

The background features a dark blue space-themed pattern with white stars. Overlaid on this are several technical diagrams, including circular gauges with numerical scales (e.g., 160, 170, 180, 210, 220, 230, 240, 250, 260) and various circular paths with arrows indicating direction. The main title is centered in a large, bold, yellow font.

# **THE SCINTILLATION PREDICTION OBSERVATIONS RESEARCH TASK (SPORT): A SPACECRAFT DEVELOPMENT FOR AN INTERNATIONAL MISSION**

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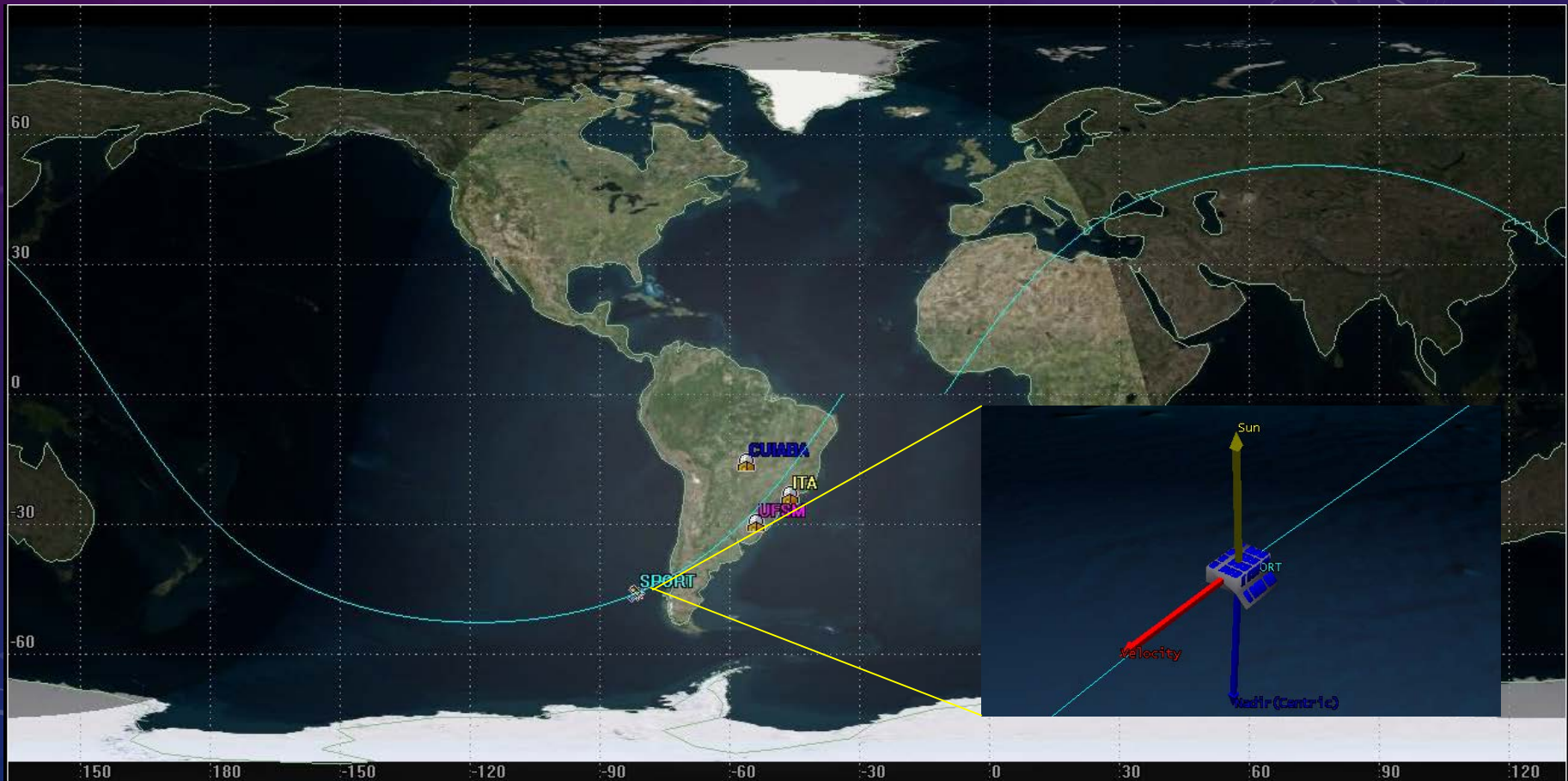
# AGENDA

- **SPORT MISSION**
- **SPORT PARTICIPANTS & RESPONSABILITIES**
- **PROJECT MANAGEMENT**
- **SYSTEM ENGINEERING**
- **SPACECRAFT DESCRIPTION**
- **EXPECTED RESULTS**

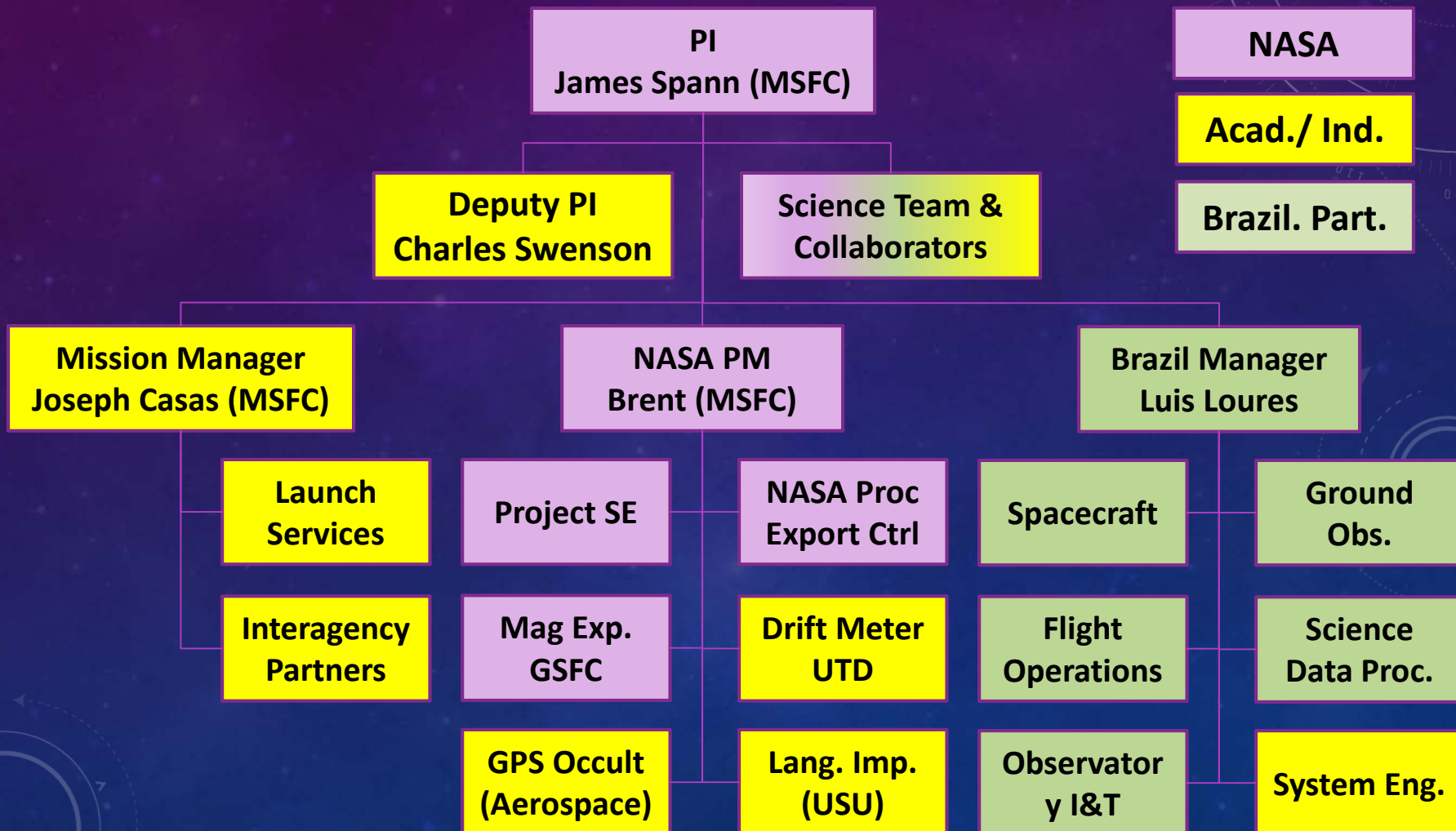
# SPORT MISSION

“The mission of this international partnership is to address the compelling but difficult problem of **understanding the preconditions leading to equatorial plasma bubbles that leads to scintillation and affects directly some services provided on Earth**, communications and navigation, for instance.”

# SPORT MISSION – ORBITAL PLANE

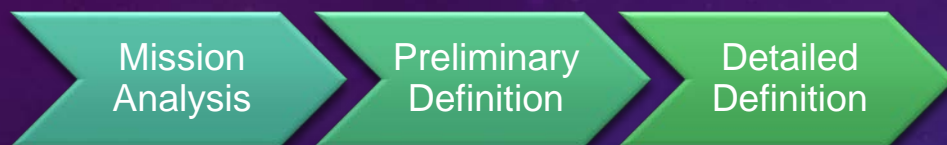


# SPORT PARTICIPANTS & RESPONSIBILITIES



# PROJECT MANAGEMENT

## PROJECT PHASES



- **During the phase 0/A the mission was defined and the mission objectives were evaluated against science objectives.**
- **During the phase B the requirements were confirmed, and the interfaces were verified. The proposed design was checked with respect to the science and mission objectives**
- **During phase C, the assurance is provided that the integrated spacecraft design, mission orbit and instruments are in accordance with the mission and science requirements prior to final assembly, integration and test**

# PROJECT MANAGEMENT

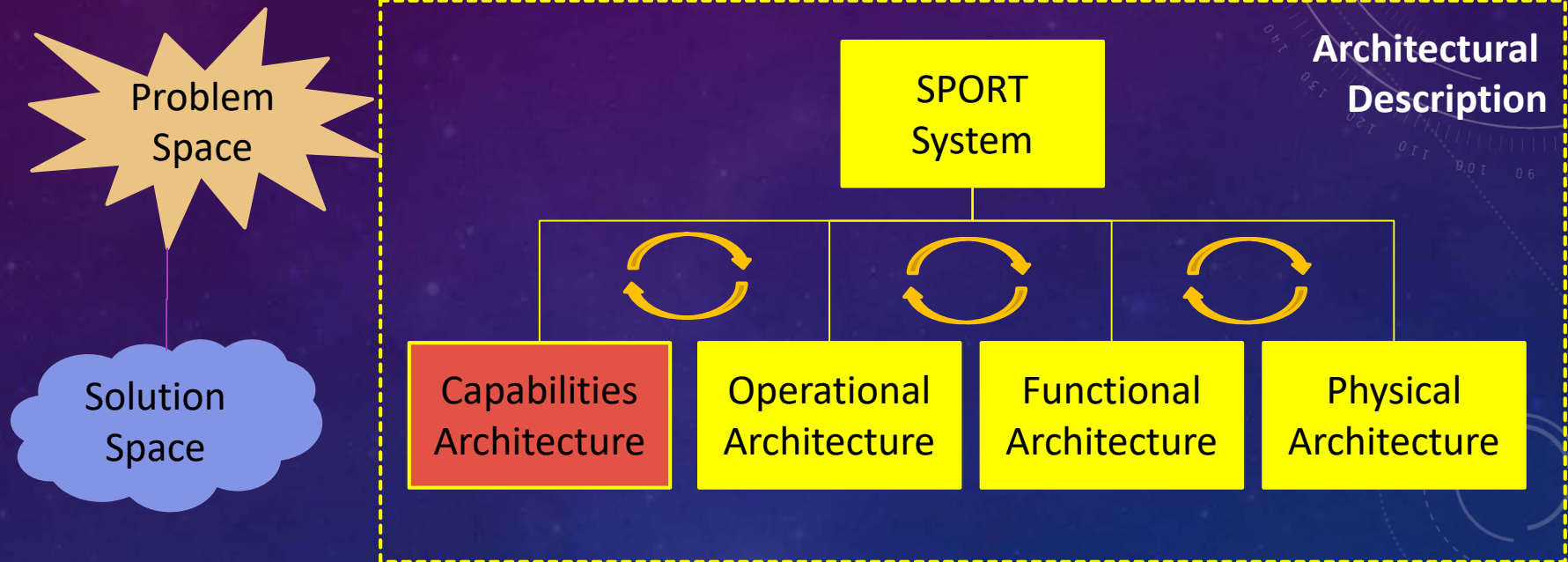
## PROJECT PHASES



- **During phase D the whole spacecraft will be assembled, integrated and tested. A detailed configuration verification of spacecraft will be performed.**
- **During phase E a checkout of launch and orbit will be performed and the observatory will be considered ready to accomplish the proposed mission**
- **During phase F the involved institutes and organization analyses the decision to terminate or decommission the system**

# SYSTEM ENGINEERING

## PROJECT LOOPS

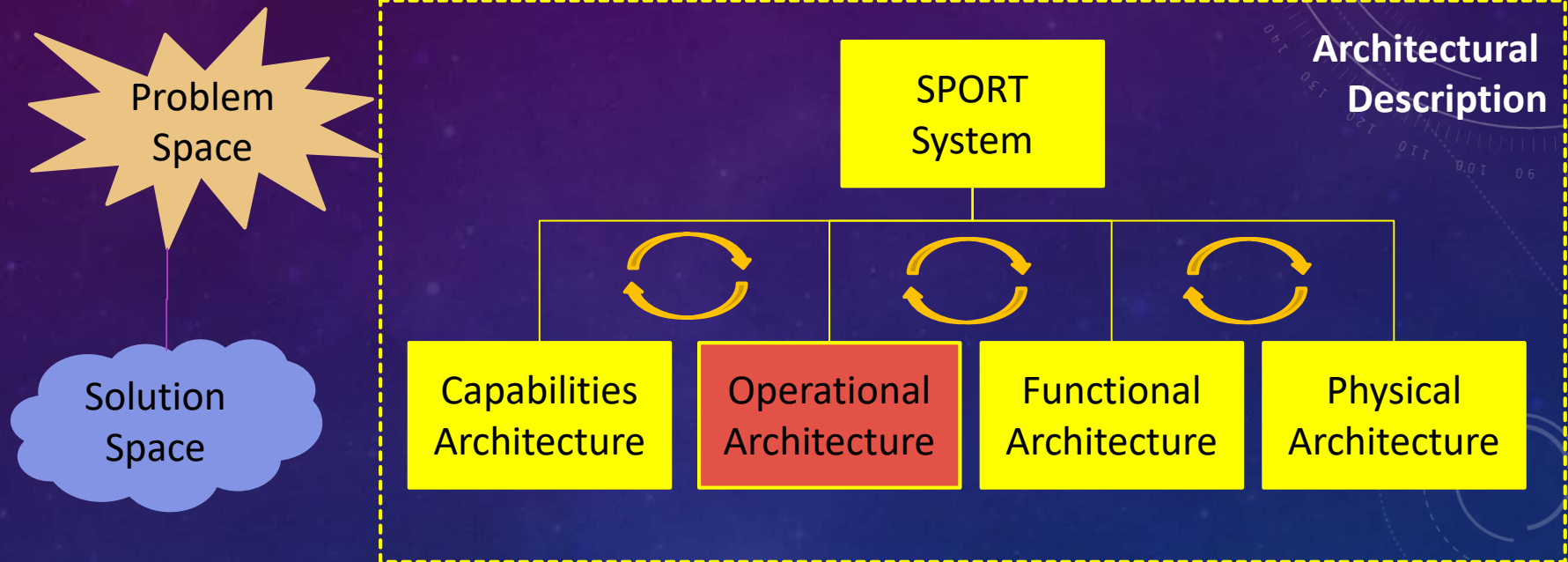


*The capabilities architecture stands for defining the user needs, i.e., understand what the statement of the mission is, and once it is identified, define the capabilities required to attend the user needs.*



# SYSTEM ENGINEERING

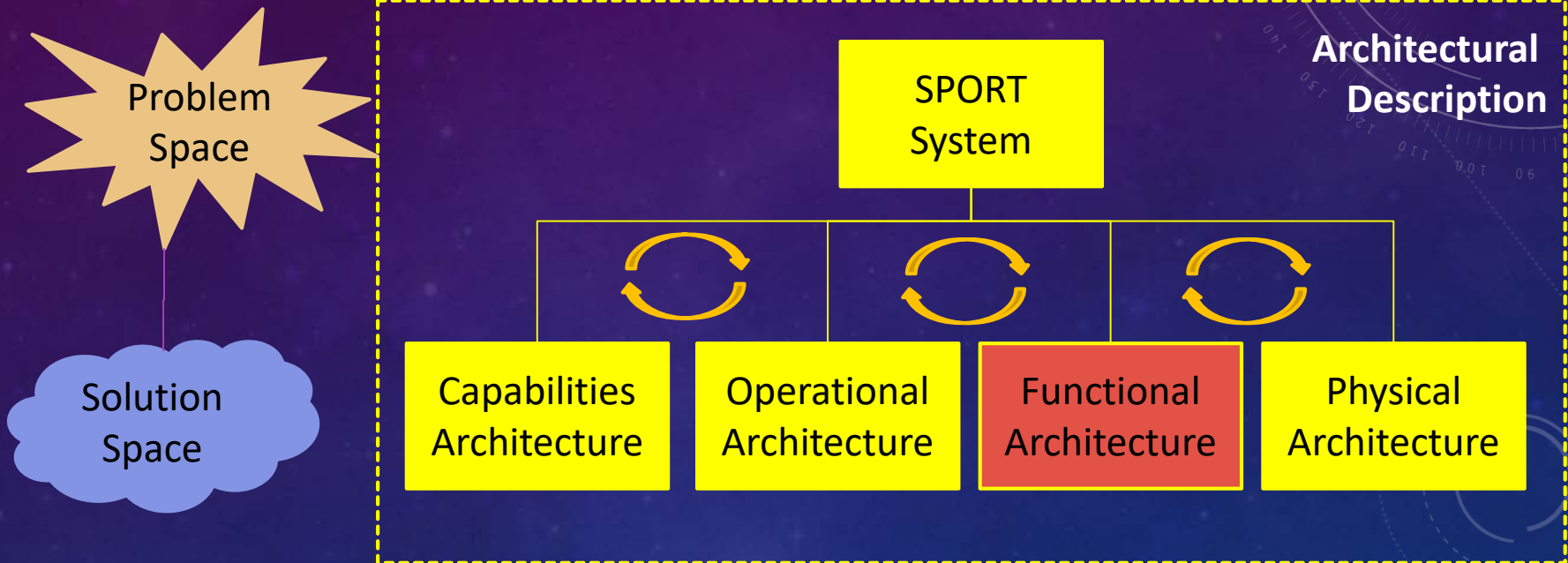
## PROJECT LOOPS



*In the operational architecture the purpose is to define the operational behavior of the system of interest, the conditions in what it may occur and the operational nodes.*

# SYSTEM ENGINEERING

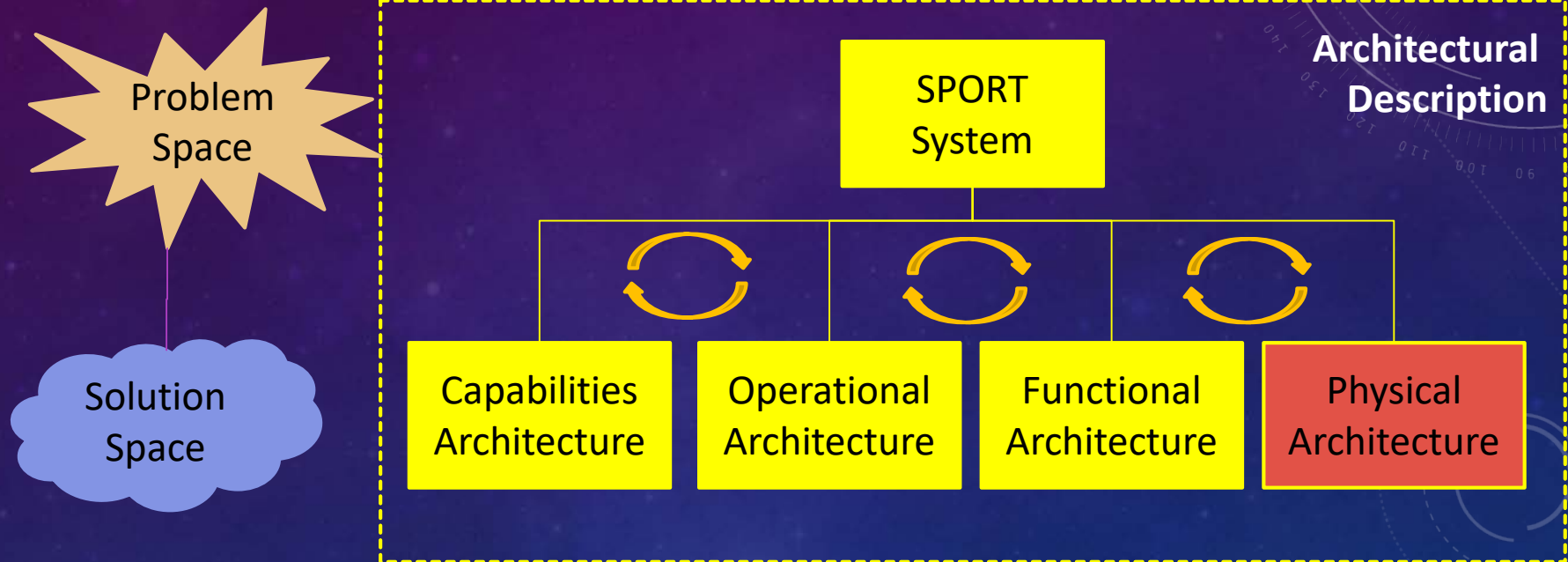
## PROJECT LOOPS



*It stands for the efforts to define all the functions the system shall have and their relationship with the capabilities expected by the users and the operational architecture.*

# SYSTEM ENGINEERING

## PROJECT LOOPS



***By the end it is the implementation of the solution that best fits the user's expectations.***

# SYSTEM ENGINEERING

*In the first project loop it was analyzed the mission and how its affects or define the system of interest to the group – the spacecraft.*

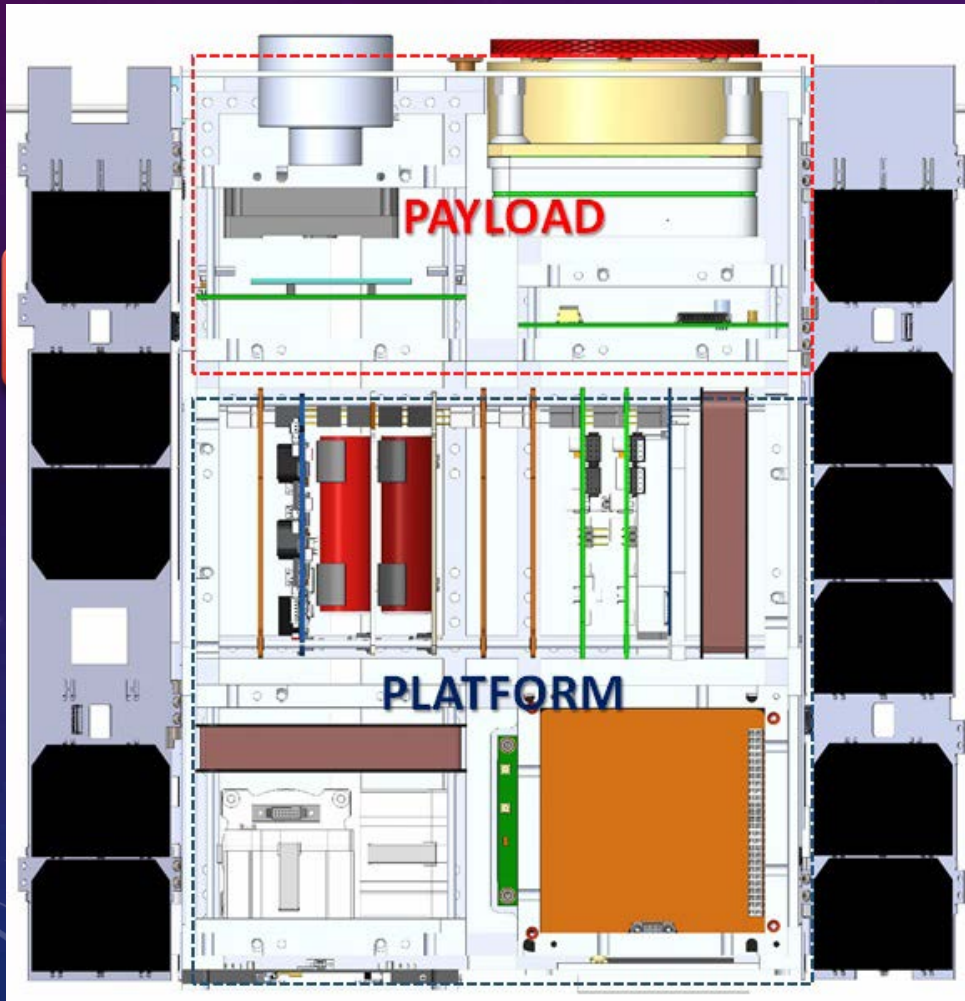
*The second loop lead to the systems definitions*

*The third loop the spacecraft interfaces with other subsystems and preliminary studies*

*In the fourth loop it was defined the spacecraft possible solutions and;*

*In the fifth loop the consolidation of the preliminary solution.*

# SPACECRAFT DESCRIPTION



## SPACECRAFT

Structure

Thermal

OBDH

EPS

ADCS

TT&C

Harness

# SPACECRAFT DESCRIPTION

**6U Structure**  
**ITA development (in house solution)**  
**Observatory total mass < 10 kg**

**Passive Thermal control**  
**Excpetion: Battery Pack**

**RTOS**  
**Distributed Computing: housekeeping and attitude control**

**9.8W Generation Capacity (Solar panels)**  
**Li-Ion Batteries Pack**  
**Self contained conditioning and Distribuiting System**  
**Controlled power lines (3V3, 5V)**

**SPACECRAFT**

**Structure**

**Thermal**

**OBDH**

**EPS**

**ADCS**

**TT&C**

**Harness**

# SPACECRAFT DESCRIPTION

**Dedicated Computer running RTOS**  
**3-axis stabilized**  
**Star tracker + magnetometer + gyrometers**  
**Reaction wheels + air coil torquers**

**VHF Uplink (1.2 kbps to 9.6 kbps)**  
**UHF downlink for observatory status data (1.2 kbps to 9.6 kbps)**  
**X-Band downlink for Science data (up to 10 Mbps)**

**In house solution**

**SPACECRAFT**

**Structure**

**Thermal**

**OBDH**

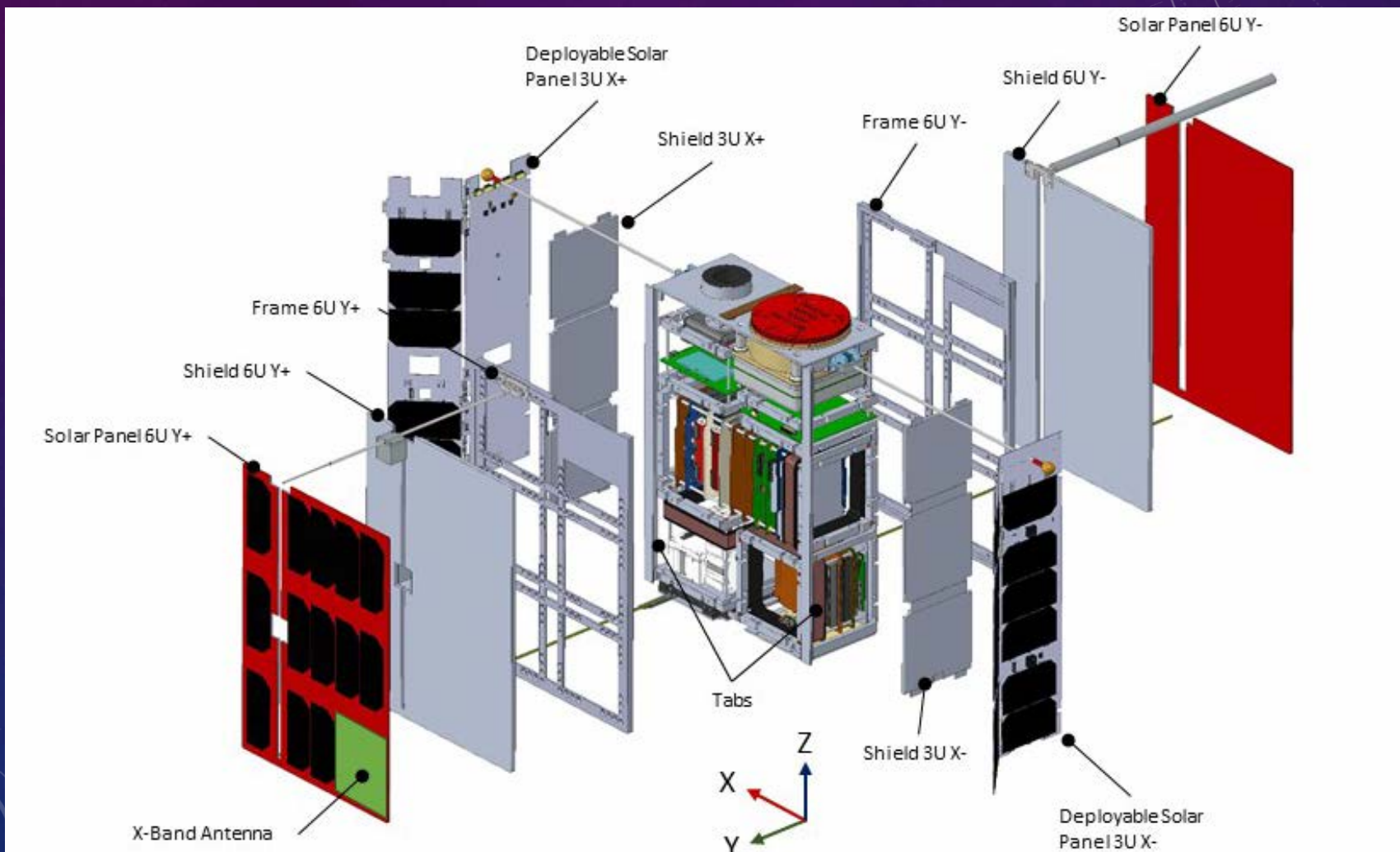
**EPS**

**ADCS**

**TT&C**

**Harness**

# SPORT EXPLODED VIEW





# EXPECTED RESULTS

- **The most important consequence of the SPORT mission is to make available, free of charge, by means of the EMBRACE system, all the collected data of the ionosphere.**
- **For ITA the expected result is to consolidate the CubeSat development at the Institute**
- **Others expected results are the consolidation of the spacecraft development and spin-off developments, the consolidation of the software architecture to be applied in future projects, the establishment of a feasible and reliable AI&V process**



THANK YOU!

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