ExoMars EDM GNC SCOE

IXV GNC SCOE

SESP-2012

GENERAL DESIGN:

GNC or AOCS SCOE. Usage:

❑   Pure GNC software verification

❑   Verification of GNC in real-time with OBC in the loop

❑   Verification of GNC having real hardware units in the loop

GNC SCOE SIMULATIONS: EXM - IXV

GNC main phase (closed loop testing):

❑   Simulation of actuators to acquire GNC-SW commands.   RCS, FPCS - RCS

❑   Simulation of Environment Dynamics and Kinematic.   Earth   - Mars

❑   Simulation/stimulation of sensors to provide data to GNC-SW.   IMU,GPS   - IMU,RDA,SDS

Additional needed simulations (health status, modes):

❑   Actuators feedback to ASW (status).   FCV_sts   - FCV, FLAP.

❑   Acquisition of commands to sensors (sensor modes).   IMU, RDA   - IMU, GPS

❑   Acquisition of GNC Mode switching signals.   Straps   - Straps, pyros

❑   Synchronization of Simulation Time with OBC Time / CCS Time. Sync mode - Async mode

❑   Redundancy management.   SDS, CAN   - LV, MIL-1553

GNC SCOE SIMULATIONS:

GNC special phases test (open loop):

❏ Navigation only mode:

> ❏ Lift off → Separation.
>
> ❏ Parachute opening → Descent to splash down/landing.

❏ Using a predefined trajectory data.

❏ Simulation of Environment Dynamics and Kinematics.

❏ Simulation of sensors to provide data to GNC-SW.

❏ Simulation of actuators to log GNC commands.

GNC SCOE HARDWARE IN THE LOOP:

GNC Actuators emulation:

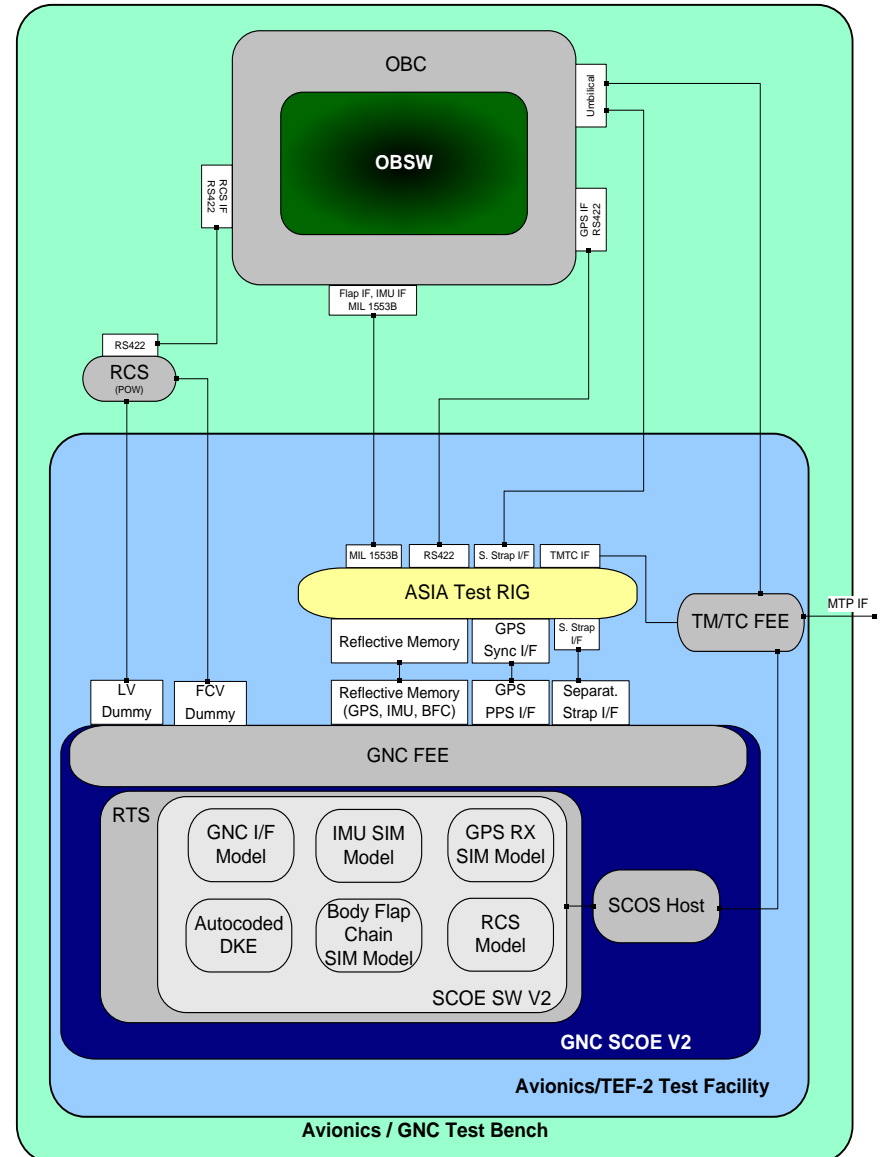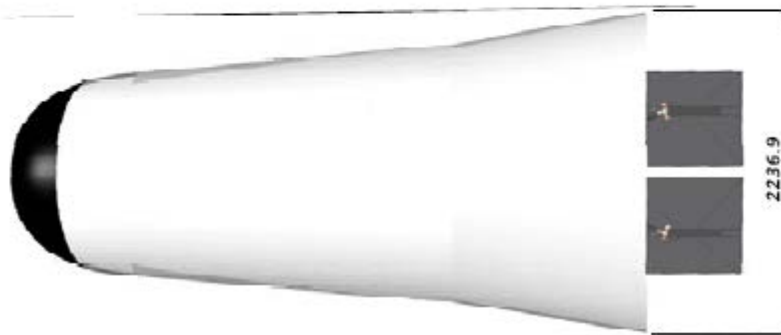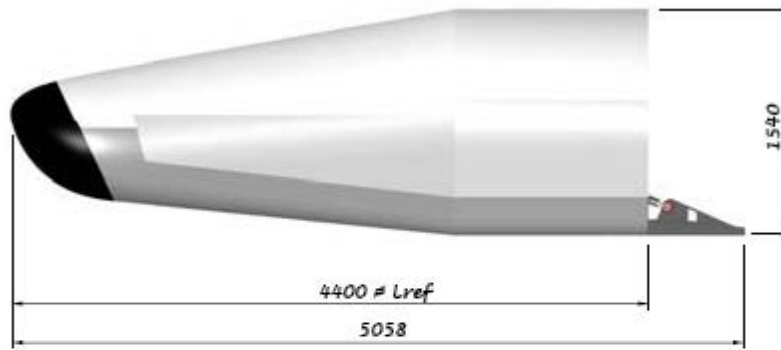❑   LV and FCV dummies

❑   MIL-STD-1553, CAN-Bus Management.

GNC Sensors stimulation:

❑   IMU Lab

❑   GPS Spirent

❑   RDA-Echo Doppler Simulation, RDA-FSM SCOE
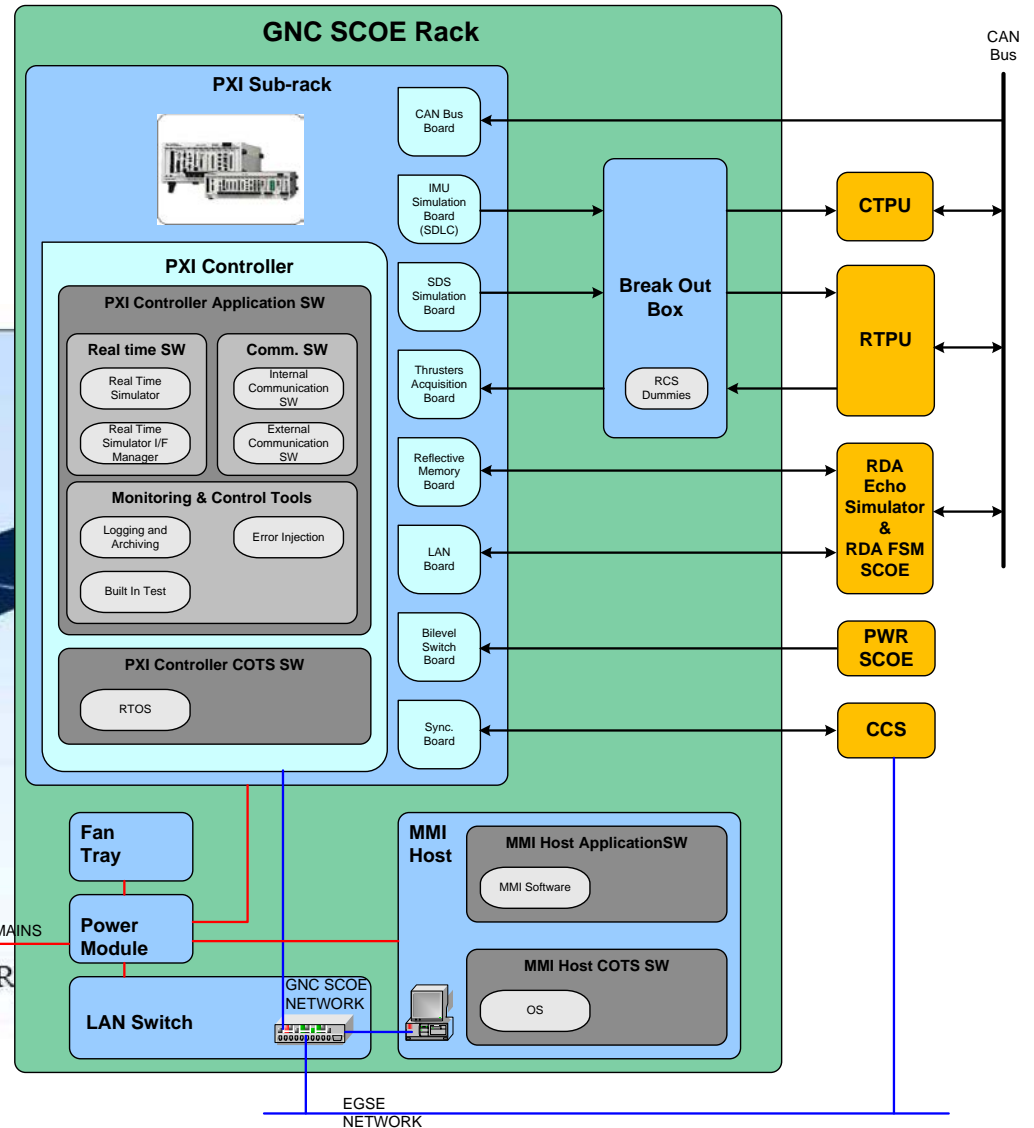
Interfaces with Non GNC SCOEs:
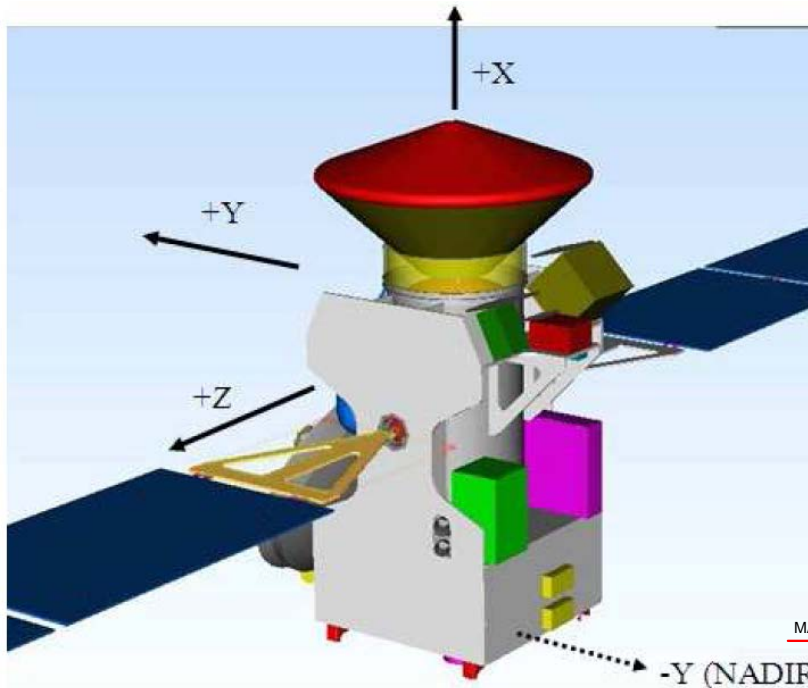
❑   MTP, RIG, Umbilical SCOE, OCOE.

IXV GNC

ExoMars EDM GNC

GNC SCOE ENVIRONMENTAL ASPECTS:

❑   Clean Room operation (ISO-7).

❑   Grounding requirements for space systems (Clean-Earth).

❑   Planetary protection (Bio-Burden).

❑   Thermal-vacuum harness.

❑   CE regulations.

❑   CSG regulations.

MAIN HARDWARE ELEMENTS:

❑   SCOE Rack.

❑   PXI Chassis (bus).

❑   PXI Controller.

❑   PXI Synchronization board.

❑   User Interfaces (MMI, SCOS-EGSE).

❑   SCOE LAN.

❑   SCOE Harness.

❑   Dummies.

❑   Protections.

MAIN SOFTWARE ELEMENTS:

❑   Monitoring and Control Tools

❑   MMI displays and controls.

❑   Built-In Test software.

❑   Logging and archiving software.

❑   Simulation Software.

❑   LV Environment → .dll generation

❑   Other Compilers → .dll generation

❑   Configuration files

❑   Variables Data-Pool

SIMULATION SOFTWARE DEVELOPMENT:

❑   Software Development Environment

❑   COTS Tools (Compilers, Converters, Graphic languages, ..)

❑   Simulink

❑   Simulator Interface Toolkit

❑   Visual-Studio (c)

❑   LabView

❑   Windows

INVOLVED COMPANIES:
IXV GNC and ExoMars EDM GNC SCOEs

❑ Customer: Thales Alenia Space – Italia

❑ GNC SCOE:
      SENER, Ingenieria y Sistemas, S.A.

❑ Simulation Models:
      DEIMOS Space, S.L.U.

THANK YOU

SENER Ingeniería y Sistemas, S.A.
Severo Ochoa, 4. 28760 Tres Cantos. SPAIN
enrique.rodriguez@sener.es