

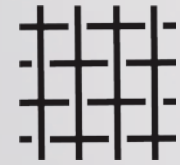
**ENDURING - PRECISION!**



**C - A S T R A L**  
AEROSPACE Ltd.



# C-ASTRAL Highlights



## Composite structures

Made from aerospace certified Kevlar, Vectran, Carbon & honeycomb. Performance, Style and Form instead of "styrofoam".



## Advanced Aerodynamics

Blended Wing Body UAV with large payload capacity, highest efficiency and long endurance for better productivity. Unrivaled.



## Precise imaging

High precision optics with inertial system data logging electronics, enabling a fast, seamless and software agnostic processing chain. ENDURING - PRECISION!



## Global tools need global support.

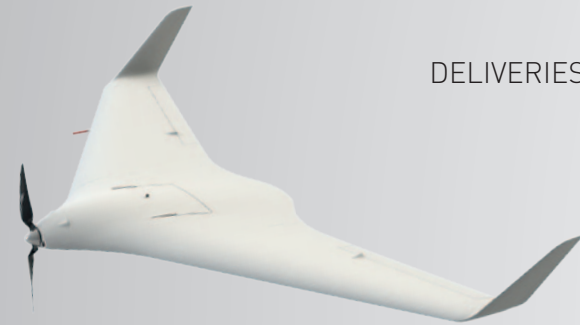
The C-ASTRAL customer service team is here to assist, support and problem solve. 24/7, 365.



# C-ASTRAL Family

## ATLAS UAS

HAND LAUNCHED



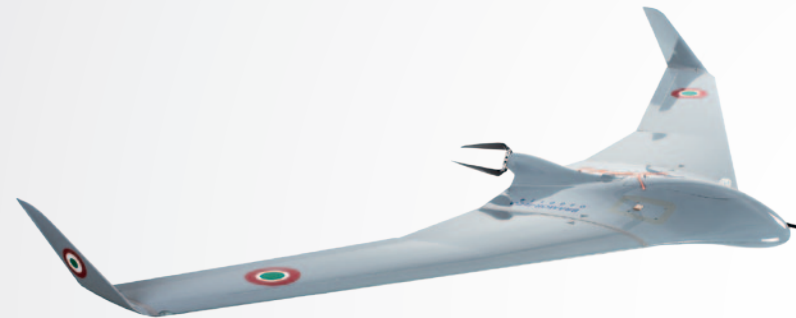
PRE ORDER **Q2 2015** -  
DELIVERIES STARTING IN **Q3 2015!**

The 2015 **ATLAS** (Advanced Technology Light Acquisition System) is currently the most compact member of the C-ASTRAL UAS family weighing only **2.3 kg!**

Developed over the last few years by C-ASTRAL X-WORKS, this hand launched system can carry an array of modular sensors, ranging from visible light, infra red, multispectral and hyperspectral to custom detectors. The ATLAS excels with a class leading endurance and modularity that enables quick reconfigurations and multiple functionality in a safe, compact, light, hand launched package, supported by a new avionics and guidance solution that is completely compatible with the current BRAMOR family ground segments.

## BRAMOR UAS

### C4EYE



The field proven **BRAMOR C4EYE** UAS line is appropriate for operations where real-time or near real time video observation and surveillance capability is of utmost importance. With an endurance of 3 hours and a standard datalink of 30 km, the C4EYE is easily the most capable and affordable small UAS in its class in the world.

#### C4EYE APPLICATIONS

- ↳ Wildfire management
- ↳ Environmental monitoring
- ↳ Infrastructure control
- ↳ Civil defense
- ↳ Long range (30 km) real-time situational awareness
- ↳ Fire control
- ↳ Over the hill observation
- ↳ Night surveillance
- ↳ Classical ISR
- ↳ Convoy following
- ↳ Moving target detection and tracking
- ↳ Low intensity conflict zone control
- ↳ Search and rescue missions

### rTK



The **BRAMOR rTK** (GNSS Post Processing) UAS is ideally suited for surveying and remote sensing applications that need a quick and industry leading high precision set of results down to sub-centimeter level also in the absence of a grid of ground control points.

#### ATLAS, rTK, gEO APPLICATIONS

- ↳ DSM, Pointcloud orthophoto mapping, Volume calculations
- ↳ IED detection
- ↳ Change detection
- ↳ Wildfire management and situational awareness
- ↳ Environmental monitoring
- ↳ Infrastructure control
- ↳ Agriculture
- ↳ Woods and landscape management
- ↳ Ecological monitoring and sensing
- ↳ Flood monitoring
- ↳ Civil defense
- ↳ Civil counter reconnaissance

CATAPULT LAUNCHED

### gEO



The industry leading **BRAMOR gEO** UAS family is suited for surveying and remote sensing applications in areas where replacement of the standard surveying methods is needed. It is capable of measuring precise results down to 1 cm with a Ground Sampling Distance that starts at 0.9 cm.



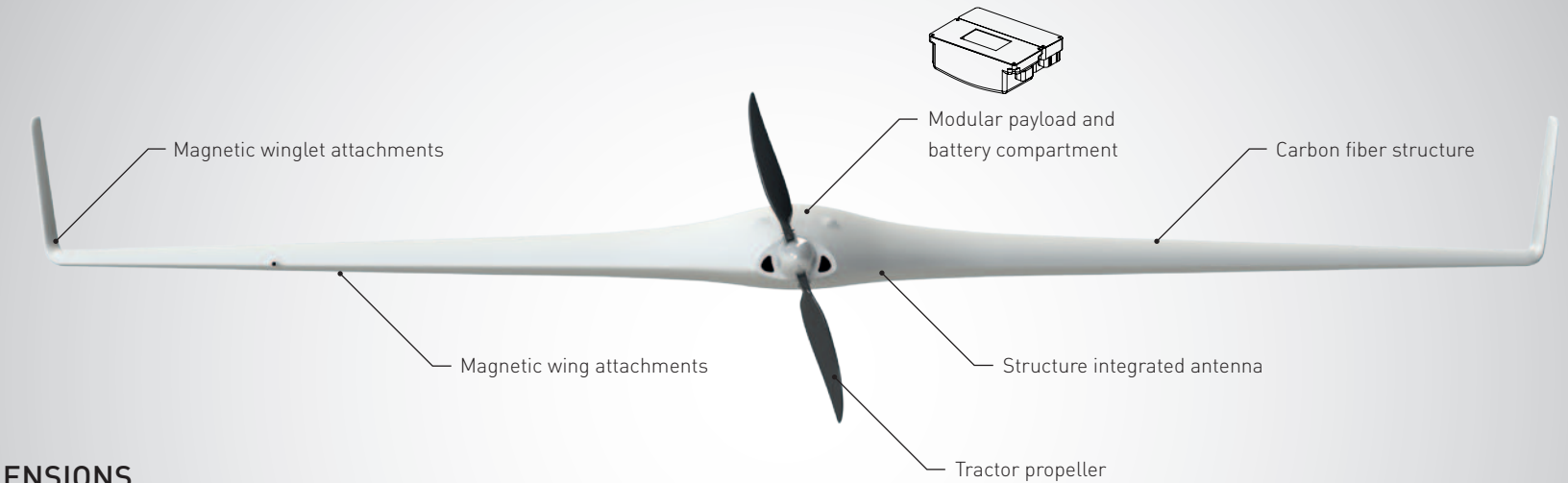
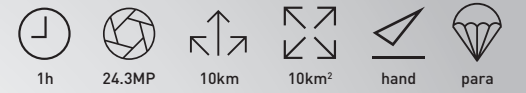
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“Hand launched takeoff, autonomous flight and parachute landing.”

# ATLAS



## DIMENSIONS

- ✎ wingspan: 155 cm
- ✎ length: 82 cm
- ✎ central module length: 61 cm
- ✎ T/O Weight: 2.3 kg

## FEATURES

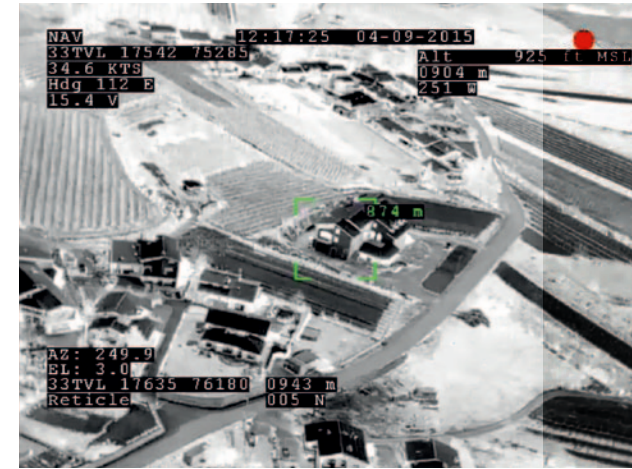
- ✎ Safe hand launch
- ✎ Autonomous guidance from take off to landing
- ✎ Up to 1 h Endurance
- ✎ Automatic parachute landing
- ✎ Flight over mountaineous terrain
- ✎ Rain proof
- ✎ Wind resistance 33 knots
- ✎ Operational temp -25°C to +45°C
- ✎ Rugged check-in luggage size transport form factor

ATLAS is compact, affordable and easy to use, but capable of complex missions in the most demanding conditions.  
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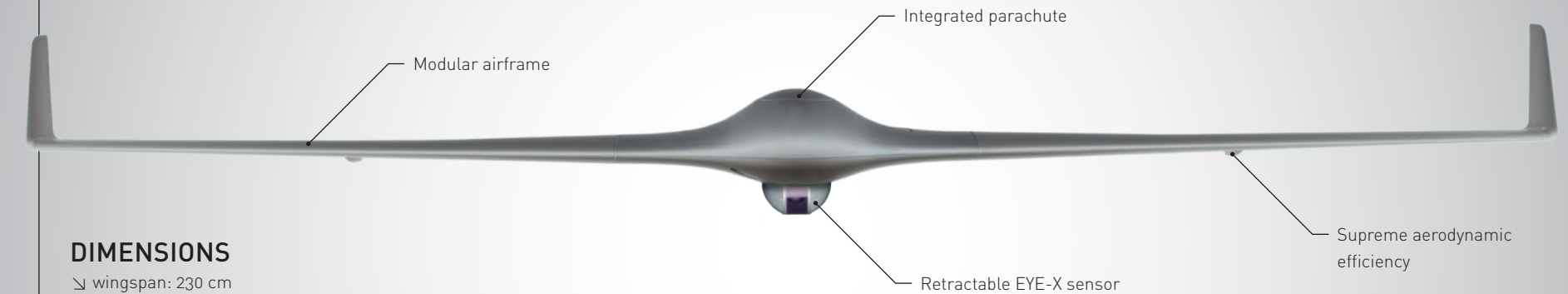


Superior situational awareness



“The Ultimate C4ISR Solution – easily the most capable and affordable small UAS in its class in the world!”

# BRAMOR C4EYE



## DIMENSIONS

- ∨ wingspan: 230 cm
- ∨ length: 96 cm
- ∨ central module length: 67 cm
- ∨ T/O Weight: 4.2 kg

## FEATURES

- ∨ In-flight waypoint management
- ∨ Camera, Altitude, and Target prosecution guidance modes
- ∨ One person operation
- ∨ Catapult takeoff
- ∨ Accurate Parachute Landing in a 30 m x 30 m zone
- ∨ Convoy following capability
- ∨ Robust fail-safe system for maximum safety
- ∨ Wind penetration up to 29 knots
- ∨ Flight ready in less than 5 min
- ∨ Ability to track, Geo-register or Lock targets
- ∨ Video/Data range up to 30 km
- ∨ AN/PVS-7B/D, AN/PVS-14 and AN/AVS-9 night vision enabled optional IR beacons

The field proven BRAMOR C4EYE UAS line is appropriate for operations where real-time or near real time video observation and surveillance capability is of utmost importance. With an endurance of 3 hours and a standard datalink of 30 km.

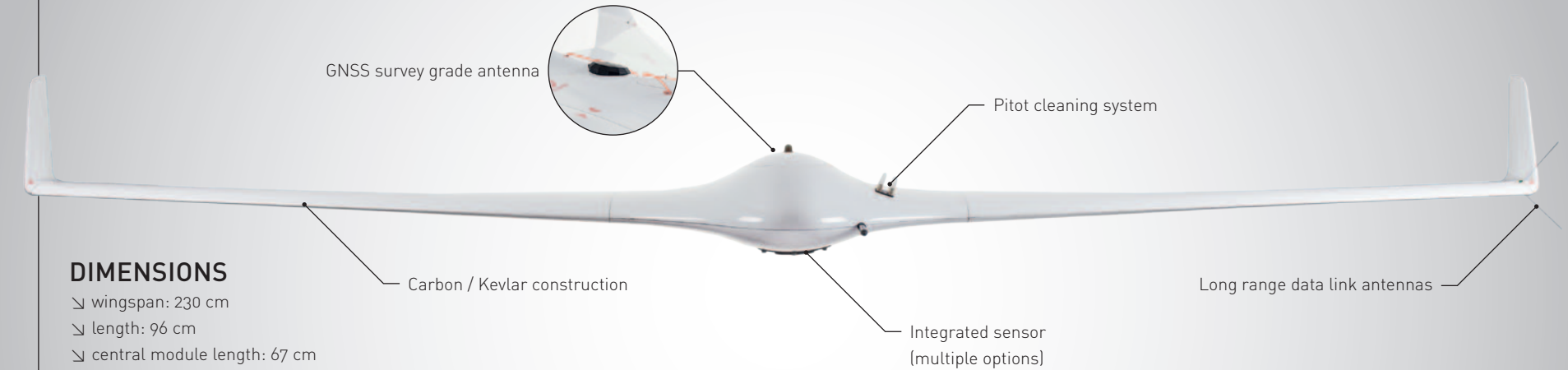


## Precision matters



“Data acquisition in the absence of a preplaced grid of ground control points. Efficiency, precision, safety and productivity.”

# BRAMOR rTK



### DIMENSIONS

- ↳ wingspan: 230 cm
- ↳ length: 96 cm
- ↳ central module length: 67 cm
- ↳ T/O Weight: 4.2 kg

### FEATURES

- ↳ 100% Autonomous
- ↳ Automatic parachute landing
- ↳ Orography capable flight planning with GSD maintenance over slopes, hills and valleys
- ↳ Safe catapult launch
- ↳ Rain proof
- ↳ Wind resistance 33 knots
- ↳ Operational temp -25°C to +45°C

### Mapping area in one flight

- ↳ 15 km² / 900 m AGL / 12 cm GSD
- ↳ 2 km² / 100 m AGL / 1.3 cm GSD

### rTK and post processing specs

- ↳ Absolute dataset accuracy down to 1.5cm
- ↳ 24.3 Megapixel Camera
- ↳ GSD sub cm @ 70m AGL
- ↳ Survey grade GNSS antenna onboard
- ↳ L1&L2 GNSS Receiver
- ↳ GPS, Glonass, Beidou, Galileo Ready

### rTK Survey modes

- ↳ Known point base station
- ↳ Unknown point base station
- ↳ Virtual Reference station
- ↳ Compatible with RINEX Base data

The **BRAMOR rTK** (GNSS Post Processing) UAS is ideally suited for surveying and remote sensing applications that need a quick and industry leading high precision set of results down to sub-centimeter level also in the absence of a grid of ground control points. Autonomous takeoff, 2.5 hr flight, parachute landing.



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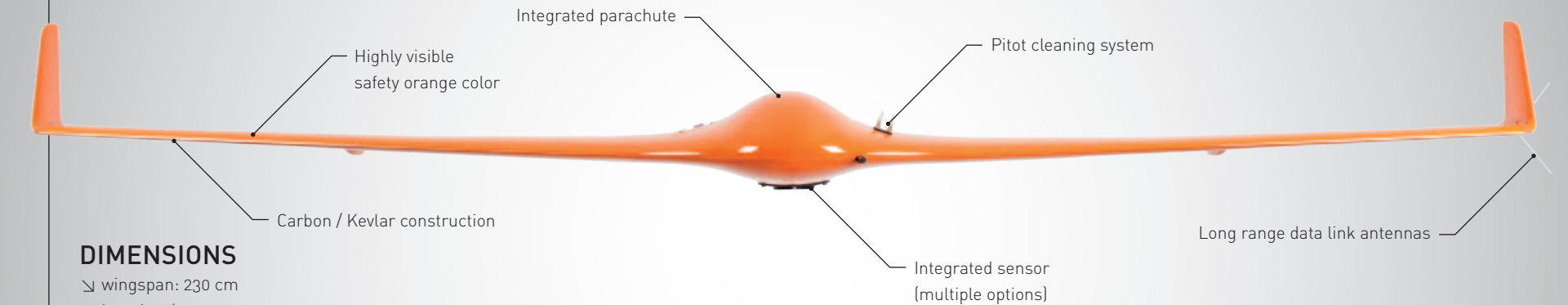


Advanced and reliable mapping solution



“1.3 cm GSD at 100 m AGL!!!  
Unrivalled dataset accuracy.”

# BRAMOR gEO



## DIMENSIONS

- ✎ wingspan: 230 cm
- ✎ length: 96 cm
- ✎ central module length: 67 cm
- ✎ T/O Weight: 3.8 kg

## FEATURES

- ✎ Create Georeferenced maps, DTM, DSM and 3D models
- ✎ Map over 10 sq km in a single flight
- ✎ Simple flight preparation procedures
- ✎ Simple mission planning
- ✎ Reliable catapult takeoff and parachute landing
- ✎ More than 20.000 hours in the air and still flying
- ✎ 3 hr Long endurance version option

## PRODUCTION VERSIONS

- ✎ **gHY** equipped with Hyperspectral sensor
- ✎ **gDS** equipped with dual sensor RGB + Multispectral or RGB with NIR
- ✎ **gMS** equipped with laser mass spectrometer for gas detection

The industry leading **BRAMOR gEO** UAS family is suited for surveying and remote sensing applications in areas where replacement of the standard surveying methods is needed.

It is capable of measuring precise results down to 1 cm with a Ground Sampling Distance that starts at 0.9 cm.

Customized systems for a variety of applications in aerophotogrammetry and remote sensing.

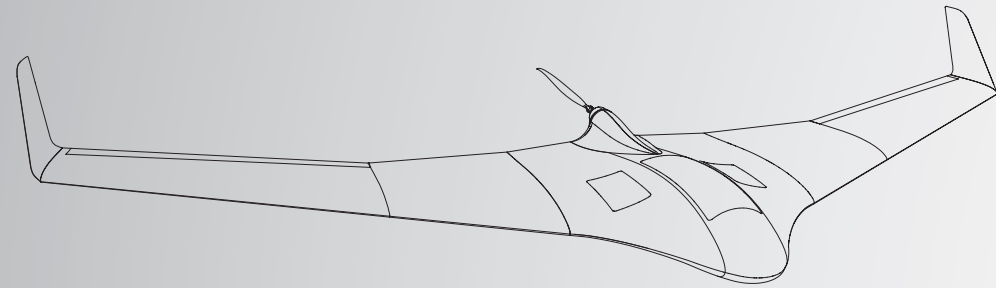


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# VISION UNLIMITED!

## BRAMOR



## C4EYE



### EYE-X EO/IR Gimbal

10 MP ePTZ CMOS RGB visible light sensor  
 LWIR Uncooled bolometer core FLIR QUARK 640  
 2x, 4x, 8x zoom capability  
 Full Frame Rate 7.5 Hz (NTSC); 8.3 Hz (PAL)  
 Pixel Pitch 17 µm  
 Spectral Band 7.5-13.5 µm  
 QUARK VPC module  
 Brushless electric motor  
 Pan 360°, Tilt 90°  
 Gyro + Software continuous stabilization

## gEO/rTK



24.3 MP  
 RGB or CIR



24.3 MP  
 NDVI sensor

### C-ASTRAL APS-C sensor

RGB  
 CIR (630 nm, 720 nm or 850 nm)

### C-ASTRAL APS-C Sensor

NDVI output capability  
 (NIR, Vegetation Monitoring,  
 Vegetation Health, NIR Total Spectral)

## Dual sensor gDS



24.3 MP  
 RGB



1.3 MP  
 multispectral

### Multispectral RGB + NIR

3.2 micron pixel size  
 520nm-920nm  
 1024x768 image resolution  
 GSD at 122m AGL: 7cm  
 GSD at 200m AGL: 12cm  
 GSD at 350m AGL: 20.5cm

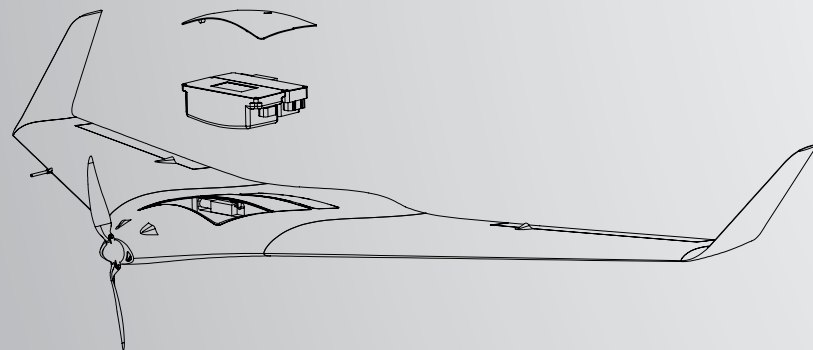
## gHY



### Hyperspectral imager

Spectral range 500-900 nm,  
 Spectral resolution 10 nm FWHM  
 Spectral step > 1 nm  
 Sensor CMV4000  
 Sensor pixel clock frequency 80 MP/s  
 Default image size 860 x 620 2x binning  
 Max image size 1720 x 1240  
 50ms readout

## ATLAS



24.3 MP  
 RGB or CIR

### C-ASTRAL APS-C sensor

RGB  
 CIR (630 nm, 720 nm or 850 nm)

## Dual sensor aDS



24.3 MP  
 NDVI sensor

### C-ASTRAL APS-C Sensor

NDVI output capability  
 (NIR, Vegetation Monitoring,  
 Vegetation Health, NIR Total Spectral)



16 MP  
 RGB



1.3 MP  
 multispectral

### Multispectral RGB + NIR

3.2 micron pixel size  
 520 nm-920 nm  
 1024x768 image resolution  
 GSD at 122 m AGL: 7 cm  
 GSD at 200 m AGL: 12 cm  
 GSD at 350 m AGL: 20.5 cm

## iSR



### C-Astral µEYE

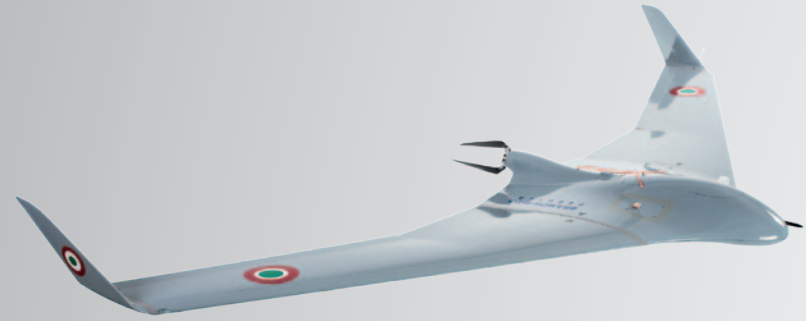
Stabilized video gimbal



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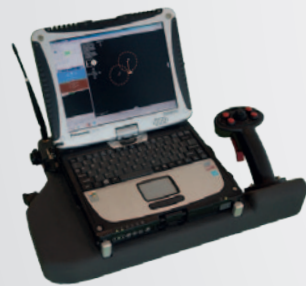


# UNLIMITED PERFORMANCE!



## Basic Bramor C4EYE system package consists of:

- ↳ BRAMOR C4EYE airframe
- ↳ KJ-200 GCS
- ↳ Flight case transportation system
- ↳ CAT 1 catapult launcher
- ↳ ASTRALTRACK automatic tracking antenna
- ↳ Recovery parachute (2 units) with protective packs
- ↳ Set of basic spares (carbon tubes, small material, 1 extra propeller)
- ↳ Battery charger (including cables for GCS and Li-Po)
- ↳ Training in Slovenia (excluding lodging & transportation costs)
- ↳ Documentation & Manuals



## Basic BRAMOR gEO/rTK system package consists of:

- ↳ BRAMOR gEO/rTK airframe
- ↳ KJ-100 GCS
- ↳ Flight case transportation system
- ↳ CAT 1 elastic launching system
- ↳ Recovery parachute (2 units) with protective packs
- ↳ Set of basic spares (carbon tubes, small material, 1 extra propeller)
- ↳ Battery charger (including cables for GCS and Li-Po)
- ↳ Training in Slovenia (excluding lodging & transportation costs)
- ↳ Documentation & Manuals



## Basic ATLAS system package consists of:

- ↳ ATLAS airframe
- ↳ KJ-100μ GCS (touchpad)
- ↳ Flight case transportation system
- ↳ Recovery parachute (2 units) with protective packs
- ↳ Set of basic spares (carbon tubes, small material, 1 extra propeller)
- ↳ Battery charger (including cables for GCS and Li-Po)
- ↳ Training in Slovenia (excluding lodging & transportation costs)
- ↳ Documentation & Manuals



## BRAMOR OPTIONAL ENHANCEMENTS



### EMERGENCY BEACON LOCATOR

Find the location of your system with a built-in VHF beacon and handheld receiver.



### ASTRALTRACK Tracking Antenna

Automatic tracking technology for 30 km range DATA and VIDEO transmission.

REACH-30 video TX and RX units  
2.4 GHz, 30 km LOS video link



### CAT 2 Pneumatic Launching System

For cold weather operations (-20°C).

Aluminum lightweight folding pneumatic catapult including a compressor & an electronic valve.



### ADS-B S-Mode Transponder

Make your UAV visible to other cooperating traffic and air traffic control.



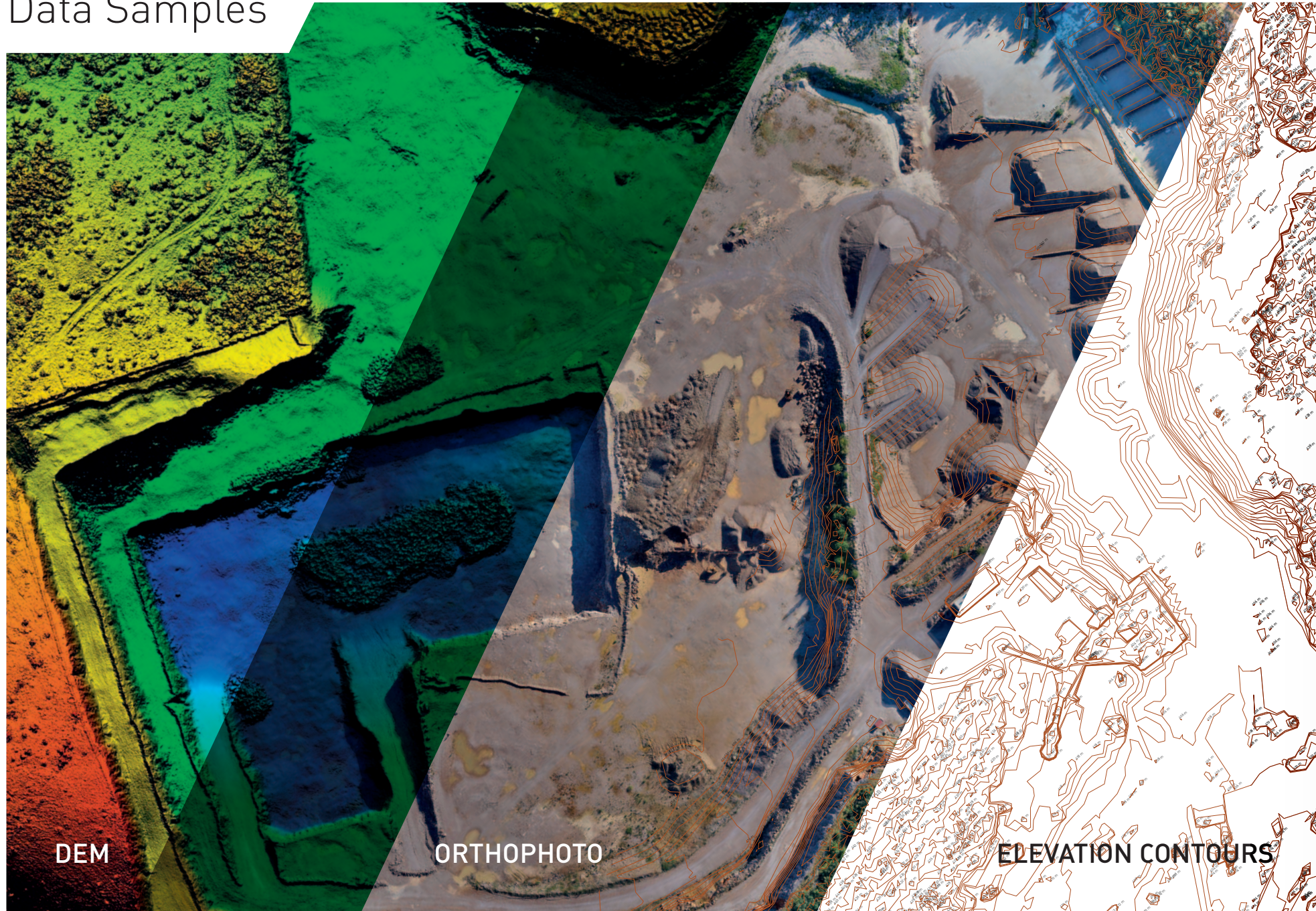
### Waterproof Backpack

Heavy duty whole system waterproof carrying backpack for gEO, rTK and C4EYE systems.



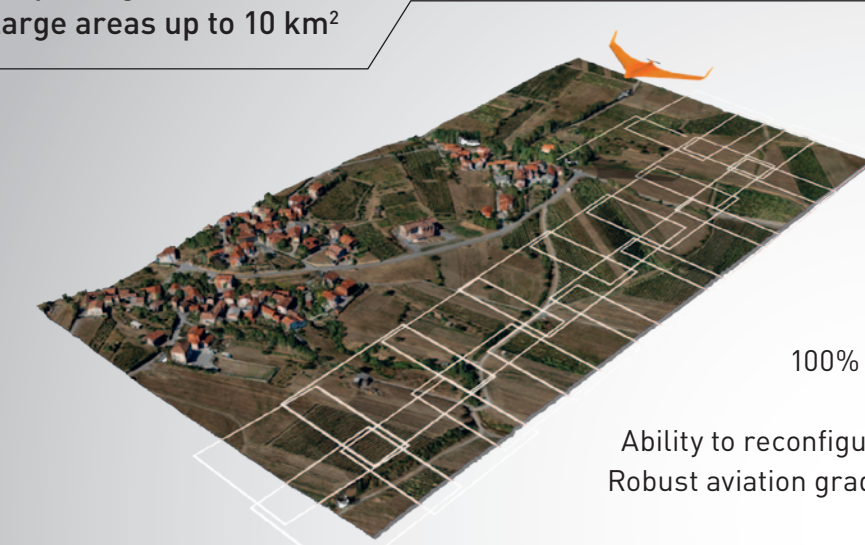


# Data Samples



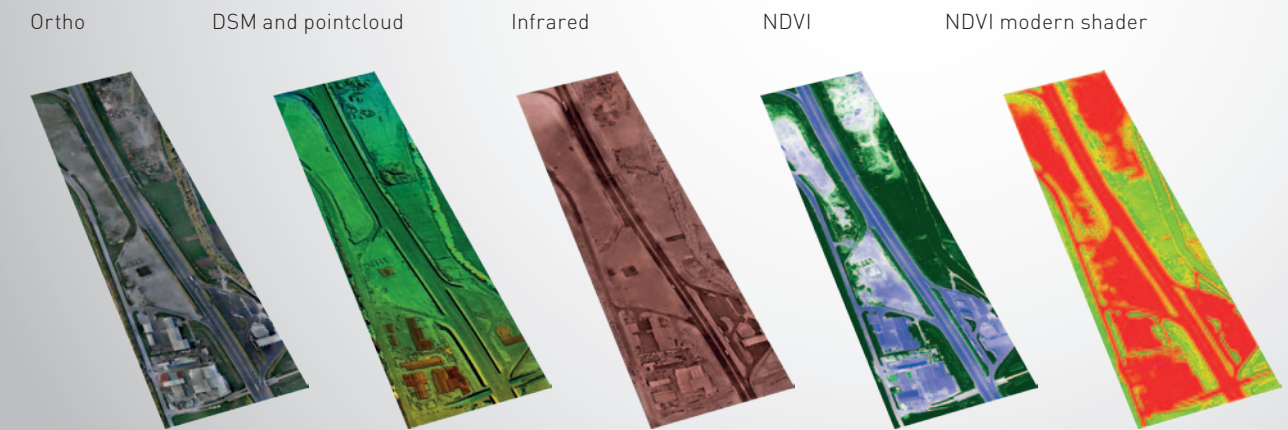
# C-ASTRAL Surveying Systems

Map and georeference large areas up to 10 km<sup>2</sup>



Choose your project geometry  
 Map rivers, roads, pipelines  
 100% autonomous from takeoff to landing  
 Land safely with parachute landing  
 Ability to reconfigure your mission and landing in flight  
 Robust aviation grade fail-safe systems and procedures

### Data output:



“Integrated precision AHRS data-logging board for best mosaic accuracy.”

### Working phases:

- ⌵ Flight planning
- ⌵ Imaging flight
- ⌵ Image processing

### Sensor options:

- ⌵ RGB 24.3 Mp
- ⌵ CIR 24.3 Mp 560-850 nm
- ⌵ ARINOV multispectral agroSensor
- ⌵ TETRACAM ADC Snap 520-920 nm
- ⌵ GAMAYA Hyperspectral
  - 16 channels 450 – 630 nm
  - 25 channels 600 – 950 nm
- ⌵ RIKOLA Hyperspectral 500-900 nm
  - Spectral Step ~ 1 nm

C-ASTRAL systems are fully compatible with the following image registration and processing software packages:

- ⌵ EnsoMOSAIC
- ⌵ PIEnearing
- ⌵ Agisoft Photoscan
- ⌵ Pix4D
- ⌵ Menci and other software packages



# C-ASTRAL Technical data

COMMERCIAL DESIGNATION	ATLAS		BRAMOR <b>C4EYE</b>	BRAMOR <b>gEO / rTK</b>			
SENSING TECHNOLOGY	C-Astral $\mu$ EYE	24.3 Mpx RGB, CIR or NDVI	+ Multispectral / RGB + NIR	C-Astral EYE-X payload	24.3 Mpx RGB, CIR or NDVI	<b>gDS</b> 24.3 Mpx RGB + Multispectral / RGB + NIR	<b>gHY</b> Hyperspectral
WINGSPAN	155 cm			230 cm			
LENGHT	82 cm			96 cm			
AIRCRAFT TYPE & AIRFRAME	fixed wing, blended wing body configuration, carbon composite airframe, modular payload bay			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	2.3 kg			3.8 - 4.2 kg			
PAYLOAD	0.3 kg			0.6 - 1.0 kg			
CRUISE SPEED	16 m/s						
Vne	30 m/s						
TAKEOFF SYSTEM	AUTONOMOUS / HAND LAUNCHED			ELASTIC LAUNCHER / PNEUMATIC LAUNCHER			
LANDING AREA	<b>30 m x 30 m</b>						
LANDING	PARACHUTE						
SERVICE CEILING	up to 5000 m AMSL						
VIDEO & DATALINK RANGE	<b>Up to 30 km LOS with the ASTRALTRACK tracking antenna</b>						
ENDURANCE	up to 1 hour			up to 3 hours (demonstrated)	up to 2 hours (demonstrated)		
T/O READINESS	System T/O ready in less than 3 minutes			System T/O ready in less than 5 minutes			
OPTIONS	navigation lights, strobe convoy following target tracking 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			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 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 operator			one or two operators			
FLYING	100% autonomous from takeoff to landing						
GIMBAL CONTROL	flight stick control						
ORTHOPHOTO CONTROL	<b>100% autonomous, multiple orthophoto mission geometries possible in 1 flight, reprogrammable on the fly while vehicle in the air</b>						
MANUAL FLIGHT CONTROL	optional flight stick						
GCS ENDURANCE	up to 10 h						
EMERGENCY FAIL-SAFES	yes, user configured						
TRAINING	<b>3 day training in Slovenia provided to all customers, special training arrangements are possible</b>						



**C-ASTRAL** Aerial surveying systems bring unrivaled accuracy to your operational workflow.



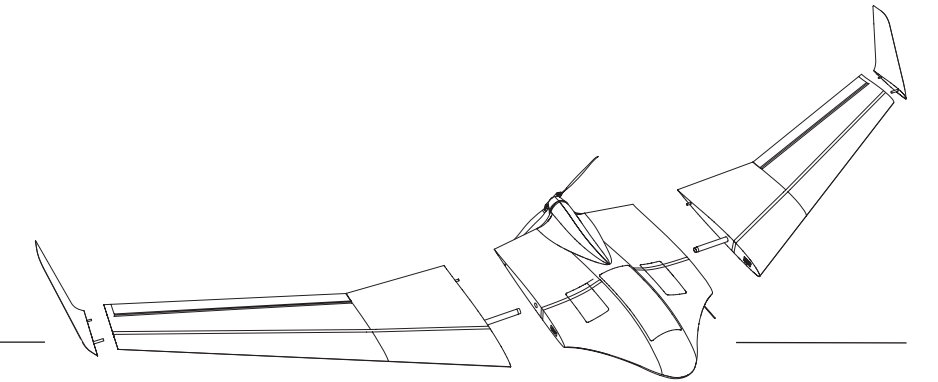
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**C-ASTRAL** is your dynamic aerospace and unmanned systems partner!

## Sales Partners



SOUTH AFRICA

**AFGEN**

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POLAND

**EUROSYSTEM**

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web: [www.eurosystem.com.pl](http://www.eurosystem.com.pl)

IRELAND

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ITALY

**EUROLINK SYSTEMS**

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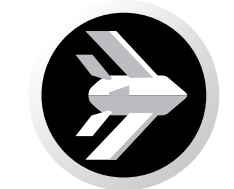
web: [www.tskay-tech.com](http://www.tskay-tech.com)

CENTRAL AND LATIN AMERICA

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# ENDURING - PRECISION!

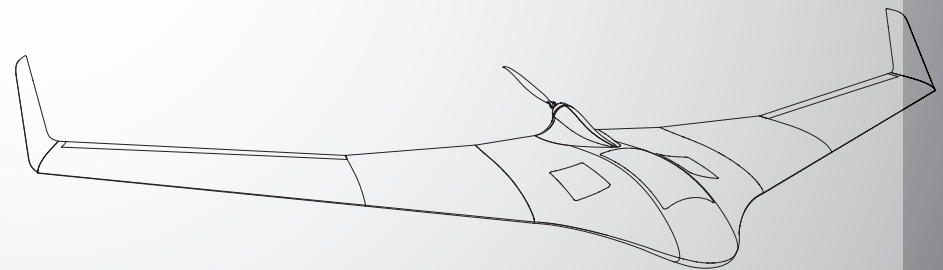
**C-Astral** is an aerospace enterprise and solution provider based in Ajdovscina, Slovenia, the “hub” of advanced aerospace development and integration in this part of the world. The company is one of the market leaders in the small unmanned systems (UAS) and services field and has a global presence, a robust research and development program and advanced integration/customization capacities.

The company is built around the fields of expertise and practical experience in aerospace, unmanned systems, electronics and sensor development, aerial based surveying and processing, remote sensing, telecommunications, renewable energy systems and extreme environment autonomous habitats and communications.

C-Astral operates a software and hardware laboratory for aerodynamics and systems integration work and a prototyping CAD/CAM workshop facility for composite and metal materials work, modeling and systems integration.

The founders of C-ASTRAL have been active in renewable energy systems integration and habitats work since 1994 and in aerospace since 1999 and are responsible for the first Slovenian Unmanned Aircraft System test flight in 2005 with the Spectral System platform.

Our systems are now flying over all continents, including Antarctica and over the Arctic.



**C-Astral d.o.o.**

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