

# COMMAND

PROFESSIONAL EDITION



# COMMAND PROFESSIONAL EDITION

## ALL-DOMAIN, DIGITAL WARGAMING

- Analysis
- Education
- Training



## EXTENDABLE

- Training for Artificial Intelligence
- Override built-in models

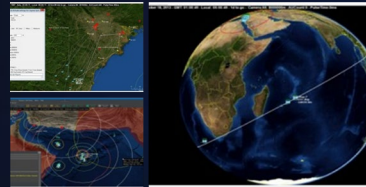
# WHAT IS COMMAND PROFESSIONAL EDITION?



## 01 CMAND / CMO

Command PE is based on the commercial software titles

- Command: Modern Air/Naval Operations and its successor,
- Command Modern Operations



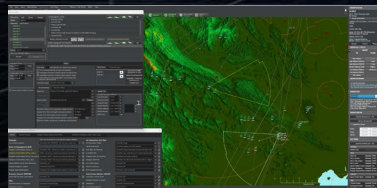
## 02 Product

Whole earth, Physics-based Battlespace Simulation;  
all-domain with emphasis on Air and Maritime



## 03 Industry

Used by the world's largest defence contractors to  
test concepts and create scenarios to demonstrate  
capabilities



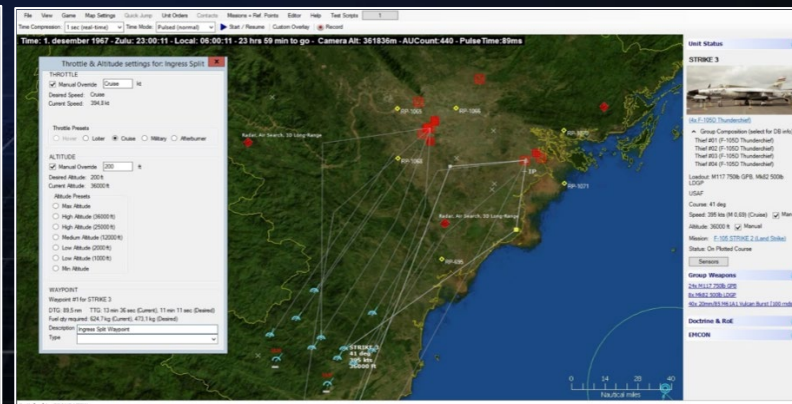
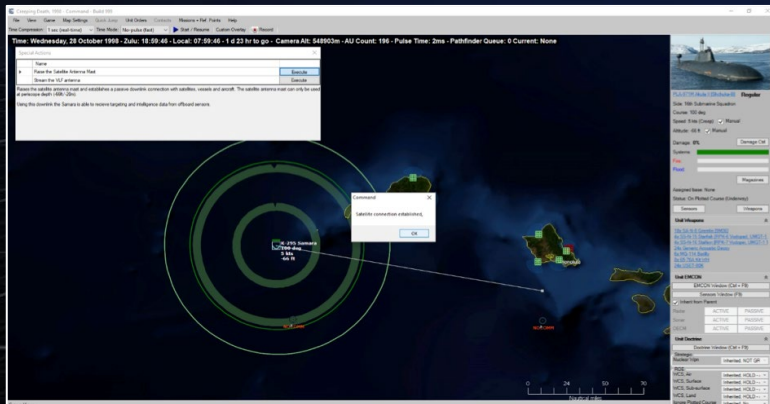
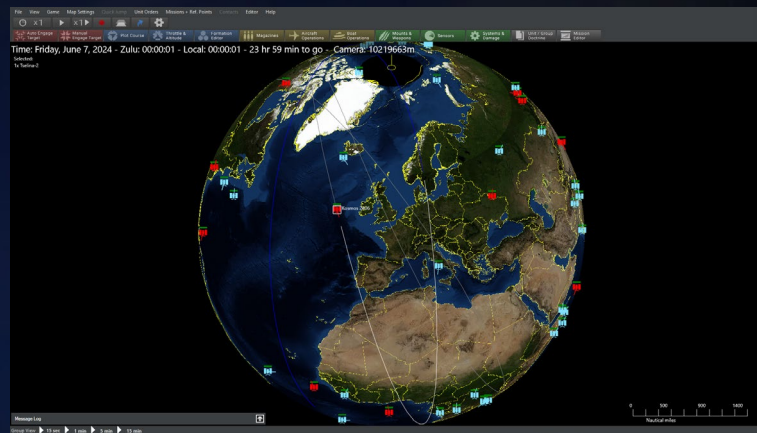
## 04 Military

Used in 25+ Nations for Analysis, Training, and Education;  
rapidly create scenarios to test capabilities, tactics,  
strategies and individual/staff performance

# COMMAND PROFESSIONAL EDITION – WHOLE EARTH & ALL DOMAIN

SATELLITE

- All-domain, Physics-based battlespace:  
Air, Sea, land, space and cyber effects
- SRTM-3 data (DTED Level 1) and 450m<sup>2</sup>/cell bathymetry
- Database of the world's frontline Air and Maritime equipment from 1946 to near future (all editable)



# BRIEF HISTORY: COMMAND → COMMAND PROFESSIONAL EDITION



# BRIEF HISTORY: COMMAND → COMMAND PROFESSIONAL EDITION

Hundreds of scenarios, created by military personnel and the Command user community

Comprehensive database, including almost every platform and weapon system currently in use worldwide

Complex physics/environment, sensors, weapons & AI models

Continuously updated with new data, techniques, routines, hardware models etc

# BRIEF HISTORY: COMMAND → COMMAND PROFESSIONAL EDITION

Command Professional Edition is used by armed forces, defence contractors, analysts, and academic organizations

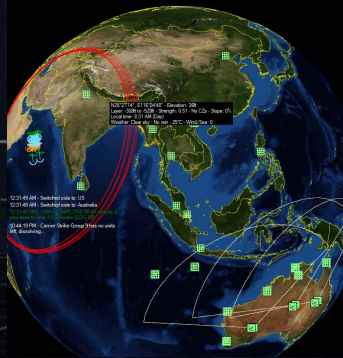
Detailed modelling, simulation, and analysis tool

Flexible and adaptable to meet specific needs and classification environment

Create and simulate scenarios rapidly; run in single or multiple-user modes

# COMMAND PE BUILDS ON TOP OF COMMERCIAL COMMAND

1



Added-value features for the military, industry and academic professionals

2

Praised by the pros: “half the time and cost” — Dstl





# USED & TRUSTED WORLDWIDE

Armed forces and defence industry of over 23 Nations use Command PE for analysis, planning, training and education



## US to buy two Iron Dome batteries as first part of \$1.7b missile defense project

Systems to be deployed next year; \$373m. purchase could lead to far bigger deal if Israeli system proves able to defeat more complex threats than it was originally designed for

## Air Force Cancels HCSW Hypersonic Missile in Favor of ARRW

Feb. 10, 2020 | By John A. Tirpak

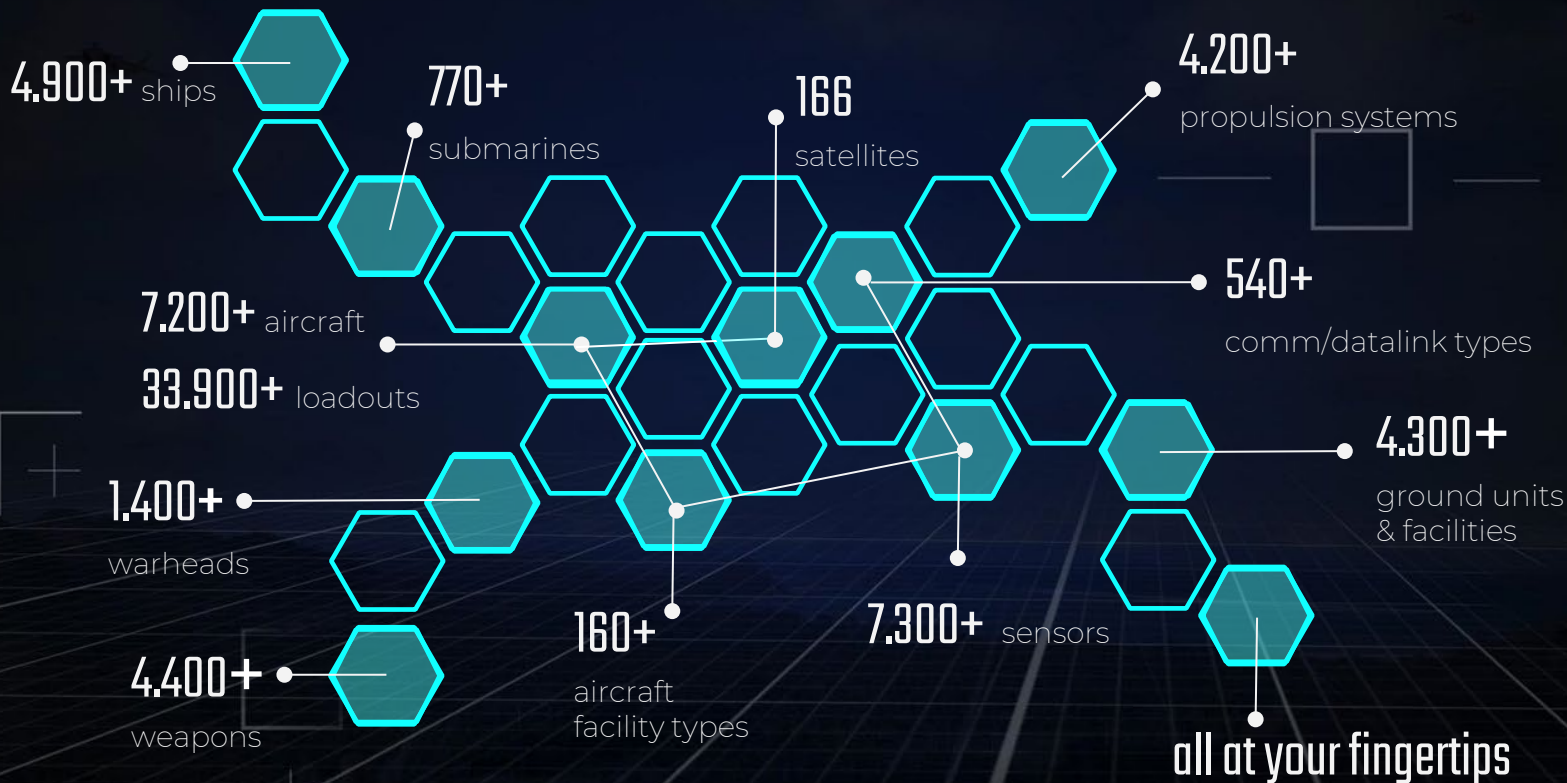
The Air Force has notified Lockheed Martin it has cancelled the Hypersonic Conventional Strike Weapon as of Feb. 10, in favor of the AGM-183 Air-Launched Rapid Response Weapon. The cancellation is not because of poor performance but because of other "budget priorities," the service said.

ARRW is the only hypersonic prototyping effort USAF is funding this year, service spokeswoman Ann Stefanek told reporters. Lockheed Martin Space in Huntsville, Alabama, is the prime contractor for HCSW, while Lockheed Missiles and Fire Control in Orlando, Florida, is the prime for ARRW.

A B-52 out of Edwards Air Force Base, California, carries an ARRW (AGM-183A) boost for its first captive carry flight on June 12, 2019. Air Force photo by Christopher DeMa.



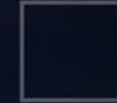
# FULLY EDITABLE, OPEN SOURCE DATABASE



# FULL DATABASE EDITOR

Modify existing systems or create entirely new ones

Rapid change-test-repeat cycle



### F-22A RAPTOR PARTIAL ENTITY BREAKDOWN

#### Edit Parameters in Microsoft Access

- Propulsion:** F-119-PW-100 Turbopfans
- Stores:** Fuel Tanks
- Weapons:** M61A2 Vulcan Cannon, Mount, Mount, Weapon
- Aircraft Loadouts:** 11 Possible Loadouts across AAW, Strike, Ferry/Maint roles
- Sensors:** AN/APG-77(V)1, AN/AESAR Radar, AN/ALR-94, ELINT - ESM
- Comms:** 1 Radio Entity, 2 DataLink Entities
- Airframe Entity:** Signatures, Agility, Special Capabilities

**Entity Details:** 4914 - Name: F-15C/B, BB-53 Falcon, Country: United States, Service: Air Force, Year: 2021, Comments: Have Class II RCS and IR Signature Red Composite

**Key Parameters:**

- Length (m): 14.1, Empty Wgt (kg): 17500, Average climb rate (ft/min + w/jet): 62000, Ferry Range (mi): 1000, Category: Fixed Wing
- Wingspan (m): 9.2, Max Wgt (kg): 19200, Average climb rate (ft/min + w/jet): 34441, Max Engine Speed: 480, Type: Multirole (Fighter/Attack)
- Height (m): 4.2, Payload Wgt (kg): 6000, Radar FxR (m): 0, Damage Points: 5, Take Off Dist (m): 790, Rise: Medium Anvark (Length 12.1-18m)
- Center: 1, Agility: 4.0, Superendur: 0, Landing Dist (m): 750, Return: 431, 3000, 1000, 40

**Sensors Table:**

No	ID	Name
1	400AN/APG-77(V)1	AN/APG-77(V)1 Radar, ECR, Air-to-Air, Air-to-Surface, Medium-Range - Radar
2	241AN/ALR-94	AN/ALR-94 Radar, Radar Warning Receiver - ESM

**Hosts Table:**

No	ID	Name
1	3800DMMSS M61A2 Vulcan (515 mds)	Aircraft - 515 (50, Ref: 50)
2	157AN/ALC-200V2	Team's 2 (4 Decoy) - 15 (40, Ref: 150)
3	170AN/ALC-200V2	Team's 2 (4 Decoy) - 15 (40, Ref: 150)

**Loadouts Table:**

ID	Name
4	Generic: Maintenance (Unavailable) ( , , , )
5	Generic: Reserve (Available) (10mm, , , )
11317F	10C BK 52, USAF, 2018, Ferry) 10mm, 180mm, 0.0000 kg/gram
11317F	10C BK 52, USAF, 2018, AIA: AIM-1200 AMRAAM, AIA: APWS 16A, AN/ALQ-184 Pod, Light 202 (1...)
11317F	10C BK 52, USAF, 2018, AIA: AIM-1200 AMRAAM, AIA: APWS 16A, AN/ALQ-184 Pod, Light 202 (1...)
11317F	10C BK 52, USAF, 2018, AIA: AIM-1200 AMRAAM, AIA: APWS 16A, AN/ALQ-184 Pod, Light 202 (1...)
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11317F	10C BK 52, USAF, 2018, AIA: AIM-1200 AMRAAM, AIA: APWS 16A, AN/ALQ-184 Pod, Light 202 (1...)

**Notes:**

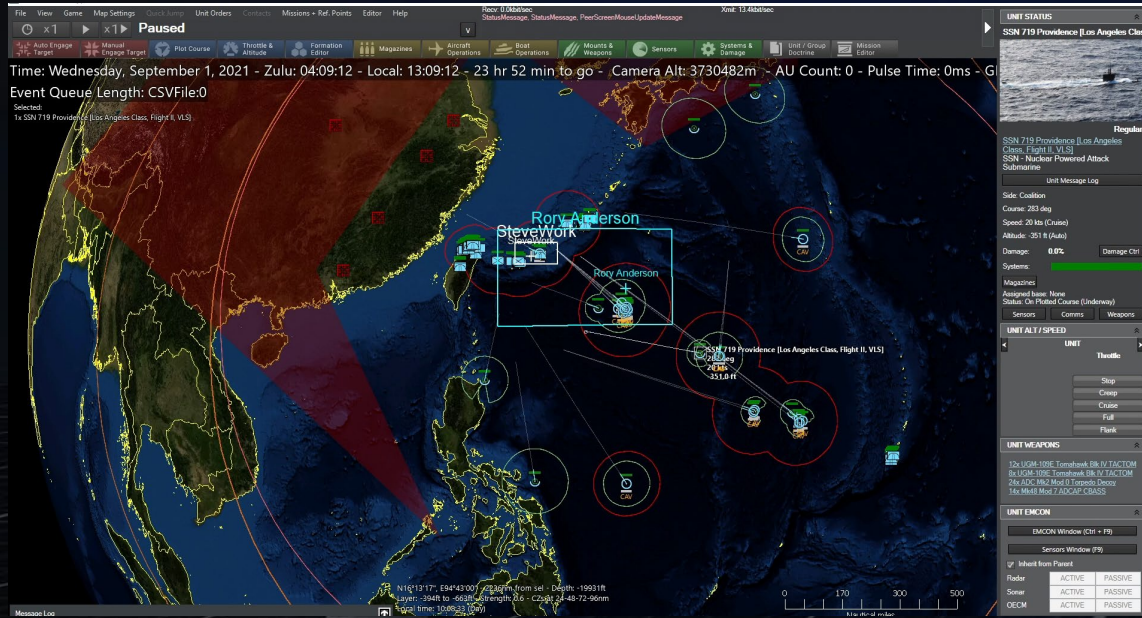
- 1) Ferry range is the range for the ferry loadout at max altitude. 10% reserve is automatically added to this figure by the database editor.
- 2) The pod's fuel and pod drop rates in the ferry loadout form the basis for the calculation. Make sure the ferry loadout carries the correct drop rates and use tanks.

# COMMAND IN THE ACQUISITION PROCESS



Digitise and test the value of ideas/concepts in Command PE before advancing them for validation in higher fidelity, but slower to use tools

# MULTIPLAYER



Realtime Multiplayer via server-client model

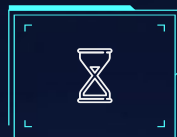
2-16 players including friendly, hostile, allied and commercial sides as well as umpire and observer modes.

Use your way - in unclassified or classified environments and with the server and clients on premises or in a cloud environment

# RAPID SCENARIO DEVELOPMENT



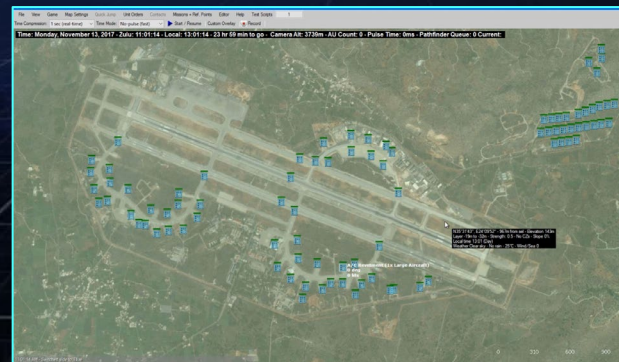
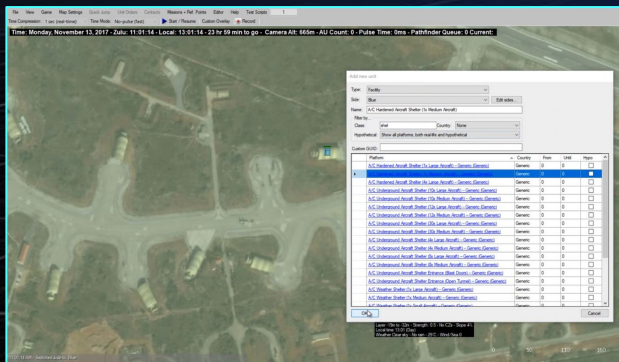
Powerful, GUI-driven integrated scenario editor allows creating elaborate scenarios in minutes



Save & re-use sprawling facility installations or nationwide defence complexes - or batch-import from your own data



Turbocharge creation speed with parallel development & scenario merging



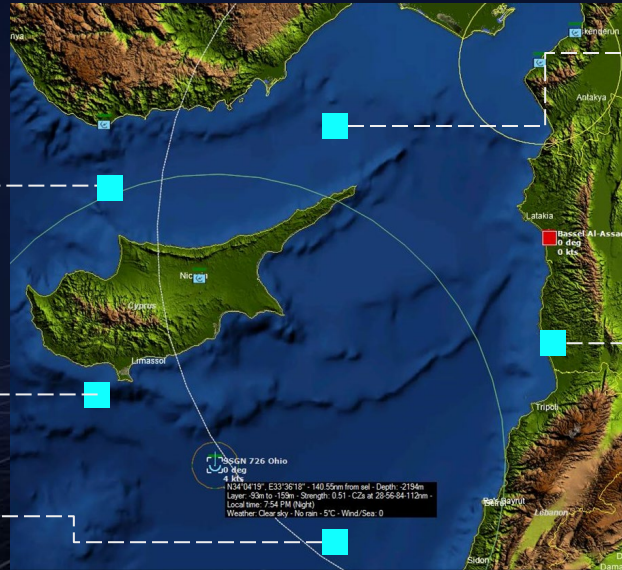
“Wargaming with Command is an Order of Magnitude faster than our previous tool.”

# ON-DEMAND FREE & COMMERCIAL IMAGERY

Bring your virtual battlespace to life with real-world imagery

Use publicly available, or commercial imagery sources, or utilise your own private datasets

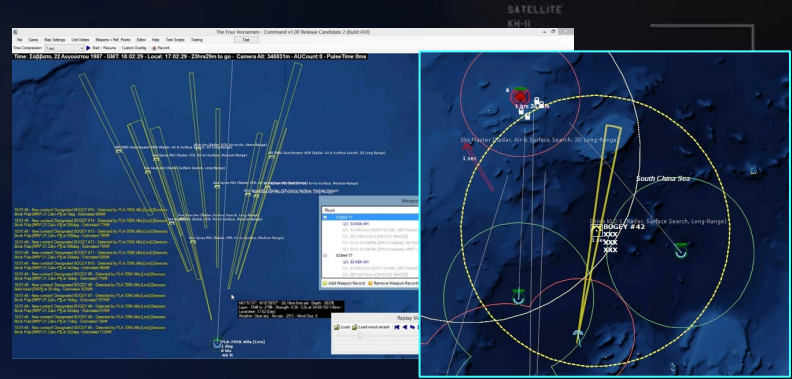
Place facilities at their real-life coordinates with pinpoint accuracy



Available Sources:  
MS Bing Maps, or any  
OpenStreetMap-  
compliant map source

Interfaces to additional  
sources can be implemented  
(e.g. Google Maps)

# ANALYSIS: INTERACTIVE & MONTE-CARLO



Run any scenario 10 times or 100,000 times depending on need

High-performance simulation engine generates speedy results

Put your multicore supercomputer to good use with parallel execution

Command Line Interface for superfast automated analysis

Use “butcher's bill” to assess losses and weapon expenditures, or drill-down deeper to examine events and their causes



# EVENT EXPORT



Analyse “Human Readable” data:

- unit positions & movements
- fuel consumption
- weapon endgame events
- units hit/destroyed
- fuel transfer
- sensor detection and more

## Export Data Types:

- XML
- CSV
- MS-Access
- SQL-Server and SQLite

## 3D viewers

- TacView
- SIMDIS

WeaponSide	ParentFiringUnit Name	TargetName	TargetSide	TargetLon	TargetLat	TargetAlt _ASL_m	TargetAlt _AGL_m	Distance FromFiringUnit	Result	EndgameMessage
United Kingdom	No. 814 NAS #06	K-239	USSR	-0.9816439	68.729378	-450	2055	1.9953	POINTDEF:FAILURE	Decoy (Generic Acoustic Decoy; Tech: Early 1980s) from K-239 is attempting to seduce sensor: Torpedo Seeker [Tech: Late 1980s](Guiding weapon: Stingray Mod 0 #616). Final probability: 15%. Result: 18 - FAILURE Point defence systems on K-239 defeated by weapon Stingray Mod 0 #616
United Kingdom	No. 814 NAS #06	K-239	USSR	-0.9816439	68.729378	-450	2055	1.9953	HIT	Torpedo Stingray Mod 0 #616 is attacking K-239 with a base PH of 80%. Final PH: 80%. Result: 67 - HIT Weapon: Stingray Mod 0 #616 has impacted K-239.
United Kingdom	No. 814 NAS #06	K-239	USSR	-0.9978601	68.728697	-52.348	2514.652	0.6376	MISS	All weapon seekers were spoofed - weapon missed target
United Kingdom	No. 814 NAS #06	K-239	USSR	-0.9978601	68.728697	-52.348	2514.652	0.6376	POINTDEF:SUCCESS	Decoy (Generic Acoustic Decoy; Tech: Early 1980s) from K-239 is attempting to seduce sensor: Torpedo Seeker [Tech: Late 1980s](Guiding weapon: Stingray Mod 0 #618). Final probability: 15%. Result: 12 -
United Kingdom	No. 814 NAS #06	K-239	USSR	-0.9978601	68.728697	-116.848	2450.152	2.4629	POINTDEF:FAILURE	No point defence systems employed by K-239 against weapon Stingray Mod 0 #618
United Kingdom	No. 814 NAS #06	K-239	USSR	-0.9978601	68.728697	-116.848	2450.152	2.4629	HIT	Torpedo Stingray Mod 0 #618 is attacking K-239 with a base PH of 80%. Final PH: 80%. Result: 49 - HIT Weapon: Stingray Mod 0 #618 has impacted K-239.
USSR	830 OKPLVP Det B	S 90 Torbay	United Kingdom	-0.0389	71.000344	-36.8552	2898.145	0.4207	POINTDEF:FAILURE	Decoy (Type 2066 Bandfish; Tech: Early 1970s) from S 90 Torbay is attempting to seduce sensor: Torpedo Seeker [Tech: Early 1980s](Guiding weapon: APR-2 Orlan-M #621). Final probability: 15%. Result: 19 - FAILURE Point defence systems on S 90 Torbay defeated by weapon APR-2 Orlan-M #621
USSR	830 OKPLVP Det B	S 90 Torbay	United Kingdom	-0.0389	71.000344	-36.8552	2898.145	0.4207	HIT	Torpedo APR-2 Orlan-M #621 is attacking S 90 Torbay with a base PH of 75%. Final PH: 75%. Result: 23 - HIT Weapon: APR-2 Orlan-M #621 has impacted S 90 Torbay.

# EDIT & CUSTOMIZE THE SIMULATION

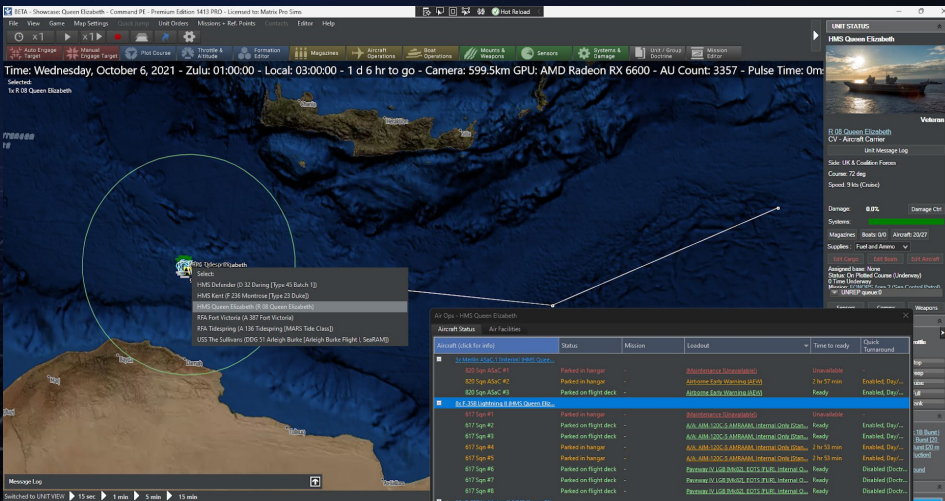
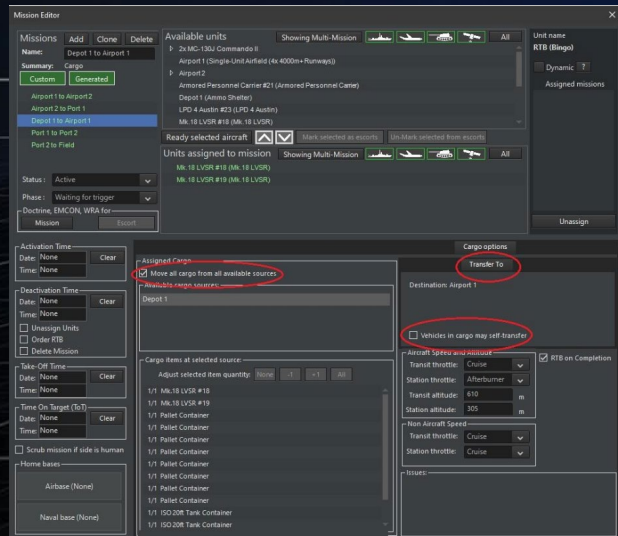
Multiple ways of customizing data & models:

DB editor

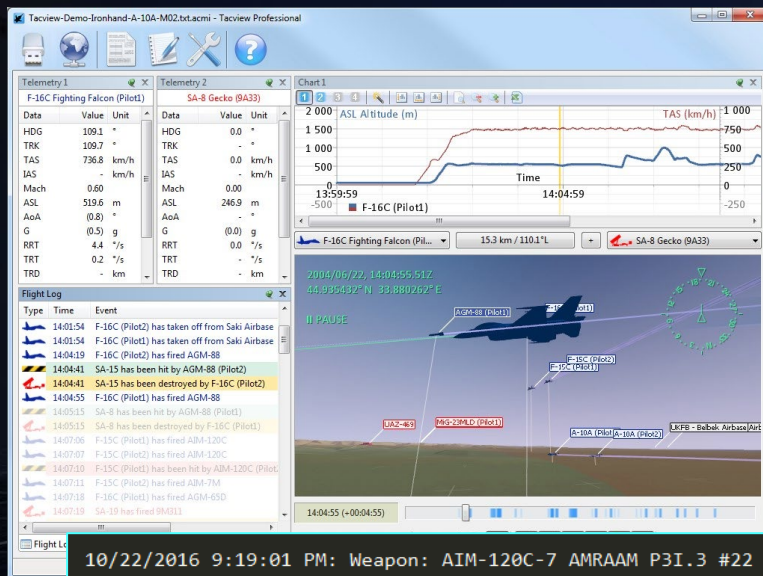
Mechanics  
overrides

Lua plugin API

Direct editing  
of raw scenario  
state (via XML)



# PLUG-IN YOUR OWN MODEL: MECHANICS OVERRIDES



10/22/2016 9:19:01 PM: Weapon: AIM-120C-7 AMRAAM P3I.3 #22 is attacking MiG-29SMT Fulcrum C with a base PH of 95%.  
 \*\*\*AMRAAM PK OVERRIDE ACTIVE\*\*\*  
 Weapon is AIM-120A/B/C and target is MiG-29; using override.  
 Inputs for high-fidelity model: Weapon speed: 2500 kts. Target speed: 724.8661 kts. Impact angle: 91.65361 deg. Calling external DLL.... Result: 82% probability.  
 Final PH: 82%. Result: 92 - MISS

Create and edit your own models & mechanics using Mechanics overrides, in-code, or remote connection to Lua API.

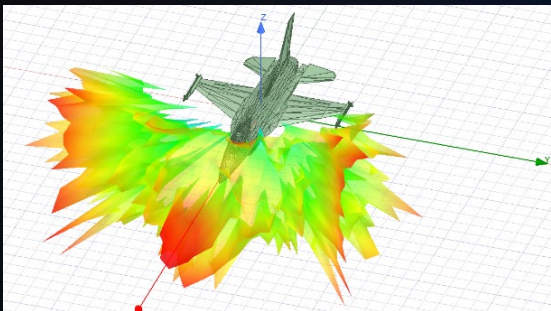
Overrides configurable per session - Additional methods can be added on request.

# PHYSICS-BASED SENSORS AND PROPULSION

Physics-based simulation using open-source algorithms

USAF Classified Verification and Validation testing (sensors and propulsion)

- Real-world propagation algorithms
- 3D and 2D Radar Cross Section signatures
- Propulsion calculations include altitude and throttle settings



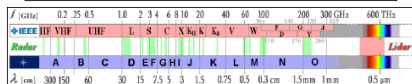
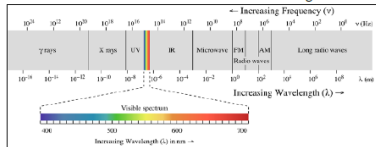
## Physics-Based Movement

- Movement in 5-dimensions (3D + Pitch & Role) & time
  - Platforms (e.g., aircraft, missiles, etc.) DO NOT teleport
    - Displacement, velocity, and acceleration of a platform are all coupled and a function of time
    - Acceleration/deceleration are a function of engine/fuel performance and platform weight/drag
      - Multiple throttle settings with manual override
      - Increases in platform weight (i.e., cargo & munitions) result in decreased range and increased fuel consumption

## Signature/Sensor Relationship

In C:Pro sensors' use a system's signature(s) to detect & classify/identify systems at a distance from the sensor

- There are 4 main types of signatures, Visual, Infrared, Radar & Sonar
- Sonar is not covered in this briefing



Search/Track Frequencies	
Visual Light	<<<<
Near IR (0.75-8 μm)	<<<<
Far IR (8-1000 μm)	<<<<
Search/Track Frequencies	
▶ A Band (30-250 MHz) [Old P Band (HF)] 100-	<<<<
B Band (250-500 MHz) [Old P Band (VHF)] 60	<<<<
C Band (500-1000 MHz) [Old L Band (UHF)] 6	<<<<
D Band (1-2 GHz) [Old L Band] 15-30 cm	<<<<
E Band (2-3 GHz) [Old S Band] 10-15 cm	<<<<
F Band (3-4 GHz) [Old S Band] 7.5-10 cm	<<<<
G Band (4-6 GHz) [Old C Band] 5-7.5 cm	<<<<
H Band (6-8 GHz) [Old C Band] 3.75-5 cm	<<<<
I Band (8-10 GHz) [Old X Band] 3-3.75 cm	<<<<
J Band (10-20 GHz) [Old X Band] 1.5-3 cm	<<<<
▶ K Band (20-40 GHz) [Old Ku Band] 0.75-1.5 c	<<<<
L Band (40-60 GHz) [Old Ka Band] 5-7.5 mm	<<<<
M Band (60-100 GHz) [Old V/W Band] 3-5 mm	<<<<

The Thrust of an engine is calculated (i.e., interpolated ratio) in the C:Pro database for the following conditions:

- Operation at 0ft, 12kft, 24kft, & 36kft
- Mach 0.0 (i.e., static thrust – test stand configuration)
- Military and afterburner throttle settings (TS #3 & 4 respectively)

$$Thrust_{0ft,3} = \frac{Thrust_{0ft,S}}{(1+(0.5 * M_{0ft}))} * 1 \quad Thrust_{0ft,4} = \frac{Thrust_{0ft,A}}{(1+(0.5 * M_{0ft}))} * 1$$

$$Thrust_{12kft,3} = \frac{Thrust_{12kft,S}}{(1+(0.15 * M_{12kft}))} * 0.693 \quad Thrust_{12kft,4} = \frac{Thrust_{12kft,A}}{(1+(0.15 * M_{12kft}))} * 0.693$$

$$Thrust_{24kft,3} = \frac{Thrust_{24kft,S}}{(1+(0 * M_{24kft}))} * 0.464 \quad Thrust_{24kft,4} = \frac{Thrust_{24kft,A}}{(1+(0 * M_{24kft}))} * 0.464$$

$$Thrust_{36kft,3} = \frac{Thrust_{36kft,S}}{(1+(-0.15 * M_{36kft}))} * 0.298 \quad Thrust_{36kft,4} = \frac{Thrust_{36kft,A}}{(1+(-0.15 * M_{36kft}))} * 0.298$$

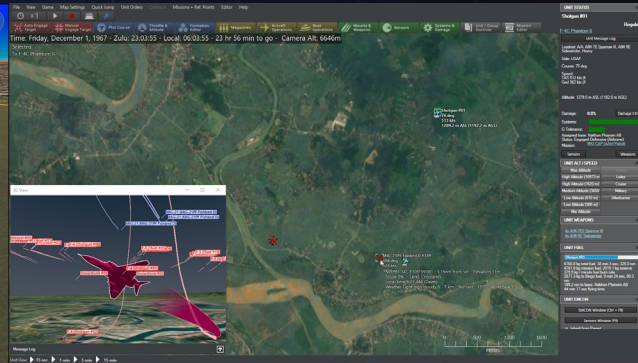
# RICH 3D VISUALIZATION - EXPANDED OPTIONS

Export simulations to Tacview, SIMDIS or ANY DIS-compatible viewer for comprehensive, all-aspect 3D view of the battlefield

Stand back and observe the big picture, or zoom-in for more detail or pan from a different angle to view a new perspective

Go forwards or backwards in time to observe trends and identify subtle factors

After-action and real-time modes supported

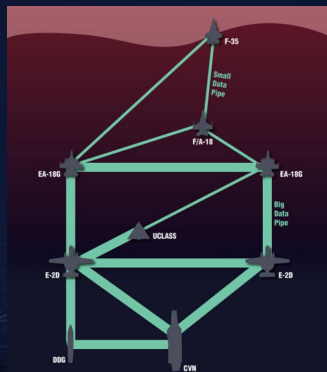


# COMMUNICATIONS JAMMING & DISRUPTION

How well can your forces operate in the dark?

Communication jamming & disruption and out-of-contact units explicitly modelled

Execute in different ways: either broadly via comms jamming, or more specifically through Lua scripting e.g. cyber/network attack!



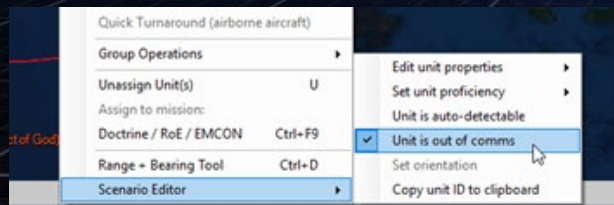
Units aren't entirely blind: they can still fight alone, but the advantages of teaming are lost and efficiency is severely degraded

Allows analysis of disrupted comms networks

Coming soon:

- Isolated local area networks and variable comm quality/data rates
- Override built-in comms model with external simulations for high-fidelity comms (e.g. Exata network simulator)

Damage Status for FFG-61 Ingraham		
Name	Status	
AN-VPS-2 Search/Track (M-16 CWIS)	Operational	
Comms & DataLinks		
Link 16 (Secure)	Damaged	
VHF Radio (Secure)	Damaged	
AN-VSC-3 FLTSATCOM SHF Shipboard Transceiver	Damaged	
Link 14	Damaged	
VHF Radio (Secure)	Damaged	
Docking Facilities		
Dave (2x Very Small Dock/Devil ID-114 Long)	Operational	
Air Facilities		
Pad with Helium (2x Medium Aircraft (12.1-18x Long))	Operational	
Hangar (2x Medium Aircraft (12.1-18x Long))	Operational	
Engineering / Population		
Status: Operational Overall Damage:		



# TACTICAL / OPERATIONAL LOGISTICS & CARGO

Get your forces to the theater - and sustain them

Units have finite weapons, fuel & stores - consider your staging ports & bases carefully

Rich cargo model places realistic volume/weight/personnel restrictions on your supply chain capacity

Amphibious landings and airdrops: Perform multi-dimensional, multi-domain maneuvering to secure your objectives



# DETAILED DAMAGE AND REPAIR

Live to fight another day

All platforms are complex systems made of discrete components, each individually damage or destroyable

Discrete armour levels for hull, superstructure, fuselage, etc. and per-component

Surviving units may return to ports/airbases/carriers to repair, refuel and re-arm - but this costs time!

Use Command's built-in ETIC & turn-around estimators, or override with your own data/models



Damage Status for MiG-29 Fulcrum A	
Name	Status
Damage: 6%	
<b>Mounts</b>	
30mm Gsh-30-1 (150 mds)	Operational
BVP-30-26M v 2 (50 Cartridges)	Destroyed
<b>Sensors</b>	
Slot Back (N-019 Rubin)	Damaged
OLS-K (IRST)	Destroyed
SPO-15 Beyoza (L-006)	Operational
OLS-K (Laser Rangefinder)	Operational
M:1 Eyeball	Operational
<b>Comms &amp; Datalinks</b>	
JHP-WHF Radio (Unsecure)	Destroyed
HF Radio (Secure)	Damaged
<b>Engineering / Propulsion</b>	
Rubins	Damaged
RD-33 #2	Operational





# WEAPONS OF THE PRESENT & THE FUTURE



1

Lasers with multiple subtypes, each with its own capabilities and limitations



2

Tactical EMP weapons, both omni-directional "grenade" warheads and directional systems like CHAMP



3

Hypersonics: cruisers and boost-glide vehicles



4

Railguns and High Velocity Projectiles

# LUA SCRIPTING & PLUGIN API

Go beyond the graphical interface

Built-in Lua console provides direct access to the internals of the running simulation

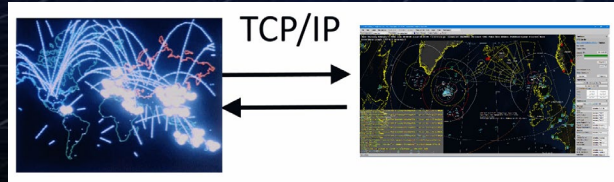
```

Scenedit_AttaCkContact("AttackerNameID", "ContactNameID", 1010)
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TCP/IP socket access to Lua API – remote-control Command from any external console or application

Script commands can be either human or machine-driven (HAL or WOPR/Joshua as adversary!)

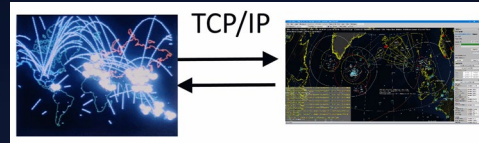


Lua I/O (optional) – use any of Lua's built-in input/output abilities to facilitate information import & export

# INTER-SIMULATION CONNECTIVITY & INTEGRATION

Talks to what you already use

Join existing distributed simulations through DIS (v6 & v7 support)



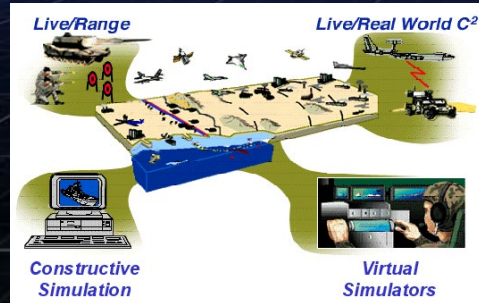
TCP/IP socket access to Lua API to control Command from any external console or application

Complete import/export of scenario state via XML: allows changes to everything



Mechanics Overrides: Use your data & models directly inside Command

Rich event-export framework to output data to other existing systems



Future Growth: HLA, CIGI, other; LVC Integration

# CONTACTS

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