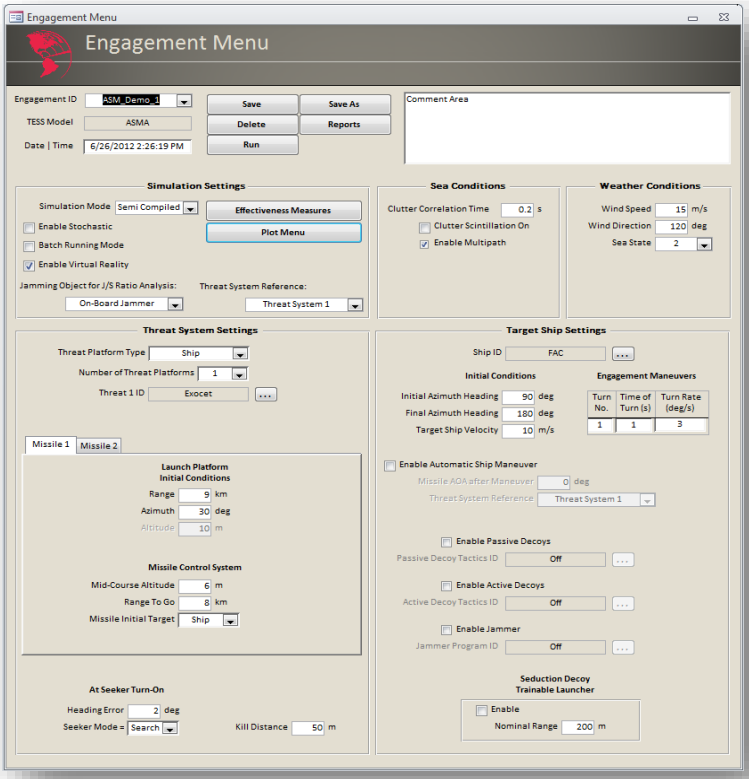
TACTICAL TECHNOLOGIES
a LEONARDO company

Anti-Ship Missiles
Active Radar Guided
ASM(AR)

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

Overview

ASM(AR) is a member of the Tactical Engagement Simulation Software (TESS) Sea RF family of physics-based simulation products. ASM(AR) models closed-loop engagements and interactions between a naval target platform and up to two sea or air launched radar-guided (active seeker) anti-ship missiles. The maneuvering target ship can deploy chaff, passive and active decoys, and/or use its coherent DRFM-based on-board jammer to defend itself from the incoming threats. In long range engagements, a mid-course estimation option optimizes the missile's flight path to achieve maximum range. ASM(AR) 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(AR) 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

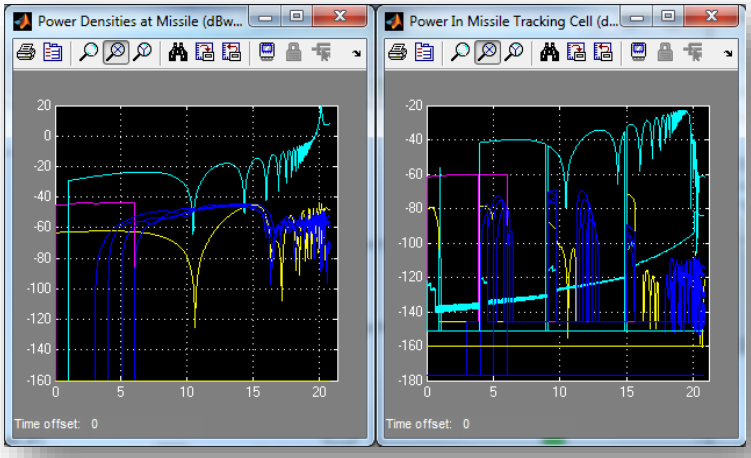
Technical Description

Target Modeling

- Set the ship's initial position, orientation and velocity.
- Specify manual or automatic ship maneuvers using turn rates, turn time or threat angle of arrival after maneuver.
- Import existing RCS data or generate lookup tables from 3D objects using the built-in RCS prediction tool.
- Model the ship's RCS as a point or distributed target with Log Normal or Rayleigh distribution scintillation.

RF Countermeasure Modeling

- Select chaff, single/dual corner reflectors, active hovering decoys and/or an onboard jammer to protect the ship.
- Deploy Confusion, Distraction and/or Seduction chaff and decoys.
- Use repositionable fixed or trainable launchers to deploy chaff and decoy payload.
- Customize the decoy deployment timing sequences, flight time and orientation.
- Model the chaff RCS as a point or distributed target with customizable scintillation.



Typical TESS Output Scopes

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- Model the single/dual corner reflector (passive) decoys with activation times, nodding motion frequency/amplitude and aspect dependent RCS profile.
- Model the hovering or suspended active decoys with launch, trajectory and physical parameters. Generate CW noise, pulse repeater and RGPO programs.
- Characterize the onboard RF jammer by its transmit power, antenna beamwidth, efficiency and beamshape, RF delays, system gains, source separation, and side-lobe reduction.
- Run cross-eye, cross-pol, swept AM with variable duty-cycle, RGPO and CW noise jamming programs.
- Employ the various RF countermeasure techniques individually or in combination against all search, acquisition and track modes of the missile seeker.

Threat System Modeling

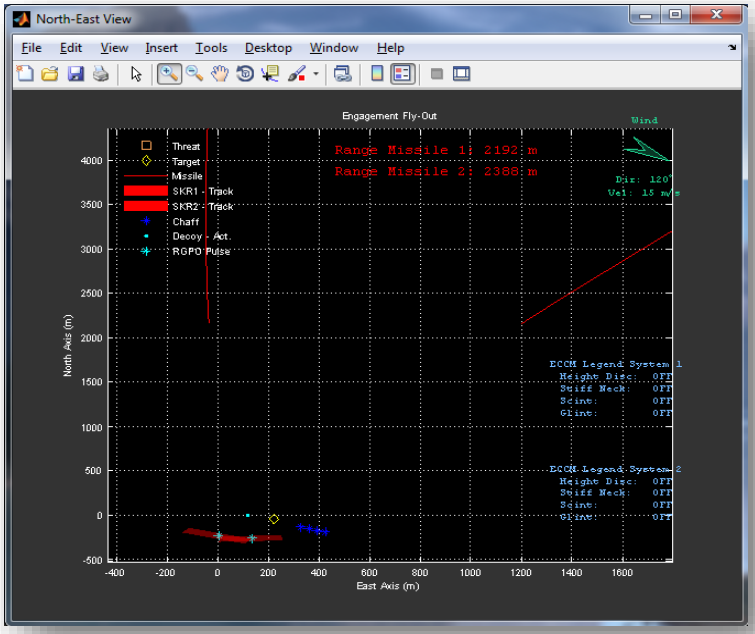
- Define each Threat Systems' initial launch position, mid-course and terminal phase maneuvers.
- Model the missile body dynamics and control (skid/bank to turn) by transfer function representations or using aerodynamic tables.
- Characterize other subsystems such as guidance, autopilot, propulsion, warhead and seeker type (Monopulse, SWC, LORO).
- Characterize the seeker transmitter and antenna parameters with power, pulse width, PRI, peak pulse power, antenna diameter.
- Characterize the seeker receiver search and track modes with range, angle, Doppler and ECCM parameters.

Environment Modeling

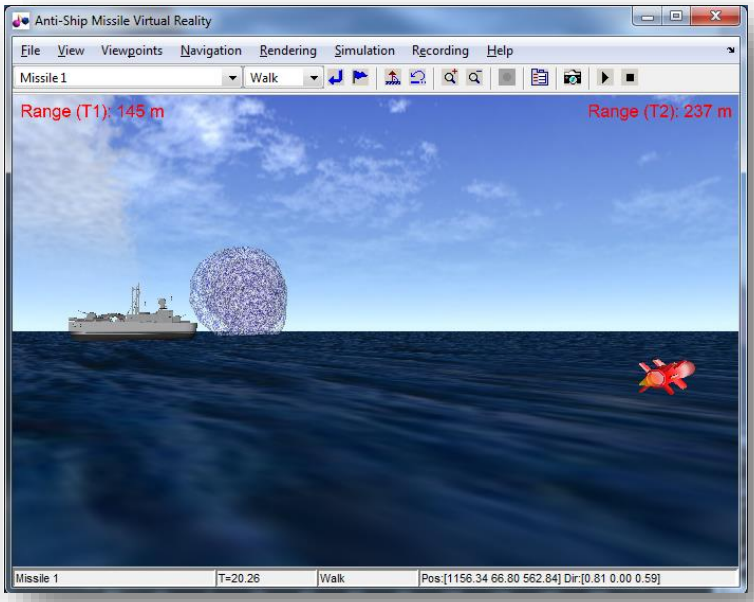
- Simulate both Rx and Tx environmental effects such as propagation losses, Doppler shifts and phase delays.
- Represent the sea-clutter model with selectable sea states, scintillation and multipath.

Simulation Outputs

- View 3D trajectory plots and dozens of default scopes such as power density, 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, seeker track/search percentage, and burn-through range.
- Insert additional scopes to display signals of specific interest.



TESS 3D Trajectory Plot



TESS Visualization Display

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.