Hello, **I'm**

orbital_OLIVER

AIKO

INFINITE WAYS TO AUTONOMY

www.aikospace.com_info@aikospace.com

FOLLOW US ON

COVER **LETTER**

orbital_**OLIVER at a Glance**

AN INTELLIGENT ONBOARD SOFTWARE THAT SUPPORTS AND AUGMENTS SPACE MISSIONS BY MAKING SATELLITES HIGHLY INDEPENDENT FROM GROUND CONTROL.

A meteoric rise in the number of applications that leverage access to Earth's orbits is propelling the Space Economy through a period of incredible growth. As new players enter the market, the ability to develop and capitalize on disruptive innovations has become pivotal for competitiveness.

In this context, the traditional spacecraft management systems centred on human intervention are becoming inefficient for the deployment of data-driven operational and business intelligence.

High-performing but resource-demanding payloads, diverging end-user needs, and the increasing congestion of Low-Earth Orbit (LEO) translate to complex missions that demand innovative solutions.

+ THE FUTURE OF OPERATIONS IN SPACE

I'm orbital_**OLIVER,** created to solve these problems by enabling spacecraft autonomy.

I make sure that satellites can carry out complex endeavours such as timely data analysis, payload product optimization, and platform diagnostic and prognostic . **I can support satellite operators** in the mission control centre with optimal and rapid decision-making, allowing ground control to focus on high-level strategic mission goals.

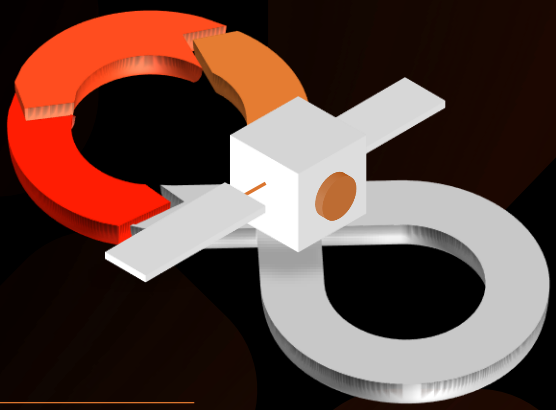
I will fly in orbit for the first time at the end of 2022.

AIKOSPACE.COM

SATELLITE EDGE AUTONOMY

orbital_OLIVER

AN INTELLIGENT ONBOARD SOFTWARE THAT SUPPORTS AND AUGMENTS SPACE MISSIONS BY MAKING SATELLITES HIGHLY INDEPENDENT FROM GROUND CONTROL.



THE **FUTURE OF OPERATIONS** IN SPACE

It supports satellite operators with **optimal and rapid decision-making onboard the satellite**, allowing ground control to focus on high-level strategic mission goals. The software embeds **AI-based models on the edge** to detect, predict and fix problems related to the complexities of the mission, enabling a **generalized data-driven approach to the standard operation services.**

AN ENABLER FOR **COMPLEX ENDEAVOURS**

+ **TIMELY DATA ANALYSIS.** extract actionable information in real or near-real time, both from telemetry data and from payload data.
+ **PAYLOAD PRODUCT OPTIMIZATION.** Pursue an optimal mission plan by continuously evaluating whether the current schedule is the most appropriate given the current mission objectives
+ **PLATFORM DIAGNOSTIC AND PROGNOSTIC.** Detect and prevent potential contingencies before they affect satellite operability.
+ **BANDWIDTH OPTIMIZATION.** Reduce the amount of data that is exchanged with ground control on Earth.

orbital_**OLIVER** is nearing trl7 and **will fly in orbit for the first time later this year.**

READY FOR **LIFTOFF**

THE **GROWTH** OF THE **SPACE ECONOMY**

THE KEY CATALYST FOR THE GROWTH OF THE SPACE ECONOMY HAS BEEN THE REDUCTION IN BARRIERS TO ENTRY. INSTITUTIONAL ENTITIES HAVE SUPPORTED PRIVATE ACTORS THROUGH FUNDING AND PARTNERSHIPS, SIGNIFICANTLY ACCELERATING THE PACE OF INNOVATION.

WHAT WAS ONCE A SEEMINGLY UNREACHABLE DOMAIN HAS NOW BECOME AN ACCESSIBLE MARKETPLACE FOR VALUABLE SERVICES AND PROFITABLE BUSINESS OPPORTUNITIES.

The Space Economy is booming. In 2021, nearly 2000 satellites were launched to space [*]. Although this quantity already represents a 4.5x increase compared with the average of the last decade, it is expected to further grow in the upcoming years. Such a thriving ecosystem has been primarily driven by lower barriers to entry and novel support mechanisms. The lower launch costs, mass production techniques, and innovative procurement methodologies by space agencies have facilitated entry in the market for many players from the private sector, including both companies and investors.

Advancements in space technology are impacting a wide variety of industries; companies across the economic value chain are leveraging space-based services and products for their own endeavours. Estimates suggest that the roughly $350 billion Space Economy could surge to over $1.4 trillion by 2030[**].

Against this backdrop, **I will play a fundamental role** by enabling more efficient, less resource-intensive operations for satellites in LEO, relieving operators on ground from basic controlling activities, and ensuring satellites exploit their potential at the best.

** Satellites to be Built & Launched, 24th edition; Euroconsult, 2021*

*** The space economy of the future; Nasdaq, 2022*

ON A **MISSION**

The Autonomy Leap in the Space Domain

The rapid market growth shall be complemented by a radical shift in how satellites are operated, to be sustainable in the long term. Only with a starkly innovative process we can secure effective, economically efficient, and intelligent space-based services.

+ FROM AUTOMATED, PRE-PROGRAMMED CAPABILITIES TO AI-POWERED AUTONOMY

The space industry is transitioning towards an automated approach to service, ground, and flight operations. Automation with pre-programmed capabilities is the state-of-art in mission autonomy.

On the other hand, diverse end-user needs, demanding equipment, unforeseen payload opportunities, and unexpected contingencies are concurring to augment the unpredictability and the difficulty in modelling the mission itself.

It is therefore necessary to improve the adaptability and the flexibility of robotic assets (such as satellites and satellite constellations) providing services by shifting to intelligent data-driven space operations. In such a complex and demanding scenario, autonomous satellites only can achieve optimal mission performances, even in operational scenarios characterized by the highest levels of uncertainty.

+ A PRODUCT FOR INTELLIGENT LEO-BASED SERVICES

I enable a generalized data-driven approach to the standard mission operation services by applying AI and Machine Learning-based algorithms and models. My AI-powered onboard services enable the necessary strategic shift, to augment the operational autonomy of LEO satellites.

ON A **MISSION**

The benefits of Edge AI

I embed AI-based models directly on the edge to detect, predict and fix problems related to the complexities of satellite missions.

Edge computing enables the application of data analysis and processing right on the device, where operational data is collected. This design architecture reduces network costs, transmission delays, avoids bandwidth constraints, limits service failures, and better controls sensitive data transfers. An AI-based edge computing approach allows more reactive and proactive devices to make operational decisions in a generalized mission environment.

Today, thanks to the integration of edge computers, even small satellites can be equipped with high-performing computational capabilities.

Thus, edge AI will be the key enabler in space for the shift towards operational mission autonomy. The new generation of independent satellites will contribute enabling advanced mission concepts, adopting new technologies, and redefining the interaction between human operators and space assets.

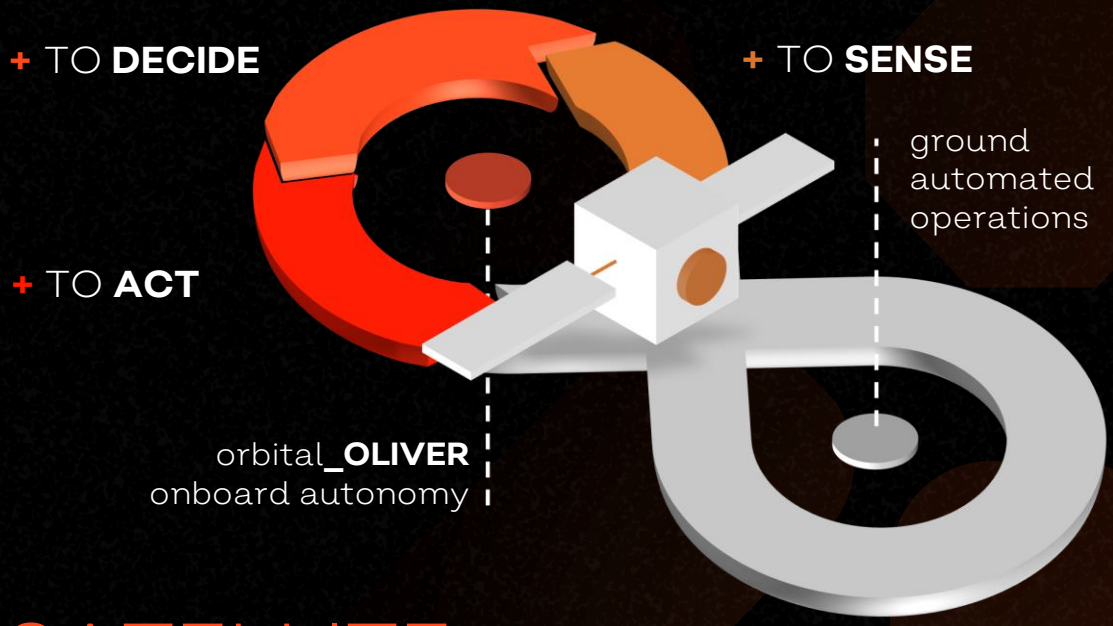
+ SMART DATA PROCESSING

+ FAST RESPONSE

+ COST REDUCTION

+ REAL-TIME DECISION MAKING

orbital_**OLIVER**



SATELLITE **EDGE AUTONOMY** FOR YOUR SPACE **OPERATIONS**

FLEXIBILITY AND ADAPTABILITY FOR IN-ORBIT OPERATIONS. DATA ANALYSIS, DIAGNOSTICS, PROGNOSTIC AND PAYLOAD PRODUCT OPTIMIZATION PERFORMED ON THE EDGE.

+ I'm an autonomy enabler. Reduce the amount of data sent to ground, optimizing bandwidth and resource allocation.

+ I've got an AI-technology core which embeds disruptive software models for real-time analysis and decisions. **I'm compatible** with COTS space-grade hardware.

+ I can cooperate with several levels of ground automation. Deploy me on multiple mission scenarios.

STRENGTH & **POTENTIAL**

Areas of Application

+ TIMELY DATA ANALYSIS

I extract actionable information in real or almost-real time, both from telemetry data and from payload data.

+ PAYLOAD PRODUCT OPTIMIZATION

I ensure to pursue an optimal mission plan by continuously evaluating whether the current schedule is the most appropriate given the current mission objectives, to deliver the most valuable data for your mission.

+ PLATFORM DIAGNOSTICS AND PROGNOSTICS

I detect and prevent potential contingencies before they affect satellite operability. To do that, I analyse telemetry and housekeeping data streams from the platform, by exploiting the state-of-the-art of Deep Learning-based technologies for time-series analysis.

+ BANDWIDTH OPTIMIZATION

I reduce the amount of data that is exchanged with ground control on Earth through the optimization of payload data products, and through the processing of telemetry data directly onboard.

HARD **SKILLS**

Product Features

+ BESPOKE CONFIGURATION

While the algorithmic core does not change, my customizable knowledge-base allows me to be easily employed in multiple mission scenarios.

+ MODULAR STRUCTURE

A modular software structure guarantees me a high flexibility. **I can interact with multiple onboard services** and even turning them off or on depending on the customer's needs.

+ COMPLIANCE WITH STANDARDS

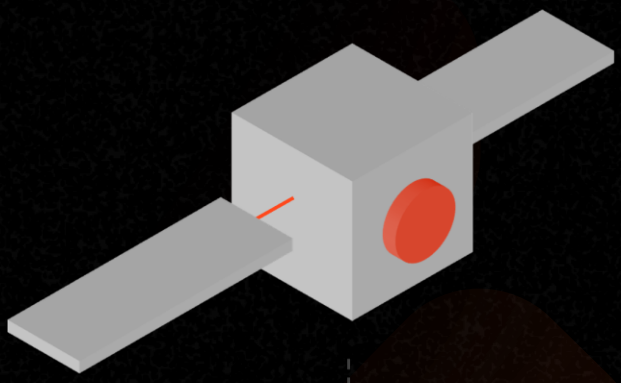
All my services' interfaces are developed in compliance with ECSS and CCSDS standards. Data exchanges occur through PUS/MO services.

+ FLEXIBLE INTERFACE

My proprietary APIs ensure ease of installation on several platforms, with little to any need to act on the platform's original flight code.

FIT WITH **THE ENVIRONMENT**

Hardware Compatibility

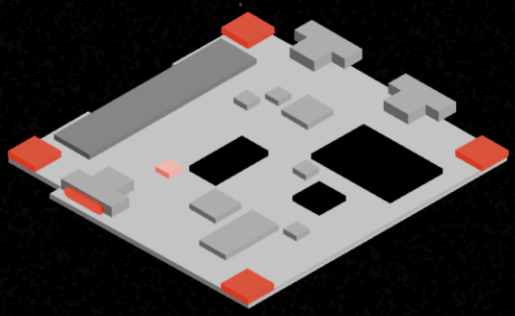


TESTED FOR **ARM** AND **X86-64** COMPUTING BOARD ARCHITECTURES

+ **32-bit ARMv7**
+ Torpedo SOM
+ Raspberry Pi3
+ **64-bit ARMv8**
+ NVIDIA Jetson Nano
+ Xilinx Zynq Ultrascale
+ Raspberry Pi4
+ **64-bit x86**
+ AMD Ryzen Embedded

TESTED COMPATIBILITY WITH **STATE-OF-THE-ART HW ACCELERATORS**

+ **Hardware-specific runtimes**
+ Intel OpenVINO (Myriad VPU)
+ Google Edge TPU
+ NVIDIA TensorRT
+ **Multi-platform runtimes**
+ TensorFlow Lite
+ ONNX Runtime
+ ArmNN



IN **ACTION**

Remote Sensing

Manage acquisition tasks and retain only the most relevant data by cooperating with onboard payload data processing solutions.

I UPDATE THE TASKS PRIORITIZATION BY TAKING INFORMATION FROM GROUND, PAYLOAD DATA, AND OTHER ONBOARD DATA PROCESSING PRODUCTS AS INPUTS.

+ EVENT-DRIVEN MONITORING

Example: a wildfire is detected over a given area, but there is no contact with the ground before the next pass over the area. Such observation opportunity cannot be feasible by using ground-generated mission plans. **I rearrange the payload plan in real-time,** thanks to my onboard payload optimization capabilities so that additional monitoring over that area can fit in the schedule. **This is how I deliver an effective monitoring service!**

+ CLOUD-FREE EARTH OBSERVATION

Leveraging onboard cloud coverage information, **I can continuously rearrange the payload acquisition plan** to maximize the quality of the data to be transferred to Earth.

get in touch to know more about AIKO's technology for onboard object detection.

check out AIKO's solution for onboard cloud detection;

cloudy_**CHARLES**

BEYOND THAT, **HOW CAN I SUPPORT YOUR MISSION?**

ON MY **WAY TO SPACE**

Heritage and In-Orbit Validation

I was born in 2017, and I was called MiRAGE.
In 2018, AIKO received the European Commission H2020 SME Instrument Phase 1 funds that allowed me to reach TRL6. In 2020, AIKO released my first stable version.

Since 2021, the European Space Agency (ESA) has been supporting my development, validation, and commercialization activities.

AIKO recently launched the Early Adopters Program to let me face real operational scenarios in LEO and validate me in orbit, starting with five missions scheduled between 2022 and 2024.

I am currently undergoing several rounds of testing to verify my module performances, compliancy with the standards, and compatibility with multiple space-graded COTS boards.

Let's **work together!**

AIKO

INFINITE WAYS TO AUTONOMY

www.aikospace.com_info@aikospace.com

FOLLOW US ON