BATTLESPACE SIMULATIONS

BATTLESPACE SIMULATIONS

18+ Years of US DoD and International Investment in Technology

MACE
MODERN AIR COMBAT ENVIRONMENT

ARMOR

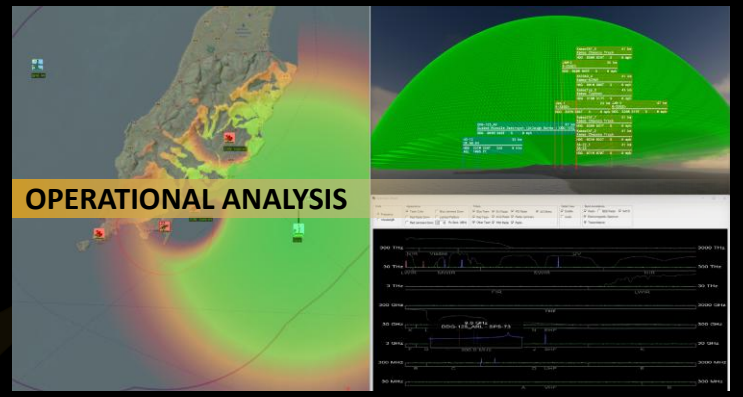
VIPER

DISCORD

Flagship Software MACE (~ 1700 Commercial Licenses) – ARMOR Unity based 3D XR Engine – DSC Military Equipment Emulation

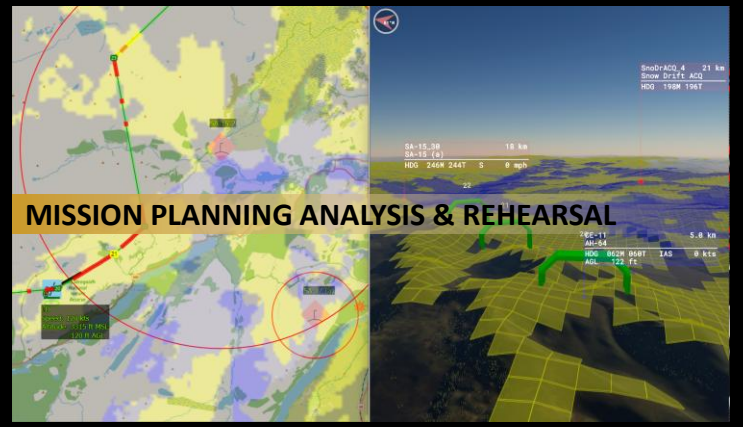
BATTLESPACE SIMULATIONS

Multidomain Combat Simulation & Analysis in Near Peer Threat Environments



Conflict is often determined by what is not seen, such as…

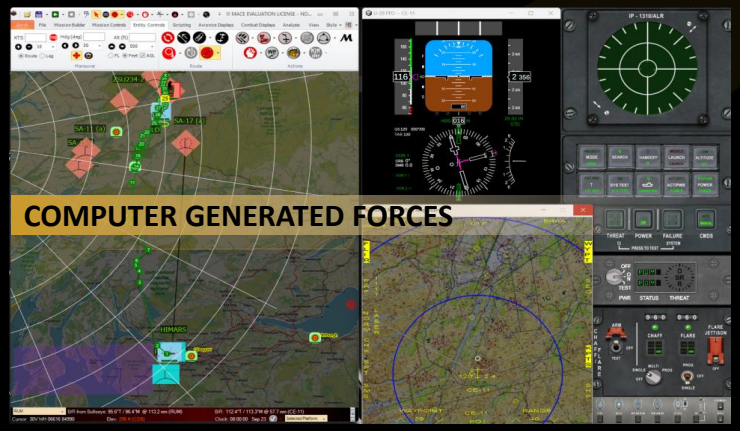
- Beams and Waves (Lasers, Radars, RF and IR)
- Countermeasures (Decoys & Jamming)
- Communications (Radios & Data-links)

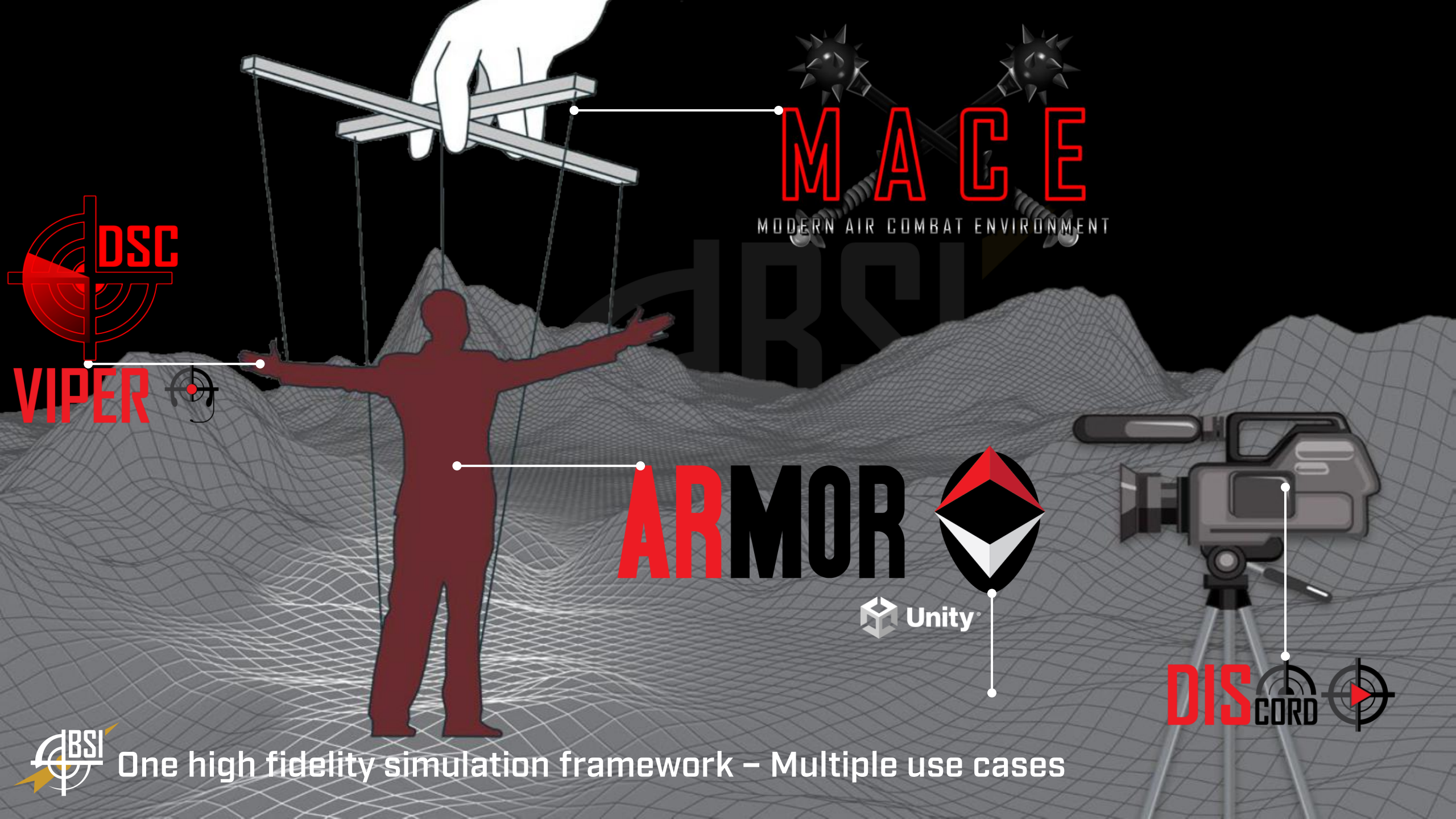


Simulate the entire battlespace, seen and unseen, using (user configurable):

- Pulse level fidelity EW simulation
- Physics-based movement models
- Worldwide geo-specific terrain

Don't settle for only part of the Battlespace!




DSC
VIPER
MACE
MODERN AIR COMBAT ENVIRONMENT
ARMOR
Unity
DISCORD
BSI
One high fidelity simulation framework – Multiple use cases

BSI Products Summary

ARMOR

Worldwide 3D Image Generator

- Multi-perspective 1st, 3rd Person, Tabletop
- Multi-spectrum, Multichannel, XR
- Procedural Terrain Generation
- Detailed Visualization Tools

MACE

MODERN AIR COMBAT ENVIRONMENT

Full Spectrum Multi-domain CGF

- Complex scenario creation
- Pulse level fidelity EW simulation
- Precise weapon/sensor modelling
- Extendable simulation framework

DSC VIPER

Simulated Device Development

- Customize and build realistic HMIs
- Military Device Emulation
- Radios, GPS, Cockpit Instruments…
- High fidelity signal modelling

DISCORD

Scenario Recording and Playback

- Record all network DIS traffic
- Bookmark and playback
- Use with MACE, ARMOR, Viper for detailed post scenario analysis

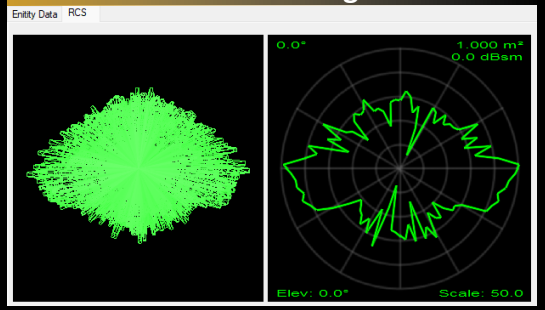
Modern Air Combat Environment (MACE)

- Full-spectrum combat simulation
  - Worldwide GIS data platform enabled battlespace
  - Physics based modelling – aircraft, missiles, hydrodynamic, EW…
  - EW environment (including the unseen) modelled at pulse level fidelity
- Grounded in Open and Mil Standards SISO
  - DIS (up to version 7) + CIGI
  - CADRG Maps / Open GiS Terrain data / EOB / EAG / METAR / TAF / ATO / ACO / Vectors / WKT / …
  - Link-16 / VMF / COT / ADSB / SADL / ASTERIX
- Multiple Use Cases
  - CGF, EW Training & Analysis, Mission Planning, Joint Fires
  - Virtual / Constructive Role-players
  - Live interaction – Military Links, Software Defined Emitters
- Simulation framework
  - Plugin architecture
  - C# API enables 3rd parties to extend MACE
- Non-Developer User Extensible
  - Use the same tools we do to develop content
  - Classified/ Unclassified Databases

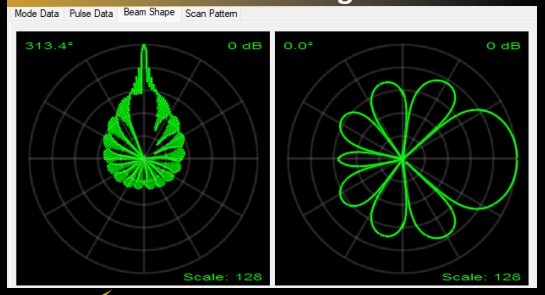
MACE USP: Highest Fidelity EW Environment

- Industry leader simulating modern air defence systems
- AESA/PESA systems; tracking and engagement of in-flight weapons
- Pulse-level simulation → can stimulate actual EW systems
- Physics-based assessment of chaff/flares, jamming and manoeuvres
- ARMOR viewer allows instant assessment of the validity of the data (E.g. incorrect beam shape / scan)

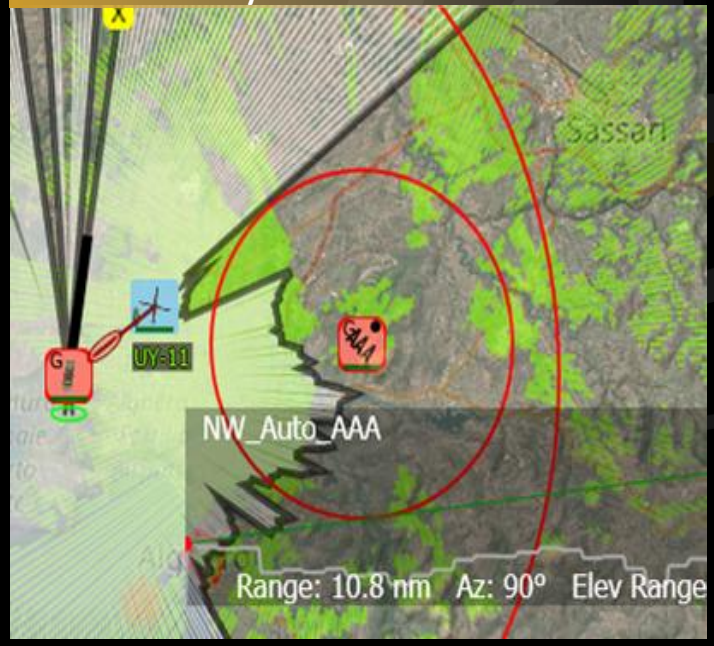
Radar Crossection Editing

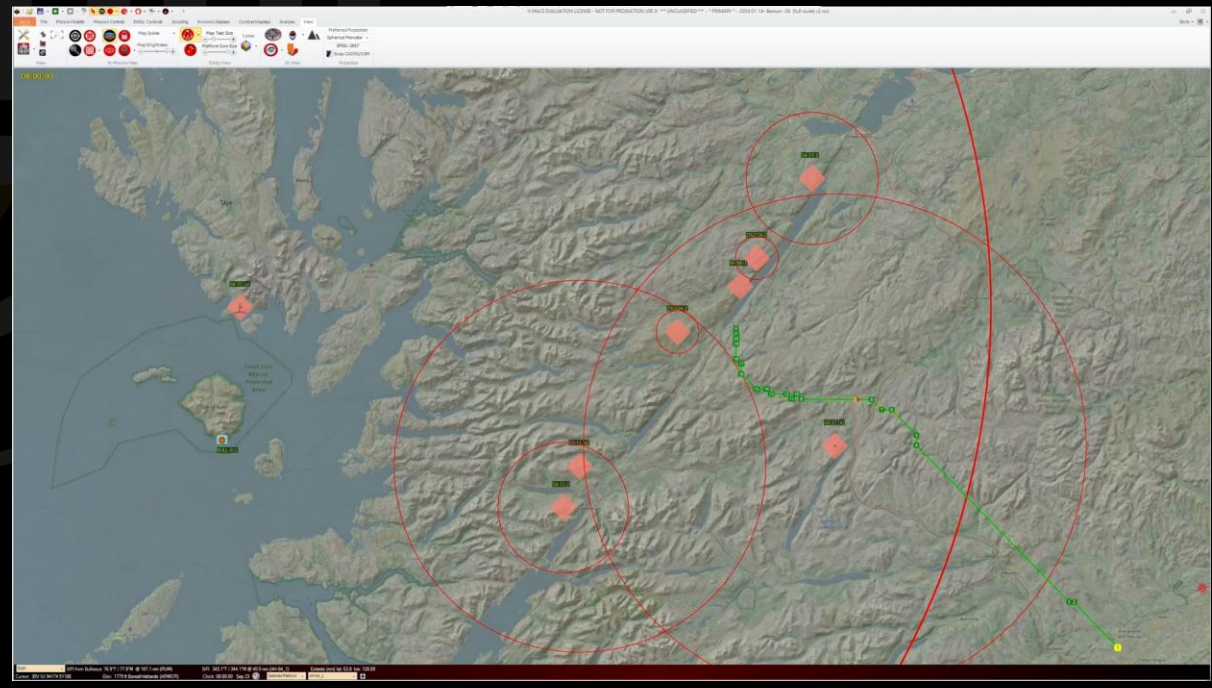


Beam Parameters Editing



Beam Mask Analysis





MACE US Marketplace Snapshot

Air Force Major Systems

- ACC A-10
- ACC JTAC
- ANG JTAC (Havik)
- AFSOC JTAC
- AFSOC AC-130
- AFSOC MC-130
- AFSOC CV-22
- ACC MQ-9
- AFSOC MQ-9
- ANG MQ-9
- ACC JTAGSS (ASOC Trainer)
- AETC CSO School (T-1)
- AETC CSO Sensor Training
- AF MH-139 Grey Wolf
- ACC 526 Intel Squadron Nellis
- ACC 805th Nellis

DMO, Range, & Training Centers

- USAFE-AFAFRICA WPC
- USAFE Polygone
- SOCOM – Training Center
- NATO TLP (Albacete, Spain)
- ANG DTOC
- ACC DMOC
- AFSOC MROC
- ACC DTC (Langley)
- ACC NMON (Nellis)
- ACC 1st AFNORTH
- JPARC Range Alaska
- Melrose Range NM
- ACC iATTACK LVC Program

Other US Agencies

- SOCOM – Joint Fires
- Army's 160th SOAR
- 7th SOS
- AFRL
- AFAMS
- US Navy JTAC
- ANG C-130
- ANG HH-60 PaveHawk
- Army ISR
- ANG Mesa Research
- BICES Langley (ISR)
- Army Futures Command
- Naval Postgraduate School

ACC: ~350 licenses
ANG: ~250 licenses
AFSOC: ~200 licenses
USAFE ~85 licenses

MACE International Users

- UK Defence Science Technical Lab (DSTL) – Tactical Aviation Team + Bright Corvus + Maritime Experimentation Lab
- UK Joint Electronic Warfare Operations Support Center (JEWOSC)
- UK Joint Aviation Command Mission Planning & Rehearsal
- UK Defence Academy – Simulation Employment Training
- UK Mobile JTAC Simulator
- UK Multiple Commercial Customers – Draken, MASS, BAe, Northrop Grumman, JD2E
- KSA Electronic Warfare School
- NATO Tactical (Air) Leadership Programme (TLP)
- Europe Defence Agency (EDA) – Helicopter Tactics Simulator
- AUS – Air 9000 Future Naval Aviation Combat System Helicopter
- UAE Presidential Guard Joint Fires Simulation Centre
- Finish F-18 Simulator
- RNL Army Simulation Centre
- Japan JTAC Simulator
- ROK Special Warfare School
- Sweden Gripen Program
- Sweden Swedish Defence Research Agency
- European Multinational Helicopter Training Center

Visualisation of the 3D environment

- MACE – Can drive CIGI and DIS based IGs
  - e.g. VBS Blue, VRSG, X-Plane

And BSI's Own Unity based IG

- Proven very capable game engine
- Huge developer community / industry expertise
- Fast Development Cycles
- Huge content catalogue
- Not Chinese owned / influenced

Augmented Reality Mission Observation & Rehearsal

Unity based visualisation coupled with MACE

- Bundled with all MACE EW
- VR / AR / MR
- Single & Multichannel
- 1st person / Cockpits / Sensor Views / Tabletop
- Information dense overlays
- Worldwide terrain - No GIS Expertise required

Night NVG

IR

DAY

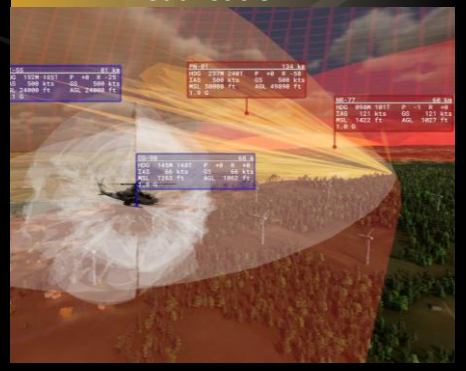
Multichannel

ARMOR Extended Reality (XR)

- Virtual / Augmented / Mixed Reality
- Tabletop mode for collaborative planning
  - Local multiplayer in MR in the room
  - Networked 'Virtual Players' in the right physical locations
- Transition to 1 to 1 mode for mission rehearsal
- Supports all Open VR / Steam VR Headsets

Remote Collaborative XR Mission Planning

VR EW Visualisation 1:1



MR Roleplayer Station 1:1

MR Outdoor 1:1

Device Simulation Container

- Simulated devices – accurate HMI representation
- Can be attached to any DIS Entity
- Shares MACE libraries (DIS, SGE)
- Reads Terrain Files
- Multiple Devices to only one MACE

BSI products developed in DSC

- **Viper Radio** VIPER
- PRC-117
- PRC-148
- PRC-152
- Defence Advanced GPS Receiver
- SA-8 Operator Station
- Cockpit up-front controller
- AWACs Radar simulation

Use Cases

Multidomain Combat Simulation and Analysis In Near Peer Threat Environments

Pulse level fidelity EW simulation ↔ Physics-based dynamics ↔ Worldwide geo-specific terrain

Enables...

EW Training

- Complex IADS creation, interaction and editing at pulse level
- Physics based countermeasure evaluation
- Multiple visualisation and analysis tools

Computer Generated Forces

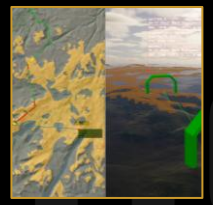
- Multi domain simulation of tactical platforms & pattern of life
- Driving full mission simulators & distributed simulation
- DMON and CAF-DMO certified

Capability Design Analysis

- High detail user definable content and model parameters
- Constructive scripting engine and code scripting interfaces
- Control multiple scenario iterations & logging

ISTAR Training

- Realistic IR and EO sensor displays on physics-based aircraft
- Custom dynamic overlays
- Coupled with high detail pattern of life simulation



Mission Planning Analysis and Rehearsal

- Uses worldwide GIS data and Mil data to create battlespaces
- Import/Export to mission planning systems formats
- Simulate, iterate, visualize & analyse with diverse toolset

Joint Fires Training

- Accredited as part of national JTAC training systems
- Train with accurate weapon, flight, and threat models
- Out of box integration with DACAS systems

Live Virtual Constructive Simulation (Real Military Systems)

- Live connection with military systems
- Drive synthetic tracks in real-world systems (e.g. L-16, COT, SADL)
- Drive software defined emitters stimulate real protection systems

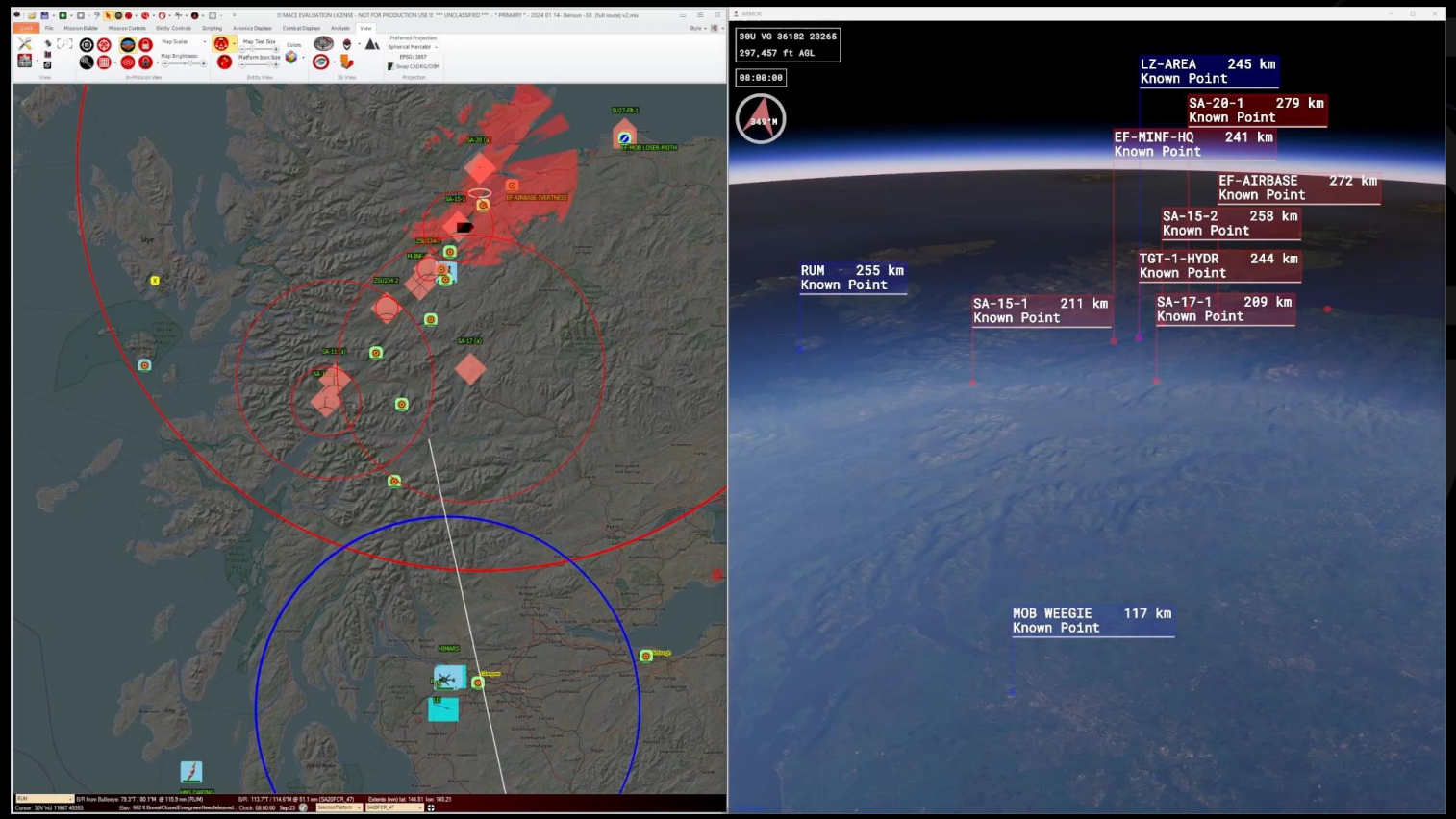
Specific Device Training

- High detail functional equipment emulation
- Integrated into battlespace simulation attached to any entity
- Train device specifics in realistic contested environment

BATTLESPACE SIMULATIONS

Don't settle for only part of the battlespace

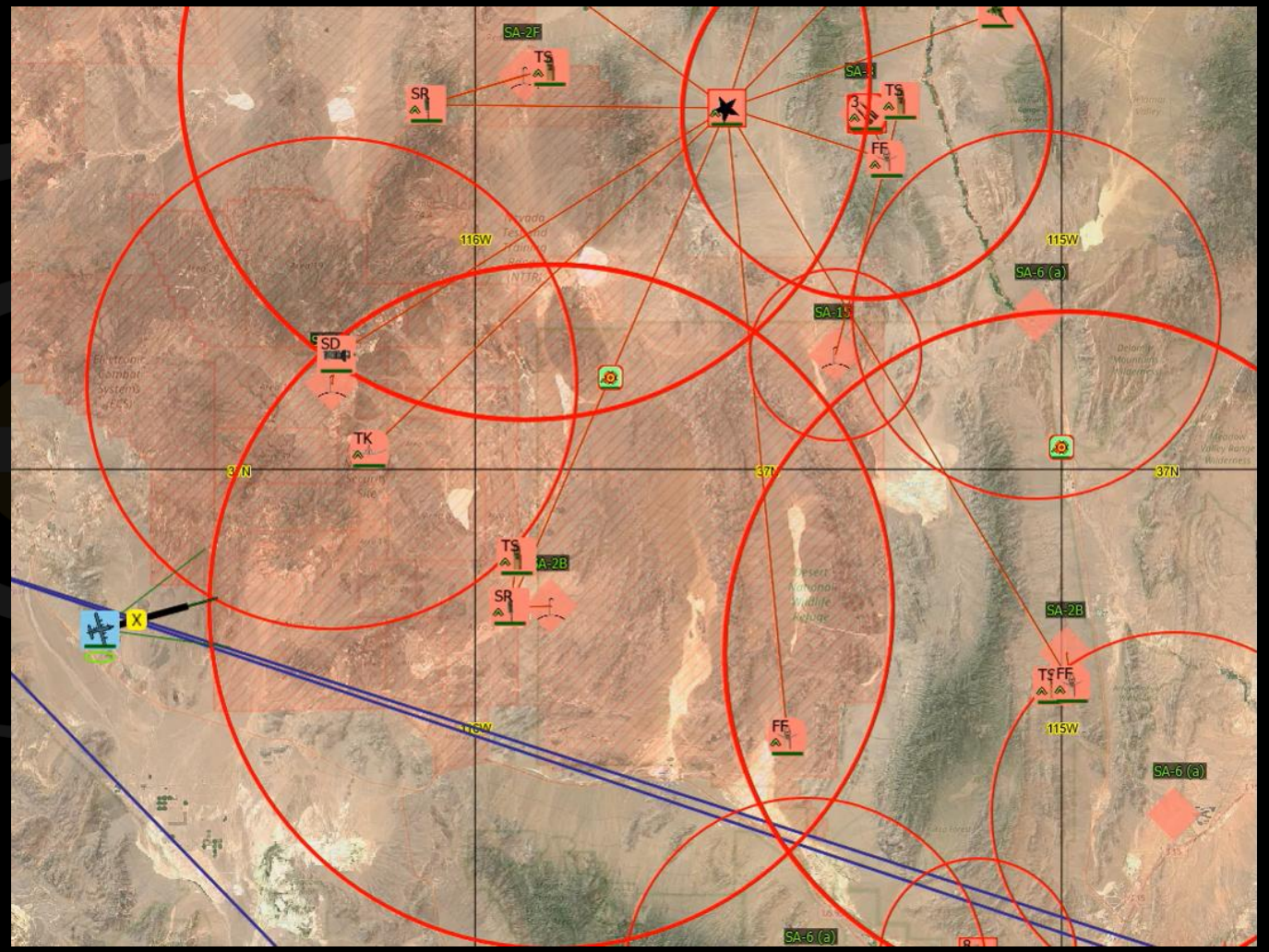
Mission Planning Analysis and Rehearsal (MPAR)



- A suite of tools - extend/improve existing mission planning process
  - Radar propagation analysis
  - Radio propagation analysis
  - Route evaluation (vs radar threats)
  - Missile flyout evaluation vs countermeasures & manoeuvres
  - MACE Assisted Route Creation (MARC)
    - Aircraft
    - Surface Ships

MARC: MACE Assisted Route Creation

- AI for Mission Rehearsal
- MARC lets the user specify how threats are weighted
  - Distance cost
  - Detection cost (search radar)
  - Tracking cost (target tracking radar)
  - Weapon range cost (how far inside range)
  - Threat priority
  - Indirect terrain masking
  - Target RCS (3D RCS)
- Works with all existing mission planning systems that support CRD route files
  - AMPS, JMPS, SOMPE, XPLAN, Nyx



MPAR – In Combined Air Operations Training

Battlespace Simulations, Inc.

MISSION ANALYSIS, PLANNING, & REHEARSAL

WITH MACE & ARMOR

MACE
MODERN AIR COMBAT ENVIRONMENT

ARMOR

Mission Planning Analysis and Rehearsal (MPAR)

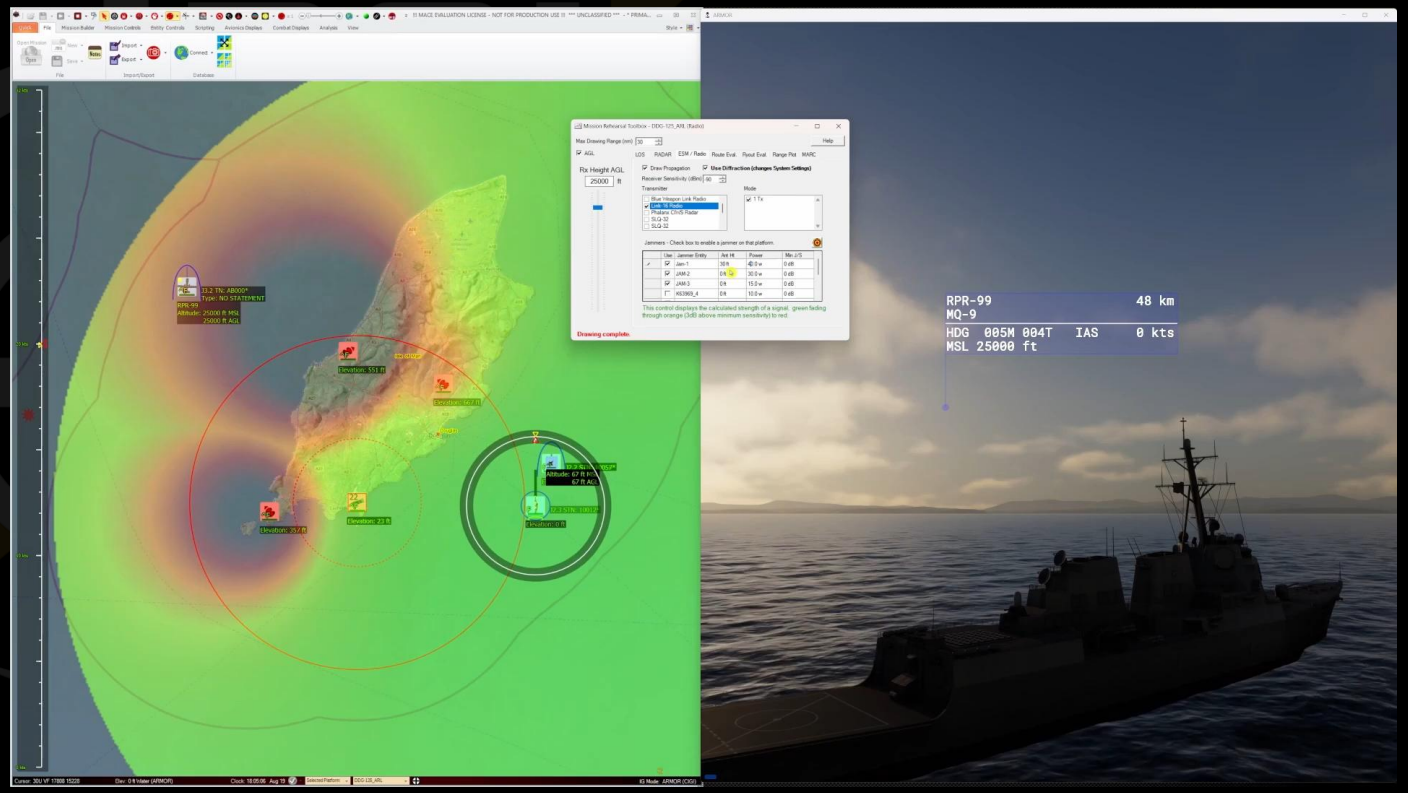
Julia Demaree Nikhinson/AP

Helicopters from the 160th Special Operations Aviation Regiment, from left, MH-6 Little Bird's, MH-60 Black Hawk's, and MH-47 Chinook's, fly behind the Washington Monument during military parade commemorating the Army's 250th anniversary Saturday, June 14, 2025, in Washington.

- MACE and ARMOR in use to plan and brief routing for **US Army's 250th birthday celebration**

Operational Analysis

- 2 Main requirements
  - Worldwide accurate GIS data
  - High fidelity simulation – including the 'unseen'
    - Radar, Jammers, Radio, IR/NIR, Laser, GPS …
    - Aerodynamics, Orbital Dynamics, Hydrodynamics …
    - Weather effects on all of the above
    - Weapon <> Sensor Pairing, physical weapon limits …
- Import and Export to multiple formats – Routes, EOB, ATO, ACO etc.
- Visualise in a capable game engine with high detail annotations
- Leads to multiple new use cases
  - Operational Analysis
  - Tactics development
  - Mission rehearsal
  - Air Defence / Counter IDF Strategy / Tactics / Assessment
  - EMCON Planning



Joint Fires Training

- Costly to train live joint fires
- Many cannot simulate the near peer threat and/or weapon behaviours
- Meets all US & NATO JTAC Accreditation standards
- Task and Control as in the field – Fire-plans, Call-for-fire, 9-Line, 5-Line, L-16 and VMF Tasking
- Accreditation support
  - Evidence slide-pack and missions that demonstrate all JTAC MOA Simulation Criteria
- Beyond the standards
  - Contested environments – Sophisticated 5th gen Air defence systems and C2
  - Electronic Fires – Standoff and Self-protection Jamming / Anti-Radiation Munitions
  - Data Link + Network Enabled Weapons
  - Digital CAS – Accept, respond & execute DACAS VMF messages
  - Live entity feed to SA systems (e.g. ATAK) via COT
- Increased Training Value at Decreased Cost
  - Controllable military behaviour + effects on military targets

ATAK Receiving MACE + ARMOR Data and Pod Stream

ISTAR and Digitally Aided CAS Training

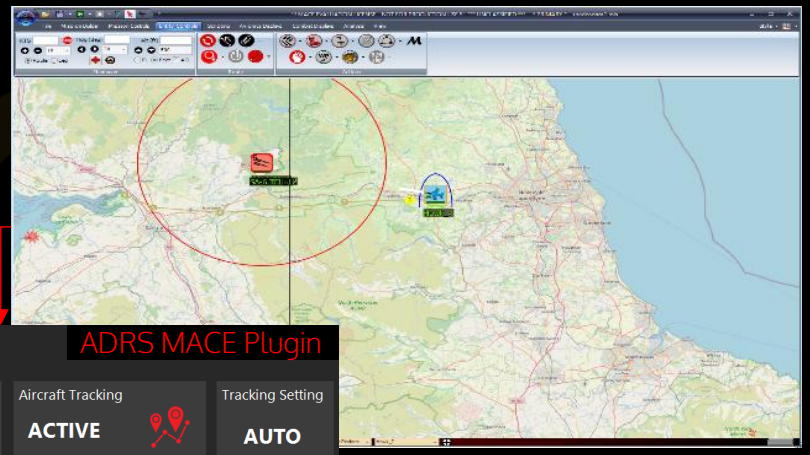
- Video downlink controls with live aircraft is costly and impractical

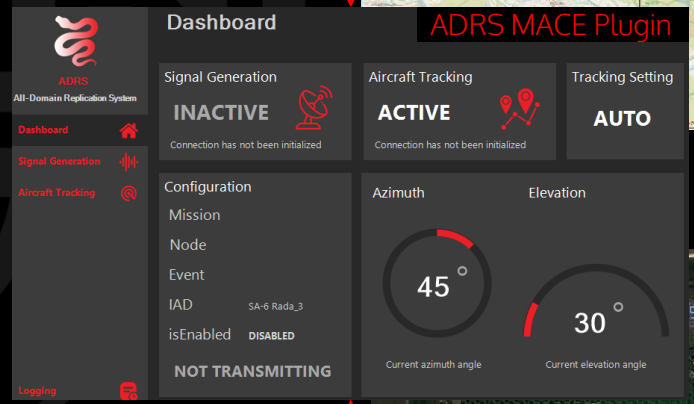
- ARMOR Sensor View broadcast to JTAC
  - Over network standard protocols for VDL streaming
- MACE + ARMOR Live Aircraft
  - Using aircraft position
  - Correctly orientated synthetic sensor view
  - Populate the environment with realistic targets
  - Interact and destroy with realistic effects
    - e.g. Instead of JTAC imagining a tractor as SAM site – See an SA-15 launching / being destroyed

- Decreased Cost
  - No Sensor Required
- Increased Training Value
  - Controllable military behaviour + effects on military targets

Live / synthetic training – EW Training

- Integration of MACE (via MACE Plugin) with live pulse generator
- MACE uses a live feed to cue the emitter
  - Link 16
  - ADSB
  - Any other integrated feed
- Emitter is slewed to point at correct piece of airspace
- MACE Air Defence system works through the engagement
  - Mode changes sent from MACE to emitter via plugin
  - Emitter changes pulse characteristics
- Can stimulate live aircraft RWR/ASE
- Low cost – considerably cheaper than actual emitter
- Flexible – multiple emitters can be simulated
- Accurate – mode changes, pulse frequency





ATAero ADRS Software Defined Emitter

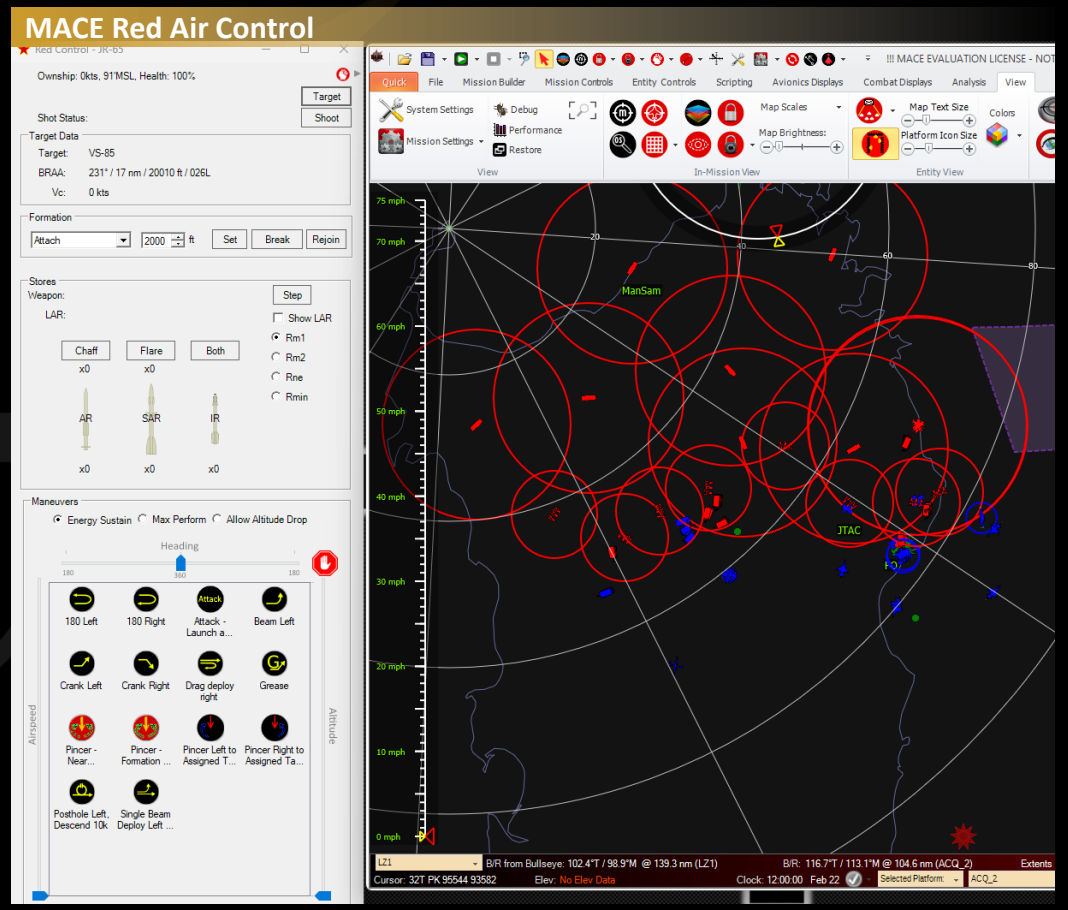
Live / synthetic training – Augment Live Forces

- High Cost of providing multiple live Red Air forces vs presenting complex training to Blue forces
- 90% of Blue Air to Air is BLOS
- Using the MACE JREAP-C and Link-16 interface
- L16 provides telemetry of Blue and Red aircraft
  - Virtual Red forces controlled from ground/air in MACE
  - In cooperation with live red players
    - Coordinated manoeuvres (e.g. pincer etc)
    - Coordinate ground to air engagement
- Live red force supplemented with virtual forces in MACE
  - Red lead aircraft with multiple responsive wingmen
  - Multiple Tactics for multiple entities on demand in Red-Air UI
  - Red ground air defence systems engage live aircraft

+ During action and After-Action Analysis

  - Weapon flyouts in MACE followed by Kill-Remove as appropriate
  - Recorded for combined live-synthetic debrief
  - Visualised in both MACE and ARMOR

- Low cost – additional red air is free
- High training value – increased complexity of presentations for users



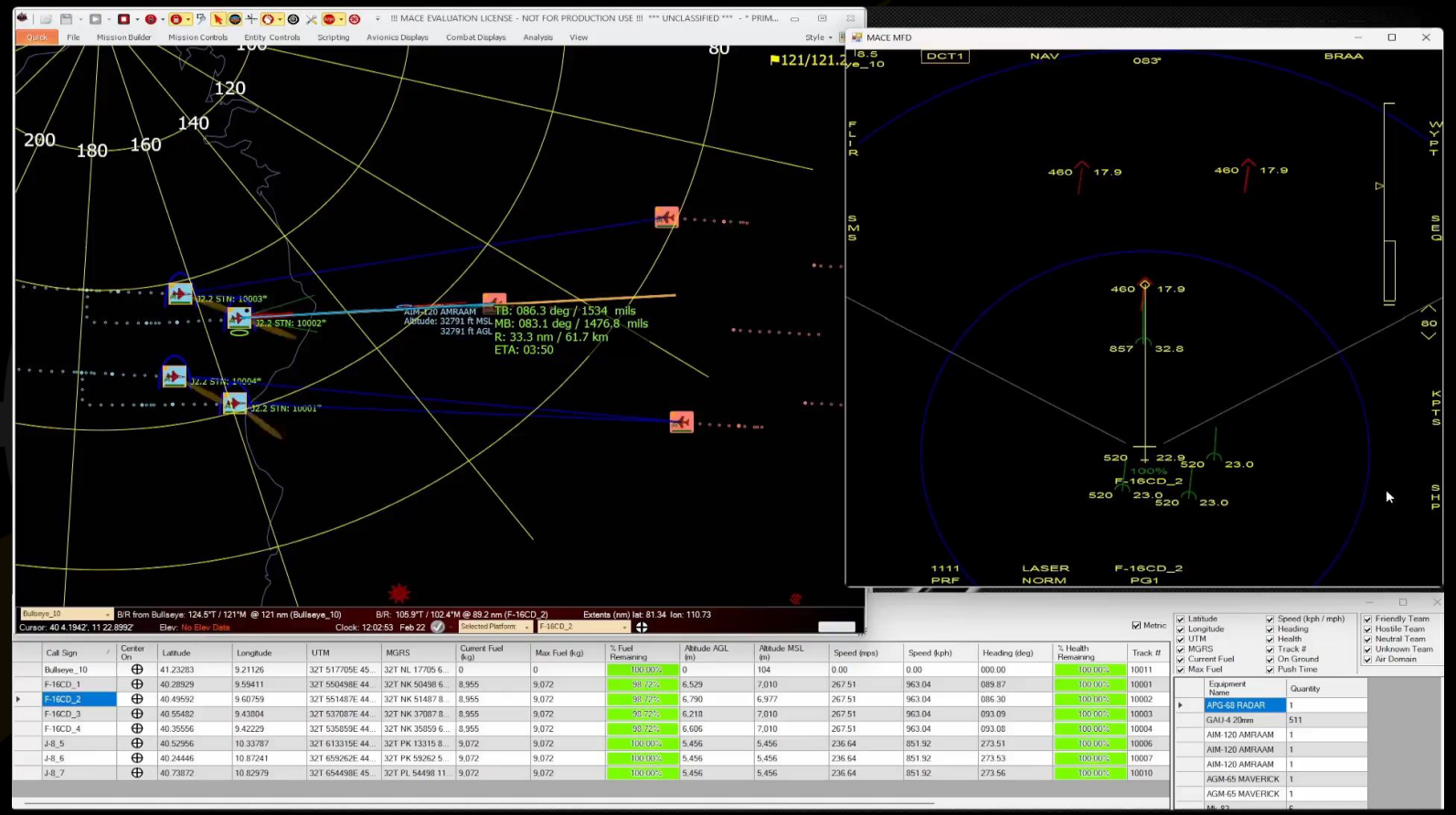
Live / synthetic training – NATO TLP

- COMAO Training and Red Air Control
- 30 Part Task Mission Training cockpits
- Instructor stations PFOR/RED Air stations
- EW stations, and dedicated C2/AWACS stations
- Link 16 Entity Creator – Live TDL integration
  - JREAP-C and Link-16
  - Live flying events – enabling sorts, kill removes etc
- Cockpits
  - HOTAS enabled Tactical Display
  - Radar and TDL target tracks
  - Stores Management System (SMS) / Programmable weapons
  - Radar Warning Receiver (RWR)
  - Touch screen enabled Up-Front Control Display
  - DIS VHF/UHF radios, SATCOM, 2 x MIDS
  - Voice transceivers, and autopilot
- Live – Synthetic Synchronized Debrief
  - TISPI integration EAG Aircraft logs in MACE
  - Synchronised with synthetic entities

TLP Cockpits – Albacete (Spain)

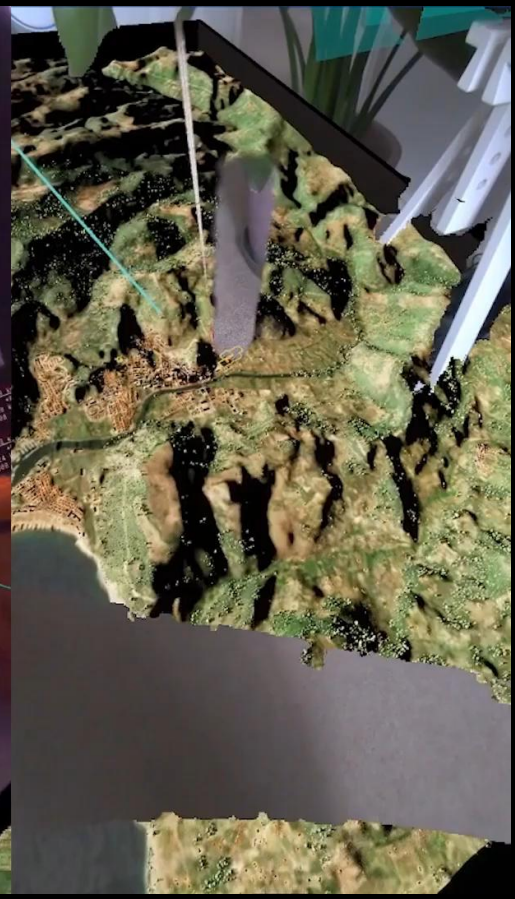
Live – Synthetic Review / Debrief / Analysis

- During or after-action review
- Deep Analysis in MACE
  - **From** Range and Bearing
  - **To** Radar Analysis, Flyouts + CM Effectiveness
- Visualization in ARMOR
  - Labels
  - Trails
  - WEZ
  - Beam Visualization
- Live Aircraft System Data Fusion
  - EAG / TSPI Aircraft Data Download
  - Synchronized with MACE Mission timeline
  - Debrief the combined Live-Virtual scenario
  - Synthetic and Live entities in one battlespace



Collocated / Remote - Collaborative Mission Planning

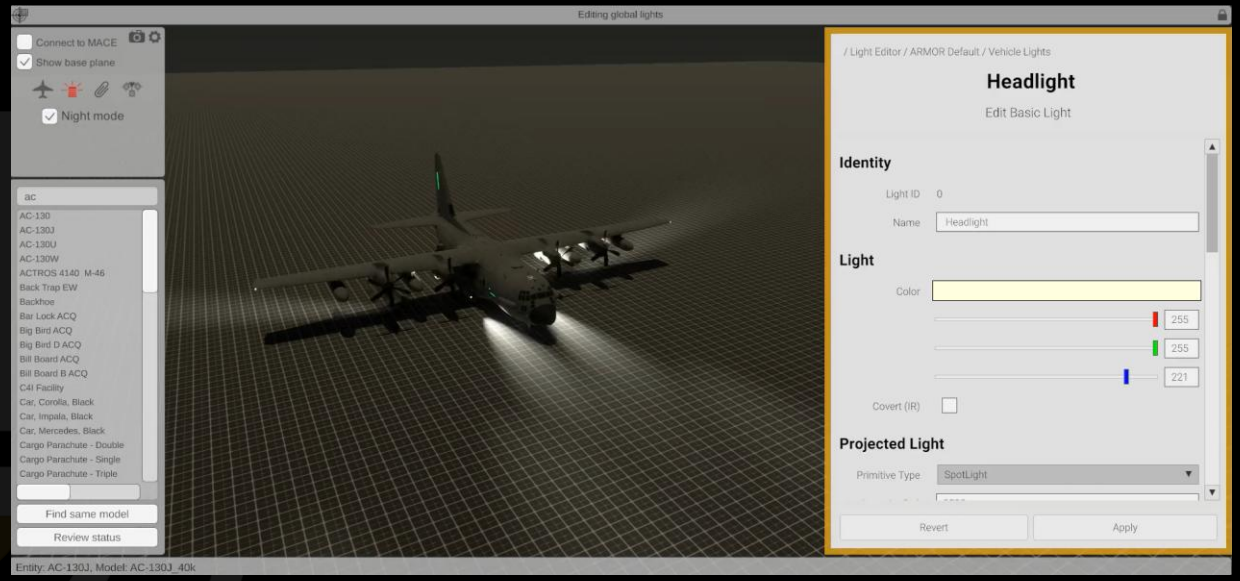
- Using MACE and ARMOR
  - In VR or MR
  - Collocated or Remote
  - See all participants and gestures
  - Anyone can ‘drive’
- See the entire battlespace
- Tabletop perspective (god’s eye view)
  - 3D Airspace & coordination measures
  - Waypoints / routes vs vulnerability
  - EW Threat Zones Beams, Jamming, Corridors
  - Labels, Platform and Weapon Trails, Control Zones, WEZ
- Plan, test and iterate
- Execute and analyse

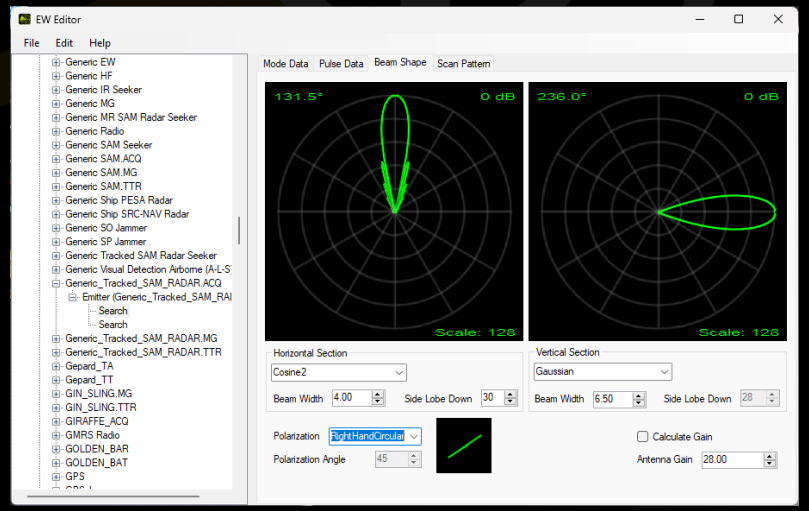


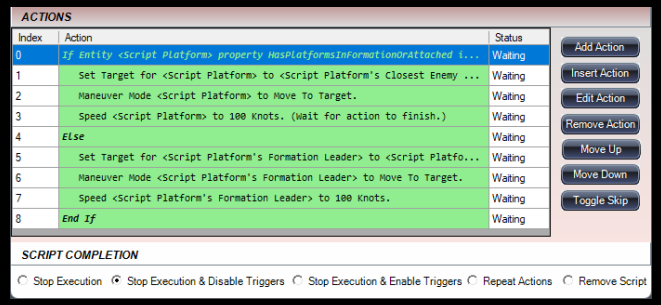
Develop Your Own Content

Non Dev Users - Tools

- Worldwide Terrain Generation
  - No GIS Expertise required
- User Model Editing/Creation
  - Mission Object Config Tool (MOCT)
  - WEZ Generator
  - ARMOR Model Editor
  - Emitter Editor
  - Script Editor







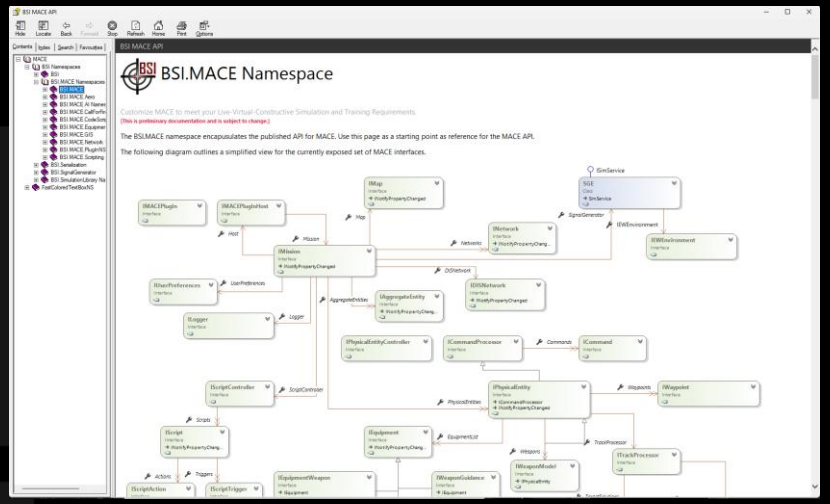
World Terrain Generation

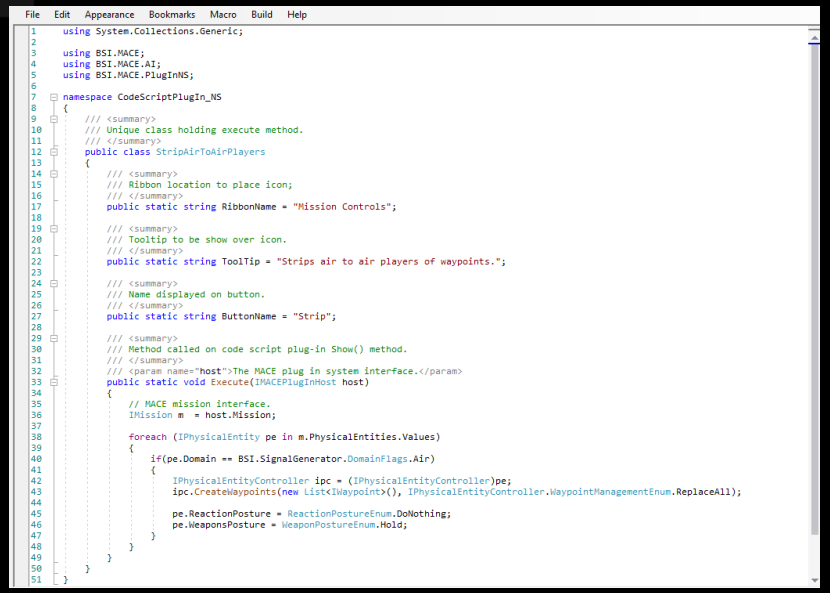
- MACE built on a worldwide GIS core
- Rapid development and now 4th iteration:
  - Round earth terrain system
  - No User-GIS-specialism required
  - 3D Terrain creation from multiple GIS Data
    - Open Street Maps
    - Land Usage
    - Climate Zone Data
    - Hi Resolution Imagery
    - Regional Data
    - Airfield and AIRNC data
    - AI building facade
    - Production of terrain surface and correctly positioned and appearing on-terrain objects
  - Fast recall – go to any fully populated terrain any location within seconds

Kuala Lumpur (Left: Real Right: ARMOR)

Dev Users - MACE Development Framework

- MACE APIs
  - Considerable runtime exposure
  - Tie into critical data and events in the MACE engine
- Code script & Embedded Editor
  - Small snippets of C# code
- MACE Plugins
  - Rapidly build new simulation systems
  - Seamlessly integrate components
- Device Simulation Container – DSC
  - Shared libraries with MACE
  - Develop displays / devices networking with MACE





FAAC

One high fidelity simulation framework

Multiple use cases

For help contact: support@bssim.com

www.linkedin.com/company/battlespace-simulations-inc-/

www.youtube.com/BattlespaceSims