TACTICAL TECHNOLOGIES
a LEONARDO company

Anti-Ship Missile Imaging Infrared Homing ASM(IR)+

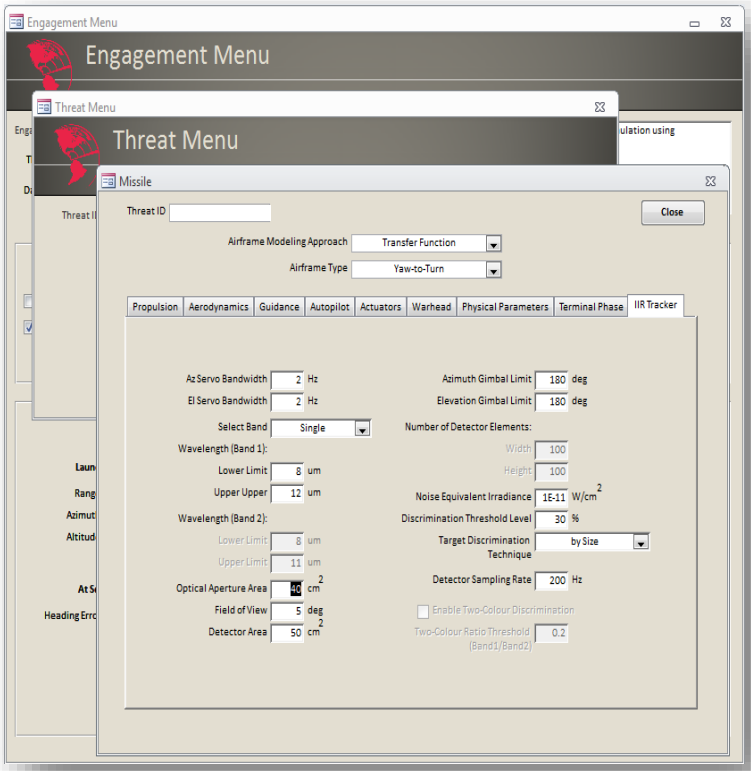
IR Synthetic Environment Powered by OKTAL-SE

TACTICAL ENGAGEMENT SIMULATION SOFTWARE – TESS™
Modeling and simulation based tools for electronic attack and protection development

OKTAL SE Synthetic Environment

Overview

ASM(IR)+ is a member of the Tactical Engagement Simulation Software (TESS) Sea IR family of physics-based simulation products. ASM(IR)+ models closed-loop engagements and interactions between a ship platform and a sea or air launched IR-guided (imaging) anti-ship missile. To defend itself from the incoming threat, the maneuvering ship can deploy infrared decoys with sub-munitions to achieve a "walk-off" effect. In long range engagements, a mid-course estimation option optimizes the missile's flight path to achieve maximum range. ASM(IR)+ models all phases of the engagement but the dynamic part of the simulation starts in the terminal phase with the missile seeker turned-on in either Search or Track mode and operating autonomously until end-game. Measures of effectiveness such as miss distance, probability of kill and probability of survival are computed at the end of each simulation run. Like other TESS products, ASM(IR)+ is built in the MATLAB/Simulink environment and, with its available source code, users can review, inspect and modify any of the underlying models and algorithms. The coupling to OKTAL-SE's software suite allows TESS to leverage the power of SE-WORKBENCH in order to generate complex and realistic IR synthetic environments. A front-end database allows the user to define and store data libraries of Targets, Countermeasures and Threats. A programmable batch runner is included for executing batch runs (Monte Carlo) of simulated tactical engagements.



TESS Master Interface

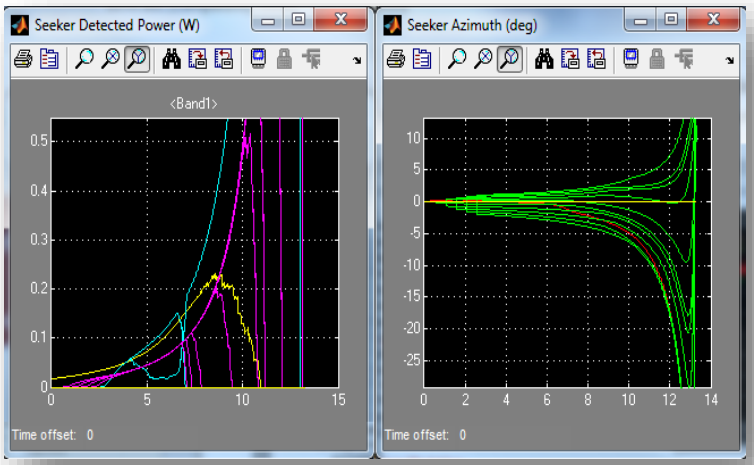
Technical Description

Target Modeling

- Set the ship's initial position, speed and heading.
- Specify manual or automatic ship maneuvers using turn rates and turn times or threat angle of arrival after maneuver.

IR Countermeasure Modeling

- Deploy Distraction and/or Seduction (with "walk-off" effect) IR decoys.
- Use repositionable launchers to deploy the payloads.
- Customize the decoy deployment timing sequences and flight characteristics (muzzle velocity, diameter, mass, drag coefficient) or use a pre-scripted flight trajectory.
- Define the IR decoy volume and motion with user-enterable maximum size, growth/sustain/decay times, and deceleration/descent rates.



Typical TESS Output Scopes

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Threat System Modeling

- Define each Threat Systems' initial launch position, mid-course and terminal phase maneuvers.
- Model the missile body dynamics and control (skid/bank to turn) by transfer function representations or using aerodynamic tables.
- Customize the IIR seeker with user-defined spectral operating bands (single/dual), servo bandwidths, detector array size, horizontal and vertical field of view, noise equivalent irradiance (NEI), target tracking technique and IR counter-countermeasures (IRCCM).
- Characterize other subsystems such as guidance, autopilot, propulsion and warhead.

Environment Modeling

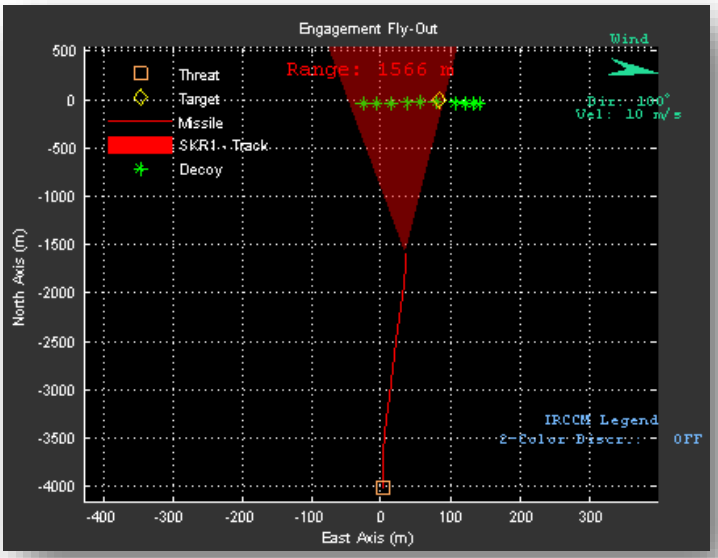
- Select atmospheric conditions from a list of pre-defined summer/winter environments (rainy, foggy, cloudy, snowy, fine) at various times of day.

Simulation Outputs

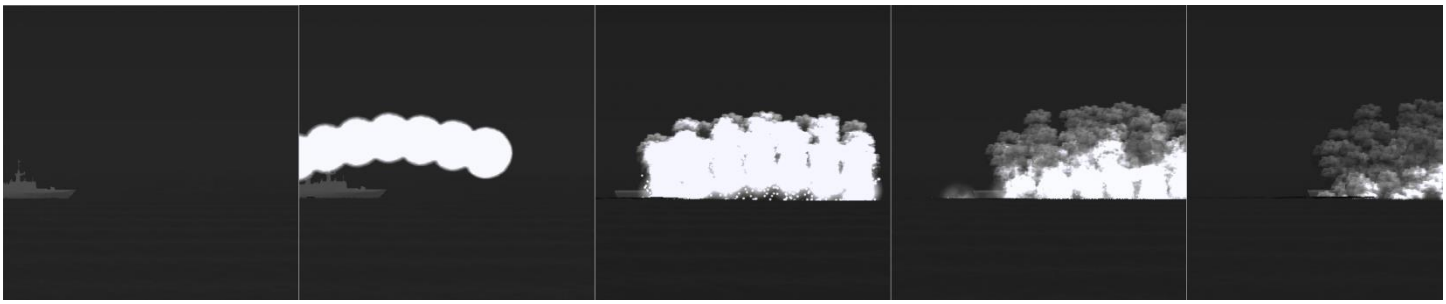
- View 3D trajectory plots and dozens of default scopes such as radiant intensity, seeker rates, seeker orientation, seeker modes and missile body acceleration.
- Record missile fly-outs for replay or further analysis.
- Compute several measures of effectiveness such as miss distance, probability of kill, probability of survival and seeker track/search percentage.
- Insert additional scopes to display signals of specific interest.

IR Synthetic Environment

- Leverage the power of OKTAL-SE's SE-FAST-IR for improved and dynamic IR rendering of complex 3D scenes, advanced naval IR decoys and realistic sea surface representation in SWIR, MWIR or LWIR bands.



TESS 3D Trajectory Plot



ASM(IR)+ advanced scene generator using OKTAL-SE technology

TESS™ APPLICATIONS

Electronic Attack Development
Conduct research, development, testing and optimization of countermeasure techniques, deployment parameters and mode sequences in relation to particular threat characteristics.

Threat Weapon Analysis
Analyze and characterize the performance and susceptibilities of threat weapons and subsystems. Reverse engineer threat characterization parameters in relation to tracking, guidance and aerodynamic performance factors.

Electronic Protection Development
Conduct research, development, and testing of electronic countermeasure-countermeasure techniques in relation to many types of countermeasures, both on-board and off-board.

EW Operational Support
Development of effective tactical programs and data loads in relation to specific threats, engagement geometries and tactics.

Lab and Range Testing
Optimize platform survivability in laboratory and field trial environments through trials planning. Carry out after-test results analysis to support trial documentation and report generation.

OKTAL-SE APPLICATIONS

Infrared Simulation Software
Offers comprehensive and validated IR simulation software chain from 3D complex scene modelling up to IR sensor rendering. Enables the simulation of atmospheric effects, IR sensor effects, material physical behavior and thermal states. Integrates advanced special effects like dynamic decoys deployment, aircraft exhaust plume or active laser illumination. Adapted to any kind of real-time or non-real time scenarios (air2air, air2ground, etc…) in the visible, SWIR, MWIR, LWIR and far IR domains.