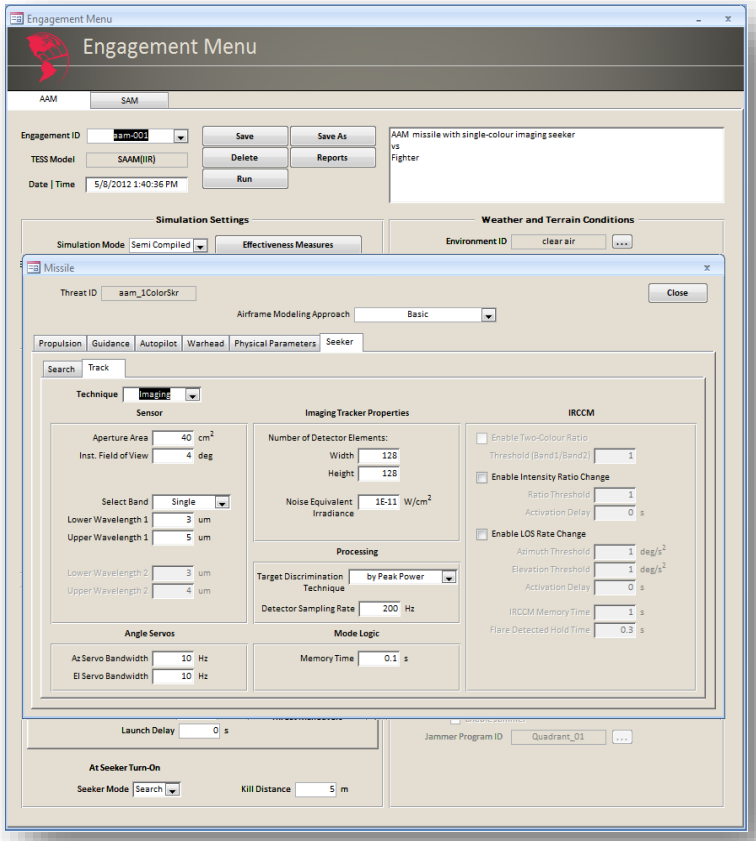
TACTICAL TECHNOLOGIES
a LEONARDO company

Surface-to-Air and Air-to-Air Missile Imaging Infrared Seeker SAAM(IIR)

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

Overview

SAAM(IIR) is the newest member of the Tactical Engagement Simulation Software (TESS) family of physics-based simulation products. SAAM(IIR) models closed-loop engagements and interactions between a target platform (fixed or rotary wing) and up to two surface or air launched imaging IR-guided missiles. The maneuvering aircraft can deploy various types of flares and/or activate a laser-based directed infrared countermeasure (DIRCM) system to defend itself from incoming threats. TESS products simulate all phases of an engagement from missile firings, target acquisition and tracking, countermeasure deployment and end-game intercept. Measures of effectiveness such as miss distance and probability of kill and probability of survival are computed. Like other TESS products, SAAM(IIR) 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. 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

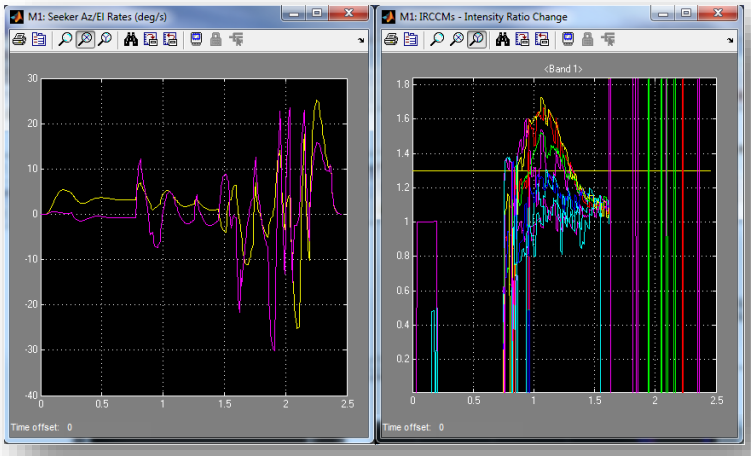
Technical Description

Target Modeling

- Configure the target aircraft with 1, 2 or 4 engines.
- Import established 3D aircraft models and set the initial position, orientation and velocity.
- Specify the evasive maneuvers using acceleration commands and timings.
- Customize the aircraft's IR signatures using TESS' IRProfiler by characterizing individual surface elements' temperatures and spectral emissivities or by importing texture maps.
- Define the engine plume signatures using aspect dependent 3D lookup tables generated from third party signature prediction software or from own measurement data.

IR Countermeasure Modeling

- Select standard, propelled or distributed flares to protect the target aircraft from the imaging IR-guided threats.
- Customize the deployment timing sequence, orientations and ejection velocities.
- Define ballistic or propelled flare motion using aerodynamic parameters such drag, reference area and



Typical TESS Output Scopes

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cartridge size, mass of flammable material, nozzle area and specific impulse.
- Customize the DIRCM tracker's detectivity, spectral bands, servo bandwidths, gimbal limits and search patterns.
- Characterize the DIRCM jammer by its power, beamwidth, turn-on times, duty cycles and modulation sweep rate.
- Assess DIRCM effectiveness against the threat through dazzling, saturation and permanent detector damage.
- Employ the various IR countermeasure techniques individually or in combination against all search, acquisition and track modes of the missile seeker.

Threat System Modeling

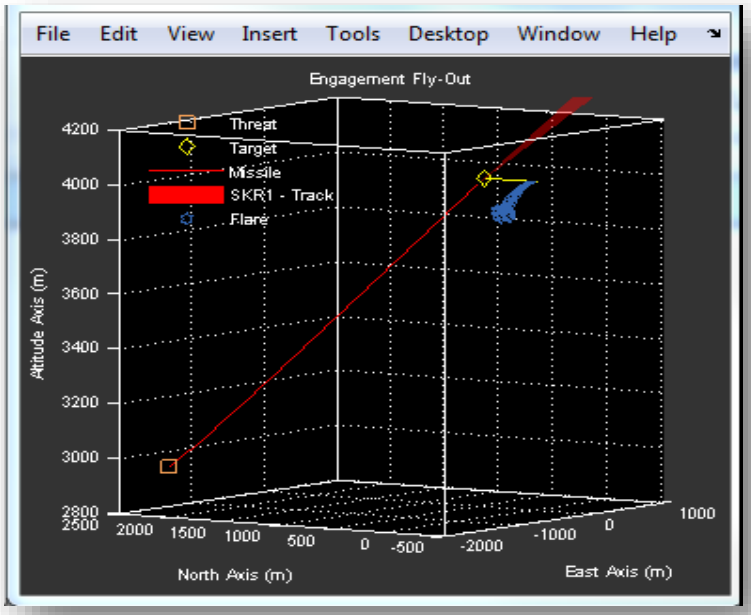
- Define each Threat Systems' initial launch position, maneuvers and timing.
- Model the missile body dynamics by transfer function representations or by using aerodynamic tables generated from 3rd party software such as MISSILE DATCOM.
- Characterize other subsystems such as guidance, autopilot, propulsion, warhead and IIR seeker.
- Customize the IIR seeker with user-defined spectral operating bands, servo bandwidths, detector array size, horizontal and vertical field of view, noise equivalent irradiance (NEI), target tracking technique and IR counter-countermeasures (IRCCM).

Environment Modeling

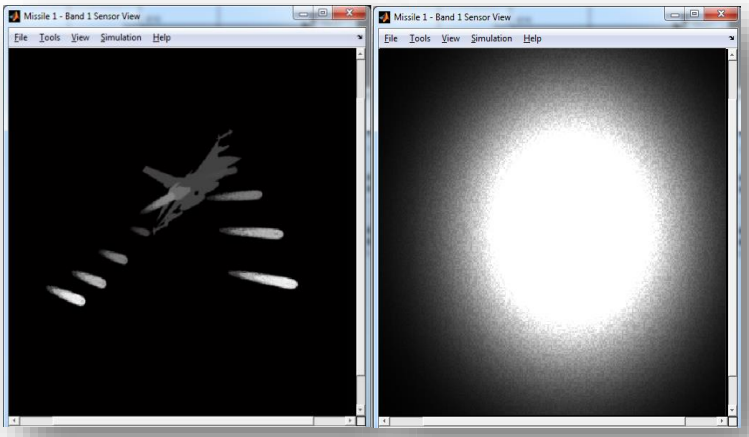
- Import MODTRAN data files to define spectral transmittance and solar/lunar irradiances for various environmental conditions.
- Apply IR signature texture maps to Digital Terrain Elevation Data (DTED) for custom IR terrain backgrounds.

Simulation Outputs

- View 3D trajectory plots and dozens of default scopes such as radiant intensity, seeker rates, seeker orientation, seeker modes, IRCCM levels, 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, seeker track/search percentage.
- Insert additional scopes to display signals of specific interest.



TESS 3D Trajectory Plot



TESS IR Scene Generator

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 in a wide range of tactical engagement geometries.

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, and a wide range of tactical engagement geometries.

EW Operational Support
Support the programming of operational equipment by developing effective tactical programs and data loads in relation to specific threats, engagement geometries and tactics.

Lab and Range Testing
Optimize and validate platform survivability in laboratory and field trial environments through trials planning supported by inexpensive but high fidelity software simulation trials. Carry out after-test results analysis to support trial documentation and report generation.