Polaris
Sensor Technologies, Inc.

See More. Know More.®

Custom Sensor Solutions

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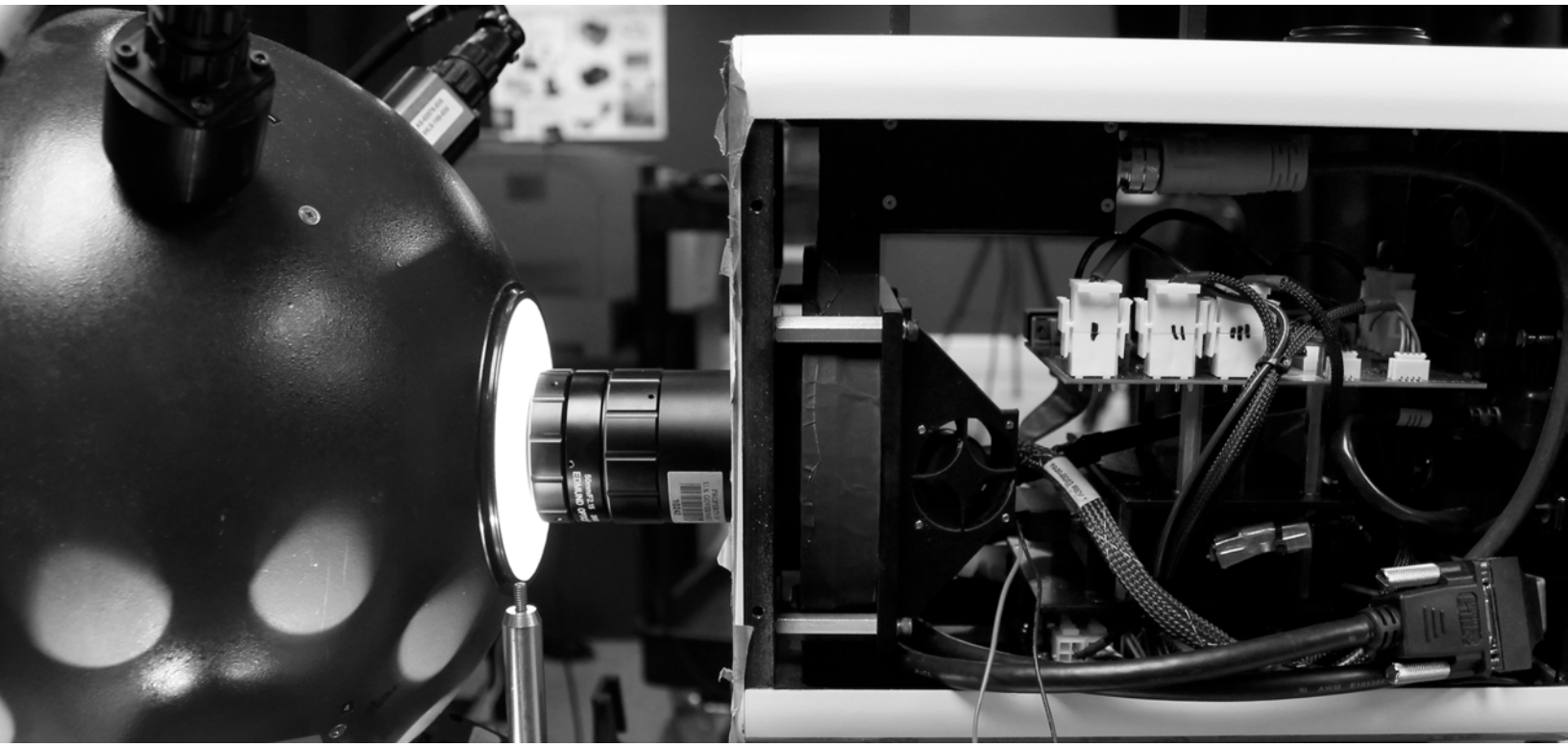
WHERE WE OPERATE

defense & security • oil & diesel on water • transportation automation



WHAT CAN POLARIS BUILD FOR YOU?

Research and Development

- Custom electro optic sensors
- Polarimeters and multispectral sensors
- Architectures optimized for the application
- Expertise in VIS, NIR, SWIR, MWIR, LWIR
- Unique optical relays, telescopes and micro optics
- Rapid prototyping
- Limited runs of production

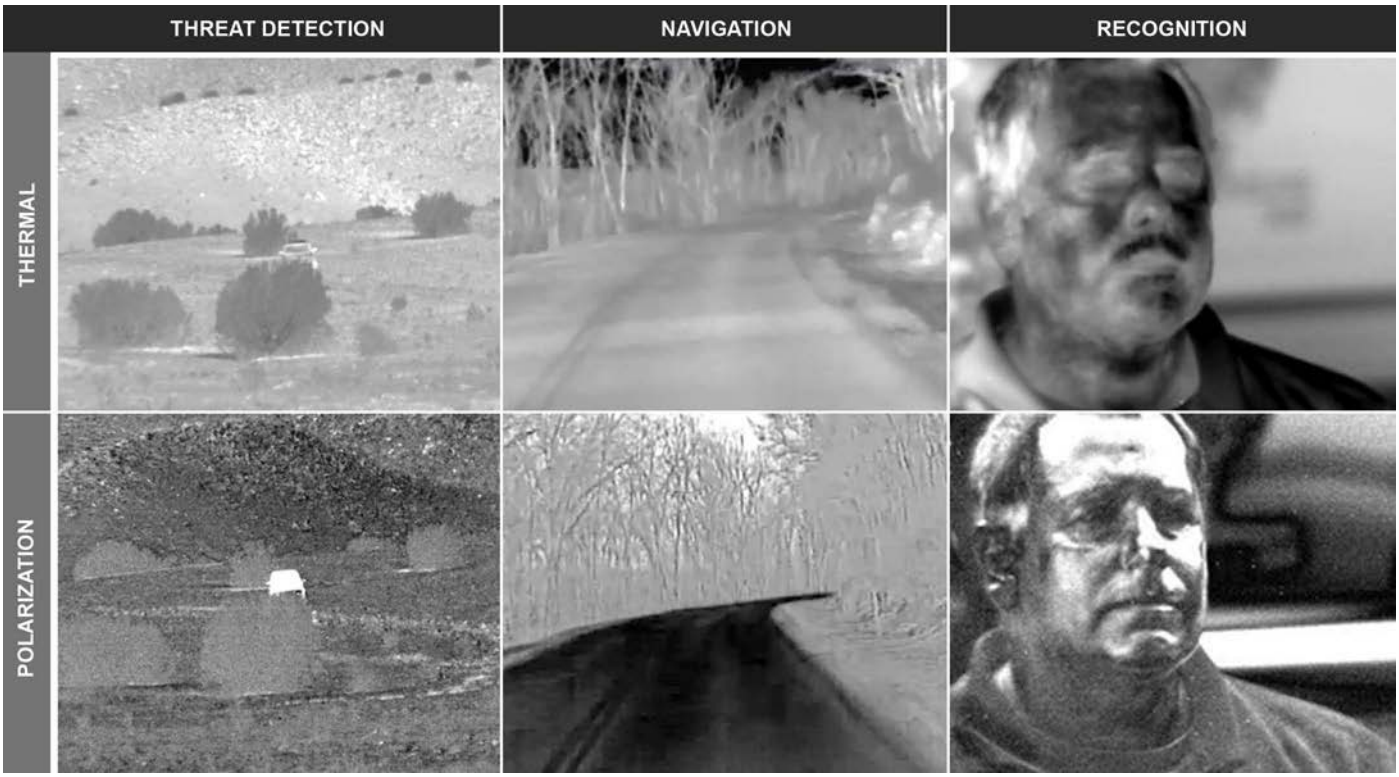
Testing and Measurements

- Polarimetric: Muller matrix and Stokes vectors
- Multiple modalities and flexible spectral resolution
- Radiometric: optical power and direct/diffuse measurements across multiple modalities
- Field and flight test support
- Custom data acquisition and collaboration is available

Algorithm Development

- Multi object detection, recognition, and tracking
- Low signal to noise acquisition and tracking
- Vehicle and pedestrian collision avoidance
- Orbital debris detection in ground based sensor imagery
- Processing of satellite imagery
- Multiple modalities fusion algorithms
- Multiple data products from sensors

POLARIZATION IS BETTER THAN THERMAL



The power of polarization is a property of light that offers more information than the traditional intensity sensing. By measuring one or more parameters of polarization, details can be extracted from a scene that is not readily apparent when using conventional thermal or visible imagers. The polarization signature of man-made objects and certain natural substances are different than the surrounding background, thus providing additional contrast in polarization imagery when compared to standard thermal or visible imagery. For this reason, objects which blend in to the background when using standard thermal or visible cameras often stand out in polarization.

For more than 13 years, Polaris Sensor Technologies, Inc. has been the industry‘s leading designer and developer of polarization-based imaging systems providing daylight detail in the dark as well as visibility in low contrast conditions for military and scientific entities. These systems have provided vast improvements in mission critical target detection and surveillance for the military war fighter. Commercial applications for these systems include, but are not limited to, autonomous vehicle navigation, facial recognition, and oil on water detection. Throughout its history Polaris has developed a large variety of polarization sensors to meet a wide range of applications, including laboratory and field research to vehicle mounted sensing for commercial and defense uses.

Polarimetric Imagers

LWIR

Corvus

Ursa MCT

Pyxis®

Ursa VOx

Vela

Ursa Minor

MWIR

Indus

Indus Pyxis® MSIP

SWIR

Pyxis®

Corvus

VIS

Ursa High Speed

Ursa High Res

Lyra

Indus

Ursa

Multispectral

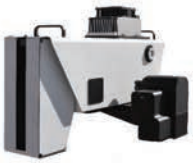
Ursa MWIR/LWIR

Corvus VIS/NIR

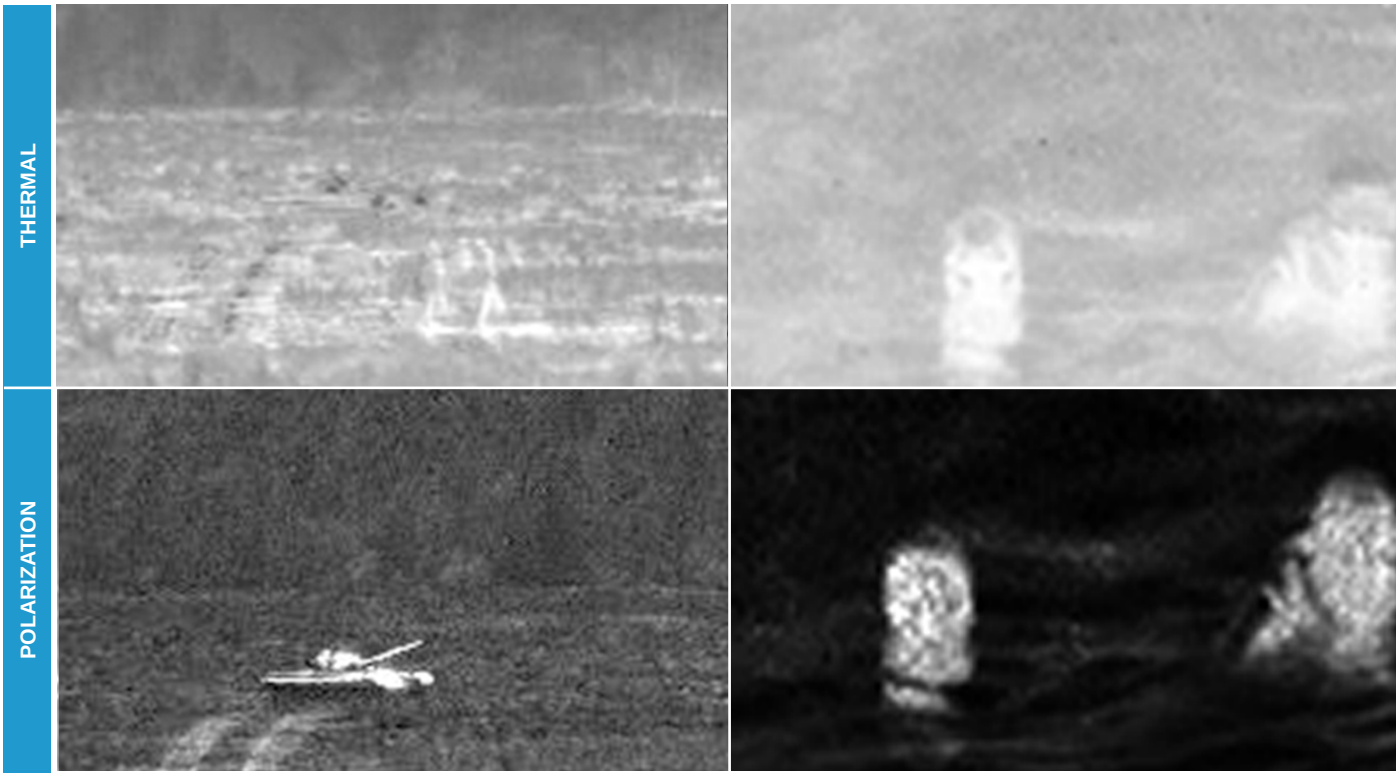
Corvus SWIR/MWIR

Hyperspectral

Indus


Corvus

POLARIZATION REVEALS TARGETS



Tank (left) and swimmers in neoprene hoods (right) are hard to spot in thermal imagery, but are easily revealed with polarization.

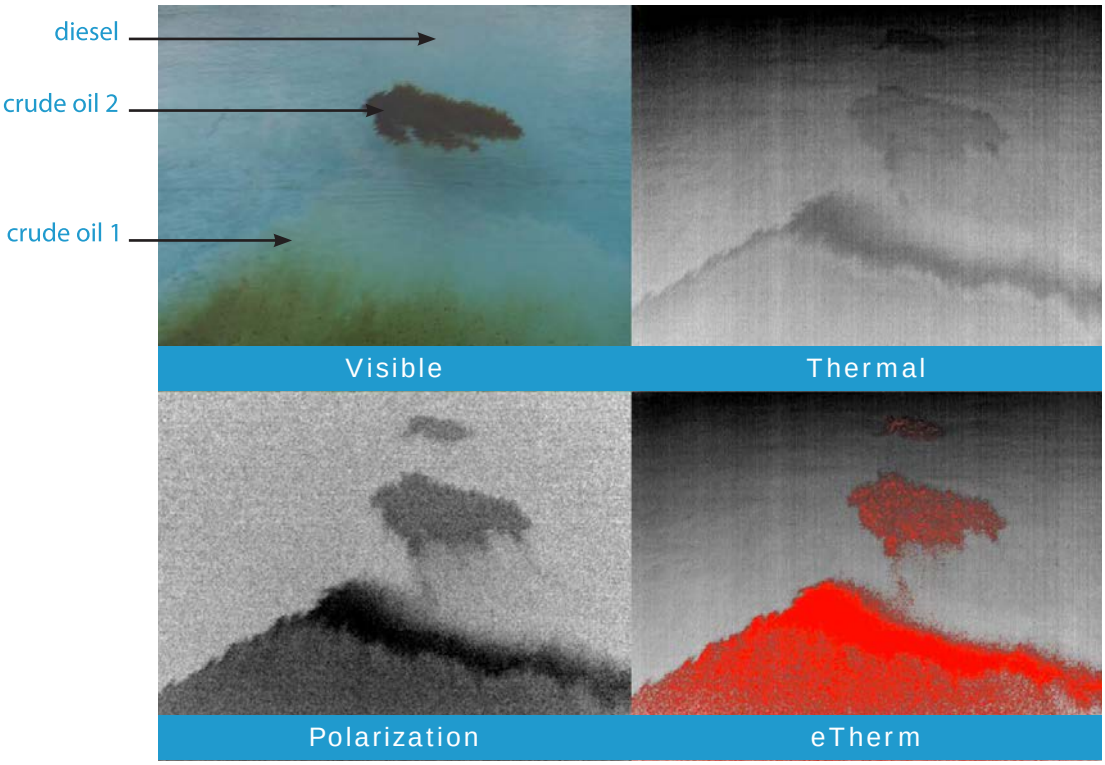
Our primary focus for the defense and security sector is detecting man-made threats in natural clutter. These threats may be ground vehicles such as tanks and armored personnel carriers; maritime vessels including ships, submersibles and go-fast boats; airborne targets such as UAVs, missiles and projectiles, and other man-made objects such as improvised devices and roadway obstacles. While detecting vehicles and missiles primarily appeals to the defense markets, man-made object detection and classification is an important capability for the commercial security sector.

The Benefits of Polarization for Seep and Leak Detection

- Up to 400% better identification of oil on water than thermal with no false alarms
- Suitable for automated continuous monitoring, detection, and alarm
- Distinguishes oil from seaweed and other debris
- Works in both daylight and dark
- Mitigates spectrally reflected light
- Saves money by reducing man power needed to detect oil on water

Oil & Diesel on Water

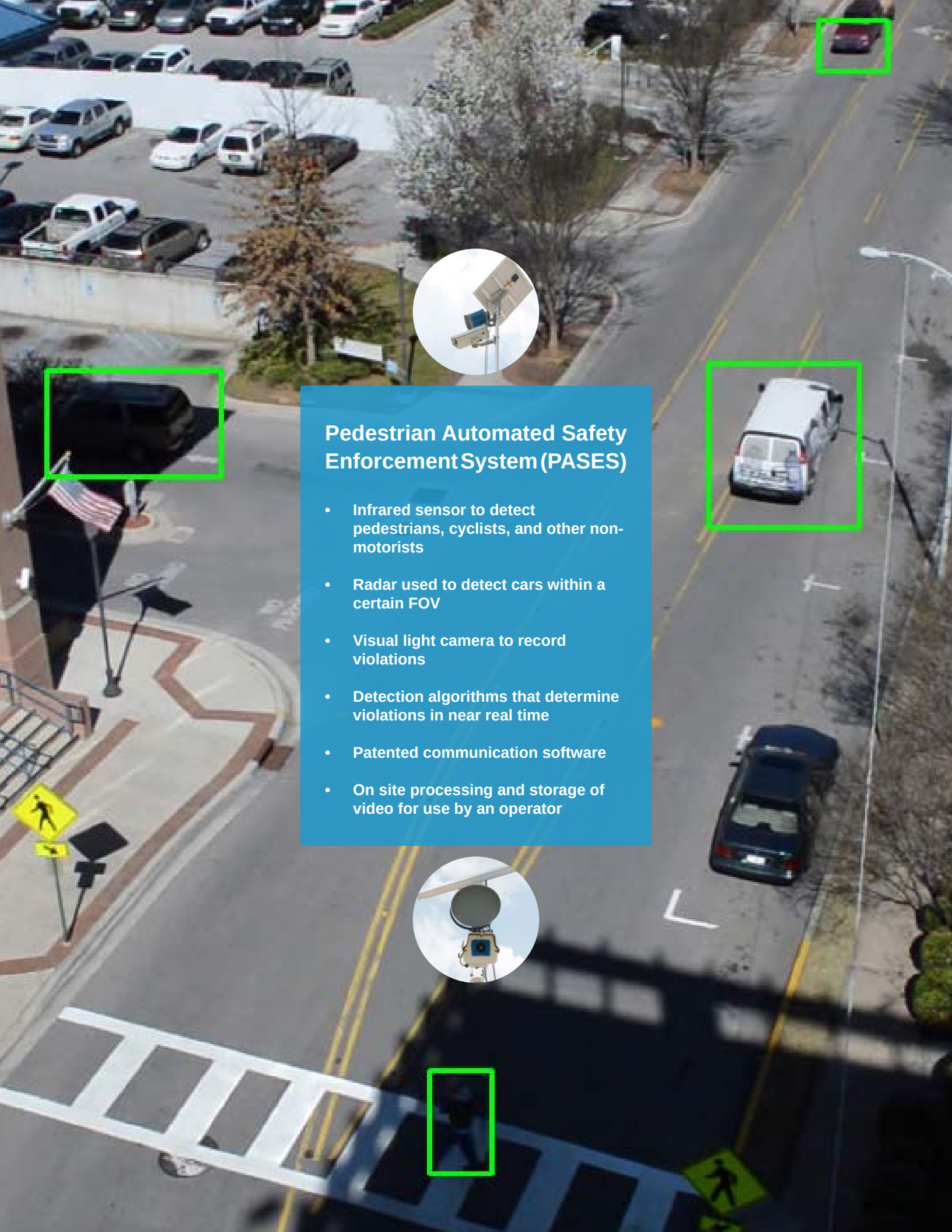
400% GREATER DETECTION THAN THERMAL



The oil and gas industries are plagued by the inability to accurately discriminate between oil, diesel, vegetation, sea kelp, and sun glint on water, because thermal and infrared sensors are limited. However, Pyxis® can distinguish between oil or diesel on water up to 400% better than standard thermal, while seepage can be detected up to a kilometer away.

Pyxis is the industry's lowest SWaP-C polarization sensing thermal camera. Our software experts have developed a polarization enhancement called eTherm® to filter through the data and identify critical data. Oil on water can be distinguished from vegetation, sea kelp, and sun glint and colorized for greater clarity.

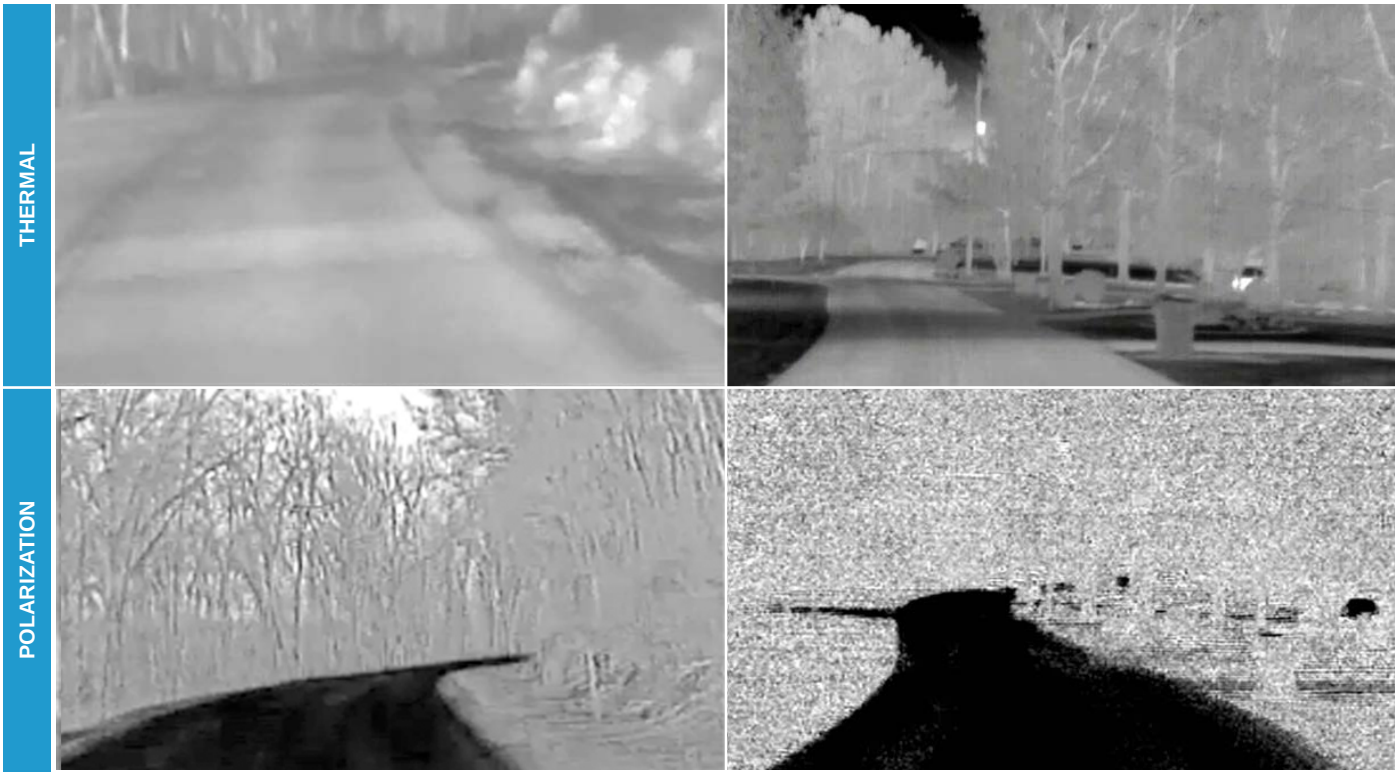
PYXIS MOUNTING OPTIONS
drone • handheld • oil rig



Pedestrian Automated Safety Enforcement System (PASES)

- Infrared sensor to detect pedestrians, cyclists, and other non-motorists
- Radar used to detect cars within a certain FOV
- Visual light camera to record violations
- Detection algorithms that determine violations in near real time
- Patented communication software
- On site processing and storage of video for use by an operator

IMPROVED AUTONOMOUS NAVIGATION



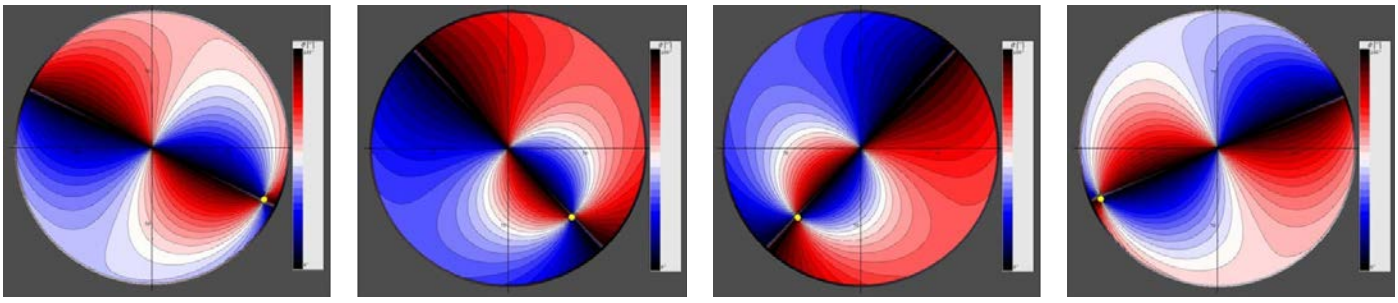
Autonomous vehicle navigation is an emerging technology that is forecast to radically change the automobile market within the next 20-30 years. The ability to reliable sense and recognize roadways and hazards has been a limiting factor in the adoption of this technology. Traditional visible cameras have difficulty in low light, bad weather, and shadows. Traditional thermal cameras rely on temperature difference for detection, and can fail to detect objects which are at the same temperature as the background of the scene. Polarization offers the added ability to sense reliably in a variety of operating conditions where standard visible and thermal cameras fail.

As shown above with Pyxis, the road is clearly defined regardless of shadow or illumination, during both night and day operation. Using Pyxis for reliable detection of the roadway provides the vehicle's vision system with strong and consistent contrast relative to the surroundings. This helps the autonomous vehicle arrive safely at its destination.

Features and Benefits

- Preliminary spec: 1-2 mil heading accuracy
- Calculates absolute heading
- Works even when GPS is denied
- Low SWaP-C
- Low cost
- No start-up delay
- No set-up or leveling
- Not affected by magnetic disturbances
- Driftless
- Spoofproof

HEADING IN GPS DENIED ENVIRONMENTS



8:00 10:00 15:00 17:10

Sky polarization is an upper atmosphere phenomenon observable from any point on earth or from any aerial platform. In the diagram above, the time of day is shown at the bottom of each polarization map, the sun is shown as a small, yellow disc, and the center of each plot is the zenith. Using advanced algorithms and optics, SkyPASS is able to detect and decipher the polarization map of the sky to compute highly accurate heading.

Localization is critical for autonomous vehicles, sea transport guidance, air transport guidance, and present day military missions. The most important components of localization are global position (latitude, longitude), and heading.

When the Global Position System (GPS) is denied or spoofed, current navigational devices can become highly inaccurate. Without reliable GPS an Inertial Measurement Unit (IMU) heading estimate will drift, accumulate error, and degrade the position over time. Systems designed to address shortcomings in the precision of GPS data require additional fixed position hardware including transmitters, receivers, and base stations which are still susceptible to GPS denial, and aren't always practical given the need to distribute the hardware within the area of operation.

SkyPASS™ provides heading within a fraction of a degree and is not affected by magnetic disturbances. SkyPASS is configured to use sky polarizationton, during sunrise to sunset or even when the sun is blocked by clouds, in order to determine an accurate heading.

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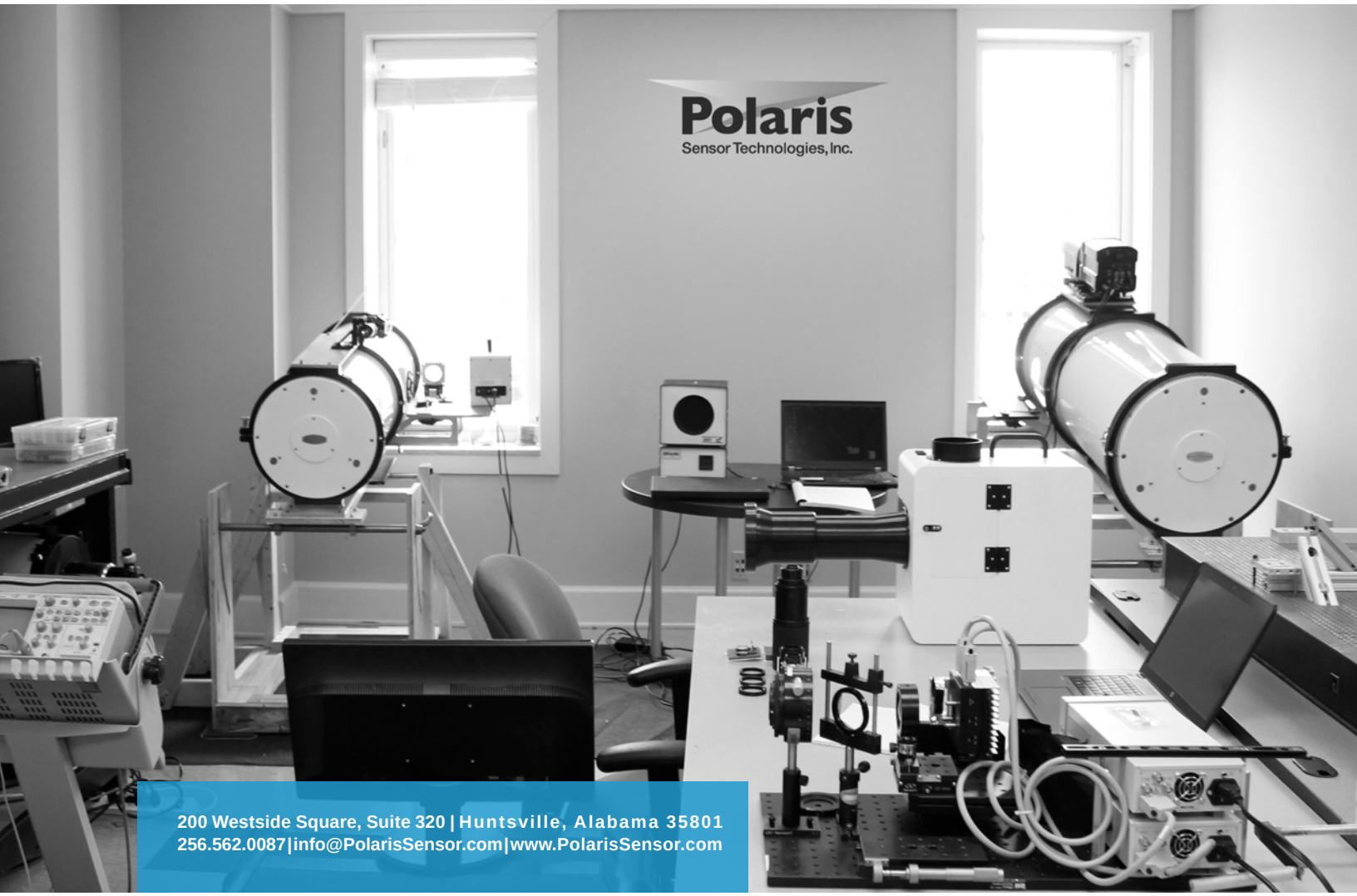

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About Polaris Sensor Technologies, Inc.

Polaris Sensor Technologies, Inc. is a dynamic commercial and prime government supplier providing innovative designs, unique products, and state-of-the-art analyses of optical systems. We have a team of optical experts who have extensive experience in designing high-performance optical systems. Our portfolio includes polarization-based imaging systems, sensors, seekers, light scattering modeling, and measurement services. Located in Huntsville, Alabama, our engineering facility features an extensive laboratory. Holding many national and international patents, Polaris creates custom hardware and unique software solutions providing our customers with the ability to meet mission objectives.

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