SIMULATION SOLUTIONS

MAIN TYPES OF THE SIMULATORS

1. Software Verification Facilities (SVFs)

Digital-twin of the DHS subsystem, especially the OBC hardware to the extend required to allow the real onboard software (OBSW) to be loaded and executed unmodified on an emulator (e.g., TEMU), while the OBSW is being developed and verified.

2. Operational Simulators (OpSims)

Integrated model of the complete spacecraft platform, payload, and its ground segment interfaces to the Mission Control System to allow a closed-loop operational procedure validation and training. The OpSim will run the real flight OBSW unmodified.

Both simulators utilize our own product TEMU (Terma Emulator), that supports the processor types for space applications.

SOFTWARE VERIFICATION FACILITIES (SVFS)

- Supporting all phases of the OBSW development, test, and verification
- Hardware representative level of modelling to allow the OBSW verification and testing

OPERATIONAL SIMULATORS (OPSIMS)

- Provides the simulation capability to perform the operational scenario for training and flight control procedure validation (before launch)
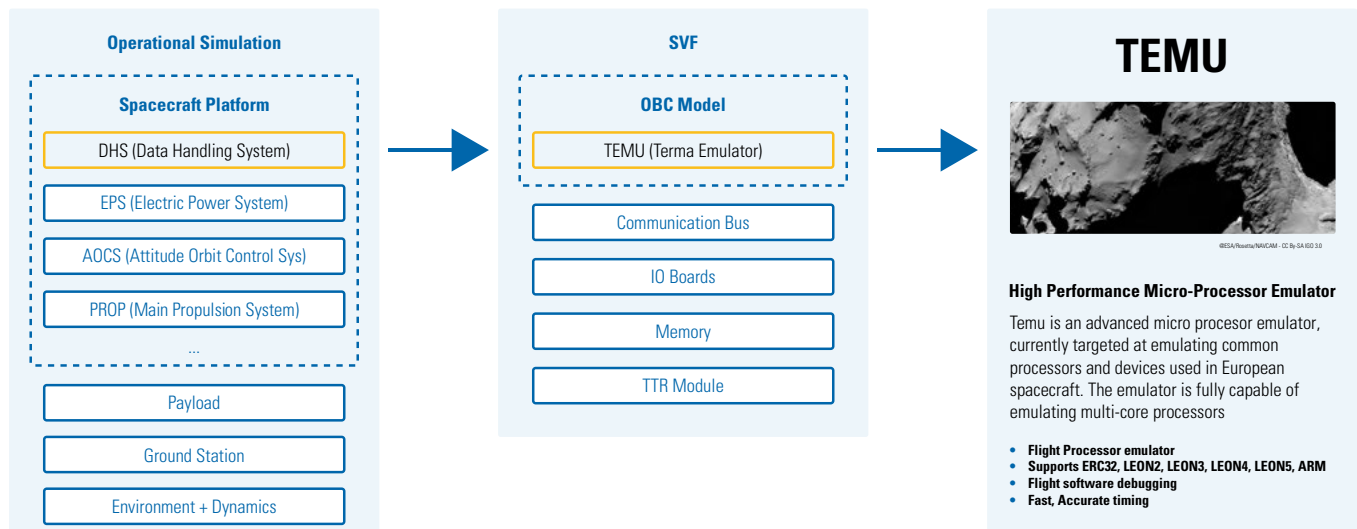- Used for Anomaly analysis and recovery procedure testing (after launch)

OTHER TYPES OF SIMULATORS

RTS (HITL)

Real Time Simulator used for AIV/AIT activities for testing assembled system in HITL

Mission Development Timeline → SVF → RTS/EGSE → OpSim → Launch

OVERVIEW ON THE SIMULATOR COMPONENTS

Operational Simulation

Spacecraft Platform

DHS (Data Handling System)

EPS (Electric Power System)

AOCS (Attitude Orbit Control Sys)

PROP (Main Propulsion System)

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Payload

Ground Station

Environment + Dynamics

SVF

OBC Model

TEMU (Terma Emulator)

Communication Bus

IO Boards

Memory

TTR Module

TEMU

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High Performance Micro-Processor Emulator

Temu is an advanced micro procesor emulator, currently targeted at emulating common processors and devices used in European spacecraft. The emulator is fully capable of emulating multi-core processors

- **Flight Processor emulator**
- **Supports ERC32, LEON2, LEON3, LEON4, LEON5, ARM**
- **Flight software debugging**
- **Fast, Accurate timing**

TERMA has more than 20 years heritage in building spacecraft simulators for both, the commercial EO domain and institutional science missions including deep space.

Project Name	Short Description	Role of Terma
ROSE-L, CIMR, CHIME Operational Simulators	SIMULUS based operational simulators for ROSE-L, CIMR, CHIME missions	Prime
FORUM Operational Simulator	A SIMLUS based operational Simulator for the FORUM Mission	Prime
ARIEL RTS Simulator	SVF, HITL and TOMS Simulator	Prime
Galileo CSIM L3 Maintenance	Maintenance of CSIM in GCS	Prime for CSIM Mnt
IRIDE Operational Simulator	A SIMLUS based operational Simulator for the IRIDE Mission	Prime
EAGLE-1 Operational Simulator	A SIMLUS based operational Simulator for the EAGLE-1 Mission	Prime
NAOS Operational Simulator	A SIMLUS based operational Simulator for the NAOS Mission	Prime
BMOTT	MSG Operational Simulator Development and now maintenance	Prime
RUAG OBC-NG Model	Adapting of PLATO CDMU Model to OHB generic environment and CO2M	Prime
PLATO CDMU Model	On Board Computer Model for new RUAG OBC Family – OBC-NG	Prime
Euclid Operational Simulator	Operational Simulator for the ESA Euclid program	Prime
Euclid CDMU Model	Development of a CDMU Model for the Euclid SVF	Prime
Sentinel-4 Instrument Environment Simulator	Development of models for Sentinel-4 UVN ICU	Prime
SARah SMU and uRTU models	Development of SMU and MicroRTU models for SARah	Prime
Sentinel-1 Operational Simulator	Operational Simulator for Sentinel 1A, 1B and later 1C and 1D	Sub
Integral/XMM	Upgrade of Integral 7 XMM Operational Simulators to SIMSAT 4	Prime
MTG SMU Model	Development for MTG Operational Simulator Development of model of (RUAG) LEON-2 based Spacecraft Management Unit (SMU) to be integrated into MTG SVFr	Prime
EXOMARS Ops Simulator	Operational Simulator Development for EXOMARS 2016 Mission	Sub
Solo RTS Simulator	SVF, HITL and TOMS Simulator	Prime

If you have any questions, please contact our team, terma.space@terma.com

TERMA ⊤

ALLIES IN INNOVATION