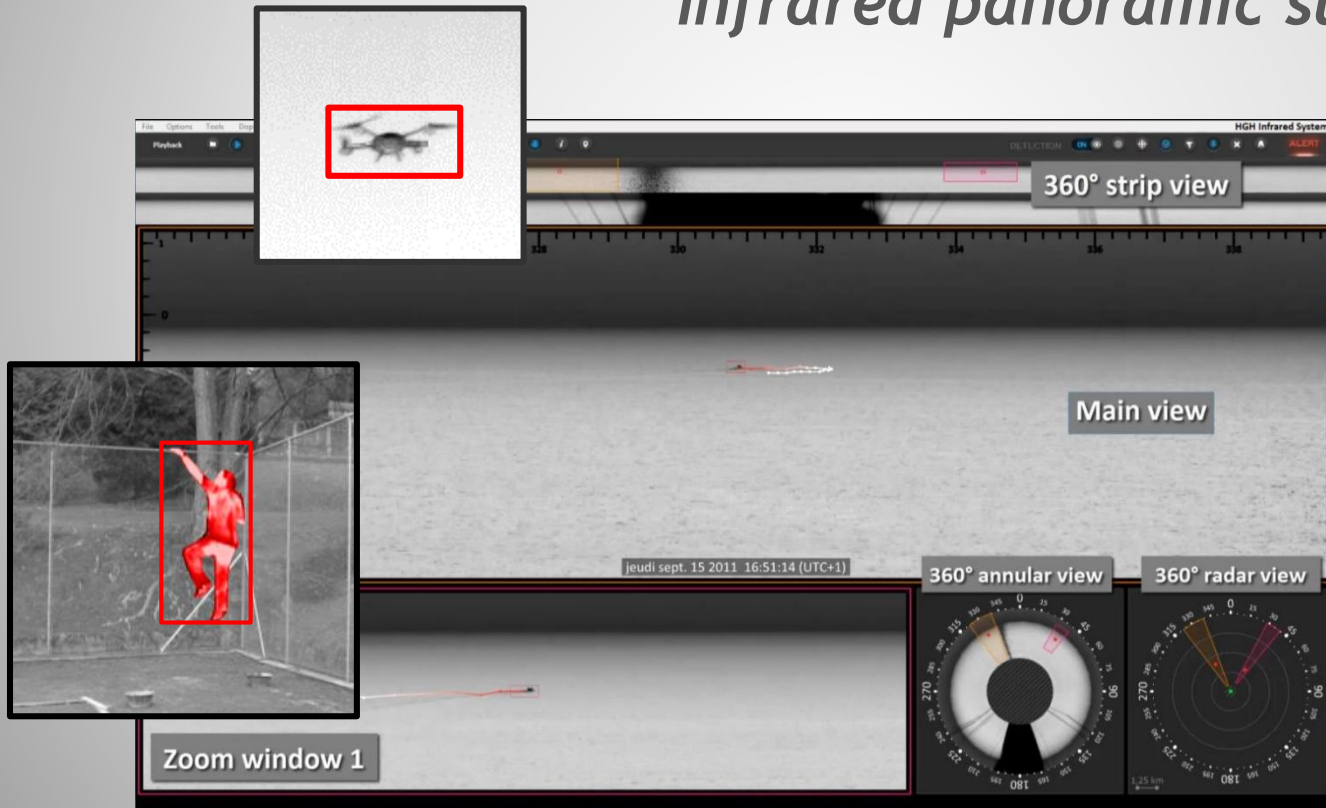


HGH Infrared Systems

Infrared panoramic surveillance

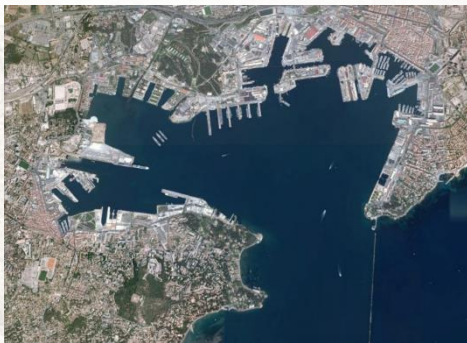


with SPYNEL



Typical challenges for Wide Area Security

- **Maximum coverage with reduced budget.**
- **Early warning before intrusion**
- **Automatic & real time intrusion detection**
- **True Day & Night recognition, even in total darkness.**
- **Tracking & location of multiple intruders for security forces.**





Typical challenges for Wide Area Security

- **Track all types of intrusions:** humans, vehicles, but also approaching swimmers, crawling men, RIBs, skiffs, jet-skis, aircrafts, UAVs
- **Withstand harsh conditions:** heat, cold, wind, rain, sand, maritime environment
- **Fast deployment, with limited infrastructure**
- **Passive:** no electromagnetic radiation
- **Easy integration into current security systems**
- **Need for stored video and forensics analysis**
- **Easy situation awareness on one single workstation**



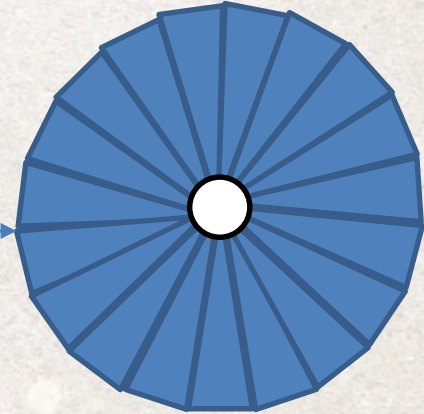


Solution for Wide Area Security

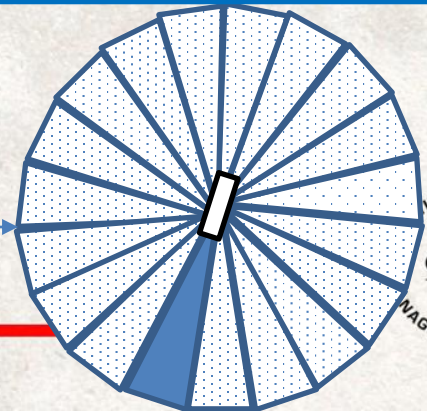
The SPYNEL concept



What Spynel sees



What a Pan&Tilt camera sees



Solution for Wide Area Security

The SPYNEL series



Solution for Wide Area Security

- **Unique designs for 360° thermal cameras:**
 - ✓ One real time panoramic 360° image with fast frame rate
 - » Cost-effective wide area surveillance system
 - » No event missed for real time video analysis
 - ✓ Thermal infrared with high thermal sensitivity
 - » Day & Night real operation, all weather conditions
 - » No electro-magnetic disturbance
 - ✓ High spatial resolution: up to 120 millions pixels in the 360° image
 - » Intruders identification in zoom windows
 - » Forensic capabilities





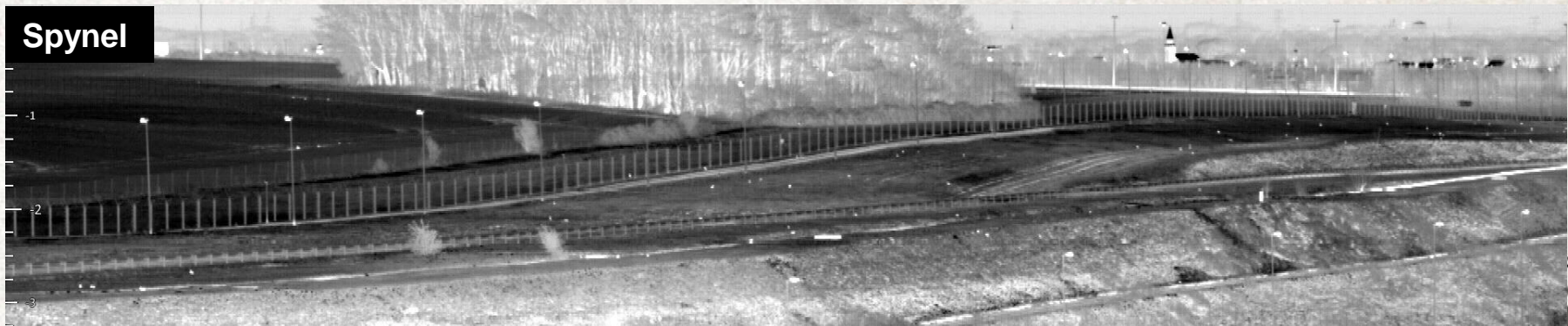
Solution for Wide Area Security

➤ **Thermal imaging: the invisible revealed**

Visible camera



Spynel





Solution for Wide Area Security

- **15 Spynel models available for human detection range from 0m up to 8 000m**
 - » For short, medium or long range requirements
 - » Multiple possible Spynel configurations for one single security project
 - » Less cameras and infrastructures required for surveillance of wide areas

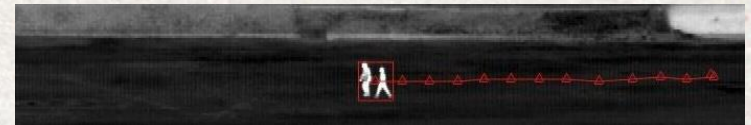




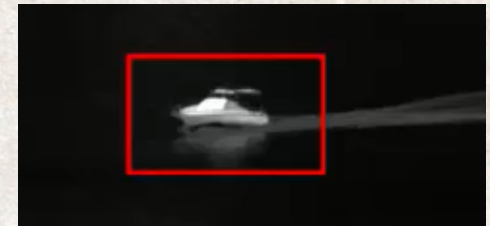
Solution for Wide Area Security

➤ **Thermal imaging : to detect any kind of intrusions**

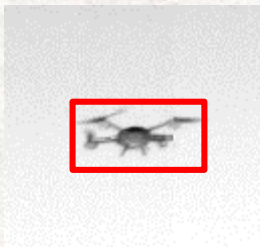
✓ Ground



✓ Maritime



✓ Air





Solution for Wide Area Security

- **Various vertical Fields Of View (FOV) available**
 - » Wide range of 15 products for all specific requirements and applications
- **Line of sight adjustment**
 - » Adaptation to specific surroundings and topography
- **Field proven in very harsh environmental conditions**
 - » Worldwide installations & references







Solution for Wide Area Security

- **Real time & Recorded panoramic video**
 - » Multiple target tracking&recognition capability
 - » No missed event for forensics analysis
- **Compact and transportable systems**
 - » Easy & fast deployment (<5 min. for 1 man)
- **IP connection**
 - » Easy and fast integration
- **Passive:**
 - » Undetectable unlike radars & no jamming
 - » No disturbance with other existing devices
 - » No radiation for on-site personnel or for EM sensitive materials



Spynel comparison table

	Spynel-M 	Spynel-U 	Spynel-C 	Spynel-S 	Spynel-X 
Horizontal FOV	360° ⁽¹⁾	360°	360°	360°	360°
Vertical FOV	36° or 18°	18° or 9°	20°, 10° or 5°	20°, 10° or 5°	20°, 10° or 5°
Sensor head rotation	Fixed	Continuous	Continuous	Continuous/Staring ⁽²⁾	Continuous/Staring ⁽²⁾
Line of sight range	-18°/+18°	Fixed	-20° / +45°	-45° / +45°	-45° / +45°
Frame rate	Up to 1Hz(*)	Up to 0.5Hz	Up to 2Hz	Up to 2Hz	Up to 2Hz
Spectral bandwidth	LWIR (8-12μm)	LWIR (8-12μm)	LWIR (8-12μm)	MWIR (3-5μm)	MWIR (3-5μm)
IR technology	Uncooled IR	Uncooled	Cooled	Cooled	Cooled
Detector format	336x256 or 640x512	640x512	288x4	640x512	Megapixels
360° image resolution	Up to 5Mpxs	Up to 9 Mpxs	Up to 12 Mpxs	Up to 30 Mpxs	Up to 120 Mpxs
Weight	1,8kg	22kg	28kg	38kg	38kg
Operating Temp.	-40°C to +55°C	-40°C to +71°C	-40°C to +71°C	-40°C to +71°C	-40°C to +71°C
Human detection 	Up to 700m	Up to 2 000m	Up to 3 000m	Up to 6 000m	Up to 8 000m
Vehicle detection 	Up to 1 400m	Up to 4 000m	Up to 6 000m	Up to 12 000m	Up to 15 000m
RIB detection 	Up to 1 400m	Up to 4 000m	Up to 6 000m	Up to 12 000m	Up to 15 000m

⁽¹⁾ : sector scan capability and staring mode at higher frame rate

⁽²⁾ : optional integrated visible full HD camera and/or Laser Range Finder available in staring mode



The Spynel solution – CYCLOPE™ Software

Fichier Options Outils Affichage Aide HGH Systèmes Infrarouges

Rejou AUTO ON + - x ALERT

-2 328 332 336 340 344 348 352

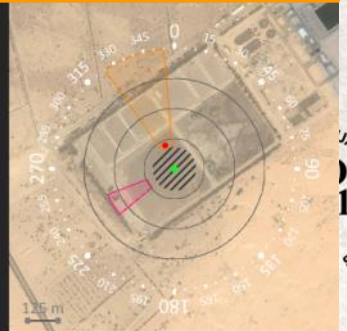
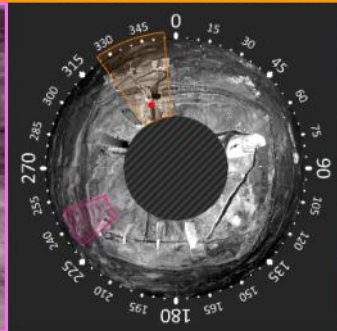
-4

-6

-8

-10

mardi 15 févr 11:02:35 (UTC+2)



QUALITY SYSTEM



The Spynel solution – CYCLOPE™ Software

- Automatic Detection & Tracking of multiple intrusions over 360 degrees (ground/air/maritime)
- Visualisation of simultaneous intruders in different directions
- 360° Recording & Playback for Forensics analysis





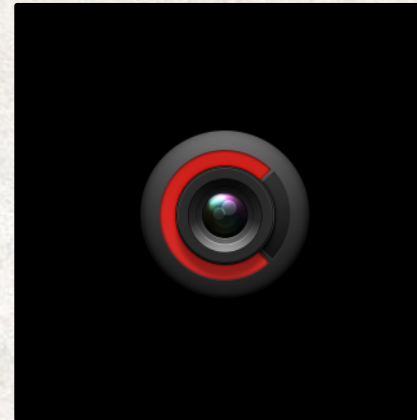
The Spynel solution – **CYCLOPE™** Software

General Block Diagram



Power supply

IP communication link



Data processing system* running **Cyclope** software for :

- Visualisation
- Detection & tracking
- Recording & playback

(*) Windows Desktop PC or Laptop PC





User-Friendly « Cyclope » Software

The screenshot displays the HGH Infrared Systems software interface. At the top, there is a menu bar with 'File', 'Options', 'Tools', 'Display', and 'Help'. Below the menu bar is a toolbar with various icons for playback and image processing. The main display area is divided into several sections:

- 360° strip view:** A horizontal strip at the top showing a wide-angle view of the airport tarmac. Two red boxes highlight specific areas of interest.
- Main view:** A large central area showing a detailed view of the tarmac. A red box highlights a target, and a white line indicates its tracking path. The axes are labeled with numerical values (e.g., 324, 326, 328, 330, 332, 334, 336, 338 on the x-axis; -1, -2, -3 on the y-axis).
- Zoom window 1:** A smaller view at the bottom left showing a zoomed-in view of the target from the main view.
- 360° annular view:** A circular view at the bottom right showing a 360-degree view of the tarmac. A red box highlights a target, and a white line indicates its tracking path.
- 360° radar view:** A circular view at the bottom right showing a 360-degree radar view of the tarmac. A red box highlights a target, and a white line indicates its tracking path. The radar view includes a scale for distance (e.g., 1.25 km).

Blue arrows point from the text boxes to the corresponding views in the software interface.

Simultaneous Detections & Tracking over 360° of 2 different targets

Radar view for distance estimation

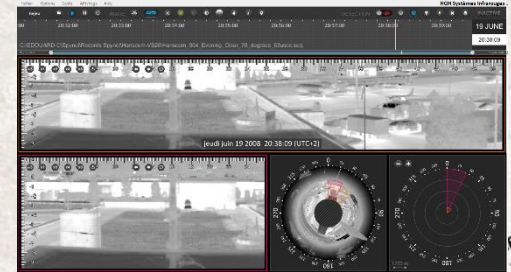
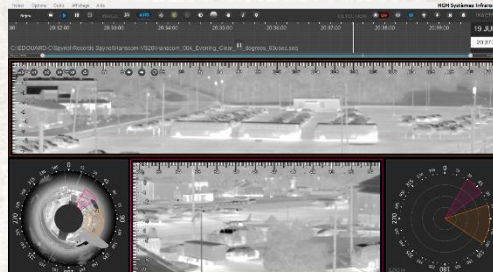
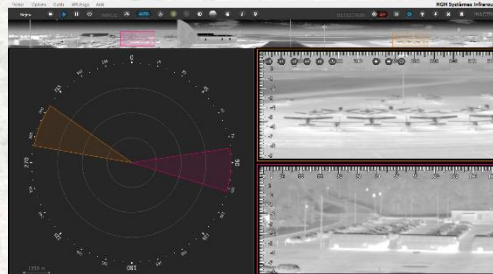
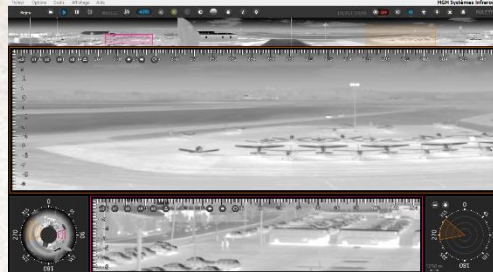


User-Friendly « Cyclope » Software





User-Friendly « Cyclope » software – Flexible GUI





User-Friendly « Cyclope » Software

- Easy creation of detection zones

Detection OFF
Detection ON
depending on zone &
date/time

Groups of zones for alarm
classification

Sound and visual alarm
output

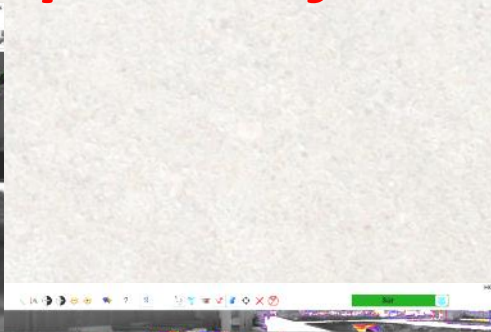
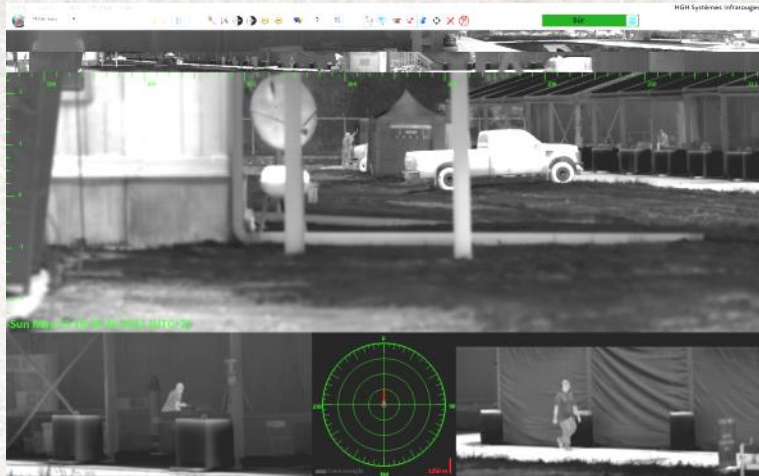
Alarm activation according
to date/time

The screenshot displays the Cyclope software interface. The top portion shows a thermal image of an airport tarmac with several green rectangular detection zones overlaid. Labels like 'Zone polygonale 1' and 'Zone polygonale 2' are visible. Below the image is a configuration window titled 'Configuration des groupes et zones'. This window includes a tree view on the left for 'Groupes 1' and 'Groupes 2', and a central grid for 'Activation' with columns for 'Heures' (hours) and rows for 'Activé' and 'Désactivé'. A 'Contrôleur de séquence' panel is visible on the right side of the interface.

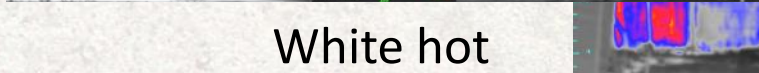




Zoom and colour palette for recognition



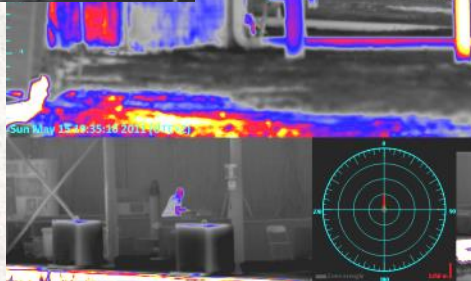
New zoom window



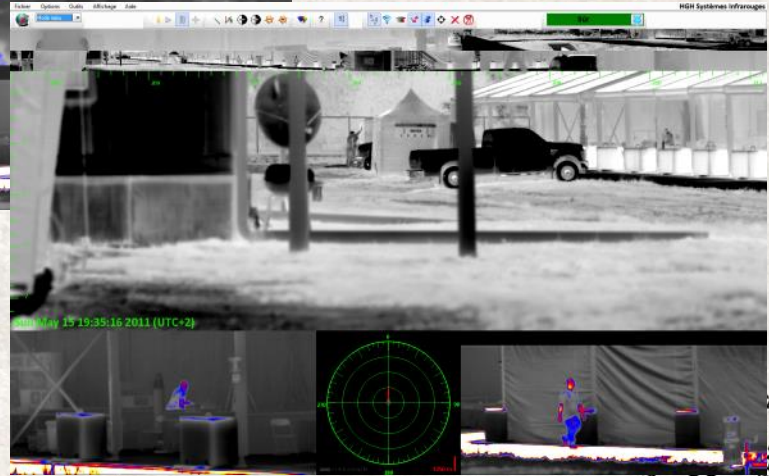
White hot



Black hot



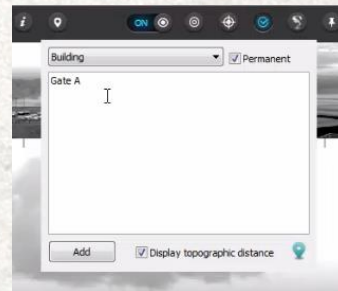
Color highlight





User-Friendly « Cyclope » Software

- Bookmarks can be easily added to quickly localize events, in space and time with target classification and comments



- The timeline gives a quick overview of events for forensics analysis



Bookmark



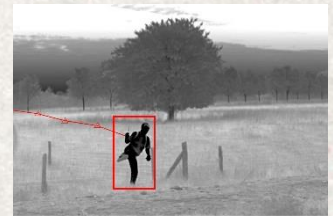


APPLICATIONS

- **Perimeter Security :**

- **Energy : nuclear plants, dams, power stations, solar/wind farms**
- **Official buildings : prisons, embassies**
- **Private properties: palaces, golf, ranches**
- **Large sites: logistic warehouses, parking lots**

References : France, Mexico, USA, Japan, UAE, Saudi Arabia



- **Seaport/airport security:**

References : USA, Canada, UAE, Saudi Arabia, Argentina, Benin, Singapore



- **Wide area surveillance:**

- **Coastal and Border Passive Surveillance**
- **Border Patrol**

References : Malaysia, France (Eurotunnel), Colombia, USA, South Korea





APPLICATIONS

- **Oil & Gas industry :**

- Onshore : refineries, exploration sites, terminals
- Offshore : Oil rigs (FPSO, CPF, FLNG...)

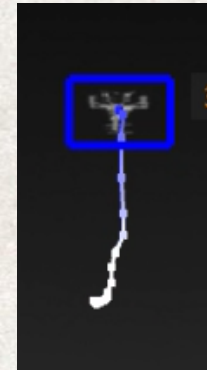
References : INPEX, TOTAL, SHELL, ENI, NCOC



- **Air surveillance:**

- Counter UAV systems
- Air traffic monitoring
- Short range air defence systems

References : France (Ministry of Interior, MBDA), Canada, Japan, Mexico



- **Others :**

- Fire detection
- Ecology & Wild life protection
- Merchant Navy and Yachts : anti-piracy, navigation assistance, search and rescue
anti-collision (interface with AIS & Radar)





APPLICATIONS

- **Defence:**

- LAND**

- Site protection : air/naval bases, camps, FOB
 - Short range air defense systems
 - Special Operation Forces



References: US Army, French Army, French Special Forces (GIGN), MODs (UK, Nigeria, Singapore, India, UAE)

- NAVAL**

- Asymmetric threats detection (InfraRed Search&Track)
 - Fight against piracy, navigation assistance
 - USV

References: US Navy, French Navy, MODs (UK, South Africa)





Typical installations - Fixed





Typical installations - Fixed





Typical installations – Fast deployment (tripod or telescopic mast)





Typical installations – Fast deployment (tripod or telescopic mast)





Typical installation : Special Operation Forces

Spynel-M : ultra-light & fast deployable surveillance system





Typical installation : vehicle mounted
Situational Awareness for temporary surveillance





Typical installation : shipborne

Stabilized Platform Specifications:

- Roll motion: $\pm 20^\circ$
- Pitch motion: $\pm 20^\circ$
- Stabilization accuracy: 0.1°
- Weight : 48kg
- Dimensions: 450 mm (dia.) x 490 mm (H).
- Environmental protection level: IP66
- Compatible with Spynel-U/-C/-S/-X



Gyro-stabilized platform





Typical installation : shipborne





Typical installation : shipborne for USV *for anti-collision or remote control*



Stabilized Platform Specifications:

- Roll motion: $\pm 15.5^\circ$
- Pitch motion: $\pm 15.5^\circ$
- Stabilization accuracy: 0.2°
- Weight : 7kg
- Dimensions: 350 mm (dia.) x 150 mm (H).
- Environmental protection level: IP67
- Compatible with Spynel-M





Product awards

 <p>winner 2017 Innovation AWARDS</p>			
<p>2017 SPYNEL Best Anti-Drone System</p>	<p>2014 SPYNEL Best Wide Area Long Range Surveillance</p>	<p>2014 SPYNEL Label Observateur Design</p>	<p>2012 SPYNEL Perimeter Security Award</p>
<p>Milipol Innovation Awards</p>			
	<p>2011 SPYNEL H. Kummerman Award French Marine Academy</p>	<p>2010 SPYNEL Innovation Prize EURONAVAL</p>	<p>2008 SPYNEL Product of the Year Nasa Tech Briefs</p>



A grayscale photograph of an airfield or airport tarmac, showing various aircraft, ground service equipment, and a control tower in the distance. The image is slightly faded and serves as a background for the top portion of the slide.

SPYNEL : To keep in mind

- **Cost effective for wide area/perimeter surveillance**
- **Automatic Detection & Tracking capabilities**
- **Recognition of multiple intruders simultaneously**
- **UAV, RIB & human detection capabilities**
- **Proven and COTS technology**
- **Passive detection (undetectable, no EM disturbance)**
- **Automatic tracking before and after intrusion**
- **Fast & easy deployment (mobile/temporary surveillance)**
- **Insurance to record all intrusions (360° video recorded)**