ELECTRONIC COUNTERMEASURE (ECM) TRAINING TOOL

Due to the ever-increasing sophistication of missile threats, there is a growing need to comprehend and constantly create efficient countermeasures. The CSIR's Optronic Sensor Systems team has developed an infrared (IR) ECM training tool that simulates scenarios of aircraft under attack, as well as the defence mechanisms available to deploy against it. The tool is aimed at equipping military and non-military forces with experience and training in the use of countermeasures as protection against missile threats.

The likelihood of survival under a missile attack will improve over time as the pilot, electronic engineers and other members gain enough exposure to a variety of scenarios, rigorous classroom discussions, and share experiences.

ECM trainer operation

- The ECM trainer provides a virtual environment where the teacher can play out different scenarios to the pilot, observing and discussing the outcomes.
- It allows the user to select specified scenario parameters and evaluate the vulnerability of the aircraft against the selected threat.
- The tool showcases the vulnerability of the aircraft against the threat launched at different aspect angles.
- The simulation is played out in a visualisation tool (requiring only a laptop) that shows the movement of aircraft, missiles and flares in 3-D view, from different viewpoints.
- The tool also contains the effects of using manoeuvring as a protection measure to deter an approaching threat.

ECM integrated systems, platforms and decoys

- The ECM trainer caters for fixed-wing aircraft, helicopters and fighter aircraft and can be selected through a graphical user interface, as shown in Figure 1.
- The available missile threats are the air-to-air, amplitude modulation reticle and frequency modulation reticle-based missile models.
- The available flare models include the Magnesium/Teflon/Viton flare and the new generation flare or spectral flare.

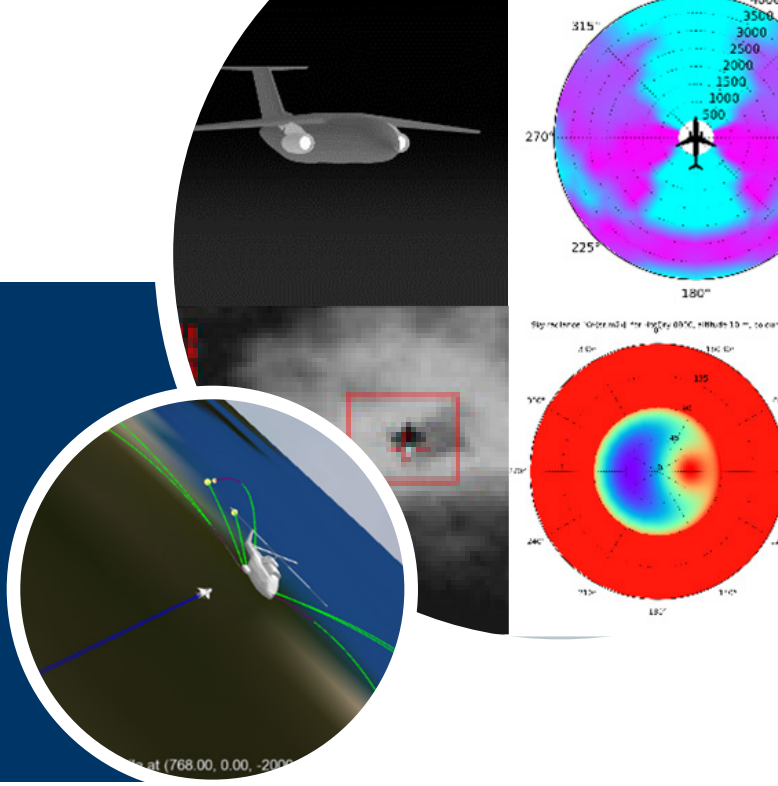
The ECM trainer gives students (pilots or EW engineers) in the classroom insight into aircraft self-protection – which countermeasures work (or do not work) and explains the outcome for the different scenarios. The ECM trainer also develops insight into the missile operation in the student's mind – knowing how the missile reacts enables them to better develop new tactics in new conditions. It has a steep learning curve but, once proficient, the tool provides the pilot and EW engineers with a tool that brings the real world onto their lab desk, providing realistic and physics-true optical and IR image sequences.

Contact: Edwin Magidimisha | **E:** emagidimisha@csir.co.za | **www.csir.co.za**

science & innovation
Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

CSIR
Touching lives through innovation

OPTRONIC SYSTEM SIMULATOR (OSSIM)



The CSIR's Optronic Sensor Systems (OSS) group focuses on new and novel electro-optic sensors, as well as the modelling, simulation, engineering, testing, evaluation and development of advanced electro-optical sensor systems for day, night and multispectral surveillance. In addition, researchers evaluate and design countermeasure and electronic warfare techniques in the visual and infrared wavelengths.

The development of sophisticated electro-optical equipment, such as infrared missile seekers, thermal imagers and infrared countermeasure systems, requires radiometrically calibrated infrared imaging scene simulators to support the evaluation and optimisation of system performance under diverse environmental conditions. The Optronic System Simulator (OSSIM) is an engineering development tool that was created to meet this need.

OSSIM provides the deeper support infrastructure that enables engineers to focus on their optronics systems, rather than the physics of the radiometry of optical systems.

OSSIM is used to study the interactions of static, moving and flying objects, using optical/infrared sensors, in a complex world scene, rendering images in the 0.4-14 µm spectral range. The simulation creates a virtual three-dimensional (3-D) world containing all the elements of a real-world scenario, comprising any number of interacting objects, against various background scenarios, and realistic modelling of atmospheric conditions.

OSSIM is used in the following applications:

- Evaluation and optimisation of aircraft self-protection measures (e.g., miss distance);
- Development of embedded image processing algorithms for missiles, missile warning systems and Directional Infrared Countermeasures (DIRCM) trackers;
- Pre-flight flight test preparation and post flight test analysis;
- Aircraft and missile infrared signature studies under different conditions;
- Performance evaluation of complex integrated missiles and DIRCM systems;
- Play out of one-on-one or many-on-many engagements, using realistic models and under realistic conditions;
- Image generation for machine learning applications; and
- Satellite image generation and target contrast testing.

Contact: Gene Stoltz | **E:** gstoltz@csir.co.za | **www.csir.co.za**

science & innovation
Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

CSIR
Touching lives through innovation