RADAR-BASED PERIMETER PROTECTION FOR CRITICAL INFRASTRUCTURES

BY
• Founder of Eurocontrolli 25 years ago

• A quarter of life spent providing security systems

• Vast experience in Security, Telecom and Fire

• Established in Dubai 4 years ago to follow the Gulf region in O&G market
• **Eurocontrolli** was established in **1994**, and is based in **Milan, Italy**.

• We participated at **2012 AIS** event in **Rome**.

• **Eurocontrolli** is an independent **system integrator**, we choose the best solution in the interest of the client.
EUROCONTROLLI’S SERVICES

**Detailed Engineering & Design & Procurement**
- Detailed Engineering according to EPC’s existing design (FEED)
- Detailed Documentation for each step.

**Project Management**
- Following O&G rules and HSE procedures.
- Respecting requested national and international security standards for Health and Civil sectors.

**Test & Integration**
- Factory test (FAT) & Integration test (iFAT) at our premises.

**Transportation & Delivery**
- Partners to deliver Worldwide according to IMO/IATA reputation

**Commissioning**
- Short period to perform
- Highly skilled and friendly personnel

**Training & Maintenance**
- Deep and extended knowledge of technologies and different HW & SW
EUROCONTROLLI’S BUSINESS UNITS

- Telecom and Security system
- Fire & Gas system and solutions

EUROCONTROLLI’S FOCUSED MARKETS

- Oil & Gas
- Civil & Health
- Industry
MAJOR CLIENTS and END USERS
Esperiments from Heinrich Hertz in the late 19th century about radio waves reflection

The German inventor Christian Hülsmeyer was the first that used this physical principle to build a simple ship detection device.

In the 1934–1939 period, eight nations developed independently, and in great secrecy, the radar technology: UK, Germany, US, USSR, Japan, Netherlands, France, and Italy from Guglielmo Marconi.

Radio (Aim) Detecting And Ranging: The term “RADAR” was officially coined as an acronym by U.S. Navy Lieutenant Commander Samuel M. Tucker and F. R. Furth in November 1940.
Radar is a security application for wide open areas.

- Airports
- Seaports
- Off Shore Processing Rigs
- Chemical facilities
- Critical Infrastructure
WHY USE A RADAR IN PERIMETER INTRUSION DETECTION (PID)

**CCTV** - Because of the tradeoff between range and field of view, hundreds or thousands of cameras would be needed to cover a perimeter. This is not practical or affordable, and furthermore, it is not an effective solution in bad weather.

**Patrols** - Security officers can only see the area where they are presently located, so they can’t monitor the entire area. Enough patrols to monitor the entire area 24/7 is not practical or affordable.

**PIDS** - Perimeter Intrusion Detection Systems are expensive, and only monitor disturbances at the fence. With a PIDS, once intruders are inside your perimeter, the system will not follow them.
HOW TO SELECT THE RIGHT RADAR

Wide Beam Vs. Narrow Beam:

Rotating Vs. Fixed:

FMCW Vs. Doppler:

High Resolution Vs. Low Resolution
**Wide Beam vs. Narrow Beam**

Wide Beam is Like a Streetlight, Narrow Beam Like a Flashlight

Wide Beam has a Smaller Blind Spot

Wide Beam Looks Down Into Elevation Dips

Wide Beam Can Mount on Buildings and Look Down to Ops Area or Perimeter

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**“X” MODEL BEAM COMPARISON**

Flexible Mounting Height
Rotating vs. Fixed

Rotating Offers More Coverage Per Radar

Rotating Requires Fewer Radars and Less Infrastructure

Contactless Slip Rings Extend Service Interval to 5 Years
High Resolution vs Low Resolution

High Frequency has High Resolution and 1+ Mile Range

Low Frequency has Much Longer Range but Low Resolution

High Resolution is Needed for a Security System to Detect and Track People Near Stationary Objects

<table>
<thead>
<tr>
<th>GHz</th>
<th>Band</th>
<th>Range Res.</th>
</tr>
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<tbody>
<tr>
<td>77</td>
<td>W</td>
<td>15 cm</td>
</tr>
<tr>
<td>32</td>
<td>Ka</td>
<td>30 cm</td>
</tr>
<tr>
<td>16</td>
<td>Ku</td>
<td>5 m</td>
</tr>
<tr>
<td>9</td>
<td>X</td>
<td>4 m</td>
</tr>
<tr>
<td>3</td>
<td>S</td>
<td>10 m</td>
</tr>
</tbody>
</table>
FMCW vs. Doppler

FMCW Calculates the Position, Direction, and Velocity of Moving and Fixed Objects from the Radar Image – All Objects Are Tracked, Including Stationary

Doppler Gets the Velocity From the Radar Itself - Only Detects Objects Moving Toward or Away From the Radar
The table below compares the 7 available ground radars in the attributes in the previous 4 slides – field of view, beam width, processing, and resolution.

<table>
<thead>
<tr>
<th>Ground Radar Comparison</th>
<th>Band</th>
<th>Freq (GHz)</th>
<th>FOV (deg)</th>
<th>Vert Beam (deg)</th>
<th>Processing</th>
<th>Range Res (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynetics GroundAware</td>
<td>S</td>
<td>3</td>
<td>120</td>
<td>10</td>
<td>Doppler</td>
<td>10.00</td>
</tr>
<tr>
<td>DMT IDAR</td>
<td>X</td>
<td>10</td>
<td>360</td>
<td>23</td>
<td>Doppler</td>
<td>3.00</td>
</tr>
<tr>
<td>SpotterRF C950</td>
<td>X</td>
<td>10</td>
<td>90</td>
<td>10</td>
<td>Doppler</td>
<td>4.00</td>
</tr>
<tr>
<td>Blighter B202</td>
<td>Ku</td>
<td>16</td>
<td>90</td>
<td>20</td>
<td>Doppler</td>
<td>1.00</td>
</tr>
<tr>
<td>Terma</td>
<td>Ku</td>
<td>16</td>
<td>360</td>
<td>6</td>
<td>Pulse</td>
<td>5.00</td>
</tr>
<tr>
<td>FLIR Ranger R2</td>
<td>Ka</td>
<td>32</td>
<td>360</td>
<td>6</td>
<td>FMCW</td>
<td>0.30</td>
</tr>
<tr>
<td>Navtech HDR-321</td>
<td>W</td>
<td>76</td>
<td>360</td>
<td>40</td>
<td>FMCW</td>
<td>0.15</td>
</tr>
</tbody>
</table>
**TRADITIONAL PIDS TECHNOLOGIES**

**Buried Sensors:** covert perimeter intrusion detection sensor that generates an invisible electromagnetic field around buried sensor cables.

- Intelligent 4th generation ported coaxial sensor
- Covert sensor with invisible volumetric detection field and Terrain-following
- Continuous field of detection with over 99% Probability of Detection
- Lowest vulnerability to defeat of any outdoor sensor

**Fence Mounted Sensors (wire or fiber):** unique microphonic intrusion detection system for outdoor, fence-mounted perimeter security applications.

- Fence mounted cable, Low cost
- Quick and Easy to Install
- Digital Signal Processing
- High Probability of Detection

**Microwave Sensors:** microwave intrusion detection sensor is a volumetric, high-performance system that creates a microwave field between transmitter and receiver units to detect intruders based on their size and speed

- Bistatic: Zone length up to 450 m (1500 ft.)
- Simple Installation
- Audio output for trouble-shooting
- 6 Field-Selectable Modulation Frequencies
<table>
<thead>
<tr>
<th>Technology</th>
<th>Cost</th>
<th>Reliability</th>
<th>Maintenance cost</th>
<th>Environmental Adapt</th>
<th>Weather impact</th>
<th>Covered area</th>
<th>Deployment time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fence Vibration Sensors</td>
<td>LOW</td>
<td>MID</td>
<td>MID</td>
<td>HIGH</td>
<td>HIGH</td>
<td>LOW</td>
<td>HIGH</td>
</tr>
<tr>
<td>Active Infrared Barriers</td>
<td>HIGH</td>
<td>LOW</td>
<td>HIGH</td>
<td>MID</td>
<td>HIGH</td>
<td>LOW</td>
<td>HIGH</td>
</tr>
<tr>
<td>Microwave sensors (Bi/Mono static sensors)</td>
<td>HIGH</td>
<td>MID</td>
<td>MID</td>
<td>MID</td>
<td>MED</td>
<td>LOW</td>
<td>HIGH</td>
</tr>
<tr>
<td>Buried Line Sensors</td>
<td>MID</td>
<td>MID</td>
<td>LOW</td>
<td>HIGH</td>
<td>ZERO</td>
<td>LOW</td>
<td>HIGH</td>
</tr>
<tr>
<td>Video Motion Detectors</td>
<td>HIGH</td>
<td>MID</td>
<td>HIGH</td>
<td>MID</td>
<td>HIGH</td>
<td>MID</td>
<td>HIGH</td>
</tr>
<tr>
<td>Radar Surveillance</td>
<td>LOW</td>
<td>HIGH</td>
<td>LOW</td>
<td>LOW</td>
<td>ZERO</td>
<td>HIGH</td>
<td>LOW</td>
</tr>
</tbody>
</table>
VIDEO ANALYTICS VS. RADAR DETECTION

- 26 cameras for detection
- Partial coverage
- Extensive set up, tuning
- Daylight operation only
- Highly susceptible to weather
- $450K + $60K Maintenance

- 1 radar for detection
- Substantially more coverage
- Less set up, maintenance
- 24 hour detection
- Less susceptible to weather
- $250K + $20K Maintenance
RADAR PID INTEGRATION IN A SECURITY SYSTEM

• CCTV integration

• Access control integration

• GPS to exclude friendly target

• C2 (Command and Controls) softwares
The radar based security system uses sensors to detect intruders, displays them on a satellite image, automatically points cameras, starts recording, and generates alarms into the security management system.
HONEYWELL PRO-WATCH
The radar can be mounted in an elevated position to cover areas such as large roof space.

The radar is unaffected by environmental conditions such as rain, sunlight, smoke and fog.

Images and activity inside and outside of the premises can be relayed to the security services.

Guards manage monitors and track potential intruders from a central location.

Should someone or something move within its range, the radar directs the focus of the PTZ camera to the location.
The radar is unaffected by environmental conditions such as rain, sunlight, smoke and fog.

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THANK YOU FOR YOUR ATTENTION!

Q&A