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AIR DISTRIBUTED MISSION TRAINER

Redefine Integrated Air Combat Mission Training

ST Engineering

LEADING-EDGE

SIMULATION TRAINING

In pursuit of taking virtual mission training to greater heights, the Air Distributed Mission Trainer (ADMT) is a distributed simulation training system that provides fighter pilots with training in advanced fighter operations and mission rehearsals in the virtual arena to train across a full spectrum of operational missions – including those that cannot be replicated effectively in the live training environment.

The high-fidelity flight simulation in the synthetic training environment of the ADMT provides for both Type training (aircraft handling and flight operations) and Task training (individual and team-level missions) in a network-integrated training system.

Addressing modern-day challenges of complex air missions and limitations of live training logistics, the ADMT allows the conduct of "all day, all weather" training exercises, including multi-site participation in the same training scenario over network from different locations.

For maximum deployability, the ADMT is now Mixed Reality capable, delivering immersive, cost-effective training in a compact training footprint. For unparalleled fidelity, the ADMT set-up may be integrated with full visual simulator domes. These interchangeable configurations offer flexibility to cater to every training need and budget.

The core of the ADMT is a flexible simulation infrastructure and common synthetic environment, which facilitates the addition of interoperable networked simulators of various air and ground elements.

FEATURES

Flexible Simulation Infrastructure

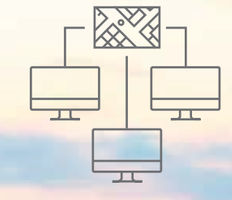
Built on industry-standard simulation infrastructure and extensible architecture of DIS/HLA, the ADMT is modular and scalable. Simulators for other air and ground elements, including command and control systems, can be connected to inter-operate with the aircraft simulators. This allows their operators to participate virtually with the pilots in the same mission scenarios, increasing the range and realism of simulation training. Furthermore, multiple sites of the ADMT can be connected over a wide-area network, for their diverse simulators to participate in the same mission rehearsals.

Mixed Reality Capable

Elevate flight simulator training with the latest human eye-resolution Mixed Reality headsets. Gain perfect clarity of the virtual environment, and experience a seamless blend of the virtual flight scene with real-world controls.

Computer-Generated Forces (CGF)

A distributable CGF subsystem populates the mission locale with activity of other air and ground elements, including interactions with the simulated aircraft in the virtual environment. Instructors can configure the CGF to be cooperative, neutral or adversarial - providing the desired mission setting and realistic training experience for pilots.



Single-Source Visual Database

The virtual scenery is generated from a visual database capable of streaming to multiple ADMT sites and component image generators, for consistent views of the virtual environment among all the participating simulators in a mission rehearsal.

Instructor Operating Station (IOS)

The Instructor Operating Station - the IOS - is specially designed for distributed simulation systems and large-scale missions. Comprehensive real-time controls for the mission scenario allow instructors to dictate the scope and intensity of training. Furthermore, multiple IOS in the new ADMT can be dynamically allocated to concurrent scenarios, offering the choice of Standalone or Integrated training for flexibility in utilisation of training resources.

Predictive Maintenance Capability

Over the lifetime of the system, a predictive maintenance tool will collect and analyse data on the utilisation of the system, then provide advanced notification on probable impending component failures. The information will facilitate timely and targeted maintenance activities to sustain high system availability.

Integrated Training Analytics

Simulation data is processed with advanced analytics to provide new information and insights into pilot performance, to enhance training effectiveness.

Debriefing and Communications

Conduct offline briefing or debriefing for the trainees before and after each mission rehearsal with recorded playback of the simulator session. Supports voice communications between cockpits, instructor, operator, and other external systems.

APPLICATION

Mission Training

The ADMT serves as a virtual arena for mission training, for pilots to gain proficiency safely and efficiently in areas such as:

- **Prioritising Tasks**
- **Situation Awareness**
- **Flight Leadership**
- **Wingman Responsibilities**

With the simulator domes providing immersive visual display, the ADMT allows pilots to practise different types of formations and sharpen their skills in formation selection, employment and discipline, It can apply to both basic formation techniques, such as radio and visual signals, as well as formations for tactical operations, extending to multi-ship formations and tactical turns.

Team-level Training

With monitoring and controlling of the scenario from a comprehensive Instructor Operating Station (IOS), the ADMT allows fast turnaround of team-level training in different mission roles e.g.:

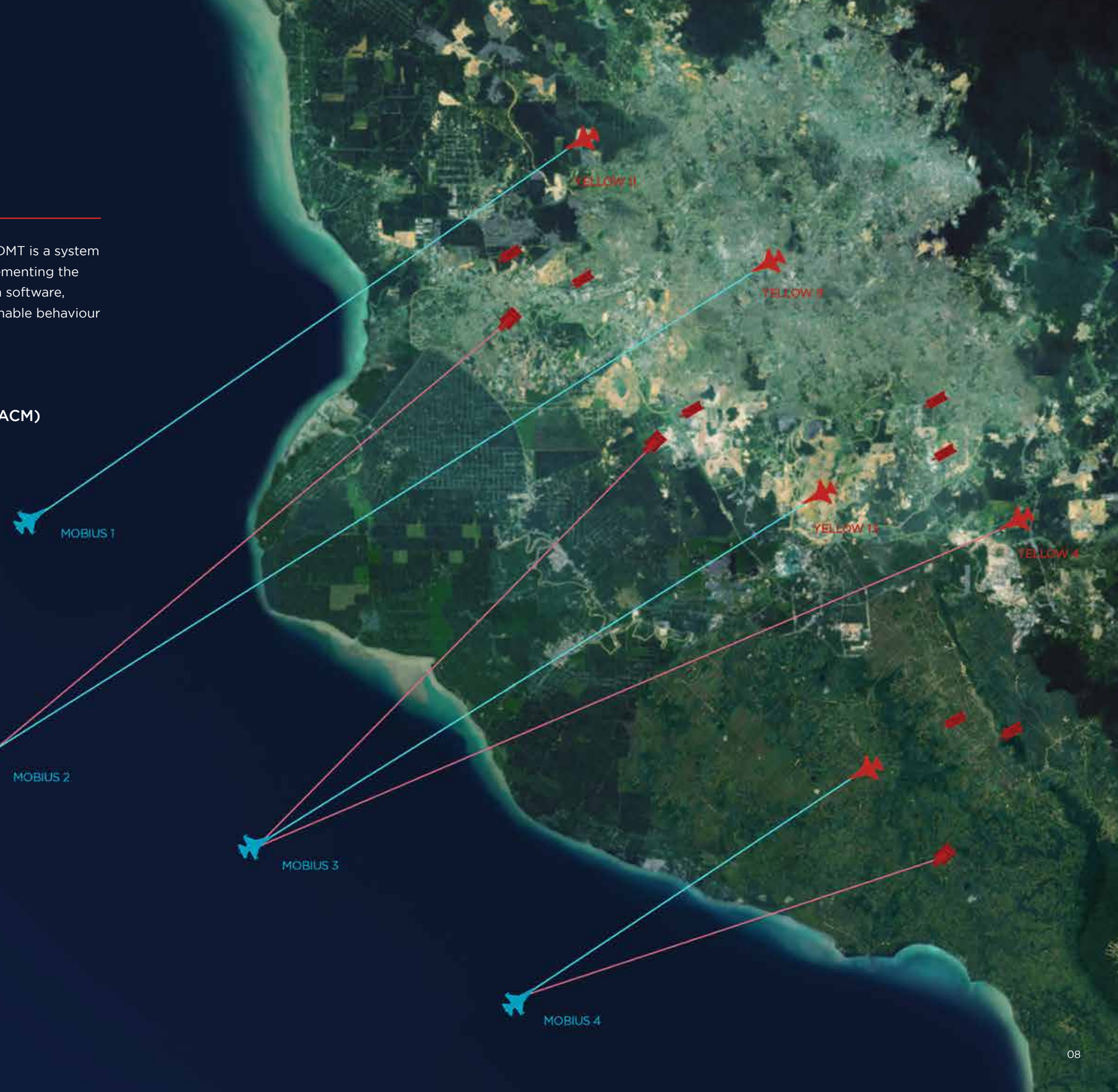
- **Escort**
- **Counter Air**
- **Interdiction**
- **Combat Air Patrol**

Special task training may also be conducted e.g. Air Refuelling, with specific high-fidelity CGF simulation.

Air-to-Air Capabilities

Apart from aircraft handling characteristics, the ADMT is a system for training pilots in Air-to-Air capabilities. Complementing the high-fidelity flight model for the aircraft simulation software, Computer Generated Forces (CGF) with programmable behaviour provide for training in the following:

- **Basic Fighter Manoeuvers (BFM)**
- **Defensive Visual Manoeuvring**
- **High-Aspect Air Combat Manoeuvers (ACM)**
- **Intercepts**
- **Weapons/Guns Employment**



COMPONENTS

Visual Display Subsystem Simulator Domes

The ADMT consists of simulator domes - aircraft cockpits enclosed by an immersive visual display system providing complete coverage of the pilot's field of view - delivering immersive visuals for a visceral experience that maximises the effectiveness of simulator training.

In the simulator domes, pilots are presented with realistic virtual scenery of the desired mission locale. With simulation-class projectors driven by state-of-the-art image generators, the immersive visual display system delivers impeccable panoramic imagery to match the visual acuity of pilots. Actual night vision equipment can also be used in night missions through infra-red stimulation, enhancing training realism and effectiveness.

Optionally interchangeable cockpits provide training planners with the flexibility of choosing the simulated aircraft for each mission scenario, as well as accommodating new aircraft types in the future.

Mixed Reality Training System

With portability and scalablity as its highlights, the Mixed Reality ADMT enables trainees to achieve more reps and sets within a compact training set-up, till they achieve mastery. Train more pilots at an accelerated pace by freeing up utilization of full-mission simulators, and enable training at the point of need while saving on training costs.

Briefing / Debriefing Facility (BDF)

With the BDF, the ADMT is also a system for pilots to practise mission planning e.g. establishing priorities and delegation to flight members.

Trainees can conduct mission briefing at the BDF just before adjourning to the Simulator Domes for the virtual mission i.e. simulated flight in the training scenario. Mission debrief can be conducted immediately afterwards with the BDF, for an efficient mission-centric workflow.

SYSTEM OVERVIEW

Flexible Simulation Infrastructure

Common Synthetic Environment

IT Security and Information Assurance

System Health Monitoring and Predictive Maintenance

Support Services

SPECIFICATIONS

Visual Display Subsystem - Simulator Domes

- Simulated aircraft cockpit enclosed by an immersive visual display system
- Back-projected display with simulation-class projectors
- High-resolution, high framerate imagery with state-of-the-art image generators
- Complete coverage of the pilot's field of view from the cockpit
- Night Vision Equipment compatibility
- (Optional) Interchangeable cockpits for choice of simulated aircraft cockpit

Mixed Reality Headsets

- Photorealistic visual fidelity
- Ultra-low latency
- Integrated eye tracking at up to 200 Hz
- Integrated Ultraleap™ hand tracking for natural interactions

Instructor Operating System (IOS) Subsystem

- Full situation picture for instructors with 2D map view and 3D "stealth" views
- Instrument Repeater graphics of the simulated aircraft cockpits
- Out-the-window Repeater views of the simulator domes
- Intuitive and accessible touchscreen user interface
- Virtual environment settings including time-of-day and weather
- Detailed control of airbase runways, fast repositioning of aircraft
- Managing of multiple scenarios over the same simulation network
- Live Charts on mission progress and setting of recording bookmarks
- Dynamic allocation of IOS to concurrent multiple scenarios
- (Optional) Mobile IOS wirelessly connected for on-the-move usage

Computer-Generated Forces (CGF) Subsystem

- Distributable subsystem populating the mission locale with entities and activity
- Air, sea and ground elements e.g. aircraft, vessels and vehicles
- Interactions with the simulated aircraft in the virtual environment
- Configurable to be cooperative, neutral or adversarial

Communications Subsystem

- Simulated radio comms and intercom between training participants
- Over network among simulated aircraft cockpit and instructor / CGF consoles
- Replication of actual user interfaces by physical controls or graphical touchscreen
- Administrative intercom for safety and coordination of training sessions
- (Optional) Speech-to-text conversion for display at IOS and BDF consoles

Visual Database Subsystem

- Single-source database for visual correlation within and among simulator domes
- Use of high-resolution satellite imagery for terrain textures
- Customised geo-specific features e.g. air bases and places of interest
- Material classification for Night Vision visuals
- Integration with image generators through run-time interfaces
- Streaming of data to multiple sites for consistent views of the virtual environment

Briefing / Debriefing Facility (BDF)

- Reviewing of mission plan and locale study before running of training scenario
- Online monitoring of training scenario to serve as observer station
- Selectable displays of repeater views, 2D map and 3D "stealth" views
- Comprehensive After-Action-Review (AAR) with synchronised displays
- Playback of training scenario recordings with bookmarks
- Centralised recordings database for retrieval for debrief at alternative site

Training Analytics

- Automatic episode mining and contextualisation for assisted AAR
- Individual or team performance statistics and analysis reports
- Possible determination of performance factors
- Integrated performance measurement and analysis with Live Charts on IOS

(Optional) Desktop Simulator Stations

- Lower-fidelity aircraft simulation with simplified cockpit replication
- Desktop-mounted cockpit flight controls and touchscreen flight deck
- Joining in training scenarios with same synthetic environment as Simulator Domes
- Easy setup and scaling-up i.e. addition into the same simulation infrastructure

IT Security and Information Assurance

- Industry-standard IT Security measures on computer and networking equipment
- Enterprise Security Management features
- Multi-factor authentication and authorisation-based access control for data protection
- Data redundancy and automated backups in case of accidental data loss

System Health Monitoring and Predictive Maintenance

- Background collection and analysis of data on system utilisation and health
- Automatic generation of periodic reports
- Advance notification of probable impending component failures
- Advice for timely and targeted maintenance activities