An air born SSM system of monitoring sea and land areas

The system consists of the following basic components:
- a light reconnaissance aircraft EM-11R ORKA,
- an optoelectronic monitoring system,
- optional, one or two compact radars with synthesized aperture - SAR in the L, X or P band,
- a radio link for image and data transmission in real time.

SSM can be used for the following missions:
- sea-born search and rescue operations,
- reconnaissance and patrolling operations,
- protection of customs areas and economic spheres,
- protection of fisheries,
- control of illegal immigration and terrorist threats,
- supporting rescue operations in cases of disasters,
- detection of pollution and oil spillage at sea surface,
- monitoring and tracking of objects,
- identification of objects recognition and recording of objects and events,
- detection and recording of sea surface pollution,
- detection and recording of damage to power transmission lines,
- detection and recording of forest fires,
- detection and recording of epidemiologic contamination,
- geodetic reconnaissance,
- detection and identification of waterborn objects,
- detection of destruction at sea and land surface,
- monitoring of land surface - creation of „ground maps”,
- transmission of images and data in real time.
EM-11R Orka Aircraft

- a long range, high ceiling and remarkable endurance that might be enhanced further by replacement wing tips that can be stored in a hangar with an option extending wingspan from 13 m to 16 m,
- a two-engine system and a retractable undercarriage that enable optimum arrangement of optoelectronic sensors and antennas,
- silencers and constant speed low-noise propellers of special design reducing the level of noise,
- flying qualities and maneuverability of the aircraft tested in flight allow also for flight with one engine out of operation (lower fuel consumption and reduced noise level),
- cockpit connected directly with the luggage space facilitating simple arrangement of instruments and assuring good working conditions for the crew,
- an excellent field of vision from the cockpit comparable to the field of vision from a helicopter is an important factor for visual observation,
- possibility of taking off and landing on poorly equipped airfields or casual landing grounds very useful in patrol operations from distant bases.

Patrolling and observation tasks were carried out only by big aircrafts until recently. They can be performed now by CRKA class aircrafts thanks to the development of miniaturization of electronic systems.

**Basic version performance and data**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum take-off weight</td>
<td>1820 kg (3640lb)</td>
</tr>
<tr>
<td>Standard empty equipped weight</td>
<td>1270 kg (2315lb)</td>
</tr>
<tr>
<td>Wing span</td>
<td>13,5 m (44.3ft)</td>
</tr>
<tr>
<td>Folded</td>
<td>10,2 m (33.5ft)</td>
</tr>
<tr>
<td>Length</td>
<td>8,85 m (29.0ft)</td>
</tr>
<tr>
<td>Height</td>
<td>2,9 m (9.5ft)</td>
</tr>
<tr>
<td>Cabin Width</td>
<td>1,35 m (53.1in)</td>
</tr>
<tr>
<td>Baggage compartment</td>
<td>374 dm³</td>
</tr>
<tr>
<td>Wing area</td>
<td>18,65 m² (179ft²)</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>350 km/h (189kt)</td>
</tr>
<tr>
<td>Cruising speed</td>
<td>280 km/h (151kt)</td>
</tr>
<tr>
<td>Minimum speed</td>
<td>95 km/h (51kt)</td>
</tr>
<tr>
<td>Take-off distance</td>
<td>250 m (820ft)</td>
</tr>
<tr>
<td>Landing run</td>
<td>300 m (985ft)</td>
</tr>
<tr>
<td>Max range</td>
<td>1500 km (800n.mi)</td>
</tr>
</tbody>
</table>

The following have been achieved in comparison with helicopters:
- considerable reduction of operational costs
- increase of range and mission duration
- reduction of noise
- reduction of cockpit vibrations.
The SON girostabilized optronic unit

The rotary girostabilized optronic system (SON 124L) with built-in television and thermovision channels for civilian applications, is designed for monitoring and control of objects at large surfaces (gas lines, oil lines, power transmission lines, sea areas, agricultural and forest areas, rescue operations, threat control in crisis situations, coordination of post-crisis operations).

Girostabilized platform

Excellent characteristics of stabilizing longitudinal and transverse tilt and course are provided by the four-axis mechanical stabilization system and the electronic image stabilization system with permits to use this equipment on board of any aircraft.

Technical specifications of the optoelectronic monitoring system

<table>
<thead>
<tr>
<th>Type of mechanical stabilization</th>
<th>Four-axes (azimuth, elevation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of electronic stabilization</td>
<td>Tilt, vibrations</td>
</tr>
<tr>
<td>Range of rotation angle in azimuth</td>
<td>± 190°</td>
</tr>
<tr>
<td>Range of rotation angle in elevation</td>
<td>From +5° (up) to -90° (down)</td>
</tr>
<tr>
<td>Angular acceleration</td>
<td>Up to 180°/s²</td>
</tr>
</tbody>
</table>

Thermovision channel

<table>
<thead>
<tr>
<th>Detector type</th>
<th>Cooled CMT IRCCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of elements</td>
<td>768 x 576</td>
</tr>
<tr>
<td>Spectral range</td>
<td>3-5μm</td>
</tr>
<tr>
<td>Type of cooling</td>
<td>Micro-cryogenic</td>
</tr>
</tbody>
</table>

Television channel

<table>
<thead>
<tr>
<th>Detector type</th>
<th>Matrix 1/2&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of elements</td>
<td>752 (H) x 582 (V)</td>
</tr>
<tr>
<td>Image parameters</td>
<td>625 lines, 25 restoring</td>
</tr>
<tr>
<td>Spectral range</td>
<td>0.6-0.95μm</td>
</tr>
</tbody>
</table>

Automatic system of object tracking

The especially designed tele- and thermovision type system for automatic object interception and tracking permits to intercept the object according to operator's instructions and then to track it automatically.

Electronic image-processing

It permits for efficient monitoring even when weather conditions are poor; it improves the image quality and its contrast, it improves efficiency, and reduces image recognition time.

The operator's control console

Thermovision view of people and a car

Refinery industry

View of a valve system defects
Examples of television and thermovision image processing

Conditions: morning time, fog, distance, 21 km

THE REAL IMAGE

Contrast 0.345
Mean brightness 25
Number of levels 88
Interference signal 66.67

IMAGE AFTER PROCESSING

Contrast 1.0
Mean brightness 189
Number of levels 252
Interference signal 69.48

Conditions: winter, evening, distance, 3.5 km

THE REAL IMAGE

Contrast 0.525
Mean brightness 160
Number of levels 126
Interference signal 107.20

IMAGE AFTER PROCESSING

Contrast 1.0
Mean brightness 99
Number of levels 229
Interference signal 126.24