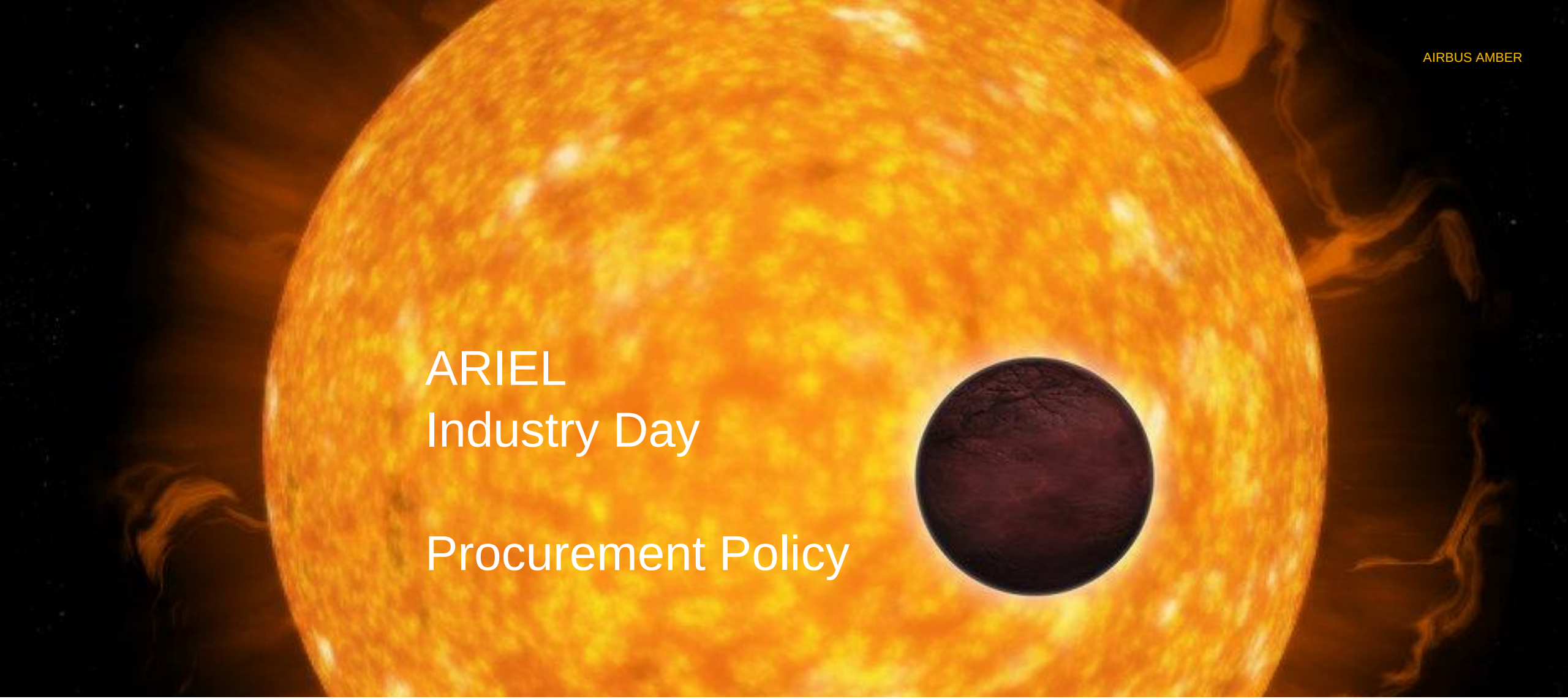

ARIEL
Industry Day

Procurement Policy

DEFENCE AND SPACE

07/04/2022

AIRBUS

Welcome

YOUR SPEAKER TODAY

Frank Souquet-Basiège

Airbus Defence and Space

Ariel Industrial Manager

“I have the pleasure to present you the details of our procurement strategy.

This presentation will give you the ins and outs of the Ariel industrial organisation, the geographical return situation and the remaining procurement items description and schedule.”

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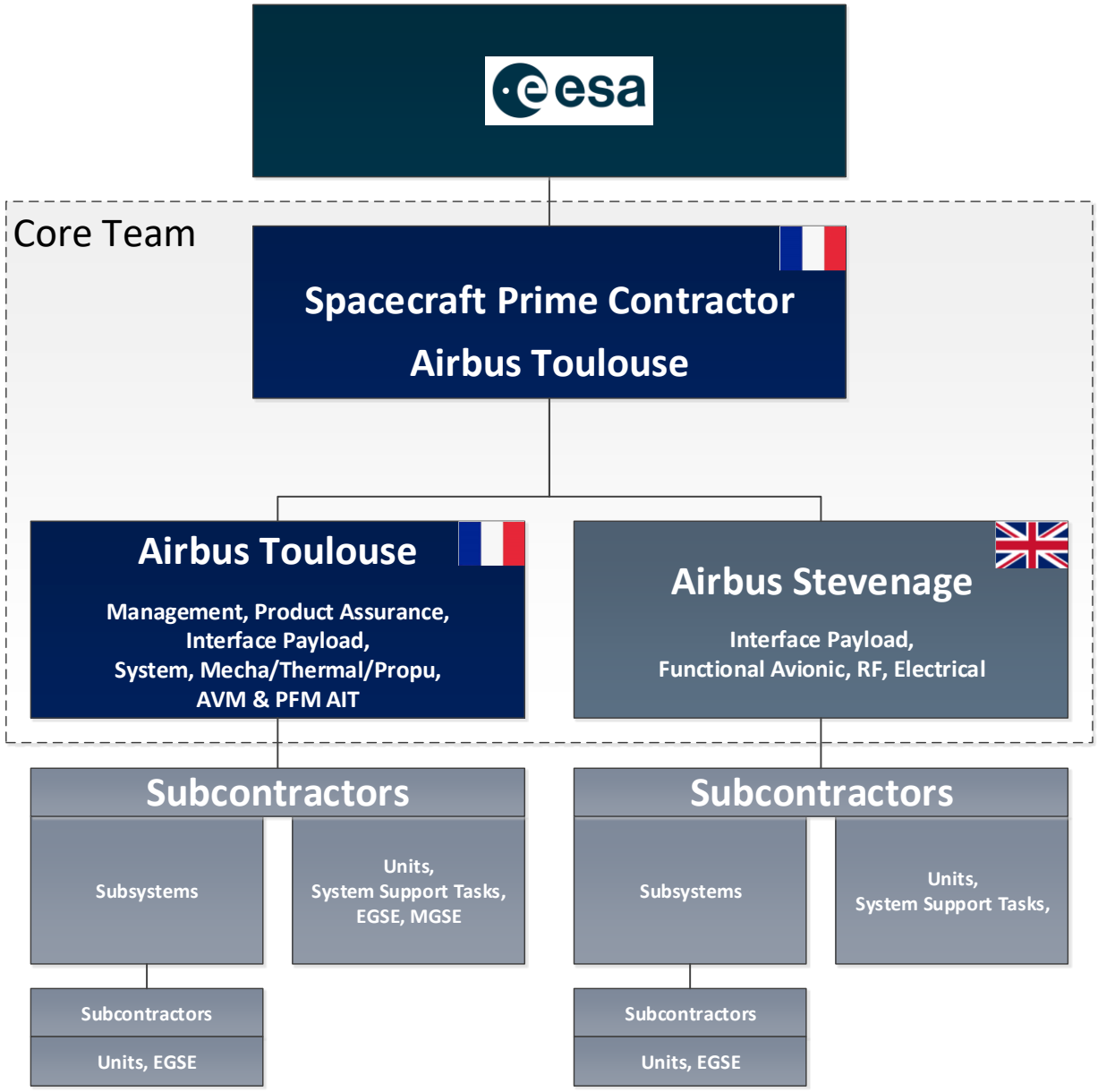
Ariel Industrial Organisation



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Pre-selected subcontractors

Pre-selection of 20% of the contract amount was required by ESA in the frame of the Prime proposal for the B2/C/D phase ITT

Pre-selected subcontractors had to be out of DE/FR/IT and ES/NL

Pre-selected item	Supplier		
Structure Subsystem (STS)		CH	APCO Technologies
Chemical Propulsion Subsystem (CPS)		SE	OHB
On Board Computer (OBC)		SE	RUAG
Remote Interface Unit (RIU)		SE	RUAG
Power Conditioning and Distribution Unit (PCDU)		BE	THALES ALENIA SPACE
Harness		RO	SONOVISION
Rate Measurement Unit (RMU)		IE	INNALABS
Acceleration Measurement Unit (AMU)		IE	INNALABS
Medium Gain Antenna Main Assembly (MGAMA)		PL	SENER
Thermal HW		AT	RUAG
Mechanical and Thermal Analyses		CZ	L.K. ENGINEERING

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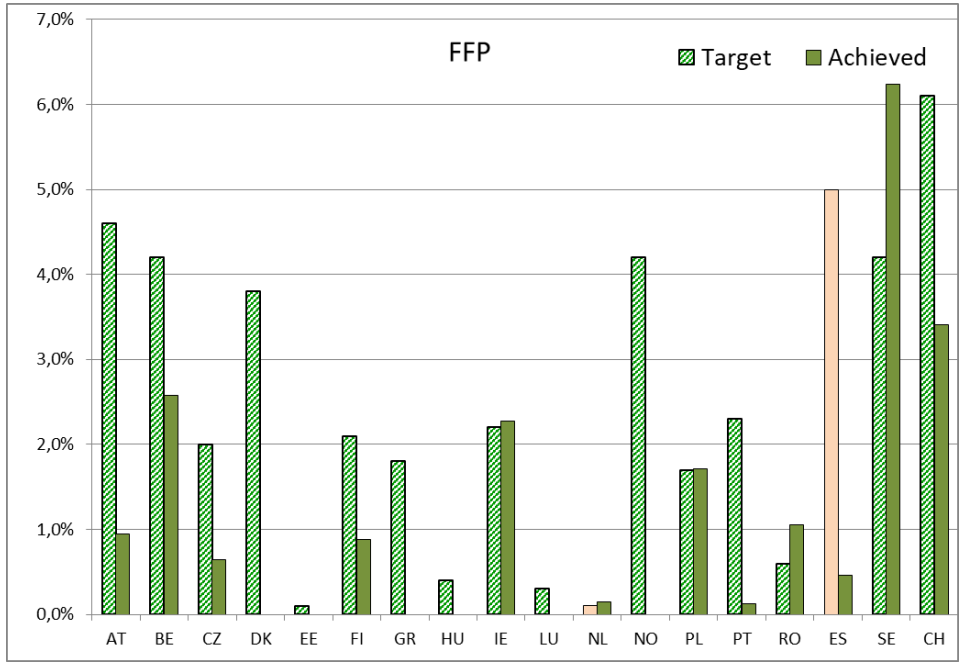
Ariel – Geographical return obligations and current situation

NON BIG-4 COUNTRIES	
Member State	**Geographical Return Requirements for Ariel (%)**
Austria	4.6
Belgium	4.2
Czech Republic	2.0
Denmark	3.8
Estonia	0.1
Finland	2.1
Greece	1.8
Hungary	0.4
Ireland	2.2
Luxembourg	0.3
Netherlands	<0.1
Norway	4.2
Poland	1.7
Portugal	2.3
Romania	0.6
Spain	<5.0
Sweden	4.2
Switzerland	6.1

BIG-4 COUNTRIES	
Member State	**Geographical Return Requirements for Ariel (%)**
DE + IT	<6%
UK	>16%
DE+FR+IT+UK	<55%

SME > 7%



Ariel procurement is run according to ESA Best Practices in the frame of a science mission

- All ESA member states are contributing and expecting a fair return
  - Outside of Big-4 countries (DE, FR, IT, UK)
  - For UK SMEs
  - Not forgetting Member states with critical geo-return situation

Situation at Ariel program Kick-Off:

- Some countries have their return already fulfilled: IE, NL, PL, RO, SE
- SME ~ 3,8%

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Remaining ITTs (description and planning)

DEFENCE AND SPACE

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Remaining ITTs to be published

Flight HW :

- Communication Subsystem
- Solar Array Subsystem
- Reaction Wheels
- Star Trackers
- Coarse Sun Sensor
- Battery

GSE :

- EGSE, including the SIS
- MGSE
- Simplified PLM SM
- RF Suitcase
- Real Time Simulator models
- SVM Warm Box Thermal Control GSE
- Thermal GSE 45K

Support tasks :

- AOCS support
- Schedule support
- RAMS support
- PA support (supply quality, EEE, M&P (TBC))
- Database support
- CSW development support
- ISVV
- Operations & FV support
- AVM & PFM AIT support

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Remaining ITTs
FLIGHT HW

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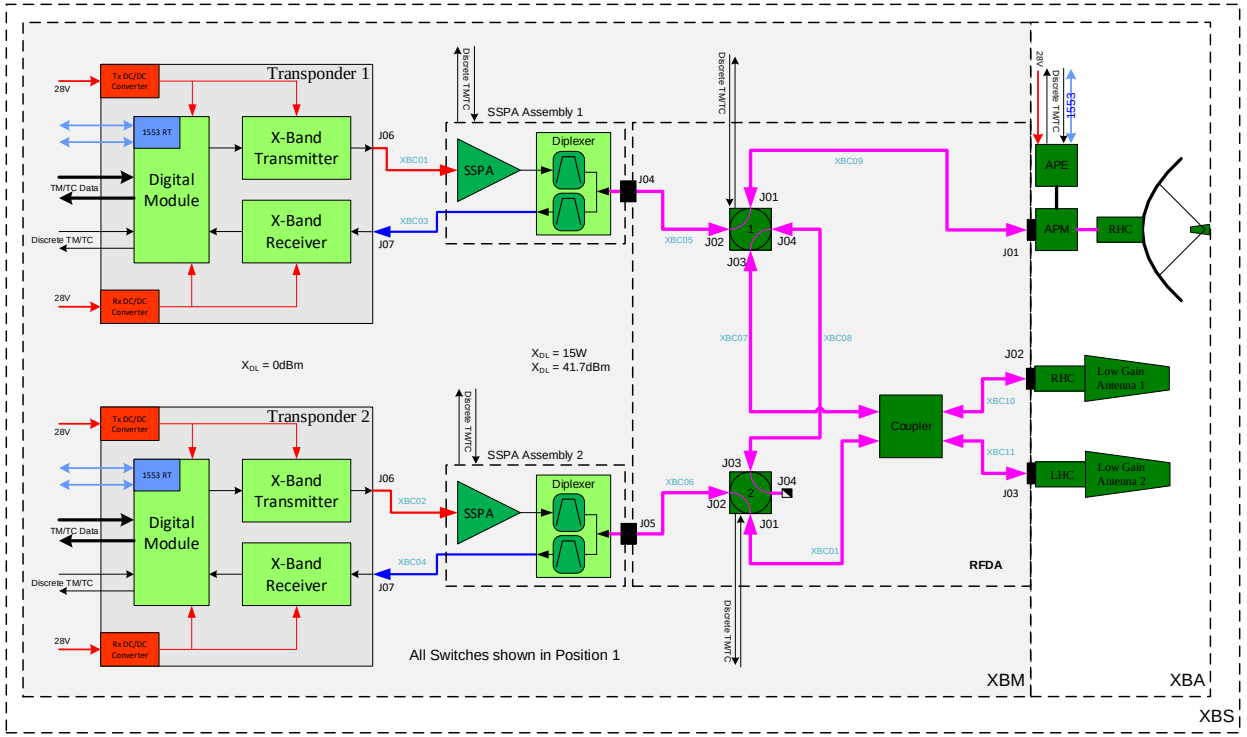
Communication Subsystem

ITT expected to be published in September 2022

The communications / TT&C Subsystem consists of the following hardware:

- 2x X-Band Transponders
- 2x 15W SSPA
- RFDN consisting of Coax, Coax Switches and a coupler
- 2x Low Gain Antennas for 4pi steradian coverage



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Power Equipment

Solar Array Subsystem

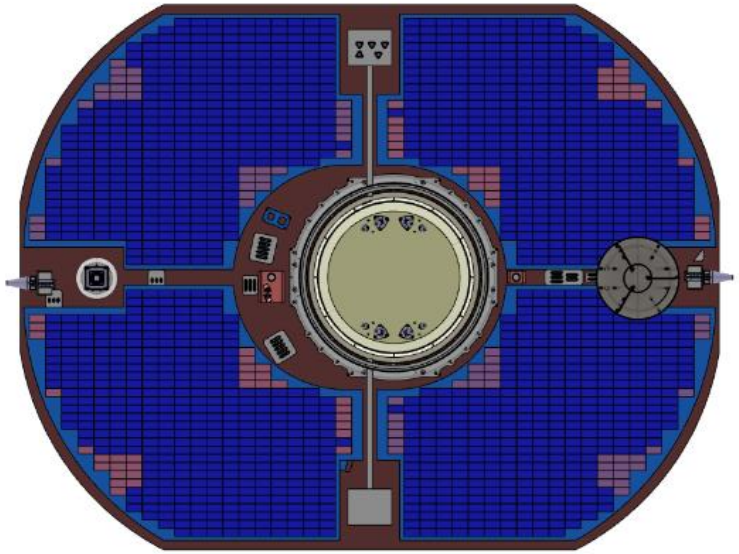
ITT expected to be published in January 2024

Body mounted Solar array

4 panels / 6 sections (9A)

Steady State Power of ~1100W EoL

Operating Voltage of 29.1V



Battery

ITT for the Battery expected to be published in March 2023

1 Battery

Minimum nameplate energy ~1400 Wh

Unregulated bus

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Sensors and Actuators

Reaction Wheels

ITT expected to be published in January 2023

4 Reaction Wheels

Angular momentum:
- Momentum : H1 > 3.75 N.m.s at 600 rpm
- Momentum : H2 > 20 N.m.s at full nominal rotation rate

The wheel shall implement a speed control loop to mitigate RW spikes

It shall be possible to operate the wheel at a constant low speed of 200 rpm for periods of up to 12 hours. This is needed to avoid microvibrations above 10 Hz

Star Trackers

ITT for the Star Trackers expected to be published in July 2023

2 Star Tracker Optical Heads

Sun Sensors

ITT for Coarse Sun Sensors expected to be published in October 2023

2-axis CSS
2 units

High level of TRL is required for all these units

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Remaining ITTs
GROUND SUPPORT EQUIPMENT

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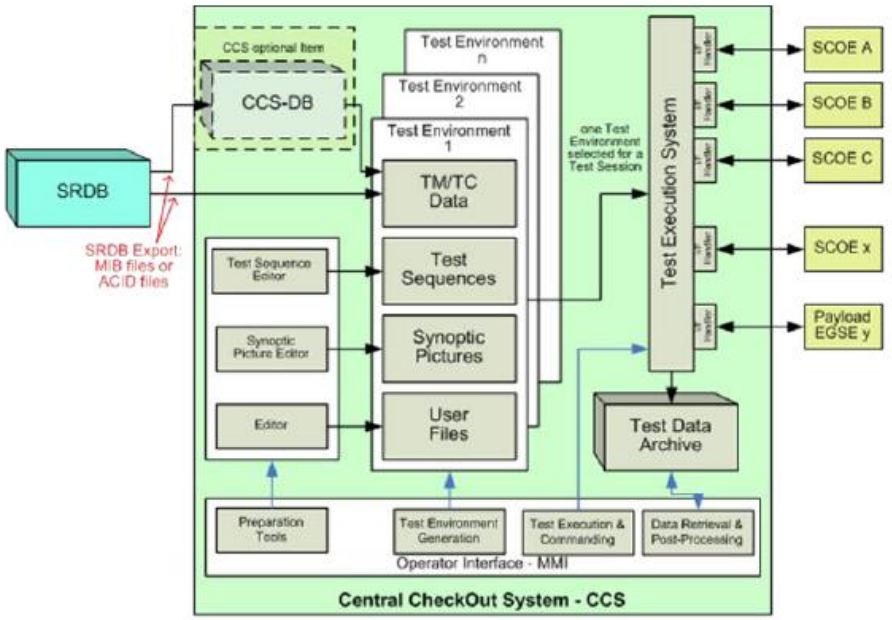
EGSE
CCS and TM/TC SCOE

Central Check-out System

ITT for the CCS expected to be published in April 2023

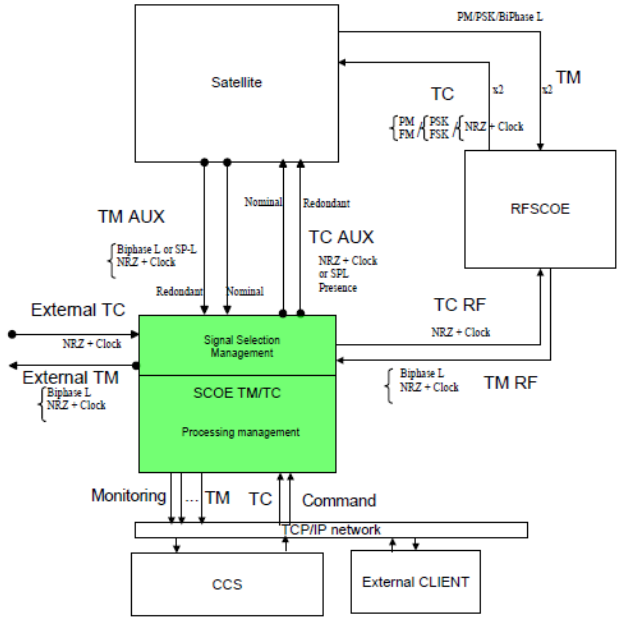
3 units to be procured
Full CCS system including SW
Implements EGS-CC



TM/TC SCOE

ITT for the TM/TC SCOE expected to be published in April 2023

3 units to be procured



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EGSE
Power SCOE and RF SCOE

Power SCOE

ITT for the Power SCOE expected to be published in February 2023

It is composed of :

- Umbilical SCOE (3 units)
- Solar Array Power Simulator (1 unit)
- PCDU Simulator (1 unit)

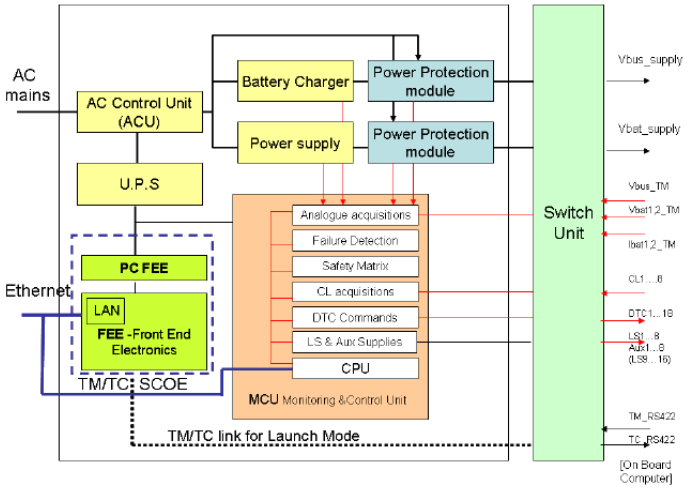


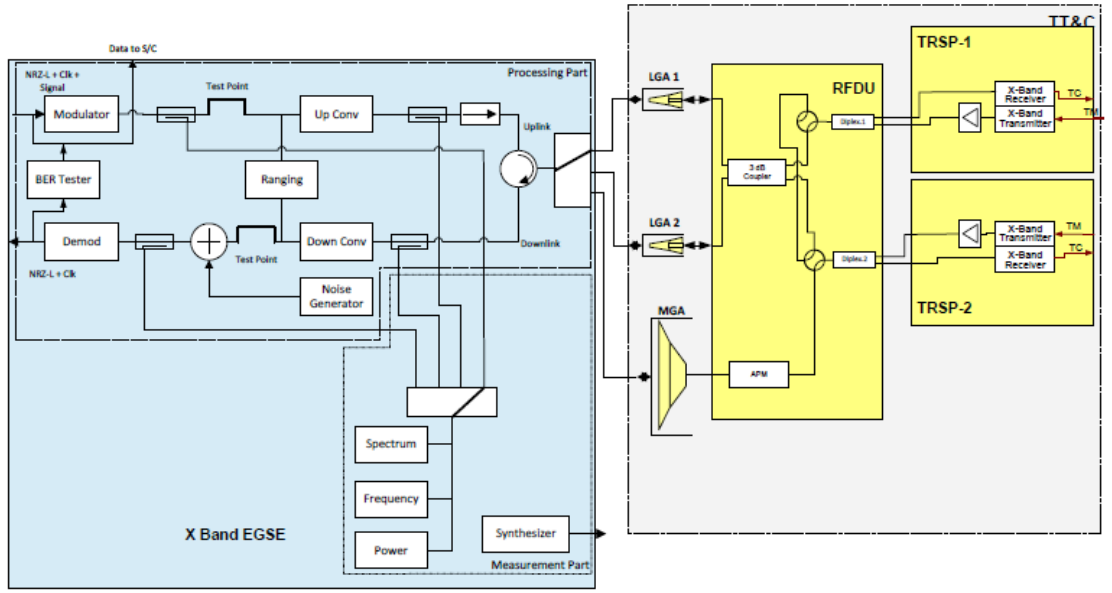
Figure 4: Umbilical rack of the Power SCOE

RF SCOE

ITT for the RF SCOE expected to be published in November 2023

2 units to be procured

X-Band



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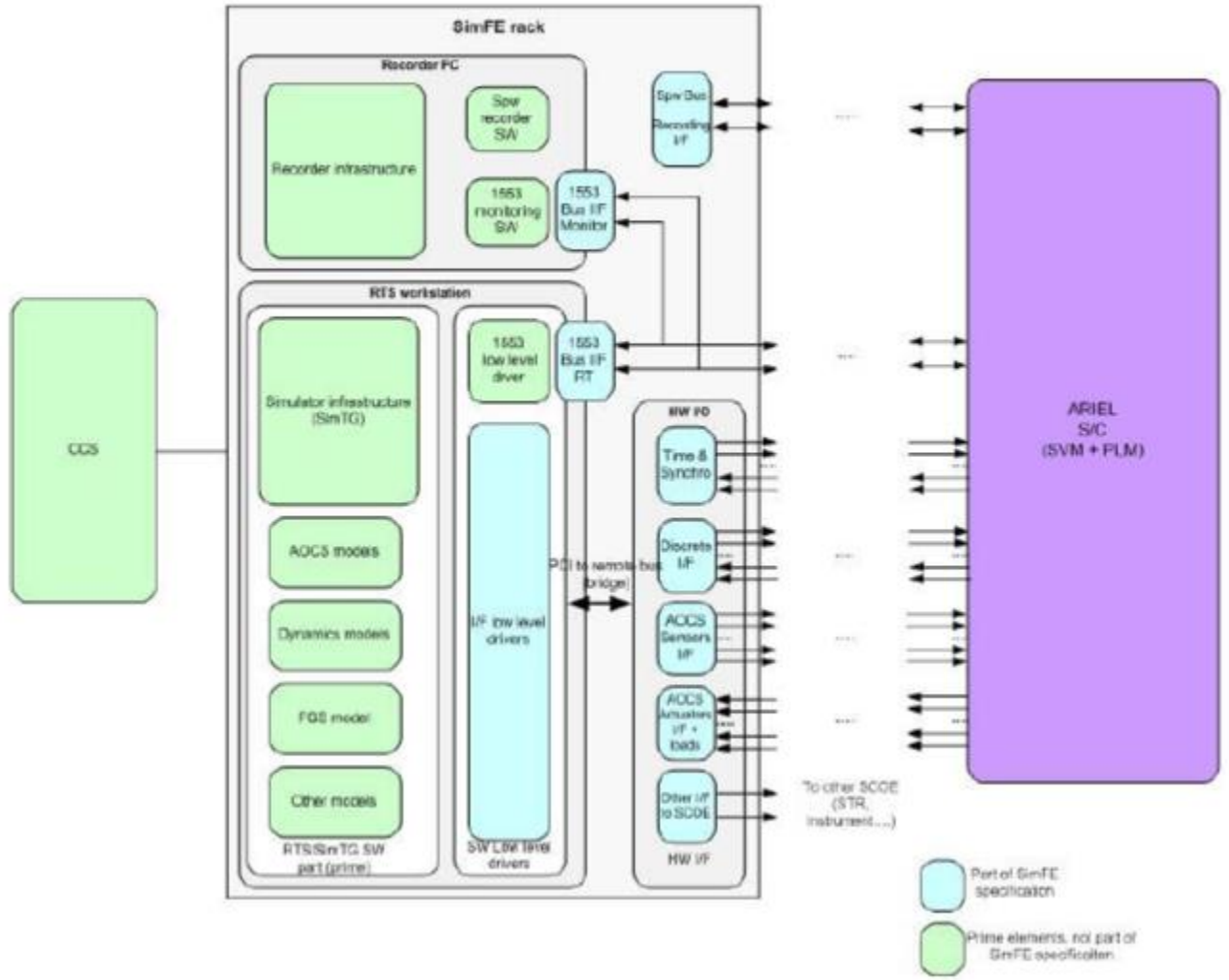
EGSE
Simulator Front End

Simulator Front End

ITT for the Simulator Front End expected to be published in July 2023

2 units to be procured

Implements the HW/SW interfaces necessary to interface the numeric simulation of the real-time simulator (RTS) with the specimen under test (S/C AVM or S/C PFM)



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EGSE

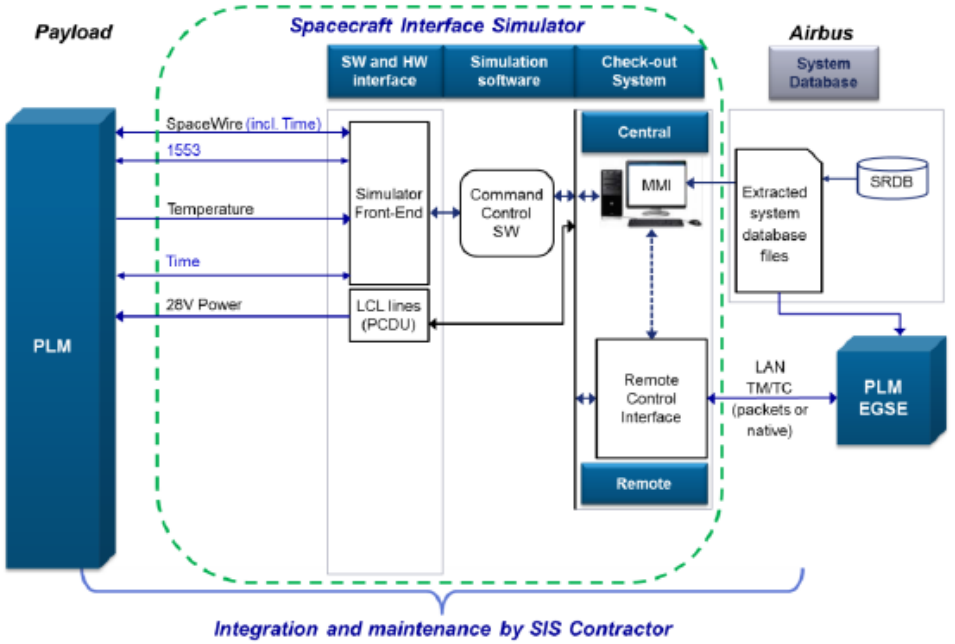
Spacecraft Interface Simulator

This ITT will be released soon !

ITT for the SIS expected to be published in June 2022

Simulate Ariel Platform electrical and functional interfaces.
Used during Payload level testing to control the entire Payload in a representative way.
The SIS supports the required hardware and software interfaces to:

- Power the instrument
- Control the instrument (TC packets via SpaceWire and Milbus)
- Monitor the instrument (TM packets via SpaceWire and Milbus)
- Synchronize the instrument



It includes a full Central Check-out System (CCS) providing a MMI to control the SIS, to inject failures, to log data, to offer scripts facilities running automatically.

4 models are developed in parallel:

- Two SIS reduced models: used to support the development and testing of a single Payload unit (ICU+TCU at INAF in Italy and FCU at CBK in Poland).
- Two SIS complete models including one spare: used to support the development and testing of the CCE and the overall Payload. They are delivered at RAL Space in GB.

Harness is supplied with each model to connect it with the equipment in test, but also to connect the Payload units to each other (TBC)

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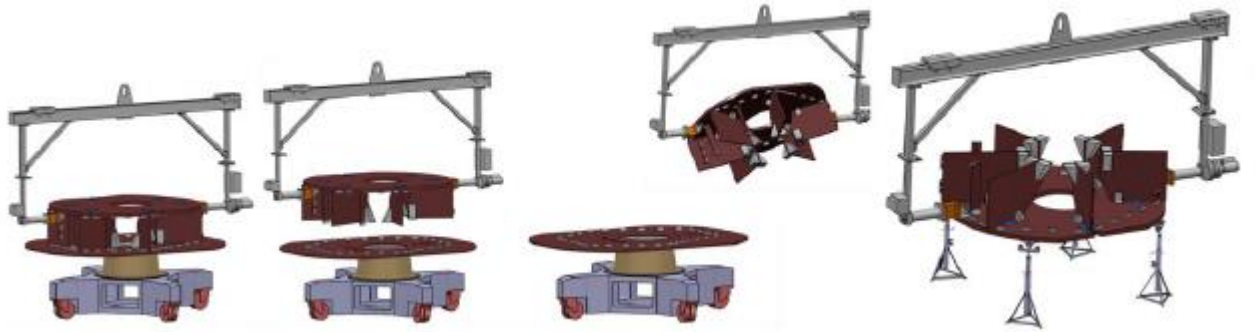
MGSE

Two Sets of MGSE are procured.

ITTs for the two sets of MGSE expected to be published in July 2024

First Set : S/C handling GSE

- Vertical Integration Stand
- Spacecraft Lifting device
- Thermal Test Adaptor
- Top floor tilting device
- AIT Clampband



Top floor lifting device

Second Set : Solar Array GSE

- Solar Array integration device
- Dummy Solar Array for S/C TB/TV

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Simplified PLM SM

ITT for the Simplified PLM SM expected to be published in June 2022

This ITT will be released soon !

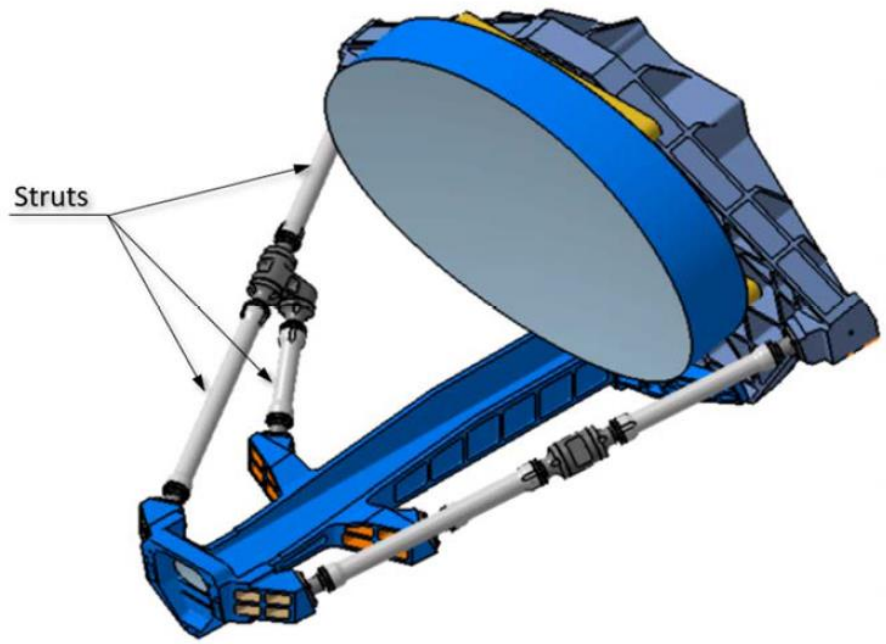
A Structural model of the satellite is required for Ariel
It embeds a structural model of the Platform (done by APCO) and a simplified structural model (SPSM) of the Payload.
The SPSM is made of :

- A structural model of the Telescope
- The V-Grooves and bipods provided as CFI

The tasks to be done by the subcontractor for the SPSM:

- Design, manufacturing and delivery of the Payload Telescope SM
- As an option : assembly and modal characterization of the complete SPSM

It is foreseen that the build material of the PLM Telescope SM is aluminium



Ariel Payload Telescope

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RF Suitcase

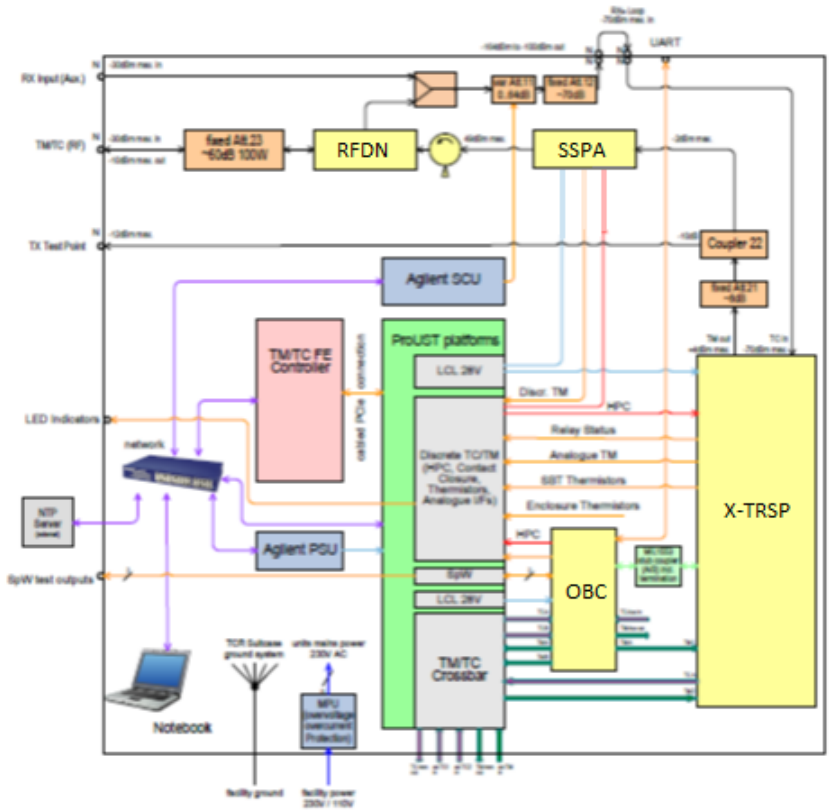
ITT for the X-Band RF Suitcase expected to be published in July 2025

To be delivered to ESA

On board units are provided by Airbus as CFE : Elegant breadboard of the OBC, EM of the X-TRSP, SSPA, RFDN

The RF Suitcase is completed with dedicated equipment supplied by the subcontractor :

- Specific HW to connect the ground station interface and to simulate the propagation losses
- Appropriate EGSE, such as TM/TC front end



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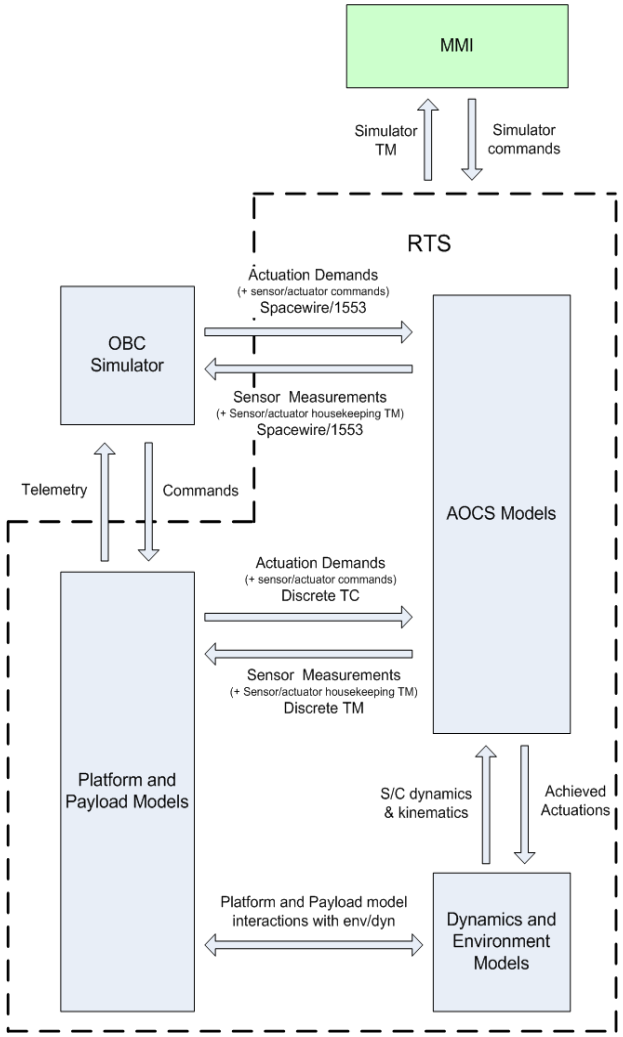
Real Time Simulators Models

ITT for the RTS Model expected to be published in October 2022

The scope of this ITT covers:

- Data Handling System (RIU, Mass Memory) models
  - Note that On Board Computer Model is excluded from list of models to be developed.
- Electrical Power Subsystem models (PCDU, Battery, Solar Array)
- AOCS Subsystem models (CSS, RW, STR, Coarse gyro, Accelerometer)
- Propulsion Subsystem models (Tanks, Valves, Transducers, Thrusters)
- Communication Subsystem models (Xband Transponders, SSPA, RFDN)
- Medium Gain Antenna Models (APME & APM)
- Payload Instruments models (4 instruments)
- Platform Thermal model.

Airbus will provide the Simulation Infrastructure (SimTG) for the RTS models development and testing.



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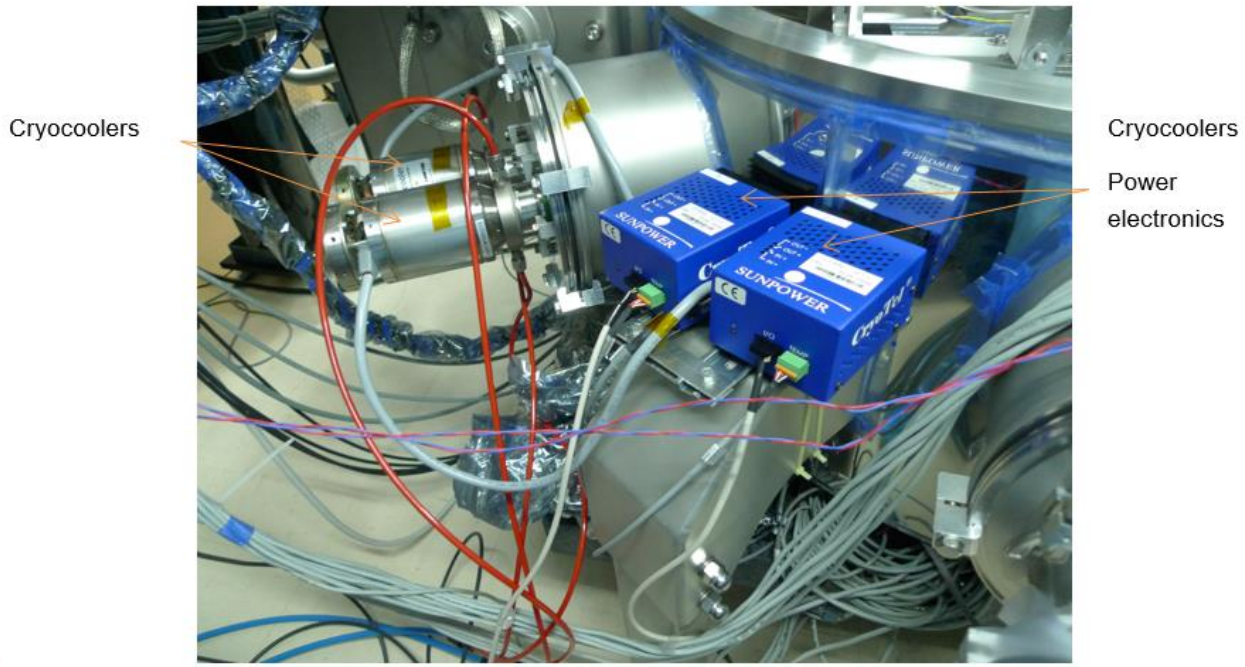
Thermal GSE 45K

ITT for the Thermal GSE 45K expected to be published in March 2025

It provides a cold interface point (45K-60K) on V-Groove IF3.
It includes a command & control bay and helium based thermal generator.
Conduction from cold point thermal generator (cryocooler) and IF is provided by a copper braid.



Example of 40K cold point generator for a previous optical TVAC test

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SVM Warm box Thermal Control GSE

The need for this GSE is TBC, under discussion with ESA and the Payload Consortium

ITT for the SVM Warm Box Thermal Control GSE expected to be published in February 2024

The SVM Warm box is a GSE simulating the Platform environment supplied to the Payload Team to support the Thermal test of the Payload

This GSE aims at measuring the thermal sensors and commanding heaters of the Warm box.

Remaining ITTs
Support Tasks

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AOCS and Schedule Support

AOCS Support

ITT for the AOCS Support expected to be published in August 2022

Responsibility for AOCS subcontracted modes design, performance and verification :
- AOCS architecture and design for the ARIEL NOM-C, NOM-O modes (TBC), including production of AOCS MCL Matlab/Simulink model
- AOCS modes verification

Support expected from January 2023 up to April 2026 (S/C CDR)
Most of the activity is realised at the subcontractor premises, with some colocation periods (in UK - Stevenage) to be defined.

Schedule Support

ITT for the Schedule Support expected to be published in October 2022

Schedule control for the Spacecraft
Consolidation of schedule inputs from the equipment suppliers and the Payload supplier
Perform the Key Interface Data (KID) process
Support expected from April 2023 up to August 2028
The activity is realised at the subcontractor premises.

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RAMS and Product Assurance Support

Reliability, Availability, Maintainability and Safety (RAMS) Support

ITT for the RAMS Support expected to be published in November 2022

Objective is to provide RAMS engineering support to Airbus PA and Engineering managers for the management of subcontractors and the preparation of equipment inputs to the system RAMS
Support expected from May 2023 up to June 2026 (S/C CDR)
Most of the activity is realised at the subcontractor premises, with some colocation periods (in Toulouse) prior to the S/C PDR & CDR.

Product Assurance Support

ITT for the Product Assurance Support expected to be published in May 2023

Scope of work is divided into 3 activities defined in separate work packages (applying to the Platform) in order to provide:

- Materials & Processes support to Airbus PA and Airbus M&P managers for the management of subcontractors and the preparation of equipment's inputs to the system M&P.
- EEE support to the Airbus PA and Airbus EEE managers for the management of subcontractors and preparation of equipment's inputs to the system EEE
- Supply Quality Assurance support to the Airbus PA Manager for the procurement of Platform equipment

Support expected from October 2023 up to August 2026 (Start of P/F AIT)
Most of the activity is realised at the subcontractor premises, with some colocation periods (in Toulouse) prior to the S/C PDR & CDR.

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Database, CSW and ISVV Support

Database Support

ITT for the Database Support expected to be published in September 2023

Support to the Database Manager for the population, consolidation and follow-up of the Ariel satellite database deliveries
Support expected from March 2024 up to August 2028
Mostly colocated in Airbus UK (Stevenage)

CSW Development Support

ITT for the CSW development Support expected to be published in September 2023

Scope of work consists in all the classical software development phases: software engineering, architectural design, detailed design, coding, unit testing, integration testing and validation.
Functions to be subcontracted are TBD.
Activity performed in the subcontractor premises.

ISVV Support

ITT for the ISVV Support expected to be published in February 2024

Activity performed in the subcontractor premises.
Preliminary information on the scope of the ITT:

	ISVV level 1	ISVV level 2	ISVV level 3
OBC boot software		x	
HD software		x	
CSW I/O		x	
CSW DMS		x	
CSW PUS-services			
CSW - AOCS		x	
CSW – avionics mgt		x	
CSW - system mgt		x	
CSW - FDIR			x
Option 4 : STR SW	x		
Option 5 : TRSP SW	x		

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Operations & FV, AVM & PFM AIT Support

Operations and Functional Verification Support

ITT for the Operations & FV Support expected to be published in June 2024

- Participation to the Spacecraft User's Manual elaboration
- Definition & validation of Operational Procedures,
- Functional validation tests preparation & execution on Spacecraft Simulator.

Support expected from January 2025 up to August 2028
Partially colocated in Airbus UK (Stevenage) and Airbus FR (Toulouse)

AVM & PFM AIT Support

ITT for the AVM & PFM AIT Support expected to be published in June 2024

This support will be provided in the domains of:

- AVM assembly (including harness installation)
- Mechanical integration of electronic equipment and their dedicated electrical connection on AVM and PFM,
- Functional testing, including preparation, execution and test result evaluation on AVM and PFM,
- EGSE and database support on AVM and PFM

Support expected from January 2025 up to August 2028
Activities colocated in Airbus FR (Toulouse)

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Best Practices Schedule summary

Procurement Selection sets	ITT date	Items
Set #1	06/2022	Simplified PLM SM Spacecraft Interface Simulator (SIS)
Set #2	08/2022	AOCS Support
Set #3	10/2022	Schedule Support Communication Subsystem (COMS) Real Time Simulator (RTS)
Set #4	11/2022	RAMS Support
Set #5	01/2023	Reaction Wheels (RW)
Set #6	02/2023	Power SCOE
Set #7	03/2023	Battery
Set #8	04/2023	TM/TC SCOE Central Check-Out System (CCS)
Set #9	05/2023	Product Assurance Support
Set #10	07/2023	Simulator Front End Star Tracker (STR)
Set #11	09/2023	CSW development Support Database Support
Set #12	10/2023	Coarse Sun Sensor (CSS)
Set #13	11/2023	RF SCOE
Set #14	01/2024	ISVV Solar Array Subsystem
Set #15	02/2024	SVM Warm Box Thermal Control EGSE
Set #16	06/2024	Operations Support AVM & PFM AIT Support
Set #17	07/2024	MGSE Set 1 (Stand, adaptors, clampbands etc.) MGSE Set 2 (Solar Array GSEs)
Set #18	03/2025	Thermal GSE 40K
Set #19	07/2025	RF Suitcase

Kick-Off date of each procurement item is between 5 to 7 months after the ITT release

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Ariel

Observing exoplanets across light-years

Thank you, we wish you to make good proposals for the Ariel Best Practices procurement and to join the programme

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