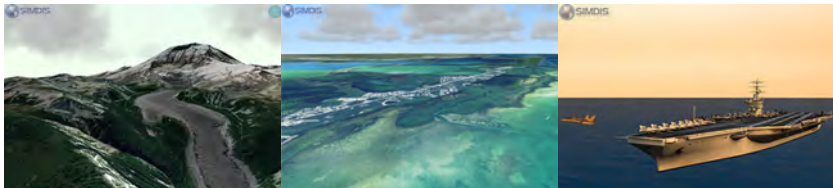




SIMDIS™
ANALYSIS & DISPLAY

Introduction



- A set of Government-off-the-Shelf (GOTS) software tools developed and maintained by the Naval Research Laboratory (NRL) to support analysis with 2-D and 3-D display.
- Allows an integrated view of both time-space position information (TSPI) and telemetry data. Provides an intuitive view of complex system interactions before, during and after an event.
- **CAC:** <https://www.trmc.osd.mil/simdis.html>
- **Public:** <https://www.tena-sda.org/simdis.html>

Advantages

- Integrates multiple data sources into a common picture
- Used for training and T&E by various DOD and foreign organizations
 - Large user base
 - Independently certified and accredited
- Facilitates integration of user-developed software
 - Allows users to customize and extend existing software via APIs
- Distribution Statement A
 - Approved for public release; Distribution is unlimited
- GOTS software
 - No license fees
 - Lower cost basis; Development spread across multiple sponsors
 - Users leverage improvements funded by others
 - RCC cost savings/avoidance for the DOD over similar COTS products

Current Version

- SIMDIS Service Releases (SR) occur every March and September
 - Statement Distribution A: Public release; Distribution unlimited
 - Identical operation across Linux and Windows
 - Supported operating systems: Windows 10 and RHEL 6, 7 & 8
- Active RMF based ATO under US Navy: eMASS 6753
- Certified on CANES HW/SW baselines 1.x, 2.x and 3.0: PSC-2016-00018
- Department of Navy DADMS ID: 90052

SIMDIS Uses

- System of Systems
 - Navy Enterprise, Combat System and EW Testbed Displays
 - Joint After Action Review (JAAR) Display
 - Integrated Threat Analysis and Simulation Environment (ITASE)
 - Air Force's BRAWLER (Air Combat Simulation Model)
- Support for JREAP-C, NMEA, OTG, TLE, DIS, HLA and TENA via plug-ins
- Live situational awareness with DVR-like replay
- Vehicle performance assessment
- Range safety monitoring
- Modeling and simulation
- Post-event reconstruction and debrief
 - Synchronized with audio, chat, images and/or video
 - Presentation mode via bookmarks

SIMDIS Operational Use

- East and West Coast Navy Tactical Training Ranges
- NSWC Qualitative Fleet Feedback
- NSWC Performance Assessment
- Carrier Strike Group 4/15
- Surface Mine Warfare Development Command
- Naval Undersea Warfare Center
- Program Executive Office Integrated Warfare Systems
- Marine Aviation Weapons and Tactics Squadron One
- Air Force Green Flag
- US Army Test & Evaluation Command
- Missile Defense Agency
- Canadian Forces Maritime Warfare Centre
- Defence Science and Technology Organisation, Australia
- Defence Science and Technology Laboratory, UK

System Requirements

Minimum System Configuration

| | |
|--------------------|---|
| CPU | Dual-core processor 1.6 GHz, 2 MB L2 Cache, 667 MHz FSB |
| RAM | 4 GB DDR-400 |
| HDD | 100 GB HDD Space |
| GPU | 256 MB Texture Memory; OpenGL 3.3 |
| OS | Windows 10 or RHEL 6 |
| Display | 800x600 screen resolution |
| Peripherals | Mouse, Keyboard, Ethernet Card |

Recommended System Configuration

| | |
|--------------------|---|
| CPU | Quad-core processor 3.0 GHz, 8 MB L2 Cache, 1066 MHz FSB |
| RAM | 16 GB DDR2-800 SDRAM |
| HDD | 1 TB Solid State Drive (SSD) |
| GPU | 1 GB Texture Memory; OpenGL 3.3 |
| OS | Windows 10 or RHEL 7 |
| Display | 1920x1080 screen resolution |
| Peripherals | Three-button mouse with scroll wheel, Keyboard, Ethernet Card |


Installer Types

- **Core:** A stripped-down package offering only basic SIMDIS functionality. It does not include programs such as Plot-XY, Model Viewer, etc. It also does not include documentation. The Core install is meant for users who want to redistribute a SIMDIS package containing their own custom plug-ins and data sets.
- **Full:** A software suite that includes general purpose plug-ins and extensions. The installer is packaged as either an **.exe** for Windows or **.run** for Linux. SIMDIS does not require elevated privileges to install or run. Elevated access is only required if installation is to a folder where the installing user does not have write access.
- **ZIP:** Contains the same setup as Full Installer. The big difference is that the installer is a ZIP file and does not require elevated privileges to install or run. This is useful in situations where users are blocked from downloading executable programs.

Virtualization

- The Windows versions of SIMDIS have been installed and tested using the following virtualization software:
 - VirtualBox
 - VMWare Workstation Player
 - VMWare Workstation Pro
- For correct operation a virtualization system supporting OpenGL 3.3 Core Profile as well as access to the accelerated video card is needed.

Starting SIMDIS

- Run the executable from the folder specific to the host OS:
 - e.g. `$(SIMDIS_DIR)/bin/amd64-linux` for **Linux**
 - e.g. `$(SIMDIS_DIR)/bin/amd64-nt` for **Windows**
- Double-click the SIMDIS icon  on the desktop (if configured)
- Type **simd**is in a command prompt (if **PATH** is configured)
- Create a Windows batch or Linux sh file to customize SIMDIS
 - SIMDIS can also be executed with a variety of optional command line arguments which affect the way SIMDIS is initialized. The available command line arguments can be shown by typing **simd**is10 **-help** in a command prompt or refer to the Command Line Help option in the SIMDIS **Help About** dialog.
- Additional resources on starting and operating SIMDIS:
 - Quick Start Guide, accessed via the **Help About** dialog.
 - Chapter 3 of SIMDIS User Manual accessed via the **Help About** dialog.

Display Modes

- SIMDIS has two display modes: Overhead and Perspective
 - **Perspective Mode | Default** - a 3D view of the Earth. The Eye can pitch, roll, rotate, pan, and zoom
 - **Overhead Mode** - An orthographic projection pointing North, 2D view of the Earth with all entities rendered on the surface. The Eye can pan and zoom around the Earth but cannot pitch, roll, or rotate.

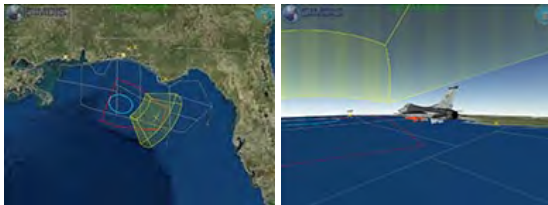
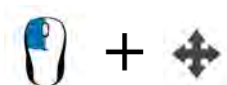


Figure: Overhead Mode vs. Perspective Mode

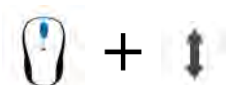
Mouse Modes

- SIMDIS Classic | Default
 - Mouse controls similar to previous versions of SIMDIS
- GIS
 - Mouse controls similar to popular GIS programs such as ArcGIS
- Builder
 - Mouse controls similar to the RF Propagation TACAID tool Builder

SIMDIS Classic Mode



Rotate/Tilt View



Zoom In and Out



Grab and Pan

Tool Tips

- SIMDIS contains numerous detailed tool tips that are meant to guide as you explore and operate the application. The tool tips are written as the primary user guide, thus allowing the manual to focus on deeper topics.



SIMDIS Scenario

- A collection of data that exists between a specific start and end time
 - Time-stamped **position**, orientation and velocity data
 - Preference rules, media, bookmarks and eye positions
 - Overlay graphics (GOG), imagery and elevation data
- File-based data entry
 - Recorded data stored in a compatible format that can be read by SIMDIS.
 - Data can be read at once and stored in RAM for instantaneous access, or paged in based on filter criteria.
 - Supported native file formats are documented in the User Manual
 - Files can also be loaded via drag and drop onto graphics or dialogs
- Network-based data entry
 - Data is data streamed from a source, whether it is live or simulation based.
 - Data must be either converted to a SIMDIS compatible data format or processed and injected into SIMDIS by a user-created plug-in.
 - SIMDIS will limit the data to N number of previous points and/or drop duplicate data to reduce memory usage. The data reduction features are on by default.
- All data entry is handled via a SIMDIS plug-in

Object Types



Platform: Fundamental type that describes the “who, what, and where” of an entity.



Beam: Child of Platform that describes an RF emission. Also can be used to show and data based on range, angle and time.



Gate: Child of Beam that describes the range and angle where an RF emitter is looking. Also used to show field of view for EO/IR sensors.



Laser: Child of Beam that describes a device that emits light via a focused source.



Lines of Bearing (LOB): Child of Platform that represent RF detections from an emission on a specified bearing at a given instant in time.



Projector: Child of Platform that represent imagery projection from a perspective (e.g. from a video camera) into the 3D scene.



Custom Rendering: This can be either a stand-alone entity or a child of a Platform. Originally created for showing error ellipses and uncertainty.

Ancillary Types

- **Generic Data:** Non-positional time stamped data that has a specific life time.
- **Category Data:** Non-positional time stamped data that is used for filtering and display preferences.
- **Data Table:** Parametric time stamped data, commonly used for telemetry.

Supported Coordinate Systems

Supports conversions between position, orientation and velocity

- Global

- **ECEF** | Earth Centered Fixed

- **ECI** | Earth Centered Inertial

- **WGS84-HAE** | Geodetic latitude, longitude, altitude

- Local

- Scaled Flat Earth

- ENU** X: East, Y: North, Z: Up

- NED** X: North, Y: East, Z: Down

- NWU** X: North, Y: West, Z: Up

- Tangent Plane (WGS-84)

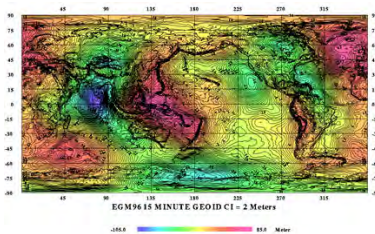
- ENU** X: East, Y: North, Z: Up

- Generic** X & Y translation, rotation about reference origin

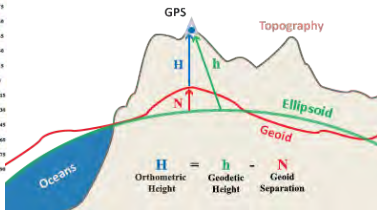
Conversions available per file, platform, or data point

Vertical Datum Support

- Specifies the zero surface to which heights are referenced
 - WGS-84 ellipsoid [Default]
 - Mean Sea Level (MSL) based on Earth Gravitational Models EGM 1984, 1996 and 2008
 - User specified datum
 - Tidal variances as an example



EGM 15' x 15' Undulation Plot Image Courtesy of NGA

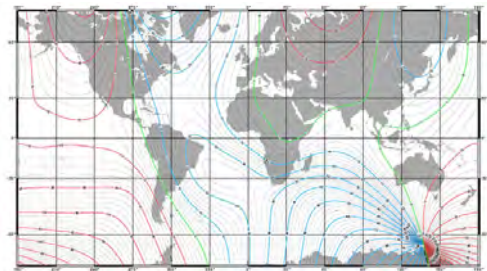


- Orthometric Height (Height Above Mean Sea Level)
 - H is measured traditionally
- Geoid Separation
 - N is modeled using EGM
- Geodetic Height (Height Above WGS-84 Ellipsoid)
 - h is approximately = N + H

Magnetic Variance Support

Supports magnetic variance (declination) calculations between magnetic North and True North

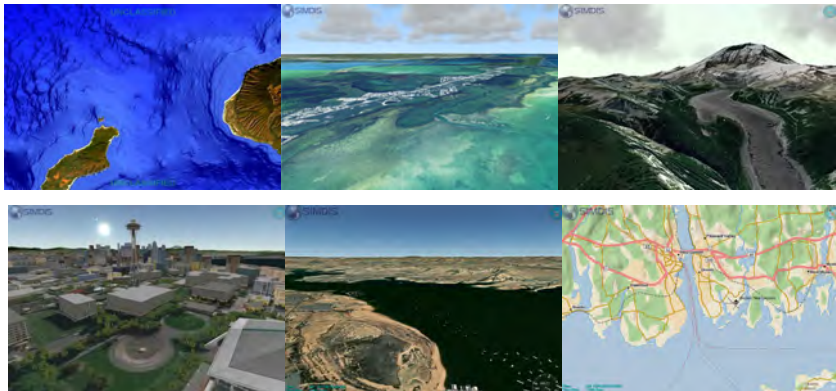
- Variance computer via World Magnetic Model (1985-Dec 31 2024)
- True, no variance [Default]
- User specified variance



US/UK World Magnetic Model, Epoch 2005, Main Field Declination
Image Courtesy of National Geophysical Data Center

Global Terrain Rendering

SIMDIS can efficiently render gigabytes of geo-located imagery, elevation and vector data using common computer hardware.



Imagery and Terrain Formats

SIMDIS supports many industry standard GIS formats directly, without having to pre-process data.

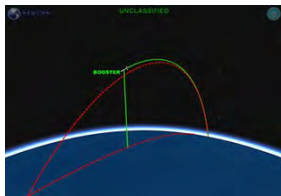
- MBTiles: Mapbox Tiles format [Preferred]
- GDAL: Geospatial Data Abstraction Library (geospatial raster formats)
- WMS: Web Mapping Service
- TMS: Tile Mapping Service
- ArcGIS: ESRI ArcGIS Server REST API
- Tile Package: ESRI compact cache v1 & v2
- XYZ: Generic Quad-key (Bing, Google, WorldWind)
- Mapnik: Vector graphics (OpenStreetMap PBF)
- DB: Legacy SIMDIS 9 database format

Overlay Graphics

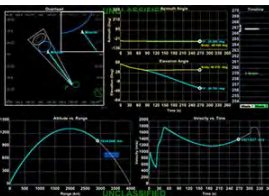
GOG | Generalized Overlay Graphics

- ASCII based graphics that represents points, lines and polygons
- Simple
 - Human readable and writable
 - Quick mechanism for displaying simple 3D objects
- Used for delineating boundaries or areas of interest
 - Can create simple 2D and 3D shapes
 - Supports free hand drawing
- SIMDIS supports the display other overlay graphics
 - Open Geospatial Consortium (OGC) KML 2.2 specification
 - GeoJSON support
 - ESRI Shapefile, SDTS, Arc/Info via GDAL
 - GCCS, JDS and LATR overlays

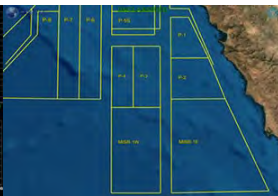
Example GOG Uses



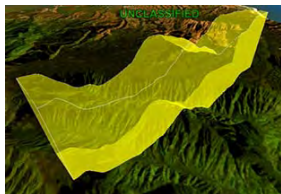
Trajectory Lines



Limit Lines



Range Boundaries



LatLonAlt Box



Hemisphere



Attached GOG

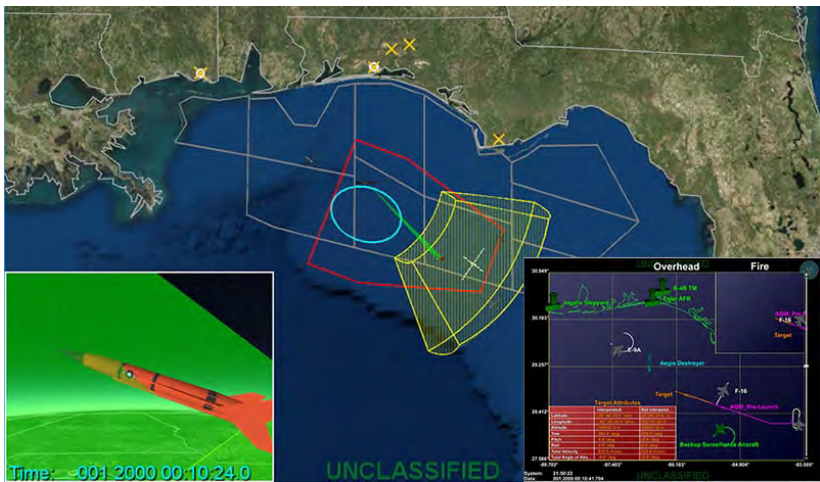
2D Image Icon Support

- Allows standard image formats: BMP, GIF, JPG, PNG, and TIF
- NTDS Symbology Shown, MIL-STD-2525B is also available



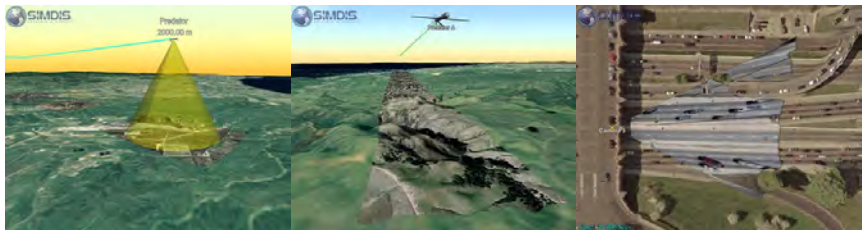
Video Icons

- Videos can be played on an icon in SIMDIS
- Positioned using platform data and oriented via data or image icon settings



Projected Textures

The **Projected Texture** capability allows SIMDIS to project a texture or video into a 3D scene in a manner similar to how a movie projector projects image onto a screen.



Antenna Pattern Support



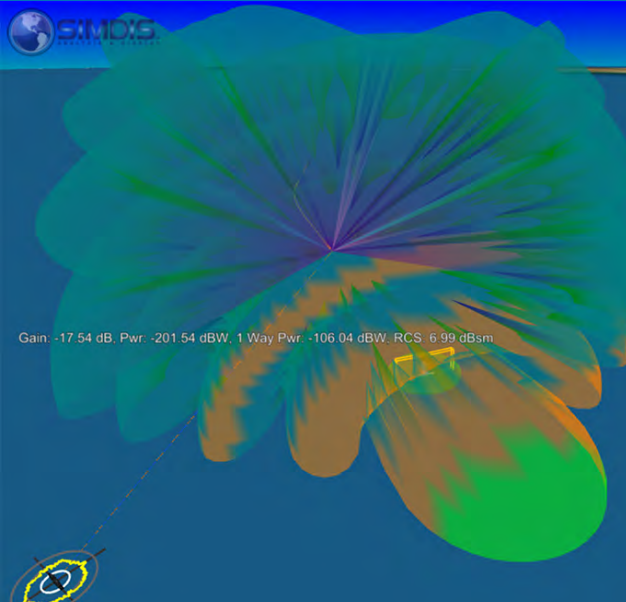
■ Algorithms

- Cosecant Square
- Gaussian
- Omni
- Pedestal
- $\sin x|x$

■ Measured

- Symmetric Table
- Relative Table
- Monopulse
- Bilinear
- NSMA
- EZNEC
- XFDTD (Remcon)

Gain: -17.54 dB, Pwr: -201.54 dBW, 1 Way Pwr: -106.04 dBW, RCS: 6.99 dBsm

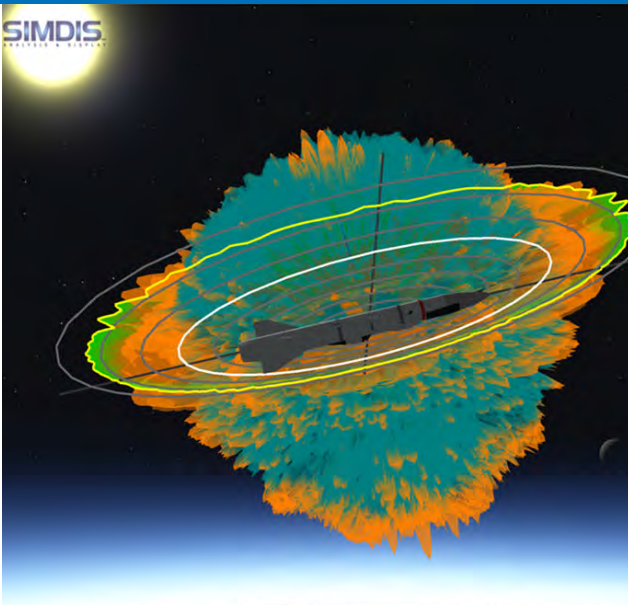


Radar Cross Section Support

SIMDIS
SYSTEMS & SIMULATION

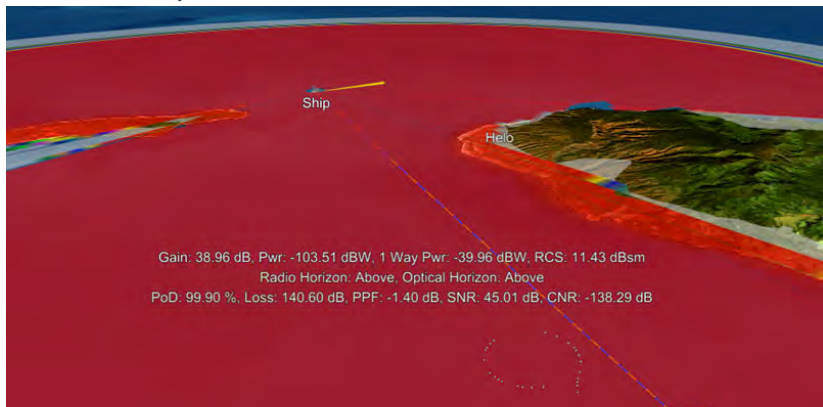
■ Measured

- Look-Up Table
- SADM
- X-Patch

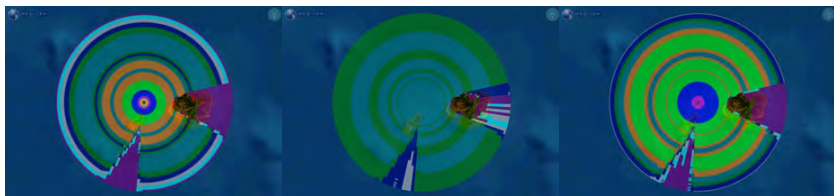


RF Propagation Data

- Plug-in API uses externally generated RF Propagation data (AREPS or Builder)
 - Probability of Detection (PoD)
 - Signal Loss
 - Pattern Propagation Factor (PPF)
 - Signal to Noise Ratio (SNR)
 - Clutter to Noise Ratio (CNR)
 - One-Way Loss



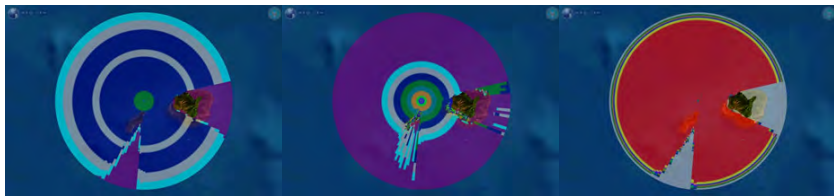
RF Propagation Data Displays



LOSS

PPF

SNR

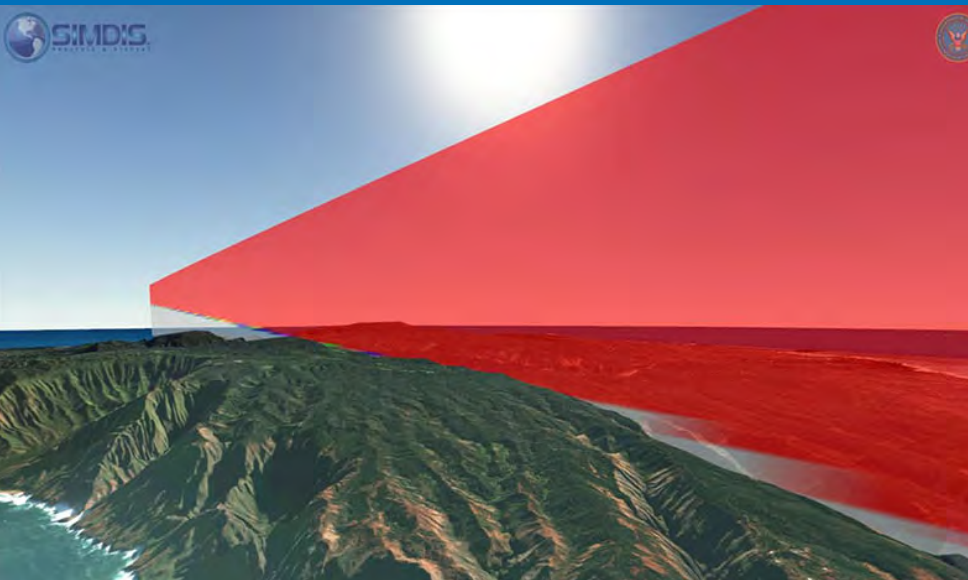


One Way

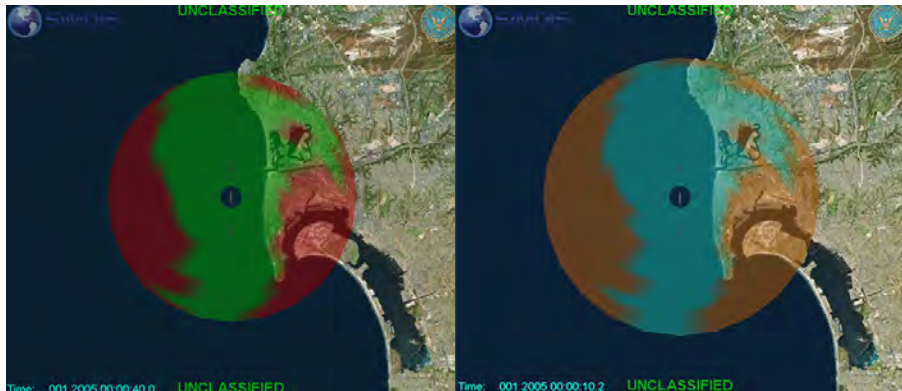
CNR

PoD

Vertical Propagation Slice



Line-of-Sight Calculation



Optical vs. Radio
Line-of-Sight Calculation

Custom Rendering Support

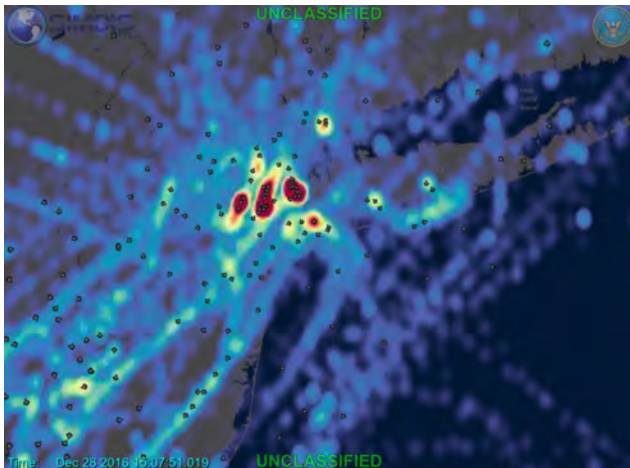
■ Uses

- Area of Probability
- Area of Uncertainty
- Covariance Ellipsoids
- Radar detections



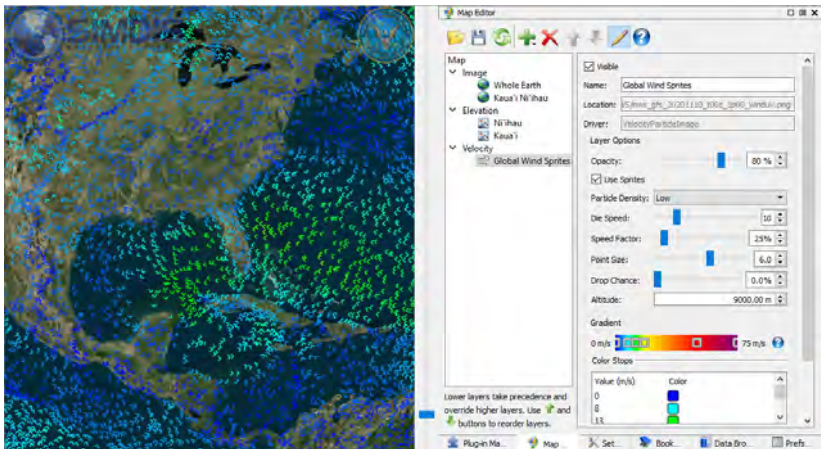
Heatmaps

- Can build and display tiled heatmaps via a MBTiles raster file
- Supports non-weighted and weighted data sources
- Refer to demos/SIMDIS/Examples/heatmap for documentation

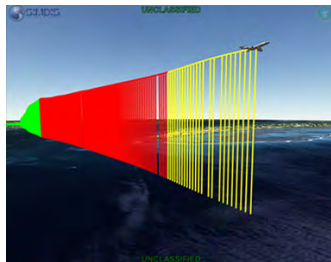
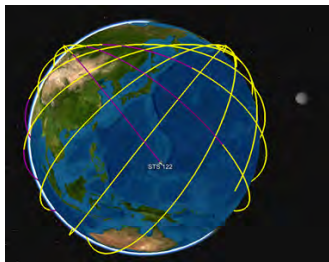
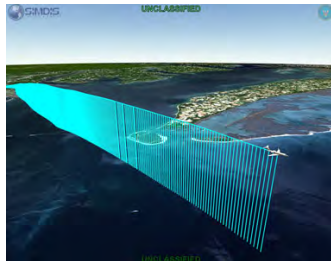


Velocity Layer

- Uses an encoded PNG image to represent particle velocity and direction
- Refer to demos/SIMDIS/VelocityLayer for an example



History Trails



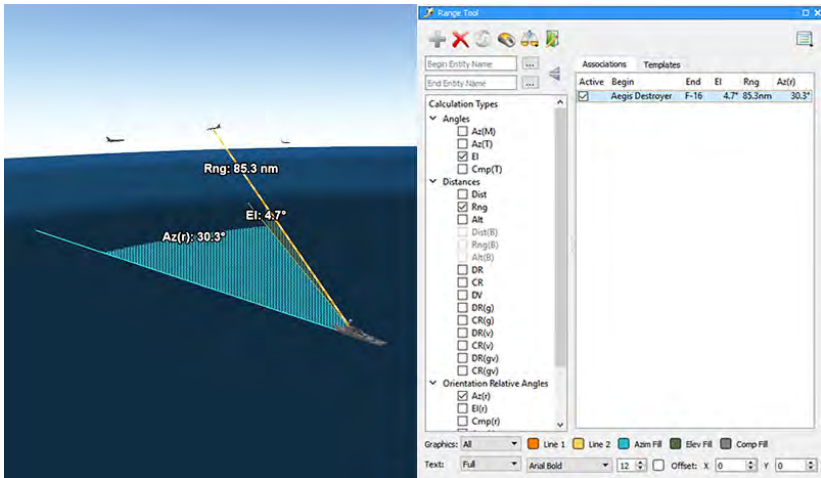
Ruler

- Quick measuring tool that supports angles and ranges
- Multiple rulers can be created, then modified or removed
- Can be attached to entities or fixed points on the surface



Range Tool

- Performs calculations between one or more entity pairings
- Calculations can be saved as templates for reuse
- Supports distances, angles, velocities, relative angles & velocity and RF



The screenshot displays the Range Tool interface, which is used for performing calculations between entity pairings. The interface is divided into two main sections: a 3D visualization on the left and a configuration panel on the right.

3D Visualization: A 3D view of a ship's radar scan. A yellow line represents the range, labeled "Rng: 85.3 nm". The elevation angle is labeled "El: 4.7°" and the azimuth angle is labeled "Az(r): 30.3°". The scan area is filled with a blue grid.

Configuration Panel: The "Range Tool" window contains several sections for configuring calculations and saving templates.

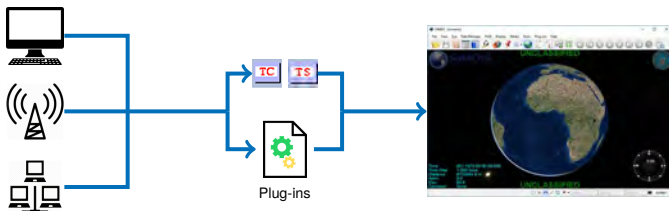
- Begin Entity Name:** [Text Input]
- End Entity Name:** [Text Input]
- Calculation Types:**
 - Angles:**
 - Az(M)
 - Az(T)
 - El
 - Cmp(T)
 - Distances:**
 - Dist
 - Rng
 - Alt
 - Rng(B)
 - Alt(B)
 - DR:**
 - DR
 - CR
 - DV
 - DR(g):**
 - DR(g)
 - CR(g)
 - DR(v):**
 - DR(v)
 - CR(v)
 - DR(gv):**
 - DR(gv)
 - CR(gv)
- Orientation Relative Angles:**
 - Az(r)
 - El(r)
 - Cmp(r)

- Associations:** A table showing saved templates.

| Active | Begin | End | El | Rng | Az(r) |
|-------------------------------------|-----------------|------|------|--------|-------|
| <input checked="" type="checkbox"/> | Aegis Destroyer | F-16 | 4.7° | 85.3nm | 30.3° |
- Templates:** [Empty Table]
- Graphics:** All | Line 1 | Line 2 | Azm Fill | Elev Fill | Comp Fill
- Text:** Full | Arial Bold | 12 | Offset: X 0 | Y 0

Software APIs

- Time Client Server (TCS) API
 - Network protocol for time synchronizing applications
- SIMDIS Plug-in API interacts with SIMDIS and Plot-XY
 - Native file converters and network readers
 - Perform calculations on file and live data
 - Create dialog boxes, text fields, buttons, simple graphics
 - Plug-ins can be written in either C++ or Python
- API source, docs and sample plug-ins distributed on SIMDIS web site



Time Synchronization

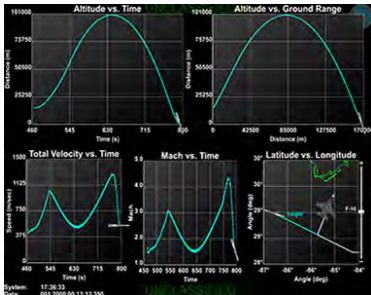
- Used for data analysis, event debrief, and after-action review
- Disparate sources are controlled and displayed in lock step
 - Position, orientation, and velocity data
 - Digital video, still images, audio, and chat
 - TCS API source available on SIMDIS web site



Application Synchronization

Synchronizes SIMDIS, SIMDIS Media Player, and Plot-XY

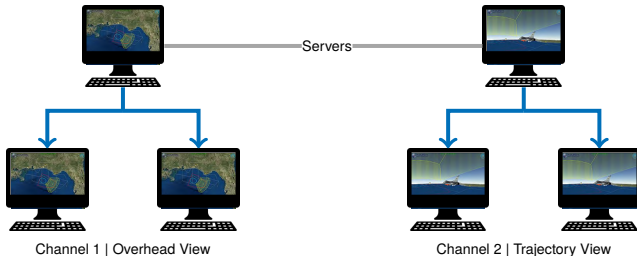
- Uses the TCS network protocol to align time between applications
- Only works with file based data for playback



Remote Control

One instance of SIMDIS can control other SIMDIS clients

- The SIMDIS controller issues configuration commands to one or more clients
- Each connected client is configured identical to the SIMDIS control server
 - Only configurations (i.e. preferences) are sent to clients
 - Each SIMDIS must be connected to the same data source (file or network)
 - Display appearances may vary due to differences in the network data received



Data Scripts

- Python-based system for managing, monitoring, and interacting with incoming data streams
- Python code executed in a callback is used to examine received data and update the display via Plug-in API commands
- A typical use for data scripts are telemetry (TM) driven displays



Mini Map and Mouse Over Labels



SIMDIS

UNCLASSIFIED



F-16 SOJ Aircraft

Chaff Cloud (1.3)

BQM-74E

F-16 Launch Aircraft

DDG

DDG

22.515396° N 159.825396° W 0.0 m
Y: 0.0°
Spd: 0.0 m/sec



Model Viewer

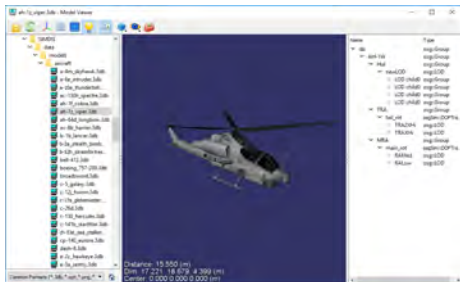
Allows users to visually inspect various model formats for use in SIMDIS

- 3D Model Formats

3ds, asc, dxf, geo, ive, lwo, obj, flt, osg, opt, 3db

- Image Formats

bmp, dds, gif, jpg, png, rgb, tga, tif



Plot-XY

Introduction

- **Plot-XY** is a general purpose two-dimensional plotting application
 - Graphs any X value versus any Y value
 - Multiple plot pairs per graph
 - Multiple plots per tab
 - Calculations between two entities can be plotted (range, angle)
 - Size, position, color, axes, text settings are adjustable
- Provides full support for the SIMDIS Plug-in API
 - Users can create software extensions to interact with Plot-XY
 - Custom plug-in modules supplies data to Plot-XY
 - Plot-XY was initial test bed for SIMDIS Plug-in API
- Graphical user interface customizable to show desired toolbars
- Plot setups can be saved and reused
- Extensive user manual available and step-by-step training slides

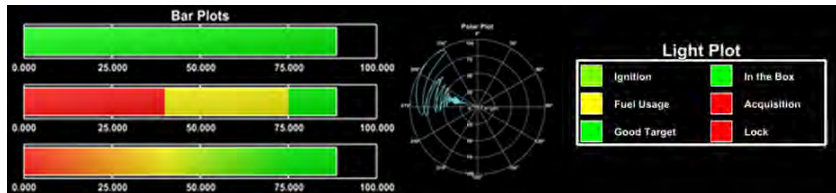
Overview

- Flexible plotting and display application
- Plot any X versus any Y value
- Supports 11 plot types
- Has 23 built-in calculations
- Can plot TSPI, Real, Integer or Boolean data
- User interface is customizable



More than SIMDIS 2D

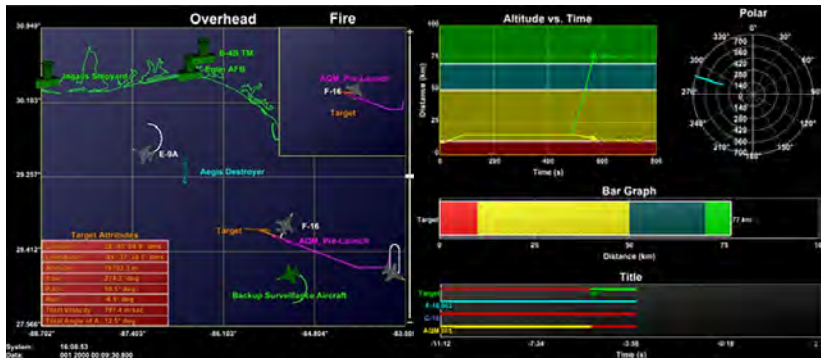
- Supports multiple plots per graph
- Plots range, angle and velocity calculations between multiple objects
- Supports input of custom calculations and equations
- Supports **Bar**, **Button**, **Dial**, **Light**, and **Text** based plot types
- Reusable scripting interface for saving and reloading configurations
- Highly configurable for live and post-process displays



Multiple Plot Types

- Processes both file and network based data

- Time series data | Scatter Plots
- Parametric data
- Radar based plots | Polar and RTI
- Geographic plots



Getting Data into Plot-XY

- Loads plug-ins already developed for SIMDIS
- Data processing plug-ins
 - Network Converters
 - File Parsers
 - Simulators
- **Widget Plug-ins**
 - Custom graphical interface add-ons
- Plot-XY options exposed to API
 - All plot space, plot pair, and GOG file options exposed
 - Mouse clicks can be intercepted and reprogrammed
 - Users can write their own plug-in to replace the entire Plot-XY GUI associated with plot configurations

Applications of Plot-XY

Live Mode

- Create plots to show parametric telemetry data in real time
 - Fuel usage
 - Elevation angle
 - Intercept display with predicted intercept points
 - Current and voltage time history charts
 - Missile and interceptor velocity plots
 - Altitude versus range plots
 - RADAR and RTI plots
- Plot-XY options exposed to API
- Used for range safety and vehicle performance assessment
 - Good Target Call display

File Mode

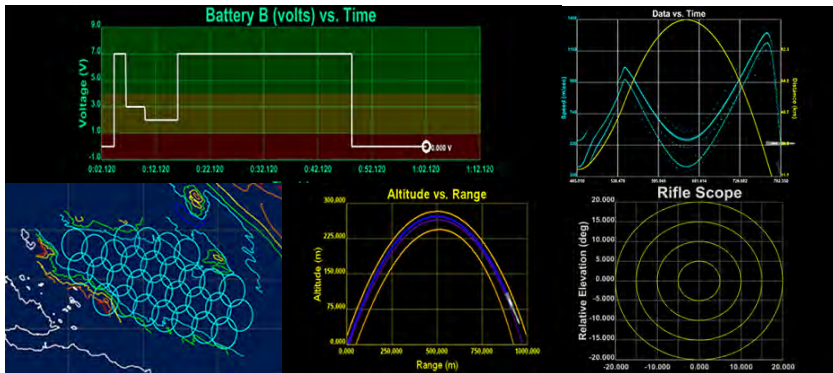
- Create plots to show playback live data or file data
 - Wind shear and wind speed displays for pre-launch analysis
- Used for analysis of RADAR accuracy
- Used for analysis of voltage and current outputs

Current Plot Types

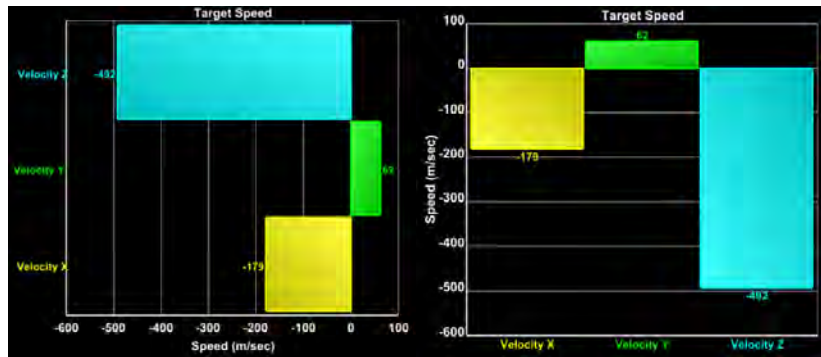
- **Scatter:** Parameter X vs. Parameter Y
- **Geographic:** Latitude vs. Longitude
- **A-Scope:** Amplitude vs. Range
- **Range Time Intensity | RTI:** Signal return and Time vs. Range
- **Range Doppler:** Signal return intensity (color) as a function of both range and Doppler
- **Text:** Single Parameter
- **Light:** Condition of Parameter(s)
- **Bar:** Single Parameter
- **Dial:** Single Parameter X
- **Attitude:** Yaw, Pitch, and Roll of an entity
- **Polar:** Angular Parameter X vs. Angular Parameter Y

Scatter Plots

- X vs. Y displayed graphically
- Overlay graphics files (absolute GOG only) can be loaded



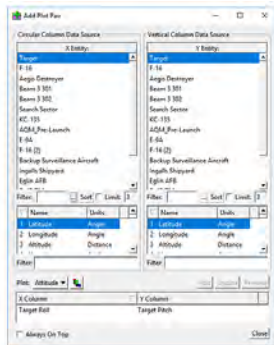
Horizontal Plots



Horizontal vs. Vertical

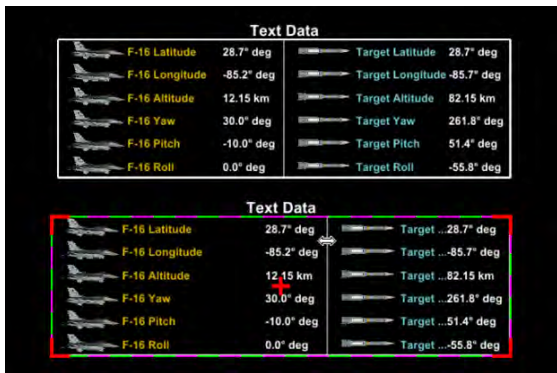
- Can be configured to act as a gauge

Attitude Plots



- Depicts one entity per graph
- Roll indicated via the white T, where the cross bar represents the horizon
- Pitch indicated via the red horizontal line

Multi-Column Text and Light Plots



- Options to select number of columns or number of rows
- Options to draw row grids and/or column grids
- Columns resizable with click and drag in Move Plot mouse mode

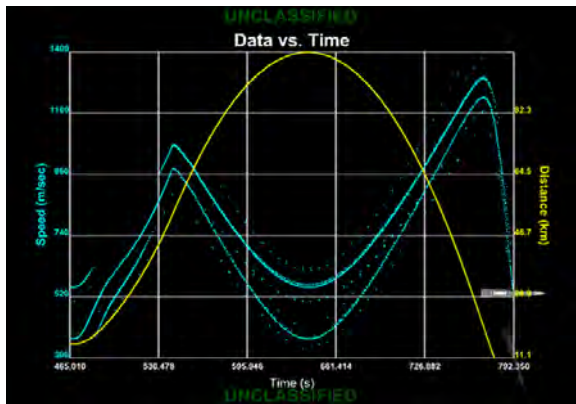
Range Calculations

- Built-in calculations between two entities
 - Ground, Slant, Down, Cross Range
 - Azimuth, Elevation, Composite Angle
 - Separation, Closing Velocities
 - Altitude Difference
- Users can add custom calculations using Python
- Calculations are available for plotting along with data parameters

Plot-XY Usage

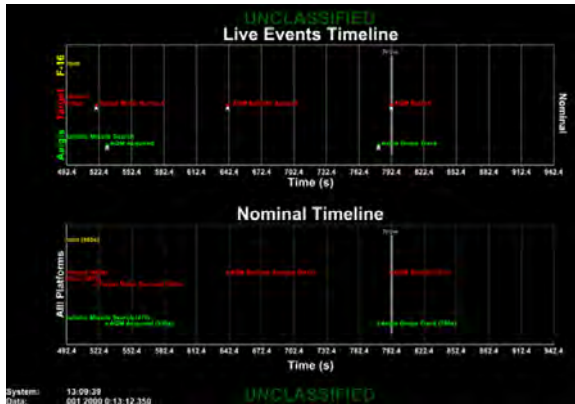
Overlay Plots

- Saves screen real estate
- Allows users to see correlations between data



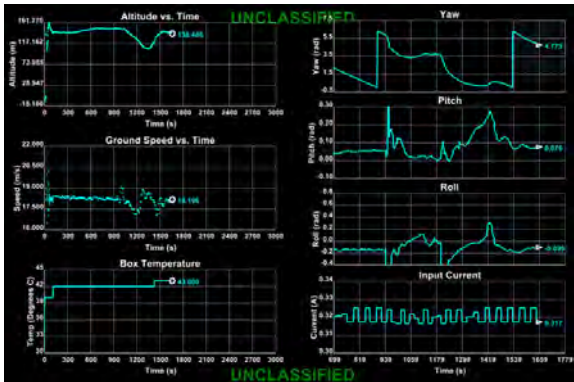
Plot Markers

- See past or future events based on nominal timeline
- Compares nominal time with actual time of event



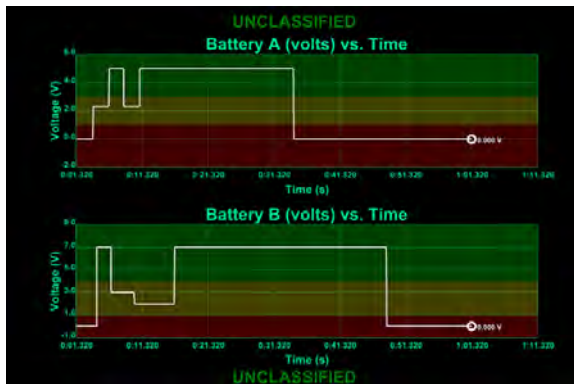
Scrolling Plots

- Live time history strip chart of data
- Shows current data as well as recent history



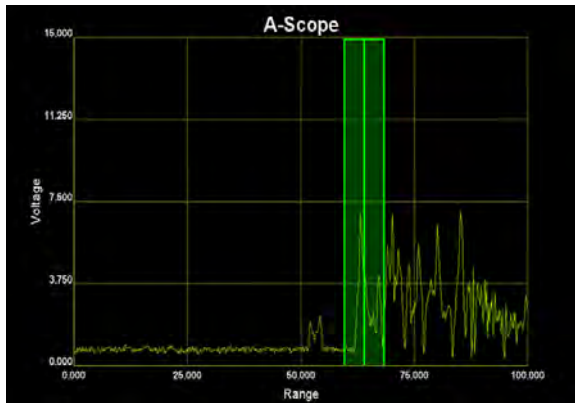
Color Coded Display

- Stop light display quickly determines good or bad data values
- Range safety monitors voltage and currents for flight termination system



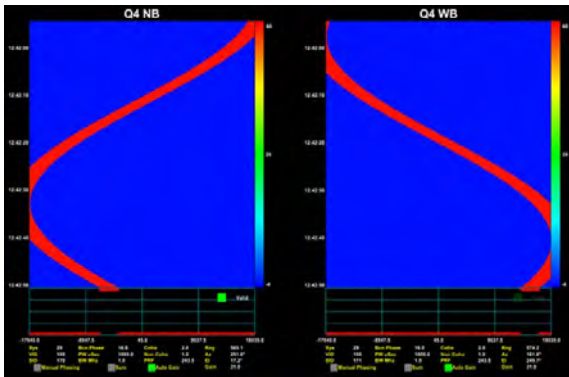
A-Scope

- Signal return strength vs. range for a given instant in time for a RF emission



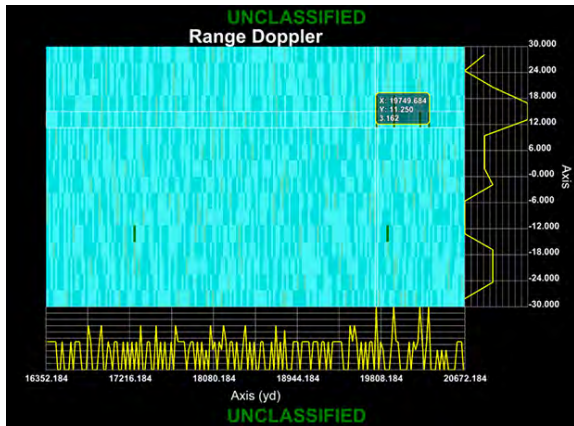
RTI/A-Scope

- Range Time Intensity (RTI): Signal return represented by color intensity
- A-Scope: Signal return graphed against range



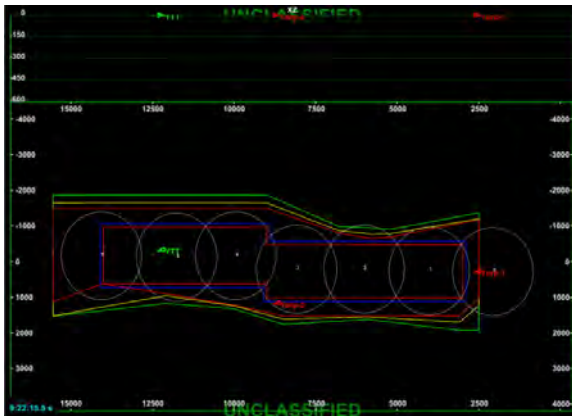
Range Doppler

- Signal return intensity (color) as a function of both range and Doppler
- Also supports inspection of Doppler bins using mouse cursor



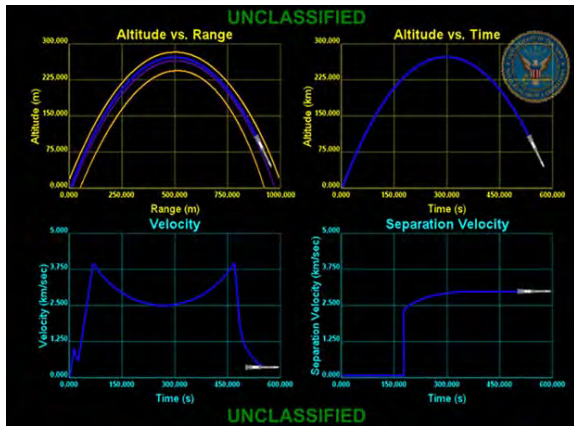
Linked Axis

- Allows plots that have similar axes to be linked
- Dragging or scrolling in one plot affects other linked plots
- Plot below shows Z vs. X and Y vs. X, where the X axis is linked



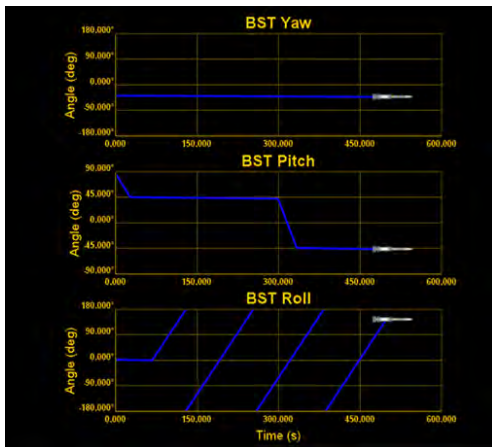
Sample Setup

- Limit lines to visualize min and max boundaries
- Color coding for plot association



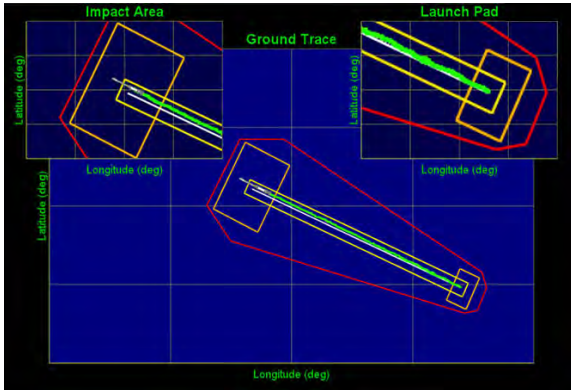
Sample Setup

- Graphically visualize complete attitude or orientation of vehicle



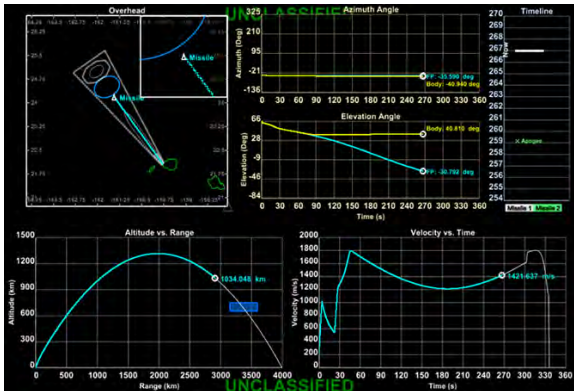
Sample Setup

- Gives overhead view of entire scenario
- Inset plots provide focused view for areas of interest

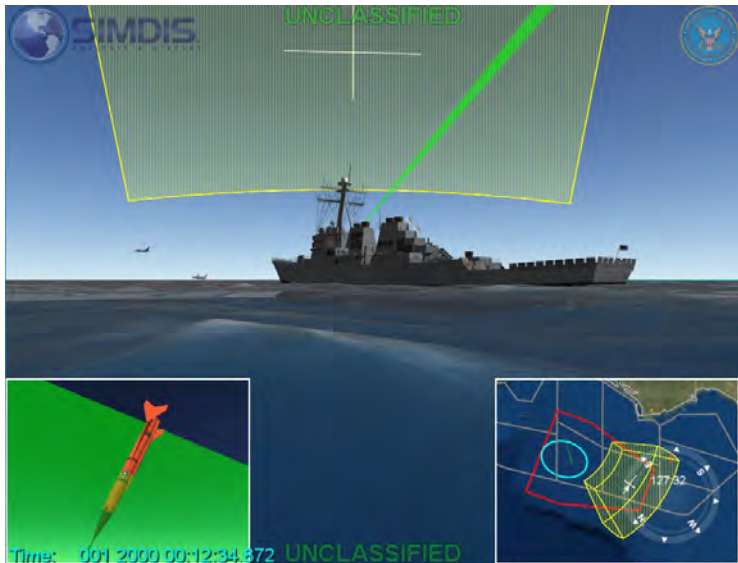


Example Event Setup

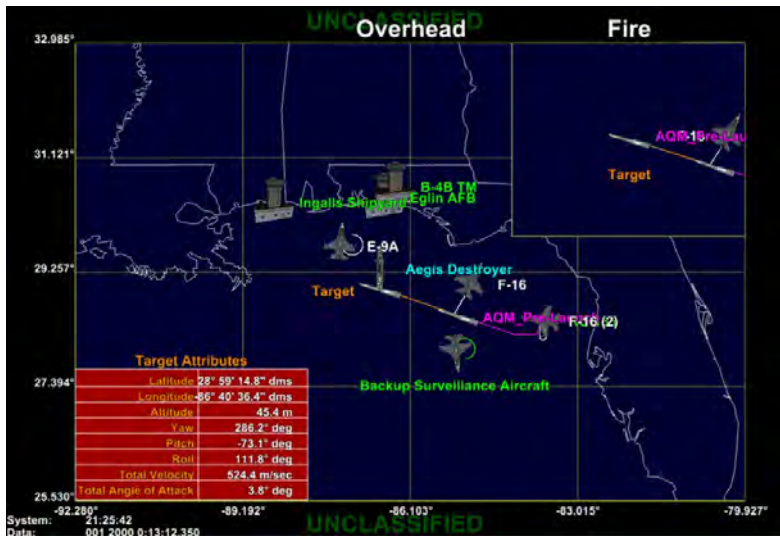
- Shows overview of an event as well as detailed data
- Provides a visual comparison with nominal performance in real time



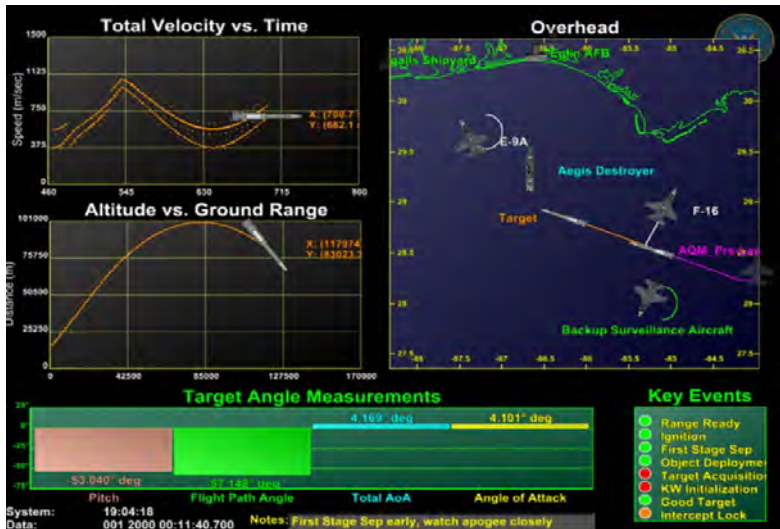
SIMDIS Display of an Event



Plot-XY Display of Identical Event



Plot-XY Display of Identical Event



Event Support Use Case

SIMDIS and Plot-XY Used

| When | What | Why |
|--------------|---|---|
| Before Event | Visualizations are based on estimates of where vehicles are expected to be, and what the assets are expected to do. | Seeing a visualization of what is expected to happen communicates information that helps a test conductor ensure a successful test. |
| During Event | Processes real-time data feeds that indicate location of vehicles, internal vehicle performance, and what the assets are doing. | Helps test executers ensure a safe and successful test. Helps VIPs see test objectives in real-time. |
| After Event | Processes recorded data that indicates location of vehicles, internal vehicle performance, and what the assets were doing. | Helps analysts and presenters understand and communicate how systems behaved during the event. |

Event Display Types

SIMDIS

- Pre-mission reconstruction and simulation analysis
- 2D Overhead
- 3D Trajectory
- Range Safety
- Weather Displays
- VIP Viewing
- Post-mission reconstruction & data product
- Global display of all participants

Event Display Types

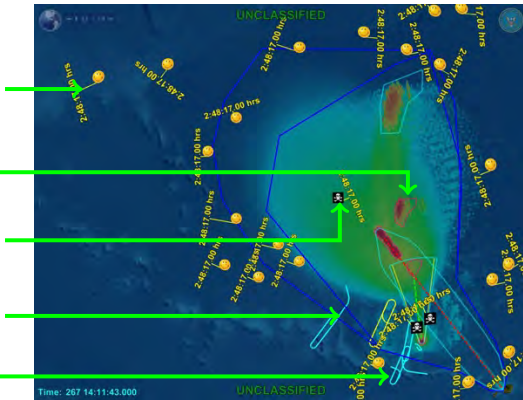
Plot-XY

- Coherent Signal Processor (COSIP) Range Time Intensity (RTI)
- Good Target Call
- Significant Events
- Health and Status Indicators
- Range Safety
- Vehicle Performance
- Wind Shear and Wind Speed
- Bar, Polar, and Strip Charts
- Text-based displays
- In-depth view of specific vehicle TM parameters

2D Range Safety Display

Surveillance position data is cross referenced with Range Safety debris model to calculate probability of impact (P_i) and expected casualty (E_c) based on RCC 321 standards.

- Track leaders show dead reckoned location at launch based on contact's current course and speed
- Range Safety Debris Model
- Icons auto toggle based on P_i and E_c thresholds.
- Hazard Areas | NOTMAR and NOTAM.
- Test Support Positions.



2D Event Displays

Static plan view of the event is overlaid with test assets, trajectory projections and range and hazard areas.

■ Interceptor Indicators

■ Range Boundaries and Hazard Areas

■ Color Coded Data of Interests

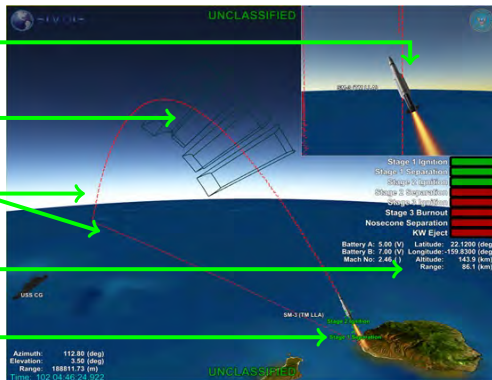
■ Data Source Indicators



3D Event Display

An overall representation of the event showing the nominal trajectories, search fences along with 3D animations of all assets. View transitions triggered by TM events.

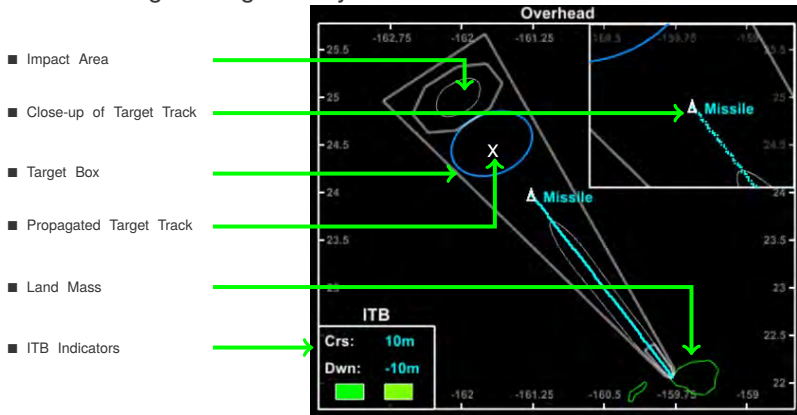
- Close-up of Key Vehicles
- Search Fences
- Vehicle Nominal Trajectory and Ground Trace
- Event Status
- Vehicle Events



Plot-XY Event Display

Vehicle Assessment

Plots multiple data sources and their propagated tracks against safety areas and target box geometry.

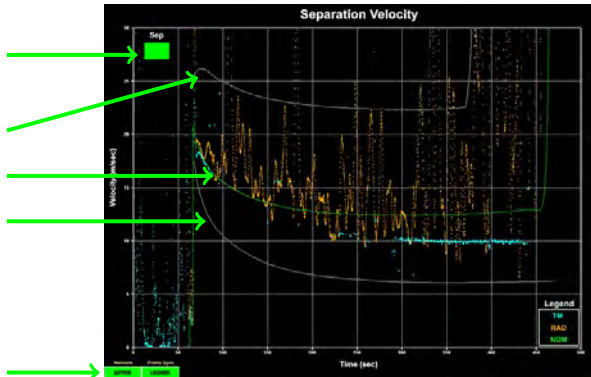


Separation Velocity

Plots Separation Velocity vs. Time Since Launch (TSL)

- Separation Indication
Green: Has Occured
- Max Velocity Constraint
- Nominal Velocity
- Min Velocity Constraint

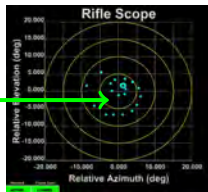
- TMD Indicators



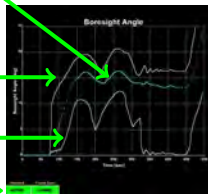
Boresight

Plots the relative azimuth, elevation, and composite angles of two objects with respect to one another

- Boresight Angle Track



- Max Angle Constant



- Min Angle Constant

- TM Indicators

Predicted Apogee

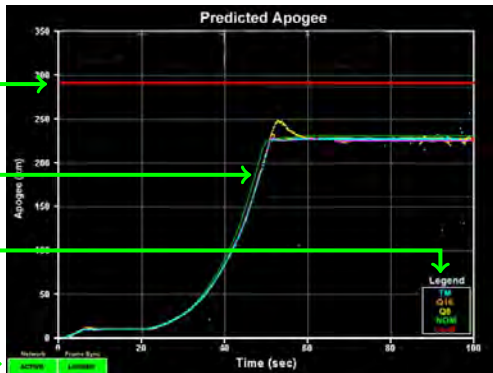
Plots Vehicle Apogee Value vs. Time Since Launch (TSL)

■ Apogee Limit

■ Nominal Apogee

■ Color Coded Legend
Based on Source Type

■ TM Indicators



SIMDIS Contact Information

CAC Enabled US Govt/Contractors Only

Confluence <https://www.trmc.osd.mil/wiki/display/SIMDIS>
Help Desk <https://www.trmc.osd.mil/helpdesk/projects/SIMDIS>
FAQ https://www.trmc.osd.mil/helpdesk/projects/SIMDIS_FAQ

Non-CAC Public Only

Confluence <https://www.tena-sda.org/wiki/display/SIMDIS>
Help Desk <https://www.tena-sda.org/helpdesk/projects/SIMDIS>
FAQ https://www.tena-sda.org/helpdesk/projects/SIMDIS_FAQ

SIMDIS Email Reflector

Email simdis@enews.nrl.navy.mil