Allied Vision
a TKH Vision brand

// WHITEPAPER

Choosing the right Vision Technology for Defense Applications

Advanced camera technology for defense applications: Reliability and Security

In no other industry the reliability and security of machine vision systems do play a more pivotal role than in the sensitive landscape of defense technology. Operational capabilities and mission success highly depend on the quality and stability of the technologies used. Each application has its specific requirements and demands different technical solutions. Depending on the task, various technologies are suitable. This whitepaper takes a closer look at project examples of the following applications:

- // Drone Navigation
- // Disaster Response with Drones
- // Aircraft Collision Avoidance
- // Long Distance Detection on board of military vehicles
- // Runway Condition Assessment for Airports
- // Unmanned Surface Vehicle (USV) for offshore mission
- // Counterattack against aerial assault
- // Border Control
- // System Performance
- // Quality Inspection of ammunition

Drone Navigation

In GPS/GNSS-denied environments, AI-based navigating plays a crucial role in ensuring precise and reliable drone operation. Low-latency cameras, integrated into multi-sensor fusion systems, support navigation by complementing Inertial Measurement Units (IMU) and Inertial Navigation Systems (INS). By leveraging low-latency, high-resolution image processing, AI-driven systems can detect and respond to obstacles in real time, enabling safe and efficient navigation in complex environments.

Customers with similar projects and requirements purchased this:

// Compact Alvium cameras with MIPI CSI-2 interface

- ☑ Available with FPD-Link III and GMSL2 interface for highspeed data transmission (up to 6,0 Gbit/s)
- ☑ Acquisition of high-resolution (up to 20 MP) images with low latency
- ☑ Robust, shock and vibration resistant with rugged Coax cables + FAKRA connector or HSD connector + STP (Shielded Twisted Pair) cables
- ☑ Small size and low weight, bareboard variants available, ideal for embedded systems e.g. drones

Disaster Response with Drones

An automated reconnaissance system delivers real-time aerial data and images to a ground-based platform. This enables disaster response teams to quickly and accurately assess the situation, identify affected areas, and prioritize their actions. Additionally, the system can support long-term environmental monitoring, providing valuable insights into the impact of disasters and the effectiveness of response efforts.

Customers with similar projects and requirements purchased this:

// Flexible Alvium G1 cameras with GigE Vision interface

- ☑ Up to 20 MP resolution
- ☑ Industrial-grade hardware in a compact format (41 mm × 29 mm × 29 mm, closed housing)
- ☑ On-board ISP functionality: Advanced image corrections and optimization features onboard

Aircraft Collision Avoidance

Low-latency cameras featuring a multi-camera setup on board of vehicles and aircraft. By providing high-resolution camera streams, the system enables real-time surround view for situational awareness. This is particularly critical for aviation, where helicopters and airplanes operate in complex environments with potential obstacles. Advanced collision avoidance technology enhances safety by detecting and mitigating risks in low-altitude flights, ensuring secure navigation even in challenging conditions.

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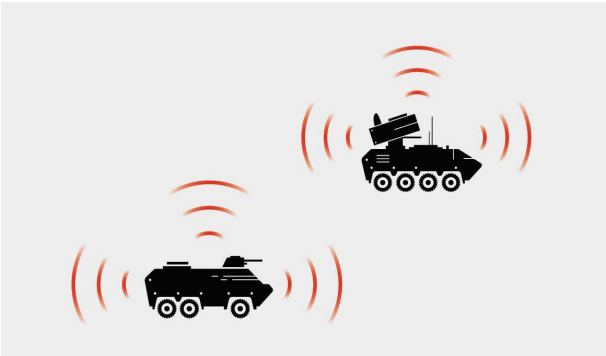
Long Distance Detection on board of military vehicles

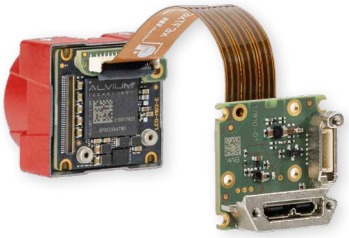
Multi-camera setup on board of military vehicle providing a comprehensive view of the surroundings, allowing military personnel to monitor and respond to potential threats from multiple angles.



Customers with similar projects and requirements purchased this:

// Customized board level Alvium camera with MIPI CSI-2 interface

- ☑ Compact industrial-grade hardware with rugged connectors
- ☑ On-board ISP functionality: Advanced image corrections and optimization features for optimal light exposure
- ☑ Image acquisition with low latency



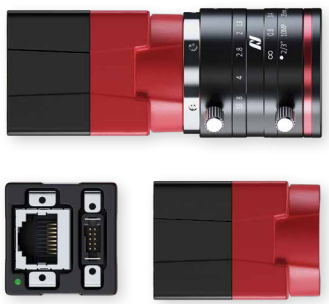
Runway Condition Assessment for Airports

Cameras sensitive in the short-wave infrared spectrum support ice detection. Multiple cameras on board of a service car allow airport personnel to quickly and accurately assess the condition of the runway and take necessary action to ensure safe takeoff and landing operations.

Customers with similar projects and requirements purchased this:

// Flexible Alvium G1 cameras sensitive from visible to short-wave infrared light

- ☑ Detecting ice, water and other liquids
- ☑ Single camera to capture images in both the visible and SWIR spectra
- ☑ Small size for easy integration into service vehicles and robot arms
- ☑ Industrial-grade housing made for extended temperature range from -20°C to +65°C



Unmanned Surface Vehicle (USV) for offshore mission

360° view for offshore maneuvering, generated by an advanced software, which stitches together the video feeds from multiple cameras to create a seamless and panoramic view of the surroundings.

Customers with similar projects and requirements purchased this:

// Compact Alvium cameras with MIPI CSI-2 interface

- ☑ Various features for synchronization and triggering of multiple cameras
- ☑ Image processing and optimization features for high-quality images and easy stitching
- ☑ Robust, shock and vibration resistant with rugged Coax cables + FAKRA connector or HSD connector + STP (Shielded Twisted Pair) cables

Counterattack against aerial assault

High-resolution cameras allow for rapid and accurate detection, even in complex and dynamic environments. The camera's onboard processing enables real-time tracking and prediction of target trajectories, providing air defense systems with the critical information needed to neutralize threats.

Customers with similar projects and requirements purchased this:

// EXO GigE camera

- ☑ Ensuring stable broadcast-safe transmission even under high network loads
- ☑ High-resolution with up to 12.3 MP resolution and up to 120 MB/s data rate
- ☑ Camera powered over Ethernet for single-cable setups

Border Control

SWIR cameras can penetrate fog, haze, and other atmospheric obscurants, allowing it to maintain situational awareness and detect potential threats even in adverse weather conditions. This makes it an invaluable asset for border security personnel, who rely on accurate and timely information to make critical decisions and respond to emerging situations.

Customers with similar projects and requirements purchased this:

// High-performance Goldeye SWIR cameras

- ☑ Reliable, high-quality SWIR imaging
- ☑ High quantum efficiency due to strong sensor cooling (TEC1, TEC2,)
- ☑ Ideal for low-light conditions, fog, haze, dust etc.

System Performance

High speed recording unit shows the blast of thermal shield in missile nose cone in slow motion. The recording provides engineers and researchers with a unique opportunity to study the behavior of the system in detail. The high-speed camera captures every aspect of the event, from the initial ignition of the thermal shield to the subsequent expansion of the gases and the impact on the surrounding structure.

Customers with similar projects and requirements purchased this:

// MotionBLITZ CVR High-Speed Recording System

- ☑ Recordings of up to 12 seconds at full speed of 560 fps possible
- ☑ High-quality images for precise slow motion analyses

Quality Inspection of ammunition

High Speed cameras enable a fast and reliable inspection of ammunition during production process. High-speed images of ammunition components, such as projectiles, casings, and propellants, allowing to detect even the smallest defects or irregularities. This level of detail is critical in ensuring that ammunition functions properly and safely, and that it meets the required specifications and standards.

Customers with similar projects and requirements purchased this:

// High-speed camera FXO

- ☑ 671 frames per second at 1.8 MP resolution
- ☑ Reliable fast CoaXPress-12 interface
- ☑ Outstanding properties in terms of trigger latency and constant data rate

A reliable Partner

In the high-stakes world of defense, the choice of supplier is not just a matter of logistics - it's a matter of trust. By choosing the right technology and partnering with a reliable supplier, defense companies can rest assured that their systems will meet the highest standards of excellence, that their operational needs will be met with precision and speed, and that they will have the best possible tools to carry out their missions.

What makes a supplier a reliable partner?

// Cameras and solutions made in Germany

// Meeting Military Standards based on project requirements

// Backed by a secure supply chain

// Strong financial backing by parent company

// Mature Quality Management System

// Reliable product and supply chain to minimize the risk of penalties

// Customizations with professional project management

// Ruggedized and reliable vision systems for extreme outdoor use

// Highest performance across various applications

// Highest performance across various applications

// Committed to your project and your product life cycle

// Early involvement of R&D

Together with the right choice of technology the right partner at your side:

// **Ensures high-quality components and technologies:** Meeting the highest standards of quality and performance, which is essential for reliability in high-stakes environments.

// **Fosters innovation and collaboration:** Enabling defense companies to integrate cutting-edge technologies and respond effectively to evolving threats.

// **Enhances mission success:** The performance of vision systems can directly impact mission success. evolving threats.

// **Ensures personnel safety:** The reliability of vision systems is crucial for ensuring the safety of personnel.

// **Maintains a competitive edge:** A reliable supplier helps defense companies maintain a competitive edge in the industry.

// **Ensures effectiveness of defense capabilities:** A reliable supplier is crucial for ensuring the effectiveness of defense capabilities.

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***Non-Disclosure Statement**

Due to the sensitive nature of our work with defense customers, we maintain strict confidentiality regarding customer identities and project specifics. In the following slides, you will find use cases accompanied by brief application descriptions that intentionally omit any military context. Additionally, while we highlight our vision technology, we do not disclose specific model specifications or requirements to protect proprietary information and ensure compliance with our confidentiality agreements.

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