

JCATS – What's New in JCATS 15.0

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JCATS Web Page: <https://csl.llnl.gov/>

 Lawrence Livermore
National Laboratory



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Enhancements & Improvements

(NF) = New Feature

(I) = Improvement

Simulation & Client

- **(I) Passive radars now detect Jammers & Counter Fire Radars**
- **(I) Passive radar display LOS/FoR**
- **(I) Define flight path of Harpy & Cruise Missiles**
- **(NF) Aircraft automatically Chase enemy**
- **(NF) Added a Position control panel**
- **(NF) Browser-Based client prototype**
- **(NF) Added the System Vs System Report to Clients**
- **(I) Added a Duplicate Route button**
- **(I) Improved Agg Hover Tip info**
- **(I) Improved Org Tree Hover Tip**

Vista

- **(I) Added new Acquire TAS model for sensors**
- **(I) Munition Propulsion & Guidance types**
- **(I) Moved AutoDirect Data to each weapon load (Sim & Client)**
- **(I) Added a “Ph&Pk Legend” to Vista Ph&Pk editor**
- **(I) System Instance search**
- **(I) Munition Group name changes to multiple fchars**
- **(I) Added RF Signature to Counter Fire Radars**

CSL Toolbox

- **(I) Added Event Batch Analyzer fields and Time Range feature**
- **(NF) Created the Param Differencer**

SysAdmin

Operating Systems for v15.0

- RHEL 7.6 & 7.7

Required for Web Client

- Java OpenJDK v1.8

Simulation & Client

Passive Radar Improvement

Passive Radars can now detect Jammers as well as Active Radars



Passive Radar Display LOS/FoR

Systems with only Passive Radars display Field of Regard lines in purple

The screenshot displays a military simulation interface. The main map shows a coastal region with a purple Field of Regard (FoR) originating from a sensor icon labeled '4'. The FoR is a large, irregular purple shape covering a significant portion of the map. To the right of the map is a control panel with various settings. Below the control panel is a 'Sensor Report' window with a table containing one entry.

Control Panel Settings:

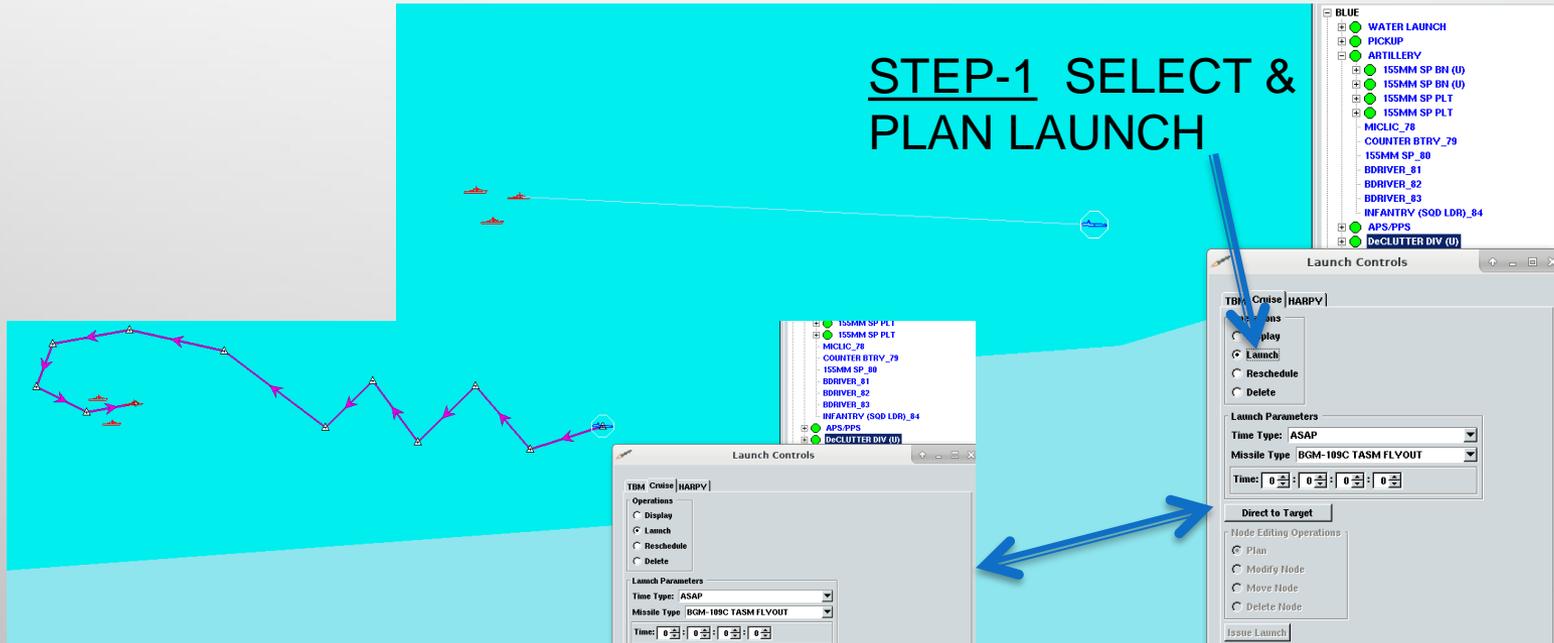
- Command: Groups
- Plan Controls: LOS, Snap LOS, Position, Orient, Face, East
- Tactical Missions and States: Set Tactical Mission: Movement
- Attributes: Display Type: Active Protection, Set: On
- Sensor Controls: Control Sensors: Set Off, Mode 1, Mode 2
- Jammer Controls: Control Jammers: Set Off
- Capture/Surrender: Capture, Surrender, Arrest, Release

Sensor Report Table:

ID	Name	Sensor	Enabled
4	EA-6B PROWLER_4 COUNTER ADA PASSIVE RADAR		

Define Harpy & Cruise Missile Flight

STEP-1 SELECT & PLAN LAUNCH



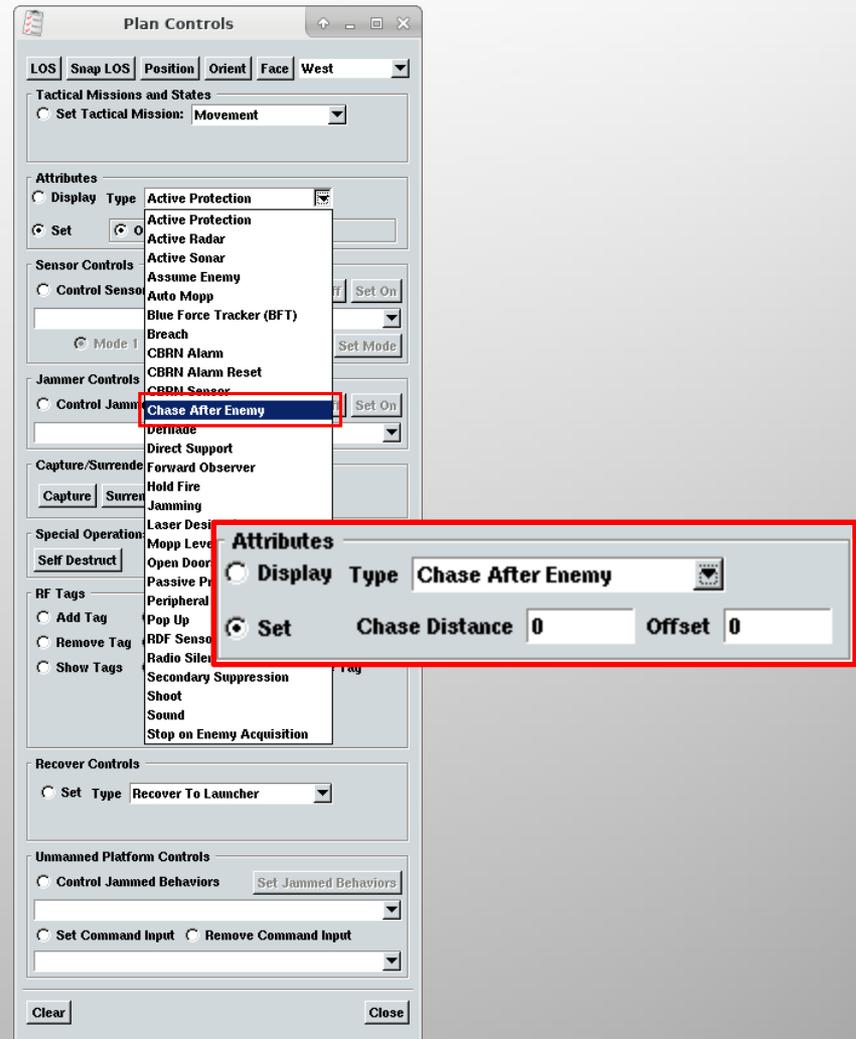
STEP-2 SELECT "DIRECT TO TARGET" BUTTON & MODIFY

STEP-3 SELECT ISSUE LAUNCH BUTTON



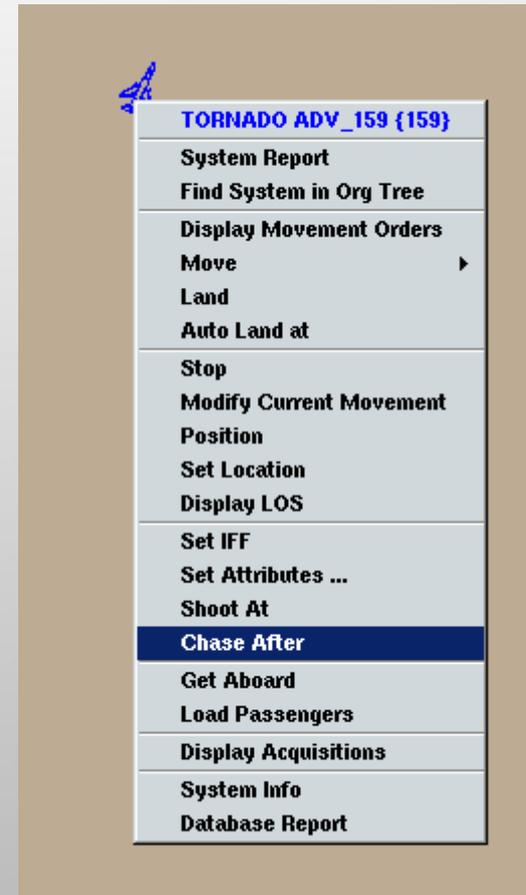
Chase After Enemy

- When set, JCATS aircraft automatically deviate from their assigned movement order to pursue observed enemy combatants
- Pursuit stops when the target is destroyed, acquisition is lost, or the operator cancels pursuit



Chase After Enemy

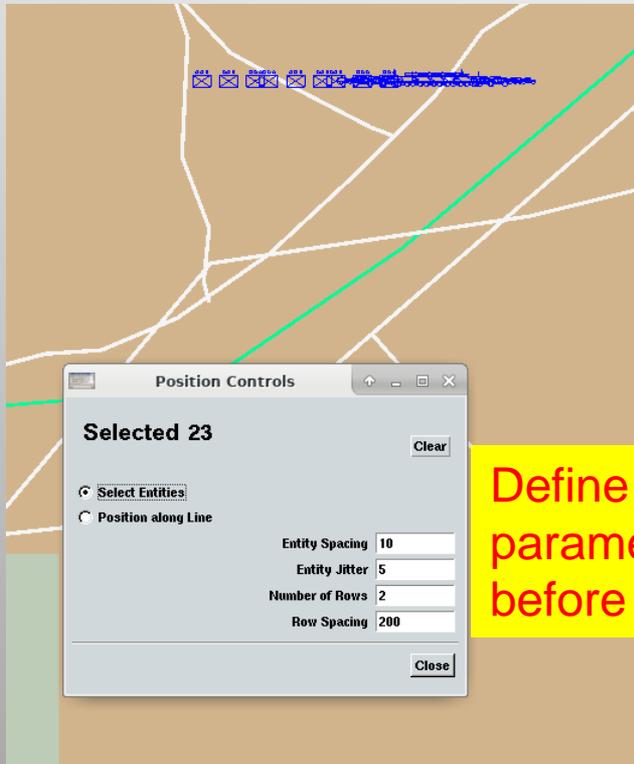
- Chase can also be set from the Ctrl+Right Button menu
- The Chase Distance & Offset cannot be defined from here – it uses fixed default values of “Infinite” chase distance & 500m behind



Position Controls

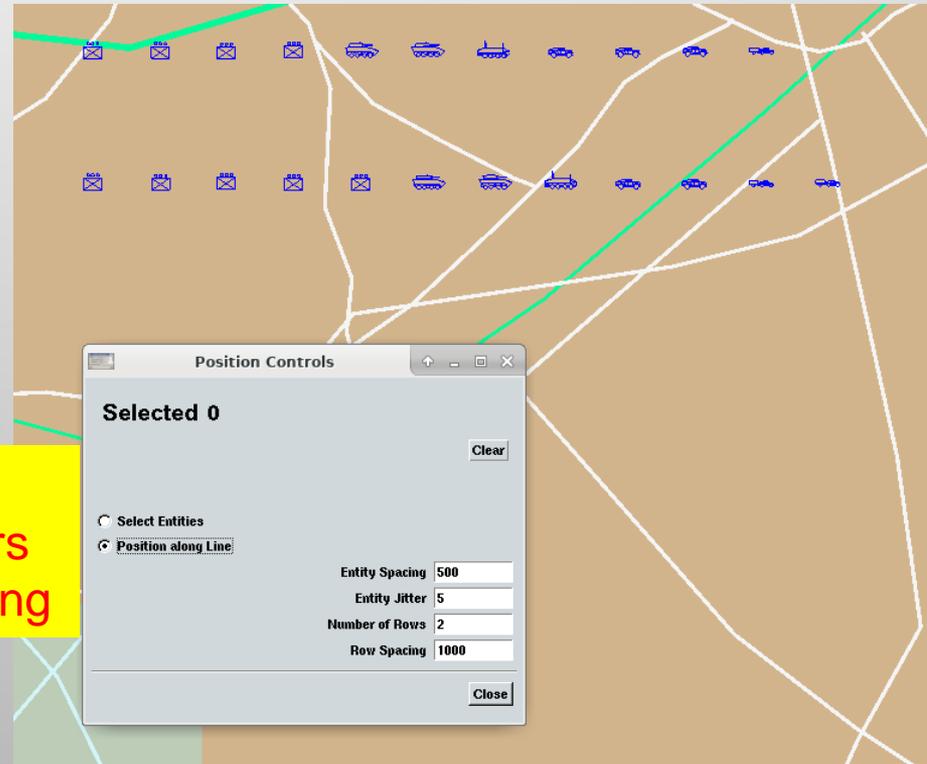
Added this menu for quick positioning of multiple entities for setup

Select Entities Using Lasso



Define parameters before using

Position Entities



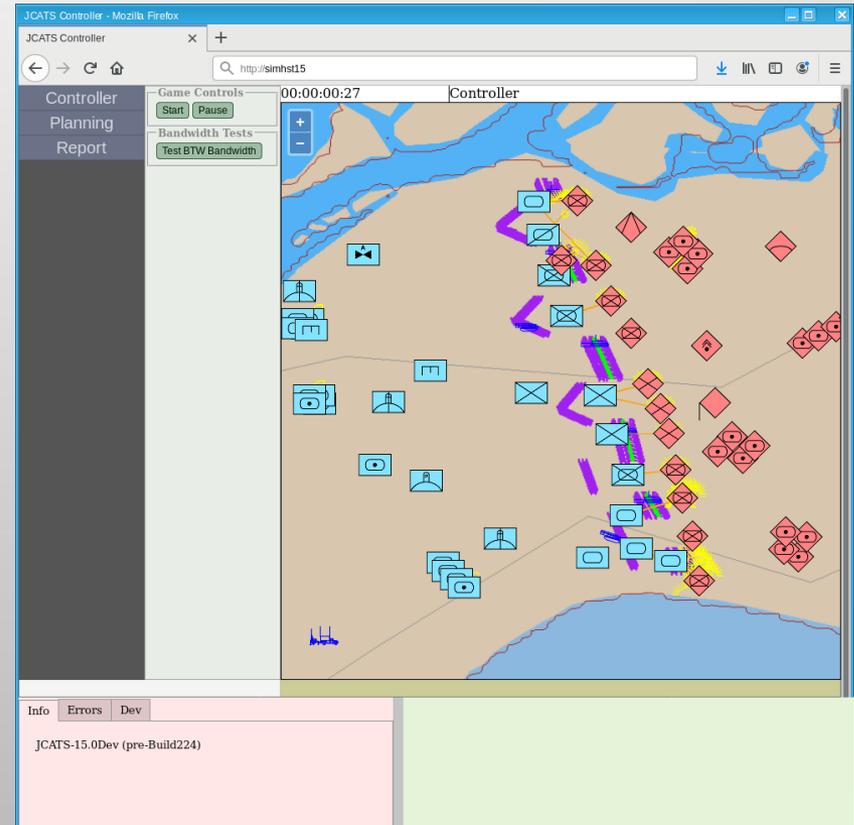
Browser-Based Client Prototype

The JCATS 15.0 Browser-based Client is a beta version, currently with display-only capabilities.

Standard JCATS Client



Browser-Based Client



System vs System Report

Report Controls

Custom Reports

Report: [dropdown] Report Editor

Entity

State Status Intel
IFF Carry Ammo
Sound Direction Casualty
Dir Sup CBRN Contam
Decon Position Weapon Loads
Federation Sensors Database
Long Report RDF Unmanned Platforms

Unit

Strength Rollup Personnel
Slant SPOT SALUTE

Global Reports

Org. POW Unit Activity
Settings Convoys Tactical Data
BFT
System Vs System

Location

Building Terrain
Range-Bearing Elevation
Environment Bridge
Checkpoint Neighborhood

Mission

Artillery Direct Fire
Laser Missions Launch Missions

Debugging Reports

Auto Direct FO Acquisition
Chem/Bio Exposure Emitter Report

Clear Close All Close

From the Client, an operator can perform hypothetical engagements between two systems

System vs. System Report

Shooter Class: SSN-688 LOS ANGELES Choose... Pick

Target Class: FRIGATE (PROC) Choose... Pick

Weapon Load Default

Target Class: SHIP

(Auto Direct) Mission: <No Mission>

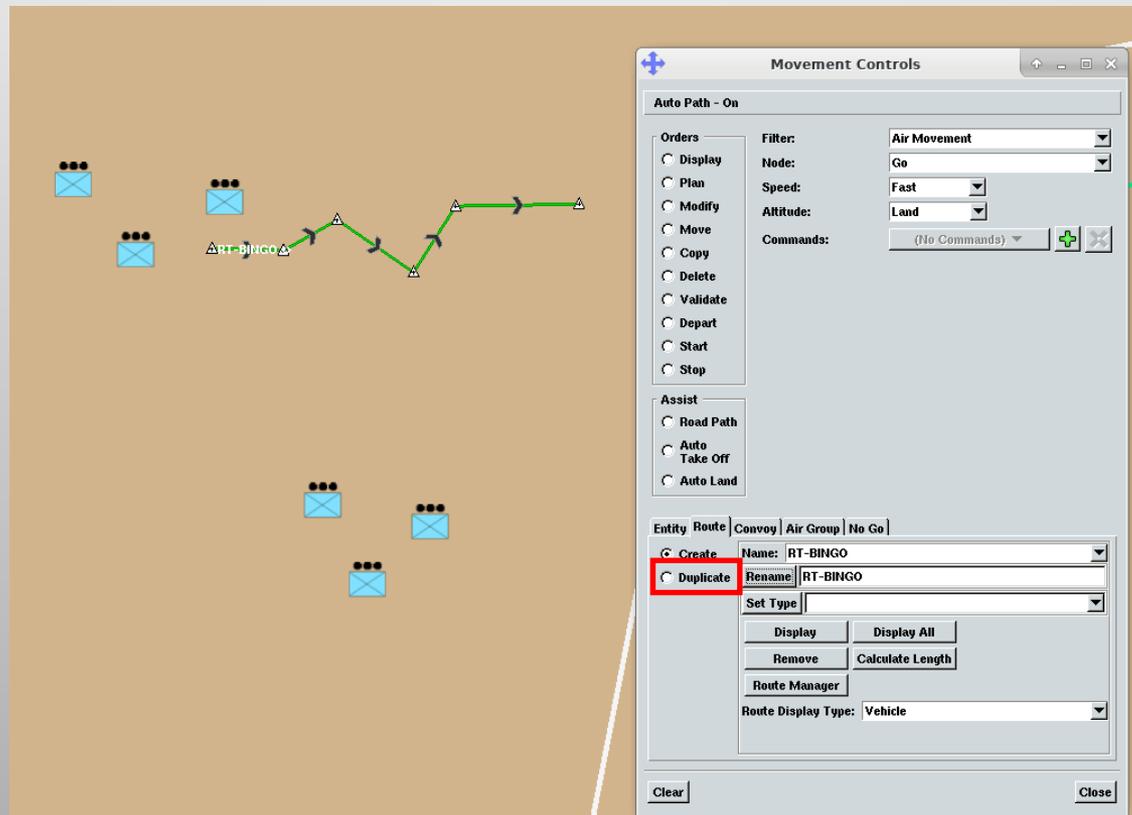
PHPK Target Group: FFG

Range (meters) 11365.1

Station	Sensor	Weapon	Munition	Mission Priority	SSPK Head Shot
2	ACTIVE SONAR	TORPEDO	TORPEDO	<Munition mission prevents use>	<Too Far for Munition:
3	UNDAIDED EYE HIGH RESOLUTION	CRUISE MISSILE LAUNCHER	BGM-109D TLAM FLYOUT	<N/A>	<Not Auto Direct:
3	UNDAIDED EYE HIGH RESOLUTION	CRUISE MISSILE LAUNCHER	BGM-109C TASM FLYOUT	<N/A>	<Not Auto Direct:

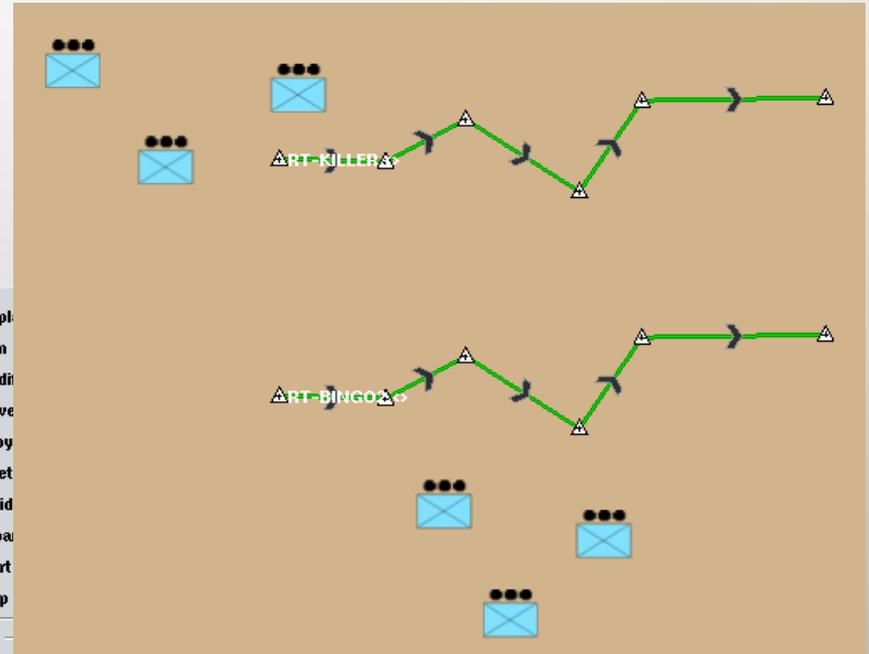
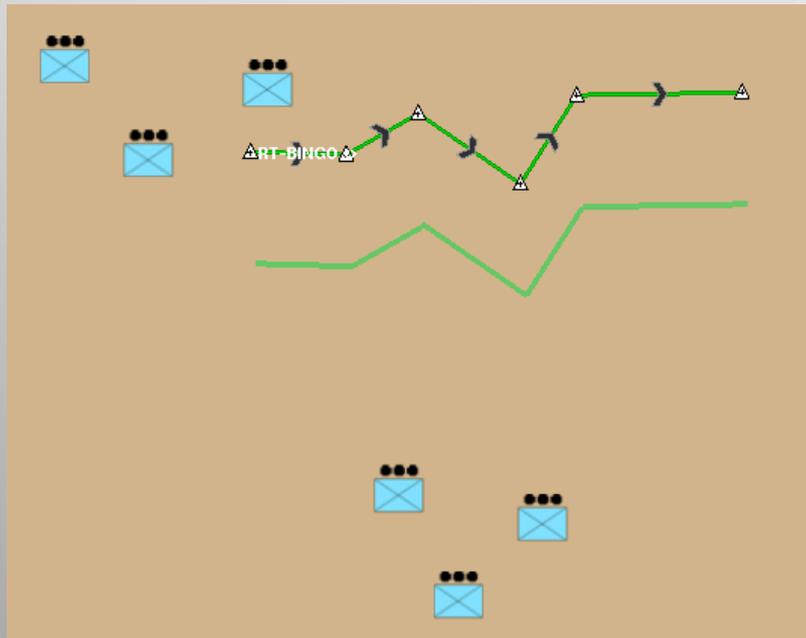
Route Duplication

A Duplicate button has been added to the Route tab to allow workstation operators to copy existing routes



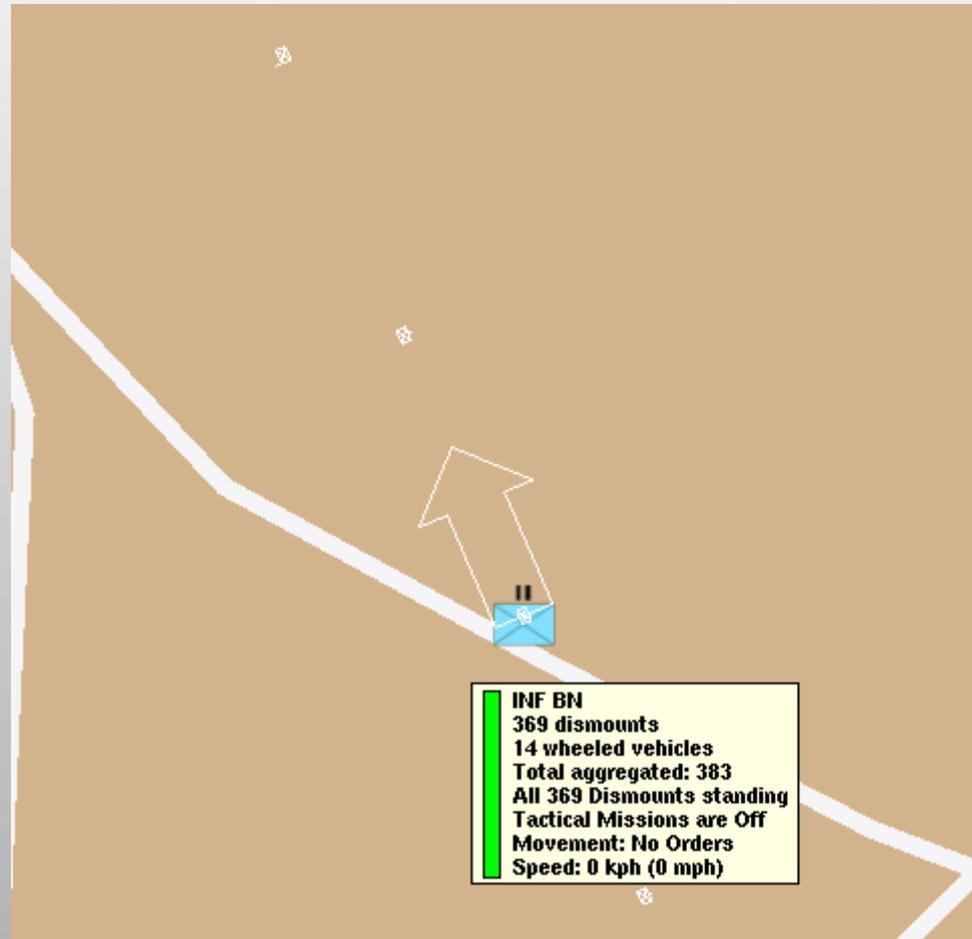
Route Duplication (continued)

Select the Route to be duplicated. A copy is tethered to the cursor. Place the duplicate route as desired.



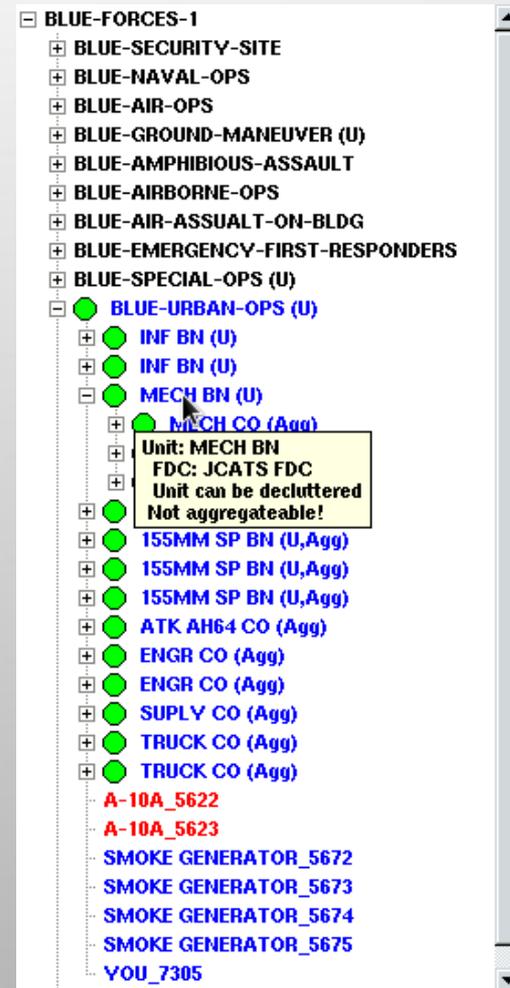
Improved Agg Hover Tip Info

In addition to the hover tip, placing the cursor over an aggregate shows the current orientation and formation (only the first level)



Org Tree Hovertip

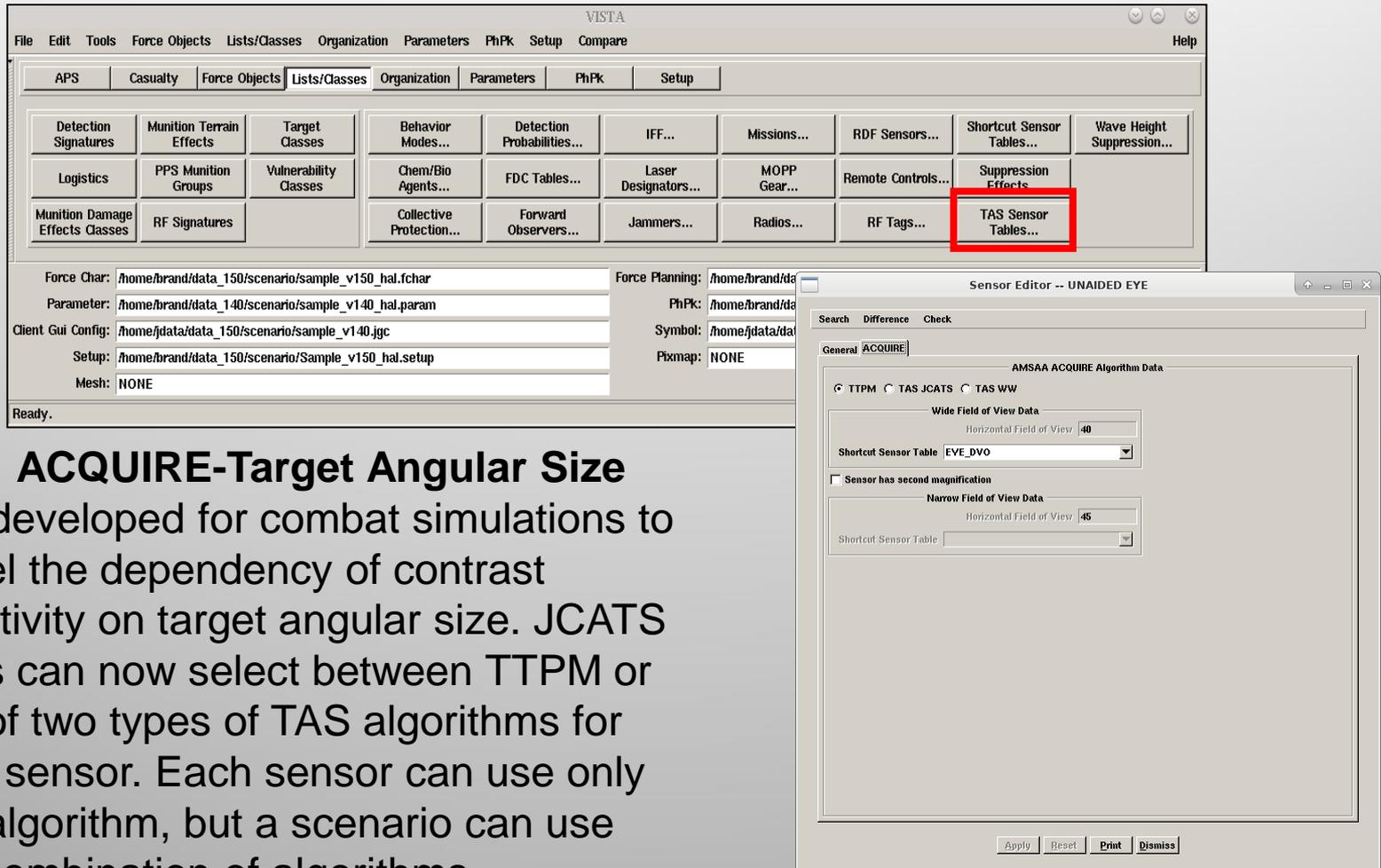
The hover tip in the Organizational Tree offers greater information about that unit.



Vista

Added an Optional New Sensor Table

Added an optional new sensor table to the AMSAA Acquire Data



TAS: ACQUIRE-Target Angular Size was developed for combat simulations to model the dependency of contrast sensitivity on target angular size. JCATS users can now select between TTPM or one of two types of TAS algorithms for each sensor. Each sensor can use only one algorithm, but a scenario can use any combination of algorithms.

Added an Optional New Sensor Table (continued)

AMSAA: In order to implement target size dependency in combat simulations, ACQUIRE-Target Angular Size (TAS) was developed.

The image displays three overlapping screenshots of the 'Acquisition Editor' software interface, showing different configuration panels for target acquisition parameters.

Top-Left Window: V50 for Ground Vehicle Targets

Acquisition Level	Target Dynamics	Thermal Clutter	Visual Benign	Visual Camo	Thermal
Detection	Stationary	Low/None	6	9	2
Detection	Stationary	Medium	6	9	3
Detection	Stationary	High	6	9	5
Detection	Moving	Low/None	4		
Detection	Moving	Medium	4		
Detection	Moving	High	4		
Detection	Firing	Low/None	3		
Detection	Firing	Medium	3		
Detection	Firing	High	3		
Classification	N/A	N/A	6		
Recognition	N/A	N/A	12		
Identification	N/A	N/A	19		

Top-Right Window: V50 for Ground Vehicle Targets

Acquisition Level	Target Dynamics	Thermal Clutter	Visual Benign	Visual Camo	Thermal
Detection	Stationary	Low/None	2	3	2
Detection	Stationary	Medium	2	3	3
Detection	Stationary	High	2	3	5
Detection	Moving	Low/None	1.3	2	1.3
Detection	Moving	Medium	1.3	2	2
Detection	Moving	High	1.3	2	2
Detection	Firing	Low/None	1	1.5	1
Detection	Firing	Medium	1	1.5	1.5
Detection	Firing	High	1	1.5	1.5
Classification	N/A	N/A	4	4	4
Recognition	N/A	N/A	7.5	7.5	7
Identification	N/A	N/A	13	13	13

Bottom Window: JCATS Extensions

Moving Sensor Parameters	Speed (kph)	Difficulty
Dismounted	6	2
Four by Two	60	2
Four by Four	30	2
Track	30	2
Track2	30	2
Water Craft	20	2
Submarine	20	2
Helicopter	1000	1
Fixed Wing	1000	1

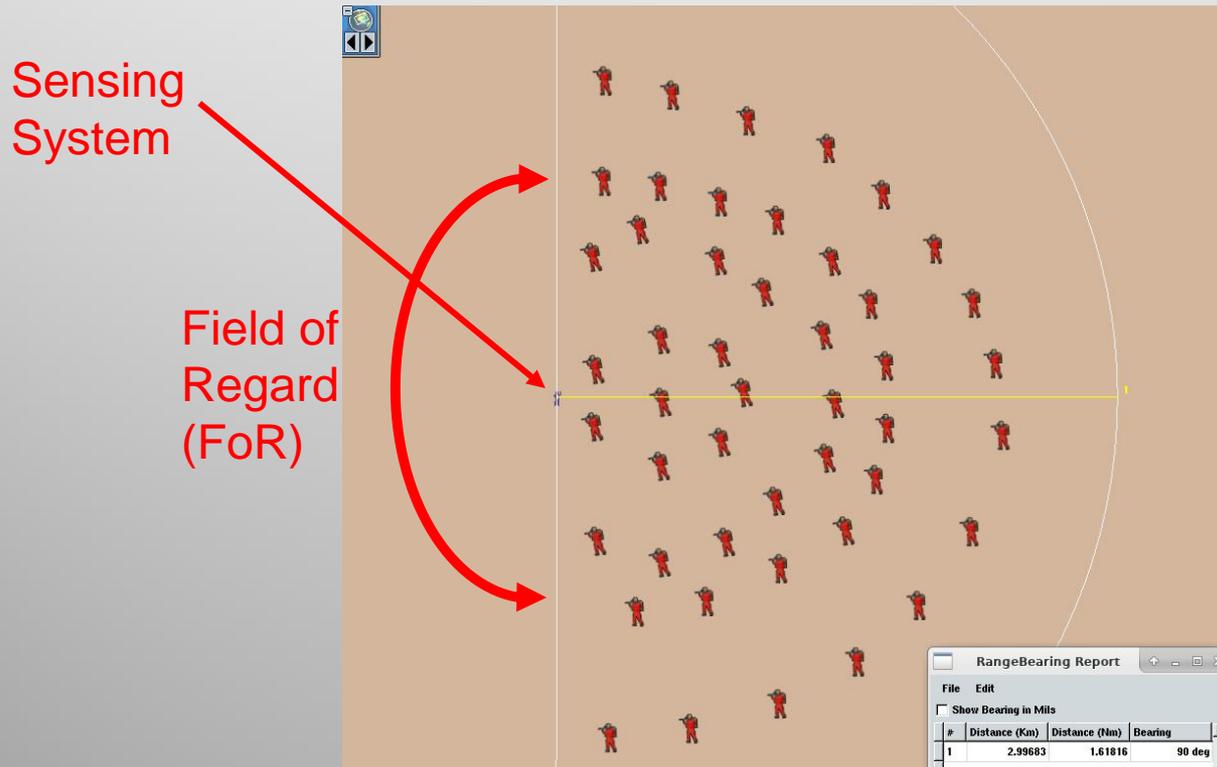
ReAcquisition Parameters

Time (sec) 15 Difficulty 0.5

Buttons: Apply, Reset, Dismiss

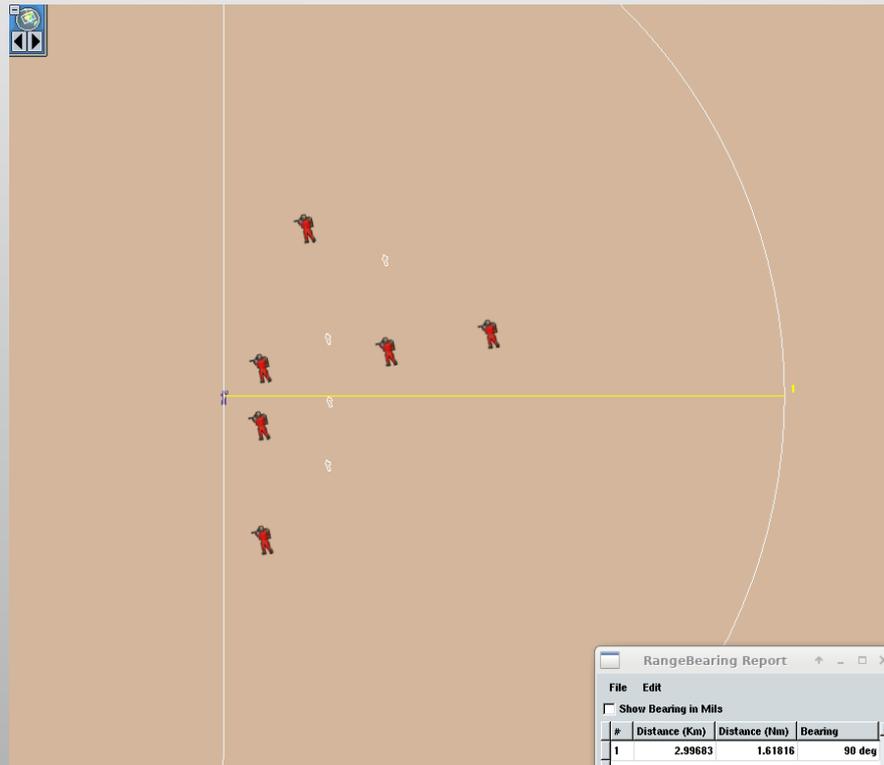
Added an Optional New Sensor Table (continued)

Given identical setups in each test case, the following slides demonstrate the differences in detection results of the existing TTPM method and the two new TAS methods.



Added an Optional New Sensor Table Detection Results - TTPM

TTPM performs a scan of the entire FoR and displays all acquisitions at once. Over time, additional targets may be acquired or acquired at a higher level.

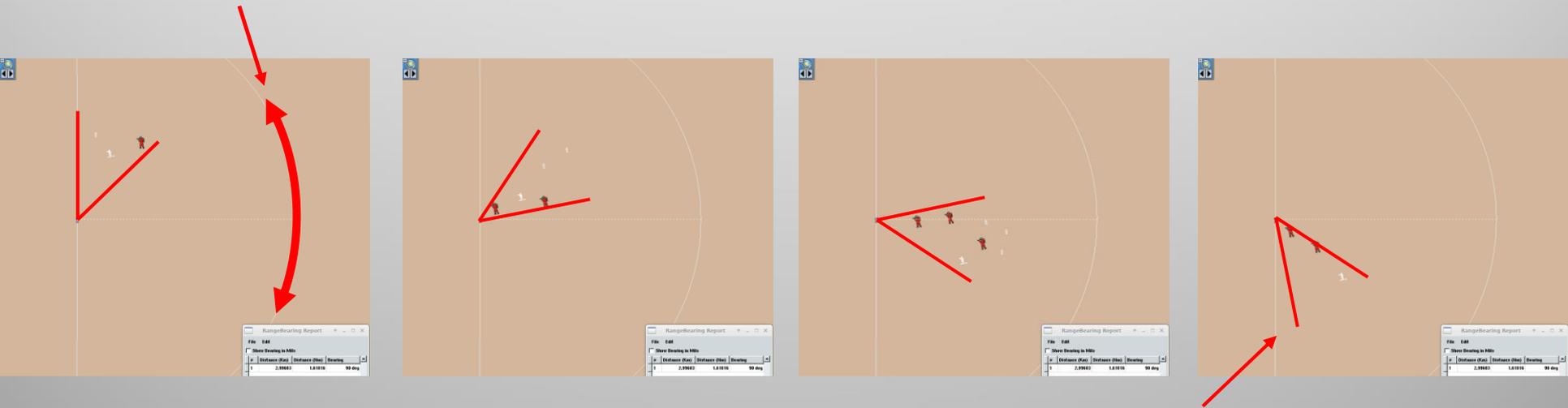


Added an Optional New Sensor Table

Detection Results - TAS WW

TAS WW (Windshield Wiper) sweeps the FoR from left to right and back, acquiring only those entities in the current sector.

Search sectors sweep back and forth continuously



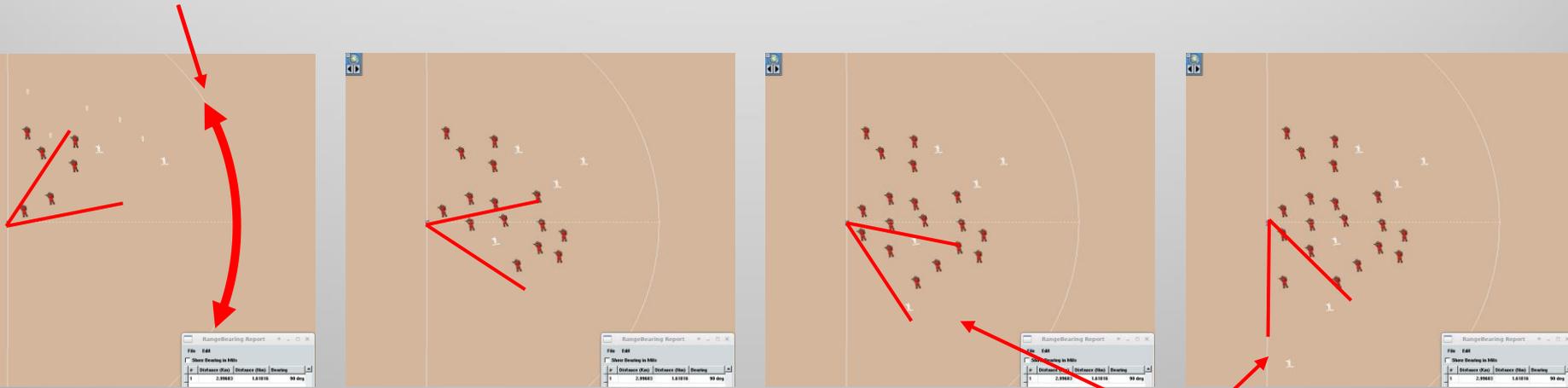
(The next search sector will cover the remaining area and overlap with this sector)

Added an Optional New Sensor Table

Detection Results - TAS JCATS

TAS JCATS is a mix of TTPM & TAS WW functionality. It sweeps the FoR from left to right and back like TAS WW, but acquisitions persist like TTPM.

Search sectors sweep back and forth continuously



(Notice the search sector at the end overlaps the previous search sector)

New Munition Propulsion & Guidance Types

- To allow JCATS to more completely capture the capabilities of modern munitions, a fundamental revision was required
- The old Guidance Type has been separated into Guidance Type and Propulsion Type
- A detailed description of the conversion process is provided following the Questions slide [Here](#)

Pre-v15
JCATS

Guidance Type:	Ballistic
	Ballistic
Minimum Range	Crew Guided
Maximum Range	Cruise Missile
Rounds/Trigger	GPS Guided
TriggerPulls/Relo	Harpy Guided
Ripple Fire Time	Laser Guided Ballistic
	Laser Guided Rocket
	Remote Guided
	Rocket
	Self Guided
	Tactical Ballistic Missile

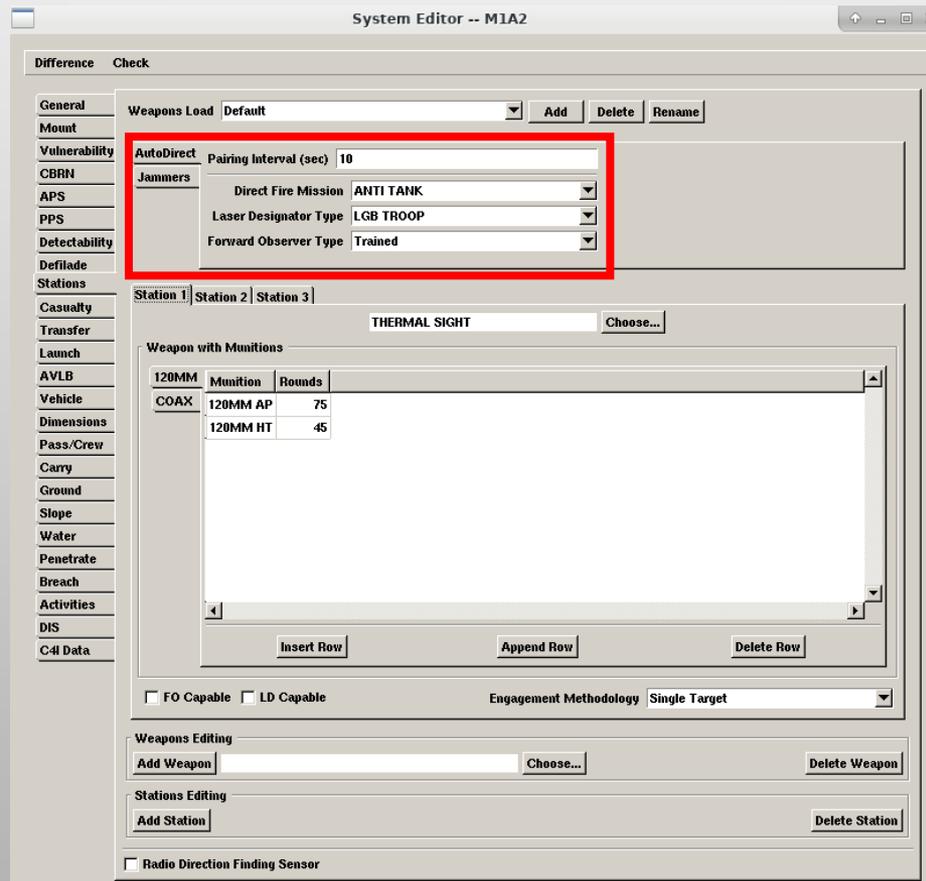
JCATS v15

Propulsion Type:	Ballistic
	Ballistic
Guidance Type:	Gravity Bomb
JCATS will treat t	Not propelled
	Powered
Minimum Range	Rocket burn and coast
	Rocket burn to target
	TBM

Guidance Type:	Unguided
JCATS will treat t	Crew guided
	DSMAC guided
Minimum Range	GPS and inertial guided
Maximum Range	GPS guided
Rounds/TriggerP	Harpy guided
TriggerPulls/Relo	Inertial guided
Ripple Fire Time	Laser guided
	Remote guided
	Self guided
	Unguided

Vista – Stations Tab – AutoDirect Data

Moved the AutoDirect Data to Each Weapon Load



Vista Ph & Pk Legend

Each Ph & Pk curve editor has a legend, which can be displayed or hidden, explaining the abbreviations used in the headings of each column.

PhCurve Editor -- 5.56MM BALL VS SOFT SKINNED

Comments: "6"

Ph Curves

Range (m)	SSDF	SSDH	SSEF	SSEH	S MDF	SMDH	SMEF	SMEH	MSDF	MSDH	MSEF	MSEH	MMDF	MMDH	MMEF	MMEH
0	100	100	100	100	0	0	100	100	100	100	100	100	0	0	100	100
50	100	100	100	100	0	0	100	100	100	100	100	100	0	0	100	100
100	100	100	100	100	0	0	100	100	100	100	100	100	0	0	100	100
200	100	100	99.97	100	0	0	99.99	99.97	100	100	99.97	100	0	0	99.99	99.97
400	99.87	100	96.07	99.88	0	0	97.34	91.45	99.87	100	96.05	99.88	0	0	97.32	91.44
600	87.29	92.92	81.15	89.55	0	0	77.62	61.59	87.27	92.9	81.14	89.52	0	0	77.6	61.56
800	46.73	43.44	46.58	42.95	0	0	36.16	24.51	46.72	43.41	46.57	42.93	0	0	36.15	24.5

Buttons: Insert Row, Append Row, Delete Row, Graph Data, Show Key, Apply, Reset, Print, Dismiss

PhCurve Editor -- 5.56MM BALL VS SOFT SKINNED

Comments: "6"

Shooter	Target	Protection	Angle
S: Stationary	S: Stationary	D: Defilade	F: Flank
M: Moving	M: Moving	E: Exposed	H: Head

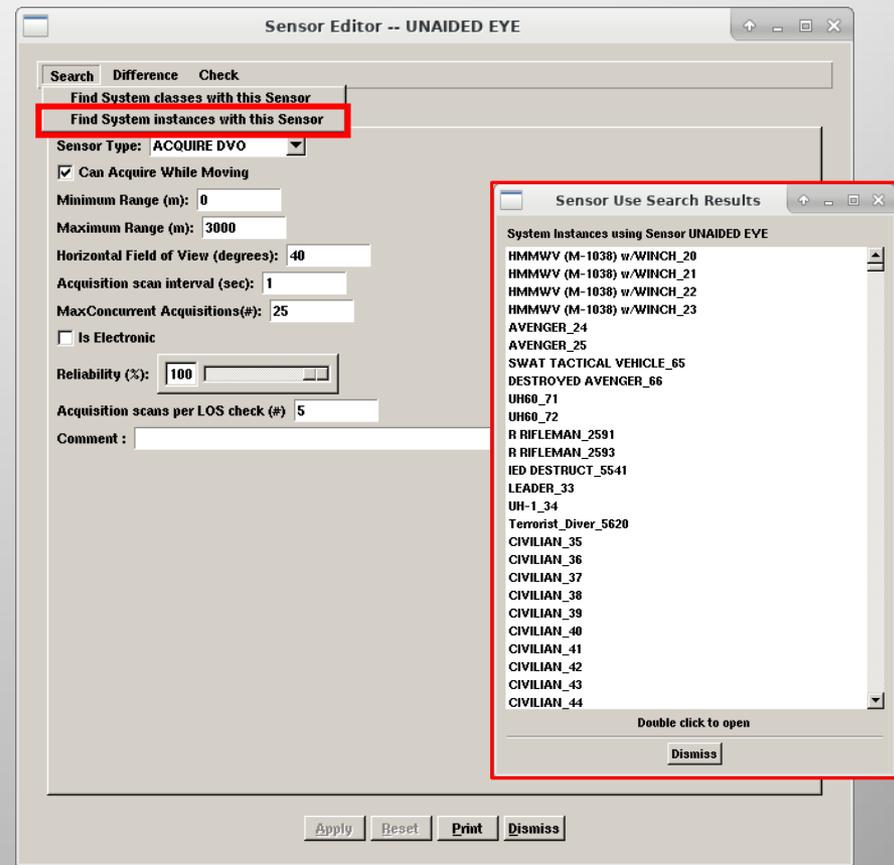
Ph Curves

Range (m)	SSDF	SSDH	SSEF	SSEH	S MDF	SMDH	SMEF	SMEH	MSDF	MSDH	MSEF	MSEH	MMDF	MMDH	MMEF	MMEH
0	100	100	100	100	0	0	100	100	100	100	100	100	0	0	100	100
50	100	100	100	100	0	0	100	100	100	100	100	100	0	0	100	100
100	100	100	100	100	0	0	100	100	100	100	100	100	0	0	100	100
200	100	100	99.97	100	0	0	99.99	99.97	100	100	99.97	100	0	0	99.99	99.97
400	99.87	100	96.07	99.88	0	0	97.34	91.45	99.87	100	96.05	99.88	0	0	97.32	91.44
600	87.29	92.92	81.15	89.55	0	0	77.62	61.59	87.27	92.9	81.14	89.52	0	0	77.6	61.56

Buttons: Insert Row, Append Row, Delete Row, Graph Data, Show Key, Apply, Reset, Print, Dismiss

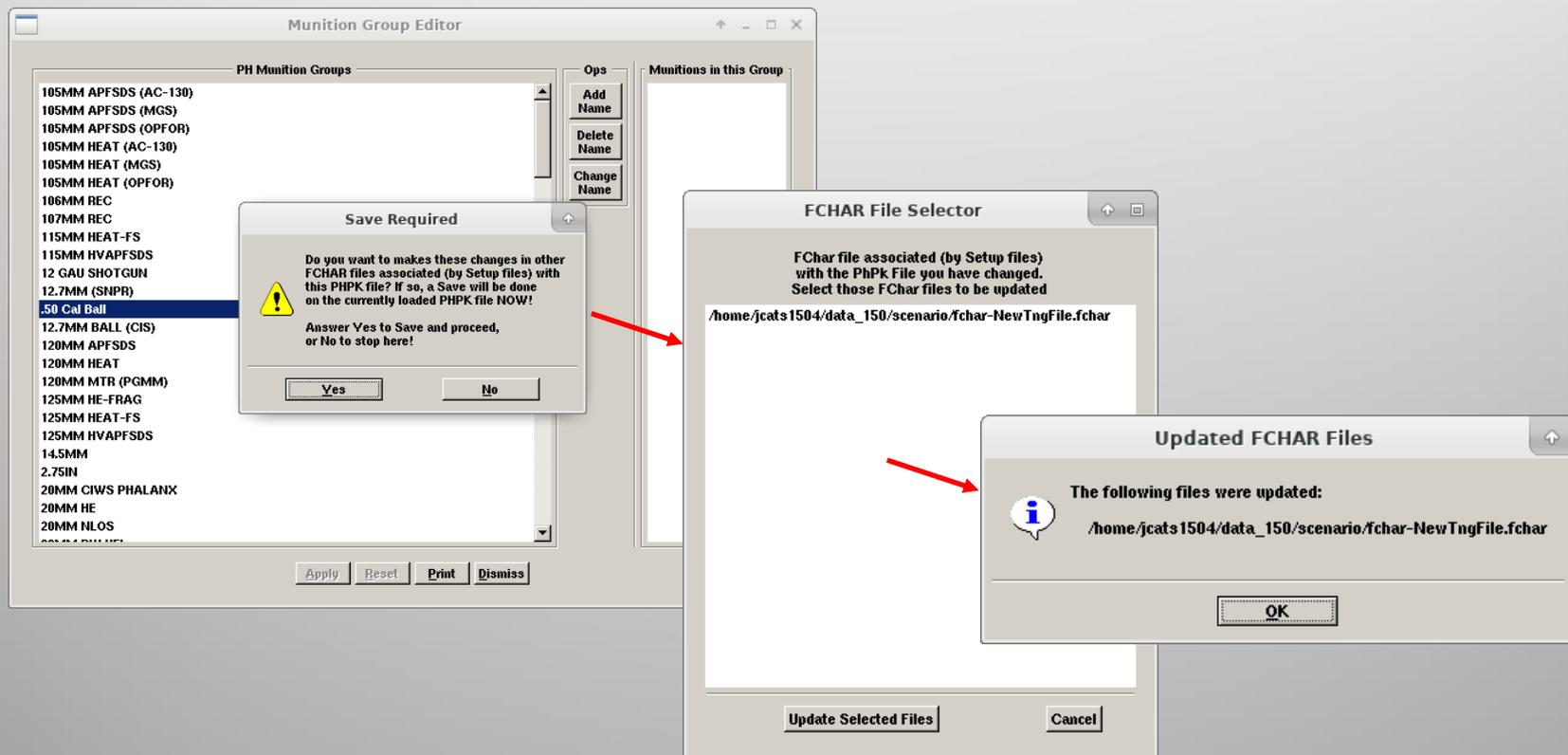
Search System & Force Org

- A new Search function allows users to find System Instances that use the selected object
- This Search applies to Sensors, Munitions, Weapons & CBRN Sensors
- The window that opens is selectable – Clicking on a system opens its instance editor window



Updating Munition Group Names

Allows updating of Vista Munition Group name changes to propagate to .fchar files other than the one currently loaded in Vista



Counter Fire Radar RF Signature

- Counter Fire radars can be detected by Passive Sensors
- To enable this, an RF Signature must be added to the CF Radar
 - The RF Signature field has been added to the CF Radar tab

Search Difference Check

General Radar Data CF Radar

RF Signature COUNTER FIRE RADAR

Detect rounds from all sides

Detect only incoming rounds

Operating Mode 1

Field Of View (degrees) 360

	Min Range	Max Range	Min TLE	TLE % Range
Mortar	0	50000	100	0
Artillery	0	50000	100	0
Rocket	0	50000	100	0

Has Second Mode

Operating Mode 2

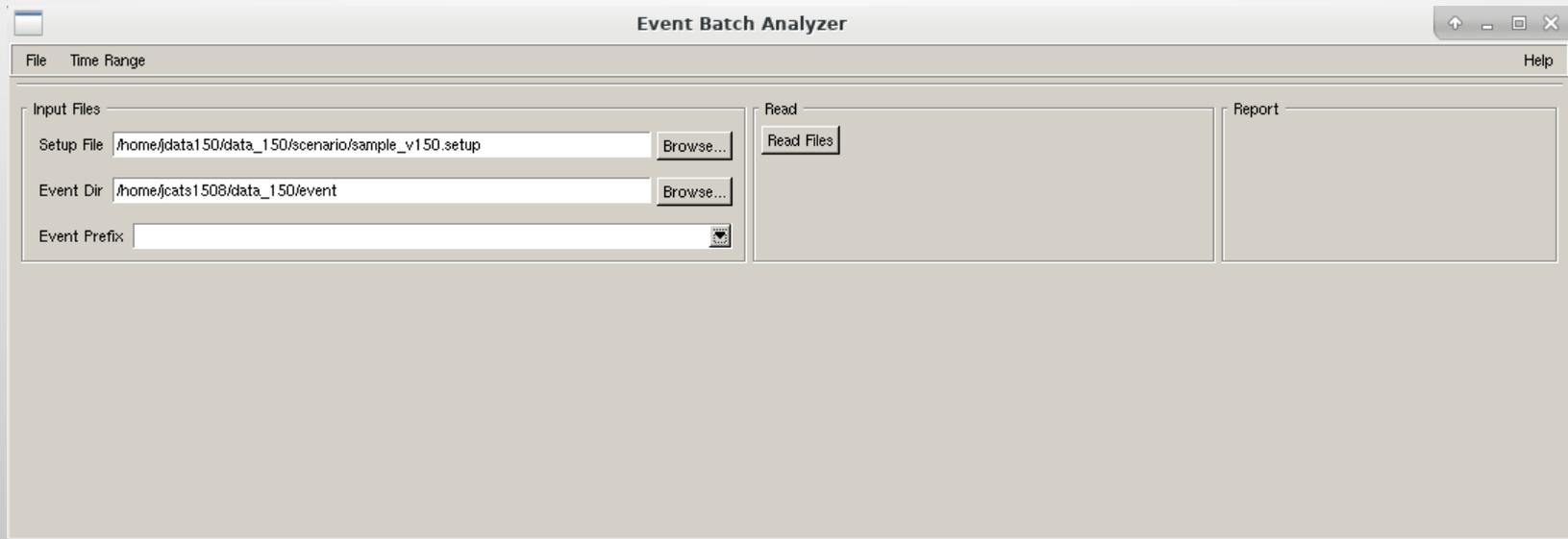
Field Of View (degrees) 360

	Min Range	Max Range	Min TLE	TLE % Range
Mortar	3000	15000	25	0.5
Artillery	4000	20000	50	0.75
Rocket	5000	25000	75	1

Apply Reset Print Dismiss

Toolbox

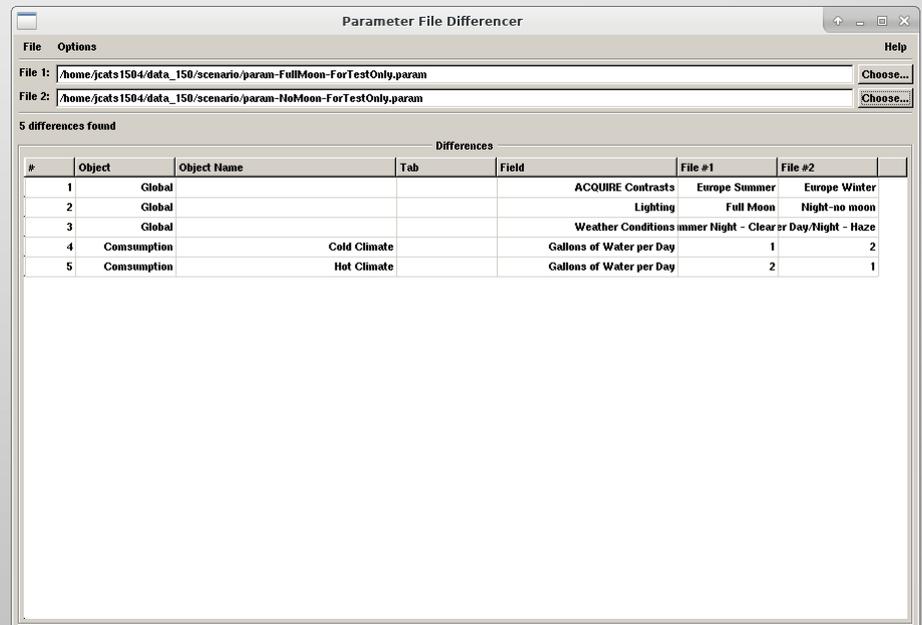
Event Batch Analyzer



- Time Range feature** - generate reports over a specific time range only
- Added a **CSV Export** under File menu
- Added StdDev to Casualty report
- Added Non KKill sum & StdDev to Casualty report
- Added total kills to direct & indirect fire reports
- Added Mounted Kills to Kill report

Parameter Differencer

- The Parameter (Param) Differencer compares two .param files to each other and reports the differences
- The Differencer works best with .param files that are related with only minimal differences
- Launch the Param Differencer from the Toolbox or by typing ***paramsDiff*** in a terminal window



The screenshot shows the 'Parameter File Differencer' application window. It has a menu bar with 'File', 'Options', and 'Help'. Below the menu bar, there are two file selection fields: 'File 1: /home/jcats1504/data_150/scenario/param-FullMoon-ForTestOnly.param' and 'File 2: /home/jcats1504/data_150/scenario/param-NoMoon-ForTestOnly.param', each with a 'Choose...' button. Below the file fields, it says '5 differences found'. A table titled 'Differences' displays the results of the comparison.

#	Object	Object Name	Tab	Field	File #1	File #2
1	Global			ACQUIRE Contrasts	Europe Summer	Europe Winter
2	Global			Lighting	Full Moon	Night-no moon
3	Global			Weather Conditions	immer Night - Clear	Day/Night - Haze
4	Consumption	Cold Climate		Gallons of Water per Day	1	2
5	Consumption	Hot Climate		Gallons of Water per Day	2	1

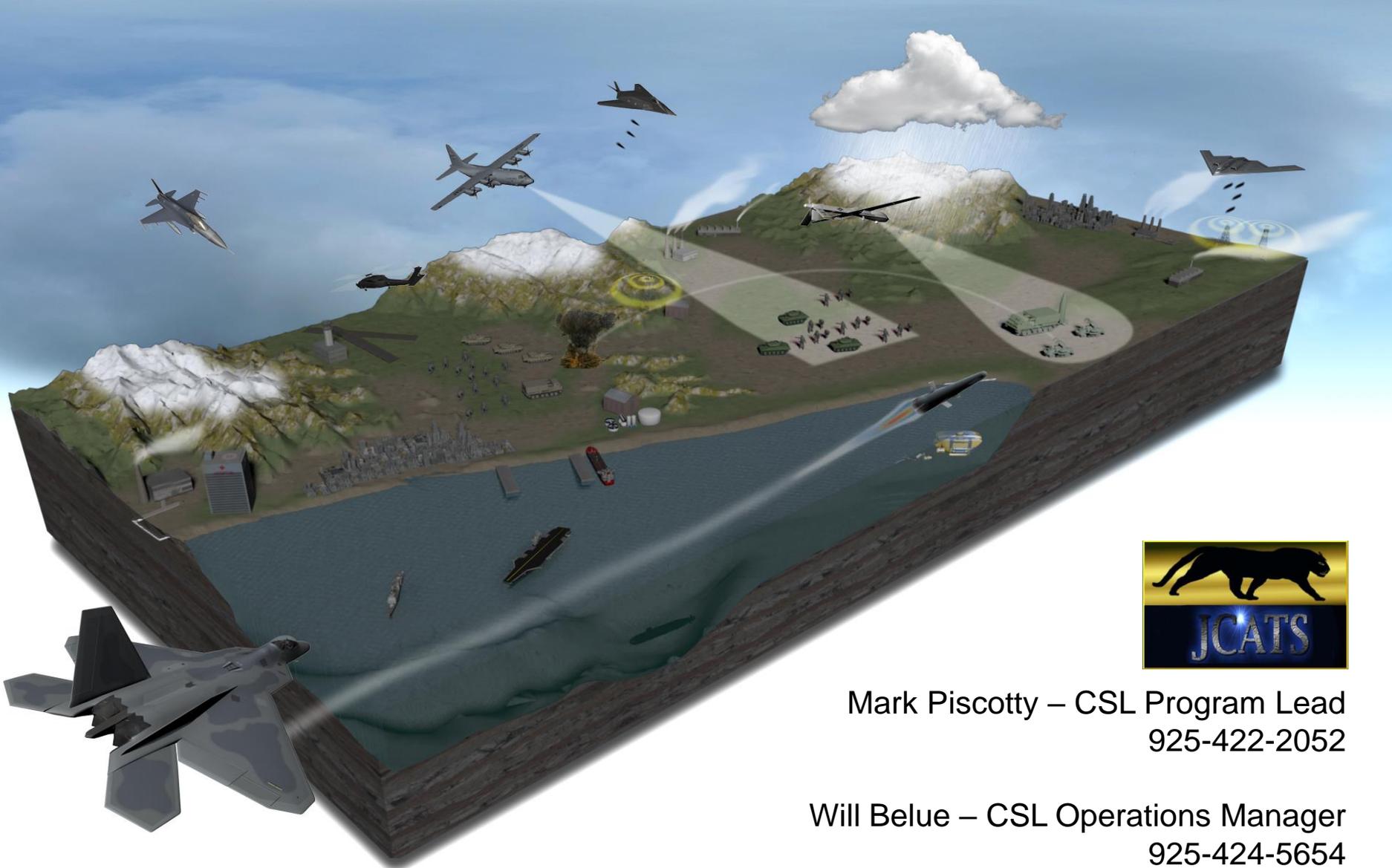
Additional Improvements

- The Look Around movement activity node uses the sensor scan interval as the time to complete the activity
- JCATS exports ACE/ACS data, in XML format
- When creating IADS nets, eligible radars are marked with white octagons
- HLA Bridge processes ACS aggregate combat attrition
- Blacklisted items can be cleared from the DIS bridge
- Added STL, JTM, and LatLon elevation exporters to TerEdit
- Vista checks domain of Active radars against domains of Detection Signatures for consistency
- Munition class Consistency Checker looks at changes to munitions that have not yet been Applied

Additional Improvements

- Added CSV Exporter to Event Batch analyzer
- Added GridFloat importer capability to TerEdit
- Improved the APS Flyout Munition intercept fidelity
- Improved OBS file importing & handling position data
- Improved Chem/Bio play by now importing HPAC Surface Dosage Output Files (NATO Request)
- New Scenario Generator Tool created in support of multinational scenario creation (NATO Request)
- Overland and Road Pathers added to RoboPucker
- Added a PGM option to the FO Target Strength Data
- Custom Reports now has an Edit button to specifically enable/restrict changes to the loaded report

Questions?



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Guidance and Propulsion Data Conversion To JCATS v15.0

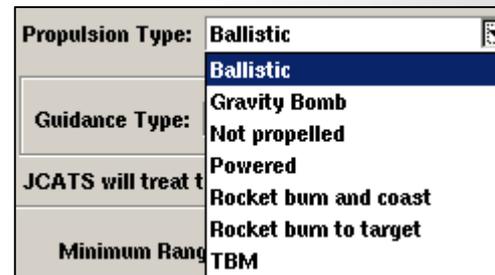
(9 slides)

Background

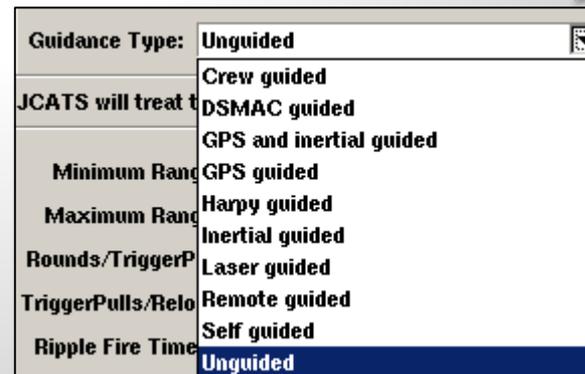
- JCATS began development in 1997
 - The methods & assumptions at the foundation of the munitions model have not advanced with technology
 - The Guidance Type has become a catchall for both guidance and propulsion
- To allow JCATS to more completely capture the capabilities of modern munitions, a fundamental revision was required
- The existing Guidance Type has been separated into Guidance Type and Propulsion Type



JCATS v14 and earlier

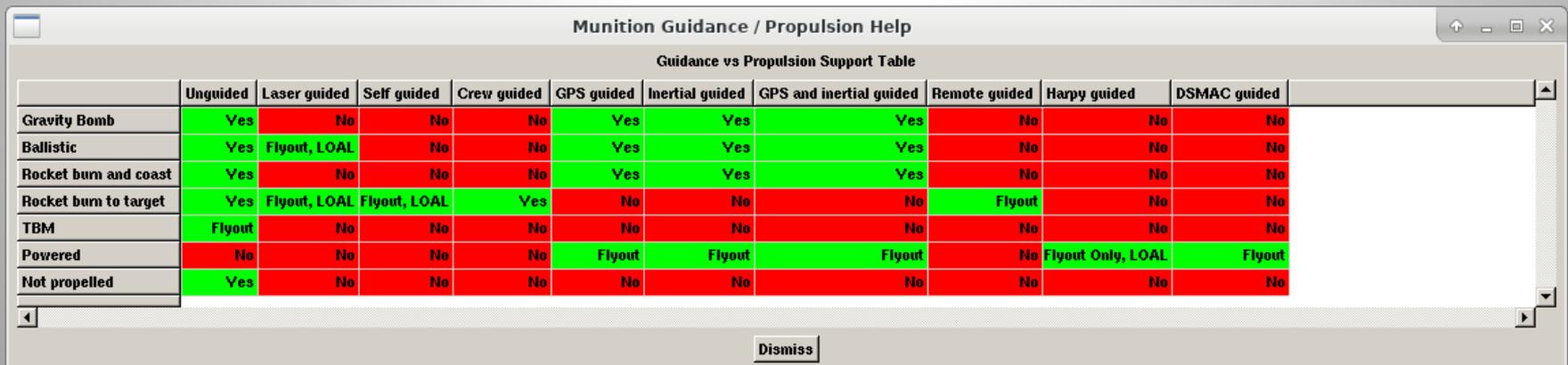


JCATS v15



Conversion

- JCATS automatically converts munition data when a v14 fchar is opened in Vista v15
- Only a limited set of Propulsion/Guidance pairings are currently simulated
 - Additional pairings will be simulated in future versions as funding allows and technological advancements require
 - A Help button on the munition's Conventional tab displays the following table of valid pairings



Munition Guidance / Propulsion Help

Guidance vs Propulsion Support Table

	Unguided	Laser guided	Self guided	Crew guided	GPS guided	Inertial guided	GPS and inertial guided	Remote guided	Harpy guided	DSMAC guided
Gravity Bomb	Yes	No	No	No	Yes	Yes	Yes	No	No	No
Ballistic	Yes	Flyout, LOAL	No	No	Yes	Yes	Yes	No	No	No
Rocket bum and coast	Yes	No	No	No	Yes	Yes	Yes	No	No	No
Rocket bum to target	Yes	Flyout, LOAL	Flyout, LOAL	Yes	No	No	No	Flyout	No	No
TBM	Flyout	No	No	No	No	No	No	No	No	No
Powered	No	No	No	No	Flyout	Flyout	Flyout	No	Flyout Only, LOAL	Flyout
Not propelled	Yes	No	No	No	No	No	No	No	No	No

Dismiss

Conversion Method

- JCATS converts munitions according to the table at right
 - RBTT = Rocket burn to target

V14 Guidance	V15 Propulsion	V15 Guidance
Ballistic	Ballistic	Unguided
Crew Guided	RBTT	Crew Guided
Cruise Missile	Powered	GPS and inertial guidance
GPS Guided	Ballistic	GPS guided
Harpy Guided	Powered	Harpy guided
Laser Guided Ballistic	Ballistic	Laser guided
Laser Guided Rocket	RBTT	Laser guided
Remote Guided	RBTT	Remote guided
Rocket	(see next slide)	Unguided
Self Guided	RBTT	Self guided
TBM	TBM	Unguided

Rockets

- 'Rocket' type munitions are converted to Guidance Type 'Unguided'. The Propulsion Type varies
 - If either or both Fire Modes Auto Direct and Planned Direct are checked, Propulsion Type = RBTT
 - If neither are checked, Propulsion Type = Rocket burn and coast

Gravity Bombs

- To distinguish a gravity bomb from other ballistic munitions (bullets), the converter checks the following AFTER running the initial conversion:
 - Propulsion Type = Ballistic
 - Guidance Type = Unguided or GPS guided
 - Munition Type \neq Ball, PhPk HE, Energy, or Smart
 - Fire Modes: Must have Planned Indirect checked; cannot have either Auto Direct or Planned Direct checked
 - Maximum Range < 16 km
- If the above criteria are met, the munition's Propulsion Type is altered to Gravity Bomb

Mines

- The **Not propelled** Propulsion Type is intended for use with mines
- This conversion process only converts the munitions listed on the Barriers – Mines tab to **Not propelled**
- All other munitions are converted according to the procedures above
 - This normally results in munitions being assigned **Ballistic** propulsion

The screenshot shows the 'Barrier Char Editor' window. At the top, there is a table with columns: Plane Width (m), Chunk Size, Density (mines/sqm), Life (hrs), Prob Destruction (%), Prob Delib Det (%), and Prob Hasty Det (%). The table contains two rows: AP Strip and AT Strip.

Barrier	Plane Width (m)	Chunk Size	Density (mines/sqm)	Life (hrs)	Prob Destruction (%)	Prob Delib Det (%)	Prob Hasty Det (%)
AP Strip	25	25	0.02	2	40	10	40
AT Strip	25	25	0.02	4	80	20	80

Below the table, there are two sections for triggering probabilities. The first section is 'Probabilities (%) of Triggering for AP Strip Mines'. It has a table with columns 'Breaching Triggering' and 'Nonbreaching Triggering'. The 'AP Munition' dropdown is set to 'AP MINE'.

	Breaching Triggering	Nonbreaching Triggering
Dismounted	1	50
Four By Two	4	50
Four By Four	5	70
Track	10	90
Track2	10	90
Water Craft	0	100
Fixed Wing	0	50
Submarine	0	0

The second section is 'Probabilities (%) of Triggering for AT Strip Mines'. It has a table with columns 'Breaching Triggering' and 'Nonbreaching Triggering'. The 'AT Munition' dropdown is set to 'AT MINE'.

	Breaching Triggering	Nonbreaching Triggering
Dismounted	0	0
Four By Two	2	30
Four By Four	2	30
Track	5	50
Track2	5	50
Water Craft	0	50
Fixed Wing	0	90
Submarine	10	50

At the bottom of the window, there are buttons for 'Apply', 'Reset', 'Print', and 'Dismiss'.

Additional Settings

- By default, munitions are defined as Lock On Before Launch (LOBL) EXCEPT:
 - Laser Guided/RBTT/Planned Indirect = Lock On After Launch (LOAL)
 - Self Guided/Planned Indirect = LOAL
 - Harpy/Powered = LOAL
 - Laser Guided/Ballistic = LOAL

Complete the Conversion

- We estimate the automatic conversion process gives about a 90% solution
- If the initial munition's data is incorrect, the conversion will be incorrect
- If a munition is defined to function a specific way for a specialized effect, it may not convert properly
- Some munitions may be incorrectly converted to Gravity Bombs.
 - A popup window at the end of the conversion displays munitions that were upgraded to "Gravity Bombs".
 - This list can be dismissed or kept open

Munition Upgrade Data Review!

JCATS V15 uses an upgraded munition description. The old single descriptor "Guidance Type" has been replaced with a new "Guidance Type" and a "Propulsion Type". See the Release Notes for information about this upgrade!

The following Munitions were upgraded to the new propulsion type "Gravity Bomb". Some of these upgrades may be incorrect and will require that you manually correct the Propulsion Type, Guidance Type, Fire Modes, and/or other munition data!

BOMB 250LB
105MM HE M1
105MM
105MM HE
BOMB 500LB GBU-12 Mk82
BOMB Mk82
ROCKEYE II MK 20
BOMB GBU-31A JDAM
 BOMB Mk83 x2
BOMB Mk82 LOW DRAG
JSOW-C
BOMB CBU-89
AGM-154B (w/BLU-108 SFW) JSM
BOMB Mk84
BOMB Mk82 x4
BOMB CBU-103
BOMB CBU AP
BOMB CBU AT
BOMB 1000LB LGB Mk83
BOMB GBU-32 JDAM
BOMB PAVEWAY III BLU-113/B
BOMB Mk84 x2
BOMB GBU-16 x2
BOMB 2000LB PAVEWAY III Mk84
BOMB BLU-109/B GBU-31B JDAM
BOMB Mk83 x4
ACFT ILLUM FLARE
TOMAHAWK

Final Check

- The guidance and propulsion type conversion is based on assumptions and may not be correct for all instances
- It is important that the database manager verify all munitions in the FChar before using the data in a scenario
- Save the changes – The fchar file does NOT turn red when the changes are made