The Space Rider System Project
END-TO-END BUSINESS DEVELOPMENT WALKTHROUGH

STE 2024
Space Transportation Ecosystem Conference

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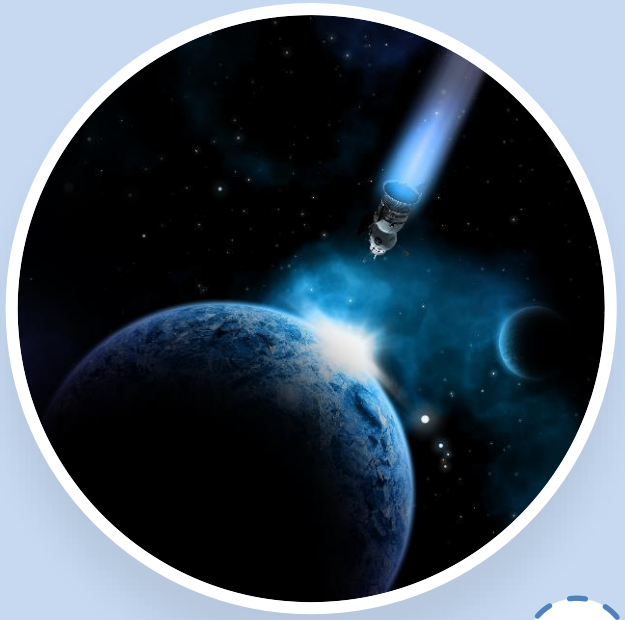
STEP ONE

SPACE RIDER PILLARS OF BUSINESS DEVELOPMENT

Each of which action-oriented and leading to the fulfilment of a new sustainable and scalable landscape for a new paradigm in the development of technologies to commercialization

SPACE RIDER PILLARS OF BUSINESS DEVELOPMENT



First Pillar: **ENGAGEMENT**

PRIORITIES > HANDS ON
CONNECT ECOSYSTEM MEMBERS
ALIGN TO TERRESTRIAL ENGAGEMENT MODELS
PROMOTE FOR DEMAND
RENEW/RE-DECLINE BUS. MODs

Second Pillar: **INTEROPERABILITY**

PRIORITIES > HANDS ON
SYSTEM OF SYSTEMS CULTURE
TECH/PROG BEST PRACTICES
STANDARDS AMONG STAKEHOLDERS
REALISTIC ACCESSIBILITY
ENABLING TECHNOLOGIES

Third Pillar: **SCALABILITY**

PRIORITIES > AUTOMATED FLEXIBILITY
COMPLEMENT MANNED PLATFORMS
PROVIDE FLEX TECH SOLUTIONS
FOCUS LIFE SCIENCE & MANUFACTURING
SERVICES STEPPED UPGRADE
PROMOTE AGREEMENTS WITH SERVICE PROVIDERS

Fourth Pillar: **PARTNERSHIP**

PRIORITIES > PUBLIC/PRIVATE
CREATE STRUCTURED HANDS ON BUS DEV TEAM
IOS STAKEHOLDERS AGREEMENTS
COLLECT/ORGANISE SYS PARTNERSHIPS
CONVEY DIVERSE ENERGIES/NEW IDEAS
OFFER GROUND FOR GROWTH

STEP TWO

SPACE RIDER COMMERCIAL SEGMENTS

To enhance the potential usefulness of unmanned platforms for a mixed institutional and private partnership thanks to the ESA Space Rider platform service flexibility

SPACE RIDER COMMERCIAL SEGMENTS

SPACE RIDER has multiple offerings geared towards 5 commercial segments

SR Transportation System

- Transportation Vehicle to support Commercial Service Provider Facilities and Capability

SR Qualification System

- Pre-eminent IOV and IOD qualification platform

In-Orbit Servicing

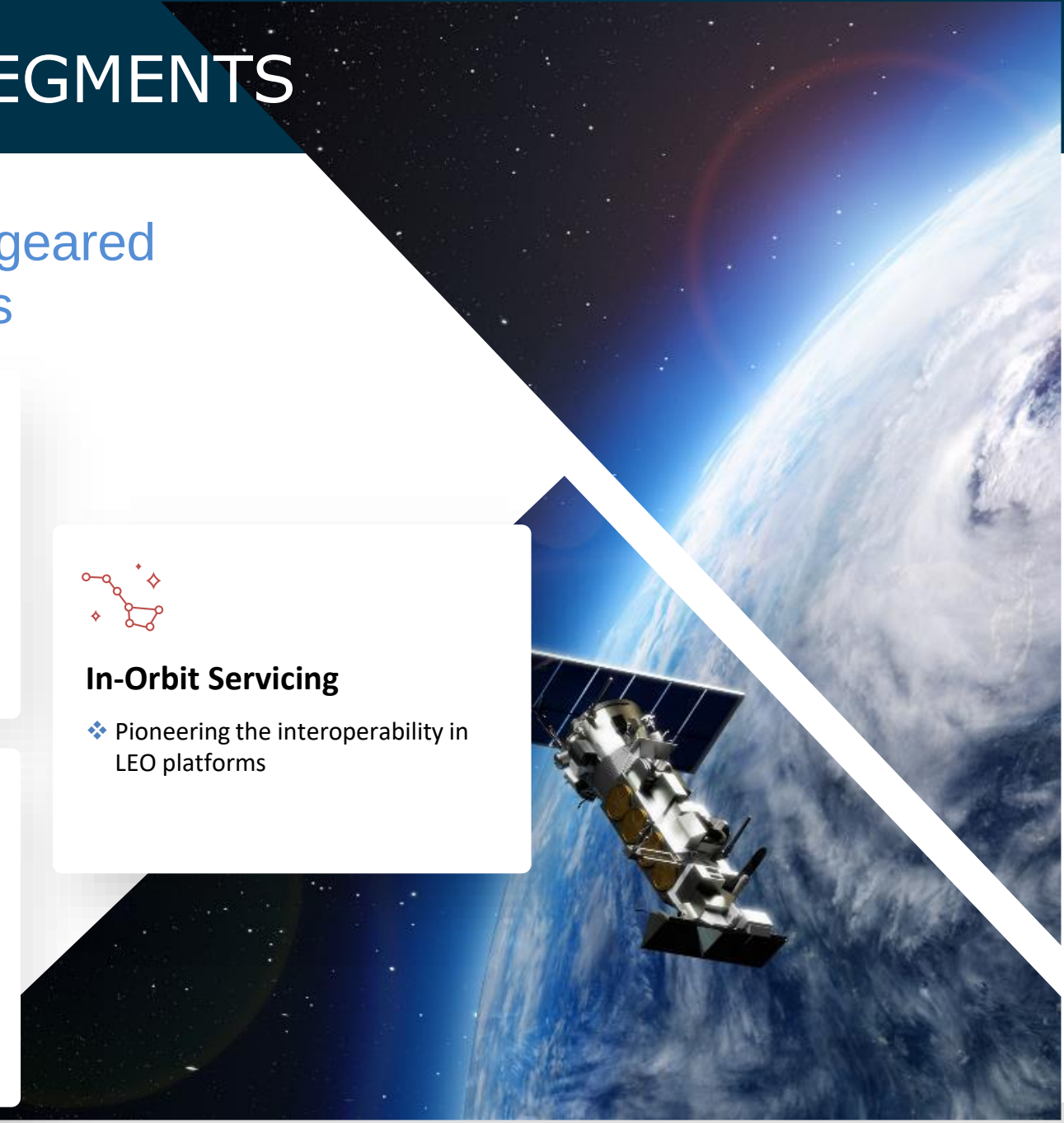
- Pioneering the interoperability in LEO platforms

SR ISS Alternative

- Options for oversubscribed and soon to be de-commissioned ISS

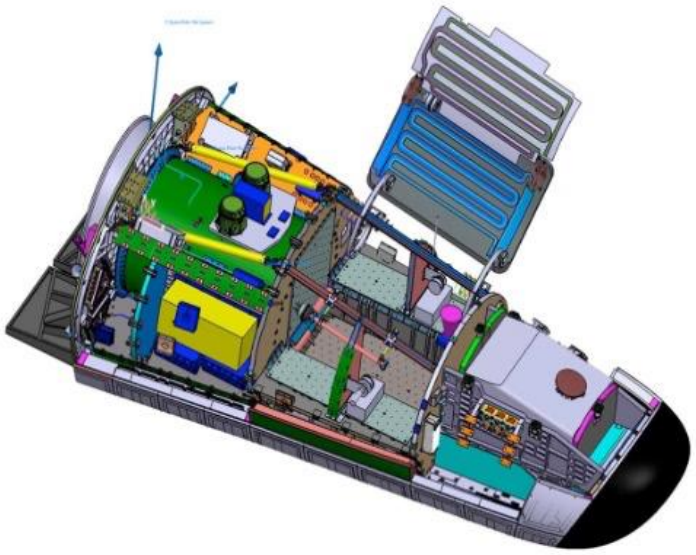
Microgravity as a Service

- Platform that supports a wide range of life and physical science applications



SPACE RIDER TRANSPORTATION SYSTEM

SR TRANSPORTATION SYSTEM



POTENTIAL SERVICE PROVIDERS

SPACE PHARMA

ICECUBES BY SPACE APPLICATIONS SERVICES

REDWIRE

Bartolomeo

YURI

KAYSER ITALIA

Nanoracks

VOYAGER SPACE

END-USER APPLICATIONS

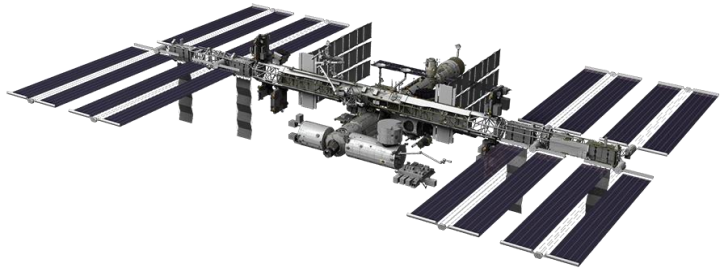
SHELF-LIFE	OBSERVATION	TECHNOLOGY	IN-ORBIT TECH
BioDegradables Air Purification Food & Beverage Packaging Agritech/ Plant Growth Pharmaceuticals Chemicals Cosmetics	Multi-use Satellites Precious Metal Locals Ecosystem Dynamics Ocean Observation Weather Forecasting Disaster Prediction Migration Patterns Microwave Radiometry	Robotics Transportation Tech Clean Fuels Thermal Processes Water Purification Imaging Tech LEO Cloud Computing	Transport Systems Resupply to Stations Orbital Trash Removal Satellite Access/ Repair Astronaut Training Systems Upgrades Repairs & Maintenance NASA Patent Access
Airlines & Hotels Beverage Companies Plastics Manufacturers Big Agricultural Firms Fast Food Companies Toxic Chemical Manu.	Lockeed Martin, Relativity Space, Telesat,Thinkom, Hiber, Capella Space, Dish, ST Engineering, Ursa Space Systems	Boston Dymanics ABB Ltd, iRobot Siemans, GE Energy, Bosch, Hitachi, Honeywell, IBM, AWS, MS, Salesforce	NASA/ Space Platrorms Trans/Logistics Firms Governments Defense Contractors Northrop, Raytheon General Dynamics

BIOTECH	MEDICAL	MATERIALS	R&D
Protein Crystalization Vaccines & Antibiotics Biomarker Discovery Regenerative Medicine Stem Cell Therapy Tissue Generation Cold Plasma Anti-Aging	Bone Adhesives Stents Telemedicine Tech Wearable Diagnostics Exoskeleton Tech Robotics Thermal Sensors 3D Scanning	Semi Conductors Polymer and Films Multilayered Barriers Industrial Casting Functional Fabrics 3D Printing Frictionless Coatings Precious Metals	Oil & Gas Water Conservation Infectious Disease Cardiovascular System Cerebrovascular Flow Capillary Flow Cellular Biology Pharmaceuticals
Pfizer, Novartis, Merck J & J, Sanofi, Roche Glaxo Smith Kline, Bayer, Eli Lilly, Amgen Gilead Sciences, Abbott Biogen, Moderna	Medtronic, Stryker, Phillips, GE, Siemens, Boston Scientific, Becton Dickenson, Baxter, Danaher, Zimmer Biomet, 3M	Intel, Nvidia, AMD, Texas Instruments, Qualcomm, Micron Precision Castparts 3D Systems, Proto Labs, Rio Tinto	Chevron, ExxonMobil, Saudi Aramco, Shell, BP Dow Chemical Anheuser-Busch, Coca-Cola, Nestle, Pepsico, Starbucks

SPACE RIDER FEATURES

COMPLEMENT TO MANNED STATIONS

As the ISS is planned to be deorbited we will need more real state in Space to allow for testing, superior R&D, and manufacturing for the non-traditional space industry. Space Commerce Matters has calculated a **Total Addressable Market of more than 800M€** for this activity



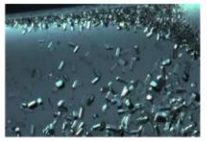
SR ISS Complement

- Options for oversubscribed and soon to be de-commissioned ISS

ACCESSIBLE TRADITIONAL AND NEW MARKET AREAS

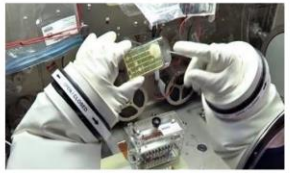
Space Rider unique **uncrewed** configuration sets it apart from new private space stations and cargo vehicles, as it **accelerates autonomous manufacturing**, **research of more complex pathogens**, and many more activities

Crystallization
Larger more ordered structures can be obtained in microgravity



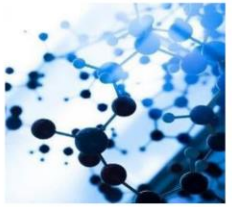
Cell Biology
Microgravity effects cell's behavior, gene expression, and allows 3D structures to form without the use of a scaffolding or matrix

Microorganisms
The diffusion driven environment of space induces changes in the behavior and virulence of microorganisms



Fluid Dynamics & Transport Phenomena
Unique fluid behavior in microgravity can allow for easier studies of Multiphase Flows, Capillary Flow, Diffusion, Surface Tension, Separation and Agglomeration, Interfacial Behavior

Reaction Chemistry
Lack of gravitational forces can influence Chemical Product Formulation, Flow, Batch, Mixing Behavior, Combustion



STEP THREE

SPACE RIDER PRIORITIES PUT INTO ACTION

Actions extend from pure business development initiatives, to actual design initiatives aimed at preparation of the vehicle to create the Space Rider manifest of operations

SPACE RIDER COMMERCIAL SEGMENTS

SPACE RIDER priorities put into action

SR Transportation System

- INTEROPERABILITY
- PARTNERSHIP

LINKING SERVICE PROVIDERS AND END USERS

SR Qualification System

- SCALABILITY

SUPPORT DIVERSE EXP/QUAL NEEDS WITH FLEXIBLE SERVICES

SR ISS Alternative

- ENGAGEMENT
- SCALABILITY

CONNECT ISS OVERBOOKING AND FILL THE ACCESSIBLE GAP

Microgravity as a Service

- ENGAGEMENT
- INTEROPERABILITY

BACKBONE OF SPACE RIDER SERVICES

In-Orbit Servicing

- INTEROPERABILITY
- SCALABILITY

PREPARE TO FULFIL PREVAILING MARKET, IMPLEMENT ADV MGMT LOGIC

STEP FOUR

TAILORING SERVICE VALUE CHAINS

it would not be appropriate to look for a standard single business model for Space Rider, standing the complexity and variety of the possible forecasted applications and the uncertainties intrinsic in the current space market

TOUCH BASE ON VALUE CHAIN ANALYSIS

	Pharmaceutical / Life Science	Semiconductor / Advanced Materials	IOV/IOD	Technology Roadmap
Business Model	• Contract Research Organization • Contract Manufacturing Organization • Contract Development and Manufacturing Organization	• R&D • Mask Production • Wafer Production • Die Fabrication • Package, Assembly and Test	• TRL 5 - 6: Prototype • TRL 6 – 7: Demonstration • TRL 7 – 8: Flight Qualified • TRL 8 – 9: Flight Proven • Small Scale Manufacturing	• Transportation • Debris Removal • Assembly / Construction • Manufacturing • Re-Supply • Re-Entry • Space Based Solar power
Pain Points	• Cost of raw materials or API • Delays: process, efficiency, technology, maintenance • Flexibility: batch volumes, quality, cost, dynamic pricing, and timelines	• High costs / High Risks • Increasing complexity especially around layered deposition • Minimizing Thermal Stress • Environmental Impacts (water, etc)	• No Microgravity effects on ground • Difficult to recreate in situ space phenomena • Ground facilities full & expensive	• Extensive technology roadmap with many new players and not many in-space qualification platforms
Pricing Model	• Service Fee for CSP • Facility Rental • Licensing fee & Royalty • Subscription Fee	• Fee for Product /Direct Sales • Facility Rental • Service Fee for CSP	• Price per kilogram • Service Bundle Package • Price per mission	• Price Per Kilogram • Price per mission • Price per U • Lab as a service
Pricing Examples	• Fee for Product: Per batch or by weight of drug or drug-related product • Example: For 500L of mammalian cell culture in 2019, the average batch price was approximately $725k +/- $150k	• Fee for Product: Per batch or by weight - relevant for seed crystal material produced in space for use on Earth • Increased pricing from terrestrial on the order of 100X terrestrial prices	Bundle could include: • Expert Advice • Design for Space Support • On-Ground Space Testing • Live Data • Return • Results Analysis Support • ESA checkmark on Space Qualified	• $15K/Kg • $20K/ Kg • $20M for 100 Kg hydrazine • $120K for 6U • $90K per flight • $5M per mission

CONCRETE ESA AND PARTNERS ACTIONS TO DECLINE SUSTAINABLE AND SCALABLE VALUE CHAIN DESIGN WITH SELECTED STAKEHOLDERS TO CREATE PROOF OF CONCEPT REAL CASES

STEP ZERO

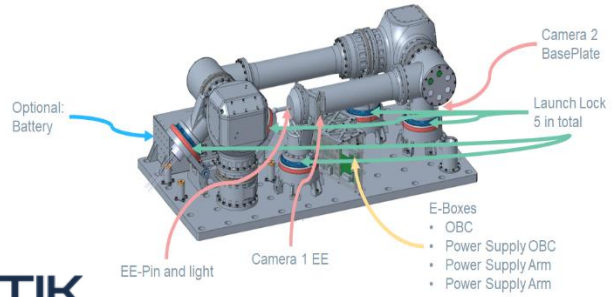
ENGINEERING WORKS

the "hands on" character of Space Rider project development allows efficient updates, enhancements and corrections for adherence to market evolutions.

INTEROPERABILITY AND IOS

Space Rider as **IOS / CPO**

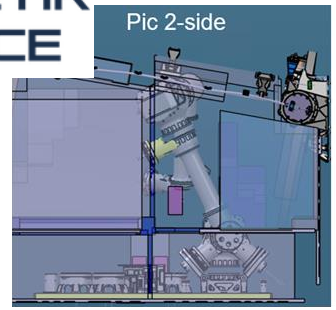
System studies ongoing and tech. dev. roadmap in preparation

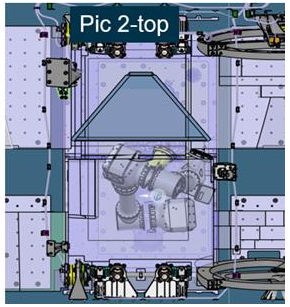


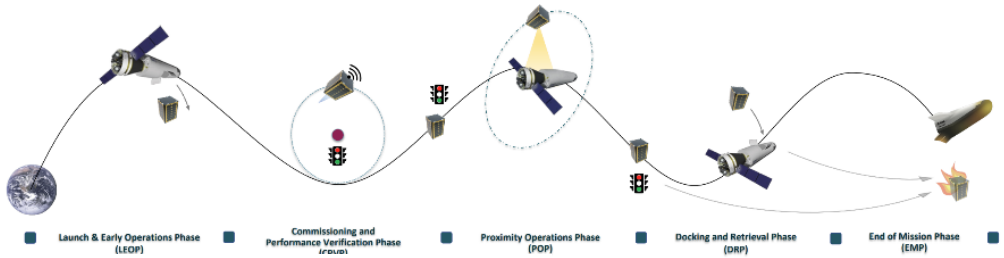
Following partner projects collaborations ongoing or offered by Space Rider

- Deploy and Retrieval: TYVAK SROC (Space Rider Observation Cubesat)
- Joint Operations: SAB IOSHEX, **Kinetik**, PIAP, Space Villages

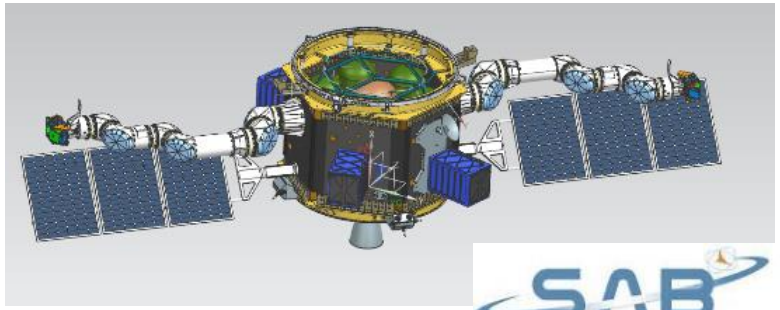
KINETIK SPACE



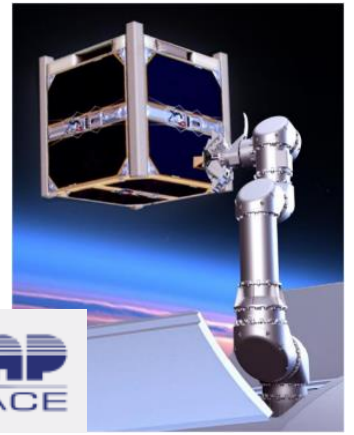




Tyvak International
A Terran Orbital Corporation



SAB Aerospace

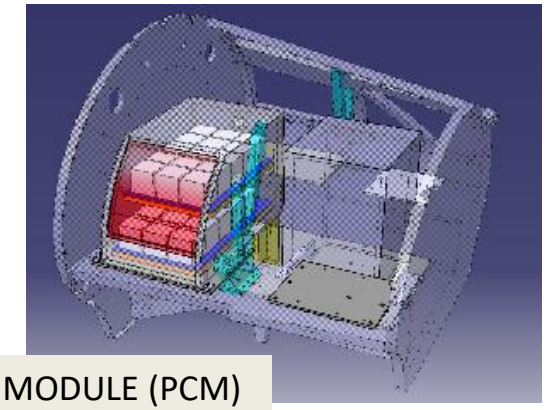


PIAP SPACE

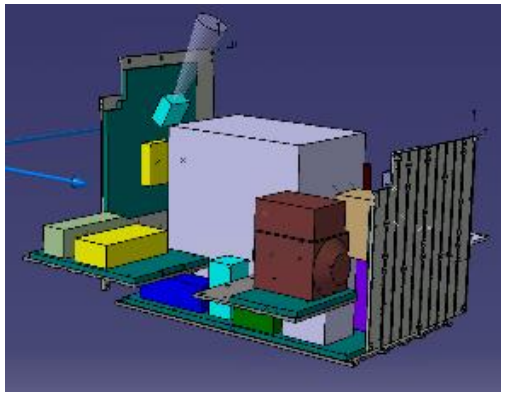
Cargo bay for maiden flight

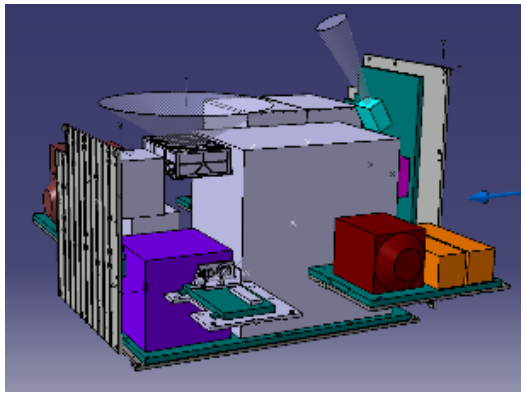
Space Rider **Payloads Aggregate** design for the **Maiden Flight** is currently **on going:**

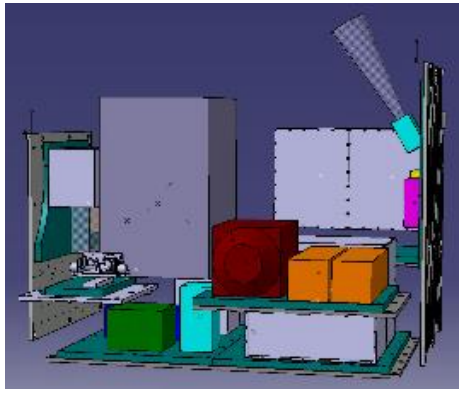
- **20 Payloads** from both **commercial** and **institutional** customers are at the moment on board, representing various typologies of experiments:
  - ✓ **Pharma/biotech micro-g R&D**
  - ✓ **Technology IOV/IOD**
  - ✓ **Physical science, remote sensing**
  - ✓ **In-orbit operation technologies and processes**
- Continuous update of Aggregate Payloads composition according to End Users evolution is on going

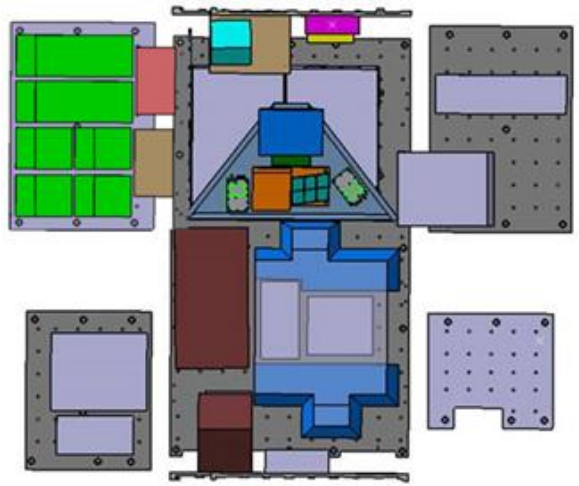


PRESSURISED CARGO MODULE (PCM)









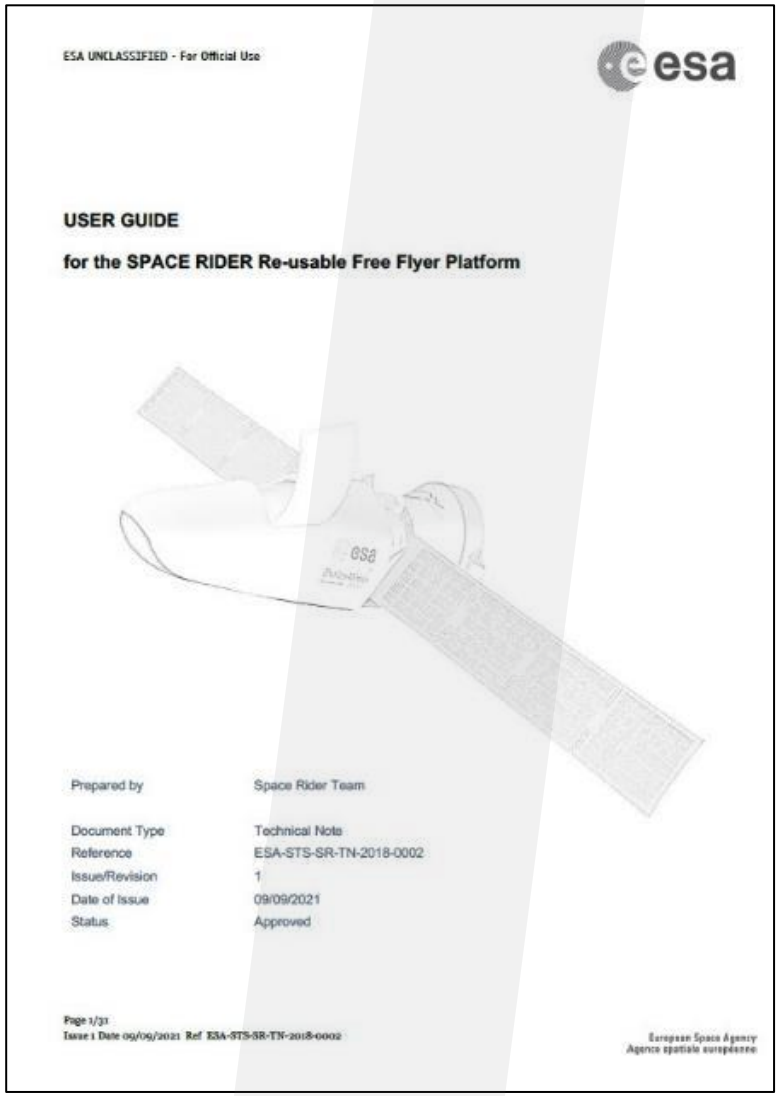
Payload User Guide

CONTENTS

- Project highlights
- Cargo Bay Payload environment
- Payload Services
- Payload Operational cycle

ISSUES

- Issue 1 dated 09/09/2021 available
- Issue 2 dated 12/12/2023 released to the public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USER GUIDE

for the SPACE RIDER Re-usable Free Flyer Platform

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