



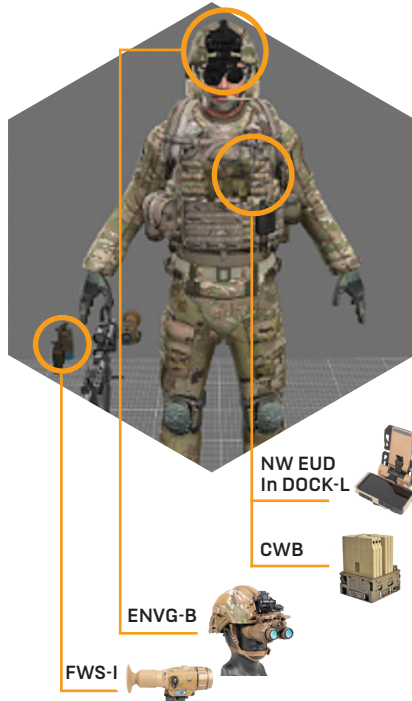
PEO SOLDIER TECHNOLOGY COMPENDIUM



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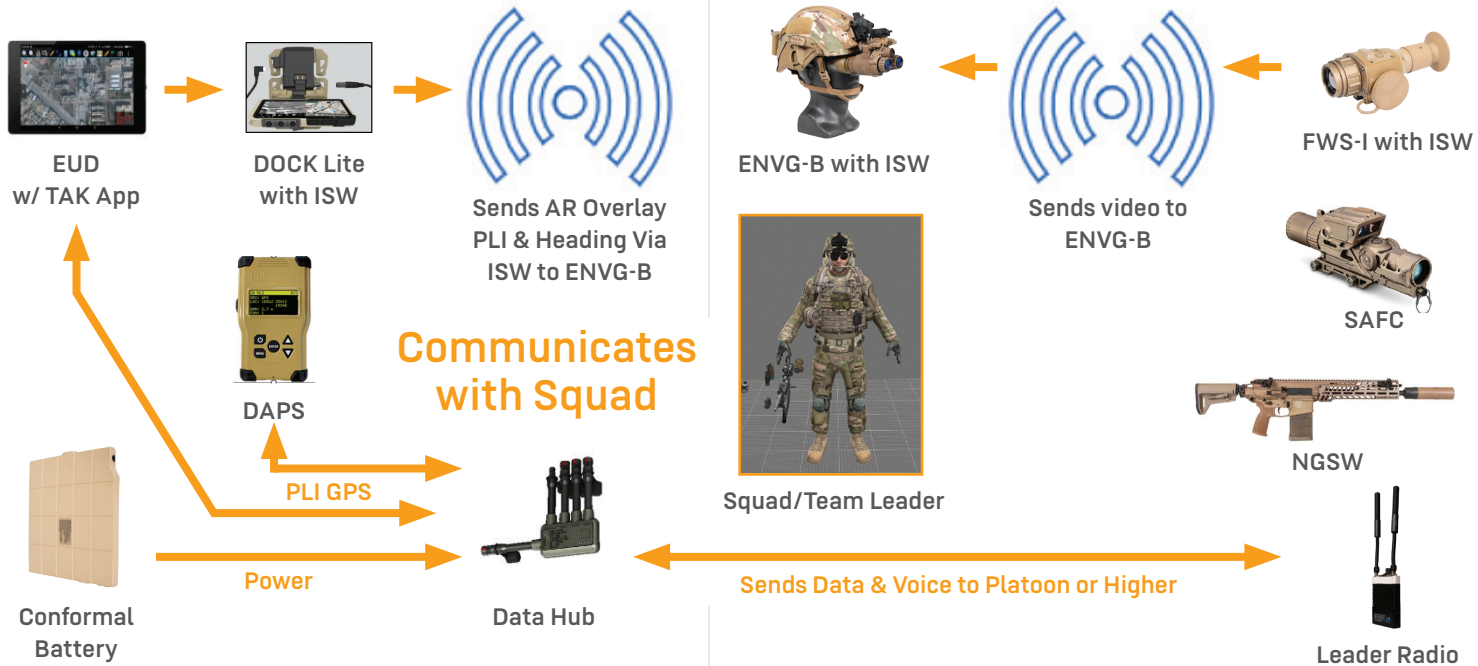
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PRODUCT	POWER	SENSORS	MICRO DISPLAY	WAVEFORMS	KEY INTERFACES
ENVG-B	4 AA lithium batteries	1^2 White Phos High FOM (I2 Resolution: 2300-2500 Figure Of Merit/32 SNR); Thermal Focal Plane Array with minimum active area of 640 (h) x 480 (v) pixels	1280 X 1024 AMOLED	ISW	ENVG-B Battery Pack Hot Shoe, Male/Female; ENVG-B Goggle Hot Shoe, Male/Female
NETT WARRIOR (With DockLite)	Lithium-Ion Internal Battery in EUD (non-removable) and external power connections to CWB battery		EUD Display 1280X 1024, AMOLED	WIFI, BLE 5.X, ISW (AES 256), 4G/LTE (via hot spot), and NFC	USB PD/NW PAN
FWS-I	3 AA lithium batteries	640 x 480 thermal Focal Plane Array	640 X 480, AMLCD	ISW	9 or 12 pin (early models have 9)
CONFORMAL WEARABLE BATTERY (CWB)	Lithium-ion	Temperature/ Charge	State of Charge (SOC) Informal Character Display (ICD)	N/A	SM Bus 1.1/Glenair 807-309-06ZNU6-6PY (6 Pin) or 7DY (7 pin)

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Flame Resistant (FR) clothing refers to garments that are specifically designed to protect the wearer from flames and thermal injury.

FR materials are designed to withstand much higher flame and thermal loads than typical non-FR materials. Fibers such as meta-aramids and para-aramids, modacrylic, and FR Rayon have inherent FR qualities and are commonly used to make materials for FR uniforms. Other fibers, such as cotton and nylon, are not inherently FR, but with the addition of special chemicals, can be rendered FR, often with similar FR characteristics to inherent FR materials. FR qualities include self-extinguishing once a flame source is removed, as well as not melting or dripping, since all of these can significantly impact burn injury during a flame exposure event.

FR clothing is routinely tested as a stand-alone material and as a clothing system, both to quantify the burn injury performance and ensure that protective attributes are meeting requirements.

When designing new FR combat clothing, key factors include durability, strength, wick-ability, fast drying, colorfastness, breathability, and FR/color/strength durability through numerous launderings.



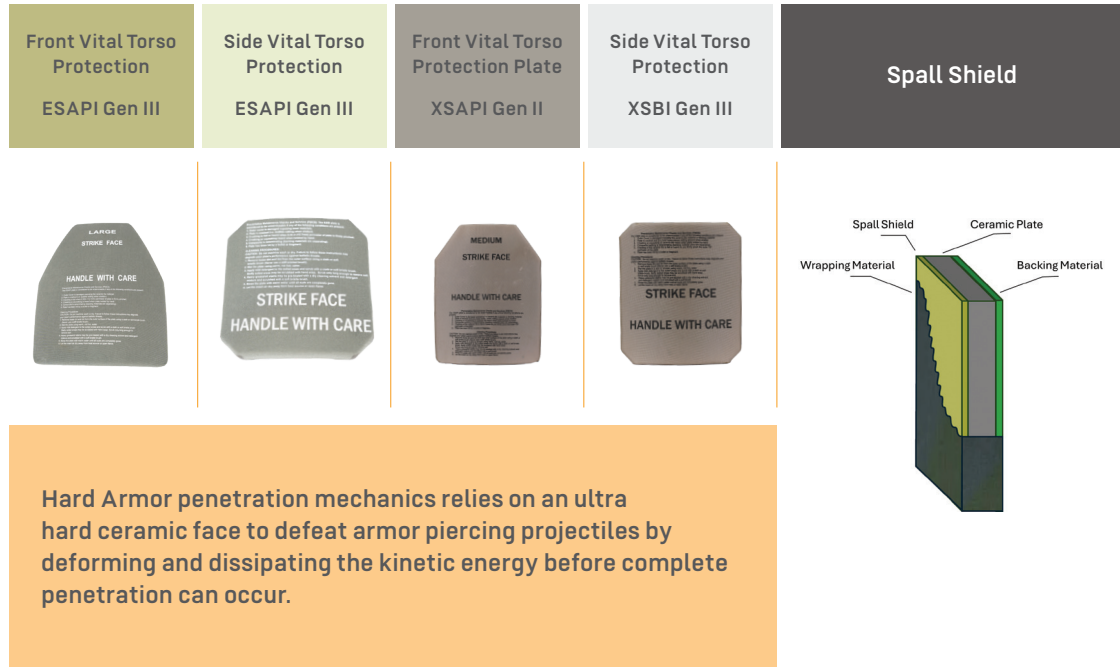
Modern Combat Helmets are made from materials like Kevlar® and UHMWPE (Ultra-high-molecular-weight polyethylene). The manufacturing process involves cutting, layering, and compression molding these materials into a solid structure. After molding, the helmets are trimmed, smoothed, coated, and painted. They are then fitted with padding, suspension systems, and accessory mounts. Rigorous quality control, including inspections and ballistic testing, ensures the helmets meet protection standards before packaging and distribution.

Modern Combat Helmet contains a suspension system, this includes helmet pads to create standoff, provide stability, and meet or exceed blunt impact. There are chin straps located towards the front of the helmet allowing the helmet to stay relatively stable during the mission.

Retention systems as H-Nape and "X" Nape reside in the back of the head to keep the helmet from moving when NVGs are attached to the front of the helmet. The H shape provides excellent stability and even distribution of weight and was introduced for female soldiers. The "X" shape is a lighter design and is easier to adjust quickly due to the simpler design.



Hard Armor is comprised of composite layers of ceramic and Ultra-High-Molecular-Weight Polyethylene (UHMWPE). The ceramic strike face and Spall shield effectively shatter incoming bullets. Spall protection plays a crucial role in reducing trauma from ballistic impacts, as the coating is to prevent the small fragments (spall) that break off from the armor plate upon bullet impact from causing injury. The UHMWPE backer absorbs the residual energy, preventing penetration.



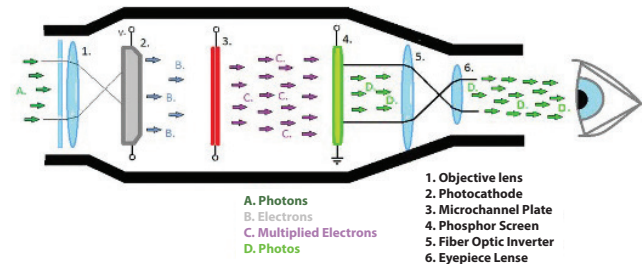
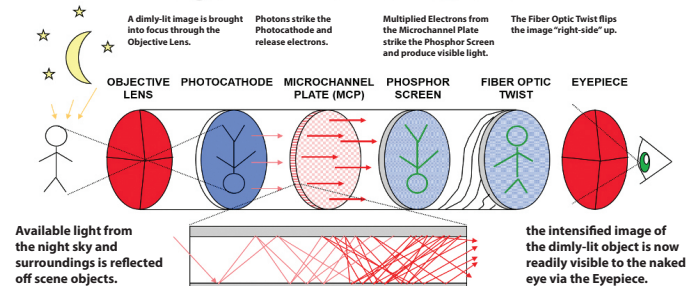
The development of high-performance fibers has been the most important driver for advancements in ballistic protection. The most popular fiber types used for this purpose are para-aramid fibers, like Kevlar® and ultra-high molecular weight polyethylene. Soft armor provides protection to the torso and extremities (neck, shoulder, lower back, groin, and knee and elbow joints).



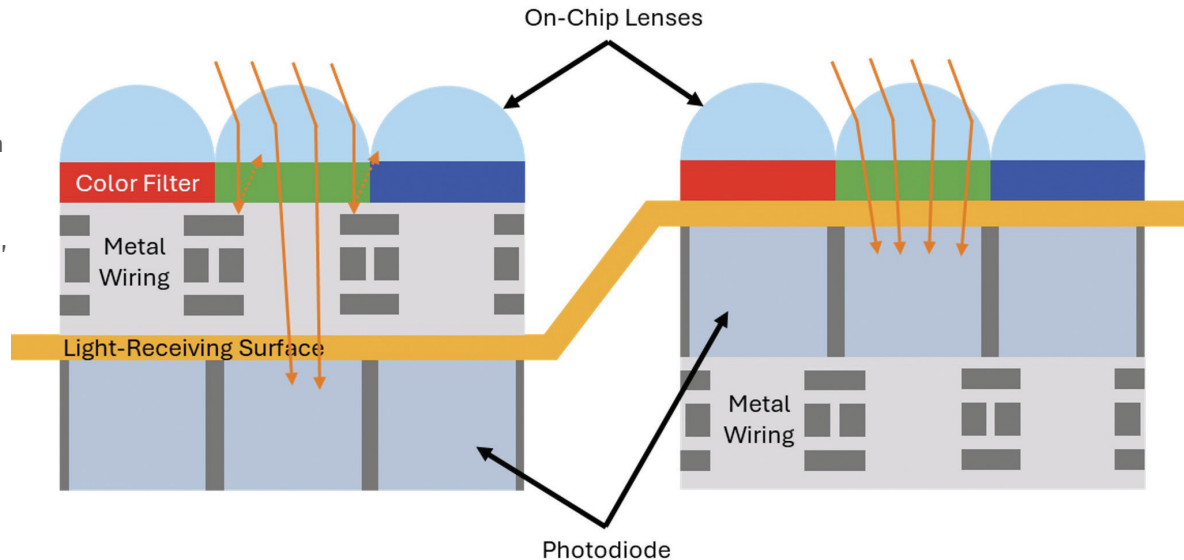
Ballistic protective and cover materials used; (A) Para-aramid felt (one layer); (B) Ultra high molecular weight polyethylene felt (one layer); (C) Silk fabric (two layers); and (D) Cover material.

An image intensifier tube amplifies available light energy in an optical system such as Night Vision Goggles, allowing the Soldier to see in low-light level conditions. Image intensifier tubes operate by converting photons of light into electrons, amplifying the electrons (usually with a microchannel plate), and then converting the amplified electrons back into photons for viewing.

Image Intensifier Operation



Similar to cell phone complementary metal-oxide-semiconductor (CMOS) cameras, a low light camera sees in the visible, but is optimized for sensitivity in the Near Infrared waveband, that is outside of what is visible to the naked eye.

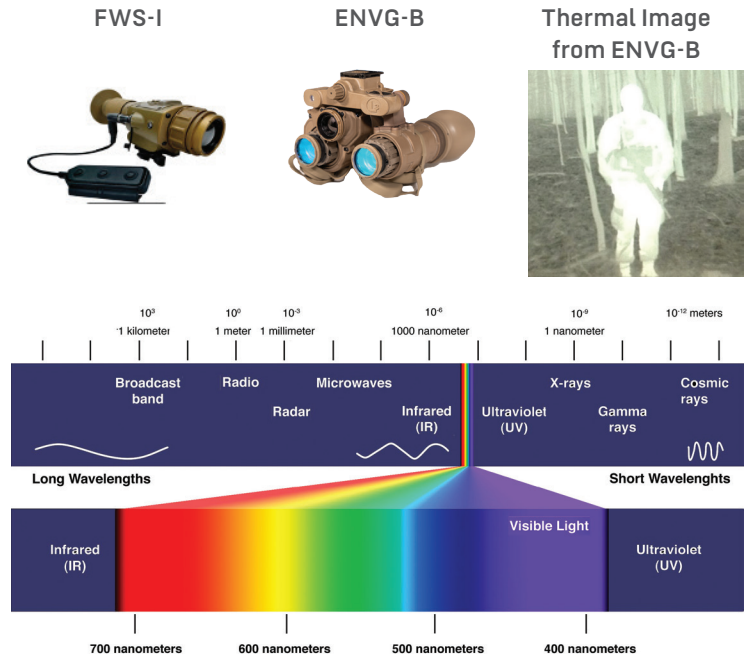


State-of-the-art frontside illuminated sensors (left) perform excellently in low-light conditions, but the design of backside-illuminated pixels (right) offers significantly improved quantum efficiency.

Thermal Imagery or Forward-Looking Infrared works by detecting an objects heat or electromagnetic radiation. All objects emit electromagnetic radiation as a function of their temperature. This radiation is invisible to the naked eye but can be detected with special infrared detectors. These detectors are sensitive to different wavelengths of radiation, which is why thermal sights come in various styles and sizes. Sights are designed to detect a specific range of wavelengths.

Thermal sights detect objects based on their heat signature, even in complete darkness! The most common type of thermal sight detects long-wave infrared radiation, also known as LWIR. This type of radiation falls between 8 and 14 microns on the electromagnetic spectrum. In contrast, visible light falls between 400 and 700 nanometers on the spectrum.

Thermal devices see infrared energy (heat) instead of light that is visible to the naked eye.



Fused Night Vision integrates a Long-Wave Infrared (LWIR) thermal sensor and image Intensification (I²) tubes or digital low light sensors and displays the fused image. Fused Night Vision can be used during low/high light levels, extreme weather and with obscurants.

Sensor fusion combines the positive qualities of the image intensifier and thermal imaging technologies into one device. Such a combination enables a user to view the image as a much greater part of the light spectrum, spanning from visible to near-infrared to long-wave infrared. Digital night vision devices operate differently than analog devices, in that light entering the objective lens is transformed into a digital signal by an image sensor of such as the Complementary Metal Oxide

Semiconductor (CMOS) sensor, or Charge Coupled Device (CCD). These are the same technologies used in commercial digital cameras.

The digital image is enhanced several times before being viewable on the devices display. The larger the CMOS or CCD sensor pixel size, the better it will perform in reduced light.



The Conformable Wearable Battery (CWB) uses Lithium-ion technology, and is a Soldier Carried battery, capable of powering Soldier systems up to 12 hours.

The charge time spans from 4-6 hours for one CWB. The CWB Charger outputs can use (UBC, ABC, UBC-L, or SPM) & a power source (solar, vehicle, other batteries, AC/generator).

Currently the CWB resides on the Soldier's back and is engineered to be ballistic safe meaning it can continue to safely provide power after being shot. The Battery is also shock and trauma-resistant, which helps it maintain functionality under physical stress.



Universal Battery Charger



- » Nominal voltage: 14.8 volts
- » Storage temp: -32C to +71C
- » Operating Temp: -30C to +60C
- » Shelf Life: 3 years @ +21C
- » Weight: 2.6 lbs.
- » EMI/RFI/EMC Protection



A microdisplay is, a human worn display—between 0.75- and 1-inch corner to corner. Most micro displays are assembled on a silicon backplane, either deposited directly or transferred, to control the individual pixels. The exceedingly small size of these circuits allows incredibly high-resolution images to be created.

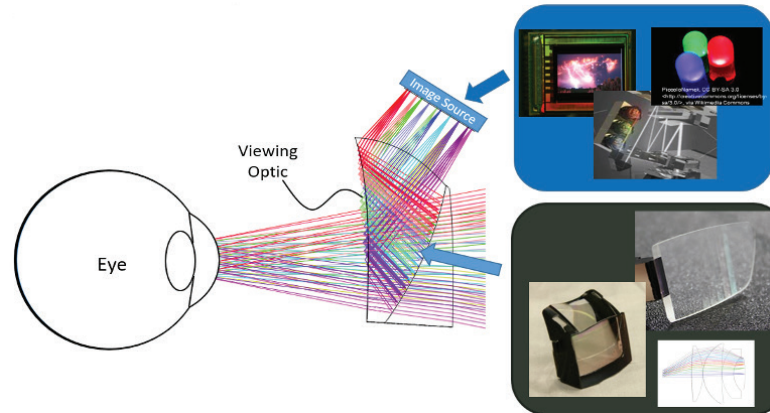
When combined with optics, such as a standard eyepiece, a freeform prism, a waveguide, or an optical combiner, the imagery from the microdisplay is magnified and focused at a comfortable viewing distance for the user.

Microdisplays have been used in various applications such as beam projectors, view finders of digital cameras, projection TVs, night vision devices, weapon sights, and augmented reality/virtual reality (AR/VR) devices.

Microdisplay technologies include Organic Light Emitting Diodes (OLED), Active-Matrix Liquid Crystal Displays (AMLCD), Liquid Crystal on Silicon (LCoS), and Inorganic Light Emitting Diodes (LED).

Near Eye Display is any information display that when placed at its intended viewing distance is close enough to the eye that it cannot be comfortably viewed without the aid of optics.

Near Eye Display = Image source + optics



INTRA-SOLDIER WIRELESS (ISW) USING ULTRA WIDE BAND (UWB)

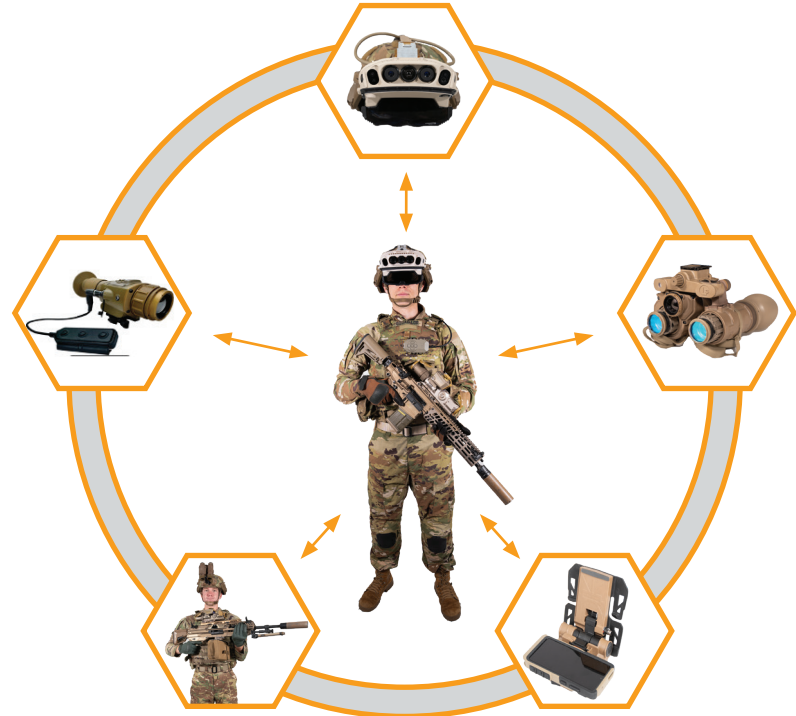


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Intra-Soldier Wireless (ISW) is a secure high bandwidth wireless personal area network technology (WPAN) that provides on-body wireless networking capability

ISW uses the unregulated Ultra Wide Band (UWB) spectrum. It's low transmission power, makes it an inherently low probability of detection (LPD), low probability of intercept (LPI) capability. It is designed to operate in congested spectrum environments making it jam resistant.

ISW is FCC certified and compliant with the ECMA 368 standard. It uses an Army owned networking protocol called SolNet (Soldier Network). The ISW hardware is a subsystem embedded in a host system and forms an onbody network for multiple devices.



Augmented Reality is the process of combining or “augmenting” video or photographic displays by overlaying the images viewed through goggles with useful computer-generated data.

This technology is beneficial to the Soldier as critical information is readily visible in the Soldier’s field of view. AR can help

Soldiers see the positions of others in their squad or platoon, designated pathways across the battlefield, enemy positions, and other data. They can also receive feeds from nearby optical sensors, including low-light and thermal sighting systems.





The NGSW-R Next Generation Squad Weapon (Rifle) is a modular, piston driven, select fire, magazine fed, fully suppressed rifle with 6.8 mm ammunition. Its fully ambidextrous controls are similar to its predecessor, the M4/M4A1 carbine. The NGSW includes a non-reciprocating left side charging handle, two position adjustable gas valve, collapsible/side folding buttstock.

The NGSW will allow Riflemen to engage targets further than the M-4 Carbine and provide a better ballistics hit to the intended target. The piston and the and suppressor both contribute to reduced recoil and the suppressor also serves to reduce both sound and visible flash signatures.



NGSW-AR Next Generation Squad Weapon Automatic Rifle is a lightweight, belt-fed, air-cooled, gas-operated, select fire, suppressed 6.8mm light machine gun that fires from the open bolt position. It has fully ambidextrous controls, a collapsible buttstock, two position adjustable gas valve.

The XM157 (Next Generation Squad Weapon Fire Control System) is designed to increase lethality, allowing the rifleman to effectively engage targets more accurately, in less time, and at a greater standoff distance. The XM157 consists of a 1-8x magnification direct view optic, ballistic calculator, atmospheric sensor suite, and a laser range finder. Combining these features with an in-scope digital overlay produces an adjusted aim-point for the Soldier within the field of view. The system also includes the Army's Intra-Soldier Wireless capability which will enable it to share data with other ISW enabled equipment. The XM 157 currently functions with a thermal optic mounted in front of the XM 157.

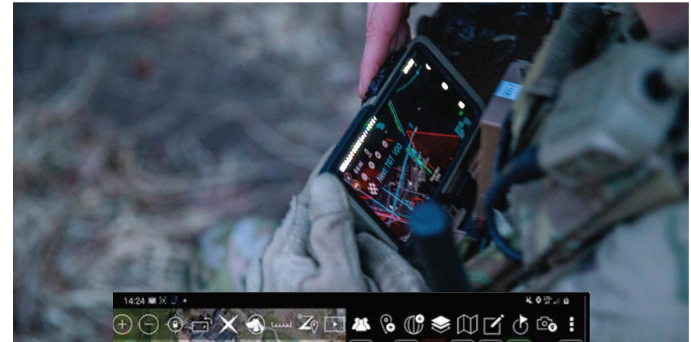
While the XM157 was designed to be integrated on the XM7 and XM250, its ballistic calculator gives it the flexibility to be able to be used with the M4A1 and M110A1 which are already in the Army inventory.



Thermal Optic

Soldier Borne Mission Command Software provides dismounted combat Soldiers with battlefield visibility through command, control, communications and information sharing at the Soldier level. The software supports Soldiers' Situational Awareness (SA) solutions and Lethality by displaying Soldier and leader positions on a digital georeferenced map system to provide a battlefield Common Operating Picture (COP), intelligence on surrounding land formations, navigation in a tactical environment, Robotics Command and Control, and communications from the tactical environment to Headquarters and mobile command locations.

Mission Command Software also includes Army required messaging, robust location services, robotic control, and enhanced security features. Mission Command Software also includes planning features that provides the capability for users to generate, manage, assemble and process mission data that would include Unit Task Organizations (UTOs), which are files containing role-specific information used primarily for message addressing; digital maps and imagery; and mission-specific information such as orders and reference files (e.g., technical manuals, quick reference cards).

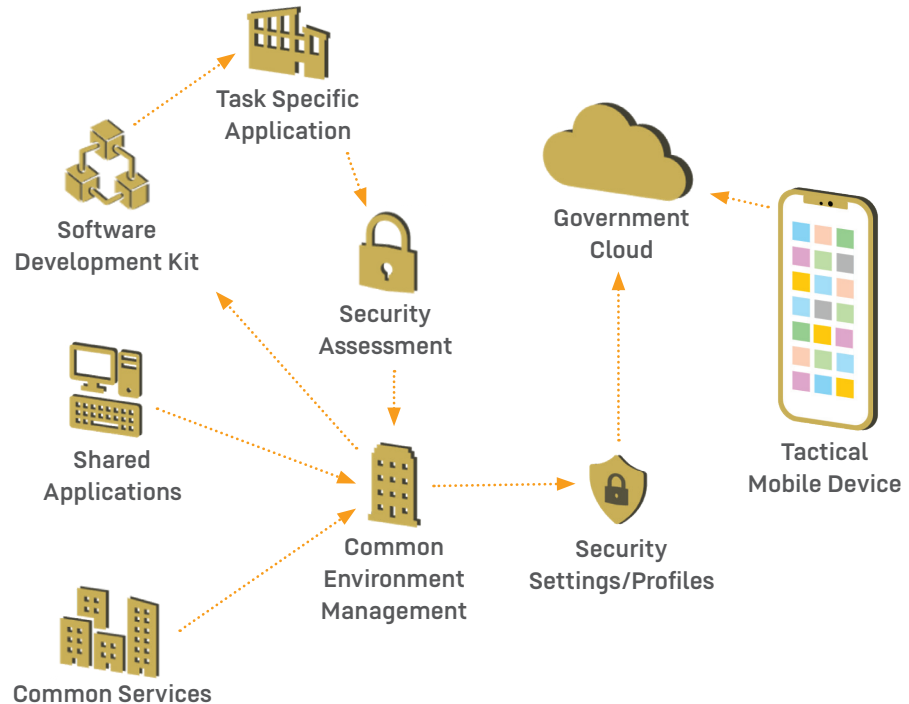


US Army Tactical Awareness Kit (TAK) view of Dismounted Soldier Borne Mission Command of local Situational Awareness and integrated Uncrewed Aerial Vehicle video data

Proliferation of commercial handheld devices (cellphones) for use in tactical scenarios requires the capability reduce the number of different devices carried by Soldiers. A common computing environment provides a singular operating system, common applications and services, software development kits, and security profiles.

The computing environment is managed by a single organization which is responsible for establishing and maintaining the security profile. This requires outside applications to undergo security assessments. These will identify any risks introduced to the system or inherent to the hosted application.

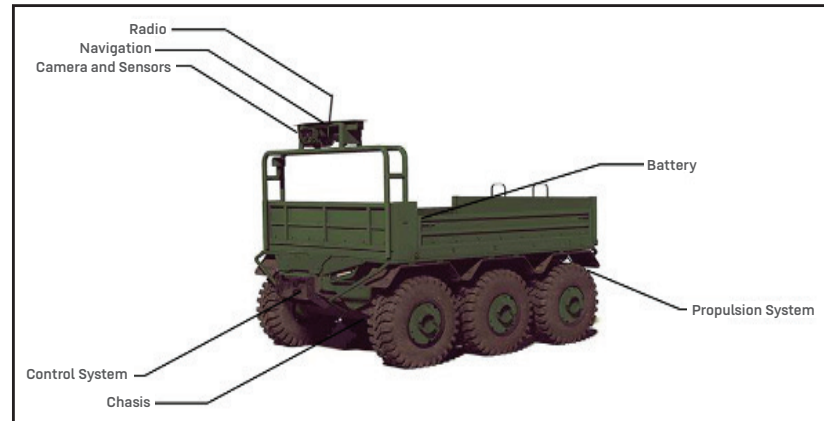
Management of the devices can be performed either through a direct wired connection (classified devices) or over a wireless network (unclassified devices).



Unmanned systems, also known as Unmanned Vehicles (UxV), are remotely controlled or autonomous systems that can operate in various environments, including air, land, and water. The technology behind UxV systems is complex and involves multiple components and systems.

Ground UxV (UGV):

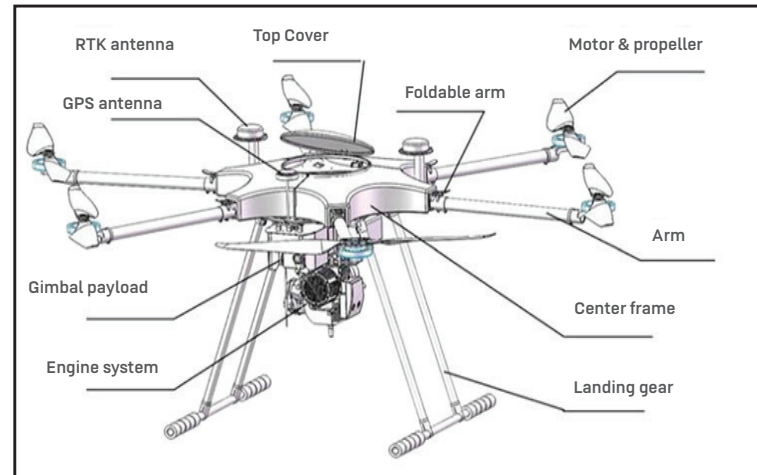
- 1. Chassis:** The physical structure of the UGV, including the frame, wheels, and suspension.
- 2. Propulsion System:** The system that powers the UGV, including engines, motors, and transmission systems.
- 3. Control System:** The system that controls the UGV's movement, including steering, acceleration, and braking systems.
- 4. Sensors:** The systems that provide data to the UGV, including cameras, lidar, radar, and other sensors.
- 5. Navigation System:** The system that enables the UGV to navigate, including GPS, inertial measurement units, and mapping systems.



Unmanned systems, also known as Unmanned Vehicles (UxV), are remotely controlled or autonomous systems that can operate in various environments, including air, land, and water. The technology behind UxV systems is complex and involves multiple components and systems.

Airborne UxV (UAV):

- 1. Airframe:** The physical structure of the UAV, including the wings, fuselage, and control surfaces.
- 2. Propulsion System:** The system that powers the UAV, including engines, motors, and propellers.
- 3. Avionics:** The electronic systems that control the UAV's flight, including autopilot systems, navigation systems, and communication systems.
- 4. Sensors:** The systems that provide data to the UAV, including cameras, radar, lidar, and other sensors.
- 5. Flight Control System:** The system that controls the UAV's flight, including autopilot systems, flight control computers, and actuation systems.



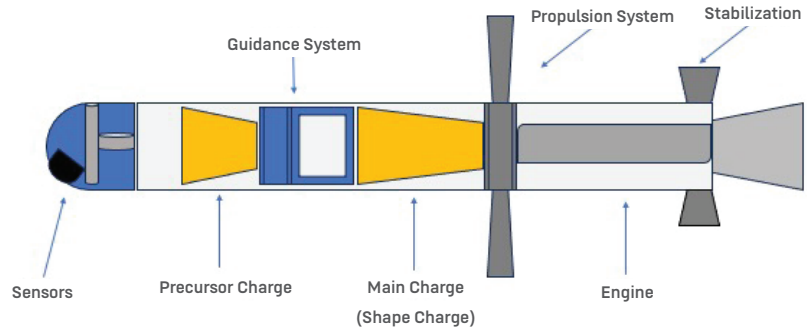
Common control of UxVs is achieved by leveraging:

- 1. Tactical Awareness Kit (TAK) UAS Tool Application:** A software application that provides situational awareness, mission planning, and control for UAS and UGV systems.
- 2. Modular Radio:** A modular, software-defined radio that enables communication with various systems, including UAS, UGV, and other tactical networks.
- 3. Power Management:** A power management system that ensures reliable and efficient power distribution to the controller's components.
- 4. Assured PNT (Positioning, Navigation, and Timing):** A system that provides accurate and reliable PNT data, even in GPS-denied environments, using alternative sources.
- 5. Edge Processing:** A processing unit that enables real-time processing of sensor data, including Automatic Target Recognition (ATR), at the edge of the network, reducing latency and improving system responsiveness.
- 6. Mission Planning:** A software component that plans and optimizes missions for UAS and UGV systems, considering factors such as terrain, weather, and system capabilities.
- 7. RAS-A (Robotic and Autonomous System—Air) Protocol:** A protocol that enables communication with UAS systems, providing command and control, telemetry, and sensor data exchange.
- 8. RAS-G (Robotics and Autonomous Systems—Ground) Protocol:** A protocol that enables communication with UGV systems, providing command and control, telemetry, and sensor data exchange.



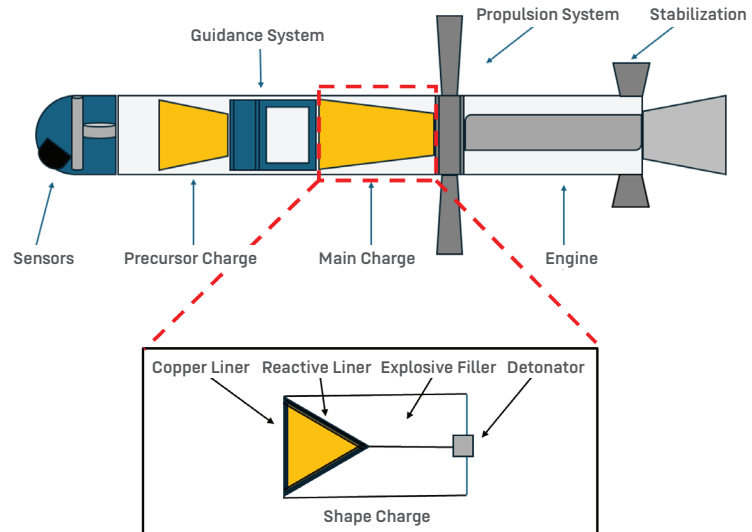
Anti Tank or Armor Munition

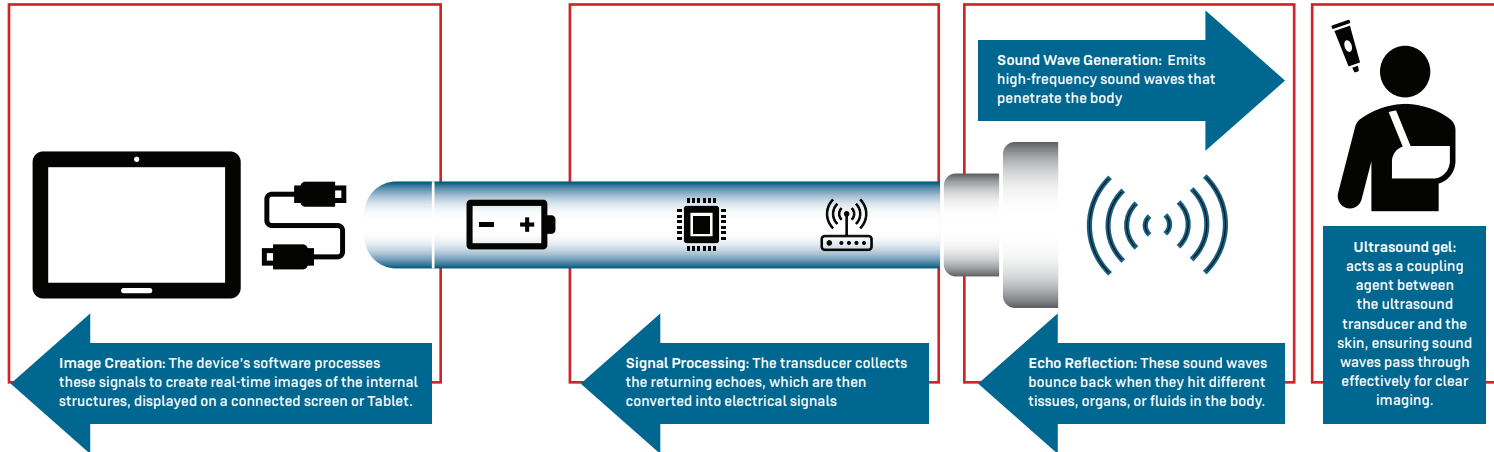
1. **Stabilization:** System responsible for maintaining the shape charge's stability and orientation.
2. **Propulsion System:** System that propels the shape charge to its target.
3. **Guidance System:** System that guides the shape charge to its target, ensuring accuracy and precision.
4. **Precursor Charge:** A smaller charge that precedes the main charge, often used to disrupt or weaken the target.
5. **Sensors:** Devices that detect and gather information about the target, helping to optimize the shape charge's performance.
6. **Main Charge:** The primary explosive charge that delivers most of the the shape charge's destructive power.
7. **Engine:** The power source that drives the shape charge's propulsion system.



Shape Charge

- 1. Detonation:** The shape charge is detonated, releasing a large amount of energy.
- 2. Formation of Jet:** The explosive energy creates a narrow, high-velocity jet of molten metal, typically copper or other dense materials.
- 3. Penetration:** The jet penetrates the armor, using its kinetic energy to overcome the armor's resistance.
- 4. Armor Interaction:** The jet interacts with the armor, causing it to deform and create a hole.
- 5. Cavity Formation:** The jet creates a cavity in the armor, allowing the shape charge to penetrate deeper.

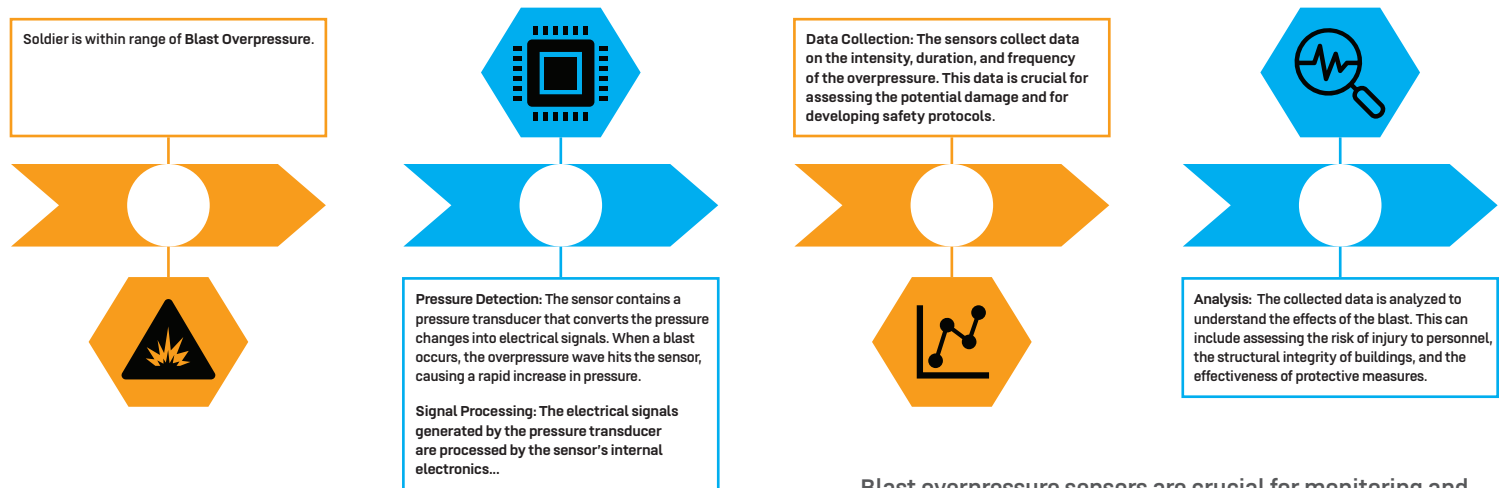




Portable ultrasounds, often referred to as Point-of-Care Ultrasound (POCUS), are game-changers for combat medics on the battlefield. Here's how they help:

- 1. Rapid Diagnosis:** Quick assessment of internal injuries (internal bleeding, fractures, etc.) prior to transport.
- 2. Guiding Interventions:** Informs life-saving procedures like needle decompression for pneumothorax or vascular access for fluid resuscitation.
- 3. Triage and Evacuation Decisions:** Imaging support to for diagnosis of challenging conditions; MEDEVAC and stabilization decisions informed by real-time imaging.
- 4. Portability:** Lightweight imaging capabilities supporting Role 1 and 2 medical care.

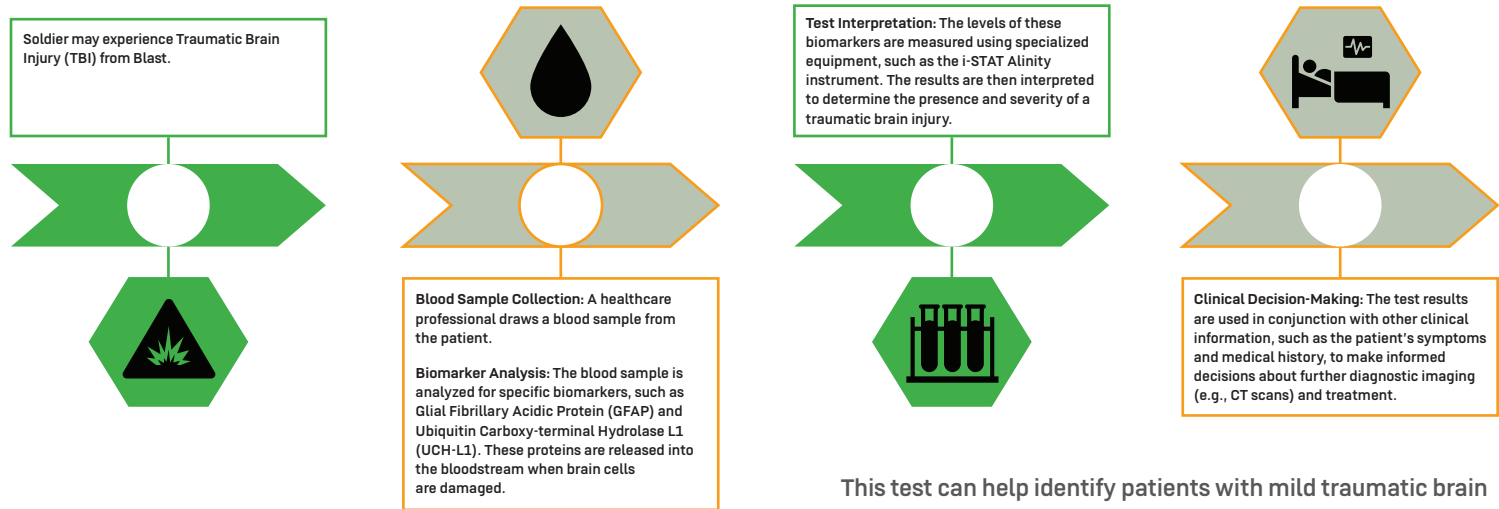
A blast overpressure sensor works by detecting and measuring the rapid changes in pressure caused by an explosive blast. Here's a simplified breakdown of how it functions:



Blast overpressure sensors are crucial for monitoring and documenting exposure to explosive blasts, which can cause traumatic brain injuries and other serious health issues.

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The Traumatic Brain Injury (TBI) biomarker test typically involves a blood sample to measure specific proteins associated with brain injury. Here's a general overview of the process:

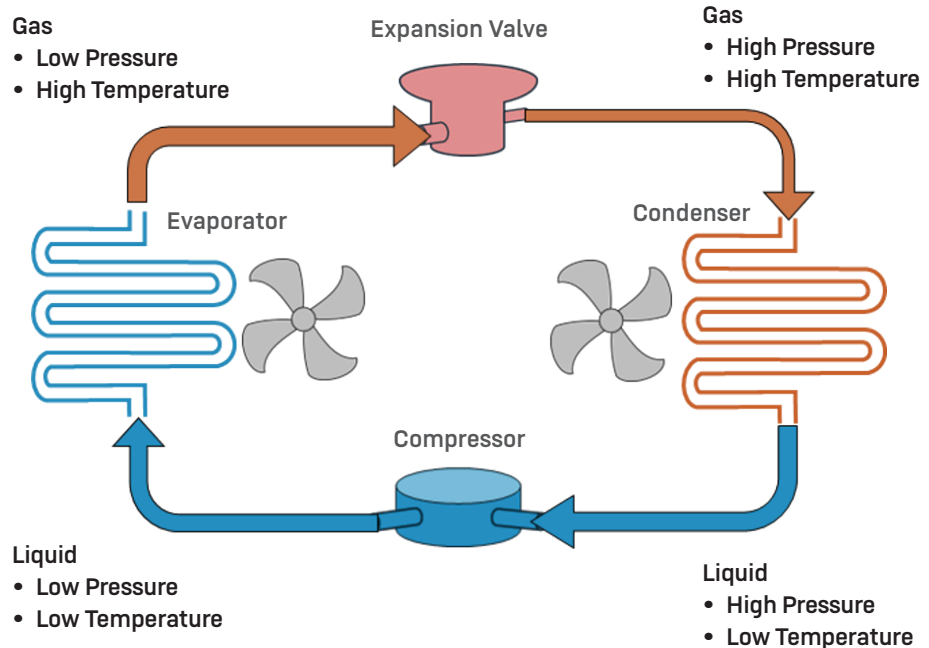


This test can help identify patients with mild traumatic brain injuries and guide appropriate medical care.

The refrigeration process involves the movement of a cooling medium through the system. This movement is controlled using onboard processing capabilities to monitor temperature levels and activation of the compressor and fan(s).

When operated, temperature sensors are monitored by onboard processors to control activation of the compressor to maintain programmed temperature.

For use in tactical environments and from battery sources, field refrigeration systems will vary compressor and evaporator speeds to maximize efficiency and run time.





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