The use of unmanned systems by defence and security forces globally has grown substantially over the past decade, and is only expected to continue to grow. In addition, unmanned systems will be used increasingly for commercial applications such as remote inspection of pipelines and hydroelectric installations, surveillance of forest fires, observation of critical natural resources, assessing natural disasters and a range of other applications. This increase in the use of UAS capabilities results in the need to have more highly trained UAS pilots, sensor operators, and mission commanders.

The CAE UAS Mission Trainer combines an open architecture with commercial-off-the-shelf hardware and high fidelity simulation software to provide a comprehensive, high quality training system. Customers benefit from greater flexibility for networking, distributed mission training and integration within a comprehensive training environment. CAE’s UAS Mission Trainer is a training solution that optimizes operational readiness while minimizing the use of live assets to train and prepare the integrated mission team for operations. The comprehensive solution also prepares the integrated mission team (pilot, payload specialist, and mission commander) in platform operating procedures, data interpretation and analysis, and team interaction.

Features of the CAE UAS Mission Trainer

The CAE UAS Mission Trainer is platform-agnostic, meaning the simulator can be tailored to simulate any specific UAS aircraft with any sensor payload suite. Leveraging the common database (CDB) open architecture and commercially available technology, CAE’s UAS Mission Trainer is not subject to the International Traffic in Arms Regulations (ITAR).

The completely immersive synthetic environment provides capabilities for ab-initio training, basic flight operation, basic payload operation as well as mission planning and mission rehearsal. Customers can select from any of the three different UAS Mission Trainer hardware configurations available, including laptop solution, portable/deployable trainer, and fixed-base trainer.

The simulation software includes:

- A common software baseline that provides:
  - High fidelity simulation independent of hardware configuration
  - Open architecture to allow easy customization
  - Not regulated by the International Traffic in Arms Regulation (Non-ITAR); UAS Mission Trainer is unclassified, vendor agnostic, and reconfigurable
  - Support for the common database (CDB) format with dynamic synthetic environment (DSE):
    - real-time dynamic database updates
    - weather, weapon effects, localized damage and feature placement
    - Distributed mission operations capable through high level architecture/distributed interactive simulation (HLA/DIS)

- Configurable Instructor-Operator-Station (IOS):
  - Computer-Generated Forces (CGF) scenario editor included

- Interfaces with various subsystems:
  - STANAG 4586 Gateway
  - Computer Generated Forces (CGF), including CAE STRIVE, Presagis STAGE, OneSAF, VBS3 and others
  - Image generators, including CAE Medallion-6000, Presagis VegaPrime, and others
Comprehensive simulated payload suite

The CAE UAS Mission Trainer includes a comprehensive suite of state-of-the-art simulated sensing technology models, including:

- Electro-optical imaging;
- Charge coupled devices (CCD)/Day TV/electro-optical (EO);
- Infrared systems (IR);
- Low light TV (LLTV);
- Sensor payloads with laser rangefinder (LRF);
- Laser target designator (LTD) and laser pointer;
- Synthetic aperture radar (SAR) payload including ground moving target indication (GMTI) mode;
- Maritime patrol radar (MPR) including real beam ground map (RBGM);
- Synthetic aperture radar (SAR) and inverse-SAR (ISAR) modes, including target track-while-scan capability;
- Signal intelligence (SIGINT);
- Communication intelligence (COMINT);
- Electronic intelligence (ELINT);
- Effectors: Smart and laser guided weapons.

The CAE UAS Mission Trainer can be further expanded to draw upon CAE’s existing state-of-the-art simulated sensors and models:

- Electronic warfare (EW): Protection sensors, including radar warning receivers (RWR), laser warning receivers (LWR), missile approach warning receivers (MAWS), and sophisticated electronic support measures (ESM) systems;
- Countermeasures: Countermeasure (chaff/flare) dispensers, infrared jammers, and radar jammers;
- Light detection and ranging (LIDAR);
- Acoustics and sonar;
- Magnetic anomaly detector (MAD).

The synthetic environment

CAE’s UAS Mission Trainer features a tactical virtual environment that simulates, in real time, a virtual battlefield for air, land, and naval operations. The HLA-compliant software provides high-fidelity, physics-based models that populate the synthetic environment with friendly, hostile, and neutral forces to conduct operational training and mission rehearsal. The standalone desktop graphical user interface (GUI) application allows the instructor to define scenarios and provide real-time control and monitoring of the entities within the tactical environment.

Train as you operate

The synthetic environment is integrated with the operational ground control station software developed for each unmanned system, or a high fidelity simulation of the actual systems. CAE’s UAS Mission Trainer is a solution designed to be STANAG 4586 compatible, which is the standard for interoperability between ground stations and air vehicles. Students train and interact with the UAS using the controls and displays they would use when operating the unmanned system in theatre, giving them the realism required to train as they would operate on a mission.

Program Example

CAE is developing a Predator UAS Mission Trainer for the Italian Air Force. The high fidelity UAS Mission Trainer specifically represents the Italian Air Force’s General Atomics Predator A and Predator B. In partnership with General Atomics and the Italian Air Force, CAE is conducting flight test data gathering on actual Italian Air Force Predator aircraft to ensure the highest fidelity simulation of flight systems and sensor payloads. The high fidelity Predator UAS Mission Trainer will be delivered in late 2016 to Amendola Air Force Base and will enable the Italian Air Force to conduct “zero flight time” training for their Predator pilots and sensor operators, thus allowing a rapid transition to flight operations without further training on the actual aircraft. In addition, the zero flight time (ZFT) training capability is expected to significantly enhance operational readiness and flight safety for the Italian Air Force compared to conventional approaches to live training.