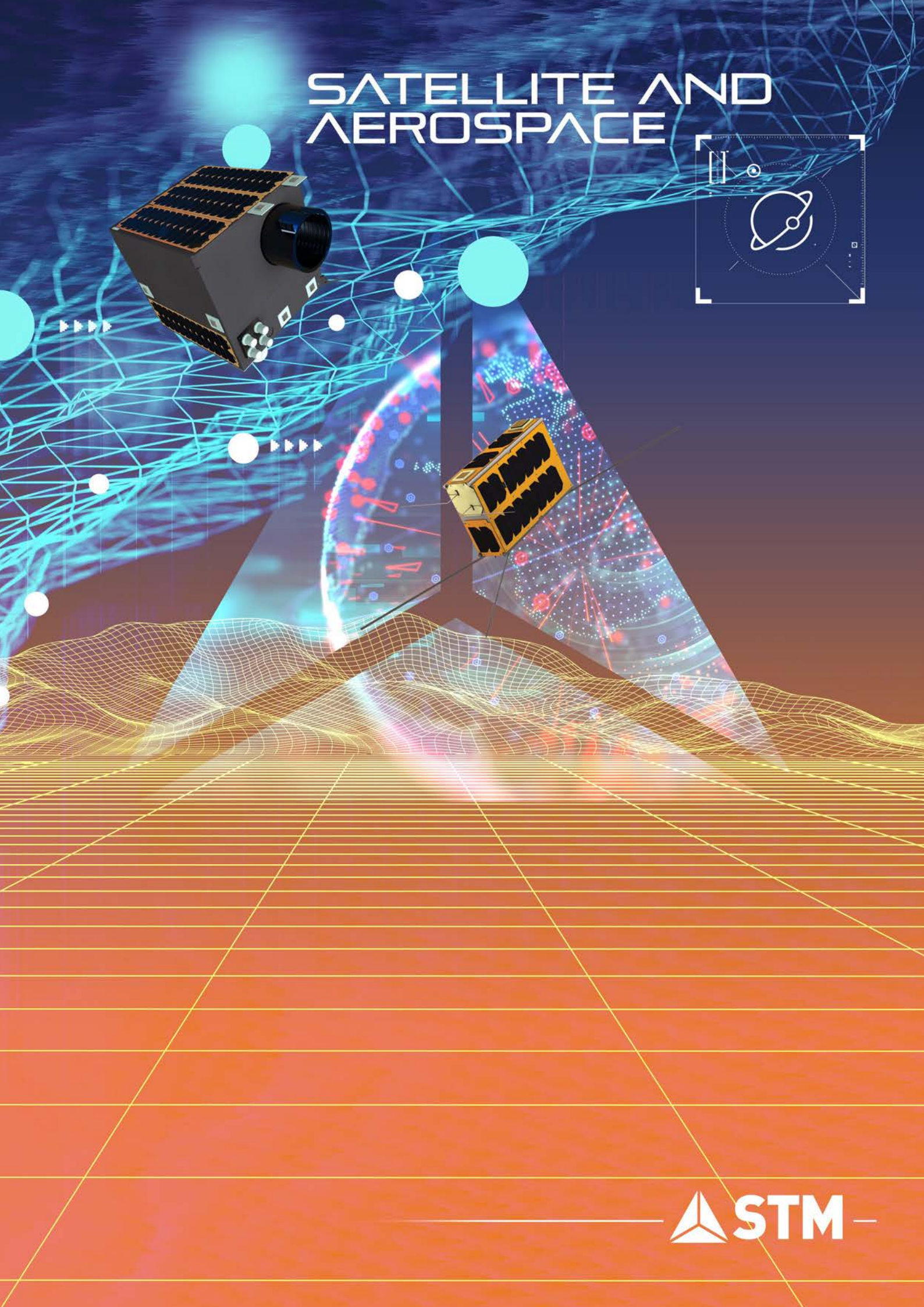# SATELLITE AND AEROSPACE

STM

LAGARİ®

High Resolution Earth Observation Microsatellite

LAGARİ is a micro class, high resolution Earth observation satellite developed by STM that will be placed to Low Earth Orbit (LEO). LAGARİ will be the first satellite of a constellation to provide imagery to be used for general mapping, forestry, agricultural, disaster monitoring, near real-time tactical field applications.

LAGARİ satellite will be the first high resolution earth observation microsatellite of Turkey. Satellite will be equipped with a new generation electro-optical camera system which has PAN and multispectral spot/strip imaging capabilities.
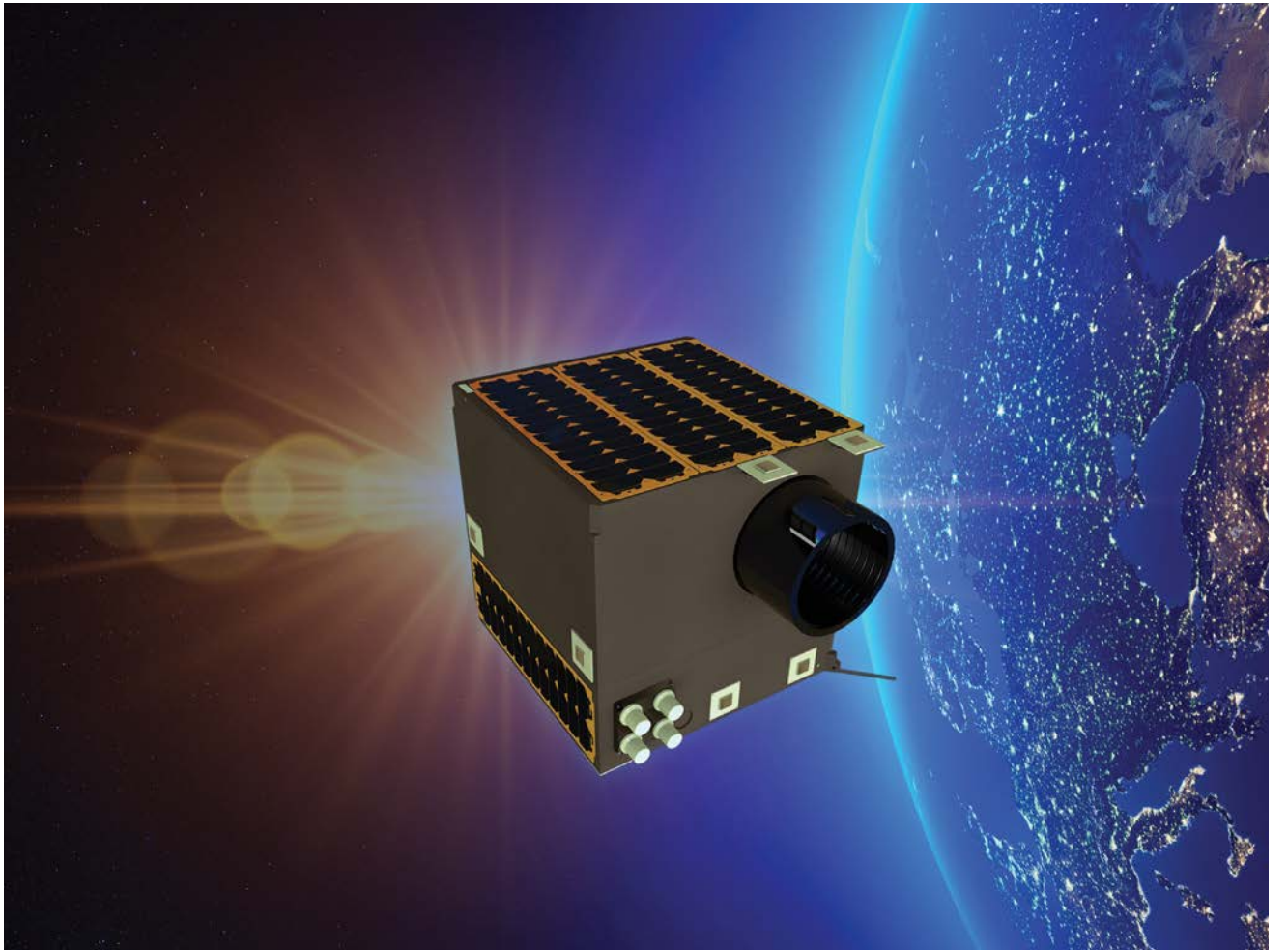
MAIN FEATURES

- High resolution imaging
- Lightweight and compact satellite structure
- High accuracy attitude determination and positioning
- 3-axis attitude control
- Body-mounted high efficient solar panels
- Lithium-Iron (Li-Fe) battery technology
- S-Band and X-Band links for communication with the ground

TECHNICAL FEATURES

Coverage	Global coverage between 80°N - 80°S latitude
Access Time	Daily access for the satellite for Turkey region
Image Download Capacity	At least 50 images per day
Lifetime	At least 2 years
Orbit	Sun synchronous orbit

SATELLITE AND AEROSPACE
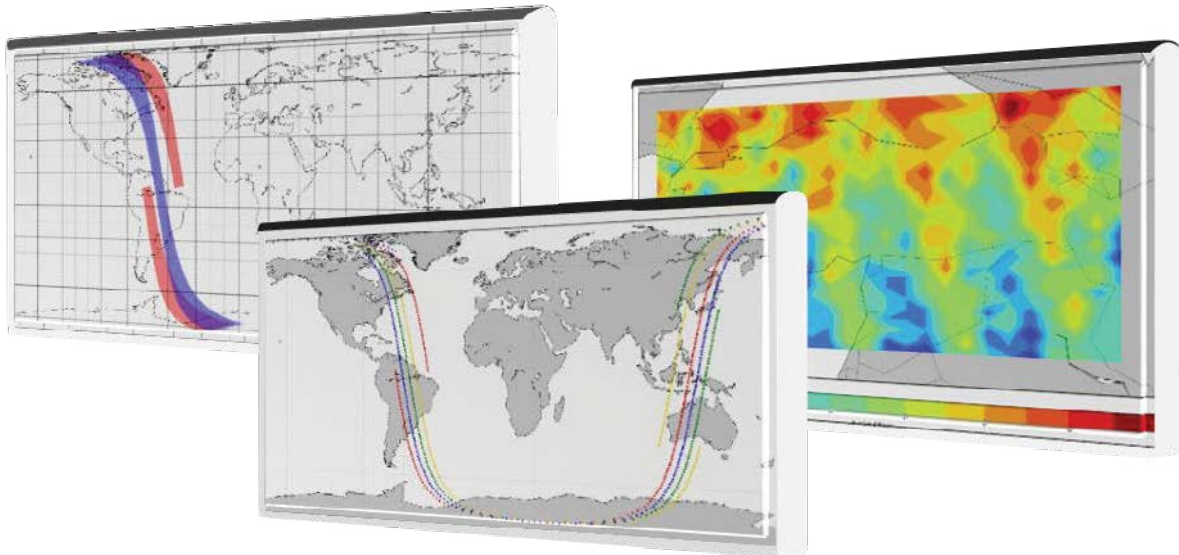
PİRİSAT

Automatic Identification System Application on Nano Satellite

PİRİSAT satellite is being developed as a satellite that will work in Low Earth Orbit to show that multiple satellite missions can be performed with a nano-satellite platform in 6U cube satellite standards. The main task of the PİRİSAT satellite is the application of the Space-based Automatic Identification System (AIS), but it will also be a history acquisition model for the multi satellite missions we are developing.

CAPABILITIES | COMPETENCIES

- Mission Design and Analysis
- Satellite Design and Analysis
- System Integration and Testing
- Software Development
- Hardware Development
- Satellite Communication

TECHNICAL FEATURES

| Main Mission	Space-Based Automatic Identification System Data Detection
Lifetime	At least 1 year (without propulsion system)
Satellite Mass	Up to 10 kg
Mission Load Volume Capacity	2U

SATELLITE AND AEROSPACE
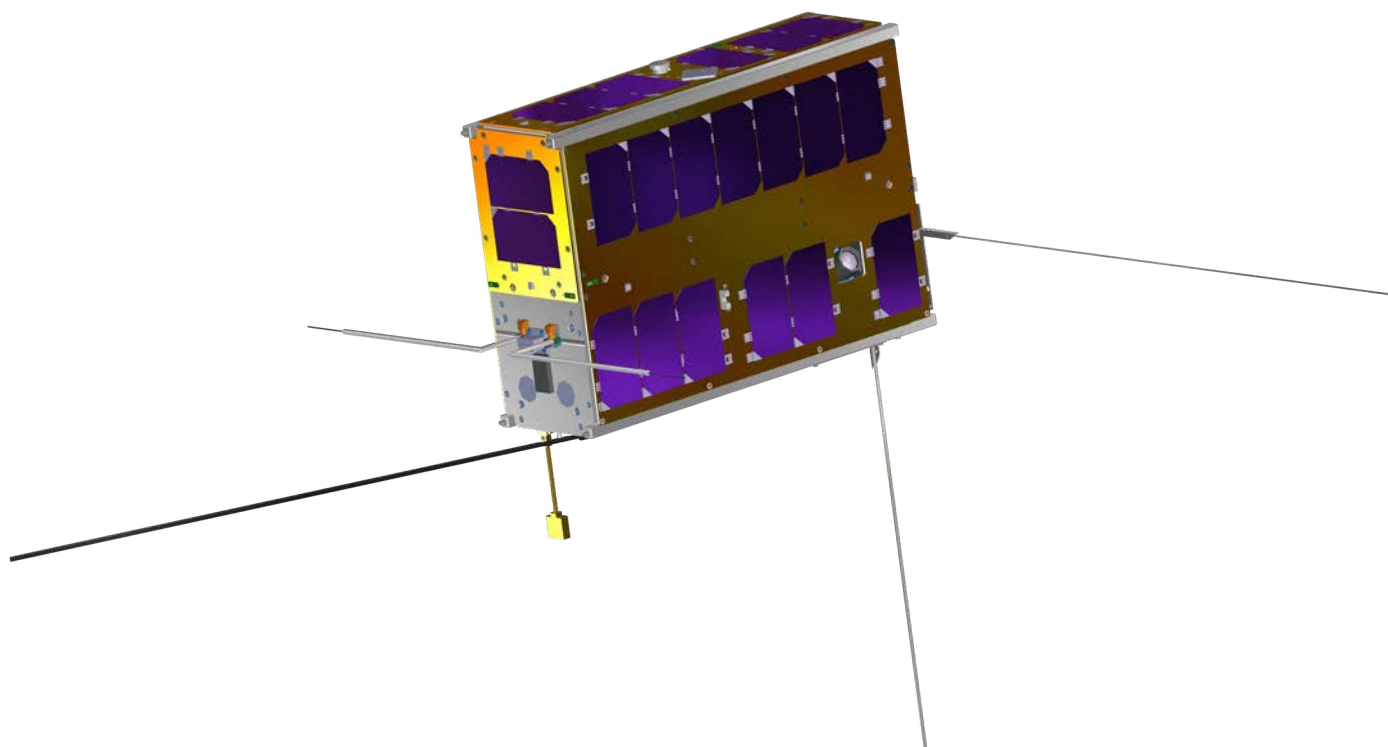
MICROSATPRO

Space Qualified Processor Unit

Space Qualified Processor Unit (MICROSATPRO) is a high performance on-board computer (OBC) compatible with micro satellite platforms for advanced space missions.

MICROSATPRO is a control unit that is resistant to harsh space conditions, has a high fault tolerance, reliable and high processor power. LEO is targeted as the operational orbit and it is designed to stay in this orbit for at least five years.

MICROSATPRO has an operating system running on FPGA (soft processor based). It is supported by interfaces frequently used in micro satellite platforms (RS485, RS422, CAN, Spacewire, SPI, I2C, etc.). Thanks to its modular design, integration into the target platform can be provided.

Single Event Effects (SEE) protection is provided through the use of a Fault Tolerant (FT-LEON3) processor core, Triple Modular Redundancy (TMR) in FPGA, Error Detection and Correction (EDAC) in memory units, Watchdog on software and Latch-up Current Limiter (LCL) in power units.
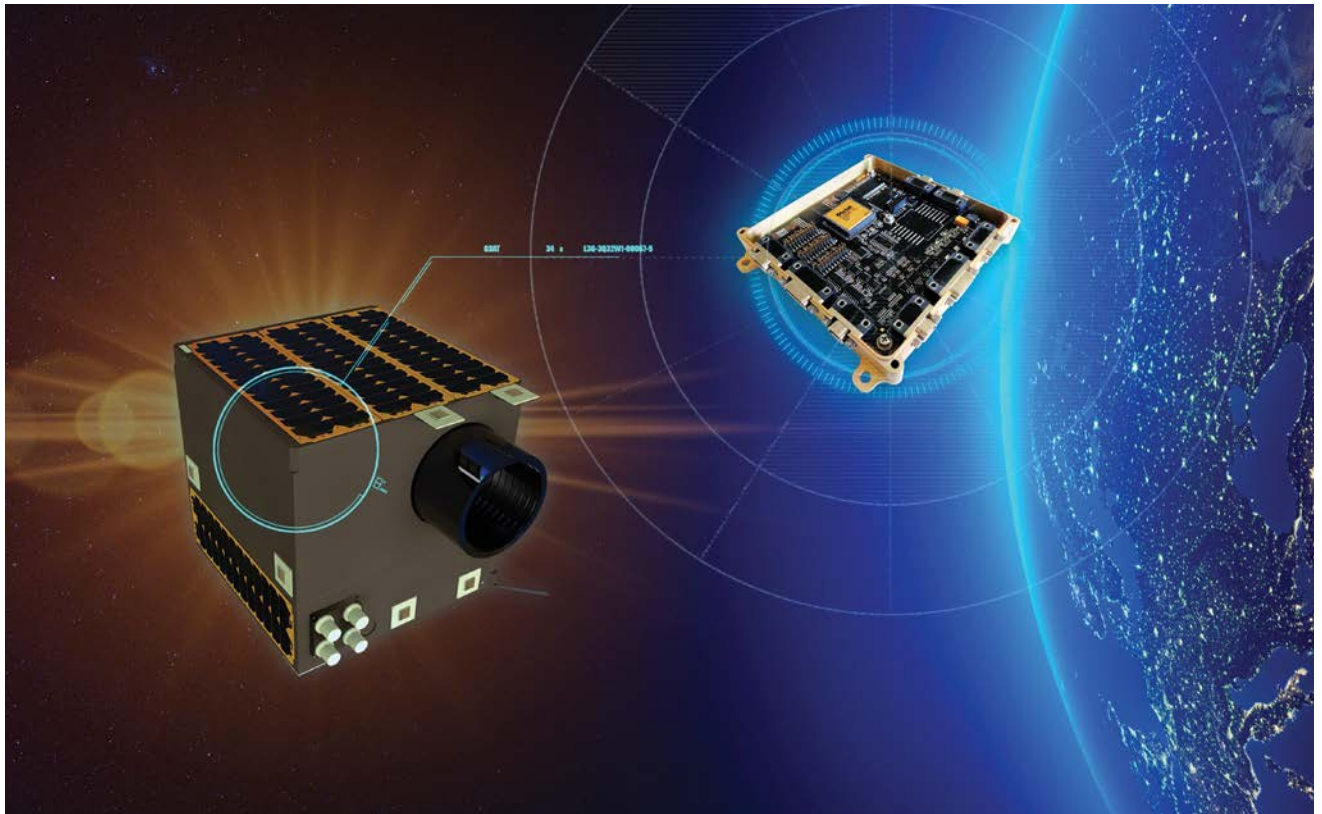
GENERAL FEATURES

Expected Life	5 years in LEO
Processor	32-bit Leon 3 Fault-Tolerant Processor
Processor Clock	48 MHz SDRAM 32 MB (EDAC on Memory)
SRAM	8 MB (EDAC)
Instruction Cache	8 kB
Data Cache	4 kB
Real Time Clock (RTC)	Available
Watchdog	Available
ROM (SPI)	128 MB (Post-EDAC)
ROM (Parallel)	8 GB (EDAC)
Operating Temperature Range	-40°C to +85°C
Power Supply Input	4.5 V to 5.5 V
Radiation (TiD)	30 kRAD (Si)

INTERFACES

SpaceWire	10 Mb/sn	2
SPI	10 Mbps	1
I2C	400Kbps	1
CAN	1 Mbps	2
Serial Ports	RS422 Input/Output	4/4
Serial Ports	RS422 / RS48 5 UART	6
PPS Interface	RS485 PPS Input/Output	1/1
GPIO	3.3 V/ 5 V	8/8
Debugging	JTAG Port for CPU (Real Time Debug Interface)	1

SIZE, WEIGHT AND POWER

|	
Nominal Power Consumption	3.0 W
Weight	280 g
Length	130 mm
Width	126 mm
Height	18 mm

SATELLITE AND AEROSPACE

NANOSATPRO

Space Qualified Processor Unit

The Nano Satellite Processor Unit (NANOSATPRO) is a high-performance on-board computer compatible with nano satellite platforms for advanced space missions.

NANOSATPRO offers a solution that is resistant to harsh space conditions, has high fault tolerance, reliable and high processor power. Low Earth Orbit (LEO) is targeted as the operational orbit and it is designed to stay in this orbit for at least two years.

NANOSATPRO has a real time operating system running on FPGA (soft processor based). It is supported by the most frequently used interfaces (UART, RS485, CAN, SPI, I2C) in nano satellite platforms. With its modular design, it easily adapts to the connection constraints of the target platform. Single Event Effects (SEE) protection is provided through the use of a Fault Tolerant (FT-LEON3) processor core, Triple Modular Redundancy (TMR) in FPGA, Error Detection and Correction (EDAC) in memory units, Watchdog on software, Latch-up Current Limiter (LCL) in power units.
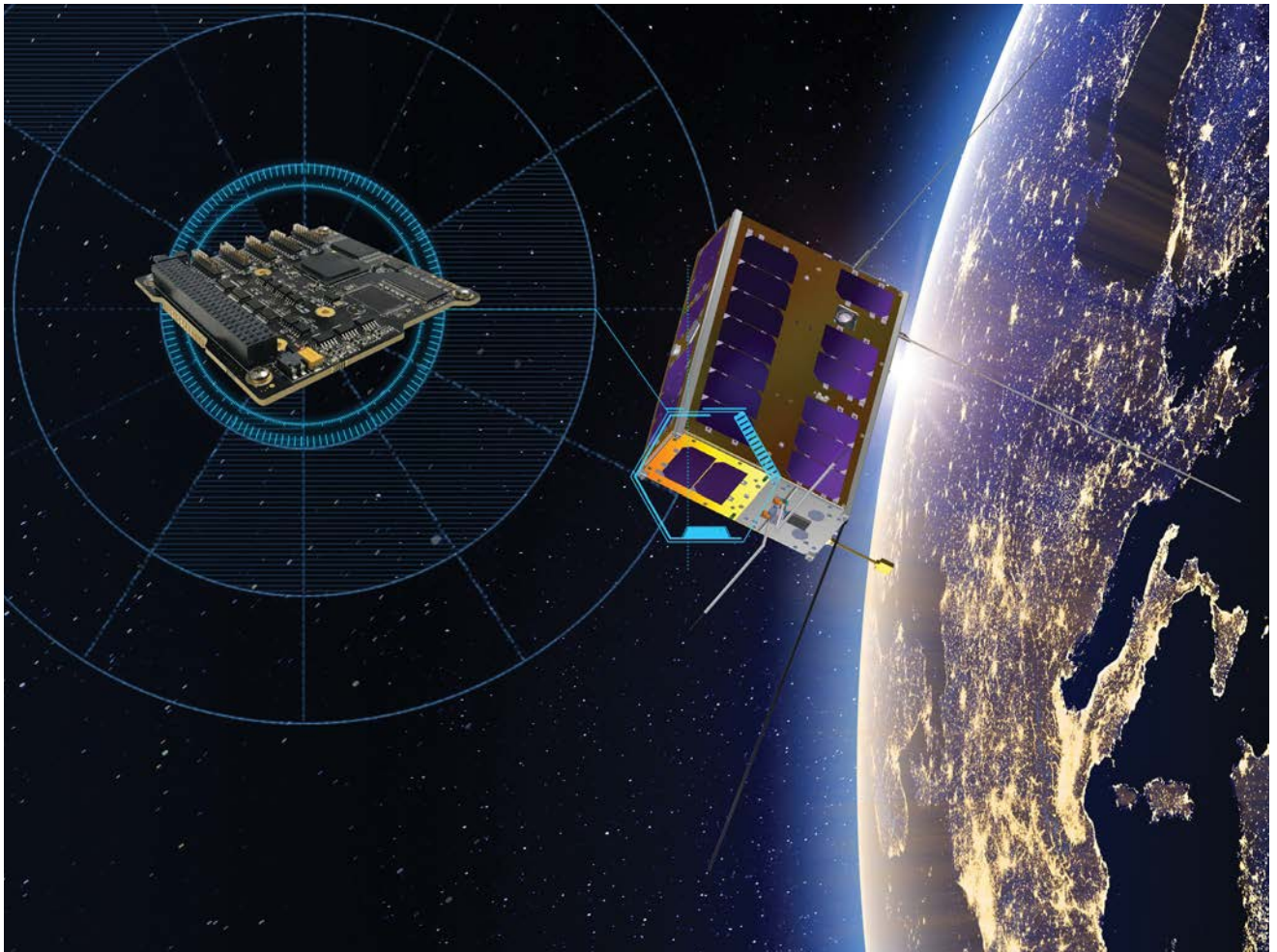
MAIN FEATURES

|	
Expected Lifetime	2 years in LEO
Processor	8051 Softcore / Leon 3 FT (Error Tolerant) Softcore
Processor Clock	48 MHz
SDRAM/SRAM	32 MB (EDAC on Memory) / 8 MB (EDAC)
Instruction Cache	8 kB
Data Cache	4 kB
SPI Flash	128 MB (EDAC on Memory)
MikroSD Card Support	Available
Real Time Clock (RTC)	Available
Watchdog	Available
Operating Temperature Range	-40°C to +85°C
Power Supply Input	4.5 V to 5,5 V
Radiation (TiD)	30 kRAD (Si)
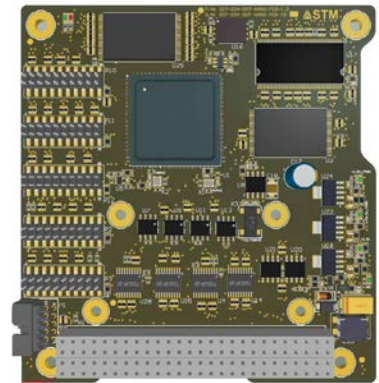
INTERFACES

SPI	10 Mbps	2
I2C	400 Kbps	2
CAN	1 Mbps	1
Serial Connection Inputs	RS48 5 UART	3
GPIO	3.3 V	8
Debugging	JTAG Port for CPU (Real Time Debug Interface)	1

SIZE, WEIGHT AND POWER

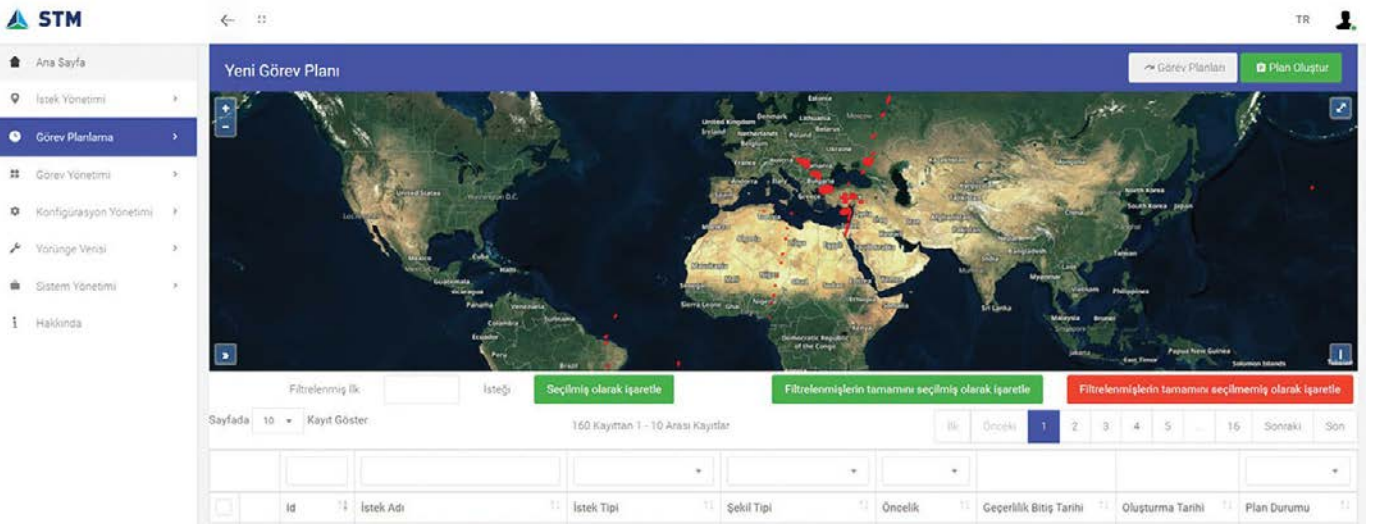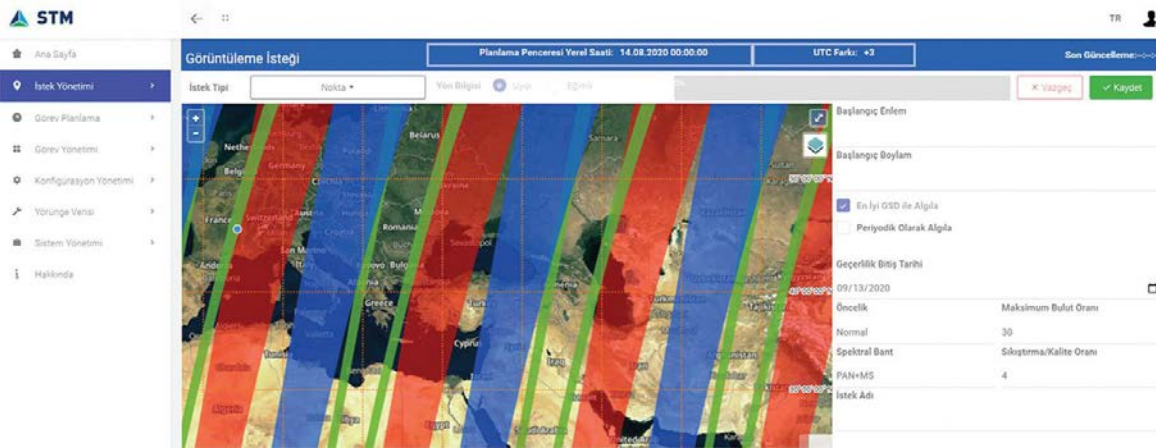|	
Nominal Power Consumption	1.5 W
Weight	100 g
Length	95.90 mm
Width	90.18 mm
Height	18.21 mm

SATELLITE AND AEROSPACE
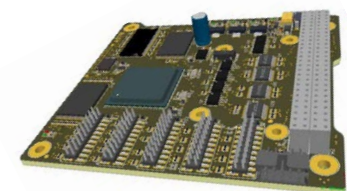
MISSION PLANNING SOFTWARE

Mission Planning Software is a Web-Based tool that plans the mission of a satellite system having one or more satellites according to the constraints and resources, calculates the parameters required for the mission with high accuracy and to get the maximum benefit from the satellite system.

FEATURES

- Automatic planning without user intervention
- Ability to create image requests through the map application
  - > Utilities such as distance measurement on the map
- Feasibility analysis at the entry of an image request using satellite dynamics and image geometry
- Satellite power and memory management
- Support for different imaging request types:
  - > Spot
  - > Strip (both parallel to orbit and inclined)
  - > Periodic Image Acquisition
  - > Single Pass Stereo
  - > Wide Area Slicing
  - > Border Line Slicing
- Best GSD and Pitch Angle Optimization