The Results of the METASTARS InnoProjects

The METASTARS consortium is pleased to announce the results of the call for innovative projects organised by the European METASTARS project.

The METASTARS project, coordinated by Aerospace Valley, supported SMEs in the Aerospace and Defence (ASD) sector. Aimed at European SMEs, the METASTARS call for projects received 53 applications coming from 17 different EU member countries and countries associated to the Single Market Programme. The funding program managed to support **11 projects involving 17 SMEs** out of the total submitted proposals.

The projects focused on **3 sectors: Space, Information and Communication Technology and Aeronautics**, addressing different market areas: software, energy, transportation, Internet of Things, manufacturing, hardware, cyber security and others.

The projects kicked off in September 2023 and were successfully finalized by October 2024. The results of each project are:

- **Low risk projects (TRL 5-7)** from technology validated in relevant environment to system prototype demonstration in operational environment (10 month duration).

Partner	Project	Results of each project (Paragraph about each project)
INFINITE ORBITS ECOSMIC	Collision Avoidance System Incorporating Visual Enviroment Recognition (ACS-VR)	The OrbSight Camera is a very powerful camera with both near range and far range capabilities complemented by a powerful processing SoC on board. This allows the camera to post process images directly on board and perform vision-based navigation accurately. SAT-SAFE is an innovative software estimating collision probabilities and proposing avoidance manoeuvres. OrbSight is the perfect setup for a software like SAT-SAFE since there is very low latency in receiving the attitude of the satellite and that ensures that the results by SAT-SAFE are highly relevant. On the other hand, Ecosmic's flagship product SAFE is an advanced software solution designed for efficient and reliable Space Traffic Management, achieving an accuracy in the estimation of risk metrics that is up to 70% higher than the traditional algorithms. Combining these technologies would empower them both, and this is what sparked the initiation of this project. Finally, both companies were able to successfully share knowledge and mature their technologies considerably. The

		commercial prospects of this work have motivated both companies to continue this fruitful collaboration, which will for sure yield successful results in the future
NABLAWAVE® Keramikblech® Walter E. C. Pritzkow Spezialkeramik	Actuated CMC Air Inlet and Flap for Aerospace (ACAIF)	The objective of the ACAIF project was to design, manufacture and test an air inlet, flap and heat shield for the Phoenix capsule, Atmos Space Cargo's inflatable de-orbit system. Phoenix requires reliable thermal protection and efficient aerodynamic performance to ensure a safe re-entry at hypersonic speeds. Nablawave conducted the aerothermodynamic design and optimization of the inlet, with CFD analyses predicting the inlet airflow and the shockwave behavior. Their simulations provided insights into the capsule performance at hypersonic (Mach 22-27) and transonic speeds. Walter Pritzkow Spezialkeramik built and tested the Phoenix inlet, flap and heat shield. The manufacturing process involved creating several components, later meticulously joined together. Each component had its own unique moulding requirements and individual layup laminating plans, posing its own set of challenges in the manufacturing process. Preliminary testing was conducted in a plasma wind tunnel, demonstrating the feasibility of the concept.
titania ready to depart	DIGItization of the SURFace treatment (DIGISURF)	TITANIA currently has two surface treatment lines: the main line in the production area and the line in the R&D area. The DIGISURF Project aims to improve the process control in the surface treatment line of the R&D area by means of digitalization, in order to later digitalize the surface treatment line of the production area. It has been achieved that the process control in the treatment line is semi-automatic thanks to the use of programmable controllers based on Arduino, which allow us to control by Dash-board, in addition to the temperature, any parameter that can be electrically connected (for example, temperature or aeration), as well as to store the data. In addition, by means of

		an internally developed management tool, it is possible to monitor and program the operating parameters of the line, voltage-current cycles, etc. Finally, QR cameras have been installed to know at all times the precise location of each test sample, monitoring its progress and planning the next steps.
beyond GeoSense tandards RespiBit	Intelligent Drones for Environmental Aerial Monitoring of Air Pollution (IDEAMAP)	The low-risk project IDEAMAP by Respibit and Geosense, successfully developed a drone-based system for advanced air quality monitoring, integrating a modular environmental sensor unit and sophisticated software modules for real-time pollutant and wind flux analysis. Through collaborative efforts between Respibit and Geosense, the team designed a robust device capable of monitoring pollutants and developed algorithms to calculate wind velocity from drone movement data, which were validated in a series of test flights. The resulting system produced a comprehensive "7D representation" of environmental data, displaying pollutant concentrations and wind vectors on observation surfaces. These innovations enable applications in environmental monitoring, industrial leak detection, and sustainability assessments, and the system shows strong potential for expansion into diverse sectors, including aerospace, defense, agriculture, and maritime.
SALLOYTECH AERO GROUP	Development of innovative high temperature equipment supporting testing of aerospace engine components at elevated temperatures (HIGH-TEMP TESTING EQUIPMENT)	The low-risk project High-tempet Testing Equipment by Salloytech Aero Group successfully developed advanced high-temperature testing equipment capable of reaching 1250°C, using the MAR-M247 superalloy, to meet the rigorous demands of the aerospace and defense sectors. The project's prototype demonstrated strong performance across thermal, tensile, and creep resistance tests and was validated with clients, with feedback incorporated for refined design.

SALLOYTECH	Development of Reusable SIlicone and Poliuretane Masking technology (REUSABLE MASKING)	The low-risk project Reusable Masking by Salloyetch Sp. z o.o., successfully developed a reusable masking technology using silicone and polyurethane for high-temperature processes in aerospace and energy manufacturing. Designed for tasks like thermal spraying and grit blasting, the reusable masks provide durable protection, significantly reducing costs and setup time compared to traditional tape. Prototype testing demonstrated the masks' high thermal resistance, durability over multiple cycles, and chemical compatibility. Client feedback confirmed the advantages in efficiency, workplace safety, and environmental impact.

- **<u>High risk projects (TRL 2-5)</u>** from technology concept formulated to technology validated in relevant environment (industrially relevant environment) (12 month duration).

SYLPHAERO	Air Plasma Engine Xperiment (APEX)	Sylphaero's innovation project focused on developing a small-scale electric plasma jet engine prototype with zero CO2 emissions. This engine achieves a power level of around 100 kW. Key components developed include the turbomachinery, a plasma system, air ducts, oil system, and a comprehensive test bench. Main results include successful prototype testing, demonstrating positive thrust and improved engine performance. Significant milestones achieved include attracting potential R&D partners. The project also facilitated increased visibility and interest from investors and industrial collaborators, setting the stage for further development and commercialization of this groundbreaking technology.
BITREZUS CYBERSPACE SECURITY	Tamper-proof of Satellite Images (TAPSAT)	The high-risk project TAPSAT designed and demonstrated a custom hardware that improves and secures the integrity of the EO imagery payload of the satellites and of the software tamper-proof module using sophisticated flows and technology innovation. The vision is to enhance the resilience of the EU ASD ecosystem but also within National Security including high-value earth observation data and provide a more sustainable solution with improved functionality and state-of-the-

Prisma Electronics SA		art security.
KREIOS SPACE Pulsar Labs	Acceleration Testing for an Air Breathing Electric Propulsion Satellite (ATAB)	ATAB project focuses on developing a key part of Kreios Space's Air-Breathing Electric Propulsion (ABEP) system for Very Low Earth Orbit (VLEO), which is the static magnetic field produced by two solenoids. These coils are designed to improve the thruster's performance by generating an increased static magnetic field in a vacuum environment thanks to the water cooling of the solenoids. The project involves detailed simulations, design, and manufacturing of the solenoids, followed by rigorous testing at the Institute of Space Systems (IRS) in Stuttgart. The collaboration with Pulsar Labs and IRS aims to enhance the resilience and capabilities of the ASD value chains, promoting innovation and sustainability in satellite propulsion technology. The main results of the project, the simulations and measurements correlate appropriately (less than 2% difference) and the increased magnetic field intensity has allowed Kreios Space's thruster to have better performance.
AENIUM Additive Systems DELTA ORBIT	Nano-AM In-Space green thruster (InSpaceAM)	The project aimed to develop a CuCrZr alloy with nano-additives to improve performance at high temperatures (up to 980K). Carbon-based nanoparticles like graphene were used to enhance the alloy without affecting its thermal properties. Stable additive manufacturing parameters and processing were established. Combustion chambers made of Ni-alloy and Cu-alloy were designed and tested for a methane/oxygen propellant system. A helical cooling channel design ensured effective cooling. Ni-alloy showed better heat absorption and lower pressure drops, while the Cu-alloy experienced higher heat flux in the nozzle due to surface roughness. While the Ni-alloy chamber performed better under thermal loads, the Cu-alloy's high thermal conductivity makes it

		promising for future optimization, especially for cryogenic cooling. The project successfully demonstrated the feasibility of high-temperature combustion chambers, with further tests planned to refine designs and assess durability for in-space propulsion system.
REVOLV	Microsatellite-compatible Solar Array Rotary Actuator (microSARA)	The high-risk project microSARA project successfully developed a Solar Array Drive Assembly (SADA) tailored for microsatellites (50-500 kg), advancing its technology readiness level from TRL 4 to TRL 6. This system enhances satellite power efficiency and payload capacity while using minimal internal space, addressing key limitations in small satellite operations. By collaborating with European suppliers and leveraging Revolv Space's prior experience with nanosatellite technology, the project reduced dependency on non-European components, contributing to Europe's strategic autonomy in space. The system, which performed reliably through testing, promises long-term impacts in telecommunications, Earth observation, and defense by enabling higher power output and reduced operational costs for satellite missions.