



TMI Simulation Solutions

MAK TECHNOLOGIES USER GROUP CONFERENCE

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Evolution of TMI Simulation Solutions

TMI's Foundation

Founded in 2005, TMI began in the international aerospace and defence industry as a subcontractor to some of the world leaders in simulation and training solutions: Saab Aerosystems, BAE Systems, C-ITS and Denel.

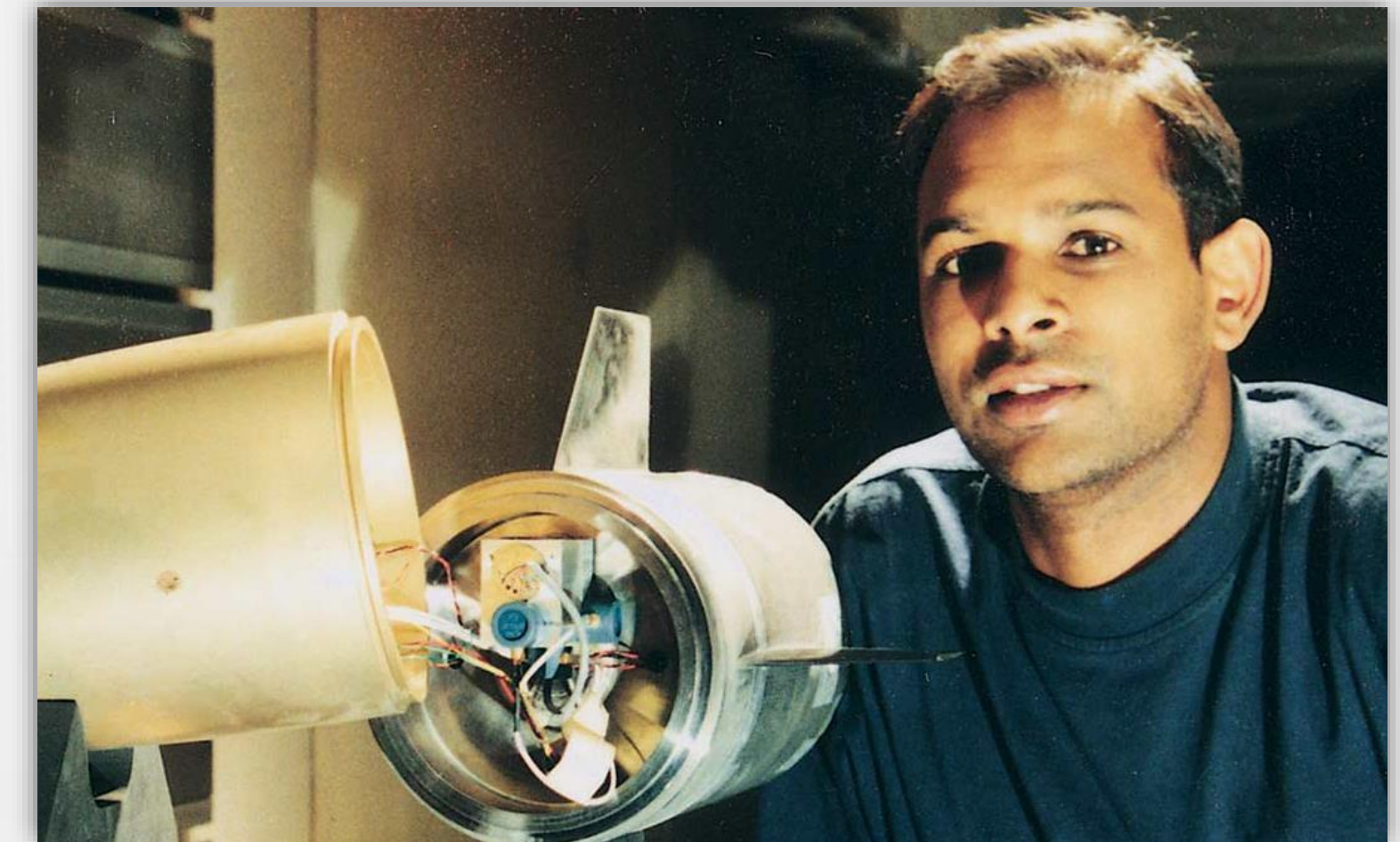
Today we also offer Engineering and Training solutions to the Aerospace, Defence, Maritime, Logistics and Mining industries.

Through partnerships with international education institutes like Linköping University (Sweden), Delft University (Netherlands), Witwatersrand University and TNO, we developed inhouse skills and technology.

To ensure we adhere to strict quality management guidelines we have ISO9001:2015 certification.

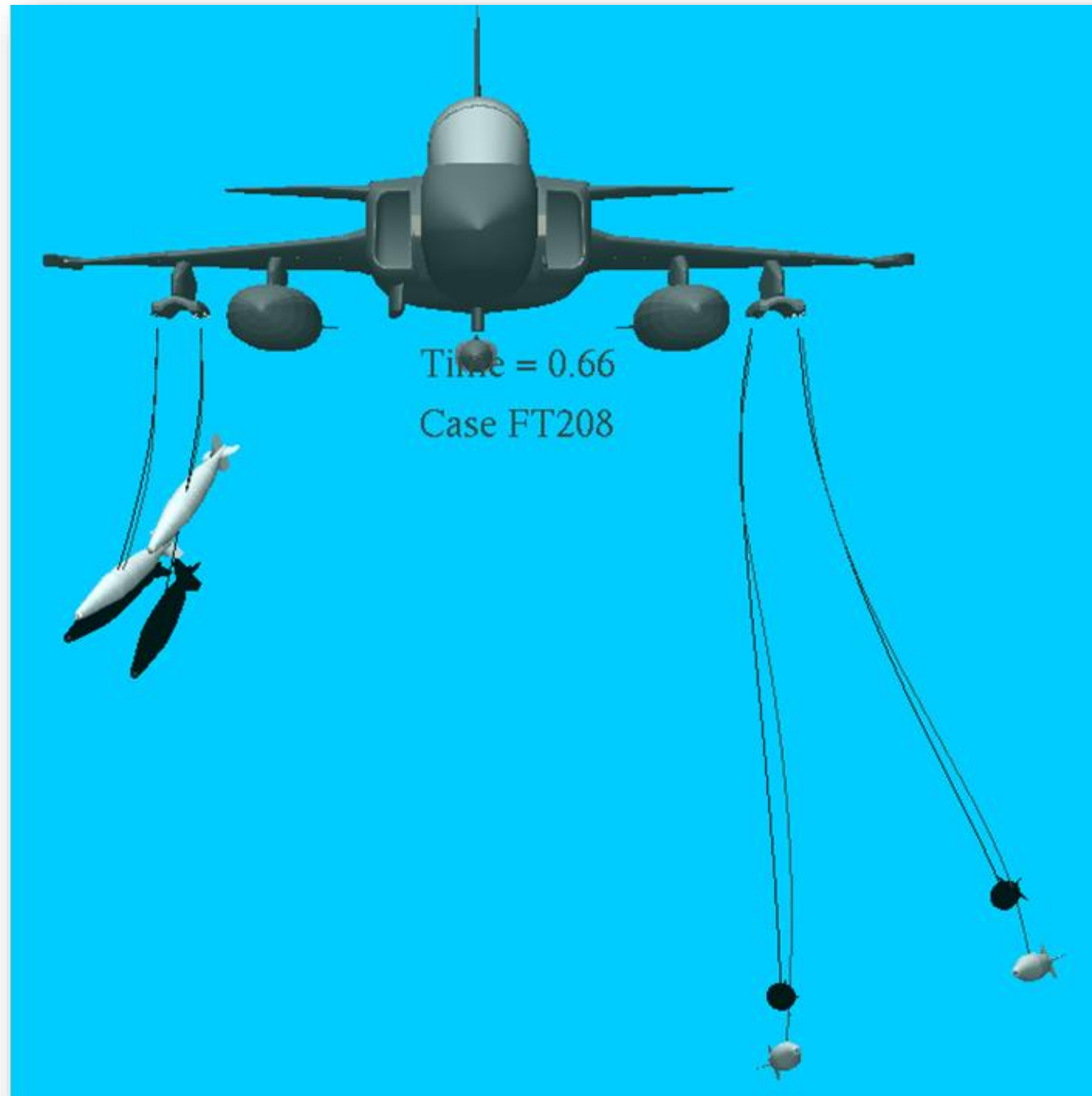
TMI's solutions comprise the following categories:

- E-learning applications for operation planning and training;
- Desktop simulations for engineering/operation analysis, modelling and optimisation;
- Immersive simulations, VR for training purposes and product development.



Thivash Moodley, Founder of TMI

Engineering Simulations for Systems Development



- TMI's involvement in the Aerospace and Defence sector came from a series of complex, high value systems engineering projects on the Gripen 4th Generation Fighter aircraft. The GripenSA, or internally known as AC39C (single seater) and AC39D (dual seater), required several airframe, avionics, communication and weapons delivery system changes, to ensure the aircraft fulfilled its role within the South African Air Force and NATO.
- TMI's aeronautical and mechanical integration team developed the GripenSA weapons integration simulation software that was used in the aeronautical and systems integration processes when integrating the South African weapon systems onto the Gripen aircraft.
- The team worked with both the Swedish engineers and South African flight test team at Air Force Base Overberg in South Africa.

Mission Planning: TACSI Scenario Analysis

Aircraft

- Gripen
- Hawk
- F16
- SU-27
- C130
- B707
- MI-24
- Tornado
- F22
- SU-24
- Nimrod
- AN-124
- MIG29



Armour & Artillery

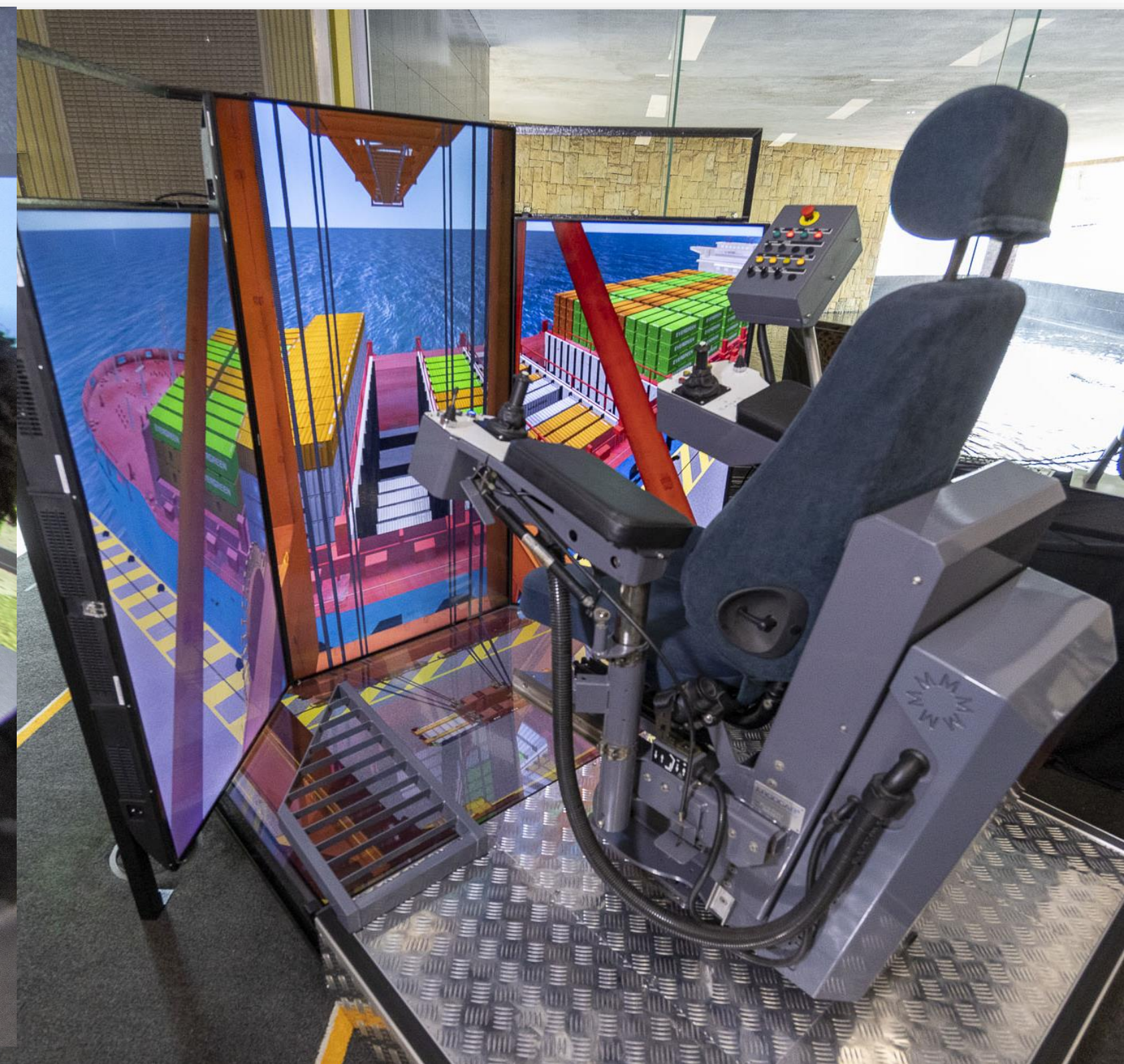
- **Guns:**
23, 30, 105 mm
- **SAMS:**
SA-11, SA-13,
SA-18, SA-19
- **Bombs:**
Mk 81-84, LD, HD
- **Launch Vehicles:**
2s6, ZSU23-4,
T72/82, MTLB
Shoulder
launchers

A-A Missiles: Alamo, AMRAAM, Sidewinder, IRIS-T

Immersive Training Simulators

Over the years TMI Simulation Solutions designed, developed and commercialised training systems:

1. Simulation systems subcontractor in the global Aerospace and Defence industry.
2. Product Portfolio:
 - Defence Simulators
 - Driving Simulators
 - Heavy Lifting Machinery Simulators



Project: 2-Man Turret Training Simulators

Denel Land Systems supplied Deftech a two-man turret system, part of the delivery were two training simulators:

1. 30mm Cannon (LCT30);
2. Anti-Tank Guide Weapon (ATGW);

Project Challenges:

CFE was mostly obsolete, built in 2014

Covid-19 a threat in South Africa

Distressed Client took 2yrs to contract

Micro team with <10 employees

Delivery schedule was fixed 12 months



MAK One: The preferred solution

A single modular software solution fulfilled TMI's requirements



VR-Forces



VR-Engage



VR-Vantage IG

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Two Man Turret Training Simulator

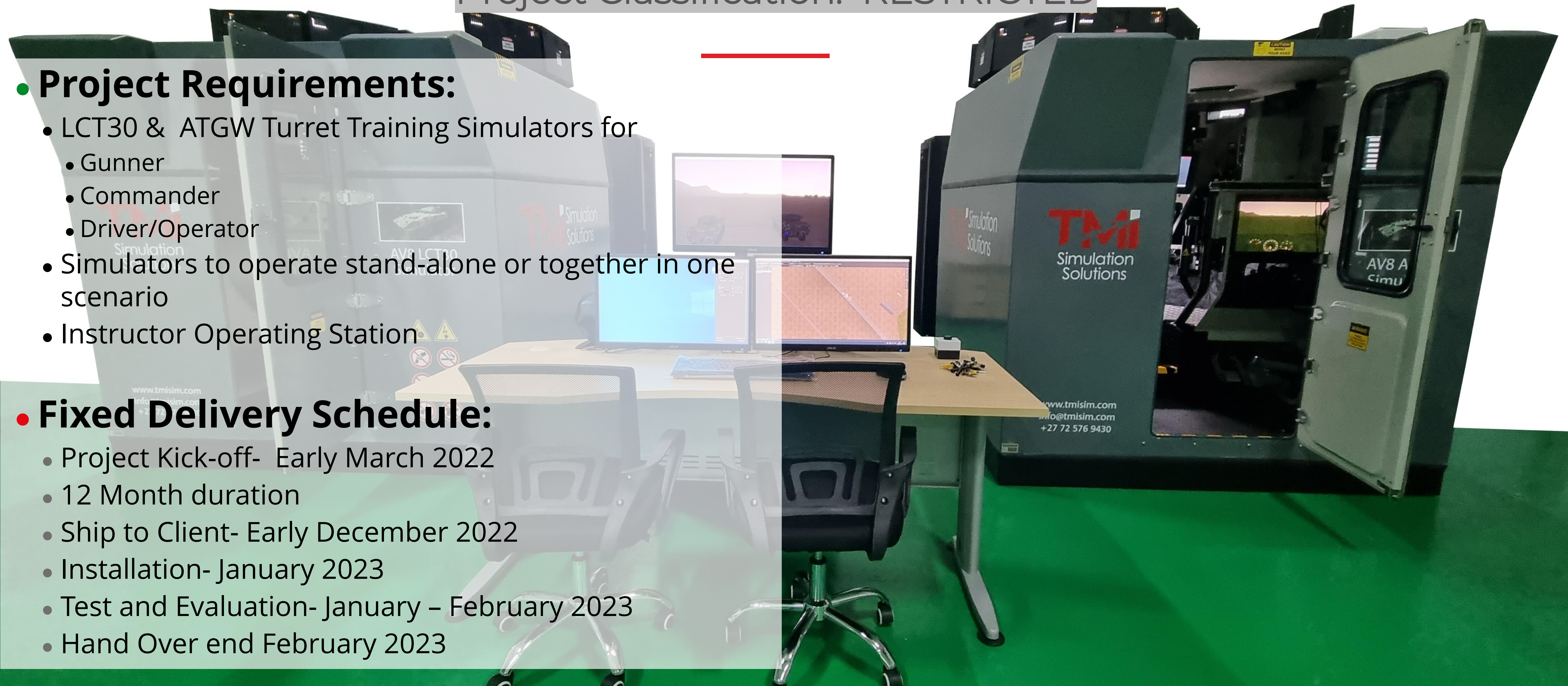
Project Classification: RESTRICTED

• Project Requirements:

- LCT30 & ATGW Turret Training Simulators for
 - Gunner
 - Commander
 - Driver/Operator
- Simulators to operate stand-alone or together in one scenario
- Instructor Operating Station

• Fixed Delivery Schedule:

- Project Kick-off- Early March 2022
- 12 Month duration
- Ship to Client- Early December 2022
- Installation- January 2023
- Test and Evaluation- January – February 2023
- Hand Over end February 2023



Vehicle System: 8x8 Amphibious Armoured Vehicle

MAK Integration with Vortex enabled rapid development of mechanical models for vehicle system

FNSS supplied vehicle platform

Drivetrain

- Deutz Diesel Engine model
- Automatic gear changer (manual override)
- All wheel drive mode
- Differentials: inter-differentials

Articulated Parts

- Turret: 360° azimuth
- 30mm Cannon: -10° to +30° elevation
- ATGW Launchers: -4° to +25° elevation
- 7.62mm: -10° to +30° elevation
- Grenade launchers fixed to turret



Weapon Systems: Cannons, Missiles, Guns, Grenades

4 Types of weapon platforms: 1-Man turret (25mm Cannon), 2-man turret (30mm& ATGW), RCWS

Weapon Systems fitted to 2-Man Turret

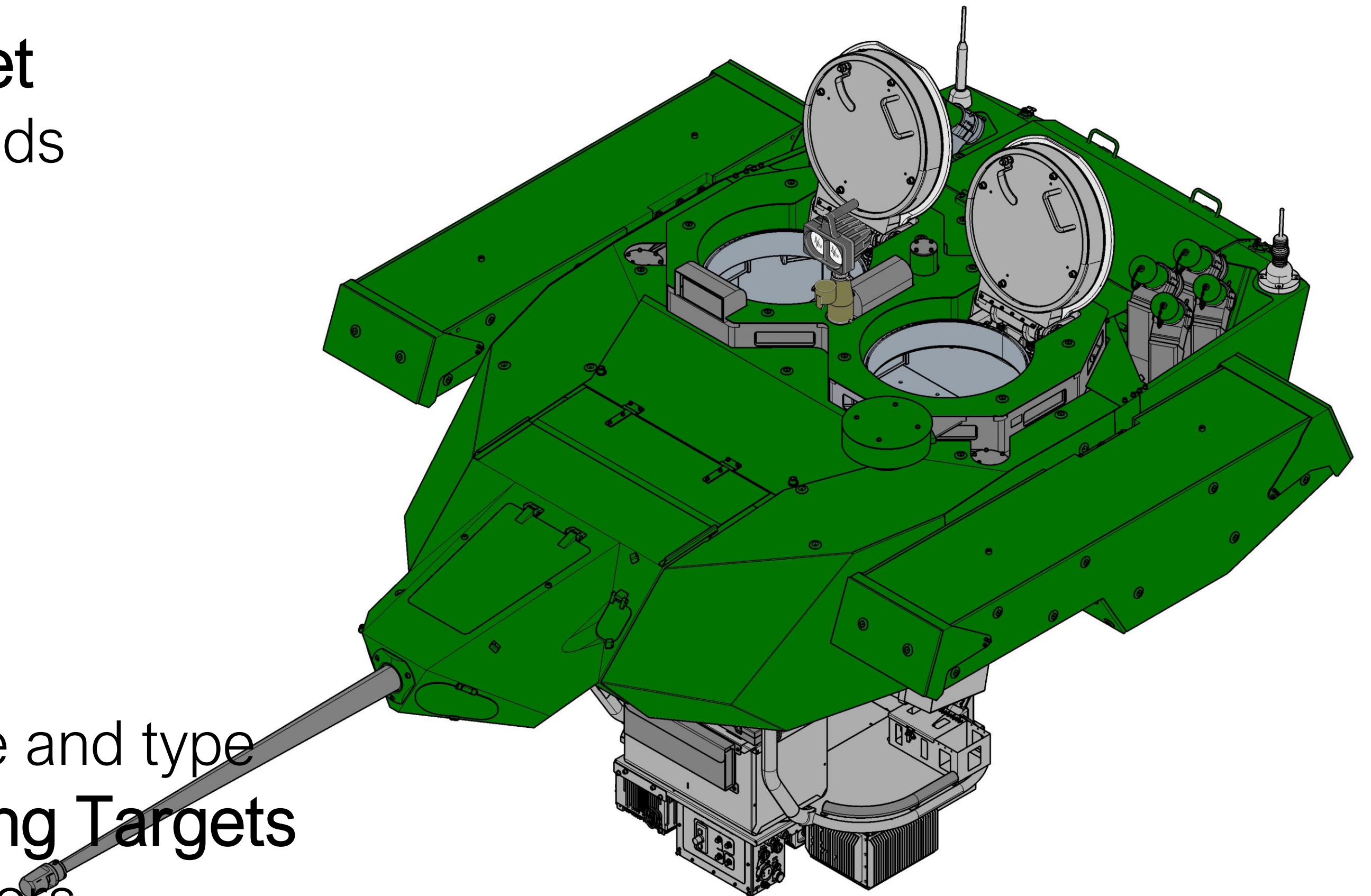
- 30mm linkless camgun: 5 types of Rounds
- Anti-tank Laser Guided Weapon
- 7.62mm Machine gun
- Grenades (Smoke and Fragmentation)

Ballistics calculations factored in:

- Ballistic firing test data
- Range tables for ammunition type
- Atmospheric and wind corrections
- Corrections for ammunition temperature and type

Trajectory Prediction for Static + Moving Targets

- Real Autotracker integrated into simulators
- Lead Angle prediction based on range & angle



Combat Management System

Emulated Battle Management Computer

- 140 Digital Input Channel / simulator
- 6 Analogue Channels
- 80 Digital Output channels
- Channel diagnostics menu

Gunner & Commander Switch Panels

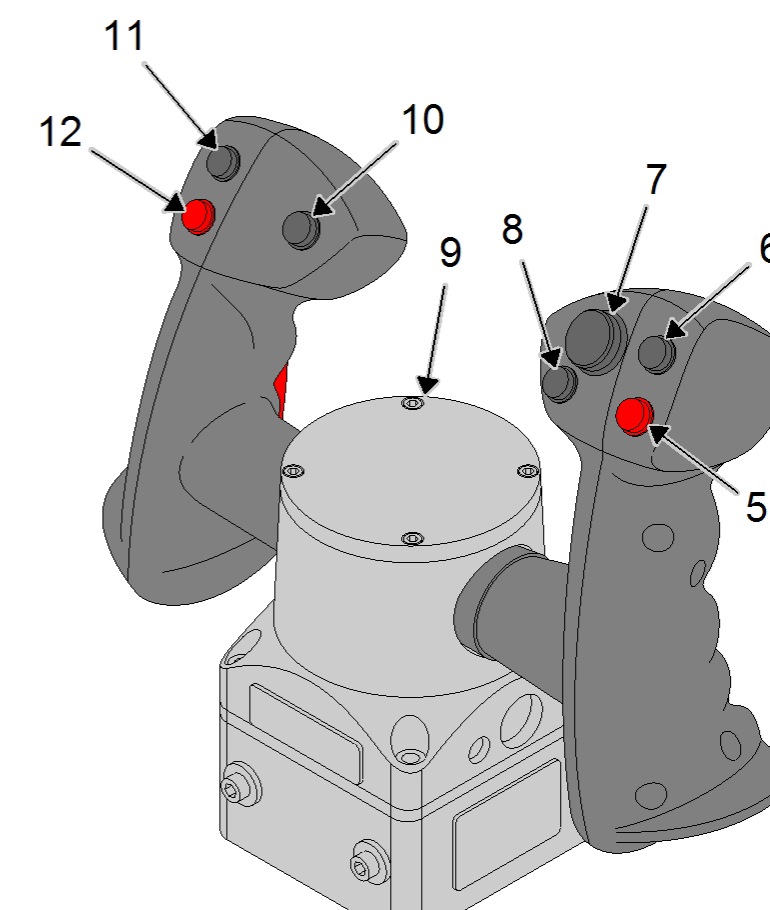
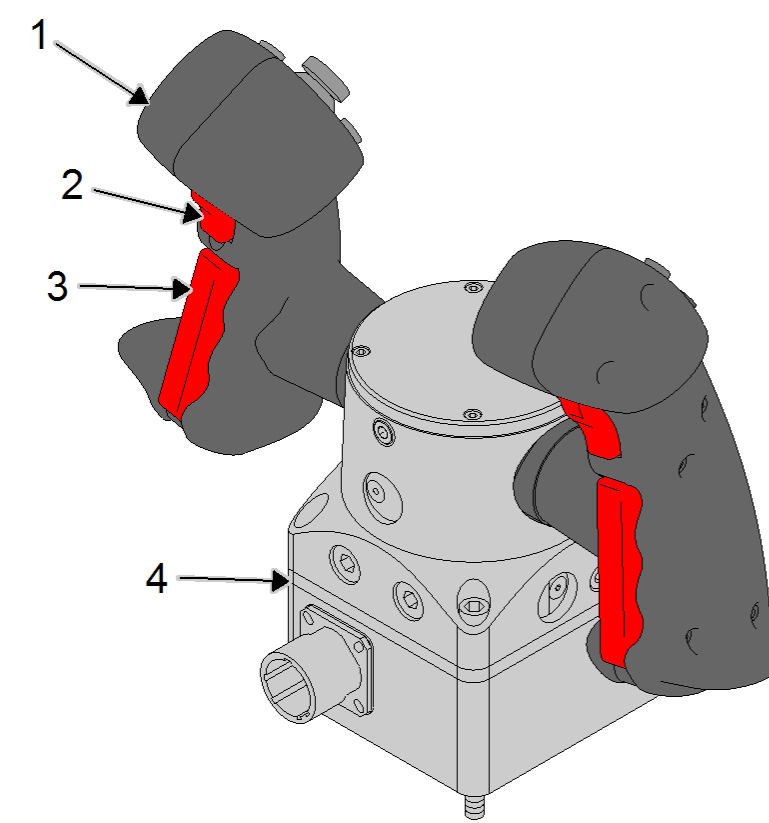
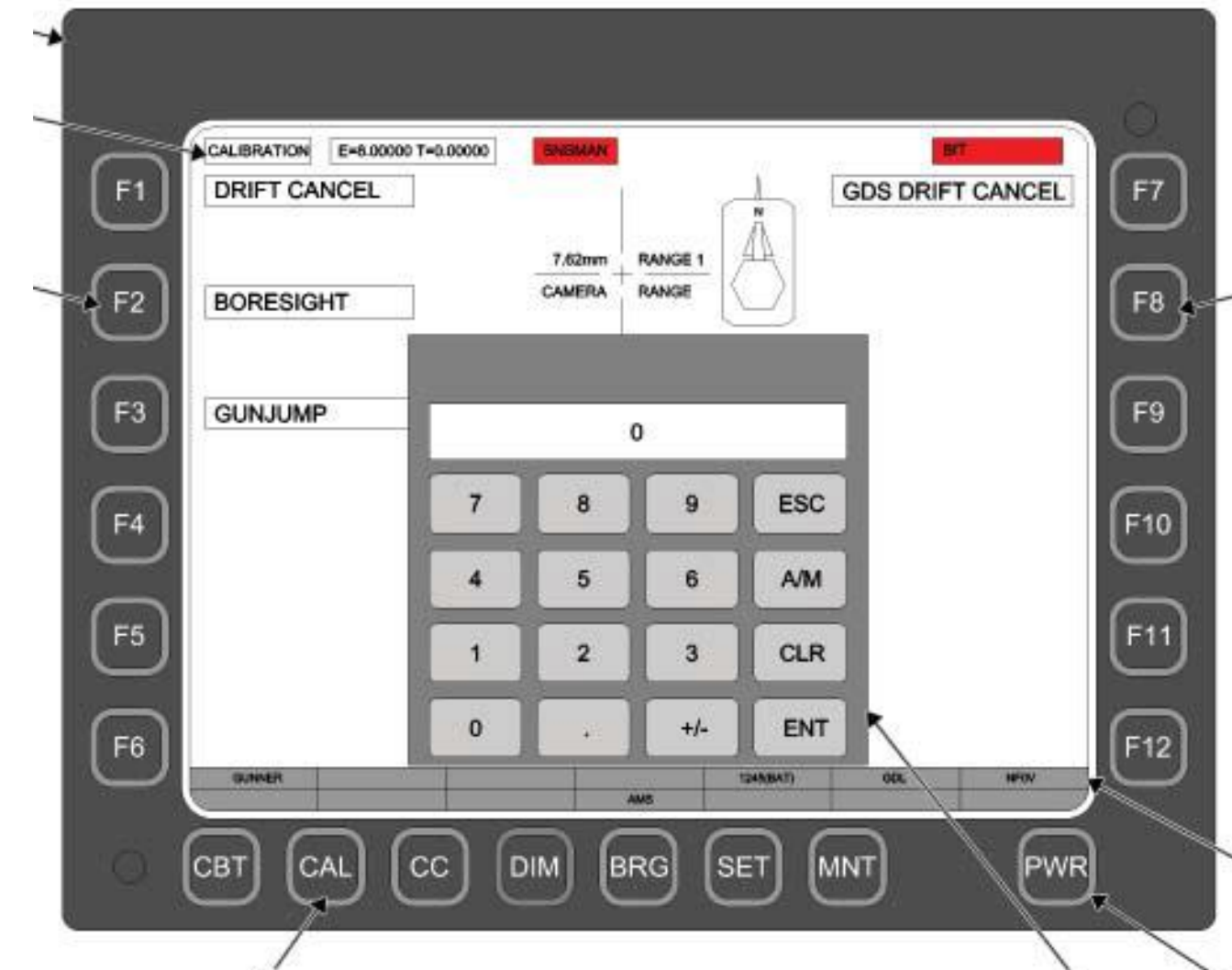
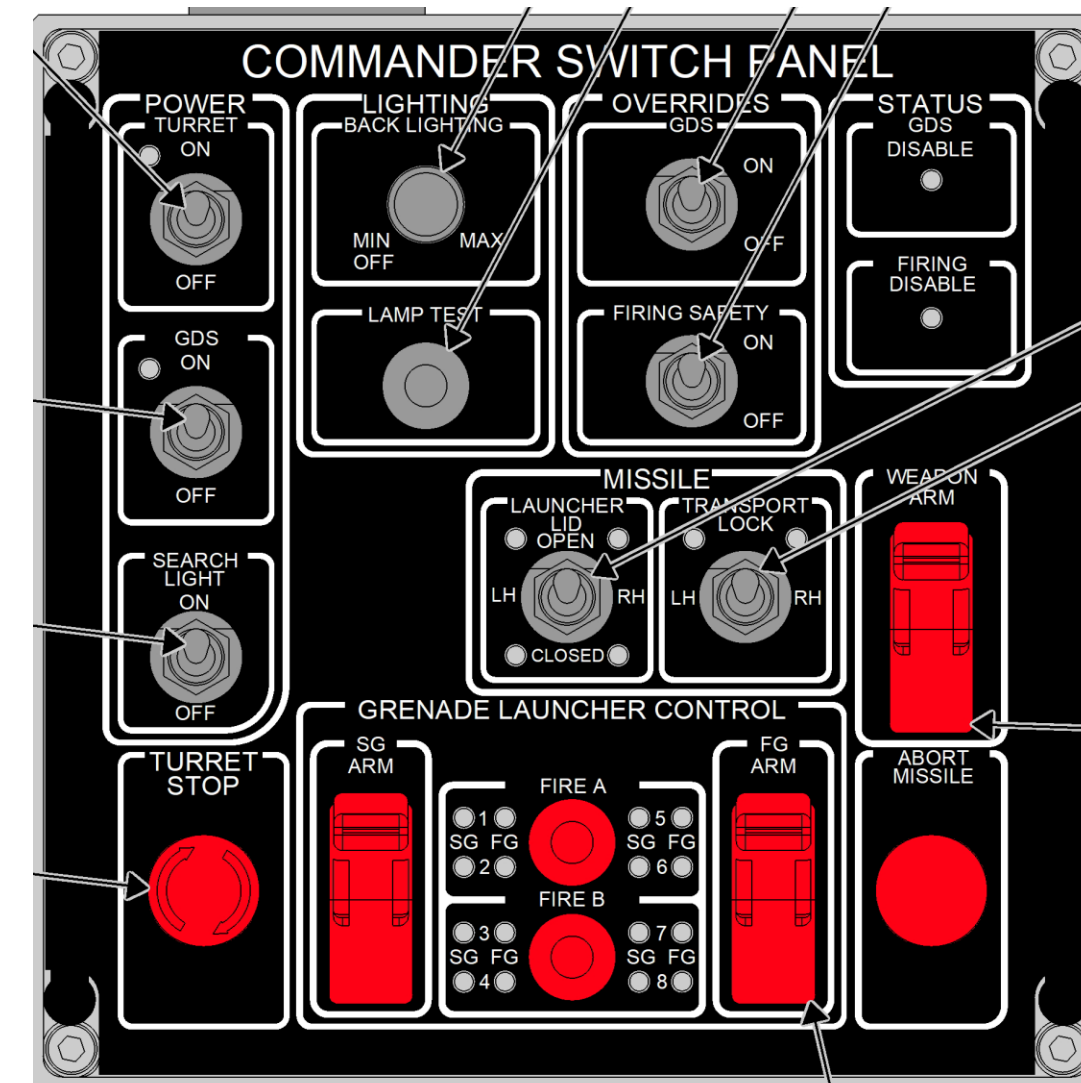
- Electrical control switch panels

Battle Panels

- Gunner and Commander panels
- Day/Night camera display (3 x FoV)
- 4-Level Menu system
- Level 1: Combat, Settings, Calibrate, Diagnose

Hand Controls

- Gunner & Commander (CiC override)



19 Channel Full HD Visual System / Simulator

Two simulators have 38 visual channels and the IOS has 3 visual channels

12 Gunner and Commander Periscopes:

- 7 Commander
- 1 Extended periscope for gunner
- 4 Gunner

Auxiliary gunner sight

Gunner Day Camera

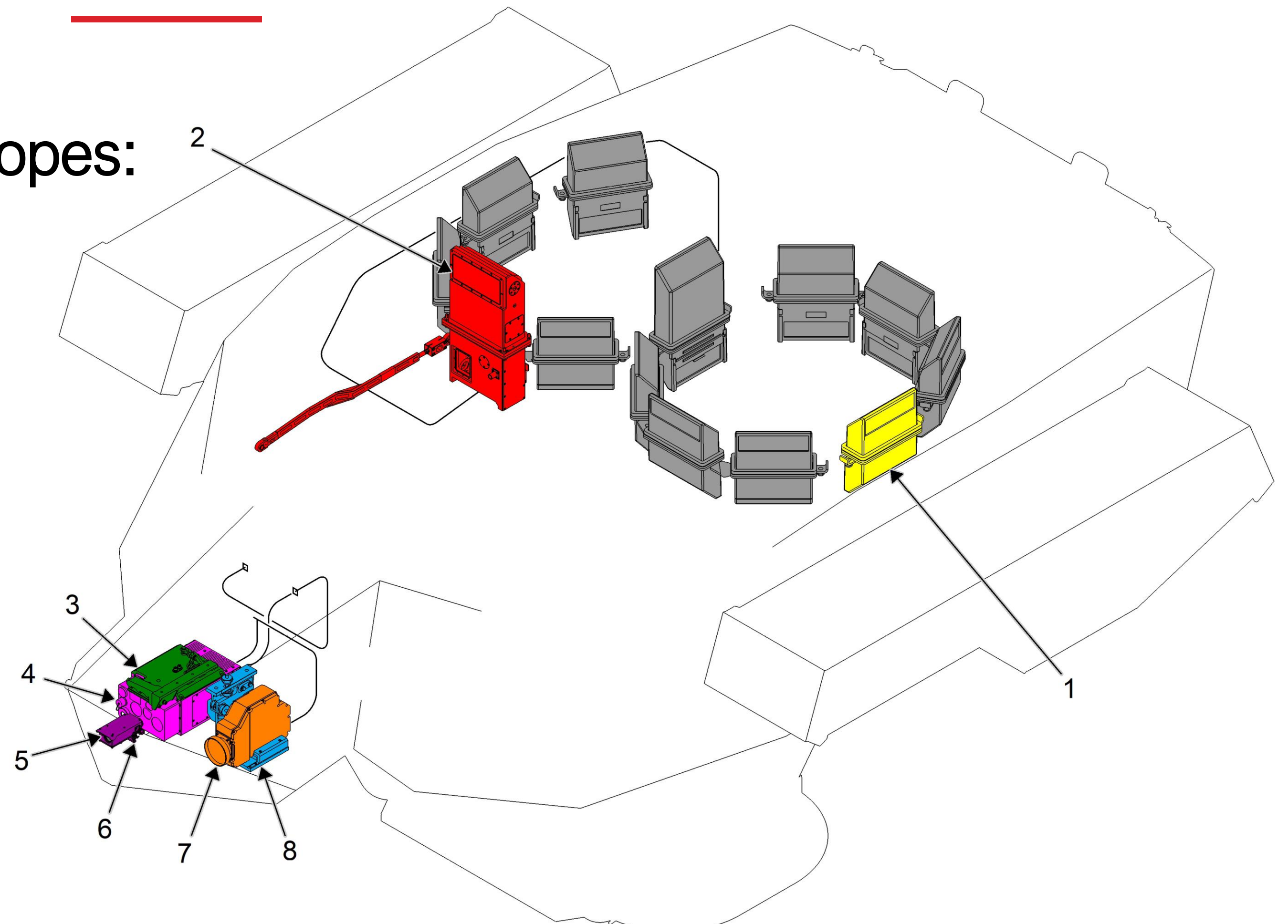
Thermal Imaging Sight

Laser Range Finder

Battle Panels x 2

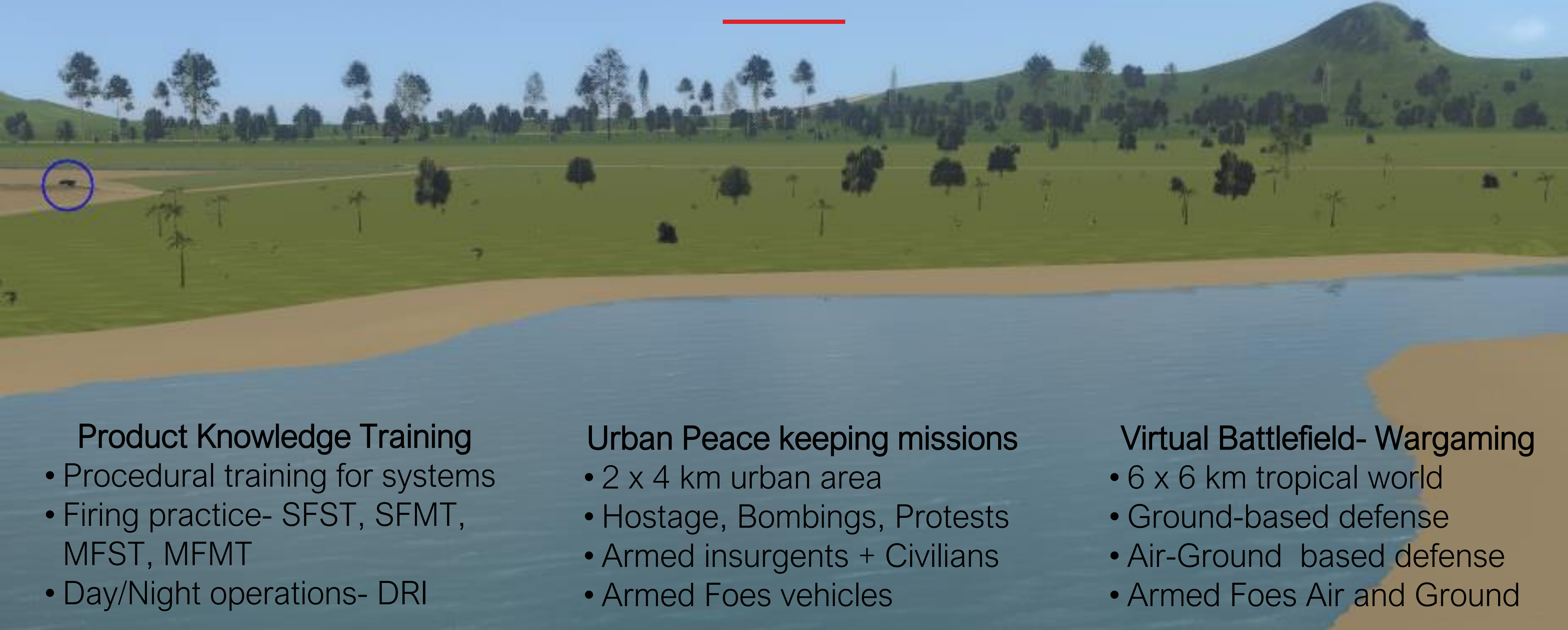
Weapon loading screen

Driver “Out of the Window” view



Training Scenarios- 16 lessons

Scenarios for Novice and Experienced Gunners and Commanders



Product Knowledge Training

- Procedural training for systems
- Firing practice- SFST, SFMT, MFST, MFMT
- Day/Night operations- DRI

Urban Peace keeping missions

- 2 x 4 km urban area
- Hostage, Bombings, Protests
- Armed insurgents + Civilians
- Armed Foes vehicles

Virtual Battlefield- Wargaming

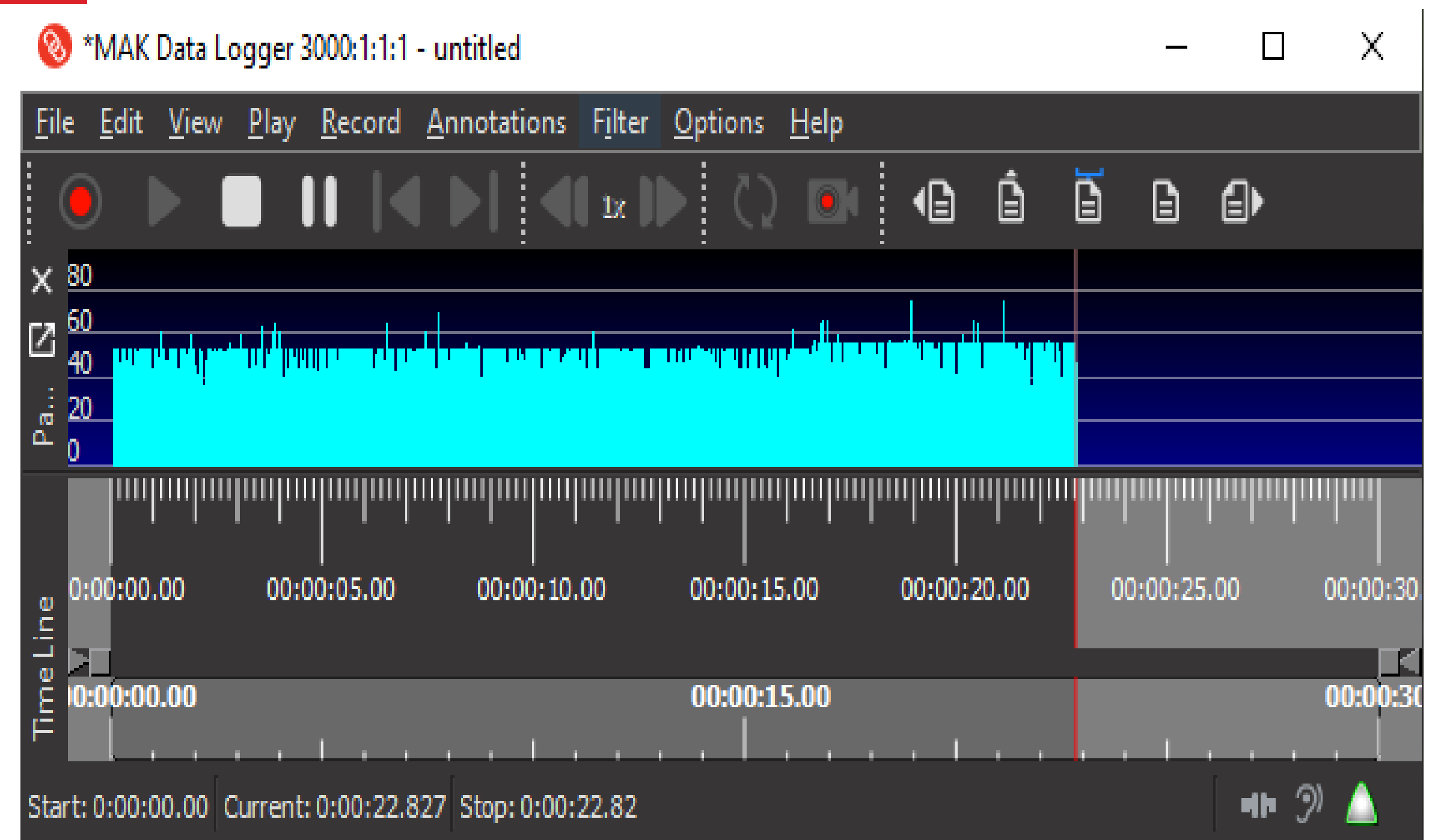
- 6 x 6 km tropical world
- Ground-based defense
- Air-Ground based defense
- Armed Foes Air and Ground

Record keeping of Learners and Lessons

Integrated Learner Management System and After-Action Review Logger

Learner Management System

- Instructor & User Registration
- Create & Modify Crews
- Record Assessment results



Order signed to Handover: 366 Days

Project Start: 09 March 2022(both parties sign) - Project End: 10 March 2023 (Handover to End User)



[Video](#)



Thank you

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U19 Enterprise Building
Innovation Hub
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South Africa