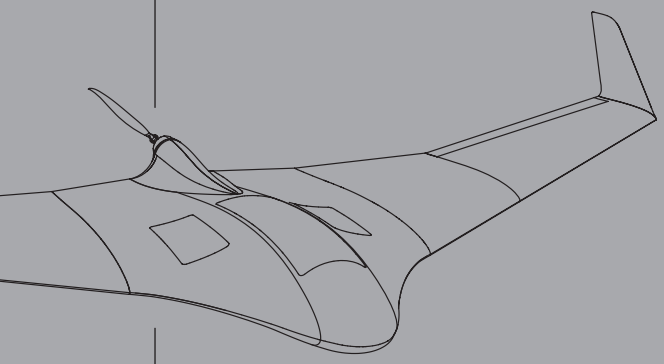
BRAMOR UAS



VISION UNLIMITED!

C-ASTRAL
AEROSPACE Ltd.

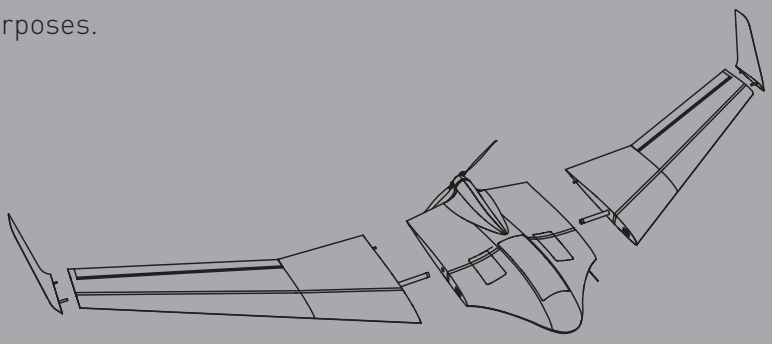
BRAMOR UAS

The **BRAMOR UAS** is based on a blended wing body modular airframe, with the emphasis on the smallest possible T/O weight, advanced aerodynamics, electric propulsion, endurance, ergonomic and user friendly ground control station, durability and mobility.

The airframe is manufactured from an advanced composite mix of Kevlar/Carbon/Vectran and when appropriate provides low radar detection probability and a high level of survivability. An ADS-B transponder can be fitted into the airframe for airspace integration purposes.

The sensor modularity [EO/IR interchangeable stabilized gimbaled turret, EO/IR/LI stabilized gimbaled turret, fixed visible light and IR spectra] is ensured by the modular construction of the airframe, which allows for multiple payload configurations and endurance/range options, including an on board video and data recorder.

The system consists of the air vehicle with the chosen sensor configuration middle section, a foldable take off low temperatures pneumatic or above 0 deg celsius temperature range elastic catapult, a communications package tripod with antennae and the optional ASTRALTRACK tracking antenna system and the ground control station (GCS). The whole system fits into a MILSPEC, rain resistant backpack with the GCS embedded in an industry standard rugged package and is flight ready in less than five minutes. The system can be safely operated by one operator/pilot in command, but a crew of two is desirable for situational awareness purposes.



Unmanned Aircraft Systems ////////////////

WHY DO YOU WANT TO BECOME AN **OPERATOR OF A C-ASTRAL** SYSTEM INSTEAD OF OUR COMPETITION?

- Endurance of more than 90 minutes
- Civil aviation authority and airspace integration experience
- Fully autonomous - from takeoff to landing
- Flight ready in 5 minutes
- Parachute landing in a 30 m x 30 m zone
- Mission profile and geometry changes possible in-flight
- Multiple mission geometries in one flight
- Arbitrary mission geometries such as road or river following completely programmable
- Complete UAS control before and during flight
- Multiple air vehicles control from single GCS
- Robust fail-safe architecture
- Inflight reprogrammable landing point changes
- Emergency flight termination by parachute
- Demonstrated flight in 15 m/s wind
- Demonstrated operations up to -25 deg Celsius
- Operated in the Arctic and Antarctica and the Mojave (of course!)
- Up to 30km datalink range
- Optional ASTRALTRACK tracking antenna
- Durable composite aerospace grade materials – high survivability
- High precision data logging for land surveying and GIS integration
- Autonomous vehicle following
- Fast mission log download
- Onboard storage of multiple mission logs
- 1 operator operation possible
- Packed and carried by 1 person
- MILSPEC rain resistant backpack
- Robust video surveillance capabilities with the C-ASTRAL EYE series of gimbals
- An extremely responsive and fast training, problem solving and assistance team available 24/7
- Tech support hotline by phone and internet
- Customer experience

»1,29 cm GSD at 100 m AGL!!!«

BRAMOR UAS

Features

- SIMPLE FLIGHT PLANNING
- ONE PERSON OPERATION
- CATAPULT TAKEOFF
- ACCURATE PARACHUTE LANDING IN A 30X30M ZONE
- ABILITY TO FLY MULTIPLE MISSION GEOMETRIES IN ONE FLIGHT
- MISSION WAYPOINTS CAN BE UPLOADED OR CHANGED DURING FLIGHT
- INFLIGHT REPROGRAMMABLE LANDING POINT
- ABILITY TO AUTONOMOUSLY PRECISION FLY AND MAP OVER TERRAIN FEATURES SUCH AS LANDSLIDES, HILLSIDES, ROADS, RIVERS, PIPELINES AND POWERLINES
- RETENTION OF GSD OVER VERTICAL TERRAIN CHANGES
- DATASET COMPATIBILITY WITH MOST SURVEY SOFTWARE PACKAGES
- CONVOY AND OPERATOR VEHICLE FOLLOWING CAPABILITY
- ROBUST FAIL-SAFE SYSTEM FOR MAXIMUM SAFETY
- C-ASTRAL ELECTRIC PROPULSION FOR MAXIMUM ENDURANCE
- FULLY AUTONOMOUS FLIGHT PROFILE FROM TAKEOFF TO LANDING
- WIND PENETRATION UP TO 15M/S
- ABILITY TO ACHIEVE RTK DATASET ACCURACY
- HIGH RATE IMU LOGGING ELECTRONICS FOR SURVEYING APPLICATIONS
- EXTREME WEATHER CONDITIONS OPERATIONS POSSIBLE
- PITOT TUBE DIRT/DUST PROTECTION
- FLIGHT READY IN UNDER 5 MINUTES
- ABILITY TO TRACK, GEO-REGISTER OR LOCK TARGETS

C-ASTRAL systems are fully compatible with:

- EnsoMOSAIC
- PIEneering
- Agisoft Photoscan
- Pix4D
- Menci software
- others

Applications

gEO

- Surveying
- Engineering
- Mining
- Construction
- Agriculture
- Forestry
- Oil, Gas
- Environmental Protection
- Public Agencies
- Waste Management
- Disaster Management
- Safety Assessment
- Flooding Change Detection
- Erosion Monitoring
- Volume Calculation
- Geology
- Archeology
- Asset Management

gHY

- Defense and Security: target detection, identification, surveillance, Search and Rescue
- Forestry: Forest mapping/classication, forest health monitoring
- Agriculture: Precision farming, growth monitoring, yield prediction, governmental legal and subsidy compliance monitoring and control
- Geology: Mineral mapping, environmental impact around mine areas
- Environmental Monitoring: Algae bloom, oil spill detection, land and sea monitoring, Cryosphere research, glaciology, anti-poaching efforts and monitoring
- Government: Land use management and urban planning

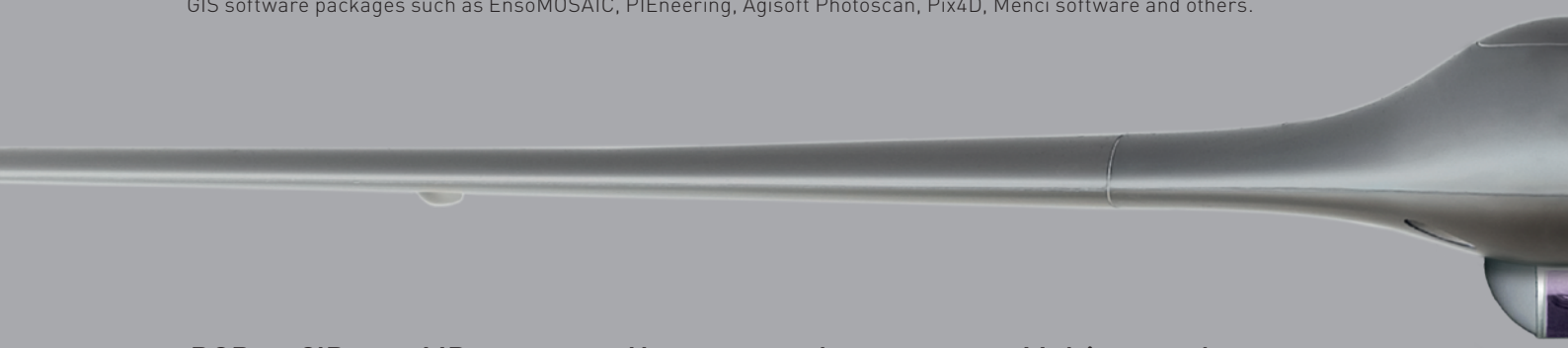
C4EYE

- Day and Night Observation
- Infrastructure Inspection
- Anti-poaching Surveillance
- Damage Assessment
- Anti-Smuggling Surveillance
- Fire Control / Spotting
- Maritime Surveillance
- Search & Rescue
- Coastal and Border Control
- Anti-Terrorist and Law Enforcement
- Surveillance
- Close-range Surveillance and Reconnaissance
- Special operations
- Low Intensity Conflicts
- Urban Operations
- Convoy Support
- Border Surveillance
- Battle Damage Assessment

BRAMOR UAS VERSIONS

The **C-ASTRAL BRAMOR** unmanned systems family consists of two product lines distinguished by use,

The **BRAMOR gEO/gHY line** is specialised for creation of cartographic datasets with different sensors (visible light, NIR spectrum and hyperspectral) that can be used in Geographic Information Systems of any kind. The BRAMOR gEO/gHY flight path precision and software capabilities are extremely high and 1,3 cm ground sampling distance (GSD) products are achievable with the system. Multiple diverse mission geometries at different flight altitudes in one flight are possible.
The systems are sold with our advanced mission design and planning software GeoPilot and are compatible with most COTS GIS software packages such as EnsoMOSAIC, PIEneering, Agisoft Photoscan, Pix4D, Menci software and others.



RGB or CIR 24.3 MP

- 24,3 MP color or IR 500-900nm
- SD Storage up to 64GB
- 30mm or 19mm lens
- C-Astral focus system
- 1,29 cm/pixel @ 100m AGL
- C-Astral High Precision IMU DATA logging

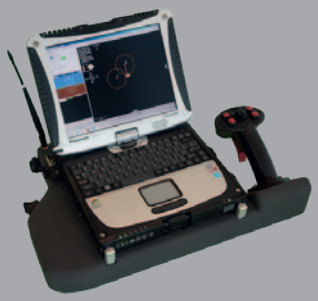
Hyperspectral sensor

- 1024x1024 pixel resolution
- SD Storage up to 64GB
- 1nm spectral step
- 500-900nm range
- F2,8 - FOV 37° X 37°
- 5.5 µm x 5.5 µm pixels
- C-Astral High Precision IMU DATA logging

Multispectral sensor

- 3.2 Megapixel CMOS sensor (2048 x 1536 pixels)
- 4,6cm/pixel @ 122m AGL
- Red, Green and NIR bands (approximating TM2, TM3 and TM4)
- extraction of NDVI, SAVI
- canopy segmentation and NIR / Green ratios
- C-Astral High Precision IMU DATA logging

Ground Control Station



- Ergonomically designed ATX-200 GCS system for Bramor C4EYE payload control.

- Robust and powerfull Kj 100 GCS for Bramor gEO and gHY platforms.

T/O catapult launchers

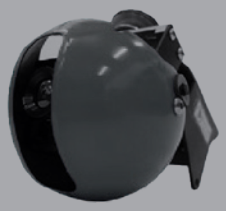
- Foldable elastic catapult launcher for gEO, gHY, C4EYE Bramor UAV

»Integrated precision AHRS data-logging board for best mosaic accuracy.«

the **BRAMOR gEO/gHY** line and **C4EYE** line.

The **BRAMOR C4EYE line** is appropriate for operations where real time or near real time video surveillance capability is of utmost importance. The stabilized C-ASTRAL EYE interchangeable gimbals provide electrooptical CCD and state of the art uncoolled microbolometer capabilities, that are capable of tracking moving objects, people and events at appropriate distances day and night.

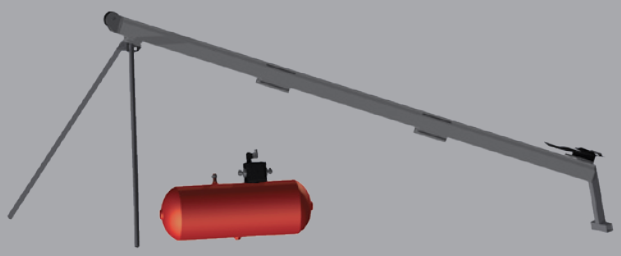
C-Astral EYE payload



- Gyro stabilized
- Sony FCB 10x optical zoom or FLIR Quark LWIR 320 thermal imaging
- Auto focus
- PAN 360°
- TILT 90°
- High quality belt drives
- Frame material 100% carbon composite

EO / IR/ LI payload

- High performance miniature EO / IR / LI payload
- 360 degree, continuous rotation
- Gyro-stabilized
- 10MP Electro-Optical (EO) imager
- Electronic pan-tilt-zoom (ePTZ)
- 640x480 long wave infrared (IR) imager
- 300 mW laser illuminator (LI), available at 400 - 2000 nm
- Image stabilization
- Target tracking
- Target geo-location
- Moving target detection



- Pneumatic catapult launcher designed for work in extreme low temperature conditions down to -25 ° Celsius

ASTRALTRACK tracking antenna

- Inovative tracking technology for long range DATA and VIDEO transmission.

Transport package

C-ASTRAL **BRAMOR** UAS FAMILY

COMMERCIAL DESIGNATION	**BRAMOR C4EYE**		**BRAMOR gEO**		**BRAMOR gHY**
SENSING TECHNOLOGY	C-Astral EYE payload 	EO/IR/LI payload 	24,3 Mpx RGB or CIR 	24,3 Mpx RGB + Multispectral RGB+NIR 	Hyperspectral 
WINGSPAN	230 cm				
LENGHT	96 cm				
AIRCRAFT TYPE & AIRFRAME	fixed wing, blended wing body configuration, kevlar reinforced carbon and vectran composite airframe				
AVIONICS	Lockheed Martin and C-ASTRAL ORTHOelectronics				
PROPULSION	C-Astral Brushless electric				
MTOW	4,2 kg				
PAYLOAD	0,6 – 1,0 kg				
CRUISE SPEED	16 m/s				
Vne	30 m/s				
TAKEOFF SYSTEM	ELASTIC LAUNCHER / PNEUMATIC LAUNCHER				
LANDING AREA	**30 m x 30 m**				
LANDING	PARACHUTE				
SERVICE CEILING	up to 5000m AMSL				
VIDEO & DATALINK RANGE	**Up to 30 km LOS with the ASTRALTRACK tracking antenna**				
ENDURANCE	up to 3 hours (demonstrated)		up to 2 hours (demonstrated)		
T/O READINESS	System T/O ready in less than 5 minutes				
OPTIONS	navigation lights, strobe AN/PVS-7 B/D, AN/PVS-14 and AN/AVS-9 compatible IR beacons heated pitot convoy following target tracking target speed estimation real time target coordinate estimation (3 m-5 m accuracy) multiple air vehicle control from single GCS air pollution, radiation, hazardous and non-hazardous gas sensors ADS-B transponder				
TRANSPORT	1 MILSPEC backpack and/or rugged case				
OPERATOR REQ	one or two operators				
FLYING	100% autonomous from takeoff to landing				
GIMBAL CONTROL	flight stick control				
ORTHOPHOTO CONTROL	**100% autonomous, multiple orthophoto mission geometries possible in 1 flight, reprogrammable on the fly while vehicle in the air**				
MANUAL FLIGHT CONTROL	optional flight stick				
GCS ENDURANCE	up to 10 h				
EMERGENCY FAIL-SAFES	yes, user configured				
TRAINING	**3 day training in Slovenia provided to all customers free of charge**				

↘ Bramor gEO, gHY, C4EYE rugged transport case

Backpack contents:
- ↘ Bramor UAV
- ↘ Elastic catapult
- ↘ GCS
- ↘ tracking antenna

C-ASTRAL

Unmanned Aircraft Systems

C-ASTRAL is a multidisciplinary R&D company based in Ajdovščina, Slovenia. The company is built around the fields of expertise and practical experience in aerospace, unmanned systems, electronics, communications, remote sensing, renewable energy systems, extreme environment operations and logistics support with projects being developed and tested in the field in the Arctic, Antarctic and deserts. C-ASTRAL also collaborates in high energy physics instrumentation development.

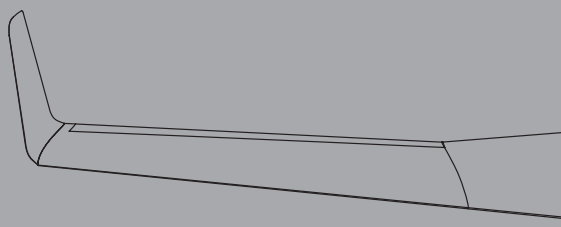
Currently the company operates a software and hardware laboratory for aerodynamics, communications, electronics and systems integration work and a prototyping CAD/CAM workshop facility for composite and metal materials work, modeling and integration.

The founders of C-ASTRAL have been active in aerospace since 1999 and are responsible for the first Slovenian UAS test flight in 2005 with the Spectral System test platform.

C-ASTRAL is a dynamic partner working in unmanned systems development, integration and operations and has established a UAS test flight facility and area in western Slovenia together with the Slovene CAA.

Contact C-ASTRAL for any cooperation, development and sales inquiries.

Unmanned - Unrivaled!



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