

Affordable Airborne Security

Advanced IR and Visual Cameras Jointly Mounted on Four Axis Gyro Stabilized Gimbal for Aircraft Operation.



Stabilized Gimbal with smart thermal camera combination

- *Cameras*
- *IR imaging*
- *Visual-SWIR-LWIR*
- *Gimbal*
- *Security*
- *Surveillance*

Xenics, the leading European developer of innovative infrared detection solutions for a wide range of applications, now offers a complete thermal imaging, or optionally an IR thermography, system configured for demanding aerial security and inspection applications. The new Xenics Pumair provides either a highly sensitive, uncooled microbolometer camera suited for long-range

temperature measurements in the LWIR range 8 to 14 μm , or a cooled MWIR camera if thermal imaging is required. Both can be combined with a visual-spectrum, high-definition color camera and mounted on a four-axis, gyro-stabilized gimbal, whose specifications are closely matched to the cameras' performance.

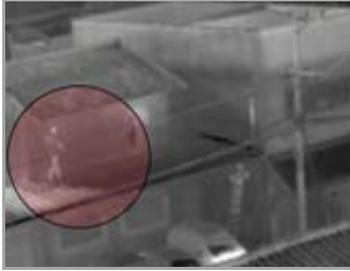


Figure 1: Surveillance_Intruder

Adapting to change

"We are broadening our product portfolio as well as our strategic presence in the world markets, changing from a mainly technology-driven to a fully market-driven approach," says Xenics founder and CEO Bob Grietens. "In addition to our fast growing business in advanced InGaAs SWIR imagers we are entering the markets for uncooled bolometer and cooled InSb / MCT / QWIP detector solutions, building on our strong scientific-based but application-oriented R&D portfolio."

One of the consequences of Xenics' new strategic direction is to extend its advanced camera program to various security applications. Of course, most of the equipment geared to these markets must rigidly conform to military specifications. But Xenics is pursuing a different path, Grietens explains. "We are delivering high-quality, multi-spec commercial systems – almost military-level – to an important and growing subset of the security markets. We are aiming for coast guards and border patrols, police and other authori-

ties, who must operate and source their equipment under severe budget constraints."

Broad range of applications

An interesting application in many countries is aerial inspection of high-voltage power transmission lines – carried out by flying along the lines to be investigated at a distance of about 50 meters and measuring the temperature of any hot spots that may be developing in the connectors. Other fields of use for a robust high-performance dual sensor system, delivering thermal and visual images under widely varying light and weather conditions, are environmental surveys, such as investigating oil spills emanating from pipelines, otherwise hidden cases of water pollution, discovering hot water patches and steam evaporations from industrial facilities, fires developing in critical structures or landfills, etc. – in general: any thermal anomalies that deserve attention from the appropriate authorities.

Covering both short and long range tracking

One of the results of this strategic thinking is the new Pumair system for aerial surveillance and inspection. It is based on a modular, customizable combination of a long-wave (LWIR) thermal infrared camera with an optional thermography capability, plus a visible-spectrum camera. Both cameras are encased in a high-quality, four-

axis, gyro-stabilized gimbal, which can be nose- or side-mounted on a helicopter or a small, slow flying sports plane, depending on the given payload condition.

Affordability is the key word, not highest sophistication. Easy operability and local maintainability. Above all: very good quality and robust design. These considerations, as a whole, Grietens says, bring down the cost of the Pumair gimbal to a fraction of what a user would have to invest in a MIL-Spec gimbal configuration - at comparable results.

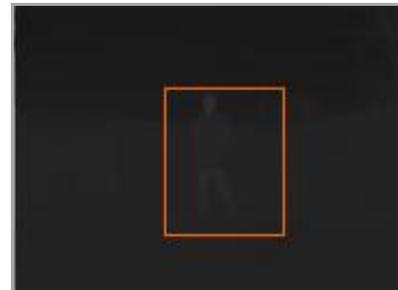


Figure 2: Surveillance visual



Figure 3: Surveillance thermal



Figure 4: Surveillance SWIR

As far as cameras are concerned, there is a broad range of flexible and customizable solutions, ranging from long-wave (LWIR) cameras to short-wave (SWIR) types, as well as long-distance cameras (for target distances of about 2,500 meters) with large detectors and small field of view, or short-range cameras to be operated at distances of a few hundred meters. Penetration of the atmosphere works well with uncooled microbolometer cameras up to about 2,500 meters. Above that, a cooled MWIR camera is advantageous.

Thermal IR camera

One of the obvious choices is the Raven-384, an advanced LWIR microbolometer camera for infrared imaging. It was specifically designed for security tasks in ports, airports, power plants, petrochemical production and storage facilities, as well as strategic infrastructures. The thermal image is crisp, even under difficult weather conditions. The camera operates also in complete darkness without the use of additional illumination. It delivers 384 x 288 pixels on a 25 μm pixel pitch. This yields a 44 percent higher pixel count than with 320 x 240 cameras.

The Raven-384 software delivers excellent images without adjustment. The built-in programmable digital signal processor (DSP) turns it into a smart camera that allows real-time image correction and offers additional image processing algorithms. The camera can be fitted with various lenses for short-range, medium-range and long-range observations. The interface can be PAL/NTSC video for CCTV security networks or Ethernet for digital LANs. Standard delivery includes a common power supply and connecting cables. The integration and use of these infrared cameras are so easy that no operator training is required.



Figure 5: Seeing through smoke visual



Figure 6: Seeing through smoke IR

Flexibility and efficiency

There are several alternatives and standard configurations of the Puma. Next to low-altitude applications with an uncooled FPA thermal camera having a field of view

(FOV) of 30° x 22.6° and a spatial resolution of 1.36 mRad covering the spectrum area 7.4 to 14 μm in combination with an appropriate color camera capturing the visible spectrum.

For medium altitudes there is the combination of a thermal imaging camera with higher resolution of 640 x 480 pixels and a dual FOV of 36° x 28° or 7.6° x 5.7°, and a spatial resolution of 1.0/0.2 mRad. For "tactical altitudes" Xenics recommends a Stirling-cooled InSb/MCT MWIR camera with an array size of 640 x 512 pixels and a dual field of view 50/200 mm lens offering an FOV of 11° x 8.7° or 2.2° x 1.7°. The spectral range extends from 3 to 5 μm , the thermal sensitivity is 20 mK at 30 °C.

All these configurations come standard with a Sony FC IX 11 visual-spectrum camera, equipped with a 1/3" CMOS sensor and a 10x optical zoom lens (50° to 5°) for low light operation down to 1.0 lx

Stable 4-axis, gyro stabilized

Next to the cameras, detectors and lenses used, the gimbal type is one of the most critical components of an aerial surveillance and inspection system. It keeps the camera(s) focused on the object under investigation, independent of the course and position of the aircraft. It is mounted by means of an optional installation kit available for most helicopter brands. The Puma gimbal comes with joystick controls and it interfaces with a monitor, usually a laptop screen, data encoder, video equipment

which are widely commercially available. The gimbal also delivers the proper GPS data to be combined with the video data stream that the system turns out for digital recording and evaluation.

A four-axis gimbal, Grietens says, is optimally suited for this type of aerial surveillance and inspection, when compared to a more costly five-axis system. The gyro-stabilized four-axis gimbal achieves a stabilization of <100 microRad. Two different camera platforms are available: with 300mm or 400mm diameter. This enables the use of both, single and double sensor configurations in almost any size. At 300 mm diameter, the gimbal weighs about 20 kg; the 400 mm version comes in at 30 kg. Power supply is 20-30 VDC/10 A. Gimbal delivery includes the camera turret, a hand control unit and a cable kit. PC analysis software, laser range finder, GPS capability and monitor are optional.



About Xenics

As a leading European-based provider of advanced InGaAs IR solutions, Xenics provides distribution coverage throughout North America, India, Latin America, Africa and Asia, focusing on mass production of high-quality IR cameras in lower price ranges, as well as on smart IR cameras offering advanced functionality and easy integration into customer systems. The company designs, manufactures and sells infrared detectors and cameras, both line-scan and 2-D, covering the wavelength ranges from 0.4 to 14 μm , as well as customized products according to agreed specifications and planning.