

Coarse Sun Sensor (CSS) Development: PECS Activity Overview

AO/ 1-10803/21/NL/MH/eh

16/04/2021

New, Associate and Cooperating States (IPL-IPS),

Industrial Policy and SME Division

DISCLAIMER



- This presentation material does not contain sufficient information to be used officially, in any way, in the context of the expected ITT (Invitation-to-Tender AO/ 1-10803/21/NL/MH/eh).
- This presentation is just to help understand, in a simplified manner, some of the Rules and Procedures associated with ESA procurements.
- Please ensure that any proposal submitted to ESA is compliant with the requirements contained in the official ITT documentation specific to the tender.

Registration in esa-star is an essential pre-requisite to bid!

To register in esa-star:

https://esastar-emr.sso.esa.int/

Introduction





The Government of the Slovak Republic adopted on 7th October 2020 the resolution approving the <u>intention of Slovakia</u> to continue in cooperation with ESA after end of PECS extension period with focus to become an Associate Member and approved financial contribution to ESA of 4,5 million € per year during new Slovak budget period.

→ PECS

The **ESA Council** approved an 18 month extension of the current PECS agreement on the **16**th **of December 2020** to enable further strengthening of the Slovak Space Industry and the opportunity for advancement of products and services to higher Technical Readiness Levels (TRLs). **This is expected to offer excellent development opportunities for Slovak Space in 2021/2022**.

This expected Top Down PECS development offers the advantage of a potential additional source supplier of <u>Coarse Sun Sensors (CSS)</u> on the world market. In particular the activity will target, the market segment of New Space and constellation satellites, where a gap in supplier capacity for Sun sensors at reduced cost and coarse performance has been identified. Thus, the CSS to be developed in this activity is considered to be complementary to the existing European suppliers.

Coarse Sun Sensor (CSS) Development: Objectives & Work Overview



The objective is to provide Slovak entities an opportunity to acquire practical and relevant space hardware development experience. The programme of work will offer greater familiarity with the working practices of the Agency and the use of applicable space standards (ECSS). Preliminary design, development and calibration of a Coarse Sun Sensor will serve as an opportunity to further strengthen the Slovak industrial base. The activity is a potential stepping stone to other space product developments, and will increase readiness of Slovak entities to collaborate with European partners for future activities in the space sector. Specifically, the activity will:

- A. Consolidation of the Technical Requirements Specification (TRS) of an analogue Coarse Sun Sensor (CSS) unit in accordance with the standards and guidelines described by the European Cooperation for Space Standardization in the ECSS standards, in particular E-20, E-32. Followed by Sun sensor breadboard design, manufacturing and testing.
- B. Develop and commission a ground test facility for accurate calibration and performance characterization of the sensor also in line with ECSS standard.

Coarse Sun Sensor (CSS) Development: Practical Information



To limit the development risk, the activity shall be split into 2 parts (CSS & ground test facility), which are foreseen to be segmented into 4 contractual phases. The preliminary design, supporting analyses and breadboard tests shall be reviewed by the Agency in a Preliminary Design Review (PDR). After completing the activity, an ending TRL of 5 is expected (successful PDR supported with breadboard results).

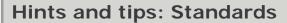
Phase 1 a CSS + Phase 2a test facility (in parallel for ~200K€ for both): These phases shall end with a Unit Requirements Review (URR), where the consolidated technical requirements specification, and the architectural design shall be reviewed by the Agency and with a Test Facility Design Review (TFDR).

Phase 1b CSS + Phase 2b test facility (in parallel for ~300K€ for both): These phases shall encompass the manufacturing and commissioning of the test facility, preliminary design activities, and breadboard test activities ending with a Preliminary Design Review (PDR) and a Commissioning Review (CR).

- Suggested duration for all work: ~15 months
- Publication date on ESA STAR: 25 May 2021
- Deadline for proposals: 6 July 2021 @ 13:00 (CEST Amsterdam)
- Start of work expected: 4Q2021



General Information







It is highly recommended to examine ECSS documentation that will be relevant for this development.

ECSS documentation is available for free download from www.ECSS.nl. Registration on the website is free.

Documents recommended for reading pleasure include:

- ECSS-M-ST-10C Project Planning and Implementation
- ECSS-E-ST-10-06C Technical requirements specification
- ECSS-E-ST-60-10C Control performance
- ECSS-E-ST-60-20C Stars sensors terminology and performance specification
- ECSS-E-ST-60-21C Gyro terminology and performance specification
- ECSS-E-ST-10C Systems engineering general requirements
- ECSS-E-ST-10-02C Verification
- ECSS-E-ST-10-03C Testing
- ECSS-E-ST-10-04C Space environment
- ECSS-E-ST-10-12C Method for the calculation of radiation received and its effects, and a policy for design margins





























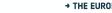












General Information

Hints and tips: Standards





- ECSS-E-ST-10-24C Interface management
- ECSS-E-ST-20C Electrical and electronic
- ECSS-E-ST-20-07C Electromagnetic compatibility
- ECSS-E-ST-31C Thermal control
- ECSS-E-ST-32C Structural general requirements
- ECSS-E-ST-32-01C Fracture control
- ECSS-E-ST-32-03C Structural finite elements methods
- ECSS-E-ST-32-08C Materials
- ECSS-E-ST-32-10C Structural factors of safety for spaceflight hardware
- ECSS-E-ST-32-11C Modal survey assessment
- ECSS-Q-ST-10C
 Product Assurance management
- ECSS-Q-ST-20C
 Quality Assurance
- ECSS-Q-ST-30C Dependability
- ECSS-Q-ST-60C Electrical, electronic and electromechanical (EEE) components
- ECSS-Q-ST-70C Materials, mechanical parts and processes







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Go to https://esastar-emr.sso.esa.int/

Support information in esa-star Registration User Manual: https://esastar-emr.sso.esa.int/Account/DownloadFile

See also: the presentation "BRIEFING HANDBOOK BASIC OF ESA PROCUREMENT" for more support information

ITT Opening: **25 May 2021**Submission Deadline: **6 July 2021 @ 13:00 CEST**

Negotiation / contract expected: 3Q2021



















THANKS FOR YOUR INTEREST IN PECS

Questions may be addressed to PECS Support Engineer: (kay.van.der.made@esa.int)



New, Cooperating and Associate States Section: Head of Section - S. Philip Airey (stephen.airey@esa.int)

Acronyms



AR acceptance review

B/L baseline

CBCP current baseline cost plan

CDR critical design review

CRR commissioning result review

DRL document requirements list

EAC estimate at completion

EGSE electrical ground support equipment

ELR end-of-life review

ETC estimate to completion

FRR flight readiness review

GSE ground support equipment

ILS integrated logistic support

ITT invitation to tender

LRR launch readiness review

MCR mission close-out review

MDR mission definition review

MGSE mechanical ground support equipment

N/A not applicable

OBCP original baseline cost plan

OBS organizational breakdown structure

ORR operational readiness review

PDR preliminary design review

PMP project management plan

PRD project requirements documents

PRR preliminary requirements review

QR qualification review

RFP request for proposal

RFQ request for quote

SRR system requirements review

WBS work breakdown structure

WP work package

Space project management



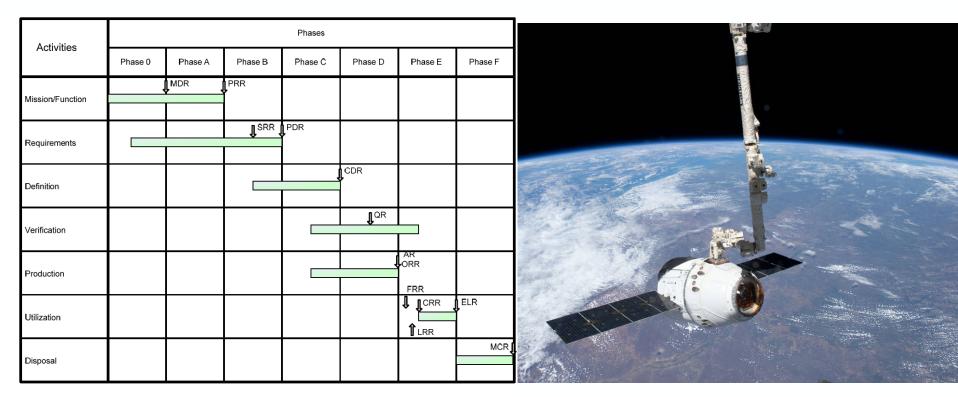
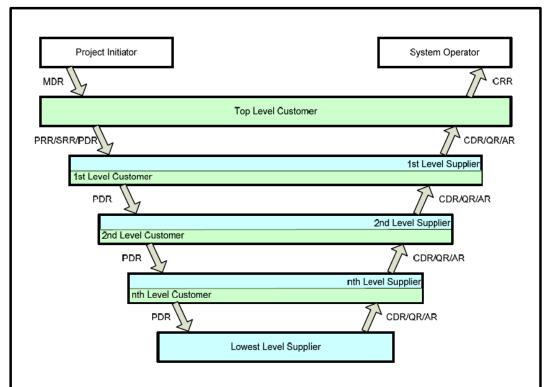


Figure 4-3: Typical project life cycle



Design and verification cycle: the V-Model





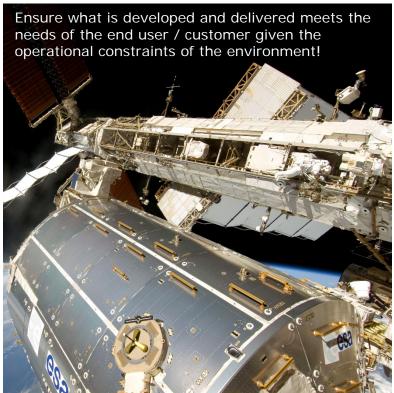
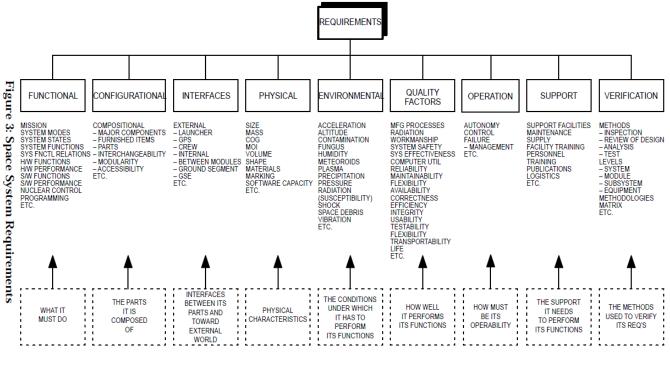
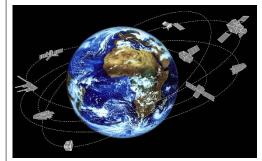


Figure 4-4: Review life cycle

Space Engineering - System Engineering







Notes: H/W = Hardware, S/W = Software, GPS = Global Positioning System, GSE = Ground Segment Equipment, COG = Centre of Gravity, MOI = Moment of Inertia







































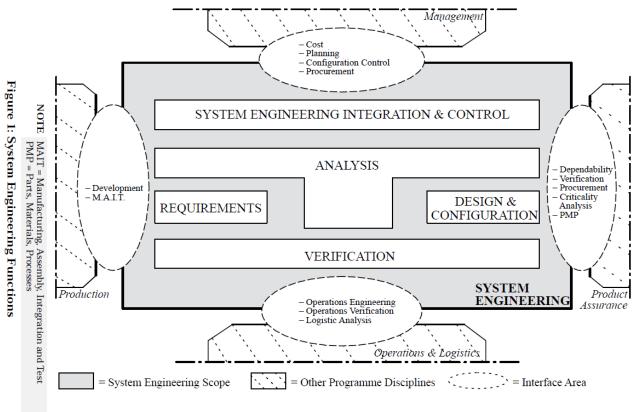






Space Engineering - System Engineering





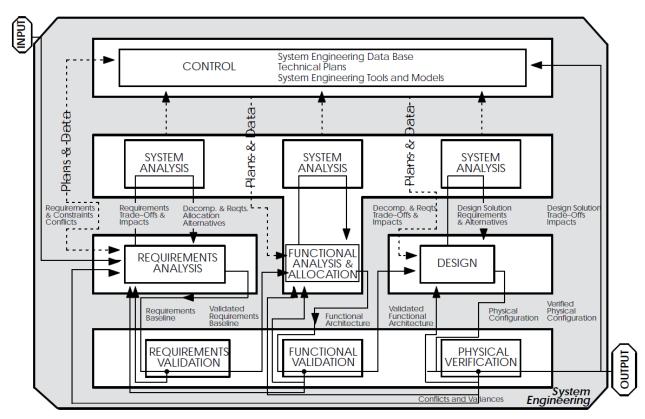


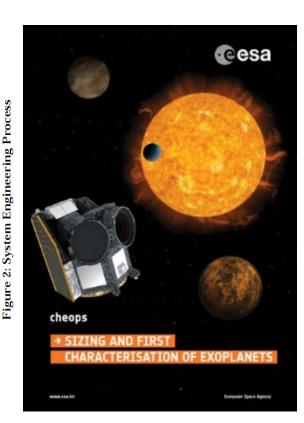




Space Engineering - System Engineering







Design and verification: structured requirements



