

SAAM(IR) Demonstration Engagements (Air to Air Passive Infrared Homing)

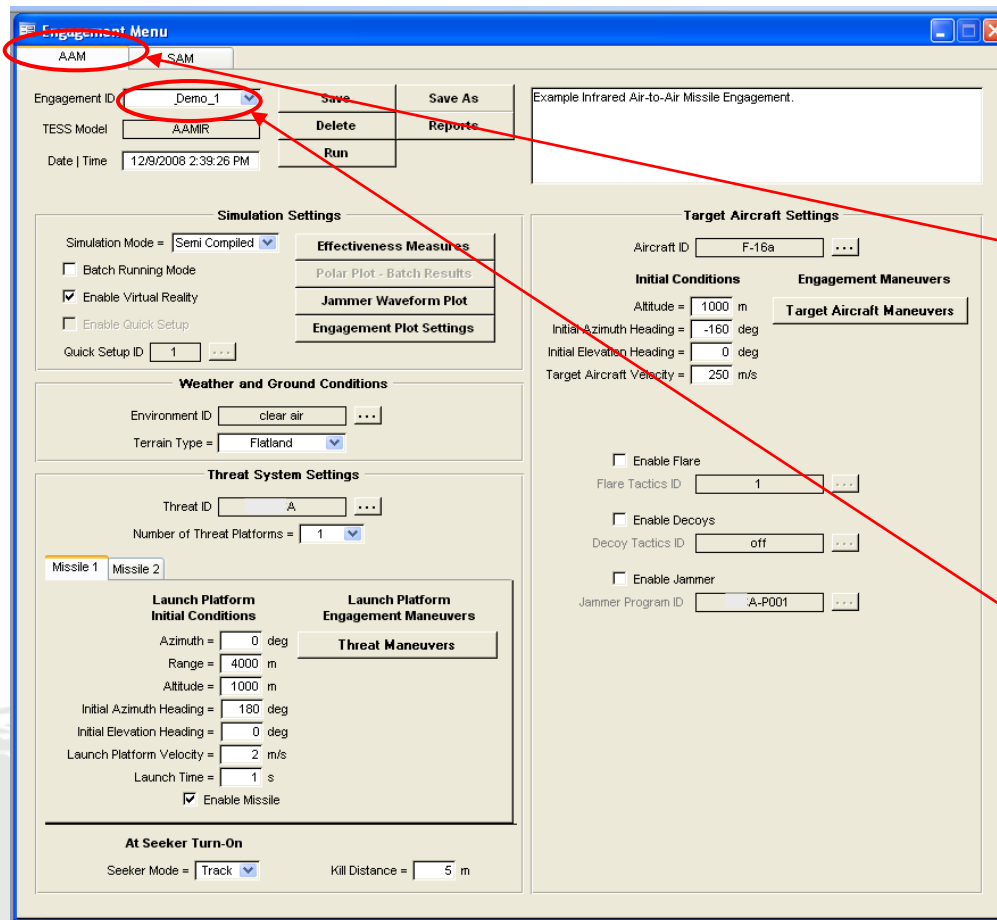
- The demonstration scenarios are:
 - 1) AA_Demo_1: Air-to-Air missile versus target aircraft executing an evasive maneuver
 - 2) AA_Demo_2: Air-to-Air missile versus target aircraft launching flares and executing an evasive maneuver (the engagement geometry is identical to AA_Demo_1 but has added a sequence of 4 flare launches)
- A brief interpretation of the major events occurring in each engagement is provided by reference to the time and spatial plots.
- Critical input parameters are shown.
- Selected output graphics are shown including time plots, Virtual Reality and 3D Plots.

AIR IR Master Interface



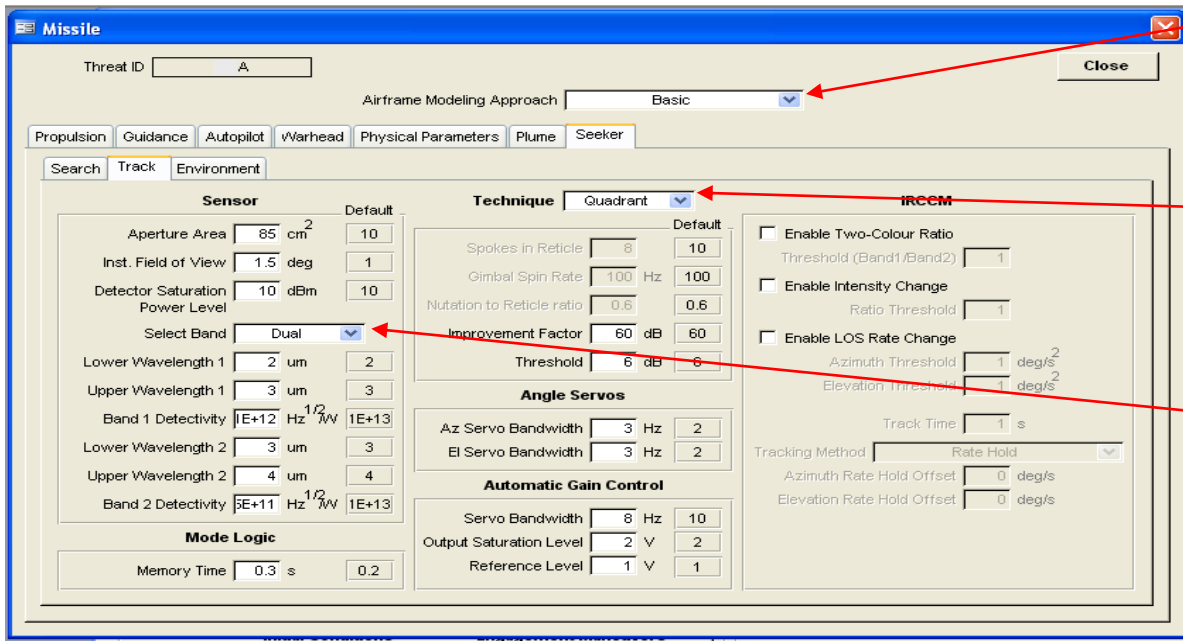
- The main screen of the AIR IR Master Interface is shown
- Clicking on the Engagements button opens the Engagement menu shown next page

AIR IR Master Interface Engagement Menu



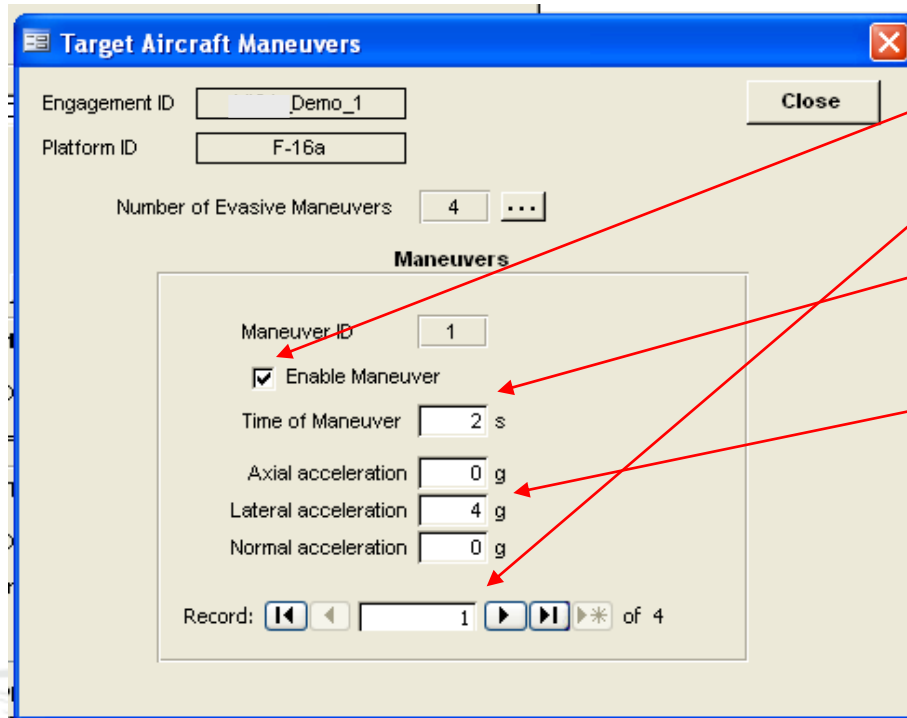
- The Engagement menu of the AIR IR Master Interface is shown
- The Engagement Type may be selected as either type AAM or SAM by clicking on one of the highlighted tabs – in this case AAM is selected
- The sample Engagements Demo_1 and Demo_2 are listed in the Engagement ID menu

All Demos - Select Missile Seeker Parameters



- Airframe Modeling Approach is set as Basic type
- Missile seeker is set as Quadrant Tracker type
- Missile seeker is set as Dual Band type with indicated limits

All Demos - Select Target Aircraft Parameters



Target Aircraft Maneuvers

Engagement ID: Demo_1

Platform ID: F-16a

Number of Evasive Maneuvers: 4

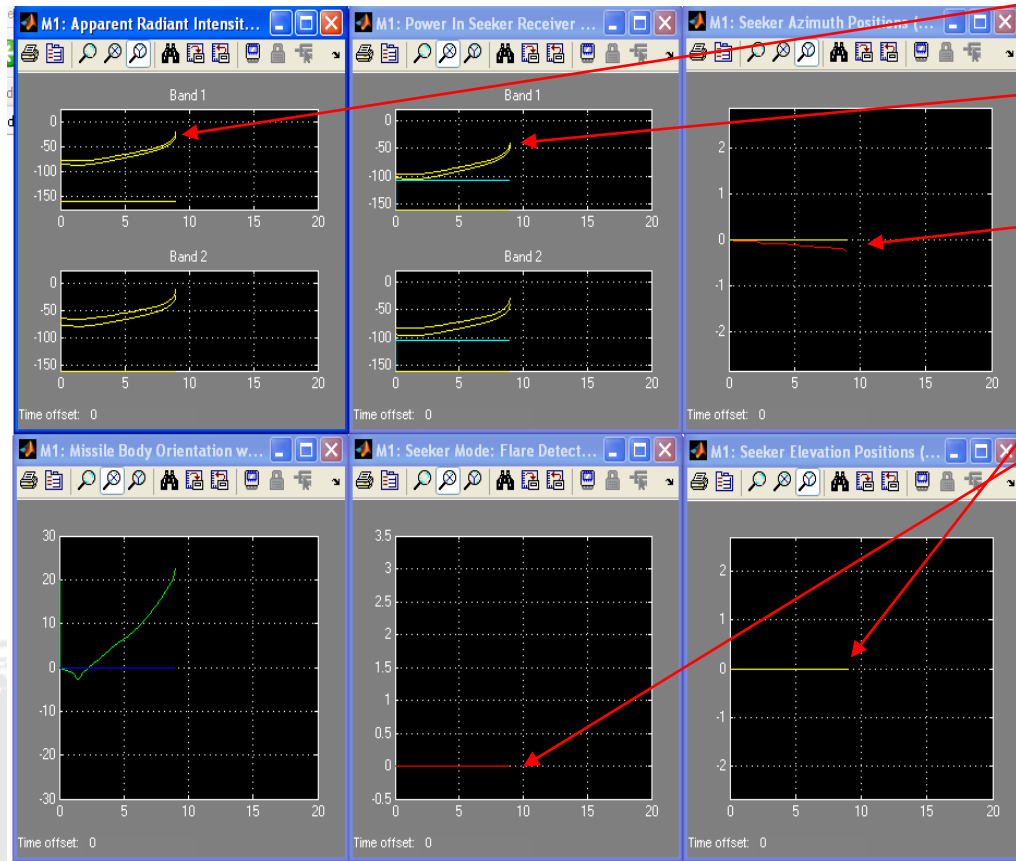
Maneuver ID	Enable Maneuver	Time of Maneuver	Axial acceleration	Lateral acceleration	Normal acceleration
1	<input checked="" type="checkbox"/>	2 s	0 g	4 g	0 g

Record: 1 of 4

- Target Aircraft employs a single evasive maneuver
- Time of maneuver is set to 2 seconds
- Maneuver is a Lateral Acceleration of 4 g

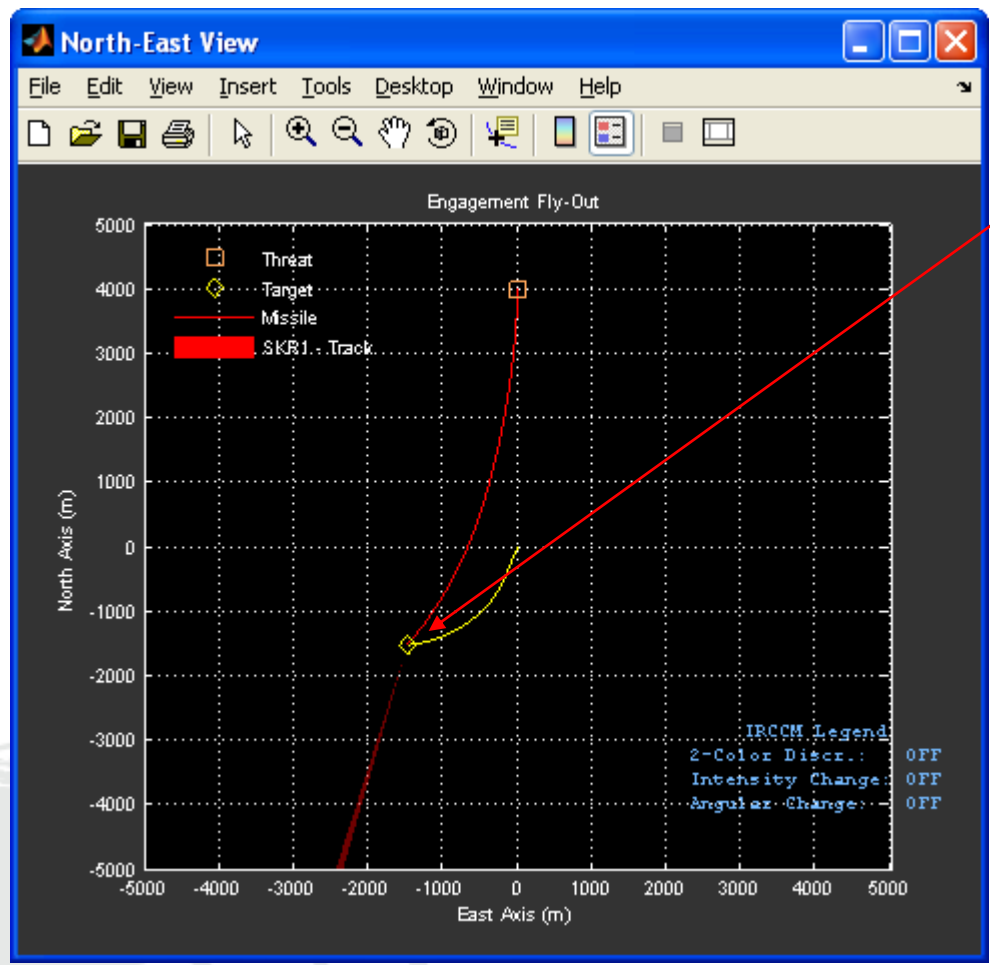
Demo 1 - Select Engagement Output

Target Aircraft and Engine(s) = Yellow
 Flares = dark blue Seeker Track Point=Red



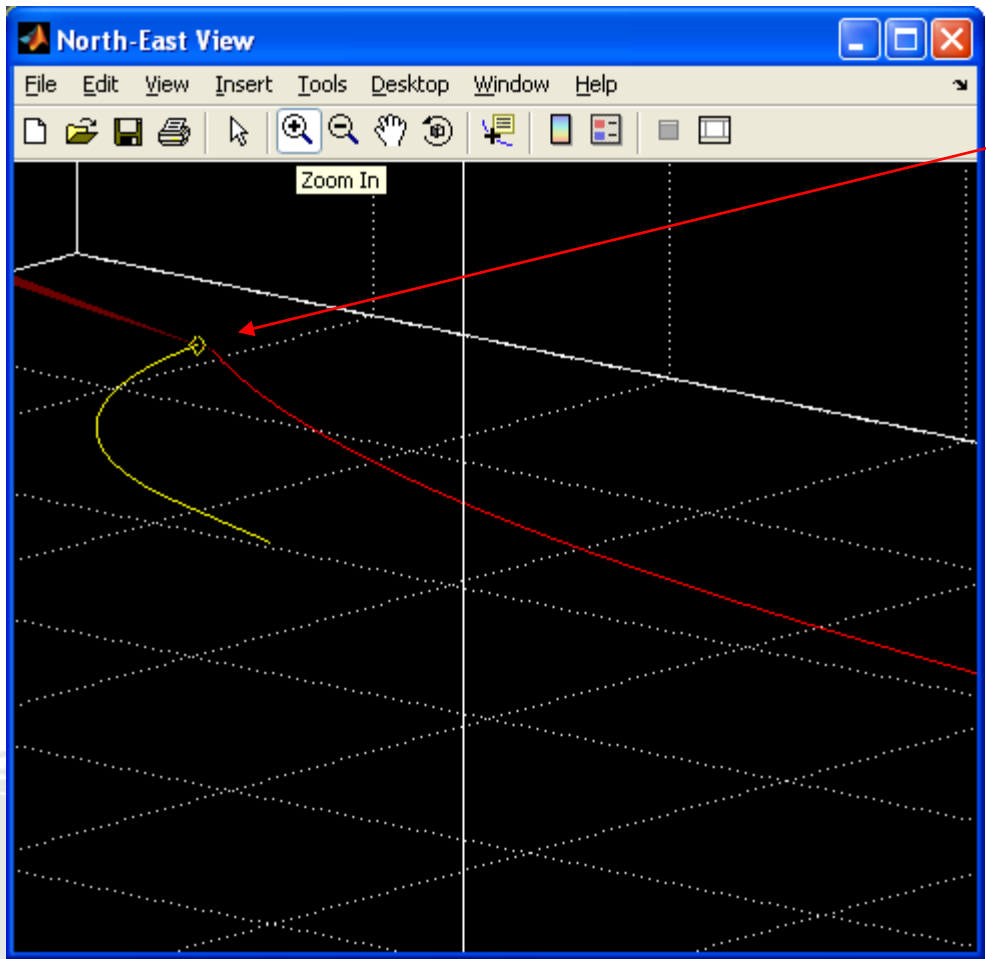
- Target aircraft and engine radiating in Band 1 and Band 2
- Target aircraft and engine in seeker receiver in Band 1 and Band 2
- Seeker tracking aircraft and engine in azimuth
- Seeker tracking aircraft and engine in elevation
- Seeker remains in Track Mode throughout engagement
- Missile hits target aircraft (see plots on following pages)

Demo 1 - Select Engagement Output



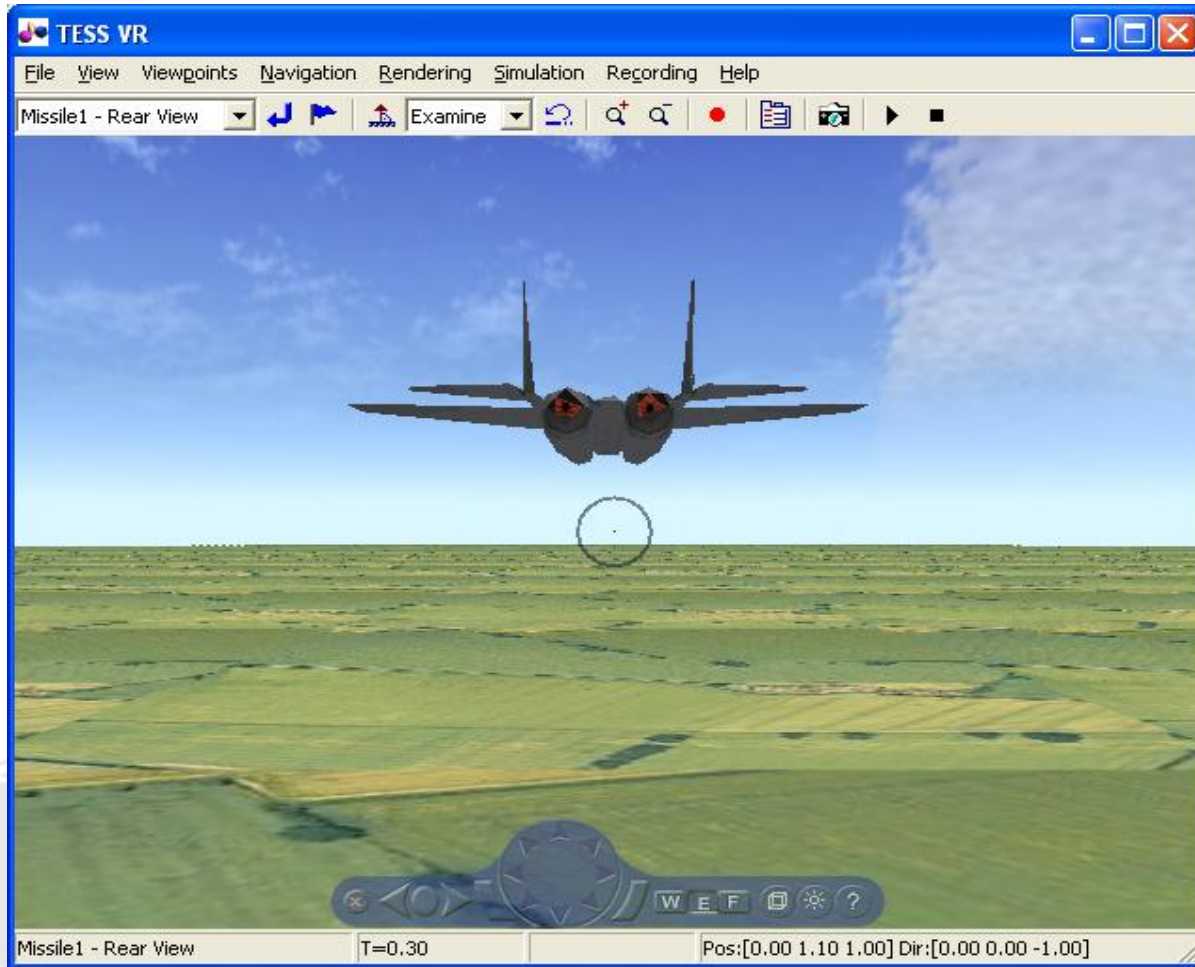
Missile hits target aircraft

Demo 1 - Select Engagement Output



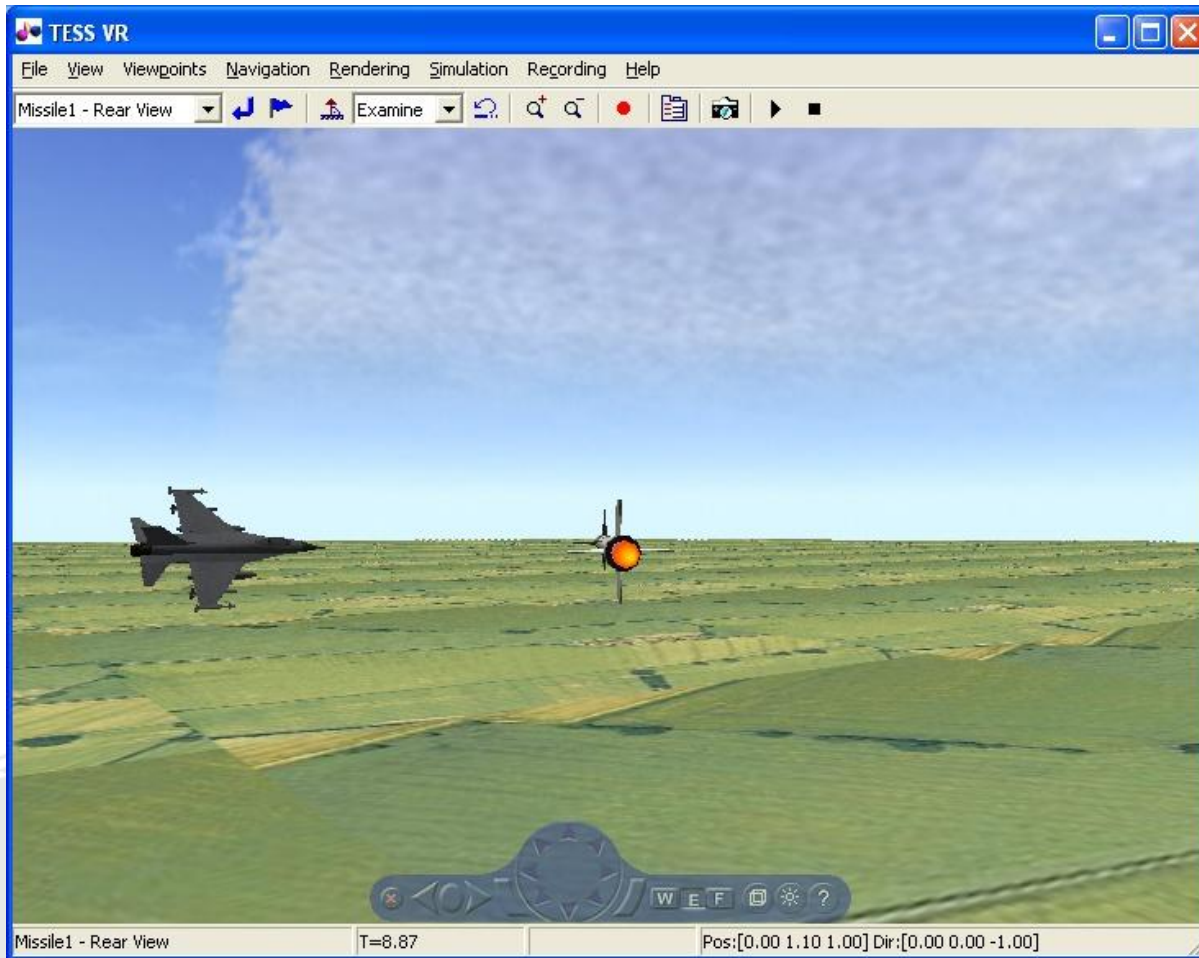
Missile hits target aircraft

Demo 1 - Select Engagement Output



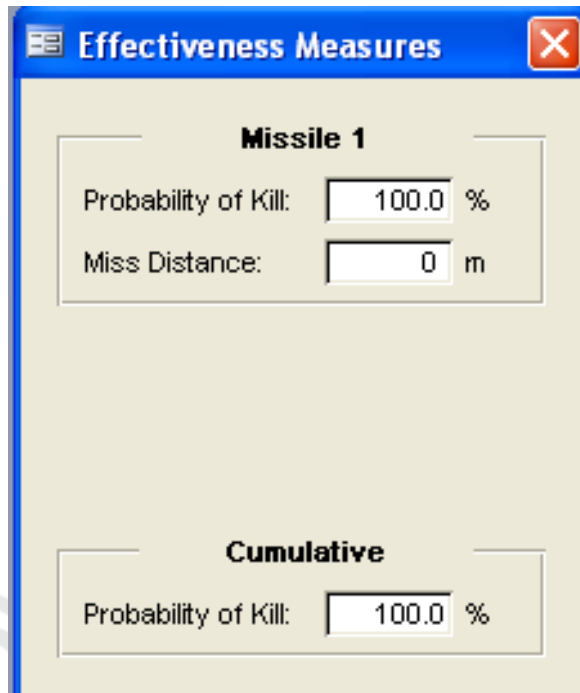
- Virtual Reality display shows missile launch from threat aircraft at simulation start
- Ring icon indicates position of target aircraft

Demo 1 - Select Engagement Output



- Virtual Reality display shows missile closing on target aircraft near end game

Demo 1 - Select Engagement Output



Effectiveness Measures

Missile 1

Probability of Kill: %

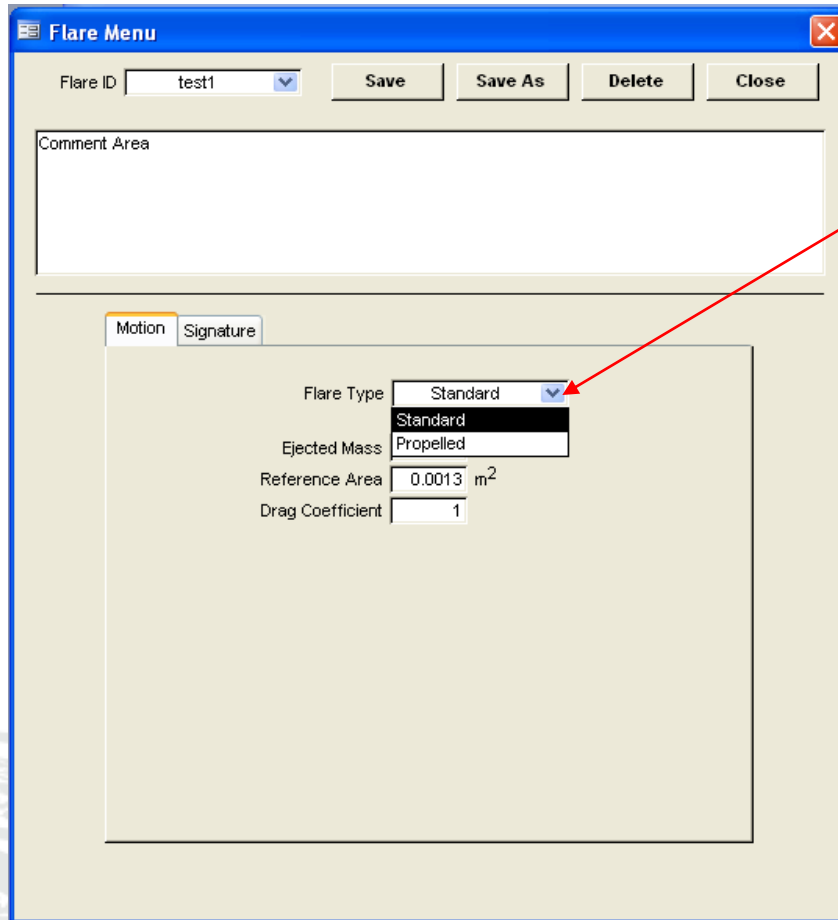
Miss Distance: m

Cumulative

Probability of Kill: %

- Missile to Target Platform miss distance = 0 meters
- Probability of Kill = 100 %

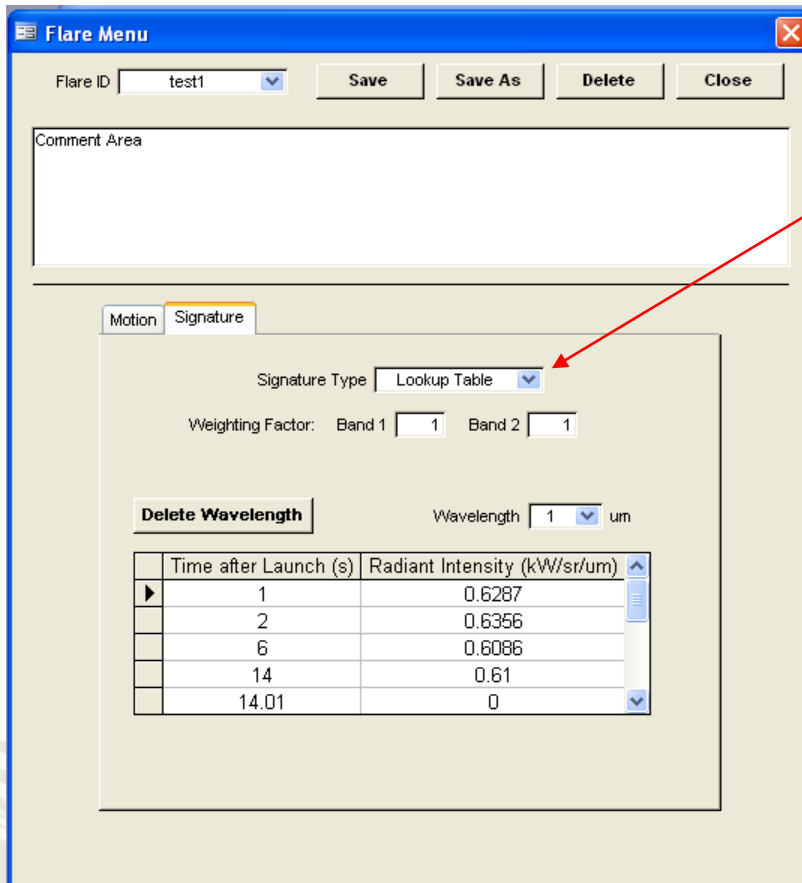
Demo 2 - Selected Parameters All Flares



The screenshot shows a software dialog box titled "Flare Menu". At the top, there is a "Flare ID" dropdown menu set to "test1", followed by "Save", "Save As", "Delete", and "Close" buttons. Below this is a "Comment Area" text box. The main section of the dialog has two tabs: "Motion" (selected) and "Signature". Under the "Motion" tab, there are four parameters: "Flare Type" is a dropdown menu currently showing "Standard" with a red arrow pointing to it; "Ejected Mass" is a dropdown menu showing "Propelled"; "Reference Area" is a text input field containing "0.0013 m²"; and "Drag Coefficient" is a text input field containing "1".

Flares Motion Type
set as Standard

Demo 2 - Selected Parameters All Flares



Flare Menu

Flare ID: test1 [Save] [Save As] [Delete] [Close]

Comment Area

Motion | **Signature**

Signature Type: Lookup Table

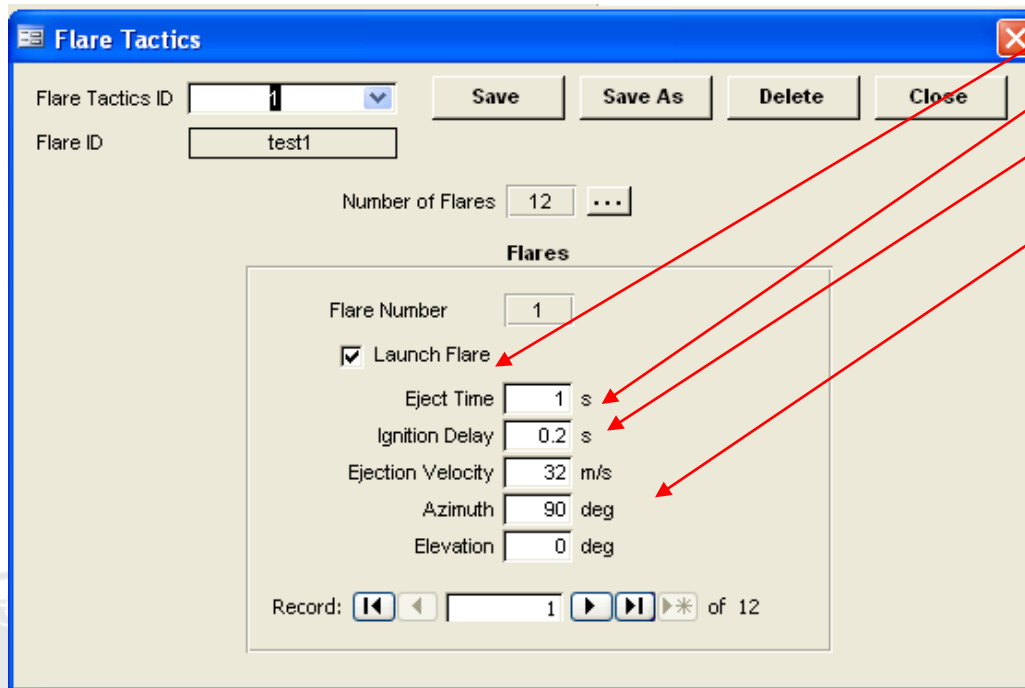
Weighting Factor: Band 1: 1 Band 2: 1

Delete Wavelength: Wavelength: 1 um

Time after Launch (s)	Radiant Intensity (kW/sr/um)
1	0.6287
2	0.6356
6	0.6086
14	0.61
14.01	0

Flares Signature Type set as Lookup Table

Demo 2 - Select Flare 1 (of 4) Parameters



The screenshot shows the 'Flare Tactics' window with the following settings:

- Flare Tactics ID: 1
- Flare ID: test1
- Number of Flares: 12
- Flare Number: 1
- Launch Flare:
- Eject Time: 1 s
- Ignition Delay: 0.2 s
- Ejection Velocity: 32 m/s
- Azimuth: 90 deg
- Elevation: 0 deg
- Record: 1 of 12

Flare 1 enabled

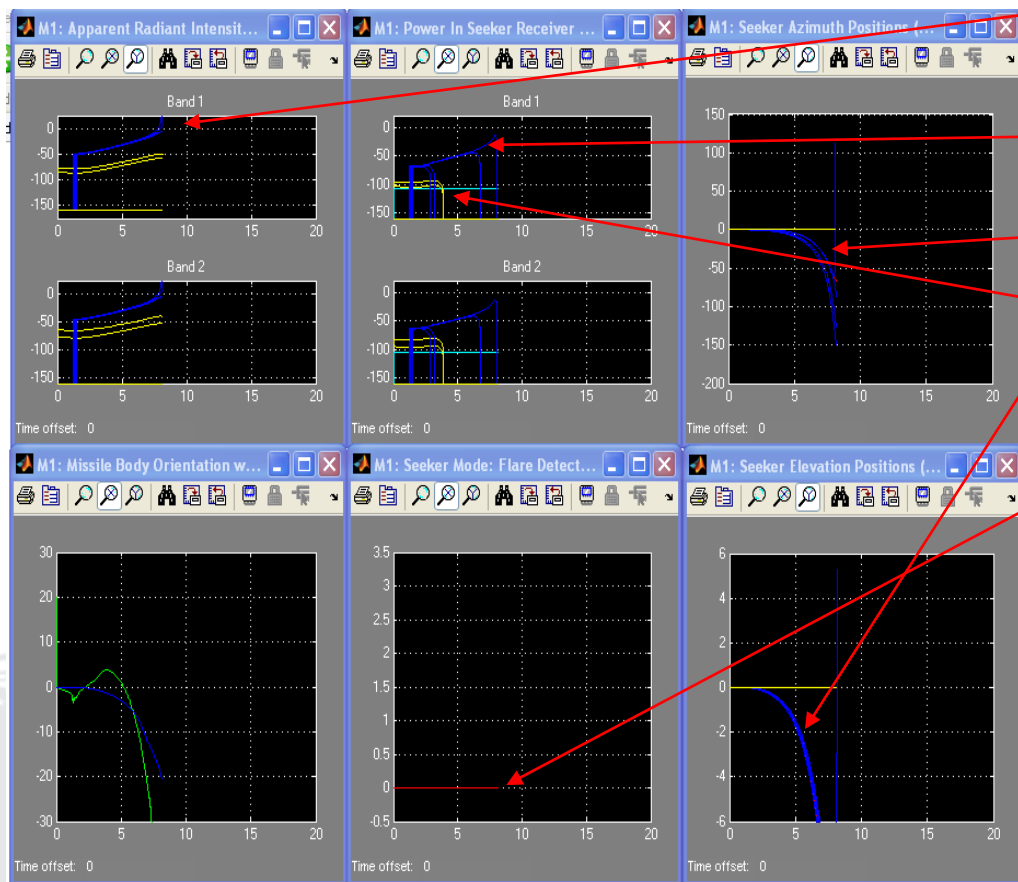
Eject Time is set to 1 second

Ignition Delay is set to 0.2 seconds

Eject parameter group as set

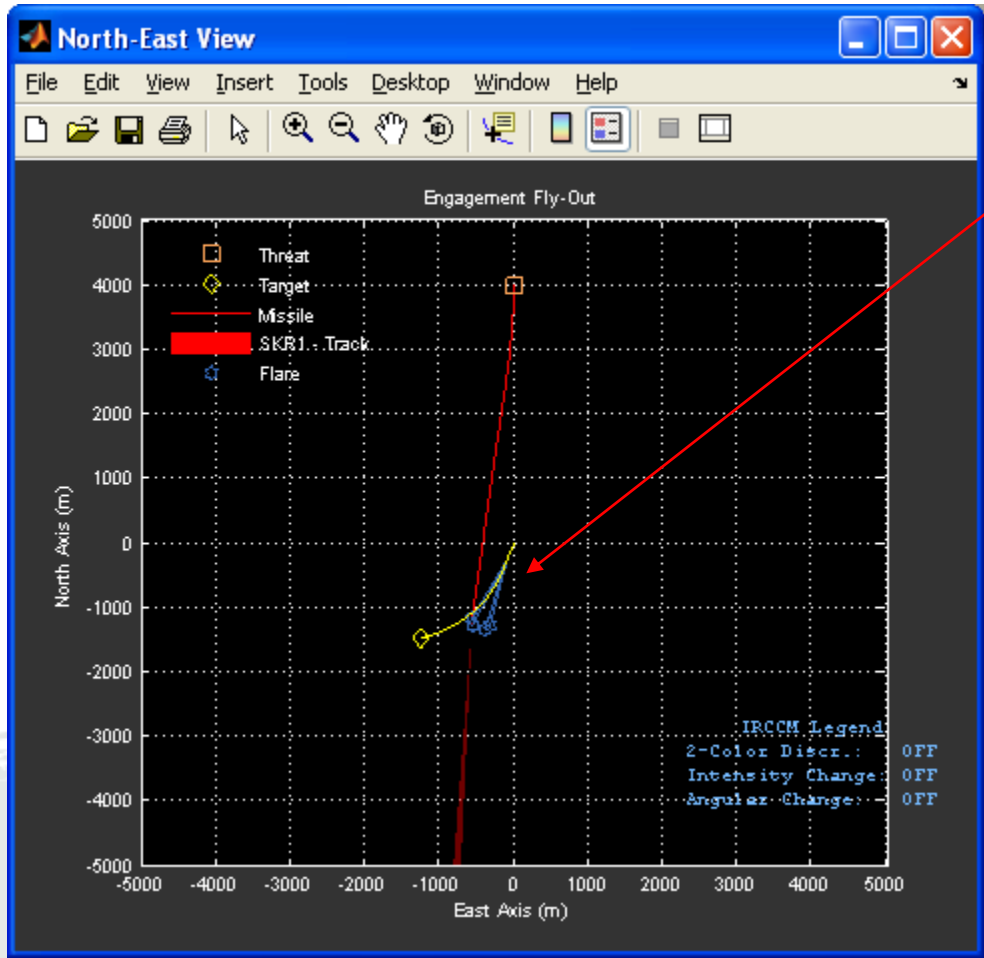
Demo 2 - Select Engagement Output

Target Aircraft and Engine(s) = Yellow
Flares = dark blue Seeker Track Point=Red



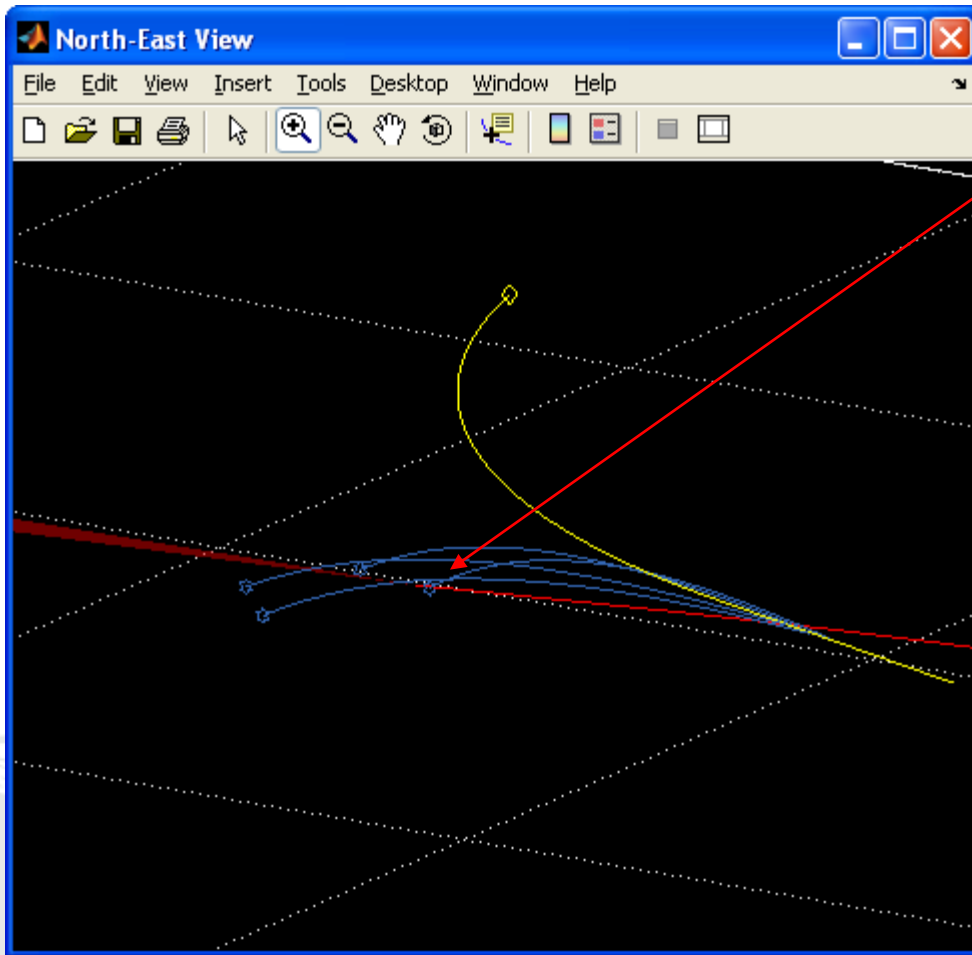
- Intensity of radiating flares exceeds target aircraft and engine in Band 1 and Band 2
- Flare 3 captures seeker receiver track
- Seeker tracks Flare 3 in azimuth and elevation
- Aircraft, single engine and flares 1, 2 and 4 drop out of seeker FOV as engagement proceeds
- Seeker remains in Track Mode throughout engagement (indicates transition to track on Flare 3 without breaklock)
- Missile hits Flare 3 (see plots on following pages)

Demo 2 - Select Engagement Output



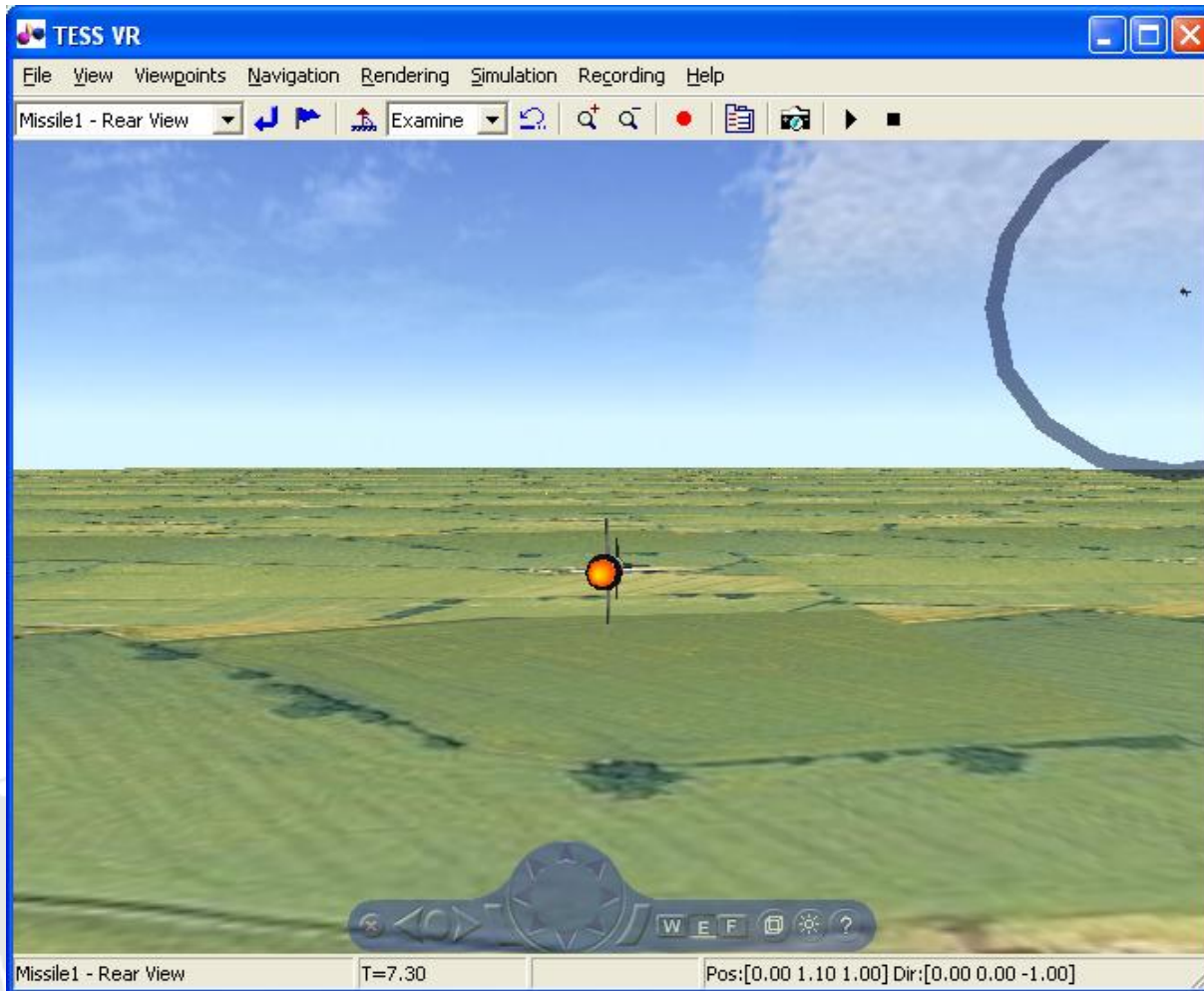
Missile hits Flare 3

Demo 2 - Select Engagement Output



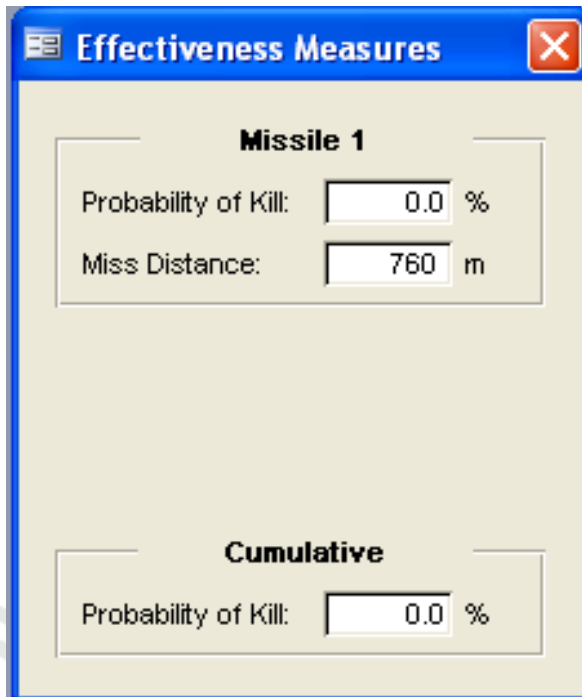
Missile hits Flare 3

Demo 2 - Select Engagement Output



- Virtual Reality display shows missile closing in on Flare 3 near end game
- Target aircraft visible at upper right of VR Display

Demo 2 - Select Engagement Output



Effectiveness Measures

Missile 1

Probability of Kill: %

Miss Distance: m

Cumulative

Probability of Kill: %

- Missile to Target Platform
miss distance = 760 meters
- Probability of Kill = 0 %