alone, self-contained system, or as part of a complete EW suite, the PAWS processing unit supports expanded capabilities such as radar warning and laser warning. PAWS provides threat information to other EW and/or avionic systems for centralized display and management and for enabling further threat handling. Operating as a comprehensive optronic protection suite, the PAWS IR-CENTRIC capabilities extend airborne superiority by maximizing platform safety and survivability and by providing enhanced mission support. PAWS systems are installed in a distributed configuration over the aircraft's skin, in a dedicated pod/bay, or in a pylon.

## **Military Aviation Aerostructures**

Elbit Systems - Cyclone Ltd. (Cyclone), our Israel-based subsidiary, serves as our design and production center for metal and composite aerostructures, as well as sub-assemblies and assembly parts for leading military aerospace companies and OEMs. With more than 40 years of experience, Cyclone is a leading design and manufacturing center for military aircraft external fuel tanks (EFT), providing EFTs for platforms such as the F-16, F-15, F-18, CH-53 and AV-8. Cyclone also designs and produces unique assemblies – from flight control and aerodynamic surfaces, to doors and specialized aircraft parts. With our strong technical and engineering capabilities, supported by a rigorous LEAN system, Cyclone is a recognized specialist in build-to-print and build-to-spec aerostructures. Cyclone is certified for AS9100 Rev-C, ISO 9001 and ISO 14000. In addition, Cyclone's quality system is authorized by some of the largest OEMs such as Boeing, Lockheed Martin and Bombardier, as well as by Spirit Aerosystems, the U.S. Air Force, the U.S. Navy and many other AS9100-2000 advanced quality systems.



## Flexible Flight Services

### Training

Our military pilot training services cover basic to advanced training for helicopter and fixed-wing aircraft in Elbit Systems' worldwide facilities. We offer tailored packages for specific training needs, and we are able to establish a complete flight academy. Our flight training services include the provision and operation of ground-based full flight simulators and the introduction of advanced training technologies for the benefit of flight cadets.

We offer computer-based trainers, partial task trainers, full mission trainers and complete training centers that comprise mission planning systems, simulators and debriefing systems.

Our advanced combat training system introduces a cutting-edge training concept for lead-in trainers and fighter aircraft. Based on data-link technologies incorporated into navigation and display systems, our combat training system solution generates virtual sensors and systems, as well as multiple types of threats.

### Logistics

Our aircraft logistics support encompasses a wide range of services, including contractor logistics support (CLS) and performance-based logistics (PBL). We also perform private finance initiative (PFI) programs in which we own, maintain and operate an entire fleet of aircraft and equipment and are reimbursed by customers based on flight hours.

Our experience with military aircraft upgrades and CLS programs enable us to maintain the aircraft in operational service by offering customers innovative solutions for grounded fleets. In a typical CLS program, we provide a "window in the wall" operation with guaranteed spares availability. Included in this concept are component repair, spares availability, on-site technical assistance, maintenance activities, training and documentation.

We offer a vertical array of flight services, including managing firefighting aircraft fleets, supplying flight-ready aircraft for military flight training or overhauling an aircraft. In addition, we continue to expand our capabilities and expertise for the benefit of our customers. Elbit Systems of America's subsidiary located in San Antonio, Texas, provides global support for an array of medium and light U.S. Government air-lifters, including engineering services, logistics support, contracting, manufacturing, maintenance, repair and overhaul, aircraft parts and service support, aerostructures and supply chain management services.

## HIGHLIGHTS

- *First flight test for upgraded C-130 transport aircraft successfully completed for the Israeli Air Force*
- *Elbit Systems' BrightNite™ performs successful demonstration flights enabling flight in more than 90% of the nights*

# TRAINING & SIMULATION

Elbit Systems offers a full spectrum of Training and Simulation systems for Air, Ground and Naval platforms



*SkyBreaker™ (Airborne Mission Training Center) – a fully networked solution for operational combat training.*

# FULL

## SPECTRUM OF TRAINING AND SIMULATION SYSTEMS for Air, Ground and Naval platforms

### **Full Spectrum of Training and Simulation Systems for Air, Ground and Naval Platforms**

The global war on terror, along with the threats posed by urban warfare, demand smooth interoperability among forces on all fronts. Our joint forces tactical training solutions prepare forces for rapidly changing scenarios that necessitate instant, coordinated responses and the ability to handle unpredictable events.

As an acknowledged leader in the field, we build on over three decades of experience in training and simulation programs. We offer comprehensive solutions that span the military spectrum and have the unique advantage of being based on actual operational systems that we develop,

manufacture and supply. Designed by pilots, tank commanders and naval officers, our systems recreate conditions, systems and munitions, which translate into increased force readiness. We employ the latest technologies and training concepts, including advanced computer generated forces (CGF) and C<sup>4</sup>I system exploitation to produce high-fidelity, virtual environments as close to reality as it gets.

Our training and simulation solutions range from mission preparation, through execution, to post-mission debriefing and analysis. Using a building block approach that incorporates commercial-off-the-shelf (COTS) components and specially designed simulation modules, our total tailored solutions are designed to evolve along with our customers' needs. Simulator operation and maintenance are part of the total package.





*Elbit Systems' next-generation, high-fidelity simulators for rotary and fixed-wing aircraft.*

## Aircraft Mission Training Center (MTC)

Our Mission Training Center (MTC) is a fully networked solution for modern combat training. A multi-cockpit, mission-oriented training center, the MTC provides realistic simulated aircraft training using a variety of aircraft systems and realistic mission scenarios to enhance the training of pilots at all levels.

As a world leader in field-proven training and simulation solutions, we developed the MTC in order to present aircrews with high-fidelity, simulator-based training, while saving actual flying hours.

The MTC houses a complex interconnected system designed to provide pilots with the tools necessary to practice modern air combat using sophisticated CGF in a fully-integrated military setting.

Developed by current and former Israel Air Force pilots with vast operational experience, our arena generator is capable of running more than 3500 entities, including smart entities with a market leading level of artificial intelligence.

The MTC covers all stages of a mission, including planning, rehearsal, training and debriefing.

## Aircraft Embedded Training Systems

Our suite of Aircraft Embedded Training Systems, including Embedded Virtual Avionics (EVA) and an In-Flight Electronic Warfare Simulator (IFEWS), equip fighter aircraft, trainer aircraft, transport aircraft and helicopters with leading-edge advanced airborne simulation. This suite provides maximum training effectiveness and unparalleled cost-efficiency.

- **Embedded Training for Trainer Aircraft** – Transforms basic/advanced trainer aircraft into 5<sup>th</sup>-generation virtual fighter aircraft
- **Embedded Training for Fighter Aircraft** – Stimulates real aircraft sensors (radar, EW suite, etc.) providing a hybrid real and virtual environment
- **Embedded Training for Helicopters** – Provides extensive sensor simulation including an EW suite, electro-optic and thermal imaging systems, radar, FLIR, ESM, C'I systems, active/passive sonar, and CSAR



***Incident Command Team Training System (HLS-ICTTS)***

## Virtual Training

Elbit Systems offers a full range of next-generation high-fidelity simulators for rotary and fixed-wing aircraft.

Built on the accumulated experience of in-service and retired Israel Air Force pilots, our complete range of training products include computer-based trainers (CBT), flight training devices (FTD) and full flight simulators (FFS).

These high-end COTS-based systems provide pilots and cadets with customized and comprehensive simulation for the full range of their training needs.

Our solutions are designed to train pilots on all basic and advanced procedures, beginning with start-up, taxi and takeoff, and continuing with emergency procedures, instrument flight rules and stand-alone tactical training. An established track record in delivering training and simulation solutions, combined with a comprehensive range of customizable systems, enables us to deliver cost-effective solutions tailored to our customers' needs.

## Air Defense Training Solutions

Our comprehensive suite of field-proven products for advanced air defense training delivers a superior training and simulation experience for air defense weapons stations and command and control (C<sup>2</sup>) personnel of all levels. These products are available for both standalone and integrated implementation and can be tailored to each customer's unique characteristics and requirements. Embedded into actual firing units, the Live Air Defense Training System allows participants to train at their weapon stations within a virtual environment.

## Incident Command Team Training System (HLS-ICTTS)

Our homeland security (HLS) simulation solutions realistically simulate complex emergency scenarios where multiple security and rescue teams must seamlessly coordinate their life-saving operations, in both virtual arenas and live training environments.

The systems simulate a variety of interactive security incidents including terror attacks, accidents, natural disasters, dispersion of hazardous materials, attacks on strategic infrastructure, security for large scale sporting events and maintenance of public order.





**Live Combat Training System (LCTS)** provides a comprehensive solution for joint tactical force-on-force live training.

## Tactical and HQ Training

Our tactical and collective team training systems incorporate the knowledge and experience required to enhance and maintain the quality of a modern fighting force. Combining cutting-edge tactical battlefield simulation with actual command, control and communications (C<sup>3</sup>) systems, our advanced Command and Staff Trainer (CST), Tactical Battle Group Training System (TBT) and Forward Observer Trainer (FOT) adapt to a wide range of combat scenarios including high-intensity conflict (HIC), low-intensity conflict (LIC), counter-terror operations, operations other than war (OOTW) and (HLS) – all within any operational environment.

## Land Forces Live Combat Training System

Our Live Combat Training System (LCTS) for land forces provides a comprehensive solution for joint tactical force-on-force live training. LCTS offers a realistic, unified, live training environment that is fully independent and easily deployable. The system enables efficient training in various terrains – including urban areas – without the need for any on-site installation. The fully integrated training system combines laser suites for dismounted infantry and armored vehicles, independent broadband communications and control center capabilities.

## Platforms and Weapon Operators Training Systems

Our Platforms and Weapon Operators product line offers a wide range of proven solutions for the training of formations, crews, commanders, gunners and drivers. Suitable for a variety of platforms and weapons, the land forces training systems are deployed worldwide, and include embedded, independent and appended tank crew trainers, driving simulators and infantry gunner training systems.

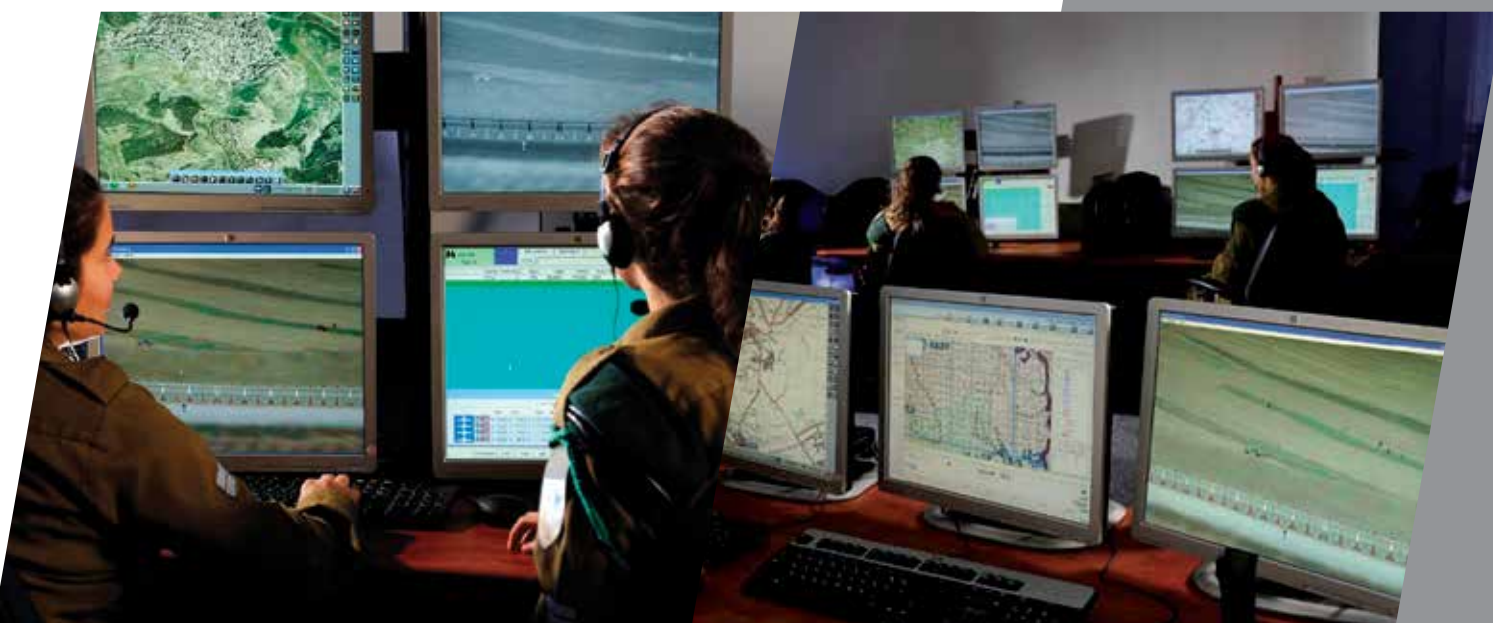
## Naval Training Center

Our Naval Training Center (NTC) is a full-scale turnkey training solution, offering operational and tactical simulation that facilitates a comprehensive and realistic naval training experience. The NTC is comprised of a naval tactical trainer (NTT), a navigation simulator and a close-range weapon trainer (CRWT). These modules can each be utilized in standalone mode or combined and integrated with additional systems for large-scale exercises.

## Naval Combat Maneuvering Instrumentation (NCMI)

Modern naval combat requires a high-level of expertise in all modes of littoral and maritime warfare. NCMI is a live training system that encompasses different combat systems. NCMI also stimulates superimposed detections of virtual targets while displaying actual detections on the operational systems. The exercise is distributed via a dedicated data-link simulation network to all participants.





**Forward Observer Trainer (FOT)** designed to offer a simulated training environment for field intelligence and artillery FOs, enabling a complete simulation of real-life battlefield situations, including joint fire planning, ranging and operating, as well as target identification, acquisition and engagement in a variety of operational scenarios.

## Electronic Warfare Simulation Center

Our EW Simulator Center is equipped with special training and simulation airborne laboratory facilities to test, train and demonstrate EW suites, both on the ground and on-board aircraft. REGEV – Realistic EW Generation and Evaluation Simulator – is an EW environment simulator that utilizes sophisticated radar signals to replicate complex, dense training scenarios typical to modern conflict zones.

## Full Spectrum of Services

Our field-proven training and simulation systems are known for being best-in-class among next-generation, high-fidelity virtual and live training solutions. We offer a full spectrum of training services and support to ensure that customers who have purchased products or services – either from Elbit Systems or from third parties – acquire the necessary skills for effective operation and optimum performance.

## Ground Forces Embedded Training

Elbit Systems offers innovative embedded training solutions designed specifically for ground forces. Elbit Systems' patented ARTIST™ – Augmented Reality Integrated Training System – combines live, embedded and Augmented Reality (AR) technologies into one innovative training suite geared for combat platforms and operators of electro-optic sensors. ARTIST facilitates live and embedded training on detection, recognition and identification procedures, and is suitable for use at the gunnery, crew and formation levels. Elbit Systems' IronVision™ helmet display and tracking system is designed for training personnel on tanks, armored fighting vehicles (AFV), and armored personnel carriers (APC). IronVision will now train crews on modern amphibious combat vehicles (ACV) equipped with situational awareness systems.

## HIGHLIGHTS

- *Elbit Systems joint venture with KBR, Affinity, awarded a contract valued at approximately £500 million for the UK Military Flying Training Systems Programme*
- *Lockheed Martin selected Elbit Systems to support F-35 Training center at Nevatim Air Force Base*

# UAS

At any moment, at least 20 of our UAS are airborne around the globe.



*Hermes™ 900 – Multi-role, Medium-Altitude Long-Endurance (MALE) UAS.*

Sophisticated capabilities and onboard systems

# TO MEET THE COMPLEX CHALLENGES

Elbit Systems' comprehensive range of unmanned aircraft systems (UAS) offer unprecedented mission flexibility – from man-portable mini-UAS, through versatile tactical UAS, to medium altitude long endurance (MALE) UAS and powerful naval solutions.

Our UAS have earned international recognition and play an increasingly vital role in the global war on terrorism. Military and homeland security forces worldwide benefit from our sophisticated capabilities and onboard systems, which are taking on many of the complex challenges previously performed solely by manned systems. Our extensive experience and innovative approach to all aspects of unmanned systems result in outstanding operational solutions for our customers.

We offer in-house design, development and production of nearly all subsystems and components required for complete unmanned systems solutions. These solutions range from mini to MALE UAS, to a variety of Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) solutions.

## Multi-mission capabilities

From field to operational levels, we are a leading source of turnkey solutions, maintenance and support, advanced air vehicles, ground control stations, major system hardware and software, UAS trainers, EO/IR Laser payloads, ELINT and COMINT payloads, SAR/GMTI and MPR payloads, UAS training and simulation systems, data links, remote video terminals and UAS engines.

The mature, operational Hermes™ family of UAS for MALE and high-end tactical UAS missions, along with the Skylark™ family of UAS for close-range tactical missions, provide

a comprehensive range of integral solutions for diverse operational needs.

## Hermes 900 - Multi-role MALE UAS

Our next-generation multi-role MALE UAS features over-the-horizon, persistent multi-mission, multi-payload capabilities with a class-leading payload carrying capacity of 350 kg. Hermes 900 is capable of performing missions for area dominance, and persistent ISTAR (intelligence, surveillance, target acquisition and reconnaissance). Hermes 900 can also be utilized for ground forces support and maritime patrol missions, as well as for integrated multi-platform, multi-sensor operations. Based on the heritage of over 300,000 operational flight hours of the Hermes 450 UAS, the Hermes 900 employs identical building blocks using a larger air vehicle with nearly double the performance. Hermes 900 is the most recent MALE UAS procured by the IDF, and has also recently been selected by multiple international customers.

## Hermes 450 Tactical Expeditionary UAS

A multi-role high-performance tactical UAS and the primary platform of the IDF in counter-terror operations, Hermes 450 is a mature and combat-proven UAS with over 300,000 operational flight hours and a class-leading safety and reliability record. Hermes 450 incorporates cutting-edge payloads and can accommodate dual-payload configurations. Choice of payloads includes EO/IR/Laser, SAR/GMTI and MPR, COMINT/COMMJAM, ELINT, hyperspectral systems, large area scanning systems and other payloads. Hermes 450's highly autonomous and ergonomic operation results in mission effectiveness with no piloting skills required.





**Hermes™ 450** Tactical Expeditionary UAS.



**Skylark™ 3** – Light UAS

#### **Hermes 90 – Close Range, Long-Endurance UAS**

A close range, long endurance, expeditionary, high-performance tactical UAS. Hermes 90 provides an optimized combination of high-end tactical UAS characteristics, with high mobility, rapid deployment, point launch and recovery in harsh field conditions and at an extremely competitive cost. It is a highly autonomous system with mission-effective flight modes such as fly-by-camera (available in all UAS from Elbit Systems), a variety of quality mission payloads and flexible deployment schemes. Hermes 90 is a self-sustained system designed for maneuvering forces. It is runway independent, offering flexible launch and recovery methods to suit the applicable operational requirements and terrain features. Offering a choice of high-quality payloads including EO/IR/laser, COMINT, large area scanning payloads and more, Hermes 90 is a technology-leading, cost-effective UAS solution for combat, peace keeping, homeland defense, security and other military and non-military applications.

#### **Skylark I-LEX Mini-UAS**

Skylark I-LEX is the latest evolution of the battle-proven, high-performance Skylark I system, which has been delivered to over 30 different users worldwide. Skylark I-LEX is an organic, highly covert aerial ISR asset delivering actionable, high-resolution video in real time. It enables man-packed or vehicle-based deployment and allows for static or on-the-move operation. Designed for in-theater operation by maneuvering forces, Skylark I-LEX is fully autonomous from takeoff, throughout the mission and landing. The UAS serves as the standard battalion-level UAS for the IDF and is used in various NATO countries and with other international users.

#### **DA-VINCI Multi-Rotor Mini-UAS**

Da-Vinci is a powerful vertical takeoff and landing (VTOL) small UAS (sUAS), suitable for a variety of missions, terrains and weather conditions. The low altitude, multi-rotor platform features automatic takeoff and landing as well as

autonomous mission capabilities. The unmanned platform can operate in marine zones and urban areas without line-of-sight (LOS) communications. The Da-Vinci incorporates a real-time HD data link and advanced control software.

#### **Skylark C**

Skylark C is a shipborne mini UAS designed for patrol boats and small vessel operations. The UAS is fully autonomous from launch to recovery, and provides persistent surveillance with an EO/IR payload. Based on the battle-proven Skylark I-LEX – with over 30 international customers and tens of thousands of operational sorties - the Skylark C transforms the land-based operational capabilities into an organic maritime ISTAR asset. The Skylark C Point Water Recovery (PWR) feature, enabling fully automatic recovery on water, is the ultimate solution for Marine Corps, Special Forces and patrol boat operations.

#### **UAS Ground Control System**

The Hermes Universal Ground Control Station is common to all Hermes UAVs platforms and can be mobile or fixed, standard size or down-sized. Its side-by-side identical and redundant operator consoles feature ruggedized COTS hardware and commercial software tools for quick and easy mission planning, management and control. Built-in data exploitation and dissemination and an advanced system concept allow “single-operator” GCS operation.

The UGCS is built to enable the full control of any type of UAVs. It provides full mission debriefing and simulation as well as in-flight mission editing and payload control. The UGCS system includes a ground data terminal, a remote video terminal and a flight line tester/loader. STANAG 4586 interoperability capability is optional.

#### **Skylark 3**

Delivering organic airborne ISTAR capabilities to the division, brigade and battalion levels, Skylark 3 is a tactical UAS optimized for both dismounted and vehicle-based operation.



**Skylark™ I-LEX Mini-UAS**



**Hermes™ 90 – Close Range, Long-Endurance UAS**



**DA-VINCI Multi-Rotor Mini-UAS**



**UAS Ground Control System (GCS)**

Based on the battle-proven Skylark I-LEX – with over 30 international customers and tens of thousands of operational sorties – Skylark 3 enables performance of ongoing covert operations, providing real-time intelligence during day and night. Its effective payload weight capabilities are industry-leading in its class. Skylark 3's high-resolution, gimbaled and stabilized dual EO/IR payload facilitates a wide-range of applications including over-the-hill intelligence, force and convoy protection, strategic infrastructure protection, border patrol and security operations.

#### **Skystriker**

SkyStriker is a cost-effective loitering munition that is capable of long-range precise tactical strikes. The technology-enabled SkyStriker improves performance, situational awareness and survivability by providing direct-fire aerial-precision capabilities to maneuverable troops and Special Forces. SkyStriker is a fully autonomous UAVs that can locate, acquire and strike operator-designated targets with a 5kg warhead (or a 10 Kg warhead for operation up to one hour) installed inside the fuselage, enabling high-precision performance. The UAV's electric propulsion offers a minimal acoustic signature, allowing covert operations at low altitude operations. As a silent, invisible and surprise attacker, SkyStriker delivers the utmost in precision and reliability, providing a critical advantage in the modern battlefield.

#### **UAS Services**

Our UAS Services offer flexible business models for supporting all types of customers. For customers desiring to employ UAS prior to owning a system, we offer service/lease-based UAS programs. In such programs, the system remains the property of Elbit Systems but is made available to the customer with versatile operating and manning arrangements including, if desired, full contractor turnkey operation. Other options are also available, such as operation by the customer, with maintenance and support provided by Elbit Systems.

#### **Data Links**

We offer advanced wireless communications systems for manned and unmanned aircraft, guided weapons, space platforms and satellite communications earth stations, as well as unique search and rescue (SAR) systems for combat and non-combat applications.

## **HIGHLIGHTS**

- *Elbit Systems Introduces Skylark 3: The Latest Addition To its Family of Mini-UAS*
- *Elbit Systems Introduces Skylark C: A New Mini-UAS for Tactical Naval and Maritime Applications*



# LAND SYSTEMS

Elbit Systems' reputation as a leader in solutions for land forces is based on more than four decades of experience.



*The **UT30MK2** is a fully overhead configurable unmanned turret capable of transforming armored personnel carriers into armored fighting vehicles – with no vehicle deck penetration whatsoever. The Remote Control Weapon Stations Family 7.62 is a lightweight, stabilized weapon station for integration into various platforms. The unique design is based on extensive battlefield experience in full scale and low intensity conflicts and underscores Elbit Systems' leadership in the field of turret and fire control systems.*





# A MARKET LEADER

## in solutions for land forces

We produce one of the most diverse and comprehensive ranges of land-based sensors and systems in the industry. Our total solution concept covers the entire spectrum of combat vehicles, from complete modernization and training to maintenance depots and life-cycle support services.

### Combat Vehicle Modernization

Building on advanced in-house capabilities and core technologies, we are a one-stop source for net-centric compatible solutions, including target acquisition, battle management, laser warning, weapon stations, surveillance, fire control (FC), turret drive, and a full range of countermeasures. We also offer life support systems (LSS), chemical, biological, radiological and nuclear (CBRN) protection, automotive improvements and robotics. We supply our advanced land systems both as turnkey solutions and on a stand-alone basis to other defense contractors. Our comprehensive solutions cater to all types of combatant forces and can be integrated into existing platforms. In order to adapt and develop control systems and electronics for combat vehicles, we have integrated technologies based on our experience in advanced avionics and electro-optics. We also provide complete communications upgrades to armored fighting vehicles (AFV). Our innovative solutions include the following product suites:

**UT30MK2:** The UT30MK2 is a configurable unmanned turret, adding effective firepower to armored personnel carriers (APC) without compromising troop safety. Built

on the success of a fully combat-proven turret in use by numerous armed forces around the world, the UT30MK2 is the latest generation armament system developed by Elbit Systems. The modular design enables unmanned and manned turret configuration with easy conversion. Designed with a very low profile, the UT30MK2 encompasses a broad range of weapon systems, countermeasures and advanced electro-optics all developed in-house to deliver reliable, high performance firepower on the battlefield.

**Remote-Control Weapon Stations Family:** Our Remote-Control Weapon Stations (RCWS) family is designed for dynamic or static operation, and for use on stationary posts, ground or naval platforms. The high precision, lightweight, low-profile RCWS can be mounted on any AFV, main battle tank (MBT) and support platform without roof penetration. The RCWS is operable from within the vehicle by the gunner using handles and a multi-functional display (MFD). With this configuration, the dual-axis and fully stabilized (optional) RCWS delivers high speed engagement, single phase aiming, and an exceptionally high hit probability without operator risk exposure. Based on in-house electro-optics, the weapon system offers superior performance in open areas, as well as urban or mountain warfare scenarios, including anti-aircraft engagements.

The RCWS family can be adapted to a wide variety of weapon types of both Western and Eastern origins, including 7.62mm, 12.7mm caliber weapons and 30 or 40mm Automatic Grenade Launchers.



*Elbit Systems develops and supplies a family of fire control systems for modernized and upgraded main battle tanks, medium and light tanks, and light armored vehicles. Migrating our experience from advanced avionics systems, Elbit Systems adapts and develops control systems and electronics for combat vehicles.*



***Combat NG** is a C<sup>4</sup>I system for field artillery. Designed for deployment from platform to brigade level, it manages all aspects of artillery operations. The system is capable of supervising all units' resources and supporting decision making at tactical and operational levels. Combat NG ensures faster response time and increased survivability.*

## Surveillance, Reconnaissance and Targeting

Our extensive range of warning and protection systems supports effective and timely responses to laser and radar-guided threats. Offering 360-degree threat coverage, the systems include a full array of soft-kill and hard-kill countermeasures. The wide range of systems can be tailored to provide the required degree of accuracy and meet a broad array of threats. Easily fitted to all AFVs, the systems are able to detect, categorize and pinpoint laser and radar/RF sources such as rangefinders, designators, beam riders, infrared illuminators and trainers. Using a combination of decoys, smoke, electro-optical signals, infrared or laser jamming, the systems effectively neutralize incoming missiles. An essential component of the vehicle's defensive capabilities, they feature audio and visual warnings, high-detection probability and a low false-alarm rate.

## Life Support Systems

### Auxiliary Power Units (APU)

Our subsidiary Kinetics Ltd. (Kinetics) offers a comprehensive array of auxiliary power units specifically designed for heavy-duty military applications. Field-proven worldwide, these units offer significant operational benefits to modern fighting forces, even in extreme and harsh environmental conditions.

## Life Support System (LSS)

Kinetics Life Support System (LSS) is an integrated, comprehensive and fully customizable solution providing a broad range of LSS to armored vehicles, including chemical, biological, radiological and nuclear (NBC/CBRN) protection; heating, ventilation and air-conditioning (HVAC); as well as cooling for electronic equipment. Each subsystem can be manufactured as an independent unit, or can be integrated into the overall solution. The LSS also has the option of being powered by the platform engine or self-propelled when connected to an alternative power source. Kinetics All-in-One solution is a unique combination of an APU with HVAC and NBC/CBRN protection capabilities. It can be operated independently and / or simultaneously while the main engine is running. In silent mode, the APU provides power to the onboard electronics equipment as well as to the HVAC and NBC/CBRN to allow full performance of all onboard functions.

## Fire Control Systems

We have developed and supplied generations of fire control systems (FCS) for MBTs, medium tanks, light tanks and light armored vehicles that have repeatedly met the test of combat. Our sophisticated suite of FCSs features long-range, day and night, on-the-move high first-round hit probability



**ATHOS** is a long-range 155mm/52 caliber autonomous towed howitzer capable of a range greater than 40km.

against moving targets. Reliable and cost-effective, the systems range from simplified FCS for one-man light turrets to high-performance hunter-killer FCS for front-line MBTs.

Every FCS is configurable with battle management systems required for use in net-centric warfare.

## Artillery

### Fully-integrated, modular artillery solutions – delivering effective, highly-accurate fire support

We offer a comprehensive array of fully-integrated, modular artillery solutions that incorporate smart technology, automatic laying and loading capacity, FCS and modular weapon products. Outfitted with enhanced ballistic computers, along with navigation and target acquisition equipment including battery and battalion command posts, our artillery solutions are easily integrated into customers' C4I systems. These combat-proven solutions have seen extensive use by the U.S. Army, NATO, the Israel Defense Forces and other leading ground forces.

Extensive integration expertise combined with in-house development enables Elbit Systems' hardware components, communications systems and applications to adapt to a

wide range of platforms. All products can be tailored to customer specifications.

Customers with existing infrastructure can benefit from our platform upgrades which enhance the performance and capabilities of existing artillery systems in order to meet modern battlefield requirements. We support multiple firing platforms – including guns that are towed, tracked, truck-mounted, self-propelled or independently propelled by an auxiliary power unit (APU) for self-maneuvering.

**ATMOS** is a 155mm/52 caliber truck-mounted howitzer that offers the advantages of superior fire power, enhanced mobility and rapid response time. The ATMOS fire range exceeds 40km with ERFB-BB ammunition and a suitable propelling charge. Designed specifically for rapid deployment and operation on difficult terrain, the ATMOS's shoot-and-scoot capabilities are supported by an integrated electronic suite incorporating an INS-based laying system, as well as an automatic loading system that reduces crew effort. The ATMOS can be mounted on any adapted high-mobility 6x6 or 8x8 truck chassis preferred by the customer.

**ATHOS** is a long-range 155mm/52 caliber autonomous towed howitzer capable of a range greater than 40km. The gun utilizes inertial navigation and aiming systems, including a GPS and an onboard firing computer as part of its autonomous capabilities. It achieves automatic control,





**SPEAR** Designed for high mobility platforms, SPEAR is a fully autonomous, vehicle-mounted 120mm soft recoil mortar system.

automatic laying, accurate navigation and target acquisition. When deployed in the battlefield, the ATHOS can maneuver itself using its own diesel engine and special hydraulic-driven road wheels which are also ideal for shoot-and-scoot positioning. The hydraulic system enables a team of seven crew members or less to deploy the ATHOS within minutes.

### **Cardom 81/120mm for Infantry Battalion and Brigade Levels**

A 120mm autonomous self-propelled recoiling mortar system with auto-laying capabilities, the Cardom solution is muzzle-loaded and turntable-mounted. It has been in extensive use by the U.S. Army, NATO, the Israel Defense Forces and other leading ground forces.

Compatible with a variety of fire control systems and inertial navigation systems, the Cardom can fire a first round in less than one minute and 16 rounds in 'burst' succession, allowing for rapid deployment. Designed for heavy and medium platforms, the system can be integrated with forward observers or UAS for quick target acquisition or target prioritization in various operational modes.

### **Spear 120mm on Light Platforms**

**Spear:** Designed for high mobility platforms, SPEAR is a fully autonomous, vehicle-mounted 120mm soft recoil mortar system. SPEAR delivers effective fire support by combining the flexibility of accurate mortar fire with exceptional tactical mobility. Equipped with our revolutionary, patent pending recoil system that reduces the 120mm barrel's firing loads from 120 tons to less than 10 tons, SPEAR can be mounted on a variety of high-mobility light vehicles.

### **Ground Deployed Mortars 60/81/120mm**

We offer a wide range of mortar systems designed to suit a variety of battlefield scenarios. Our lightweight mortars are effective support weapons for close, medium, long and extended-range shooting – making them highly effective for special forces, commando units and infantry battalions. User-friendly, quickly deployed and reliable in all weather conditions, the mortars are operated with a light handheld fire control system. The mortar systems are available with the auxiliary equipment necessary for field operation.



**ATMOS** is a 155mm/52 caliber truck-mounted howitzer that offers the advantages of superior fire power, enhanced mobility and rapid response time.





**FOXTRACK™** – a portable Ground Surveillance Radar System – is a lightweight, compact, man-portable radar carried by two operators soldiers, special operations forces or security personnel.

## MRJ – Miniature Reactive Jammer Family

The MRJ Family, the latest generation of protection systems against Remote Controlled Improvised Explosive Devices (RCIEDs), has been developed to protect ground forces, homeland security entities, special forces, penetration units, small vehicular convoys, border patrols and other forces entering hostile areas. The systems can be configured to jam RCIEDs in either reactive or active modes, or a combination of the two, working simultaneously.

## Ground Radars

We provide an array of specialized Ground Surveillance Radar (GSR) systems that can be integrated with ISR ground solutions. Foxtrack™ is a lightweight, compact, man-portable radar that is installed on a vehicle mast or as a tripod-mounted configuration. Our FPR-10 radar provides long-range, accurate, high resolution detection of vehicles and personnel behind foliage.

When unattended configuration is required, our TALOS and MTR radar solutions can be utilized.

## Autonomous Systems

The Stereo Vision System (SVS) allows unmanned ground vehicles (UGV) to autonomously detect and classify image-based objects. With a significantly lower total cost of ownership (TCO) than competing systems, the SVS features the latest innovations in hardware, software and robotic imaging

technology. The SVS is ideal for ground platforms that require autonomous perception capabilities, including a wide range of military, industrial and commercial vehicles. The SVS is field-proven and fully operational in a number of unmanned systems worldwide, including the successful Guardium UGV.

## GroundEye

Our high-resolution, Wide Area panoramic ground Persistent video Surveillance Solution (WAPSS) GroundEye brings surveillance and security to the next level. The system continuously monitors, records and analyzes large footprint areas, intercepts events and maintains constant surveillance of multiple regions of interest. Installed on high masts, towers or as a mobile configuration, GroundEye provides operators with information and tools that were previously unavailable or difficult to obtain, adding another dimension to the overall situational awareness.



**GroundEye™**





***Live Combat Training System (LCTS)** provides a comprehensive solution for joint tactical force-on-force live training.*

## Training and Simulation

Learning to operate today's advanced C<sup>4</sup>I combat systems and sensors demands rigorous practice and robust training tools. Our ground-based training and simulation solutions are geared for separate entities or entire battle groups. Their realism and overall effectiveness have enhanced operational performance of forces worldwide.

- **Appended Tactical Crew Trainer (ATCT)** enables cutting-edge training and mission rehearsal on-site. The compact unit connects to the actual combat vehicle and systems, providing a complete simulation environment for the crew.
- **Tactical Battle Group Trainer (TBT)** is a highly effective solution for training commanders and staff from the company level to battalion/battle groups and brigade-sized operations. Combining tactical battlefield simulations with actual C<sup>4</sup>I systems, the TBT's unique concept enables the battle group leaders to acquire tactical reasoning methods, skills and procedures.
- **Live Combat Training System (LCTS)** provides a comprehensive solution for joint tactical force-on-force live training. LCTS integrates laser suites for dismounted infantry and armored vehicles, independent broadband communications and control center capabilities.

## HIGHLIGHTS

- ***Elbit Systems Introduces IronVision™ Helmet-Mounted System for Armored Fighting Vehicles***



# C<sup>4</sup>I SYSTEMS

Innovative, in-house development of core technologies, products, platforms and systems that integrate every branch of the fighting force

***Integrated Operational Command and Control Headquarters System TORC<sup>2</sup>H™** is an automated, sensor-integrated C<sup>2</sup> solution for border security. It closes the sensor-to-shooter loop and optimizes data collection and border patrol operations.*





# **DIGITIZED** **BATTLESPACE**

for maximization of combat force

## **EFFECTIVENESS**

For more than 40 years, Elbit Systems has delivered a broad range of fully field-proven C<sup>4</sup>ISR solutions to customers around the world, based on multidisciplinary, in-house development. These innovative and technologically-advanced C<sup>4</sup>ISR systems go the extra mile in providing low-risk tailor-made solutions specifically designed for warriors by warriors. Our extensive global experience, technological superiority and in-depth expertise across all segments of C<sup>4</sup>ISR systems, combine to ensure that our solutions are suitable for both Greenfield (new) and Brownfield (existing) implementations.

### **Modern warfare requires a digitalized battlespace**

Our advanced networked battle management systems deliver actionable, real-time information that provides improved coordination and planning, a constantly-updated common operational picture (COP), and rapid closure of the sensor-to-shooter loop. Our renowned Digital Army Program (DAP) is a market leading field-proven C<sup>4</sup>I solution that connects all forces on land, air, and sea – from high-echelon HQ to the individual platform, sensor and soldier. With its wide range of features, DAP creates a force multiplier by maximizing combat resource coordination.

Our wide spectrum of ground, naval and airborne C<sup>4</sup>ISR systems offer solutions that deal with modern-day challenges, including terrorism, urban warfare, guerilla warfare, refugees and overall border protection. Our innovative solutions provide all operational levels with integrated end-to-end systems

that incorporate a broad range of sensors and weapon options. Autonomous C<sup>4</sup>ISR arrays enable full connectivity through highly-advanced communications systems and comprehensive network infrastructure. These systems provide all branches of the fighting force with enhanced situational awareness and mission-critical information that guarantee increased performance, combat mobility and survivability.

### **Dynamic solutions that produce effective results**

We offer a modular approach to both hardware and software, enabling tailored, customer-centric solutions for mobile and airborne platforms, for the individual soldier and for HQ command and control (C<sup>2</sup>) applications. The systems process, manage and present massive amounts of data arriving from both structured and unstructured sources into a user-friendly format that supports quick decision-making. Based on an open architecture, the solutions are highly scalable, seamlessly integrating with existing systems, communications infrastructure and sensors. Our solutions comply with international military standards for soldiers, vehicles and HQ systems, and effectively integrate with third-party solutions. We also provide a full range of simulators and customizable training programs to facilitate optimal use of these systems.

As a global leader in soldier systems, our solutions are deployed around the world and are also widely used in NATO countries. Our extensive investment in R&D as well as





**Elbit Systems' Weapon Integrated Battle Management System (WIN BMS)** enables coordination between fighting vehicles and provides situational awareness to peacekeeping operations and maneuvering forces, including combat vehicles, engineering corps and logistic support personnel.



**Elbit Systems' Enhanced Tactical Computer (ETC)** brings the power and versatility of advanced personal computers to the field. Its sun-readable display, multiple I/O capabilities and full military-grade environmental specifications make it an effective solution for combat C4I terminals.

a clear C4I technology roadmap has enabled us to deliver mobile, tactical, triple-play and cloud-based solutions that exploit Big Data capabilities for the ultimate in military effectiveness.

Bringing together the tools, tactics and technologies to deliver a significant operational advantage, our dynamic solutions meet the challenges of the modern, complex and dynamic battlefield. Our range of C4I solutions for battle management includes:

#### **Offerings for HQs**

Our comprehensive and efficient cross-platform solutions provide HQ with C4ISR capabilities in combined, joint and comprehensive operations. The Joint Operations Center (JOC) Solution for all levels of the JOC command at the JOC Center provides the Joint General Staff with C2 capabilities for military operational decision making, management and assessment. The General HQ Solution for all echelons within the chain of command supports stationary, deployed and mobile command echelons for tactical forces, enabling the use of military assets in a highly efficient and affordable manner. By doing so, HQ benefits from information superiority that allows for faster and higher quality decision-making. These solutions are interoperable with allied forces (NATO or allied nations), government organizations (police, coast guard, etc.) and non-governmental organizations.

#### **Soldier Systems**

Our DOMINATOR™ soldier system is an integrated warrior combat suite that enhances the effectiveness of the dismounted soldier. The DOMINATOR suite of solutions – Light, Basic and Advanced – enables full situational awareness across all military echelons. Comprised of a series of integrated hardware components, C4ISR applications and an advanced Load Carriage System developed in-house, the

lightweight DOMINATOR dramatically shortens the sensor-to-shooter loop, supporting battlefield dominance at all times. The components can be tailored to the needs of all soldier types such as commanders, team leaders, forward observers, snipers, special weapons operators and riflemen. DOMINATOR has been fully field-proven for a wide range of customers worldwide.

#### **Artillery C4I**

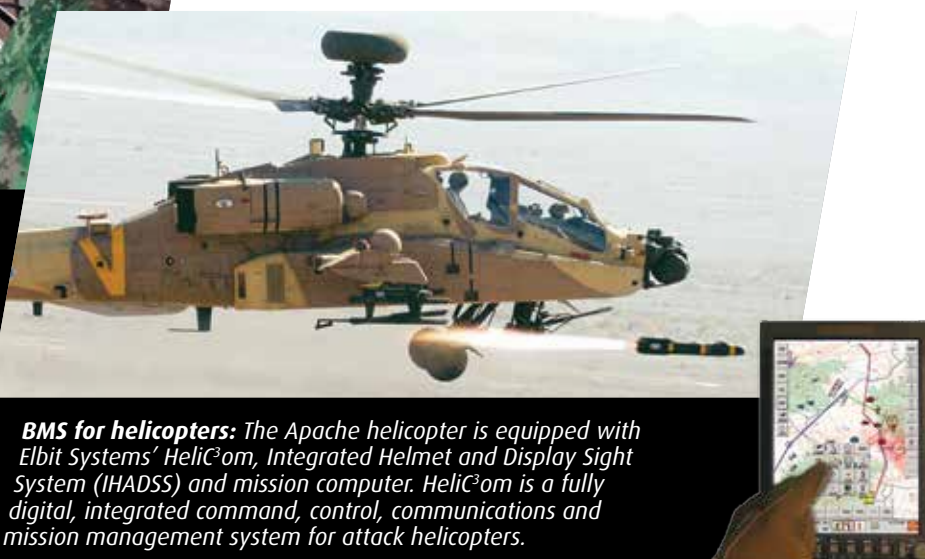
As the latest generation of C4ISR systems for field artillery, Combat NG establishes an autonomous artillery array, achieving a highly effective fire support process. Combat -proven and field-proven around the world, Combat NG manages all aspects of artillery operations, from the platform to the brigade level. In addition to capabilities that include supervising all unit resources and supporting decision-making at tactical and operational levels, Combat NG enables a short sensor-to-shooter loop, thereby increasing the combat effectiveness of combined forces. The fully-integrated modular artillery solution is designed to support a wide range of artillery platforms including self-propelled and towed guns, as well as mortars and rocket launchers.

#### **WinBMS™**

Our weapon-integrated Battle Management System (WinBMS) enhances the connectivity and coordination of maneuvering forces at the tactical level, increasing its effectiveness and survivability. Based on integrated sensor and weapon systems, WinBMS provides a full-scale solution within the armored combat platform, thereby increasing the combat effectiveness of combined forces within the dynamic battlefield. A mature and battle-proven solution, WinBMS is deployed on tracked and wheeled combat vehicles worldwide, and is well integrated with a broad spectrum of weapon systems, sensors and radios.



*The **TACTER 31D™** tactical computer is an essential C<sup>2</sup> tool for the digital battlefield, supporting complete continuity across vehicle-mounted and dismounted applications.*



***BMS for helicopters:** The Apache helicopter is equipped with Elbit Systems' HeliC³om, Integrated Helmet and Display Sight System (IHADSS) and mission computer. HeliC³om is a fully digital, integrated command, control, communications and mission management system for attack helicopters.*

### Border Protection

Our integrated solutions for persistent surveillance, regional control and perimeter protection support law enforcement, counter-terrorism and homeland security activities. Our Border Surveillance System (BSS) provides real-time regional surveillance, early warning, targeting, and border-patrol mission management. The BSS also improves terrestrial and maritime security, regional control and border protection, facilitating complete real-time connectivity across the entire border-security array. These solutions enable optimum coordination of ISR efforts throughout all operational zones and along the country's borders, supporting stationary control centers, deployed command posts and tactical patrol agents.

### Network Infrastructure

Our comprehensive tactical solutions for routing and distributing accurate and real-time data are critical for mission success in today's digitalized battlespace. Our solutions include:

- **IRCS:** A field-proven Integrated Radio Communications System (IRCS) that enables all echelons – from high-ranking commanders down to the individual soldier in the field – to communicate directly with anyone in the military network. IRCS facilitates full interoperability across a broad range of radios and communications devices including VHF, HF and multi-channel radios, as well as LAN, WAN, PABX, satellite and cellular networks.
- **TIGER™:** Tactical Intranet Geographic dissemination in Real-time (TIGER) is a powerful information grid that delivers relevant data instantly, with optimum message transfer flow and reliable delivery. This advanced tactical communications system is based on an in-depth knowledge of real battlefield conditions. Harnessing the entire infrastructure and integrating all communications media including legacy narrow-band channels, TIGER

creates an end-to-end, unified, flexible and continuously learning Intranet.

- **SMART Suite:** This family of end-to-end tactical C<sup>4</sup>ISR enables mounted and dismounted forces to maintain the flow of tactical multimedia and data information over heterogeneous tactical networks (legacy, non-IP, IP, etc.), providing the ultimate application platform for any C<sup>4</sup>ISR requirement. Utilizing both standard and TIGER routing and data dissemination protocols, the routers generate a unified "Tactical Internet" for seamless communications across the entire chain of command.

### Application Infrastructure

To effectively meet the challenges of net-centric warfare and reap the benefits of true battlespace digitization, military organizations require field-proven C<sup>4</sup>I solutions that support the full spectrum of military operations. Our solutions include:

- **TORC<sup>2</sup>H Solution:** An all-in-one C<sup>4</sup>ISR system that covers all army branches and echelons, enabling universal situational awareness as well as in-depth collaborative mission planning and management based on real-time information, and an always updated common operational picture. TORC<sup>2</sup>H is fully deployed and operational in major military organizations around the world.
- **TORCHD Solution:** A mobile embedded C<sup>2</sup> application for tactical dismounted units that enables all-terrain operability and range. TORCHD is an Android-based system based on dynamic network connectivity and integrated battle command capabilities – achieving accurate and rapid reaction within the task-force mission assignment. TORCHD transforms the dismounted commander/soldier to a force-multiplier within the task force operation and increases his operational effectiveness within the tactical force network warfare.





Elbit Systems was selected by the Israel Ministry of Defense to head the Digital Army Program (DAP) – a master program that computerizes all operations in the land forces. As part of the DAP, Elbit Systems developed **DOMINATOR™** – an Integrated Infantry Combat System that equips warfighters with advanced, miniaturized tools, enhancing situational awareness and enabling them to send, receive, view and transmit data in real-time.



- **C<sup>4</sup>ISR Solution for Air Defense and Air Surveillance:** A solution that creates synergies between a range of aerial and ground arrays to strengthen an Air Force C<sup>2</sup>, air defense and intelligence capabilities. Our C<sup>4</sup>I solution incorporates Air Command and Control Operation Centers; comprehensive IT and security suites; C<sup>4</sup>ISR suites for airborne and ground platforms and is integrated with communications media, sensors and other external systems. The C<sup>4</sup>ISR solution improves the national level airspace sovereignty by enabling early-warning and battle management capabilities, mission planning and engagement, interception control, continued monitoring and operational support.

#### Unattended Ground Sensors

Our suite of Unattended Ground Sensors (UGS) detect, track and identify human and vehicular enemy targets – facilitating terrain dominance. With a high probability-of-detection (PD) and low false alarm rates (FAR), the UGS easily integrate with existing sensors and are compatible with any C<sup>4</sup>I system. Our UGS solutions include:

- **Primrose Wireless Sensor Networks:** Comprised of miniaturized and spatially-distributed remotely monitored sensors, the wireless networks are standalone, self-powered and can detect and track the movements of people, vehicles and other events. With high PD and extremely low FAR, the sensor networks provide beyond line-of-sight (BLOS) coverage even in complex terrain. Several Primrose networks can be joined together to safeguard an even larger zone. The system utilizes advanced energy saving technology and is easily customizable to meet the needs of a wide range of missions.
- **TREASURES:** A comprehensive UGS system that enables full situational awareness and round-the-clock border protection by facilitating a quick and efficient sensor-to-shooter cycle. TREASURES detects, classifies and tracks human and vehicular targets real-time, on any terrain, and in all weather conditions. The system uses a broad network of sensor clusters, breakthrough sensing technologies, dedicated communications protocols and robust data analysis capabilities. TREASURES features a small form factor, light-weight components, low maintenance and rapid deployment time. The UGS that comprise TREASURES include: Ocean, TALOS, MTR, MID and Chameleon 2.

#### Tactical Computers

We offer a wide range of versatile, rugged and battle-proven tactical computers and displays, delivering C<sup>4</sup>ISR applications to the modern battlefield. Our solutions include:

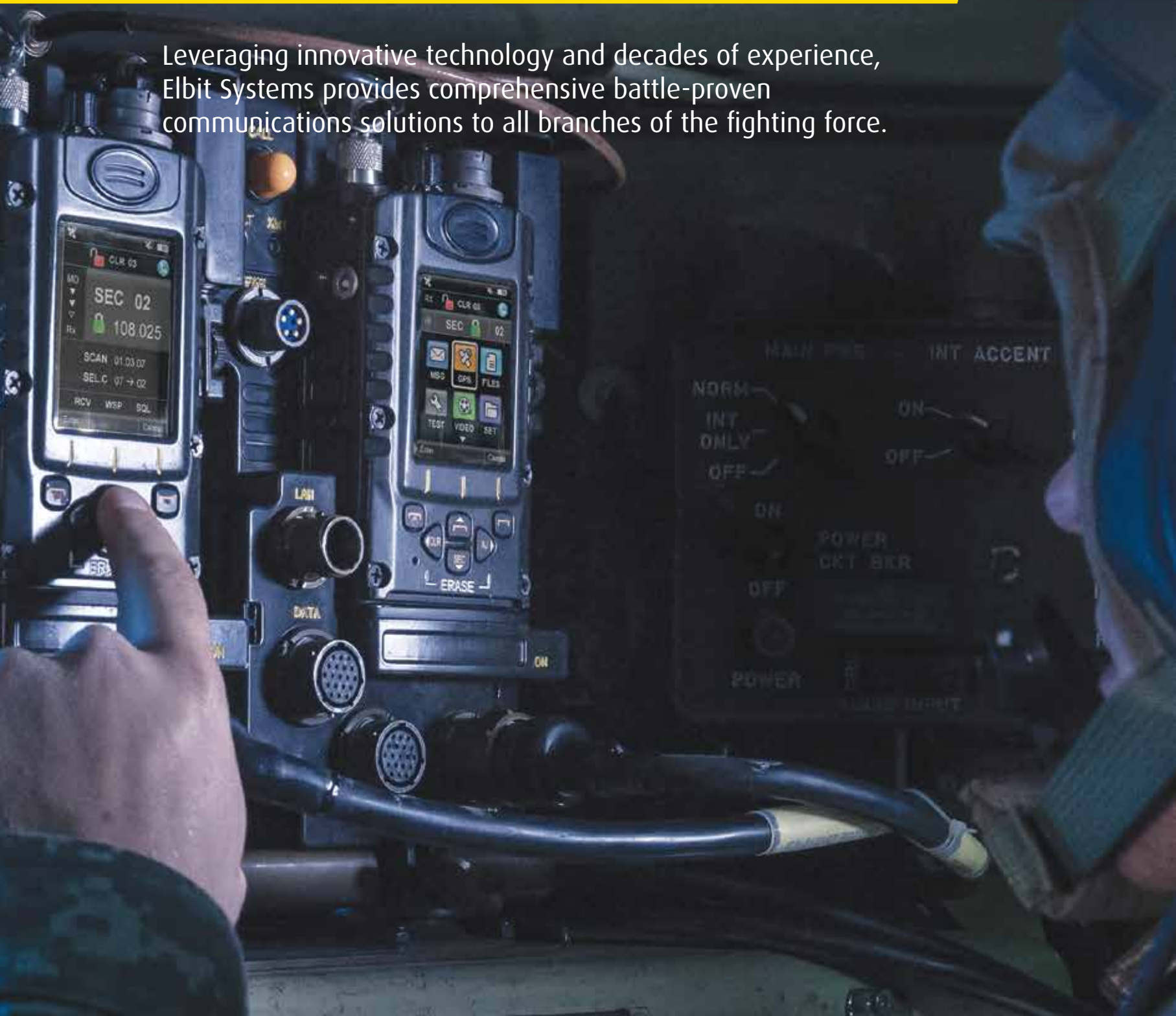
- **Enhanced Tactical Computers (ETC):** A series of rugged, battle-proven, high-performance tactical computers that provide innovative C<sup>2</sup> capabilities and tactical data dissemination for multiple operational scenarios. ETC is geared for a variety of forces and platforms including wheeled and tracked combat vehicles, tanks, artillery, APC, infantry and Special Forces. Highly ruggedized and geared for operation in harsh conditions, the ETC family offers a broad range of modular configurations and display sizes to fit numerous customer requirements, from a 10.4" tablet design, to a split display and computer unit configuration with a choice of 10.4" or 15.6" HD displays.
- **Ground Smart Display Unit (GSDU):** A multi-function, high brightness C<sup>4</sup>ISR display unit that supports multiple video formats, GSDU featuring a customizable front panel and is fully ruggedized and compliant with all relevant military standards.
- **RAPTOR:** A wearable, ultra-rugged, tactical computer for the dismounted soldier that delivers open architecture computing and communications capabilities housed in a single wearable lightweight device, RAPTOR enables the individual soldier to view a real-time common operational picture on an advanced display; send and receive live target and mission data; and manage all phases of combat including planning, briefing, execution and debriefing. A core component of Elbit Systems' Dominator suite, RAPTOR provides full situational awareness through net-centric integrated information systems.

## HIGHLIGHT

- *Elbit Systems Introduces SMART Suite-advanced infrastructure for End-to-End Tactical C<sup>4</sup>I*

# COMMUNICATIONS SYSTEMS

Leveraging innovative technology and decades of experience, Elbit Systems provides comprehensive battle-proven communications solutions to all branches of the fighting force.



## **MCTR-7200 Double Channel 50W/50W**

Advanced Multi Band - Channel - Waveform, tactical communication solutions, providing MANET capabilities for all terrain.  
E-LynX™ - networking the battlefield.



# COMPREHENSIVE BATTLE-PROVEN

## Communications Solutions

Based on decades of communications experience, including the legacy Tadiran Communications radio products line, we have extensive operationally-proven expertise in voice, video and data transmission and reception technologies. Our know-how in combining HF/VHF/UHF radio networks with telephony, satellite and IP LAN/WAN networks has resulted in the implementation of integrated military communications infrastructures for triple-play (voice, data and video) applications.

Our experience and expertise is applied to an advanced radio design that features frequencies ranging from 1.5 MHz to 5 GHz with high-grade, built-in cryptographic algorithms and electronic countermeasure techniques (e.g., frequency hopping and direct sequencing).

These systems provide reliable communications in harsh battle environments; quality modems to meet the increasing demand for C<sup>4</sup>I data communications; multichannel line-of-sight, frequency-hopping, wideband radio equipment for reliable inter-command post communications and communications controllers; tactical Internet-based integrated communications systems; and C<sup>2</sup> systems for seamless communications from HQ to any point in the battle-space.

Our comprehensive portfolio of leading-edge communications equipment and systems integrate seamlessly with our C<sup>4</sup>I and Land systems. As such, we are uniquely positioned to offer our customers a complete net-centric solution for soldier modernization, combat vehicle upgrades, artillery and air defense.

Our communications solutions include:

- **E-LynX™:** Our family of mobile tactical communications solutions based on the most advanced software-defined radio (SDR) technology, supports broadband data

communications across maneuvering tactical joint battle groups. These SDRs offer secure and reliable tactical communications to all echelons – from the individual soldier on the battlefield all the way up to headquarters. Comprised of the latest generation multi-band channel waveform tactical IP radios, the E-LynX family provides advanced mobile ad-hoc network (MANET) capabilities to a variety of platforms over any terrain type. Strong error correction algorithms eliminate the possibility of lost data packets, and a self-healing, self-forming ad-hoc networking capability enables robust data communications of several megabits per second at adaptable bandwidths.

**MCTR-7200:** Part of the E-LynX family of tactical SDRs, the MCTR-7200 features a uniquely designed software communications architecture, an intuitive user interface and multiple configuration options, including vehicular, handheld and dual configurations. The multi-use, single platform contains powerful programmable hardware that offers reliable triple-play voice, video and data services, simultaneously over a single narrowband tactical 25Hz channel. It also offers high-speed data over wideband channels, providing a significant operational edge on the battlefield. Equipped with advanced IP networking capabilities, the MCTR-7200 can build a full mobile tactical network in all terrain types and scenarios.

The MCTR-7200 supports continuous frequency coverage from 30 to 512 MHz. In addition, it offers a modular range of configurations geared to match the specific operational requirements of any mission, including handheld, manpack, vehicle-mounted and marine radio sets.

Advanced multimedia integrated capabilities render the MCTR-7200 a key factor in maintaining constant situational awareness via real-time intelligence such as maps, video and targeting information.





**PNR-1000** is the latest in a line of innovative personal network radios (PNR) providing combat-proven voice, data and video communications solutions to the dismounted soldier.



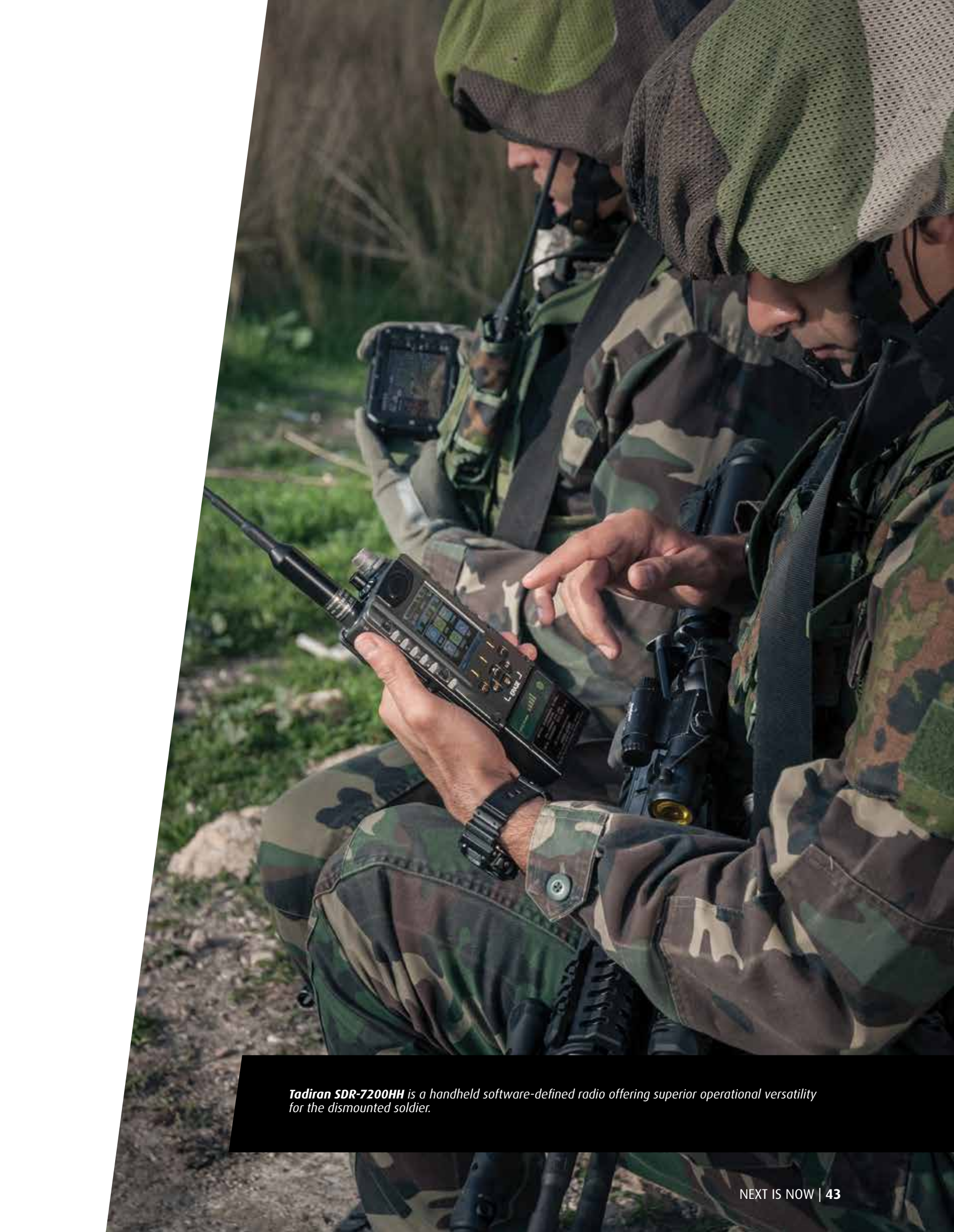
**CNR-9000HDR** – Combat IP radio, advanced multi-mode VHF/FM COMSEC/ECCM radio system for superior voice and high-speed data communications.

- **MCTR-7200 Data Radio (MIPR):** Part of the E-LynX™ family, the MCTR-7200 data radio (MIPR) provides ultra-high data rates of up to 5.5 Mbps for the transmission of high-resolution voice, video and embedded Blue Force Tracking (BFT) over a truly decentralized MANET. With frequency coverage from 225 to 512 MHz, the MIPR offers a modular range of configurations geared to match the specific operational requirements of any mission, including vehicle configurations, as well as both airborne and marine radio sets.
- **PNR-1000:** Part of the E-LynX™ family, the software-defined PNR-1000 IP radio is the ultimate solution for armed forces who wish to provide their dismounted soldiers with advanced communications technology. With its 64 member ad-hoc networking, the radio features automatic voice and data relay, which significantly enhances the soldier's situational awareness and operational effectiveness. As the newest generation of personal network radios (PNR) operating at the full RF spectrum of 225-512 MHz, the PNR-1000 is the lightest of its kind in the market. The PNR-1000 possesses a comprehensive set of features rarely found in similar radios that provide combat-proven voice, data and video communications solutions.
- **HF-8000:** Featuring superior HF operations, the SDR IP HF-8000 radio systems deliver uninterrupted data and voice communications on the battlefield. The radios comply with HF standards and are available in lightweight manpack, vehicular, ship, fixed station and high-power configurations. With its wideband version, the HF-8000

supports 120 Kbps of data and video transmissions. These systems are equipped with patented exclusive antenna solutions that ensure highly reliable and secure voice and high-speed data HF between 0-600 Km with 125 W radios.

- **GRX-8000:** GRX-8000 is the latest generation NATO Band IV with a dual-mode, high-capacity (HC) and frequency-hopping (FH) line-of-sight broadband radio relay system. Designed to meet present and future tactical communications requirements, the battle-proven radio relay system supports the latest IP and legacy communications protocols. With jamming resistant ECCM, the software-defined GRX-8000 enables interference-free communications across the battlefield.
- **HF-6000:** As a combat-proven, multi-adaptive HF radio system for reliable long-range communications, the HF-6000 delivers highly-advanced HF operations to the modern battlefield. The HF-6000 offers advanced COMSEC/ECCM functions to ensure reliable HF voice and data operations.
- **GRX-4000:** An ultra-high capacity, dual-band IP and multi-interface radio relay system for tactical communications. The GRX-4000 simultaneous dual-band and dual-mode operation. The SDR relay system supports the latest IP and legacy communications protocols. Battle-proven as a high-capacity line-of-sight means of communications, the GRX-4000 offers high-quality, interference-free communications from the palm of the hand.



A photograph of two soldiers in camouflage uniforms and helmets. The soldier in the foreground is holding a handheld radio with a screen and buttons, while the soldier in the background is also holding a similar device. They are in an outdoor, grassy field.

***Tadiran SDR-7200HH** is a handheld software-defined radio offering superior operational versatility for the dismounted soldier.*





**GRX-8000**

- **SOTM Antennas:** Our advanced broadband satellite on-the-move (SOTM) antennas are ideal for wheeled ground vehicles that require two-way transmission of real-time mission critical information. The ELSAT-2100 is a low-profile tri-band highly ruggedized military SOTM antenna that delivers high performance in Ka, Ku and X bands. The ELSAT-2100 supports high downlink rates of over 10 Mbps and uplink rates of over 5 Mbps, and is ideal for mobile and maneuvering ground military forces. The ELSAT-2000E is a highly ruggedized, field-proven military SOTM antenna especially suited for land platforms. The cost-efficient, low-profile antenna delivers high performance in Ku band. Both antennas are based on our field-proven next-generation passive waveguide planar array panel antenna technology. Offering best-in-class KU band RF performance for every given size, the antennas are designed to be fully integrated with all types of broadband satellite communications platforms, delivering continuously connected voice, video and data communications while the platform is in motion.
- **CNR-9000HDR:** As the most advanced, combat-proven VHF/FM COMSEC/ECCM radio in its class, the CNR-9000HDR offers high-speed data in addition to reliable voice communications. Its advanced capabilities include an extended communications range and powerful error correction codes along with automatic data rate and type adaptation. High-speed data transmission enables real-time video streaming, as well as tactical e-mail and file transfer.
- **CNR-710MB:** The CNR-710MB is an advanced multi-band (30 MHz to 512 MHz), frequency-hopping handheld radio – covering VHF and UHF tactical bands – to facilitate communications between ground, airborne and naval forces. It is well-suited for special forces, enabling ground-to-ground and ground-to-air communications directly from the palm of the hand.
- **VIC-500IP:** The VIC-500IP is our 3rd generation IP digital intercommunications system for armored vehicles. The system equips armored platforms with enhanced inter-crew communications to increase situational awareness and battlefield effectiveness. Fully interoperable with tactical radios (HF/VHF/UHF) and IP-based products, the VIC-500IP offers high levels of reliability and advanced functionality, and effectively handles the most demanding customer requirements and operational scenarios.
- **HU-500:** Specifically designed for use by armored vehicle personnel, the HU-500 helmet offers crew members an unparalleled combination of active noise reduction (ANR) and superior protection. Leveraging our field-proven expertise in platform modernization and communications systems, these tactical helmets enable effective radio and verbal communications between crew members for improved operational efficiency.





*ELSAT 2100 broadband low-profile SatCom on-the-move*

- **SatCom:** Elbit Systems' SatCom solutions feature on-the-move and on-the-pause terminals for military, government and HLS markets. The mature, battlefield-proven systems support a range of frequency bands in operation worldwide, including the MSR-1000 FlyAway terminals for deployed command personnel; the MSR-2000 line of low-profile on-the-move (OTM) systems supporting ground vehicles, maritime vessels and airborne platforms by providing broadband communications for the maneuvering units; and the MSR-3000 lightweight WGS-certified triple band (X, Ku and Ka) manpack terminals for the dismounted soldier.
- **Tadiran HF-6000:** A high-quality, modern HF radio family, the Tadiran HF-6000 provides fullband frequency hopping for reliable and secure communications with built-in Automatic Link Establishment (ALE) and secure voice and data.

## Communications - Data Links and Search and Rescue

Our advanced wireless communications systems for the modern battlefield include real-time digital data link systems for all types of manned and unmanned platforms, guided weapons and LEO satellites, groundbreaking battlespace video dissemination systems, and cutting edge Search and Rescue (SAR) system for combat and non-combat applications.

## HIGHLIGHT

- *Elbit Systems awarded a contract to supply Advanced Mobile Tactical Software Defined Radio systems to a Western European country*

# HOMELAND SECURITY

With an effective arsenal of advantages to counter internal and external threats, Elbit Systems' leadership in the field of homeland security emanates from a clear understanding of potential scenarios and their containment.



**LORROS™** MK-II Long-Range Reconnaissance and Observation Network System – for 24/7 border control.



# ADVANTAGES

to counter internal and external

# THREATS

International terrorism, illegal cross-border immigration, drug trafficking and inner city crime have increased the need for secure borders as well as robust urban monitoring, surveillance and control systems. In addition, the impacts of natural disasters are growing in magnitude. Local and national law enforcement agencies and first responders require expert solutions for national and public security, as well as for advanced emergency response command, control, communications, computers and intelligence (C4I) systems.

Our market-leading solutions meet the challenges of a range of homeland security (HLS) issues facing both local and national HLS command and control centers. We offer a multi-dimensional approach to securing the public with enhanced situational monitoring, awareness and analysis, as well as high-level management of the entire security process.

## **A Holistic, Modular Concept**

The complexities inherent in securing modern day cities are multi-faceted. The situation is even more challenging in the aftermath of a disaster, or when the city is host to mega sporting or cultural events. We provide a one-stop-shop for the full scope of our customers' HLS needs. All of our major subsystems and solutions are designed and developed in-house. Our extensive knowledge has been acquired through years of research and the delivery of quality end-to-end solutions for a wide range of defense and para-government customers. In addition, we have a globally recognized reputation as a Lead Systems Integrator (LSI) for complex and multi-disciplinary projects involving a range of elements and interfaces to external systems and databases.

## **Advanced Border Protection**

Our advanced border protection solutions facilitate continuous and superior coverage of terrestrial borders, air-space and jurisdictional waters. The solutions incorporate a cutting-edge C4ISR system that creates synergies between sensor arrays, ground and mobile forces, aerial assets and Big Data analytics. As a force multiplier, our cutting-edge decision - support tools and technologies deliver the operational intelligence to counter cross border threats in real-time. Our fully operational and field-proven solutions were developed with the expertise gained by protecting some of the most complex cross-border threats around the world.

Our HLS solutions feature a future-proof, modular and open architecture that enhances the user's ability to prepare, identify, manage and prevent incidents, as well as to react appropriately both in day-to-day activities and in times of crisis. Our approach uses recognized standards and protocols to ensure a highly flexible data structure and configurable security processes that enable the complete customization of security solutions. Our flexible technology-based building blocks can either be utilized as an end-to-end solution, or integrated with a customer's legacy system or other third-party components. By providing an integrated solution which incorporates unique capabilities and technologies, such as smart computer-aided dispatch (CAD), unattended ground sensors (UGS) and advanced electro-optics, we offer a cost-effective and low-maintenance approach that provides a tailored, practical and effective solution for each customer.





*Integrated Surveillance System.*



*Border anti-intrusion electronic fence with remote alert and response capabilities.*

## Command and Control Public Security Solutions

Our HLS solutions are based on a strong legacy of cutting-edge C<sup>2</sup>I systems. Designed for complex and dynamic situations, they are fully operational and used by governments, public and civil authorities, and defense forces world-wide. As such, they cover all levels of command and control centers: strategic (national HQ), operational (local) and tactical (mobile) operations.

Our HLS Public Security portfolio is comprised of four primary solutions:

**Crisis Management** – Designed to support decision-makers and emergency operation centers, the solution offers tools and applications for CAD, emergency situational awareness, preparedness management, and emergency resources.

**Law Enforcement and First Responders** – From the call center to the security of mega events, the solution supports the entire law enforcement process. Using advanced incident management, smart CAD, and analysis tools, the system facilitates police investigation, intelligence and case management.

**Safe City** – For efficient management of routine and critical situations, Safe City continuously maintains city control and civil safety. With its comprehensive security approach, the solution supports situational awareness and understanding through a common operational picture (COP) shared by central headquarters, rescue forces and command posts.

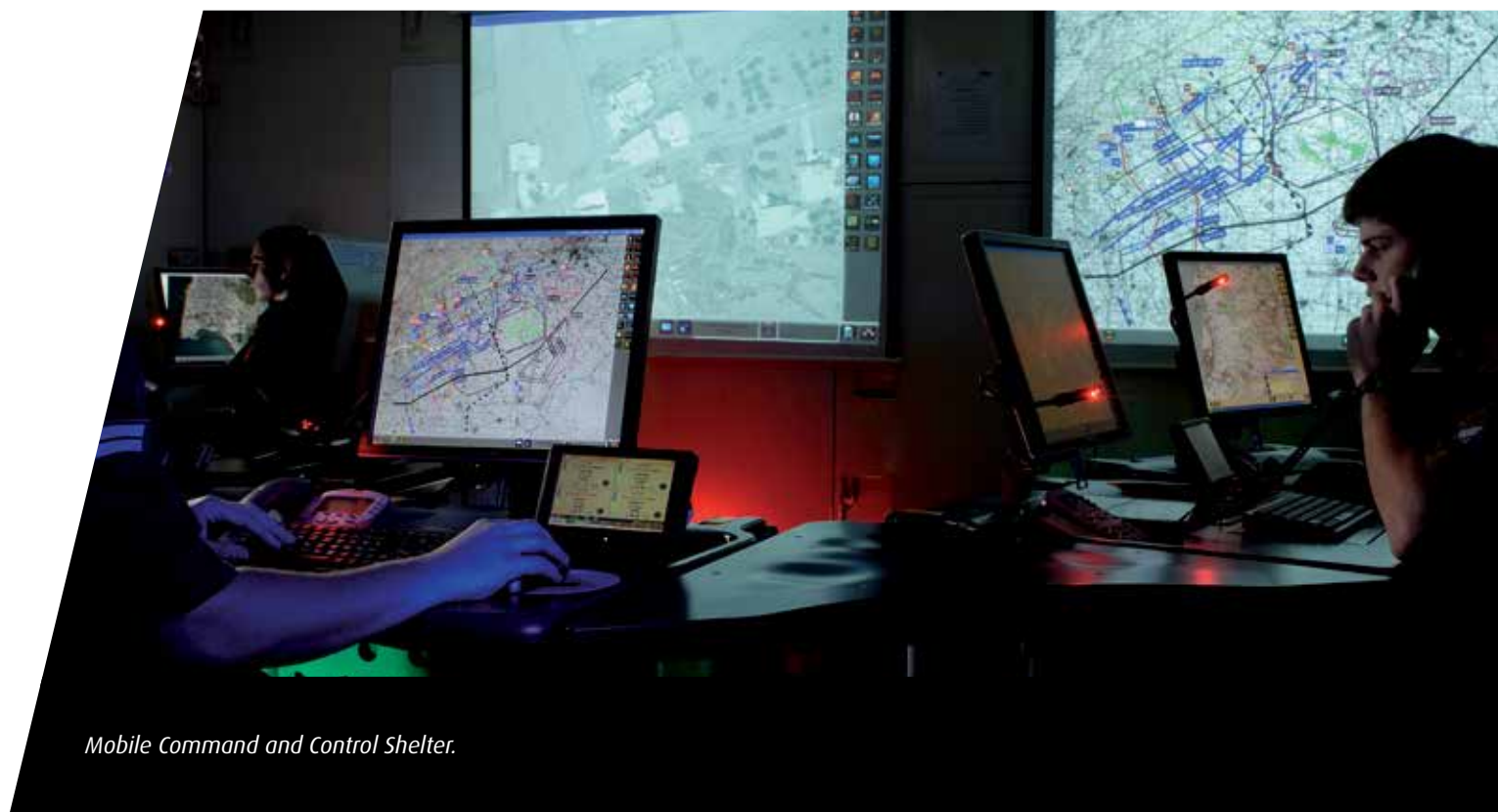
**Special Events** – The C<sup>2</sup> solution incorporates tools to design, prepare, simulate and manage public events of any scale. The system's flexibility enables seamless integration with auxiliary forces and personnel, and can easily accommodate large numbers of additional sensors. Integration with Elbit Systems' Training Simulator further enhances the preparedness of the forces and agencies involved in the management of public events.

## Border Protection Solutions

Our Advanced Broadband Services for First Responders solution is an advanced interoperable communications solution for mobile first responders, federal safety agencies, as well as state and local public safety authorities. It enables any-to-any secure, interoperable, multimedia services with seamless connectivity between various commercial broadband cellular networks. It includes a Land Mobile Radio (LMR) while maintaining the existing Long Term Evolution (LTE) infrastructure.

## Critical Infrastructure Security

Based on our cutting-edge technology and operationally-proven equipment and systems, we design, produce and maintain Critical Infrastructure Security (CIS) solutions, which are specifically tailored to meet customer needs and requirements. Our CIS solutions are fully operational and used by public and civil authorities, governments and defense forces worldwide.



*Mobile Command and Control Shelter.*

Our CIS solutions establish a perimeter security infrastructure, including smart-fences, hydraulic gates, barriers and a variety of sensor and monitoring assets. Each of these elements is integrated and controlled by a dedicated security management C<sup>2</sup> system, providing the critical facility with continuous monitoring, processing and control capabilities.

It enables any-to-any secure, interoperable, multimedia services with seamless connectivity between various commercial broadband cellular networks. It includes a Land Mobile Radio (LMR) while maintaining the existing Long Term Evolution (LTE) infrastructure.

## Mobile Command and Control Shelters

Our portfolio of command and control shelters include various configurations of portable, highly-advanced C<sup>4</sup>I facilities that can be quickly erected and then immediately function as on-site command headquarters. Among our facilities is an expandable mobile shelter, which is designed to accommodate larger command teams. With integrated hardware, software and communications, the facility offers full connectivity to all operational command units, bringing effective coordination to the heart of the crisis.

## WideBridge™

As a mission-critical secure broadband service for First Responders, WideBridge™ leverages the use of cellular

LTE networks to ensure public safety. The solution utilizes secure multimedia services including Push-to-Talk (PTT), Push-to-View (PTV), voice and video conferencing, video streaming from agents and video sensors in the network, map-activated multimedia services, situational awareness information dissemination (command and control), P25 interoperability, centralized remote user device management (MDM) and a revolutionary off-network "Direct Mode" broadband connectivity.

## Wide Area Persistent Surveillance

This wide area airborne persistent video surveillance system, continuously monitors, records and analyzes large area footprints, intercepts events and maintains multiple regions of interest (ROI) under constant surveillance with high spatial resolution. Multiple, simultaneous and independent users on the ground can access both real-time and back-in-time (stored) video events retrieved from the airborne platform. Comprehensive video processing and analytics capabilities such as Video Motion Detection (VMD) and Virtual Perimeter (safe zones) with alert mechanisms are fully supported by the system. For panoramic ground surveillance our GroundEye™ can be installed on high masts, towers or as a mobile configuration, providing operators with information and tools that were previously unavailable or difficult to obtain.



**Incident Command Team Training System (HLS-ICTTS)**



**SkEye WAPS™** is a high-resolution Wide Area Persistent Surveillance Solution

## Special Operations Police C<sup>4</sup>I Solution

The Special Operations Police C<sup>4</sup>I Solution is an integrated law enforcement system that enables full situational awareness across all police echelons. The solution's elements are all developed in-house and include advanced C<sup>2</sup> applications, personal network radios, tactical computers, tracking devices, planning displays and connectivity to sensors. The components can be tailored to the needs of individual law enforcement units. Our solution is based on an open architecture baseline and utilizes standard interfaces that allow seamless upgrades in the future.

## Unattended Ground Sensors (UGS)

TREASURES™ Tactical Reconnaissance and Surveillance Enhanced System is a comprehensive system of UGS that enables detection, tracking and identification of human and vehicular targets. Using advanced algorithms and

unique communications protocols, the system offers a high probability of detection (PD) and low false alarm rates. Our other UGS for border control and perimeter protection include Small All-Terrain Networked Detectors (SAND), which is designed for real-time target tracking using an array of seismic UGS, and TALOS™ Unattended Ground Radar, which is designed for continuous operation using solar energy. Our UGS systems easily integrate with existing UGS and are compatible with a range of C<sup>4</sup>I systems. Our experience with sensor integration ranges from tactical hand-held sensors such as designators and illuminators, to operational and strategic sensors such as EO, Radar, COMINT, EW, SIGINT and UAS. All relevant sensor data is processed and correlated to produce a coherent, up-to-date common tactical picture.

## Electro-Optic Sensors

Our HLS solutions include a high-end field-proven family of electro-optic systems. Our extensive electro-optics portfolio enhances surveillance capabilities and meets a wide range of requirements.



**MID – Miniature Imaging Detector**



**MTR – Miniature Tactical Radar**



**OCEAN – Seismic Acoustic Multi-Detector**





**FOXTRACK™** – a portable Ground Surveillance Radar System that is a lightweight, compact, man-portable radar carried by two operators, soldiers, special operations forces or security personnel.

## Ground Radars

We provide an array of specialized Ground Surveillance Radar (GSR) systems that can be integrated with ISR ground solutions. Foxtrack™ is a lightweight, compact, man-portable radar that can be installed on a vehicle mast, or as a tripod-mounted configuration. Our FPR-10 Radar provides long-range, accurate, high-resolution detection of vehicles and personnel behind foliage. For an unattended configuration, our TALOS and MTR Radar solutions can be utilized.

## Training and Simulation

Our simulation and training solutions realistically simulate complex emergency scenarios where multiple security and rescue teams must seamlessly coordinate their life-saving operations. These solutions provide comprehensive training for command, control, communications, crisis management and coordination, both in virtual arenas and in live training environments. The systems simulate a variety of interactive HLS events including terrorism, accidents, natural disasters, dispersion of hazardous materials, attacks on strategic infrastructure and security for large-scale sporting and other events. Our simulation capability is seamlessly integrated into our comprehensive HLS solutions.

## Family of Intelligence and EW Systems for Cellular Communications

Whether used standalone or as part of our Wise Intelligence Technology (WIT™) Comprehensive Intelligence System, this family of advanced intelligence and EW solutions delivers

a variety of cutting-edge capabilities, including: effective scanning of areas of interest; monitoring, locating and identifying potential threats; mapping targets and creating a complete situational picture; interception of target devices; and selective jamming and manipulation of cellular communications. Designed for military special forces, law enforcement and intelligence units, these sophisticated systems support a range of tactical operations. These operations include locating and disrupting terrorist activities, detecting and dismantling illegal drug activities, assisting in hostage situations, neutralizing IEDs, enhancing search and rescue missions, and controlling access for strategic facilities such as embassies and prisons.

## SPID – Spark Passive IR Detection

SPID is a passive, IR-based (infrared), electro-optical threat detection system for the protection of national borders, high-value infrastructure, forward operating bases and rapid deployment forces. Incorporating the latest IR technologies, SPID enables ultra-fast, high-precision, day and night detection of anti-tank guided missiles and mortar launches.

## WIT™

As a comprehensive end-to-end tool for intelligence organizations, our Wise Intelligence Technology (WIT) solution addresses every stage of the intelligence process, from planning and direction, to collection, processing, analysis and evaluation, and ending with dissemination and re-evaluation. WIT utilizes market leading technologies and is one of the few solutions to be field-proven, fully operational, and customizable for intelligence organizations.



**Cyber Trainer** Live Training for Cyber-Security Professionals.

## Cyber

Leveraging extensive experience with national-level defense organizations worldwide, our solutions empower enterprises, governments and service providers with a comprehensive cyber-defense system.

Powered by machine learning, Big-Data and behavioral analytics, our cyber-security products maximize protection against today's signature-less threats and arms organizations for tomorrow's new dimension of attack.

## Unmanned Ground Vehicles (UGV)

Our UGVs fulfill a wide range of HLS roles including anti-terror warfare, rescue efforts and reconnaissance missions. Included in our suite of field-proven UGVs are: the Guardium UGV Mark I, a semi-autonomous unmanned ground system that revolutionizes the effectiveness and utility of perimeter security; the Guardium UGV Mark II, with enhanced combat capabilities; the fully-autonomous Guardium Unmanned Ground Combat Vehicle (UGCV) Mark III for complex missions; and the AvantGuard™ UGCV for added ground maneuverability in harsh terrain. In addition, VIPeR™ – the Versatile, Intelligent, Portable elbit Robot – is a family of robots capable of supporting a wide range of missions.





*Hermes™ 450 – multi-role, high-performance tactical UAS.*

## Unmanned Aircraft Systems (UAS)

Our internationally-recognized UAS meet many of the complex challenges previously performed solely by manned aircraft. Utilizing in-house components and sub-systems, we are a leading source of turnkey unmanned solutions, high-performance air vehicles, advanced ground control stations, sophisticated payloads and trainers, as well as maintenance and support for all tactical and operative echelons.

The Hermes™ family of UAS provides expeditionary, long-endurance and cost-effective solutions for close and long-range tactical missions. The latest generation Hermes 900 Medium Altitude Long Endurance (MALE) UAS is effective within a broad range of air force, navy, army, and para-government applications. The covert Skylark™ man-portable and close-range tactical UAS is electrically propelled with a very low logistical footprint.



*MICOM – Long-Range Communications Systems.*

## HIGHLIGHTS

- *Elbit Systems presents Groundeye™ - A new revolutionary line of advanced EO ground surveillance systems for wide-area focused and persistent intelligence gathering*
- *Elbit Systems to supply Uruguay with a "Safe District" Project*



# CYBER-SECURITY

Our solutions empower enterprises to detect advanced threats in seconds, protect critical infrastructure, automate security operations center (SOC) workflows and train cyber security staff

***SOC 3D** – Automates your security operation center and maximize visibility of threats.*



# CYBER SECURITY SOLUTIONS

For large enterprises, governments, military and critical infrastructures

Cyber-security incidents are becoming more prevalent and increasingly complex to manage. These sophisticated attacks require organizations to effectively handle information overload across a range of different systems and teams to protect a wide array of assets. Organizations are required to respond quickly and effectively to the most severe threats in order to prevent the potentially serious reputational, operational, legal and regulatory consequences of these attacks.

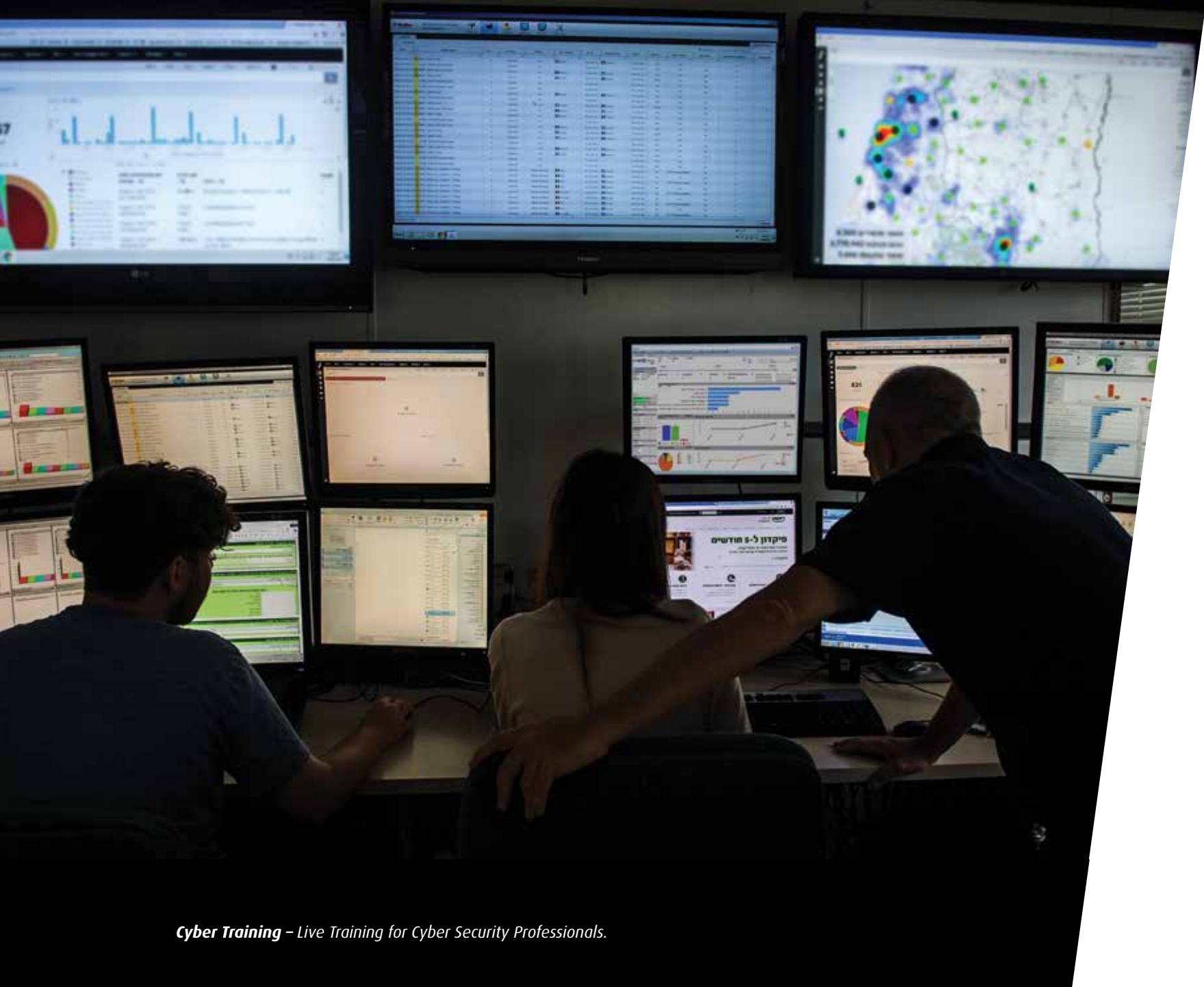
Cyber-assaults are capable of disabling power grids, telecommunications networks, water supplies, financial systems, databases, flight controls and other critical infrastructure and technologies.

Leveraging our vast experience with national-level defense and security organizations worldwide, we have developed and delivered cyber-security solutions and technologies that enable our customers to prevail in the virtual battlefield.

Our proactive cyber-defense approach, supported by our innovative technology, provides organizations with unprecedented cyber-defense capabilities.

Our battle-hardened cyber-security solutions detect, analyze and respond to the most advanced, complex and targeted threats, created to protect the most high-risk organizations in the world.





*Cyber Training – Live Training for Cyber Security Professionals.*

## Lawful Interception Solutions

Provides end-to-end solutions for addressing the entire intelligence cycle, including collection, processing, analysis and visualization - providing law enforcement agencies (LEA's), intelligence organizations and signal intelligence (SIGINT) agencies with full spectrum intelligence capabilities.

## Endpoint Detection and Response (EDR)

Empowers security teams to detect targeted and unknown threats, perform forensics, and proactively hunt for malware, by providing a unique hybrid detection engine that combines machine learning, graph-based malware analysis and behavioral analytics over big-data.

Signature and IOC-based detection only is not enough. Cyberbit EDR provides a new approach for detecting and

responding to advanced threats, based on a hybrid detection engine, which combines behavioral analysis with machine learning algorithms to identify abnormal activity.

This unique hybrid approach is proven to detect a broader range of malicious activities, including threats that have never before been encountered, and minimizes false positives. Using a kernel-level agent and big data allows also for active hunting and full forensics capabilities – all in one product.

Best detection, deployed in the world's most sensitive networks, secure and reliable product.

## SCADASHield

Uses deep packet inspection to discover and visualize your entire OT and IT network, analyze your traffic and flag continuity, security and configuration risks within seconds.



SCADASHield discovers your entire OT network and exposes continuity and security risks in real time for both IP and serial assets. It provides network visualization; identifies changes and malicious activity and tracks of unauthorized devices, communications and actions.

SCADASHield mitigates equipment and protocol vulnerabilities, provides forensic investigations and analyzes root cause, with customizable dashboards and reports compliance with industry ICS network standards.

## SOC 3D

Automating your security operations center and maximizing visibility of threats, SOC 3D is an intelligence-driven security orchestration solution that complements your SIEM to accelerate decision making, manage incident response, increase threat visibility and maximize your SOC team's value.

SOC 3D provides a single pane of glass for orchestrating the entire cyber campaign with centralized visibility, automatic prioritization, process automation, decision support mechanisms, automatic auditing and documentation and automated response, addressing the mission critical SOC operational challenges.

## Cyberbit Range

The Cyberbit Range platform powers world leading cyber-security training and simulation centers. It dramatically improves security team performance, by providing a hyper-realistic virtual training environment, advanced training tools and simulated attack scenarios.

The platform includes dynamic range modeling that is highly customizable, so trainees can practice in real-life settings. Companies can replicate their own network setup, use their actual security tools and simulate their typical network traffic so trainees can receive the most effective and realistic training available.

Additional new features include virtual and physical SCADA training, cross-functional executive training, and new attack scenarios (including ransomware variants).

Cyberbit Range Powering the world's leading cyber-security training and simulation centers.

## Sophisticated Cyber-RF Solutions and Professional Services

Sigmabit is a wholly-owned subsidiary of Elbit Systems EW and Sigint - Elisra (Elisra), relying on Elisra's advanced RF capabilities and specialize in the Cyber domain, providing innovative Cyber-RF intelligence interception and surgical Electronic Attack (EA), all fully in-house developed by Sigmabit's Cyber-RF specialists and enhanced by Elisra's powerful EW algorithms.

**SigNet™** is our Cyber-RF intelligence system tailored to address the WiFi medium challenges in various operational scenarios and different configurations. Dominating the WiFi medium with cutting-edge Cyber-RF techniques, the system operates in active and fully passive modes, providing access, inspection and manipulation of encrypted WiFi communications, supporting all common protocols – including WPA2, WPA, WPS and WEP. Designed for military and HLS forces, the system operates either as standalone or as an integrated add-on with existing intelligence interception solutions. The various RF interception kits allow uniquely wide range of operational scenarios. Smart, low profile, soft-kill capability designed to influence only the target and avoid quick detection is provided under demand.

## HIGHLIGHTS

- *CYBERBIT, Elbit Systems' subsidiary, awarded contracts to supply intelligence and cyber systems to a customer in Asia-Pacific*
- *CYBERBIT, awarded contract to supply an intelligence and cyber system to a customer in Africa*
- *CYBERBIT, to provide training and simulation platform to the new cyber-security training range of Maryland*
- *CYBERBIT selected by Samsung SDS to provide advanced cyber security solutions*

# NAVAL SYSTEMS

Bringing the benefits of net-centric interoperability to the entire naval fleet, Elbit Systems empowers naval commanders and crews with secure, reliable and continuous access to the information they need to interact with air and land forces.



*Seagull™ – Highly Autonomous Unmanned Surface Vessel (USV) System*



# MARITIME DOMINANCE & OPERATIONAL INTEROPERABILITY

for the entire naval fleet

## **Seagull™ – Highly Autonomous Unmanned Surface Vessel (USV) System**

The Seagull Unmanned Surface Vessel (USV) systems have market leading mine counter measures (MCM) capabilities. This USV facilitates end-to-end mine hunting operations, including detection, classification, location, identification and neutralization of bottom, moored and drifting sea mines while taking the sailor out of the mine field. The Anti-Submarine Warfare (ASW) capability provides naval forces with a significant tactical advantage by effectively deterring and threatening enemy submarines using an available asset with significantly lower risk. Featuring switchable, modular mission payload suites, Seagull can perform ASW and MCM, electronic warfare (EW), maritime security (MS), hydrography and other missions using the same vessels, mission control system and data links.

Drawing on decades of our unmanned systems experience and leadership, Seagull offers navies a true force multiplier. Seagull delivers enhanced performance to naval operations, reducing risk to human life and dramatically cutting procurement and operating costs.

## **Skylark C - Shipborne mini-UAS designed for patrol boats and small vessel operations**

The Skylark C, an unmanned aircraft system (UAS) designed

for small vessel operations, is fully autonomous from launch to recovery, providing persistent surveillance with an EO/IR payload. Based on the battle proven Skylark I-LEX – with over 30 international customers and tens of thousands of operational sorties – the Skylark C transforms land-based operational capabilities into an organic maritime ISTAR asset. The Skylark C Point Water Recovery (PWR) feature enables fully automatic recovery on water and is the ultimate solution for Marine Corps, Special Forces and Patrol Boat operations.

## **Skylark 3 – Shipborne light UAS for patrol boats and small vessels passive and active EW suites**

Skylark 3 delivers organic airborne ISTAR capabilities to the division, brigade and battalion levels, Skylark 3 is a tactical mini-UAS optimized for both dismounted and vehicle-based operation. Based on the battle-proven Skylark I-LEX – with over 30 international customers and tens of thousands of operational sorties – Skylark 3 enables performance of ongoing covert operations, providing real-time intelligence during day and night. Its effective payload weight capabilities are industry-leading in its class. Skylark 3's high-resolution, gimballed and stabilized dual EO/IR payload facilitates a wide-range of applications including over-the-hill intelligence, force and convoy protection, strategic infrastructure protection, border patrol and security operations.





#### **Hermes 900 Maritime Patrol Unmanned Aircraft System (MPUAS)**

Hermes 900 leverages over three decades of experience in UAS and maritime C<sup>4</sup>I. Combining a reliable and highly-autonomous UAS, high-performance payloads and maritime C<sup>4</sup>I capabilities, it covers and monitors large areas in the maritime environment – without any requirement for pilots. For maritime patrol, the Hermes 900 configuration features maritime patrol radar (MPR), AIS, EO/IR and optional ELINT/COMINT. The Hermes 900 operates over both land and sea. The system can incorporate flexible cutting-edge multi-payload configurations employing standard and long-range EO/IR/Laser, SAR/GMTI and MPR, COMINT/DF, COMINT GSM, CoMMJAM, ELINT, EW, hyperspectral systems, large area scanning systems, wide area persistent surveillance and other payloads. The Hermes 900 features over-the-horizon, persistent multi-mission, multi-payload capabilities with a class-leading payload carrying capacity. With its 15m wingspan and 1,180 kg maximum takeoff weight, the Hermes 900 is a modern and proven multi-role MALE UAS. It is capable of performing missions for maritime patrol, support for anti-surface warfare (ASuW), area dominance, and persistent ISTAR. The Hermes 900 has already been delivered to various customers including the Israel Defense Forces (IDF) and several other customers worldwide. The Hermes 900 mission control system incorporates a naval C<sup>4</sup>I system to support maritime patrol mission planning and Execution In addition to maritime patrol missions, the Hermes 900 can also perform ground support missions and

offers the capability for integrated multi-platform, multi-sensor operation. With its modular payload capability, the Hermes 900 can be rapidly re-configured in the field for versatile missions, offering users enhanced flexibility and cost-effectiveness.

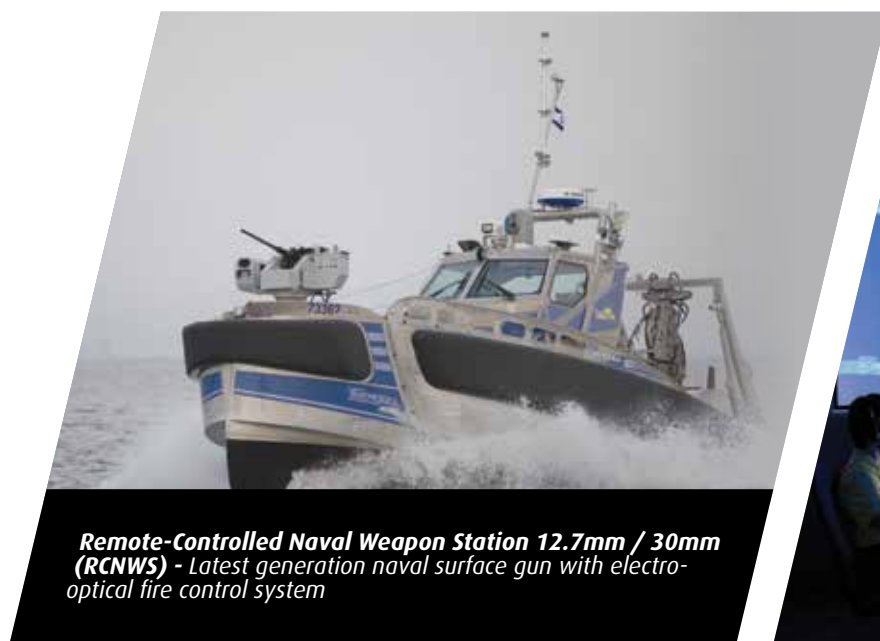
#### **Hermes Ground Control System**

Mission management is performed in a highly autonomous manner via the Hermes Ground Control System (GCS), which is designed to control combined Hermes 900 and Hermes 450 missions. The Hermes 900 can perform two concurrent missions from the same GCS using two ground data terminals (GDT).

#### **ENTCS – Naval Combat Management System**

From coastal patrol boats to offshore vessels and Corvettes, the ENTCS provides a cost-effective combat management system (CMS) and core for combat system integration and optimization of all ship operations, thus supporting all facets of surface ship-based naval warfare and maritime patrol.

The ENTCS CMS is based on three decades of naval C<sup>2</sup> experience, including pioneering C<sup>4</sup>I for the Israeli Navy. The system incorporates advanced highly-automatic tactical picture-building algorithms and SW to provide naval commanders with a processed, integrated and comprehensive common tactical picture at the ship and force levels.



**Remote-Controlled Naval Weapon Station 12.7mm / 30mm (RCNWS)** - Latest generation naval surface gun with electro-optical fire control system



**Coastal ENTCS – Maritime Surveillance Control Center**  
Central Command & Control for Critical Maritime Surveillance.

With robust networking capabilities, the ENTCS also provides the key for the integration of naval ships and shore-based naval command centers.

#### **Coastal ENTCS – Maritime Surveillance Control Center**

The modern naval arena poses significant challenges to navies, coastguards and other government agencies aiming to protect national interests along the coasts, in territorial waters and across the country's exclusive economic zone (EEZ). Coastal ENTCS provides users with a centralized local, regional or national facility for compiling, presenting and supervising the maritime situation in the entire area of interest. Coastal ENTCS achieves this by integrating off-shore and shore-based sensors, patrol vessels, MPA and UAS – utilizing a robust and flexible communications setup.

Coastal ENTCS applies a comprehensive naval C<sup>4</sup>I system as the heart of the maritime surveillance control center.

#### **Seaport Security and Critical Infrastructure Protection**

Elbit Systems has leveraged decades of experience, expert methodologies and technological superiority in the field of security electro-optics and software to produce the Elbit Systems Critical Infrastructure Protection (CIP) solution. The CIP creates a tailored security net around the seaport to provide security and HLS authorities with comprehensive control over the site. The CIP has been successfully implemented in dozens of various large, complex projects worldwide, including seaport, marine and coastal surveillance (Europe, Asia-Pacific and Israel); railway stations, tracks, bridges and

tunnel security (Israel); airport security (Europe, Africa and Israel); border security (Europe, Asia-Pacific) and more.

At the heart of this solution, we developed the ROTUNDUS command and control system for the precise mission of securing critical sites. By integrating all subsystems into a single unified situational awareness picture, ROTUNDUS provides operational management with a high-level consolidated view of the site. Other subsystems designed in-house and by various manufacturers include:

- Multi-layered perimeter intruder detection system (PIDS)
- External and perimeter surveillance cameras
- Gate access control system
- Building terminals security and surveillance
- Pedestrian and mobile security forces
- IT security
- Communications and power infrastructure

#### **SupervisIR™ and Long View CR/SW**

SupervisIR™ is a tactical, versatile IR persistent wide area ISTAR system for coastal and border applications. The system provides real-time IR panoramic situational awareness including simultaneous surveillance and automatic tracking of all maritime activity on the scene.





**Naval Combat Management Systems** provide C<sup>2</sup>, data links, sensors and control systems for ships. The systems feature automatic picture building, comprehensive tactical support, threat evaluation and weapon allocation algorithms.





**TIMNEX II** – an advanced ESM/ELINT system for submarines, installed in Dolphin Class submarines.



**DESEAVR** – Decoy Control and Launching System – responds simultaneously to multiple threats by delivering various payloads at accurate time intervals, according to specified anti-missile doctrines and guidelines.

SupervisIR, based on a breakthrough patent-pending IR technology, enables the user to visually monitor a large area and gather critical decision-making information. It fully supports activity-based intelligence with forensic capabilities. SupervisIR can be integrated with any existing system, including the Long View – SW, providing a complete solution for coastal surveillance and harbor protection requirements.

#### **Long View CR/SW**

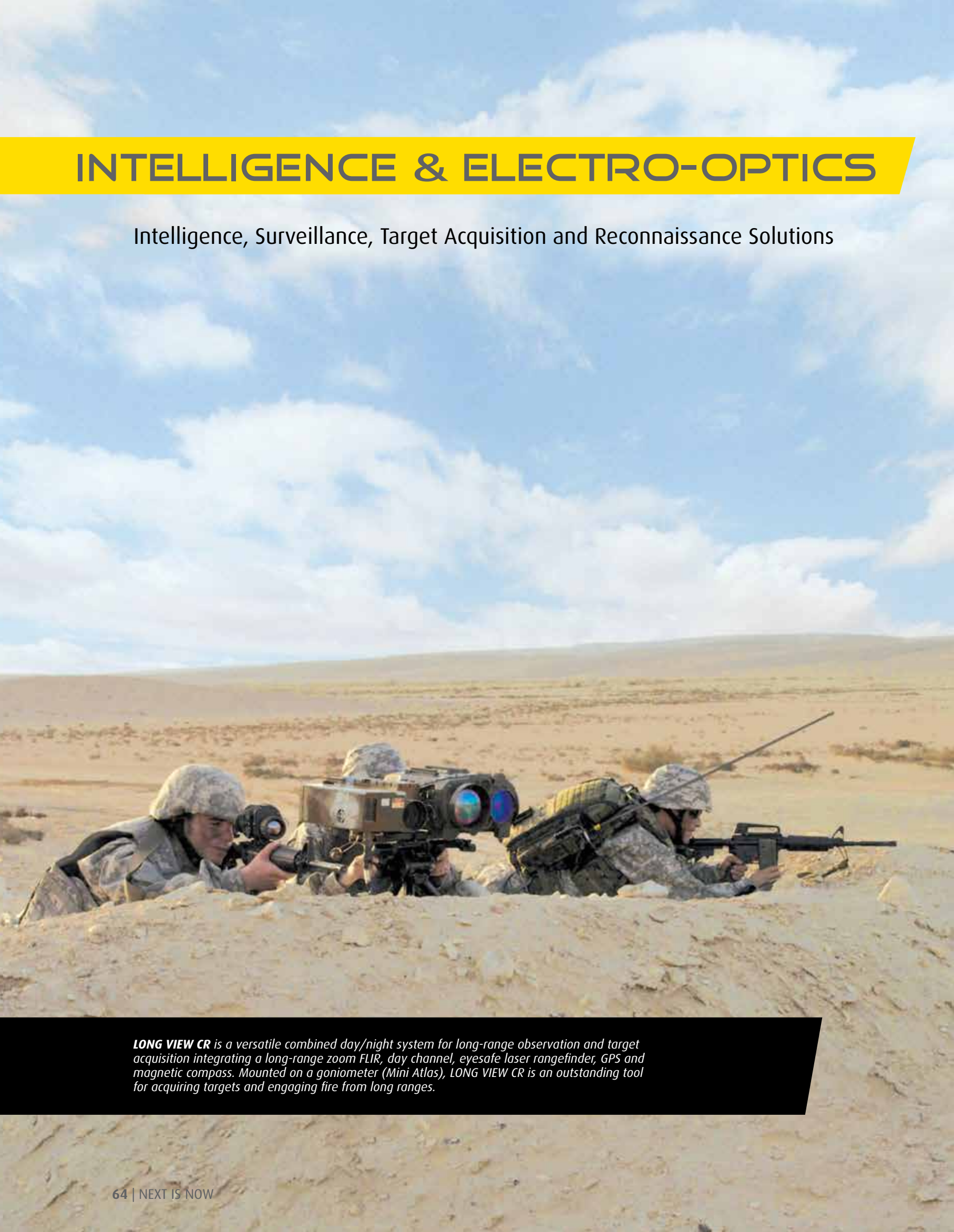
Long View CR/SW is a versatile combined day/night system for long-range observation and target acquisition. Integrating long-range zoom thermal, day and short wave infrared (SWIR) channels, eyesafe laser rangefinder, GPS and magnetic compass, the Long View CR is mounted on a tripod or P&T, and is an outstanding tool for acquiring targets and engaging fire from long ranges.

## HIGHLIGHTS

- *Elbit Systems unveiled the Seagull™ - new Multi-Mission Unmanned Surface Vehicle system for maritime warfare missions*
- *Elbit Systems' Seagull successfully completes torpedo launch trials*

# INTELLIGENCE & ELECTRO-OPTICS

Intelligence, Surveillance, Target Acquisition and Reconnaissance Solutions



**LONG VIEW CR** is a versatile combined day/night system for long-range observation and target acquisition integrating a long-range zoom FLIR, day channel, eyesafe laser rangefinder, GPS and magnetic compass. Mounted on a goniometer (Mini Atlas), LONG VIEW CR is an outstanding tool for acquiring targets and engaging fire from long ranges.



# THE FUTURE BELONGS TO those with the vision to see it

In today's ever-changing world, marked by rapidly evolving new and innovative threats on both the battlefield and the homeland, the name of the game is intelligence. With the vision to anticipate these emerging challenges – and the insight to respond with cutting-edge solutions – Elbit Systems sets the standard for excellence in Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR). Our ISTAR solutions synergize Elbit Systems' industry-leading position in the global electro-optic and unmanned systems markets with advanced communications and signal intelligence capabilities – supported by in-house developed command and control.

## **A World Leader in Electro-Optics**

### **If it's out there, you'll see it**

Elbit Systems Electro-optics - Elop (Elop), part of the ISTAR division, is an industry leader in all aspects of electro-optics (EO). Leveraging our extensive defense and security experience worldwide, we provide highly advanced EO solutions for space, airborne, ground and maritime applications that give our customers an advantage facing

the evolving challenges on the battlefield and in the homeland.

Our systems range from direct infrared countermeasure (DIRCM) systems for the protection of aircraft to payloads for space, airborne, naval and land-based missions, to head-up displays (HUD) and advanced target acquisition systems (TAS), as well as laser, thermal imaging (TI) systems, HLS solutions, ground integrated sights and I2 night vision systems for intelligence, surveillance and reconnaissance (ISR). This portfolio, combined with our heritage of decades of operational experience enable us to deliver industry leading solutions for the intelligence community, land warriors, close air support, all types of land platforms, as well as air defense and security systems.

We are one of only a handful of companies worldwide that consolidate the key skills and facilities in all major areas related to our EO systems, in-house, and under one roof. These capabilities range from research, development, engineering and manufacturing of sub-assemblies and sensors, to production and integration of multidisciplinary systems, to highly dedicated and specialized customer support and services.





**Long-Range Oblique Photography (LOROP)** – Air IMINT systems provide real-time reconnaissance, electro-optical coverage 24/7 over very wide areas from long standoff and medium to low vertical distances.



**Hyperspectral Imaging System** – Chariots of Fire is a lightweight, low-power consumption, MASINT system, fully autonomous, containing a primary HIS and a secondary bore-sighted high-resolution panchromatic camera, capable of stereoscopic imaging.

## Airborne Electro-Optics and Laser Systems

### Space Reconnaissance

Elbit Systems is a globally recognized leader in the development and production of complex space-borne electro-optic observation systems. We invest heavily in advanced research, concentrating on space telescopes, space cameras in different wavelengths and hyper-spectral systems, for military, government and civilian space applications. We have generated and placed fully operational, advanced panchromatic and multi-spectral cameras for high-resolution remote sensing in space. Currently in the third decade of innovative space activity, our space systems provide the highest resolution in the most compact, cost-effective packages available today.

### Electro-Optic Payloads

Our ISTAR solutions provide optimal observation, surveillance, tracking and targeting capabilities in harsh conditions. Our stabilized EO payloads are available for rotary and fixed-wing aircraft, unmanned aircraft system (UAS), combat vehicles, naval platforms and ground applications. The payloads feature a wide range of sensors, including third generation FLIRs, day channels with zoom, advanced SWIR sensors, eyesafe laser range-finders, laser target designators, and laser pointers in a stabilized turret. Together, they facilitate outstanding target detection, recognition and identification of tactical targets, under day, night and adverse weather conditions, at very long ranges. A world leader in ISTAR and

cutting-edge EO systems, more than 500 of our payload solutions are in use around the globe.

Our main products include:

- **LOROP** (Long Range Oblique Photography) for strategic airborne intelligence gathering
- **CoMPASS™** family (15" Compact Multi-Purpose Advanced Stabilized Systems) for the full range of purposes and platforms
  - **Micro CoMPASS™**: 8" Micro Compact Multi-Purpose Advanced Stabilized System
  - **DCoMPASS**: the industry's first 15" EO system that is a fully Digital Compact Multi-Purpose Advanced Stabilized System
  - **Spectro XR**: a day/night, ultra long-range multi-spectral electro-optical ISTAR solution that provides 20" payload performance in a 15" payload.
  - **AMPS™ NG**: Advanced Multi-Sensor Payload System for strategic airborne intelligence gathering

All of our payloads have autonomous navigation capabilities, provided by the INS/GPS embedded in the camera. The pod also contains a system management and video processing unit, data link and data recorder.



**Multi Spectral Infrared Countermeasure (MUSIC™)** – family of DIRCM systems protects military and commercial aircraft of all sizes from surface-to-air IR missiles.



**mini-MUSIC™** – a compact, lightweight system, optimized for small and medium rotary and fixed wing.



#### **DIRCM – EO Countermeasure Systems**

From rotary-wing to fixed-wing, for military and civilian aircraft, the MUSIC family provides total DIRCM solutions. Our DIRCM solutions are designed to protect aircraft against heat-seeking ground-to-air missiles. These systems integrate advanced fiber laser technology together with a high frame rate thermal camera and a small, highly dynamic mirror turret. This cutting-edge combination delivers effective, reliable and affordable protection, under all operational conditions, and to all types of aircraft. The systems utilize an open-architecture design and can be seamlessly integrated on any type of aircraft. The latest additions to the DIRCM product line are mini-MUSIC, a compact lightweight system, optimized for small and medium rotary and fixed-wing aircraft, and J-MUSIC, designed for distributed installation on small to medium-size jets.

#### **Hyperspectral Imaging System (HIS)**

Among our main hyperspectral imaging products is Chariots of Fire, a lightweight, low-power consumption measurement and signature intelligence (MASINT) system. It is fully autonomous, containing a primary HIS and a secondary bore-sighted high-resolution panchromatic camera. Hyperspectral data is useful in a wide variety of applications relating to the classification or identification of properties or objects with high precision and resolution including materials and environmental hazards, geosciences, detection of human presence and other characteristics.

We are a leader in the hyperspectral remote sensing arena, providing turnkey solutions for hyperspectral remote sensing and data exploitation. We develop and operate a full range of VNIR-SWIR, hyperspectral airborne sensors, as well as applications for end-users, both in the commercial and defense markets.

These sensors include proven applications for areas such as environmental mapping (aquatic environments monitoring and pollution control), geology (mineral mapping and environmental impact on mining areas) and agriculture (precision farming, growth monitoring, yield prediction and soil classification).

#### **Head-Up Displays**

With over 40 years of experience, we are one of the world's leading suppliers of high-performance head-up displays (HUD). With over 5000 units fielded worldwide, our HUD systems are operational on more than 25 types of aircraft, including fighters, trainers and military transport applications. We have also customized HUD systems for the commercial aviation sector and business jets. In recent years, we were selected by several aircraft manufacturers, such as Lockheed Martin, Boeing, Dassault and Embraer, to supply HUDs for their most advanced platforms. Our HUDs are in use by leading Air Forces, such as USAF, the Israeli Air Force, Indian Air Force and many others. We have also specialized in HUD upgrade programs, allowing our customers the benefit of prolonged operational life, improved LCC and a viable solution to obsolescence issues.



*Elbit Systems is one of the world's largest producers and integrators of integrated gunner and commander sights for armored fighting vehicles and main battle tanks.*



**SupervisIR™**

## Land Electro-Optics and Thermal Imaging Systems

**LONG VIEW CR SW (LVCR/SW)** – is a versatile combined day, night and SWIR system for long-range observation and target acquisition. LVCR/SW integrates a long-range zoom IR, CCD and SWIR channels, eyesafe laser rangefinder, GPS and magnetic compass. Mounted on a goniometer (Mini Atlas), LVCR/SW is an outstanding tool for acquiring targets and engaging fire from long ranges.

The SWIR channel enables the receipt of a detailed image in adverse weather conditions such as fog, haze and smoke.

**SupervisIR™** – we have pioneered a new technology that enables wide area persistent surveillance in the thermal spectral range. It changes the paradigm of persistent surveillance from reactive to user initiated. The first product of its type, SupervisIR is a tactical, versatile, ground IR persistent wide area ISTAR system for land applications with a cost-effective system architecture.

Based on a breakthrough patent-pending IR technology, SupervisIR enables the user to visually monitor a large area and gather critical decision-making information. SupervisIR enables an end-to-end solution and the ability to make quick decisions. SupervisIR can be easily integrated with any external system, providing significant operational advantages, and optimizing overall efficiency for any mission.

SupervisIR's benefits include:

- Facilitates 24/7 wide area surveillance using passive IR technology at a refresh rate of less than 1 second
- Provides real-time automatic target detection and tracking capabilities
- Operates in diverse weather conditions
- Within the panoramic picture, the operator can select several areas of interest that can be viewed simultaneously
- Outputs can be controlled and viewed by multiple users
- Allows covert passive operation so it can be installed in populated areas
- Cannot be blocked by EW

**Image Fusion** – we offer a real-time digital image fusion of various spectral channels. The various channel images are merged into one image to enable display of the optimal image of the event for the operator.

**Android-based Products** – our Android operating system allows the end-user to enjoy a familiar Android user interface and to make adjustments in the product features after purchasing. The Android-based product family is open source and enables the addition of “off-the-shelf” and customized applications. The Android-based products include medium and long-range observation systems and are already being implemented in the Coral CR II and LVSW systems.





**CORAL-CR, Rattler, & Atlas** – Lightweight and accurate target acquisition and designation systems, including goniometer with internal gyro compass for accurate north finding.



**The CORAL 3-5 $\mu$ m family** of high-resolution hand-held personal thermal imaging cameras with an integral GPS receiver is lightweight, easy to operate and provides excellent picture quality.

### Integrated Sights for AFVs and MBTs

We are one of the world's largest producers and integrators of integrated gunner and commander sights for armored fighting vehicles (AFV), main battle tanks (MBT) and tactical vehicles. Over the last three decades, we have supplied thousands of systems and subsystems for new AFVs/MBTs and upgrade programs and we are a prime systems supplier for all Merkava tank gunner and commander sights. Our battle-proven solutions feature advanced image processing and rapid, accurate target acquisition. Our modular design combines direct view observation, TV channels, eyesafe laser rangefinders and a wide variety of night TI technologies with line-of-sight (LOS) stabilization.

### Target Acquisition and Designation Systems

A wide range of lightweight, man-portable and accurate target acquisition systems are available for application by artillery forward observers (FO), forward air controllers (FAC), and intelligence, reconnaissance and Special Forces. The ATRIS and ATLAS family of systems are integrated with eye-safe laser rangefinders that determine precise distances, as well as shaft encoders and Northing methods that provide the accurate angular measurements required to automatically calculate targets. With an embedded GPS receiver, this data accurately delivers precise grid coordinates resulting in an improved first-round first-hit probability and a reduction of collateral damage.

### Thermal Imaging Systems

For over forty years, we have produced and supplied thousands of thermal imaging systems to the most demanding military organizations and defense industries worldwide, employing the latest thermal imaging technologies. Our hand-held, lightweight thermal imaging systems are currently fielded in over 20 countries across the globe, including the Israel Defense Forces, the U.S. Marine Corps, the German Special Forces and the defense forces of several other NATO countries. The thermal imagers are a key component of any large-scale infantry modernization program.

Our products include Coral CR, an advanced hand-held thermal imaging camera with continuous optical zoom and target acquisition capabilities; Coral Z, a lightweight thermal imager equipped with or without continuous zoom; CORAL LS, a camera/sight with long-range 1.06  $\mu$ m "See-Spot" capability; Micro CORAL, which is designed for day/night medium range observation; and Mini CORAL, a lightweight uncooled thermal imager and target acquisition system designed for short-range observation.

### Weapon Sights

We specialize in the development and manufacturing of weapon sights designed for individual infantry soldiers. These advanced ruggedized sights contribute significantly to enhanced target acquisition and increased first-hit capability by providing the high-quality images needed to detect, recognize, and identify targets even from extreme ranges.



**PLDR III** – *Portable Lightweight Designator/Rangefinder for Laser-Guided Munitions.*

They enable soldiers to easily distinguish between false and actual targets in adverse conditions such as dust, smoke, total darkness, camouflage and clutter. We offer every major type of weapon sight – cooled, uncooled, I2 night vision and passive reflective – and are a one-stop shop for a comprehensive range of weapon sight needs.

Our products include the XACT nv, a micro-compact monocular/binocular 16mm night vision system; XACT th, a high-performance uncooled thermal weapon sight; and the MINI N/SEAS, a modular, head/helmet/weapon mountable and water-submersible night vision 18mm monocular.

#### **Lasers**

Precision in targeting threats is achieved by our cutting-edge laser systems, which have been tested and proven in

combat for more than three decades. We are at the forefront of laser technology, with thousands of systems supplied and in-service worldwide. Featuring small size, weight and power (SWaP) and enhanced by diode-pumped and flash lamp-pumped technologies, our advanced laser designators enable pilots to rapidly hone in on hostile targets. Solutions include: airborne, ground and maritime laser designators and rangefinders with eyesafe wavelength, laser radar (LADAR) and light detection and ranging (LIDAR) systems, including helicopter warning systems. Our highly acclaimed battle-proven laser systems have been successfully fielded by the Israel Defense Forces, the U.S. Marine Corps, the U.S. Navy, NATO armed forces and many others.



***XACT** – family of soldier E/O, comprised of Micro NVG's and Thermal Weapon Sights.*

## HIGHLIGHTS

- *Elbit Systems of Australia awarded a contract for the supply of thermal weapon sights*
- *Elbit Systems introduces: SupervisIR™, a ground-based, 24/7 infrared Wide Area Persistent Surveillance system*
- *Elbit Systems Launches SPECTRO™ XR - An Ultra Long-Range Multi Spectral Electro-Optic Payload System*
- *Elbit Systems awarded a contract to supply an Asia-Pacific Country with SPECTRO™ XR Advanced Electro-Optic Systems*



The background of the page is a high-contrast, black and white aerial photograph of a city, likely Tel Aviv, showing a dense urban layout with roads, buildings, and green spaces. In the top left corner, there is a circular inset that provides a magnified view of a specific industrial or port area within the city.

# ISR

Elbit Systems' focus is to enable customers to achieve and maintain information superiority and battlefield intelligence dominance by supplying a continuous flow of ISR information for all levels, from the tactical to the strategic, across land, sea, air and space.

*For space applications, Elbit Systems Electro-optics - Elop develops advanced panchromatic and multi-spectral cameras. Several of Elop's cameras are presently orbiting and operational in various space programs.*

# INFORMATION

superiority and battlefield intelligence

# DOMINANCE

## Information Superiority and Battlefield Intelligence Dominance

Our comprehensive C<sup>4</sup>ISR solutions for space, air, sea and ground applications extract maximum value from the vast amounts of structured and unstructured data. Our fully automated and modular intelligence solutions utilize smart engines to generate and disseminate a unified intelligence picture in real-time to both the military and HLS intelligence communities.

Our solutions cover the entire ISR spectrum, from tactical to strategic levels, including advanced day and night high-resolution sensors, to innovative exploitation and dissemination centers. Additionally, we offer integrative ISR centers for the entire operational cycle of satellite and airborne imagery, beginning with the initiation of the intelligence request, through the interpretation process and dissemination of intelligence aids and reports.

With the ability to interactively handle this data and complementary intelligence information, interpreters benefit from a fully detailed intelligence information overview, and gain enhanced force coordination and connectivity on all fronts.

Our solutions include:

- Integrated ISR management centers
- ISR platforms – UAS, USVs and ground ISR platforms
- Sensors – Visual Intelligence (VISINT) Sensors, Signal Intelligence (SIGINT) Sensors and management of Open Source Intelligence (OSINT)
- Exploitation systems
- Communications and network capabilities – air, sea and land
- High-level intelligence management IT systems

## Command and Control

Our integrated Operational C<sup>2</sup> Headquarters System, TORC<sup>2</sup>H™, is a force multiplier that communicates with all external C<sup>2</sup> applications and ISR centers. It generates situational

awareness to all disciplines in the land battle space and supports the HQ operational cycle by connecting commanders with operations, firing units, intelligence and logistics.

## ISTAR Management Center

Our Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) Management Center (IMC) is an advanced, multi-dimensional and configurable decision support set of tools, adaptable to all command levels, from national HQ to battlefield commanders. It assists in achieving intelligence dominance for the net-centric battlefield by providing decision makers with a real-time situation picture of the theater.

Our Mobile Arena Dominance ISTAR Center (MADIC) is a mobile C<sup>2</sup> and All Source Intelligence Center (ASIC) for improved operational performance. A generic infrastructure for mobile management, C<sup>2</sup>, exploitation and intelligence systems, MADIC provides a centralized and integrated management center for local forces, providing full interoperability with external forces.

## Integrated Intelligence Solutions

SYN-APPS is an ISTAR intelligence analysis tool that automatically integrates structured and unstructured data from a wide variety of sensors and formats. Input is collected from land, sea and airborne platforms, as well as SIGINT, HUMINT, OSINT and WebINT sources. SYN-APPS encompasses the essential elements for intelligence including data planning, collection, smart exploitation and analysis. The automated process utilizes advanced tools such as geo-spatial processing, machine learning, Big Data technologies, as well as semantic, BI and rule-based engines. Accurate and actionable data is then efficiently disseminated via reports, geo-location data, video, images, voice or other required formats, resulting in significant savings of time and resources. Robust and modular, SYN-APPS can be tailored to meet the customer's unique requirements using open architecture and systems.





- SYN-APPS for military intelligence – sophisticated analysis that can meet any military intelligence challenge
- SYN-Apps for HLS – key to control and counteract imminent HLS challenges that threaten national safety and security

## Electro-optics Sensors

**Spaceborne Reconnaissance Systems** – We specialize in advanced research on space telescopes and space cameras for military, government and civilian space applications, in different wavelengths. For three decades, we have been engaged in the development, manufacturing, and testing of advanced EO systems for a variety of space applications including:

- Research space telescopes
- Space cameras, including ERMS, EROS, Venus and Ofeq
- Hyperspectral systems

**Airborne Reconnaissance Systems** – Our high performance Image Intelligence (IMINT) ISR systems support information superiority and battlefield dominance by supplying a continuous real-time flow of ISR data from space and airborne platforms. These ISR systems provide end-to-end solutions for a wide range of strategic and tactical levels: from collection to sensor processing, through analysis, data processing and dissemination. Day and night, 24/7, and all in/near real-time, these ISR solutions deal successfully with time-critical and time-sensitive targets, rapidly closing the sensor-to-shooter loop.

The **Condor 2** is an EO/IR LOROP (Long Range Oblique Photography) system that covers wide areas in a short time span. Condor 2 provides simultaneous high-resolution visible and IR reconnaissance images at a long stand-off distance from the target. By enabling photography at higher

altitudes and longer stand-off distances, the system reduces the risk to the platform from ground threats such as anti-aircraft missiles.

**Land Reconnaissance Systems** – ISTAR achieves terrain dominance with a networked array of sensors in support of intelligence acquisition, processing, evaluation and targeting at all operational levels. The advanced array of EO sensors provide position and orientation data required for platform operation and target acquisition. The sensors provide early-warning, abnormal activity monitoring and incident management as well as comprehensive observation and reaction capabilities. The LORROS MK-II Long-Range Reconnaissance and Observation Network System – providing 24/7 border control.

**Observation and Surveillance Stabilized Payloads** – Our stabilized electro-optical payloads provide optimal observation, surveillance, tracking and targeting capabilities under even the toughest conditions. Optimized for fixed and rotary-wing aircraft, UAS, combat vehicles, naval platforms and ground applications, our payloads include up to seven sensors, MWIR FLIRs (3rd-generation), full HD day channels with zoom, spotters, eye-safe rangefinders or laser target designators and laser pointers in a stabilized turret. Our stabilized payloads include AMPS (Advanced Multi-Sensor Payload System) for airborne intelligence gathering, Spectro XR (a day/night, ultra long-range multi-spectral electro-optical ISTAR solution that provides 20” payload performance in a 15” payload), DCoMPASS™ (15” Compact Multi-Purpose Advanced Stabilized System) and Micro CoMPASS™ (8” Compact Multi-Purpose Advanced Stabilized System).



## Laser Systems

Bringing threats into sharper focus, our cutting-edge laser systems have been tested and proven in combat for more than three decades. We hold an international position at the forefront of laser technology, with thousands of systems supplied and in-service worldwide. Products include: airborne, ground and maritime laser designators and range-finders with eyesafe wavelength, laser radar (LADAR), and light detection and ranging (LIDAR) systems, including helicopter warning systems.

## Signal and ELINT Payloads

For airborne manned and unmanned platforms, we offer solutions that detect, identify and locate ground-based, airborne and shipboard emitters. Our solutions include Emerald AES-212V (ELINT), SkyFix (COMINT) and COMINT-DF/ELINT/COMJAM/ DFECM.

## SIGINT Systems

For airborne manned and unmanned platforms, we offer signal intelligence (SIGINT) solutions that detect, identify and locate ground-based, airborne and shipboard emitters. Our operational and field-proven solutions include the Emerald AES-212, a modular airborne ESM/ELINT family of systems for comprehensive and simultaneous multi-radar detection, direction and target position, and COMINT/DF HF-6 GHz systems for delivering a complete order of battle while overcoming the challenges of highly dense electromagnetic environments. These solutions effectively manage sophisticated communications systems along the entire frequency range. They are automatically adaptable and offer flexible COMJAM and ECM capabilities.

## Data Links

Our advanced, field-proven fourth generation data links for airborne platforms including UAS and micro/mini-UAS are based on generic modules that conform to all modern payload systems and support high-rate digital and analog data communications. The tactical video links download video and telemetry data from UAS directly to ground, airborne and naval forces. This comprehensive video network solution can be deployed in all airborne and ground platforms, and for all types of portable display units for mounted or dismounted troops. Ground forces also benefit from these all-digital, ruggedized transceiver solutions that can receive, display and disseminate video and data in real time.

## Sensor Exploitation Systems

**MIES** (Mobile ISTAR Exploitation System) is a mobile station for all types of sensor monitoring. MIES centralizes all necessary functions for imagery from sensors, payloads, analysis and production workflows. It receives, processes, manages and displays data in near real time and provides tools to simplify the interpretation process. MIES can be deployed in a single or multi-workstation.

**ICE** (Integrative Component-based Exploitation system solution) is a fully integrative multi-sensor exploitation system designed as an end-to-end solution for the entire operational cycle of satellite and airborne digital imagery. With the ability to incorporate this data and complementary intelligence information, interpreters benefit from a fully detailed intelligence information overview.

## IT Solutions

The Wise Intelligence Technology (WiT™) solution brings together the experience we have gained in the intelligence and IT fields into a comprehensive solution for intelligence organizations. It provides advanced tools for supporting every stage of the intelligence process.

## HIGHLIGHTS

- *Elbit Systems presents ISTAR DS A holistic ISTAR solution for dismounted troops*

# EW & SIGINT

Electromagnetic Spectrum Warfare Survivability Solutions:  
Situational Awareness, Self-Protection and Targeting for  
Superiority in the Modern Battlefield

**PAWS Family**, the Passive IR Missile Approach Warning Systems – highly effective and operationally deployed, staring IR-based missile approach warning systems.

# SPECIALIZED SYSTEMS

for EW, IR and communications, intelligence, and solutions  
for air, sea and land applications

**Elbit Systems EW and SIGINT – Elisra (Elisra)**, a world leader for over five decades, specializes in end-to-end, flexible, multi-function Electronic Warfare (EW) and Signal Intelligence (SIGINT) systems that serve as force-multipliers for various applications across the entire electromagnetic spectrum. Elisra provides solutions in the areas of Electronic Warfare (EW) - Radio frequency (RF) and Electro-Optics (EO), intelligence - Signal Intelligence (SIGINT) and Measurement and Signature Intelligence (MASINT), and communications (C4I and Data Links). Elisra's systems, deployed on a variety of airborne, naval and ground based platforms, are in use by the Israel Defense Forces (IDF) as well as by numerous other countries worldwide.

## Airborne Self-Protection Solutions

**Complete self-protection against all threat types for all airborne platforms**

**ALL-in-SMALL™** – a next-generation unified suite for airborne self-protection, extremely small and lightweight, with a modular open architecture and multiple interface abilities, this complete cutting-edge integrated airborne EW Self-Protection Suite (SPS) in a single LRU includes: EW Controller (EWC), digital Radar Warning Receiver (RWR), IR Missile Warning System (MWS), advanced Laser Warning System (LWS) and Chaff/Flare Dispensing System (CFDS). Effectively integrated with Direct Infrared Countermeasures (DIRCM) systems it provides high range detection and DF accuracy and quick, efficient jamming and advanced capabilities: ESM, IR-Centric™ – a multi-spectral emitter that has geo-location and net-centric capabilities and net-centric EW applications.

Elisra's advanced **Unified Self-Protection Suite for Fighter Aircraft** includes the most advanced multi-spectral DAS, ESM,

RWR and ECM self-protection jamming capabilities in a single LRU, delivering market leading DF accuracy, identification and location of received signals, very high Probability of Intercept (POI), and enabling swift response. The suite is operational and is deployed onboard fighter aircraft in the Israel Air Force and other modern air forces worldwide.

**Light SPEAR™ - An Electronic Attack (EA) and Self-Protection System (SPS)**, this compact, extremely lightweight ESM and ECM self-protection jamming system for UAS, improves the UAS' survivability and meets the growing need to operate and collect accurate intelligence in highly hostile environments. It is based on multiple DRFM channels working in parallel and covering a wide spectrum. The system allows simple integration with an array of transmitters and platforms, and its low Size, Weight and Power (SWaP) consumption makes it an ideal EW system for multiple operational platforms.

**IR-CENTRIC™** – a measurable self-protection force multiplier for airborne platforms, this unique IR-based full protection and situational awareness solution provides mission protection and safety enhancement from a single system while responding to the most modern airborne and ground operational requirements. Utilizing the Infra-Red-based Missile Warning System (IR MWS), IR-CENTRIC harnesses the data transmitted by its sensors to facilitate a multi-role, multi-function nexus that includes a panoramic view of the battlefield, creating situational awareness, collision alert that enhances aircraft safety, navigation support, battle damage assessment (including recording, analyzing and learning) and mission support.

**PAWS Family**, a cross-platform family of IR Passive Airborne Warning Systems, is a combat proven, comprehensive solution significantly enhancing all airborne platforms survivability with early warning missiles threat detection and automatic





**ALL-in-SMALL™** – A next-generation unified EW Suite for airborne protection.



management of all types of applicable countermeasures available onboard. PAWS delivers cutting-edge protection against the most challenging modern and future threats faced in battle arenas. Using sophisticated signal processing and algorithms, the systems detect and track incoming missiles, identify threatening ones, alert the aircrew with audio-visual warning signals, initiate timely flare dispensing, and precisely cue Directional IR Countermeasures (DIRCM) towards an approaching missile. Operating either as a stand-alone, self-contained system, or as part of a complete EW suite, the PAWS processing unit supports expanded capabilities such as radar warning and laser warning. PAWS provides threat information to other EW and/or avionic systems for centralized display and management and for enabling further threat handling. Operating as a comprehensive optronic protection suite, the PAWS IR-CENTRIC capabilities extend airborne superiority by maximizing platform safety and survivability and by providing enhanced mission support. PAWS systems are installed in a distributed configuration over the aircraft's skin, in a dedicated pod/bay, or in a pylon.

### **Complete Intelligence, Situational Awareness, Targeting and Self-Protection Solutions for Unmanned Aircraft Systems (UAS)**

A world pioneer for over three decades in providing complete EW and SIGINT solutions for UAS, Elisra provides military and homeland security forces worldwide with comprehensive, battle-proven, modular and customizable situational

awareness and survivability solutions: sophisticated COMINT, COMJAM, ELINT, ECM, self-protection and data links. Supporting all types of unmanned aircraft platforms, applications and functions, our solutions are well suited for military and HLS intelligence and EW applications, including rapid and precise information gathering, targeting and jamming. With hands-on experience in a wide range of scenarios our systems meet the needs of diversified UAS-related missions. Extensive experience and innovative technology result in outstanding operational, mission flexible solutions for our customers.

Our key UAS-related systems include:

EMERALD - a modular Electronic Intelligence (ELINT) system for comprehensive radar detection; SKYFIX - a family of Communication Intelligence/ Direction Finding (COMINT/DF) systems, offering tactical intelligence interception in real time over any terrain type ; COLLECTIVE - a family of cellular COMINT parallel monitoring, recording and transmitting, locating and blocking incoming and outgoing GSM cellular phone communications; SKYJAM - a Communications Jamming (COMJAM) Electronic Attack (EA) solution for selective jamming, managing multiple frequency sub-bands and utilizing sophisticated algorithms and components based on the most advanced technologies available today; Light Spear - a compact Electronic Support Measures (ESM), and Electronic Counter Measures (ECM), EA and Self-Protection system, Light Spear allows easy integration with an array of transmitters and platforms. It is suitable for the growing demand for collecting accurate intelligence and operating in highly hostile environments.



**PAWS**, the Passive IR Missile Approach Warning System, is a highly effective family of operationally deployed staring IR missile approach warning systems.



**Ground Intelligence and EW**

## Integrated Intelligence and Electronic Warfare (IEW) Comprehensive Solutions

**APLAUD - An Active and Passive, Land and Air Unified Defense Solution** is a pioneering approach to integrated SIGINT and Electronic Warfare.

Suitable for air, land and naval battlefield scenarios and operational in numerous land and air forces worldwide, it suits a wide range of missions in a variety of theaters and can be deployed on varying platforms, fixed as well as mobile, including helicopters. APLAUD is a flexible, multi-function, multi-mission and end-to-end response to existing and emerging threats across the entire electromagnetic spectrum. It enables seamless integration of interoperable, operational elements. These include ESM/ELINT, COMINT, ECM, COMJAM and command and control. Integrated into one comprehensive customizable solution, operated and controlled by a single entity, APLAUD provides a complete SIGINT and EW real-time picture of the arena and simultaneous operation of elements for Electronic Support and Electronic Attack. By combining all elements into one comprehensive and customizable solution, a new level of capability is achieved, enabling intelligence gathering, processing and exploitation, EW countermeasures and command and control. APLAUD is operational and in use by numerous customers worldwide.

## Ground Intelligence and EW

The modern electromagnetic battlespace presents a host of complex and evolving challenges that are thoroughly addressed by Elisra through a highly advanced, wide range of critical, interoperable and operational COMINT, COMJAM, ELINT, ECM, Radars and C<sup>2</sup> systems. Enhanced by years of sophisticated responses to customers' needs, the systems meet all operational EW demands required during multiple military and HLS missions, successfully handling a variety of threats by using advanced capabilities, such as highly advanced intelligence collection systems for tactical radios, cellular and satellite communications, cellular blocking, tracking and locating surveillance radars and more.

**Integrated Electronic Warfare System (IEWS)** is a highly advanced, fully integrated ESM/ELINT, COMINT, ECM, COMJAM and C<sup>2</sup> system for all operational EW demands. It enables passive and active intelligence collection, processing and exploitation, EW countermeasures and C<sup>2</sup>, all-in-one comprehensive, integratable and customizable system. It provides decision-makers with a complete, real-time SIGINT and EW picture of the arena and powerfully responds to existing and emerging threats from airborne, naval and ground platforms, enabling real-time situational awareness and simultaneous operation of elements for Electronic Support and Electronic Attack.





**DESEVER** – Decoy Control and Launching System – responds simultaneously to multiple threats by delivering various payloads at accurate time intervals, according to specified anti-missile doctrines and guidelines.



**TIMNEX II** – An advanced ESM/ELINT system for submarines, installed on Dolphin Class submarines.

### COMINT and DF Solutions

Covering a wide frequency range our integrated solutions provide active detection and interception, direction and location finding, signal analysis, monitoring, decoding and digital recording. It handles agile Low Probability of Interception (LPI) signals, such as frequency hopping and burst transmissions and provides smart, swift interception, identification and pinpoint detection of the most sophisticated signals spanning the full-frequency band, providing a real-time tactical picture of the battlefield.

### Cellular COMINT System

Available for all platforms and configurations, our cellular interception system is suitable for various operational scenarios in both military and HLS environments. It provides scanning, intercepting, monitoring, recording, locating and manipulating of all cellular phone types in all available frequency bands and technologies, including fully passive and active solutions.

### Communications Jamming (COMJAM) Systems

These smart, flexible COMJAM systems for selective jamming are part of an Electronic Attack family of solutions, utilizing sophisticated algorithms combined with components based on the most advanced technologies available today. Managing multiple frequency sub-bands based on predefined threat lists and jamming priorities, effective jamming of multiple targets is enabled, using look-through and Signal Initiated Jamming (SIJ) techniques.

### RF Countermeasures against Remote Improvised Explosive Devices (RC-IED)

Offered in man-pack, vehicle-mounted and portable options

for use by military, homeland security and police forces, the Miniature Reactive Jammer (MRJ)), a highly successful C-IED family of systems deals with the escalating IED threat in all operational environments types and protects ground forces, HLS entities, vehicular convoys, border patrols and other forces operating in hostile areas.

### Modular, Field-Proven ELINT Solution

Offering simultaneous multi-radar detection for all ground-based platform types, the modular and field-proven ELINT family provides sophisticated intelligence gathering for the detection and analysis of ground-based radars. The system creates an Electronic Order of Battle (EOB) and incorporates cutting-edge integrated self-protection capabilities.

### Electro-magnetic Counter Measures (ECM) Solution

Providing simultaneous automatic or manual detection, location and selective jamming of enemy targets, this system pinpoints and neutralizes enemy systems while handling multiple threats in parallel. Combining advanced tactical and strategic capabilities, complete real-time access to the system and full local decision making and operational autonomy to forces in the field, the system includes cutting-edge selective jamming and jamming-prevention of the entire battlefield, including secondary disturbances by friendly forces. Withstanding harsh environments, it adapts to all platforms and can be positioned close to frontline forces.

### Combat Intelligence Suite for Tactical and Armored Fighting Vehicles (AFVs)

A cutting-edge, customizable and modular fully-integrated, multi-sensor and multi-mission intelligence suite for military forces, border patrols and homeland security agencies,





**HERMES 900** – Multi-role, Medium-Altitude Long-Endurance (MALE) UAS.



**ReDrone** – An advanced anti-drone protection and neutralization system

this suite is suitable for all vehicular types. It offers basic configurations of COMINT/DF, radar and electro-optic sensors.

**ReDrone** is an IEW system against drones, providing passive detection and selective jamming. Tailored to protect airports, sensitive urban and governmental facilities, and VIPs, it detects and identifies drones in all relevant frequencies. Through its Direction Finding (DF) it detects all drones and operators simultaneously, with low environmental interference, transmitting only when the drone is detected. ReDrone Integrates a C<sup>2</sup> system with interface to other sensors (RADAR, EO systems).

## Radar Systems

An array of specialized Ground Surveillance Radar (GSR) systems for battlefield surveillance and protection of borders and sensitive sites, our radar systems – which can be integrated with ground ISR – are operational and used by military, border-patrol and HLS forces. Foxtrack™ – a portable GSR fully operational in military, border patrol and HLS organizations, provides integrated, real-time tactical surveillance, intelligence gathering and target detection, classification and identification of any moving target (human and/or vehicles) operating in the area of interest. It monitors, detects and tracks, and being lightweight and compact, it is man-portable and can be installed either on a vehicle mast or as a tripod mounted configuration. FPR-10 is a highly reliable foliage penetration GSR, providing long-range, accurate, high-resolution detection of vehicles and personnel behind foliage. It covers a wide range in azimuth and elevation in the harshest environmental conditions, withstanding the densest

foliage interferences and disturbances. Mainly used for protecting borders (including tropical), critical infrastructure sites, airports and seaports and military bases, it secures large areas via multiple units that together provide end-to-end, overlapping coverage.

## Advanced Customized, Comprehensive EW and Intelligence Solutions for All Vessels Types

Suitable for the latest generation of corvettes, fast attack boats and submarines, and serving modern navies worldwide, our battle-ready advanced systems include: integrated, interoperable fifth-generation EW suites (RESM, CESM, LWS, ECM), advanced COMINT/DF and COMJAM, modular airborne ESM/ELINT systems for helicopters and Marine Patrol Aircraft (MPA), new generation RWR/ESM/ELINT, advanced Intelligence Collection System (ICS) for all submarine types and guided weapons data links. All systems are fully integratable and coexist with all other on-board systems: C<sup>2</sup>, C/F launchers, weapon systems, fire control and radars.

### Aqua Marine™

A fully integrated and interoperable naval RESM, CESM, LWS and ECM Suite and the fifth generation family of advanced naval ESM/ECM/ELINT suites for all surface vessel types, Aqua Marine is a combat-proven, uniquely flexible, modular, fully integratable and interoperable solution that allows the individual design of end-to-end EW suites. It is a lightweight, small footprint system providing situational



*Exceptionally adaptable SIGINT systems provide continuous intelligence gathering, classification processing, and advanced analysis for all levels – delivering full tactical mobility and autonomous real-time responses while in action.*



*Fully customizable, combat-proven Naval EW solutions deliver situational awareness, electronic intelligence and ship self-defense.*

awareness, electronic attack, ship self-defense and electronic intelligence. Designed to operate in littoral and blue waters, Aqua Marine is able to deal simultaneously with the most advanced threats.

**NATACS 2020**, is a new generation of on-board COMINT/DF systems coping with advanced agile frequency communications radios, NATACS 2020 is fully integrated and uniquely equipped with ultra-fast Wide Band Receivers (WBR) and DF systems. Its outstanding scanning rates handle extremely dense electromagnetic environments in the HF/VHF/UHF/HUHF frequency bands, characterized by frequency hopping, burst and other agile transmissions. When integrated with an ESM antenna, the system's COMINT antenna enables maximum utilization of the vessel's mast and significant space savings. Combining the data extracted by NATACS 2020 with the data obtained from on-board ESM systems enables completion of the mission-critical tactical naval picture.

**Emerald AES-212** is an operational and field-proven ESM/ELINT modular system for helicopters and Marine Patrol Aircraft (MPA), designed for the densest and most complex electromagnetic environments. It delivers sophisticated intelligence gathering, simultaneously detects and identifies multiple radars of all types, finds radar and target positioning direction, extremely accurately acquires radar signals and clearly distinguishes between them. Emerald creates an Electronic Order of Battle (EOB) and incorporates cutting edge integrated self-protection capabilities, including an RWR display in the cockpit. This modular system can be used in various applications with a number of receivers, channels or antennas, according to customer requirements.

## Sophisticated Cyber-RF Solutions and Professional Services

Sigmabit is a wholly-owned subsidiary of Elbit Systems EW and Sigint - Elisra (Elisra), relying on Elisra's advanced RF capabilities and specialize in the Cyber domain, providing innovative Cyber-RF intelligence interception and surgical Electronic Attack (EA), all fully in-house developed by Sigmabit's Cyber-RF specialists and enhanced by Elisra's powerful EW algorithms.

**SigNet™** is our Cyber-RF intelligence system tailored to address the WiFi medium challenges in various operational scenarios and different configurations. Dominating the WiFi medium with cutting-edge Cyber-RF techniques, the system operates in active and fully passive modes, providing access, inspection and manipulation of encrypted WiFi communications, supporting all common protocols – including WPA2, WPA, WPS and WEP. Designed for military and HLS forces, the system operates either as standalone or as an integrated add-on with existing intelligence interception solutions. The various RF interception kits allow uniquely wide range of operational scenarios. Smart, low profile, soft-kill capability designed to influence only the target and avoid quick detection is provided under demand.

## C<sup>4</sup>ISR Solutions

We are the developer of the C<sup>2</sup> system for Ballistic Missiles Defense (BMD), including the Arrow and David's Sling missile programs and the core of the Israel Test Bed (ITB) simulator for BMD systems. Our C<sup>4</sup>ISR network-centric solutions



**Miniature Reactive Jammer (MRJ)** – An RF-based family of systems that effectively counters improvised explosive devices reactively, actively or both simultaneously, and is offered in man-pack, vehicle-mounted and portable rolling case options for use by military, HLS and police forces.



**FOXTRACK™** is a portable Ground Surveillance Radar system that is lightweight, compact, man-portable and can be carried by two operators, soldiers, special operations forces or security personnel.

integrate system elements into a single communications grid, enabling effective end-to-end real-time responses. They support intelligence management, collection, processing and distribution networks, while maximizing firepower, increasing survivability and maintaining an accurate real-time situational picture of the entire arena, significantly decreasing the sensor-to-shooter cycle and meeting the most critical and complex battlefield challenges.

## RF Microwave Sub-Systems and Super-Components

Five decades of proven experience in microwave and microelectronics capabilities, enables Elisra to be a well-known supplier of best-in-class components, super-components and sub-systems for a wide range of RF and microwave applications, covering the frequency range of 1MHz to 40GHz. Our in-house design and production of highly advanced microwave components contribute to our comprehensive portfolio.

## HIGHLIGHTS

- *Elbit systems introduces Light SPEAR™ – A self-protection and jamming system for unmanned aircraft systems (UAS)*
- *Elbit Systems Reveals ReDrone – An Advanced Anti-Drone Protection and Neutralization System*
- *Elbit Systems presents MBR – A compact, easily-deployable situational awareness and perimeter surveillance radar system*



# ELBIT SYSTEMS OF AMERICA

Elbit Systems of America, LLC, and its subsidiaries throughout the U.S. have earned a reputation for precision and quality solutions by providing systems that anticipate and deliver on customer needs. Leveraging its relationship with the Elbit Systems' worldwide organization, Elbit Systems of America offers many advanced combat-proven and commercially tested systems.



*From sophisticated advanced navigational solutions for pilots to electronic systems for infantry soldiers, Elbit Systems' products and solutions are operational on all fronts.*

# REPUTATION

throughout the **U.S.**

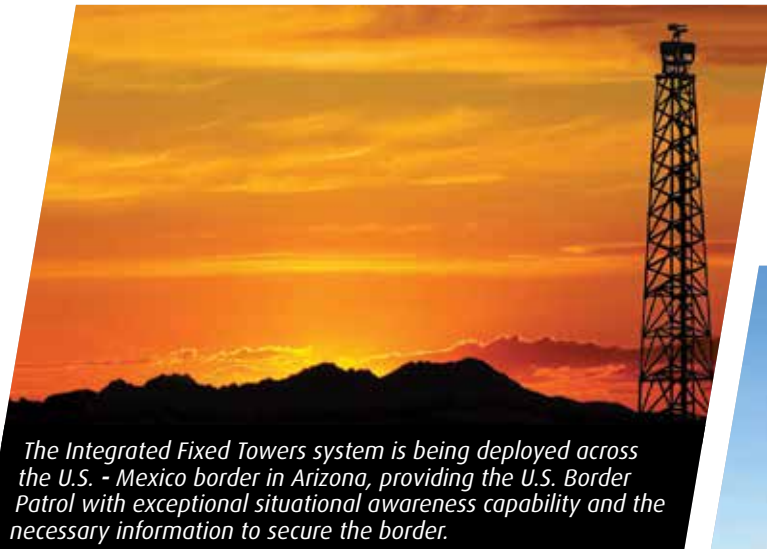
Elbit Systems of America is a leading provider of high performance products and systems and life-cycle sustainment and support solutions, focusing on the defense, homeland security, commercial aviation and medical instrumentation markets.

With facilities throughout the United States, Elbit Systems of America is dedicated to supporting those who contribute daily to the safety and security of the United States.

Decades of experience enable Elbit Systems of America to deliver solutions that anticipate real world performance requirements. From award-winning vision-based cockpit systems, commercial and military displays, to high-quality, maintenance and logistical support services, Elbit Systems of America is a market leader for innovative solutions.

Elbit Systems of America serves customers through several strategic business units with facilities throughout the United States:

- **Airborne Solutions** provides design, development, production, and life-cycle support of mission-critical systems for the U.S. and allied military fixed-wing and rotary aircraft.
- **Sensor and Fire Control Solutions** supplies sensor, networking and command and control solutions for combat vehicles and dismounted forces, in addition to integrated border security systems and communications solutions for first responders.
- **Sustainment and Support Solutions** delivers depot level repair, contractor logistics support (CLS), Performance Based Logistics (PBL), vehicle refurbishment and life-cycle support for sophisticated military electronic systems and components.
- **Elbit Aerospace Commercial Systems** leverages its history as a pioneer in aviation to provide enhanced vision systems (EVS), head-up displays (HUD) and aircraft instrumentation to meet the needs of commercial aviation customers.
- **Medical Instruments – KMC Systems** provides contract design, development, manufacturing and field service support of FDA and EU-regulated medical instrumentation.
- **Vision Systems International LLC (VSI) and Rockwell Collins ESA Vision Systems LLC (RCEVS)**, companies jointly owned with Rockwell Collins, are a leading global supplier of helmet-mounted cueing and helmet-mounted display systems for fixed-wing tactical fighter aircraft.



## Elbit Systems of America's Customers – Partners in Excellence

Elbit Systems of America's commitment to provide the highest standards of quality, performance, precision and reliability has led to long-standing customer relationships with military agencies, as well as defense, homeland security, medical equipment OEMs and commercial aviation customers. These relationships include the U.S. Department of Defense, the U.S. Department of Homeland Security, the U.S. Army, U.S. Navy, U.S. Marine Corps, U.S. Air Force, U.S. Coast Guard, Boeing, Lockheed Martin, Federal Express, General Dynamics, Gulfstream, General Electric, Northrop Grumman, Raytheon, BAE Systems, Bell Helicopter, Bombardier, Cessna, Sikorsky, the Dutch Air Force and a number of other foreign governments.

## Systems and Support for U.S. Military Platforms

Elbit Systems of America's business units, along with other Elbit Systems' capabilities, use combat-proven technologies to rapidly produce effective solutions that meet the mission critical needs of U.S. warfighters. Providing capabilities through the entire life-cycle of complex systems, from design and deployment to depot level repair, Elbit Systems

of America works with the U.S. Armed Forces to ensure combat readiness.

Elbit Systems of America designs and maintains a broad range of products and systems, including:

- Advanced cockpit systems, helmet-mounted sights, ISR systems and fire control systems.
- Cockpit navigational systems.
- Mission and weapons processing system for ground and airborne platforms.
- Laser seekers for the JDAM, Griffin missile and Viper Strike precision-guided munitions (PGM).
- Mortar weapon systems and fire control systems for combat vehicles and indirect fire platforms.

Additionally, we are a leading source for high-performance night vision devices and laser targeting systems for the U.S. Marine Corps, U.S. Army and U.S. Air Force. Backed by decades of proven performance, Elbit Systems of America also provides depot level repair, manufacturing and logistics support of sophisticated military electronic systems and components. Extensive quality control procedures, combined with a highly experienced technical staff, support our goal to consistently outperform customer expectations on service and turnaround time.





***The EJTAG Ltd.** is the lightest weight laser designator/rangefinder available and provides Joint Terminal Attack Controllers a full mobile solution for terminal guidance of munitions, laser hand-off to aircraft, and direction and distance finding.*



**Digital JHMCS [Day and Night]** Elbit Systems of America, with its joint venture RCEVS, is advancing intelligent pilot solution with day/night information display and cueing technology, night vision and degraded visual environment solutions and continuous pilot health monitoring.

## Expertise Derived from Experience

Elbit Systems of America brings in-depth understanding of customer needs and decades of experience in tailoring and integrating complex solutions to the large-scale programs it has successfully performed. Through VSI and RCEVS, our joint ventures with Rockwell Collins, we developed and are now producing the advanced Helmet-Mounted Display System for the F-35 Joint Strike Fighter (JSF). Elbit Systems of America's industry achievements include the successful development of the first high-performance strap-down, semi-active laser seekers that do not require moving parts or gimbals.

This new seeker is effective against moving targets and is now incorporated in several key laser-guided munitions programs for the U.S. military.

## We Know the Mission

Ground C4I and battlefield information systems greatly contribute to mission success by delivering mission-critical information. In addition, we process and interpret data and then present a clear scenario picture to all levels of command. Armed forces can leverage available resources for quick coordination and response.

## Medical Instruments

In the medical instruments field, Elbit Systems of America has expanded its portfolio to include fully automated in-vitro diagnostic analyzers and sample handling systems for the clinical diagnostic laboratory, therapeutic devices utilizing groundbreaking bio-technologies; and high-volume laboratory automation for diverse medical applications.





**Enhanced Vision System (EVS)** – improves flight safety and situational awareness.

## HIGHLIGHTS

- *Elbit Systems of America Announces FirstNet Ready WideBridge™ Cloud System*
- *Elbit Systems Subsidiary in the U.S. Receives a Contract to Modify Naval Test Pilot School C-26 aircraft*
- *Elbit Systems of America's Integrated Fixed Tower Program Named Most Notable Border Security Program*
- *Elbit Systems of America Receives Contract for U.S. Army Bradley Fighting Vehicle Gunner's Hand Station*
- *Elbit Systems' U.S. Subsidiary Receives U.S. Army ID/IQ Mortar Weapon Systems Contract*



# COMMERCIAL AVIATION

We offer cutting-edge commercial aviation systems and solutions that provide regional and business transport airplanes with technological differentiators. We also offer integrated solutions for commercial helicopters including an integrated modular avionics (IMA) suite and enhanced awareness applications.



**Skylens™** – The innovative wearable head-up display (HUD) packed in a lightweight, easy-to-install device, displays high-resolution information, images and video on a high-transparency visor providing superior see-through transmission.

# Advanced AVIONICS & COCKPIT TECHNOLOGIES for **COMMERCIAL AVIATION**

We provide cutting-edge electronic aviation systems and advanced cockpit technologies for the world's commercial aviation market. Our solutions serve as technological differentiators, enabling air transport, business aviation platforms and helicopters to benefit from highly innovative out-of-the-window systems. Our portfolio includes integrated Enhanced Flight Vision Systems (EFVS) for commercial aircraft and helicopters, Integrated Modular Avionics (IMA), power and control solutions and enhanced awareness applications. Our commercial aviation business line includes the following products:

## **Enhanced Flight Vision Systems**

Our EFVS offer breakthrough situational awareness and lightning detection during all phases of flight. The systems presents the pilot with fused images from live sensors and 3D-generated images and symbols over a head-up or wearable display. As a result, operational safety is enhanced in situations of low visibility and during both day and nighttime conditions. Existing regulations allow aircraft equipped with EFVS to gain increased operational landing credit.

Elbit Systems' ClearVision™ is a complete, Enhanced Flight Vision System (EFVS). Clearvision covers the full flight envelope, and overcomes extreme weather conditions and low visibility situations – both day and night. Clearvision allows for intuitive out-of-the-window flying, minimizing the dependency on airport instruments, reducing landing minima and providing takeoff credit. Generation multispectral EVS

detects incandescent and LED runway lights with provisions to support color display.

## **Avionics**

Certified avionics systems – such as computers, processors and a variety of displays – are a major part of our portfolio. We are engaged in avionics integration and upgrade programs for commercial fixed-wing and rotorcraft platforms. Our avionics solutions are designed using open architecture hardware and software components, enabled by our IMA approach. This approach reduces the dependence between the platform and the system and simplifies development and integration of the solutions.

## **Enhanced Awareness Applications**

Our certified enhanced awareness suite for rotorcraft is comprised of cutting-edge software applications hosted on smart displays, including Digital Maps (DMAP), a Helicopter Terrain Awareness And Warning System (HTAWS) and an Electronic Flight Bag (EFB).

## **Power and Control**

We offer a comprehensive range of power-related products, including power conversion, energy storage, motor and generator control, power supplies and distribution solutions. These products are designed and engineered for large commercial airliners, and both regional and business jet applications. Our skilled electronic engineers work closely with all customers to ensure that our solutions are fully tailored to their specific requirements.



*Elbit Systems provides high-end technology products for commercial aviation based on proven military technologies.*



*"Elad" firefighting squadron*

## Commercial Aviation Aerostructures

Elbit Systems - Cyclone Ltd. (Cyclone), our Israel-based subsidiary, is engaged in aircraft and helicopter maintenance, and in the production of aerostructure component assemblies for commercial aircraft. For more than 40 years, Cyclone has designed and produced metal and composite aerostructures, as well as sub-assemblies and assembly parts for leading commercial aerospace companies and OEMs.

Cyclone's unique assemblies include flight control and aerodynamic surfaces, doors, and specialized aircraft parts for commercial aircraft. As a result of our advanced technical and engineering capabilities, as well as our rigorous LEAN production practices, Cyclone is a recognized specialist in build-to-print and build-to-spec commercial aerostructures.

## Training and Simulation

The King Air B200 Training Center is a comprehensive solution for experienced and trainee King Air B200 pilots.

The training center includes the King Air B200 Full Flight Simulator (FFS), and an advanced, cutting-edge ground school.

The FFS is Level D qualified by Transport Canada (Canadian Aviation Authority), and includes a highly sophisticated "Six Degrees Of Freedom" motion system and a hi-fidelity cockpit with advanced avionics and visual system. The FFS is a total training solution for B200 pilots, from takeoff, through all normal and emergency procedures, to instrument and visual landing approaches. The flight and ground school instructors are veteran Israeli Air Force (IAF) pilots, all of whom are King Air B200 Captains, with thousands of flight hours.

## EO Countermeasures Systems

Elbit Systems Intelligence Electro-optics - Elop offers a family of advanced, highly effective DIRCM systems for military and commercial fixed and rotary-wing aircraft. MUSIC™ protects military and commercial aircraft from surface-to-air IR missiles (MANPADS) and is installed without impacting the platform's performance.

**C-MUSIC™** is a pod-mounted DIRCM system, integrated with the cutting-edge C-PAWS Commercial Passive Airborne Approach Warning Systems, specifically designed to defend large commercial jet aircraft or tankers.

**J-MUSIC™** is a DIRCM system integrated for distributed installation on small to medium-size jet platforms. It can be integrated with various missile warning systems (MWS).

## Firefighting Squadron

Elbit Systems "Elad" firefighting squadron was founded Five years ago following the Mount Carmel forest fire. The airborne platform selected for the squadron is a single-engine aircraft, manufactured by Air Tractor, and is capable of carrying approximately 3,000 liters of water and flying three hours without refueling. Elbit Systems has been cooperating with the Israeli Air Force, firefighting units, the Jewish National Fund and the Israel Nature and Parks Authority in developing the squadron's operational procedures and qualifying designated airstrips.





*Large area smart displays with enhanced mission capabilities.*



**King Air B200 Training Center**



**C-MUSIC™**



**ClearVision™** Enhanced Flight Vision System provides proven operational credit along with enhanced situation awareness.

## C-PAWS for Commercial Airliner Protection

Commercial Passive Airborne Warning System (C-PAWS) is a cutting edge, commercial member of the IR-based family of systems that serves as a comprehensive protection solution. C-PAWS boosts an aircraft's survivability by swiftly detecting incoming missile threats and automatically responding with the appropriate on-board countermeasures, such as Chaff/Flares or Directional Infrared Counter Measures (DIRCM) to divert the threat. In addition, using our unique IR-Centric™ capability, C-PAWS enhances aircraft safety in the air and on the ground, by enabling high levels of situational awareness.

## Helicopter Police Unit

Airborne law enforcement support can handle a wide variety of police activity. It is known to be a 'force multiplier', enabling a smaller work force to complete tasks with a strategic advantage. Elbit Systems' Helicopter Police unit capability consists of several elements, including the platform performance and characteristics, integration of suitable mission equipment, sustention operations and the quality of the operational crew (pilot training) to perform the missions.

A typical police mission equipment package includes: Night vision capability and HMD, Observation system, Municipal vectorial digital map, Data link, Search light, Fast rope, Radio communication, Public address system.

## HIGHLIGHTS

- **Elbit Systems Helicopter SKYLENS™ Wearable HUD Completes Flights in Final Operational Configuration**
- **Elbit Systems and ATR Awarded the Trophy for the Most Significant Partnership between France and Israel**
- **Elbit Systems Awarded Title of Industrial Best Performer Supplier by Airbus Helicopters**
- **Elbit Systems Combined Vision Systems (CVS) Receives First Certification for Dassault Aviation Falcon 2000 series**

# INNOVATIVE COMMERCIAL TECHNOLOGIES

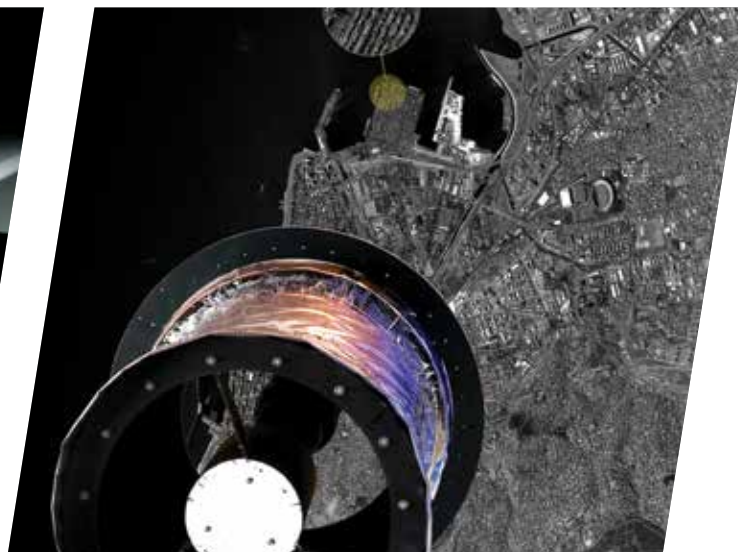


## Protecting Drivers and Enhancing Road Safety

Annually, over 50 million people worldwide are injured in road accidents, and over one million are killed. More than 50% of road fatalities occur at night due to low visibility, even though only 20% of driving takes place at this time. Regular headlights illuminate about 50 meters of the road ahead, often not leaving the driver enough time to react to avoid obstacles.

BrightEye™, developed by Elbit Systems' subsidiary, BrightWay Vision, deploys the cutting-edge Advance Driver Assistance Systems (ADAS) vision-based technology, making night-time driving easier and safer by providing an image of 250m of the environment ahead of the vehicle. BrightEye offers all the benefits of a rich, natural and intuitive imagery, even during harsh weather (rain, snow, etc.), with real-time sophisticated computer-vision features such as pedestrians, cyclists, animals and other road hazards alerts, assisting the driver to avoid road obstacles and prevent accidents.

BrightEye, which is being marketed to leading auto makers worldwide, is being considered for use in vehicles, buses and trucks. The BrightEye prototype is anticipated to be operational in the coming year. The potential for BrightEye to offer a major benefit to protect drivers and enhance global road safety is significant.



## Enhancing Civilian Protection

Observation satellites serve a wide range of functions and applications, including civilian protection, environmental assessment for risks and climate change effects, urban planning aspects related to road density and urban construction, and effects of natural disasters such as earthquakes, floods, avalanches and more. Ongoing observation from space can assist governments in their preparations for protecting populations against a range of threats to human life, or understanding environmental changes in order to develop policies to mitigate environmental impacts. Observation satellites can maintain an orbit for up to several years, providing detailed assessments over long periods of time. However, use of satellite-generated information depends on the ability to photograph clear images to transmit to analysts on the ground. Therefore, satellite cameras are essential parts of the satellite's functionality.

Our cutting-edge electro-optics capabilities have been applied in developing a super high-resolution camera – the Jupiter Advanced Camera – which can identify and capture extremely small images in space while covering an area of hundreds of kilometers. The Jupiter Advanced Camera has market-leading resolution and is the lightest-weight satellite camera in the world, delivering the highest levels of performance.

In Italy, space intelligence is highly advanced, and the Italian Space Agency is known to be one of the leading users in the world of satellite technologies. Our Jupiter Advanced Camera was selected as the camera for the OPTSAT 3000 observation satellite, which was commissioned by the Italian government to support analysis of geophysical areas and contribute to improving the quality of life and protecting the local population.



## Smart Energy Solutions for Modern Power Needs

Utilizing our high-power, aqueous supercapacitor (SC) technology, we have developed a full range of energy storage and power management solutions that address a broad spectrum of requirements. These requirements include high power, voltage and energy, extended life-cycle, rapid charge-discharge times, and environment-friendly and smart power management.

Built on our innovative “green” technology, the SC provides a new level of efficiency, power and energy densities. It is cost-effective, with a unique electrode preparation process and an advanced mechanical structure, resulting in highly-effective capacity, extended life-cycle, high energy efficiency and reliability at temperatures from -46°C to +65°C. Our unique patented structure and assembly procedure enables us to customize our SC solutions to our customers’ specifications, requirements and applications.

Every one of our novel materials and nanotechnologies has undergone extensive R&D testing throughout every phase of the materials’ design, development and implementation. We are proud to have been selected as the Israeli Nanotechnology Company of the Year (2012), for excellence in implementing cutting-edge material and innovative technology.

## Applications for our Power Management Solution

The following SC solutions meet the high power demands for several automotive and industrial applications:

### Automotive Industry:

Our Start-Stop solution maximizes the efficiency of internal combustion engines (ICE) in hybrid vehicles, delivers savings in fuel and vehicle emissions and enables regenerative braking. For heavy duty requirements, our Peak Power solution lowers inner resistance and is fully reliable across a wide temperature range, allowing for maximum power availability during cold cranking. Our BatCap Hybrid Power Pack solution combines a battery and an SC for a solution that has the energy density of a battery and the power density of an SC, resulting in the next generation of the common lead acid battery.

### High Power UPS:

SCs and PseudoCapacitors (PSCs) are ideal for bridging power during short-term power cuts. Our SCs and PSCs can provide bridging power until the main back-up starts up. Compared with the battery alternative, our SCs and PSCs have a very long life-cycle, can be charged or discharged very rapidly and supply very high power instantaneously.

### Trains and Trams:

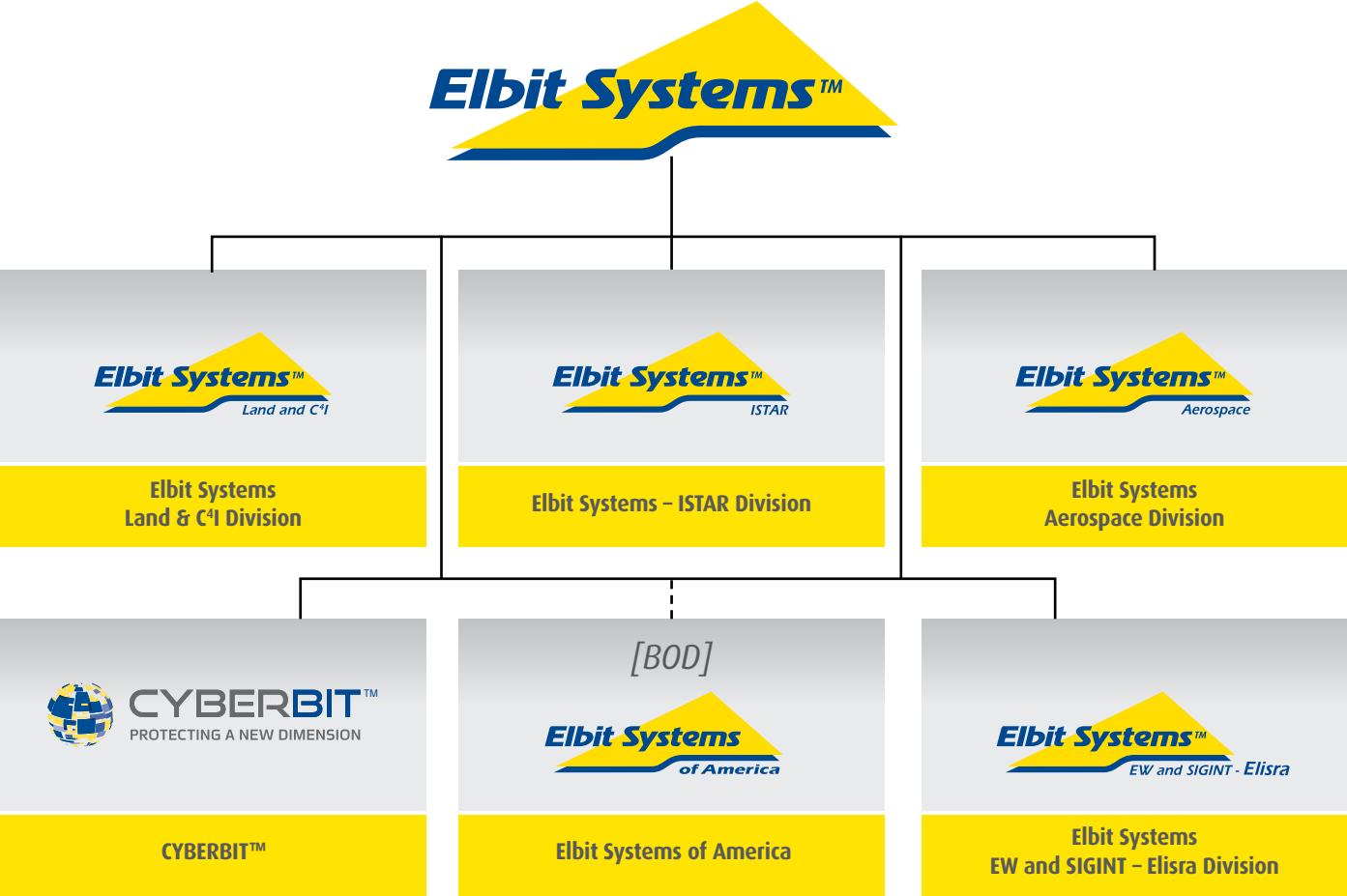
Our SC and PSC solutions reduce the overall energy consumption of trains and trams, minimizing both the operational costs and CO<sub>2</sub> emissions. With a very low life-cycle cost, our solutions provide full reliability at extreme temperatures, with no need for heating or cooling.

## HIGHLIGHTS

- *Elbit Systems subsidiary - Sigmabit presents Signet™ and E-Merge - Innovative cyber signal intelligence and data fusion systems*
- *Elbit Systems spin off EverySight's Raptor augmented reality smartglasses delivers a cutting edge display experience to boost cyclists' performance*
- *Elbit Systems to establish a new company in the field of energy for civilian transportation*



# ORGANIZATION CHART



# MAJOR SUBSIDIARIES



**Elbit Systems Electro-optics - Elop Ltd.**, is involved in the design, engineering, manufacturing, and support of a wide range of advanced electro-optic systems and products mainly for defense, space and homeland security applications.

Elbit Systems Electro-optics - Elop Ltd.  
Advanced Technology Park,  
P.O.B. 1165, Rehovot 76111, Israel  
Tel: 972-8-938-6211, Fax: 972-8-938-6237  
[www.elbitsystems.com/elop](http://www.elbitsystems.com/elop)



**Elbit Systems EW and SIGINT - Elisra Ltd.**, is engaged in the areas of EW suites, airborne warning systems and ELINT systems.

Elbit Systems EW and SIGINT - Elisra Ltd.  
48 Mivtsa Kadesh St., Bene Beraq, Israel 51203  
Tel: 972-3-617-5560, Fax: 972-3-617-5859  
[www.elbitsystems.com/elisra](http://www.elbitsystems.com/elisra)



**Elbit Systems Land and C4I Ltd.**, is the center for our land-based vehicles, C4I and communications systems activities.

Elbit Systems Land and C4I Ltd.  
2 Ha'Machshev St.,  
Netanya 42507, Israel  
Tel: 972-9-889-8080, Fax: 972-9-889-8231  
[www.elbitsystems.com/landC4I](http://www.elbitsystems.com/landC4I)



**Elbit Systems of America, LLC** – conducts business in the United States through its wholly-owned subsidiaries.

Elbit Systems of America, LLC  
4700 Marine Creek Parkway,  
Fort Worth, Texas 76136-6969, USA  
Tel: (817) 234-6799, Fax: (817) 306-6799  
[www.elbitsystems-us.com](http://www.elbitsystems-us.com)



**CYBERBIT's** solutions span the entire range of cyber security and intelligence capabilities, providing end-to-end cyber and intelligence solutions.

**Cyberbit Ltd.**  
22 Zarhin St., Ra'anana 4310602, Israel  
Tel: +972-9-779-9800  
[www.cyberbitc.com](http://www.cyberbitc.com)

# CORPORATE DIRECTORY

## Board of Directors

**Michael Federmann** – Board Chair

**Yoram Ben-Zeev** <sup>1,2</sup>

**Professor Yuli Tamir** <sup>1,2</sup>

**Rina Baum**

**David Federmann**

**Professor Ehood (Udi) Nisan** <sup>1,2</sup>

**Dr. Yehoshua Gleitman** <sup>1,2,3</sup>

**Dalia Rabin** <sup>1,2,3</sup>

**Dov Ninveh**

1 – Member of the Company's Audit Committee

2 – Member of the Company's Financial Statements Review Committee

3 – External Director

## Executive Officers

**Bezhalet Machlis** – President and Chief Executive Officer

**Elad Aharonson** – EVP and General Manager, ISTAR Division

**Jonathan Ariel** – EVP, Chief Legal Officer

**David Block Temin** – EVP, Chief Compliance Officer and Senior Counsel

**Joseph Gaspar** – EVP, Chief Financial Officer

**Zeev Gofer** – EVP, Strategy and Business Development – North America

**Shelly Gordon** – EVP, Human Resources

**Ran Kril** – EVP, International Marketing and Business Development

**Avi Mizrachi** – EVP, Business Development – Israel and Southeast Asia

**Edgar Maimon** – EVP and General Manager, EW and SIGINT – Elisra Division

**Ilan Pacholder** – EVP, Mergers and Acquisitions and Financing

**Yuval Ramon** – EVP, Chief Operating Officer

**Gideon Sheffer** – EVP, Strategic Planning

**Yoram Shmueli** – EVP and General Manager, Aerospace Division

**Udi Vered** – EVP and General Manager, Land and C<sup>4</sup>I Division

**Yehoshua Yehuda** – EVP and Chief Technology Officer

## Elbit Systems of America – Management:

**Raanan Horowitz** – President and Chief Executive Officer – Elbit Systems of America

## Registered Office

### **Elbit Systems Ltd.**

Advanced Technology Center  
P.O.B. 539, Haifa 3100401  
Israel

**Tel:** 972-77-294-0000

**E-mail:** [info@elbitsystems.com](mailto:info@elbitsystems.com)

[www.elbitsystems.com](http://www.elbitsystems.com)

## Transfer Agent and Registrar

### **American Stock Transfer and Trust Co.**

59 Maiden Lane  
New York, NY 10038, U.S.A.  
**Tel:** (212) 936-5100  
**Fax:** (718) 236-2641

## Auditors

### **Kost, Forer, Gabbay and Kasierer**

a member of Ernst and Young Global

2 Pal-Yam Street  
Brosh Building  
Haifa, 31003 Israel  
**Tel:** 972-4-865-4021  
**Fax:** 972-4-865-4022

## Investor Contacts

### **Joseph Gaspar**

Executive VP and Chief Financial Officer

**Tel:** 972-77-294-6404

**Fax:** 972-77-295-6404

**E-mail:** [joseph.gaspar@elbitsystems.com](mailto:joseph.gaspar@elbitsystems.com)

### **David Vaaknin**

Vice President and Head of Corporate Communications

**Tel:** 972-77-294-6691

**Fax:** 972-77-294-5666

**E-mail:** [david.vaaknin@elbitsystems.com](mailto:david.vaaknin@elbitsystems.com)

Elbit Systems has approximately 12,500 employees, the majority of whom are engaged in engineering, research and development and other technical areas.

Elbit Systems' shares are traded on the Tel Aviv Stock Exchange and OTC in the United States (NASDAQ:ESLT).



# SOCIAL SUSTAINABILITY

## Elbit Systems' Commitment to Sustainable Operations

We are committed to promoting sustainable operations in the communities in which we live and work. This is consistent with our policy of emphasizing ethics and integrity. Our policy enhances and encourages the voluntary efforts of our companies and employees who donate their time and efforts in the support of members of our communities who are in need. We promote numerous community support activities in other countries in which we work and live. In addition to our community-related activities, we place emphasis on environmentally sound operational practices. We follow the leading standards of corporate governance and focus on ethical behavior in our business dealings. We are convinced that contributing to the community and sustainability makes good business sense.

Our mission to be a world-leading source of innovative, technology-based systems for diverse applications that enhance safety and security stems from our values, including accountability, ethical conduct and social responsibility. Our social sustainability policy, which reinforces our commitment to acting with integrity and making a positive contribution to a safer and more secure, sustainable world, resonates with each of our stakeholders.

**For our customers:** We assist defense, homeland security and first responder agencies around the world to perform their essential roles more safely and efficiently.

**For our employees:** We strive to maintain an inclusive workplace where individuals can develop their skills and achieve excellence. We provide competitive benefits, comprehensive training and diverse career opportunities while promoting open communications and attention to the needs of our employees and their families. At the same time, we place emphasis on employee health and safety.

**For our suppliers:** We adopt a business partnership approach, aiming to develop win-win relationships with suppliers to deliver the best solutions based on synergy and collaboration. We strive to deal fairly, while expecting our suppliers to uphold the principles of responsible and accountable business practices.

**For our environment:** We manage our impacts on the environment in terms of energy consumption, greenhouse gas emissions, water consumption, waste generation and recycling against plans and defined targets, with the goal of not only ensuring full compliance with environmental protection laws and regulations, but also reducing adverse environmental impacts where possible.

**For our communities:** We invest in the well-being of our communities through donations as well as a range of volunteer activities by our employees. One of our focuses is to advance technological education by partnering with educational establishments to create opportunities for young people in technology and build skills that will enable them to join the workplace and develop successful technology-based careers.

Elbit Systems maintains a commitment to transparency in social sustainability and has reported on our Corporate Responsibility and Sustainability activities since 2008. Our Sustainability Reports are prepared in accordance with the Global Reporting Initiative guidelines and is available on our corporate website.

