

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

Overview

SAAM(APD) is a member of the Tactical Engagement Simulation Software (TESS) Air RF family of physics-based simulation products. SAAM(APD) models closed-loop engagements and interactions between a target platform (fixed or rotary wing) and up to two surface or air launched radar-guided (active seeker) missiles. The maneuvering target aircraft can deploy chaff, towed decoys and/or use its coherent DRFM-based on-board jammer to defend itself from incoming threats. In long range engagements, a mid-course estimation option optimizes the missile's flight path to achieve maximum range. The missiles operate autonomously (fire and forget) after launch from a ground-based or airborne launch platform. TESS products simulate all phases of an engagement from missile launch, target acquisition and tracking, countermeasure deployment and end-game intercept. 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, SAAM(APD) 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.

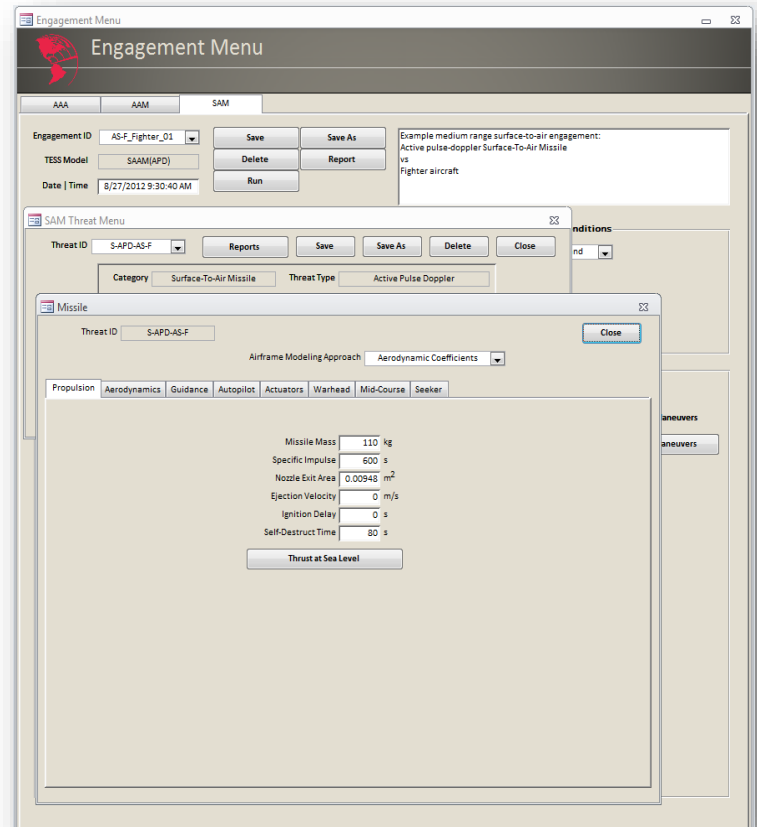
Technical Description

Target Modeling

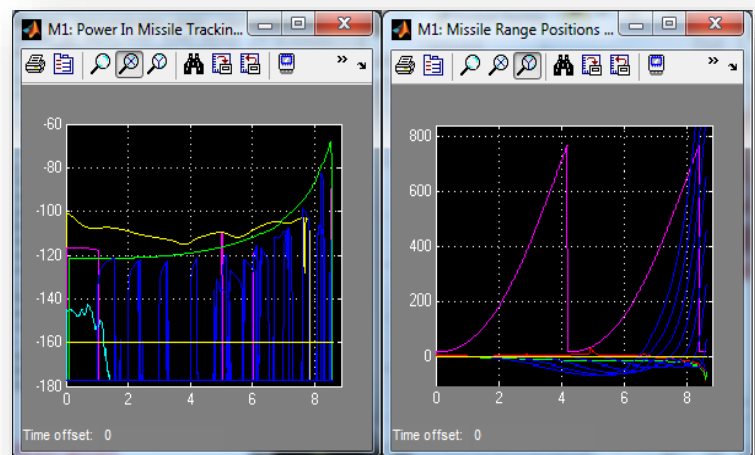
- Configure the target as a military or civilian aircraft.
- Set the target's initial position, orientation and velocity.
- Specify the target's evasive maneuvers using acceleration commands and timings.
- Import existing RCS data or generate lookup tables from 3D CAD objects using the built-in RCS prediction tool.

RF Countermeasure Modeling

- Select chaff, towed RF decoys and/or an RF jammer to protect the target aircraft.
- Customize the chaff deployment timing sequence, bloom and decay time constants, as well as the decent rate.
- Model the chaff RCS as a point or distributed target with customizable scintillation.
- Specify towed decoy parameters such as towline length, turn-on/off time, transmit power and efficiency, system gain and AM correlation time.



TESS Master Interface



Typical TESS Output Scopes

- Operate the towed decoy in either pulse repeater or continuous wave (CW) noise jammer modes.
- Characterize the RF jammer by its transmit power, antenna beamwidth, efficiency and beamshape, RF delays, system gains, source separation, and side-lobe power level reduction.
- Run Doppler noise, false targets, swept AM, cross-eye, cross-pol and FM 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

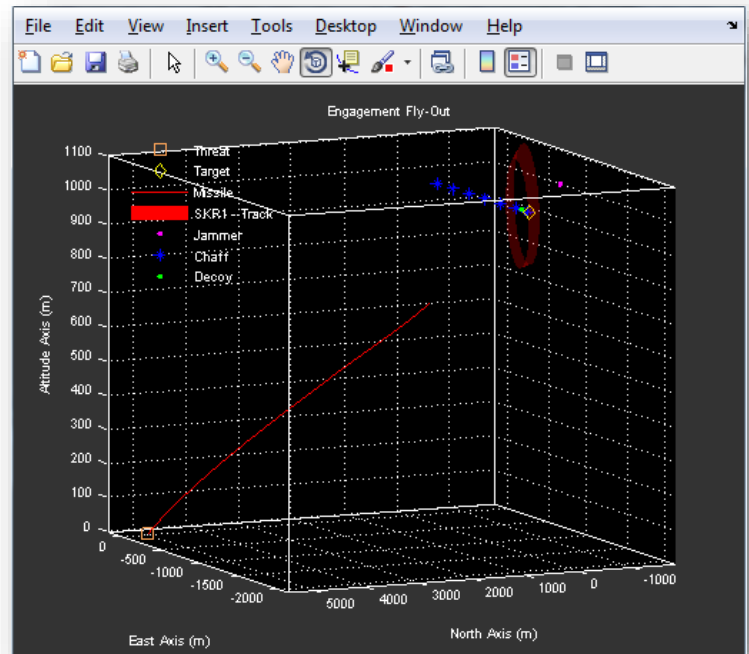
- Define each Threat Systems' initial launch position, maneuvers and timing.
- Model the missile body dynamics by transfer function representations or using aerodynamic tables generated from 3rd party software such as MISSILE DATCOM.
- Characterize other subsystems such as guidance, autopilot, propulsion, warhead and RF 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

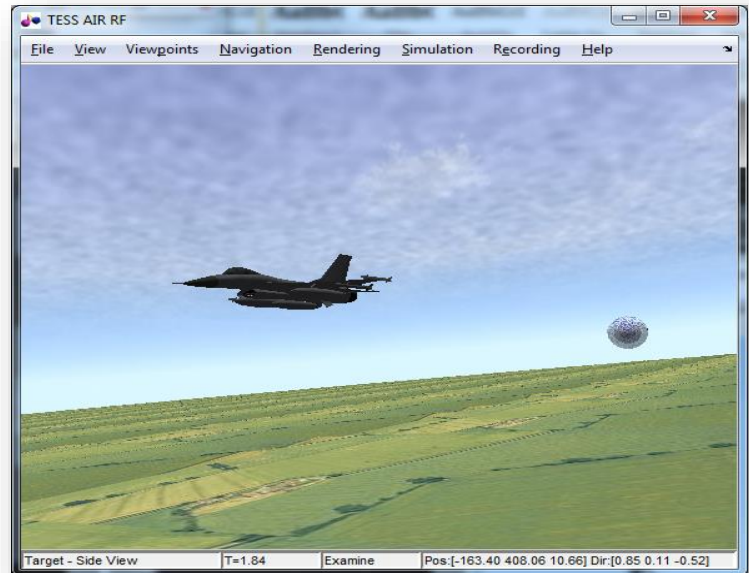
- Simulate both receive and transmit environmental effects such as propagation losses, Doppler shifts and phase delays.
- Represent the ground-clutter model with selectable terrain types and RCS correlation times.

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, seeker track/search percentage.
- 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.