SIMULATION AND AVIONIC

STM

SIMDES

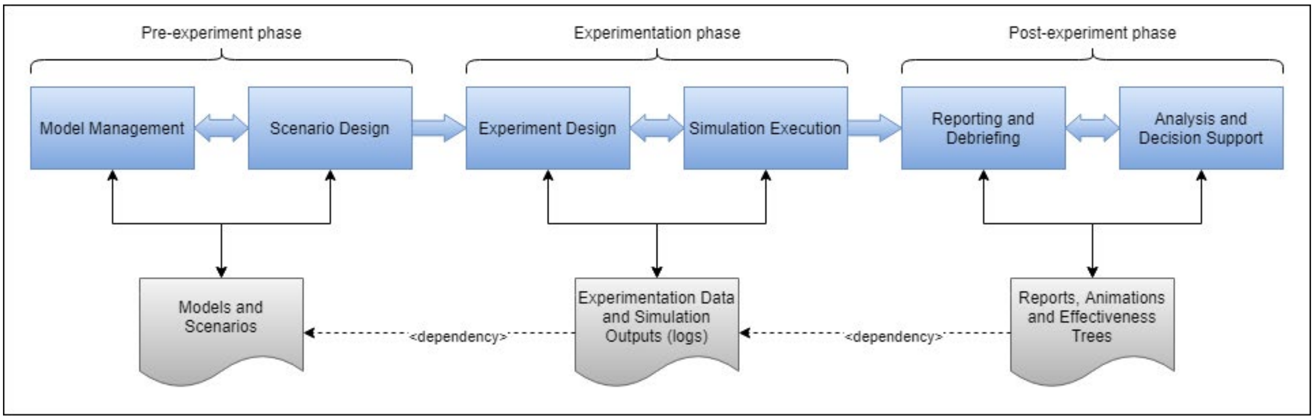
Simulation Based Tactical Decision Support System

SIMDES is a military tactical simulation framework which performs multiple runs on scenario variants defined by experiment design and enables the analysis of obtained data with statistical methods and Multi-Criteria Decision-Making Techniques.

SIMDES operates the models, created according to the multi-agent based simulation modeling approach, with discrete event and discrete time mechanisms. Thanks to its multi-agent architecture and model abstraction layers, the infrastructure is inherently modular and scalable.

The Effectiveness Analysis approach integrated into the SIMDES infrastructure is based on the evaluation of effectiveness trees, which are established on performance measures over model functionality. Effectiveness trees are introduced as a practical means to orchestrate multi-criteria decision making techniques.

SIMDES is built on the data-centric integration principle over pre-experiment preparation, experiment, and post-experiment analysis phases of the overall simulation-based decision making lifecycle.

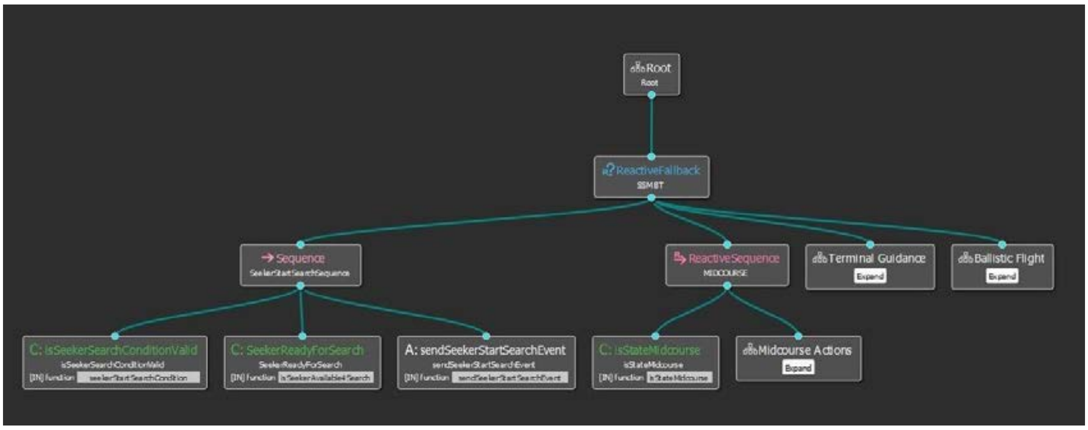


SIMDES
Simulation Based Decision Support

Pre-Experiment Phase:

Model Management:

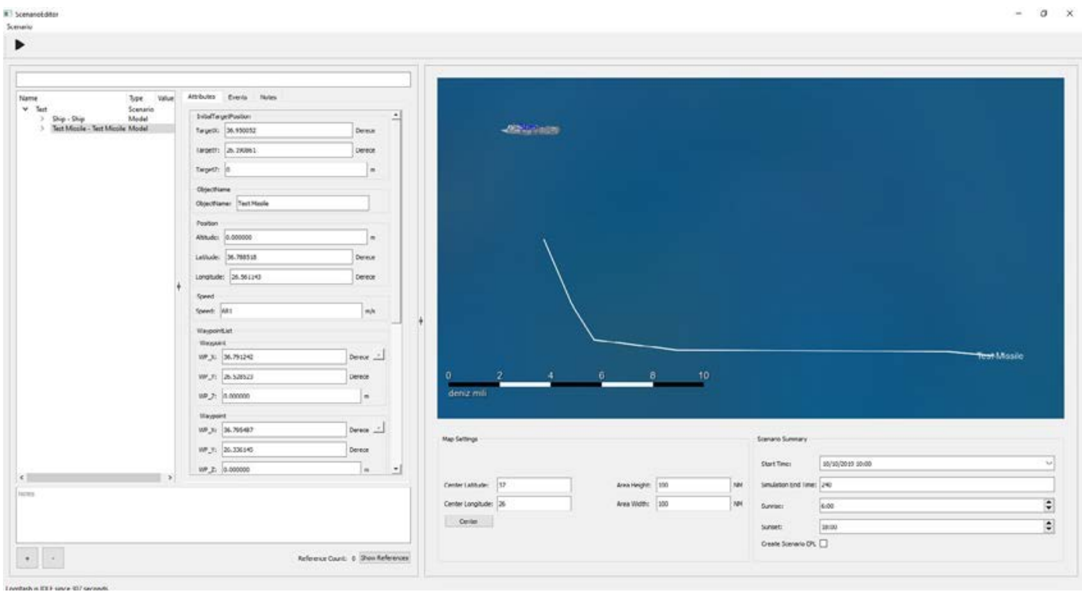
- Easy management of model repository
- Focus on high scalability of simulation, requirements change management, and calibration needs with minimum effort via SIMDES model abstraction layers:
    - Math/Physics Calculation layer
    - Behavior layer

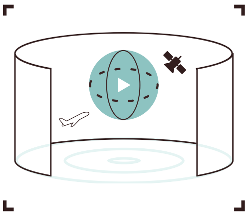


-
    - Agent Layer

Scenario Management:

- Definition of the base scenario to be experimented.
- Scenario definition as a set of conditional events.
- Scenario scene initializations: the area where the scenario will take place, start time, environmental conditions, triggering events, conditional behaviors, behavior list, selection and management of tasks etc.





Experimentation Phase:

Experiment Design:

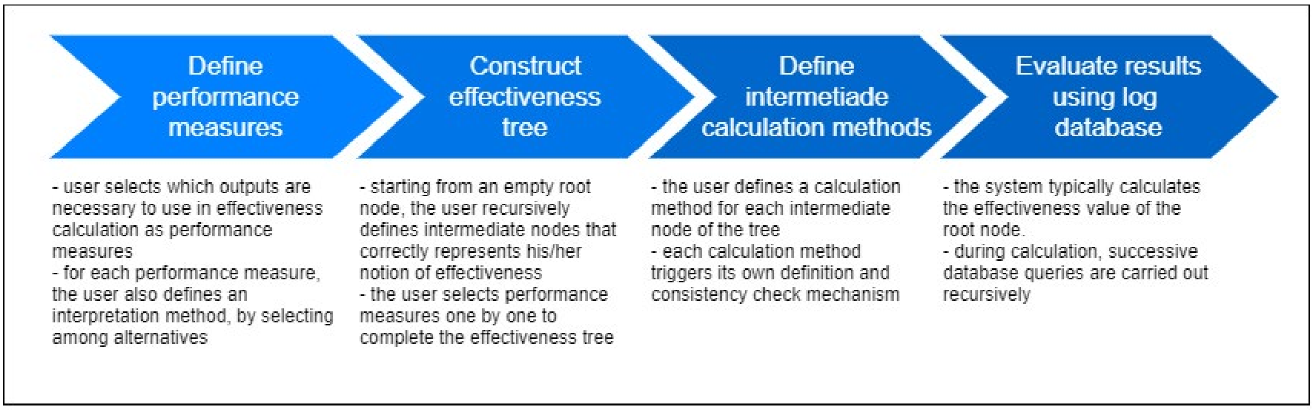
- Creation of scenario variations (scenario samples) upon the base scenario using various parameter levels
- Definition of trials (sub run) for each scenario sample via random parameters

Execution of Multiple Simulation Runs:

- Models incorporate both discrete event and discrete time advances
- Constructive trial runs, without user intervention
- Sequential, parallel and distributed executions
- Assured repeatability for manageble randomness, using well established Pseudo Random number generator libraries
- Use of database to store all simulation output

Post-Experiment Phase:

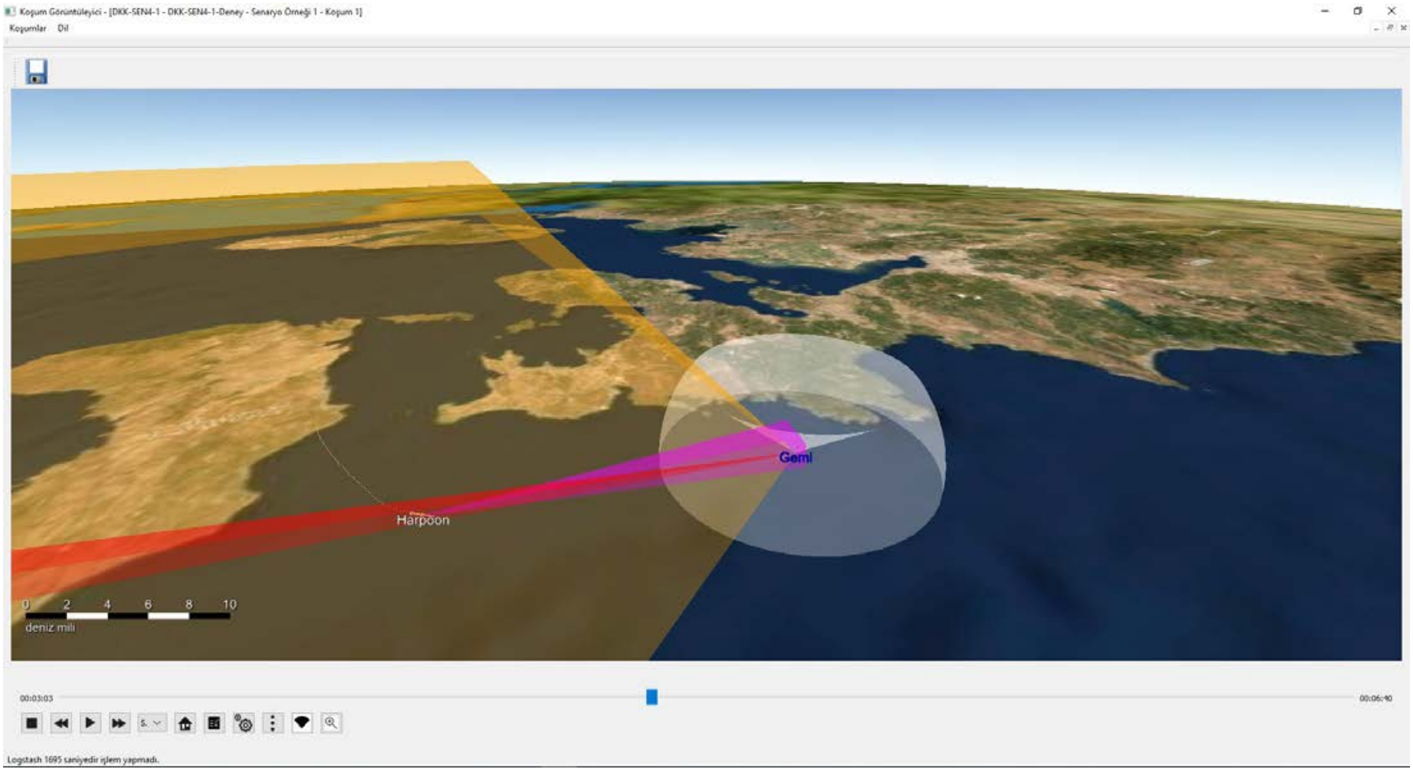
Effectiveness Analysis:

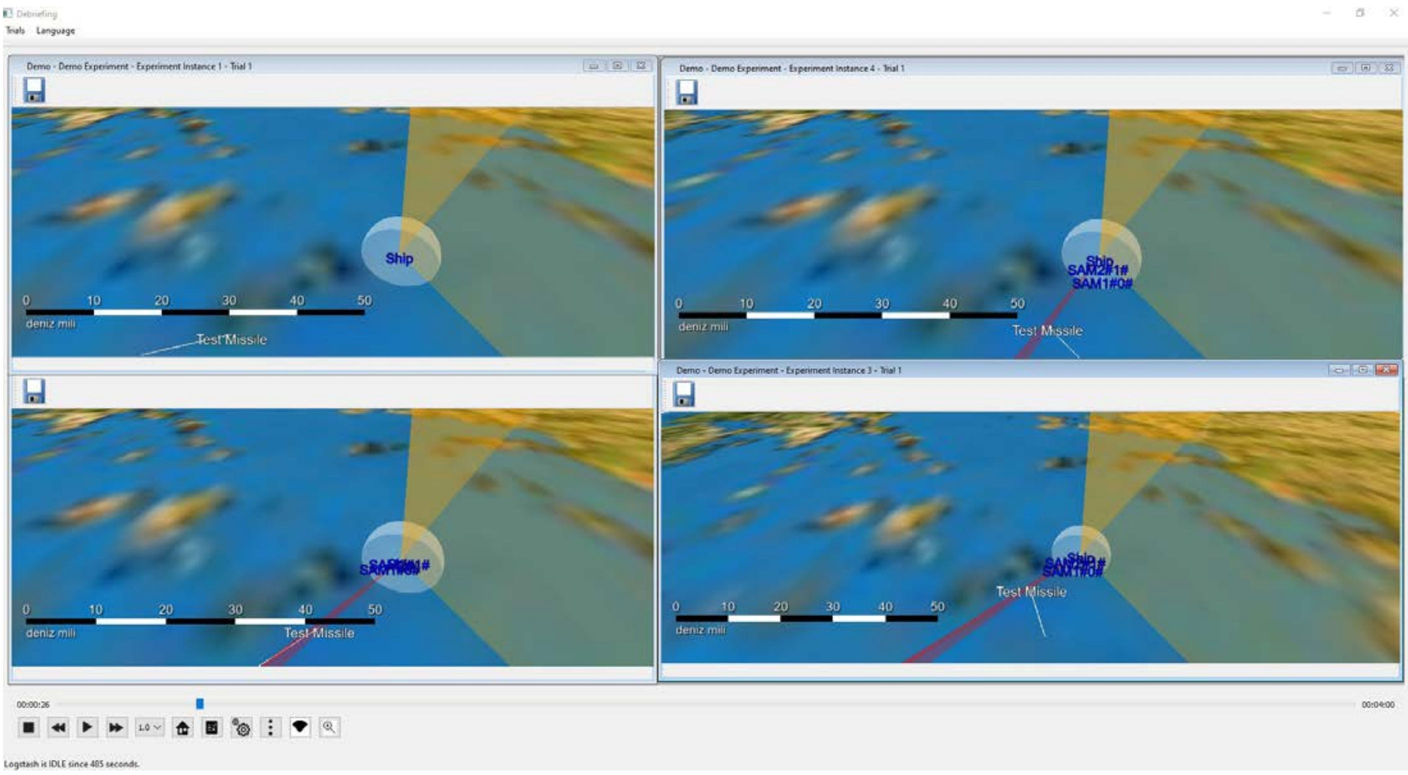


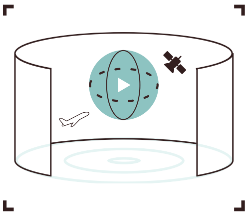
SIMDES
Simulation Based Decision Support

Reporting & Debrief:

- Simulation output reports based on statistical methods
- Visualization of simulation output by animation
- Simultaneous playback of multiple scenario samples, enables tracking of differences between samples





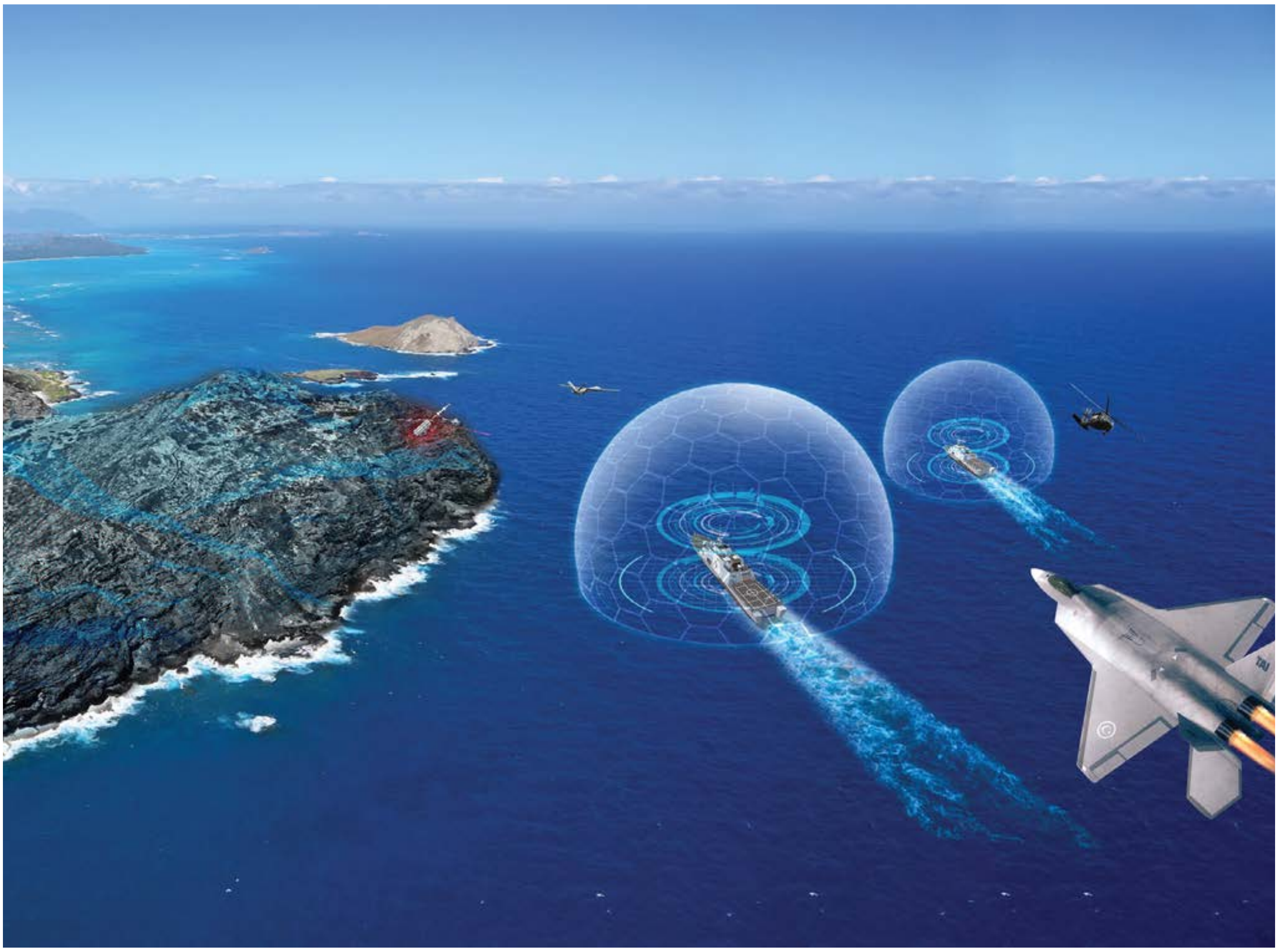


GEMED

Warfare Effectiveness Analysis Model

Warfare Effectiveness Analysis Model (GEMED) is an engineering level analysis simulation system in which combat activities of combat platforms can be measured in an integrated synthetic tactical environment. With the scenarios created, the model can be used for the purpose of decision support and tactical development for combat effectiveness assessment, ship design/modernisation and procurement.

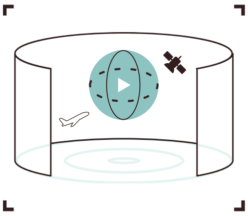
The GEMED model is based on the analysis of statistical data obtained from the interactions of high-fidelity models in multiple simulation runs with Multiple Criteria Decision Making Techniques. In this context, the Simulation Infrastructure, Weapon Systems and Electro-optic/RF sensor modelling competence and the Effectiveness Assessment approach we developed with the academy were used.



MAIN CAPABILITIES

High-fidelity simulations models	• Ammunition Models (Missile, Gun, Air Launched Bomb) • Weapon System Models • Generic RF Sensor Model • Generic Electro-Optic Sensor Model • Electronic Warfare System Models (ED, ET, Countermeasure Systems)
Simulation Engine	It is the software that provides services such as time management, data sharing, operation of rule-based behavior, record management for simulation models.
Effectiveness Analysis Tool	It is the software developed for the comparative analysis of the results obtained with multiple simulation runs with Multi Criteria Decision Making Techniques.
Scenario Planning Tool	It is the software that includes basic GIS capabilities developed for the purpose of creating simulation scenarios with visual user interfaces.
Debrief Tool	It is an assessment software for training purposes that allows replay of simulation run records.

GEMED
Warfare Effectiveness Analysis Model



SARGUS

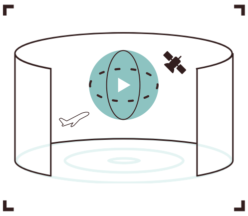
Synthetic Aperture Radar Surveillance Satellite Payload Simulation Development

Synthetic Aperture Radar Satellite Payload Simulation Development Project (SARGUS) has been developed as a simulation tool for SAR satellites in low earth orbit missions. SARGUS software provides two main capabilities related to SAR payload simulation and satellite mission analysis. Furthermore, mission planning for SAR satellite missions, efective training of satellite operators, performance analysis for planned satellite missions and design support for SAR payloads are the primary usage areas of the SARGUS software.

Mainly, the simulation software we have developed has the capabilities to modelling the SAR payload on a hardware basis, to calculate the instant location and speed information of the satellite platform where the payload is, to create the raw SAR data as a sample within the defined scenario (orbit, time, target region, etc.), to obtain SAR images by processing raw data. In addition to the SAR payload, it has the capability to conduct electro-optical mission load analyzes.

MAIN CAPABILITIES

Creating scenario	It is a software with the possibilities to create a new scenario by the user, to reorganize and save the created scenario to be optimized.
Creating satellite model	New satellites can be added to the scenarios. It is designed to suit the multi mini satellite concept. If desired, 3D models of satellites can be added and visualised. Visiting times can be calculated on the defined target area for single and multi mini satellite missions.
Coverage Analysis and Revisit Time Calculation	Frequency of re-visits of satellites within the target area can be calculated. Groundtrack and potential scanning widths can be shown on 2D and 3D surface models.
Ground Station Coverage Calculation	Interactions between satellite and ground station can be calculated. It can be presented to the user in tabular form.
Synthetic SAR Image Generation	It can create synthetic raw SAR images of objects defined by the user and process these images.
SAR image Processing	It has the capabilities to process raw SAR images created by real satellites and present them to the user.



HAVESİS

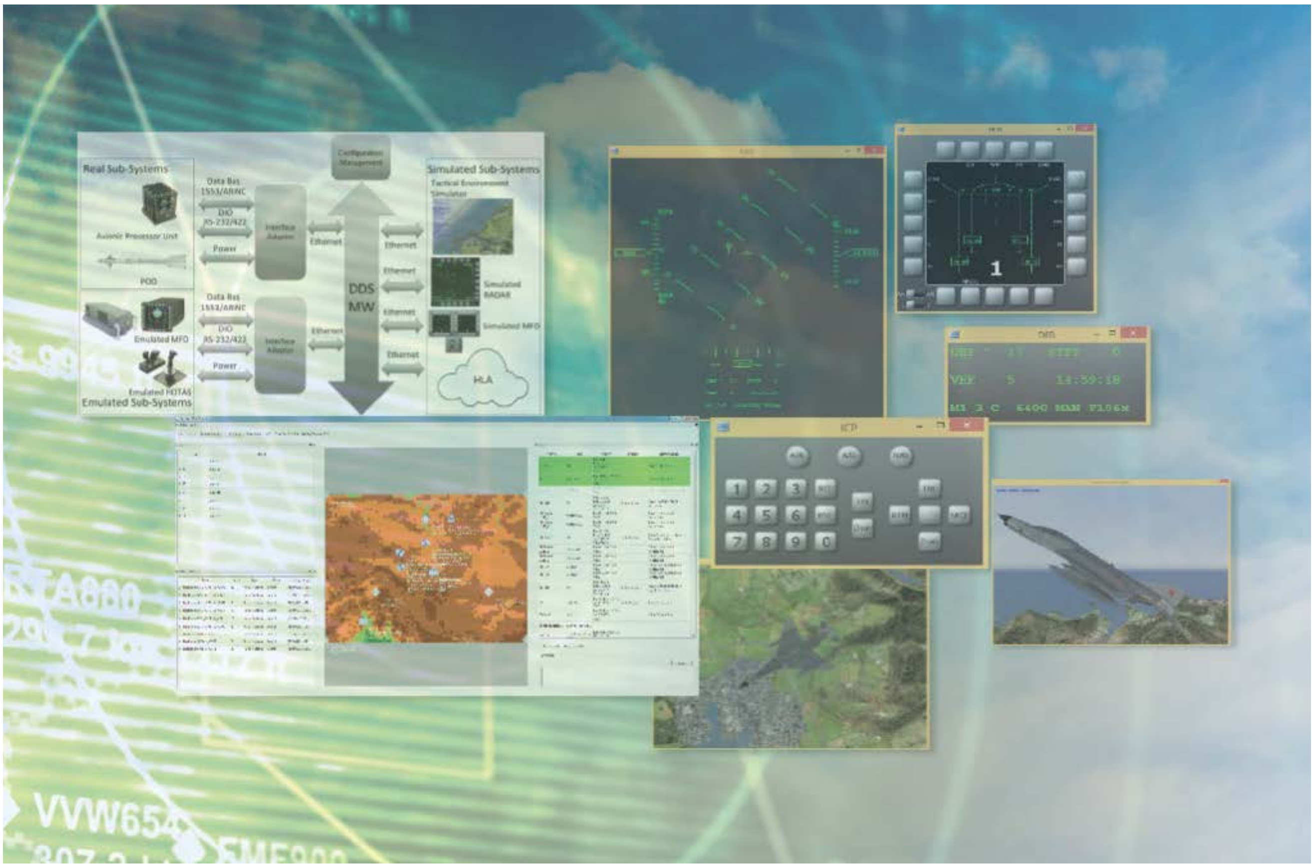
Hybrid Avionics Emulator System

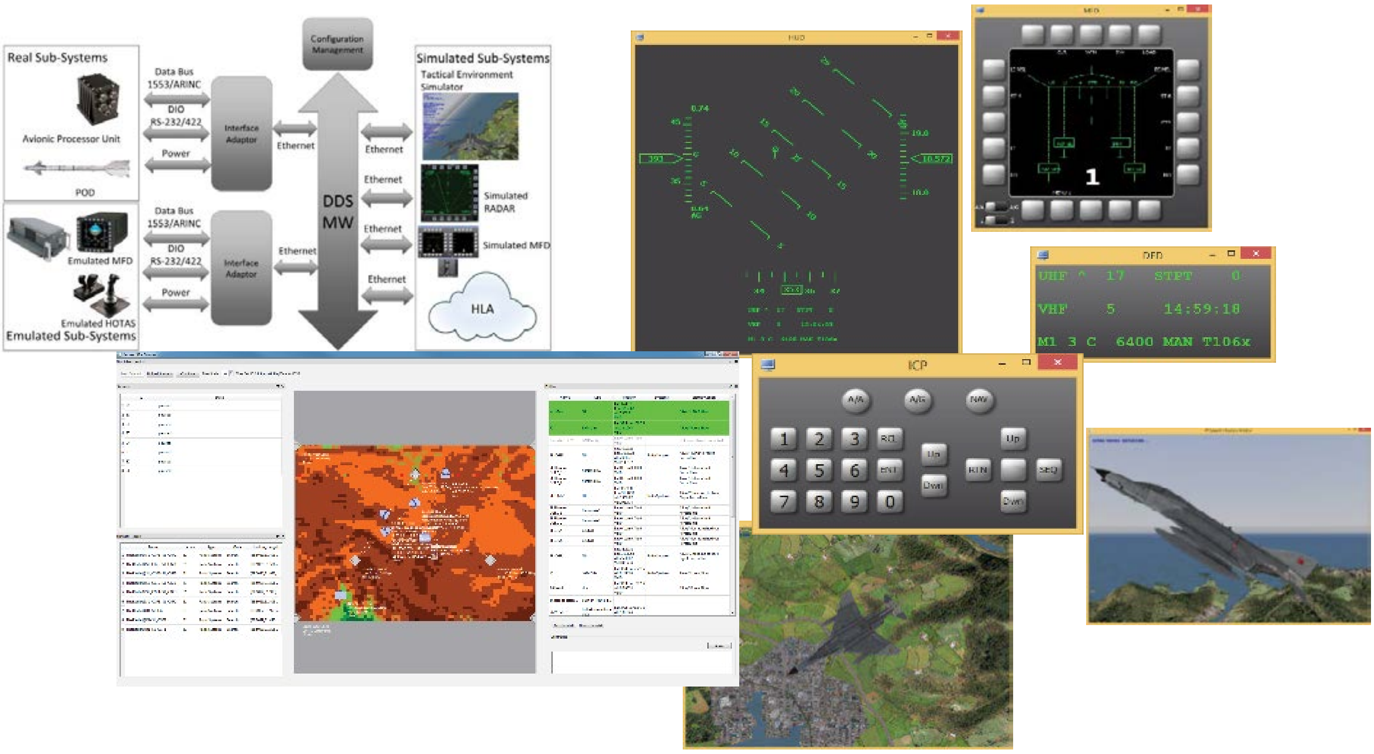
The Hybrid Avionics Emulator System (HAVESİS) is the pioneering next generation Generic Avionic System Integration Laboratory concept in Turkey.

Avionic System Integration Laboratories are widely developed by assuming a predefined target system and a common data bus protocol. This assumption requires a different configuration for each new target system, thus redesigning the existing infrastructure according to the new requirement.

HAVESİS enables to combine the avionic equipment that provides integration over different protocols and interfaces with DDS-based integration architecture. Avionic equipment developed with different bus protocols can thus be easily integrated. In this way, the integration behavior of the related equipment defined in the HAVESİS configuration file is sufficient to be included in the rest of the system.

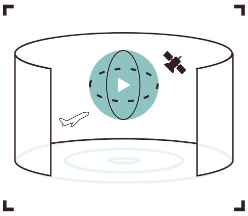
Therefore, the dependency of the bus protocol for integration tests is eliminated. In addition to its unique architectural design, HAVESİS creates an integrated solution with the subsystems we have developed for the integration laboratory concept. Sub-systems that may be needed in an Avionic System Integration Laboratory, such as HOTAS, MFD emulators, tactical environment, radar simulation software, have also been developed within the concept.





TECHNICAL CAPABILITIES

DDS-Based Architecture	DDS-based distributed architecture is designed, optimized for real-time execution.
Bus Emulator	It is a complete set of driver hardware/software and gateway software between different bus standards and DDS that provides two-way conversion between avionics and DDS topic space.
Configurability	Thanks to the flexible design of the Bus Emulator software, buses and shared information in the system can be configured in two ways via XML-based configuration files.
Tactical Environment Simulation	It is a DDS-based distributed simulation software developed to imitate the target platform in interaction with virtual elements in a virtual operational environment within a pre-defined scenario.
HLA Compatibility	Tactical Environment Simulation is designed HLA compatible for integration with possible simulation software.
Multiple Bus Support	Bus emulator supports MIL-STD-1553, ARINC-429, ARINC-629, ARINC-664, RS 232/422 protocols. The architecture is flexible and additional protocols can be added within the framework of motherboard capacity, driver hardware/software, and technical specifications.
HLA-DDS Gateway	It is a configurable two-way protocol conversion software developed to integrate HLA-based simulation software/systems directly into HAVESİS via DDS.



AVIOPRO

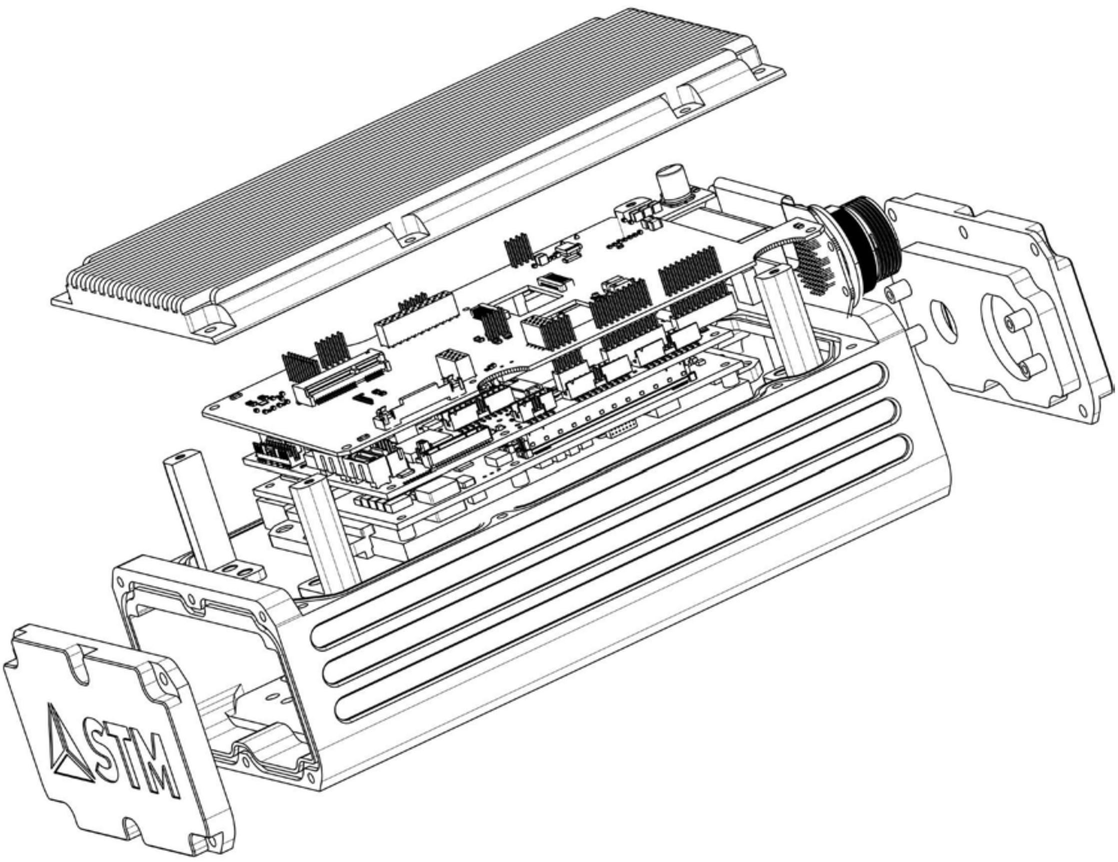
Avionics Processor Unit

Avionics Processor Unit has been designed taking the minimised volume, weight and power consumption criteria into consideration in order to meet the intensive processing and performance power required by the flying platforms or other systems containing electronic components used in the field of defence and aviation. Besides the LRU configuration, the Avionic Processor Unit can be used inside an onboard external load (POD) and similar systems.

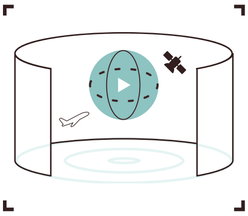
The Avionics Processor Unit we have developed consists of a high-performance multi-core processor, input-output interfaces, carrier cards, data recording/memory units and power distribution electronic components.

MAIN FEATURES

- High performance COM express processor unit
- Scalable carrier card and interface configuration
- No-cable design
- Minimised volume and weight (~ 250 Mm X 110 Mm X 60 Mm, ~ 1.9 Kg)
- Low power consumption (~ 25 W)
- Windows/Linux/Vxworks operating system support
- Extensible Data Storage
- Fanless contact (Conduction-Cooled) cooling
- LRU and external load configuration
- MIL- STD- 1553B interface (2 channels)
- ARINC- 429 interface (6 channels)
- Gbps ethernet interface (2 units)
- RS232/ RS422/RS485 interface (5 units)
- RS-170 analog video output interface (1 unit)
- RS-170 video input interface (2 units)
- GPIO I/ O interface (2 units)
- Audio output (2 channels)
- USB 2.0 interface (2 units)
- 1 TB storage area



AVIOPRO
avionic processor unit



AVIONICS POWER SUPPLY UNIT

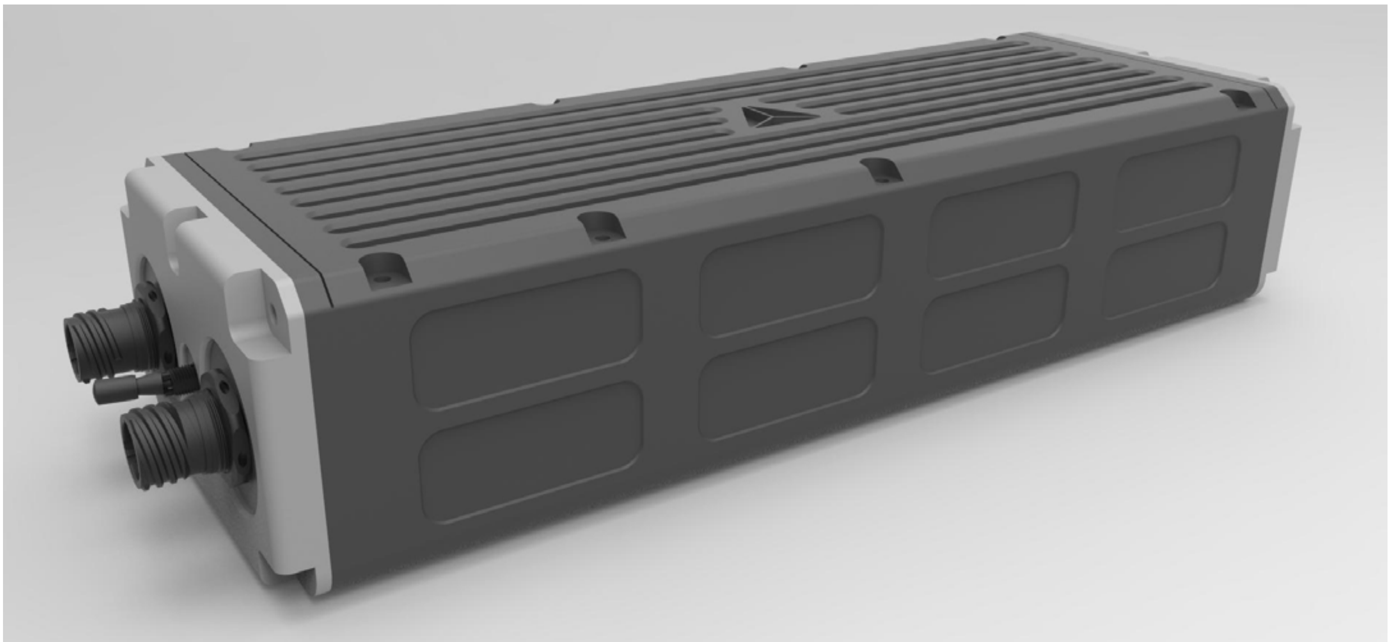
The Avionics Processor Unit has been designed taking into account the minimised volume, weight and maximised efficiency criteria to meet the voltage/current power required by systems containing vehicles or other electronic components used in the field of defence and aerospace. It can be used inside or outside the on-platform external load (POD) and similar systems.

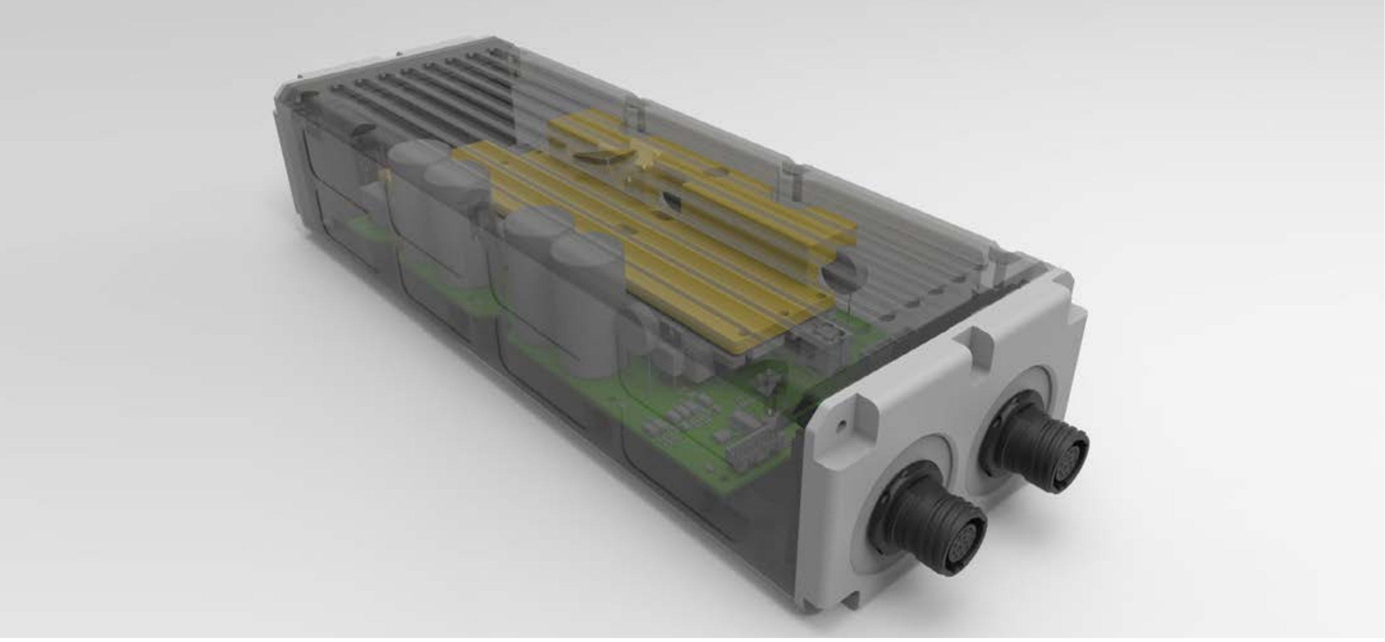
The Avionics Processor Unit we have developed consists of a power inverter board that converts the power from the AC power supply to DC power, connector cards providing communication with the input/output external interfaces, and a mechanical case and produces 0.5 kW of power.

The AC / DC converter modules on the Power Inverter Board are designed modularly according to the voltage requirement of the units to be connected to the Avionic Power Supply Unit. In this way, different variations (+12VDC, +24VDC, +28VDC) of the Avionic Power Supply Unit can be produced without changing the connection interfaces or dimensions.

MAIN FEATURES

- Input Channel 1: 115VAC @400Hz
- Input Channel 2: 220VAC @50Hz
- Output Channel - Controlled Units (2 Channels): + 28VDC @9A (~ 250 Watt)
- Output Channel - Controlled Units (4 Channels): + 28VDC @9A (~ 250 Watt) (With On/Off feature)
- Power Factor: ≥ 0.99
- Efficiency: 90%@115Vrms / 92%@230Vrms (Full load)
- Power output options: +28VDC, +24VDC, +12VDC
- Protection Functions: Opening current limiting, thermal shutdown, high/low voltage shutdown, high current protection
- Fanless contact (Conduction-Cooled) cooling
- MIL- STD- 810G, MIL- STD- 461(A- F), MIL- STD- 1399, MIL- STD- 704-2/ 4
- GPIO I/ O interface (3 units)





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