



C - A S T R A L  
AEROSPACE Ltd.

# ENDURING - PRECISION!

UNMANNED AIRCRAFT SYSTEMS



C-ASTRAL.COM

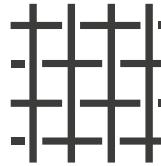


# C-ASTRAL Highlights

## C-Astral unmanned systems

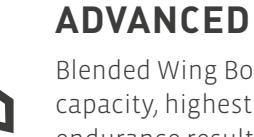
are much smaller than manned aircraft, easier to maintain and transport and therefore much more cost-effective, providing excellent productivity and fast return on investment.

The industry leading BRAMOR UAS family is electrically powered and is able to achieve superior stability and endurance through its unique advanced Blended Wing Body airframe aerodynamics. It is capable of achieving the most precise surveying results in the small UAS category down to 1,5 cm, with a Ground Sampling Distance that starts at 0,7 cm.



### MANUFACTURED FROM

Aerospace certified Kevlar™, Vectran™, carbon composites and honeycomb structural elements. Performance, Style and Form instead of "styrofoam".



### ADVANCED AERODYNAMICS

Blended Wing Body (BWB) airframes with large payload capacity, highest aerodynamic efficiency and long endurance resulting in better productivity. Unrivaled.



### ACCURATE REMOTE SENSING

Precision optics and multiple sensor options with INS 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.  
[support@c-astral.com](mailto:support@c-astral.com)



# C-ASTRAL Applications

ppX

## SURVEYING AND REMOTE SENSING

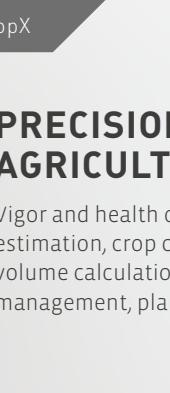
Point cloud derived DSM, DEM, orthomosaic, Aero-photogrammetry, mapping, surveying, volume calculations and estimations.



ppX C4EYE

## INFRASTRUCTURE CONTROL

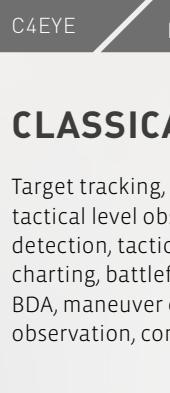
Roads and railroads management and control, critical infrastructure monitoring, pipeline and well monitoring, upstream, midstream and downstream monitoring.



ppX

## PRECISION AGRICULTURE

Vigor and health of crops, yield estimation, crop counting and volume calculations, chemical management, plant deconvolution.



ppX C4EYE

## FLOOD MONITORING

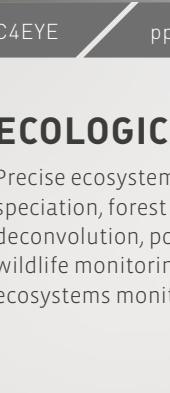
Digital terrain model derived flood simulations and real time flood control.



ppX

## OPEN PIT MINING

High precision fast revisit time volume and stockpile calculations, infrastructure and machinery control.



C4EYE ppX

## ECOLOGICAL SENSING

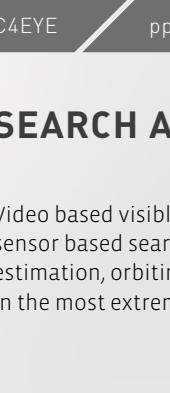
Precise ecosystems status monitoring, speciation, forest management, plant deconvolution, pollutants identification, wildlife monitoring, cryosphere, sea ecosystems monitoring, anti-poaching.



C4EYE ppX

## CLASSICAL ISR

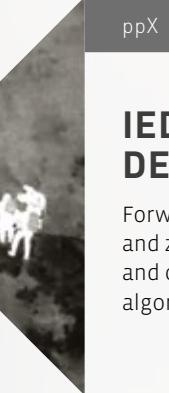
Target tracking, coordinate estimation, tactical level observation, change detection, tactical mapping and charting, battlefield zone observation, BDA, maneuver estimation and observation, communications relay.



C4EYE ppX

## SEARCH AND RESCUE

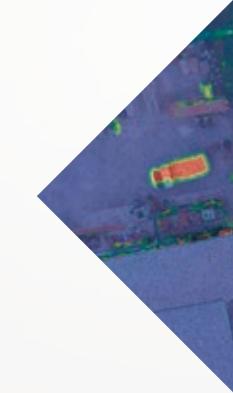
Video based visible light and thermal sensor based search, coordinate estimation, orbiting observation in the most extreme conditions.



ppX

## IED CHANGE DETECTION

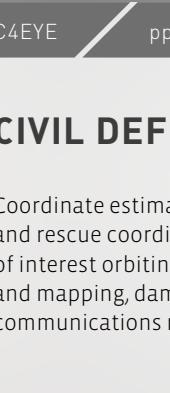
Forward area infrastructure road and zone of interest mapping and charting, change detection algorithm applications.



C4EYE ppX

## WILDFIRE MANAGEMENT

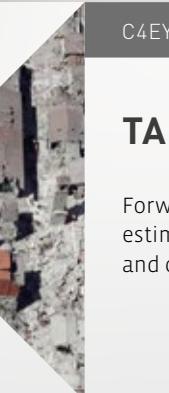
Hot zone definition and fire perimeter definition, coordinate estimation, wildfire area mapping and charting, damage assessment, communications relay.



C4EYE ppX

## CIVIL DEFENSE

Coordinate estimation, search and rescue coordination, zone of interest orbiting, charting and mapping, damage assessment, communications relay.



C4EYE ppX

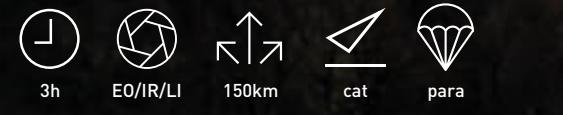
## TARGET ESTIMATION

Forward area of operations target estimation, BDA, tactical mapping and charting.



THE ULTIMATE SOLUTIONS  
FOR YOUR MISSION.

# BRAMOR C4EYE



## FEATURES AND APPLICATIONS

- Long Range (30km+) IP Manet data/videolink
- Encrypted communication
- MANET (Mobile Ad Hoc Network) optional secure digital communications
- Wildfire management
- Environmental monitoring
- Infrastructure control
- Over the hill observation (LOS)
- Night surveillance
- Fire control
- Civil defense
- Target detection and tracking
- Low intensity conflict zone control
- Search and rescue missions
- Anti-poaching
- NGO support missions

IN OPERATIONAL USE ON FOUR CONTINENTS

BATTLEFIELD AND SPECIAL OPS PROVEN

**"The Ultimate C4ISR Solution – the most capable and affordable small UAS in its class in the world!"**

A NATO OPERATIONS C-ASTRAL USER

IP VIDEO/DATA RANGE UP TO 40KM

RETRACTABLE EYE-X HD2 SENSOR

INTEGRATED PARACHUTE

SUPREME AERODYNAMIC EFFICIENCY

MODULAR AIRFRAME

TRACK, GEO-REGISTER OR LOCK TARGETS





# BRAMOR C4EYE Sensor Options



3h



EO/IR/LI

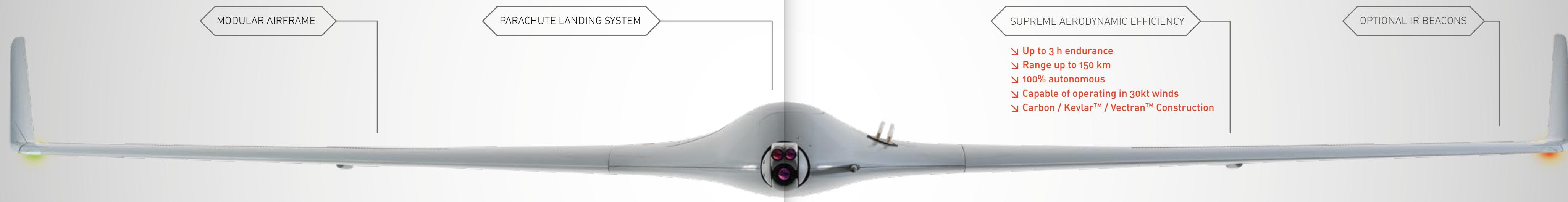
150km



cat



para



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 up to 3 hours, a standard data and payload link of up to 40km LOS, or the optional MANET digital communications capabilities.

\* Flight endurance measured at ICAO standard atmosphere conditions (15 °C / 1013,25 hPa / winds calm), depends on UAS configuration/system weight.



"We have put this machines through their paces in battle zone conditions and the MOD has decided that this will be the UAS of choice for future procurement."

A SOVEREIGN C4EYE OPERATOR IN EUROPE

SENSOR OPTIONS

NEW SENSOR AVAILABLE NOW



EYE-X EO/IR/Laser Illuminator Gimbal

EYE-XHD2 Nose mounted sensor, total 40x continuous zoom

## DIMENSIONS

- ✓ wingspan: 230 cm
- ✓ length: 96 cm
- ✓ central module length: 67 cm
- ✓ T/O Weight: 4,5 kg

- ✓ Robust fail-safe system for maximum safety
- ✓ 30kt sustained wind penetration
- ✓ Flight ready in less than 5 min
- ✓ Ability to track, Geo-register or Lock targets
- ✓ Standard video/data range up to 40 km LOS

## FEATURES

- ✓ In-flight waypoint management
- ✓ Camera, Altitude, and Target prosecution guidance modes
- ✓ 1-2 person operation
- ✓ Catapult takeoff
- ✓ Accurate parachute landing in a 30 m x 30 m zone
- ✓ Convoy following capability



# Bramor C4EYE **EYE-X** Sensor

**"The system performed much better than what we were used to from other UASs and the change detection counter IED workflow saved lives."**

— A BRAMOR SYSTEMS INSTRUCTOR FROM A NATO COUNTRY OPERATING IN AFGHANISTAN —



## TARGET GEO-LOCATION

Accurate geo-location of a target based on its location in a video image is a key functionality provided by the EYE-X gimbal sensor at day and night.



## 10MP SNAPSHOT

Enables 10MP snapshot stored on-board micro SD card or real-time download from UAV.  
Video recording is possible on-board as well as off-board.  
Live snapshot gallery accessible via MANET radio.



## VEHICLE TRACKING

Pursue mode continually updates the loiter point around the target to allow the UAV to center its flight path on the target of interest.



## HUMAN SIZE OBJECT TRACKING

Pursue mode continually updates the loiter point around the target to allow the UAV to center its flight path on the target of interest.



## LASER ILLUMINATOR

Highlight ground targets with the built-in stabilized illuminator.

|



EYE-XHD2 combined sensor

The **EYE-X gimbals** bring the capabilities of much larger UAS systems to the tactical level. Equipped with high resolution EO and IR sensor with an optional laser illuminator, capable of detecting, tracking, following and geo-locating targets, objects, features and infrastructure, day and night.

## EYE-X GIMBAL

- ↳ Belly mount
- ↳ 10 MP ePTZ CMOS RGB visible light sensor
- ↳ LWIR Uncooled bolometer core FLIR QUARK 640
- ↳ 2x, 4x, 10x zoom capability
- ↳ Gyro + Software continuous stabilization
- ↳ 300mW laser illuminator (LI) available at 400-2000nm
- ↳ Target tracking, Pursue mode and Geo-Location
- ↳ On-board / Off-board Recording

## EYE-X HD2 GIMBAL

- ↳ Nose mount
- ↳ EO Resolution: 1280 x 720
- ↳ EO zoom: 20x + 2x digital (total 40x) continuous
- ↳ IR Resolution: 640 x 480 (BH/WH toggle)
- ↳ IR zoom: 4x digital
- ↳ Gyro + Software continuous stabilization
- ↳ IR Laser pointer available at 850nm
- ↳ Target tracking, Pursue mode and Geo-Location
- ↳ NETD better than 0.05°C
- ↳ On-board / Off-board Recording

DRI – Visible Channel	DETECT	RECOGNIZE	IDENTIFY
<b>MAN</b>	<b>&gt; 5 km</b>	<b>&gt; 3 km</b>	<b>&gt; 1.5km</b>
<b>VEHICLE</b>	<b>&gt; 20 km</b>	<b>&gt; 5 km</b>	<b>&gt; 3 km</b>

DRI – Thermal Channel	DETECT	RECOGNIZE	IDENTIFY
<b>MAN</b>	<b>370 m</b>	<b>144 m</b>	<b>72 m</b>
<b>VEHICLE</b>	<b>1150 m</b>	<b>400 m</b>	<b>200 m</b>

## APPLICATIONS

### C4EYE

INFRASTRUCTURE CONTROL,  
FLOOD MONITORING,  
ECOLOGICAL MONITORING  
AND SENSING, CLASSICAL ISR,  
SEARCH AND RESCUE,  
WILDFIRE MANAGEMENT,  
CIVIL DEFENSE,  
FIRE CONTROL

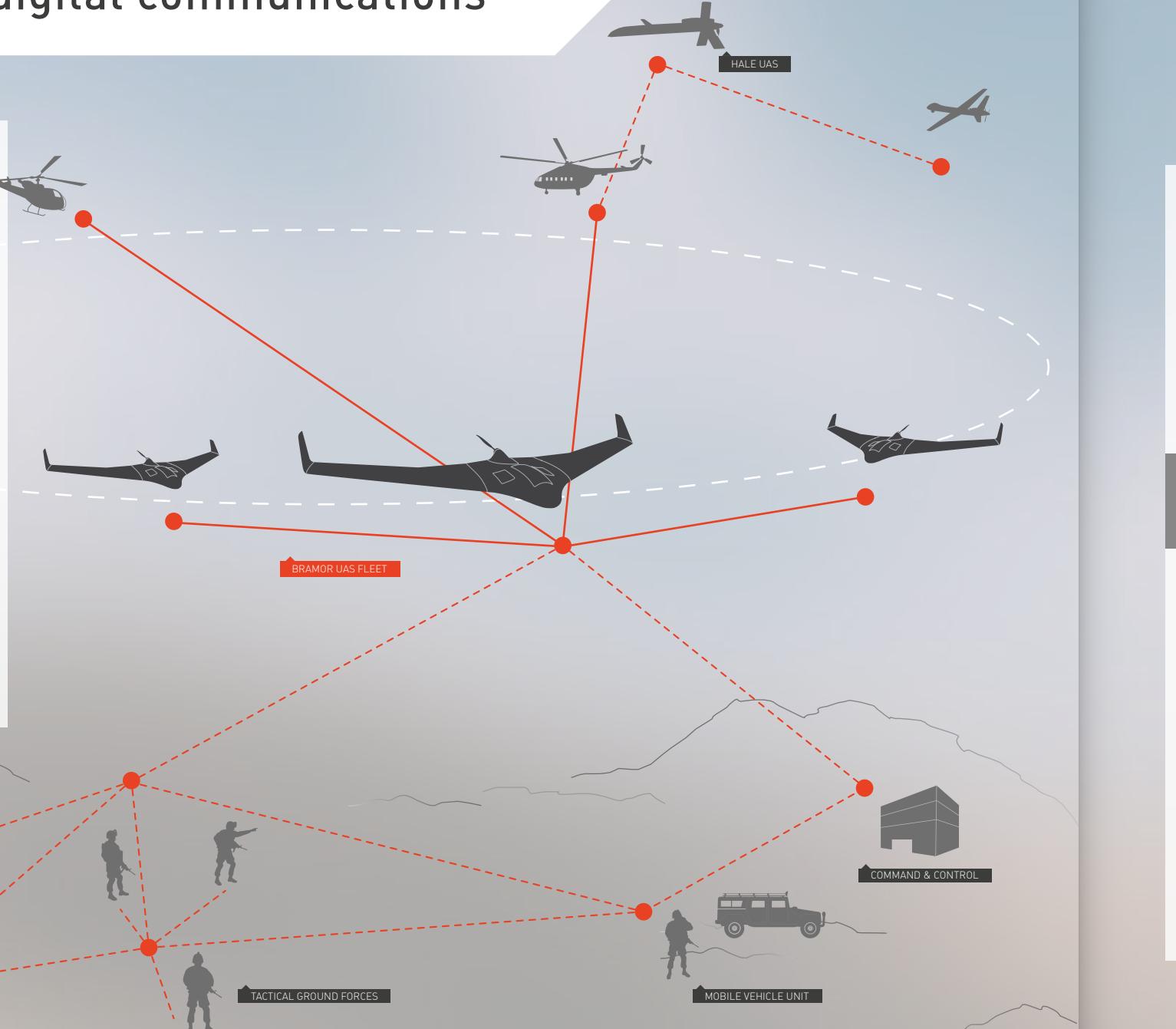


# Tactical network digital communications

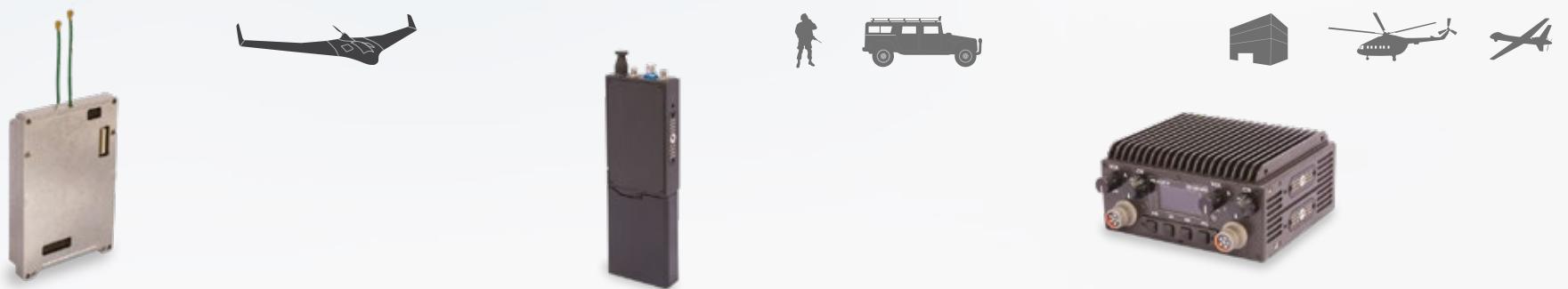
For the demanding conditions encountered in operational uses, **C-ASTRAL systems** have been integrated with the TrellisWare Technologies, Inc. TSM™ waveform mobile ad-hoc mesh networking capabilities, enabling seamless scalability and network agility in dynamic environments. TSM™ waveform networking provides robust performance in challenging environments, and can scale from a few radios to hundreds of units in a single RF channel. It uses Barrage Relay™ networking technology, where all radios collaboratively receive and retransmit multi-hop networking traffic. Sensor data and asset management is available on all tactical and command levels for agile, fast and precise decision making.

The C-ASTRAL TSM™ waveform equipped systems are completely integrated with the MIL SISTEMIKA C4i battlefield management suites and solutions, supporting several interoperability standards.

[www.milsistemika.com](http://www.milsistemika.com)



**"Advanced signal processing and cooperative communication technologies built from the ground up to deliver the world's most robust and reliable high-speed wireless IP networking coverage."**



## Embedded module

- ↳ 20 MHz occupied bandwidth, configurable to 4 MHz
- ↳ 2W TX power
- ↳ MIL-STD-810G
- ↳ 8 Mpbs IP throughput per channel
- ↳ AMR 5.9 or MELPe audio encoding
- ↳ TSM™ waveform
- ↳ Barrage Relay routing
- ↳ Constant envelope modulation

## Small form-factor handheld radio

- ↳ 20 MHz occupied bandwidth, configurable to 4 MHz
- ↳ MJPEG or H.264 video encoding
- ↳ 1 second NET entry time
- ↳ 2m immersion water resistance
- ↳ 8 hours battery life
- ↳ 2W TX power
- ↳ MIL-STD-810G
- ↳ 8 Mpbs IP throughput per channel
- ↳ AAC, AMR 5.9 or MELPe audio encoding
- ↳ TSM™ waveform
- ↳ Barrage Relay routing
- ↳ Constant envelope modulation

## High power tactical communications unit with extended network range

- ↳ 20 MHz occupied bandwidth, configurable to 4 MHz
- ↳ Multi network gateway between channels
- ↳ Monitors dual independent networks
- ↳ 8W TX power
- ↳ Splash proof
- ↳ MIL-STD-810G
- ↳ 8 Mpbs IP throughput per channel
- ↳ AMR 5.9 or MELPe audio encoding
- ↳ TSM™ waveform
- ↳ Barrage Relay routing
- ↳ Constant envelope modulation

TrellisWare, TSM™ and Barrage Relay are trademarks of TrellisWare Technologies, Inc., registered in the U.S.



# C-ASTRAL C<sup>3</sup>P Software

## WORKFLOW PHASES



MISSION  
PLANNING



FLIGHT & DATA  
COLLECTION



DATA & IMAGE  
EXPORT



ONLINE FLIGHT  
LOGBOOK



DATA  
PROCESSING

## C-ASTRAL C<sup>3</sup>P SOFTWARE

- ↗ Ergonomic touch screen GUI
- ↗ Critical flight control data always present on screen
- ↗ Seamless and fast mission planning
- ↗ In-flight systems monitoring
- ↗ Area, mission time, GSD and precision estimation
- ↗ Failsafes management
- ↗ System health monitoring
- ↗ Real-time camera feedback

## COMPATIBLE WITH

- ↗ 3D SURVEY
- ↗ ENSO MOSAIC
- ↗ AGISOFT PHOTOSCAN
- ↗ PIX4D MAPPER
- ↗ PIENEERING
- ↗ MENCI

SIMPLE FLIGHT PLANNING

FUNCTIONAL GUI MODES

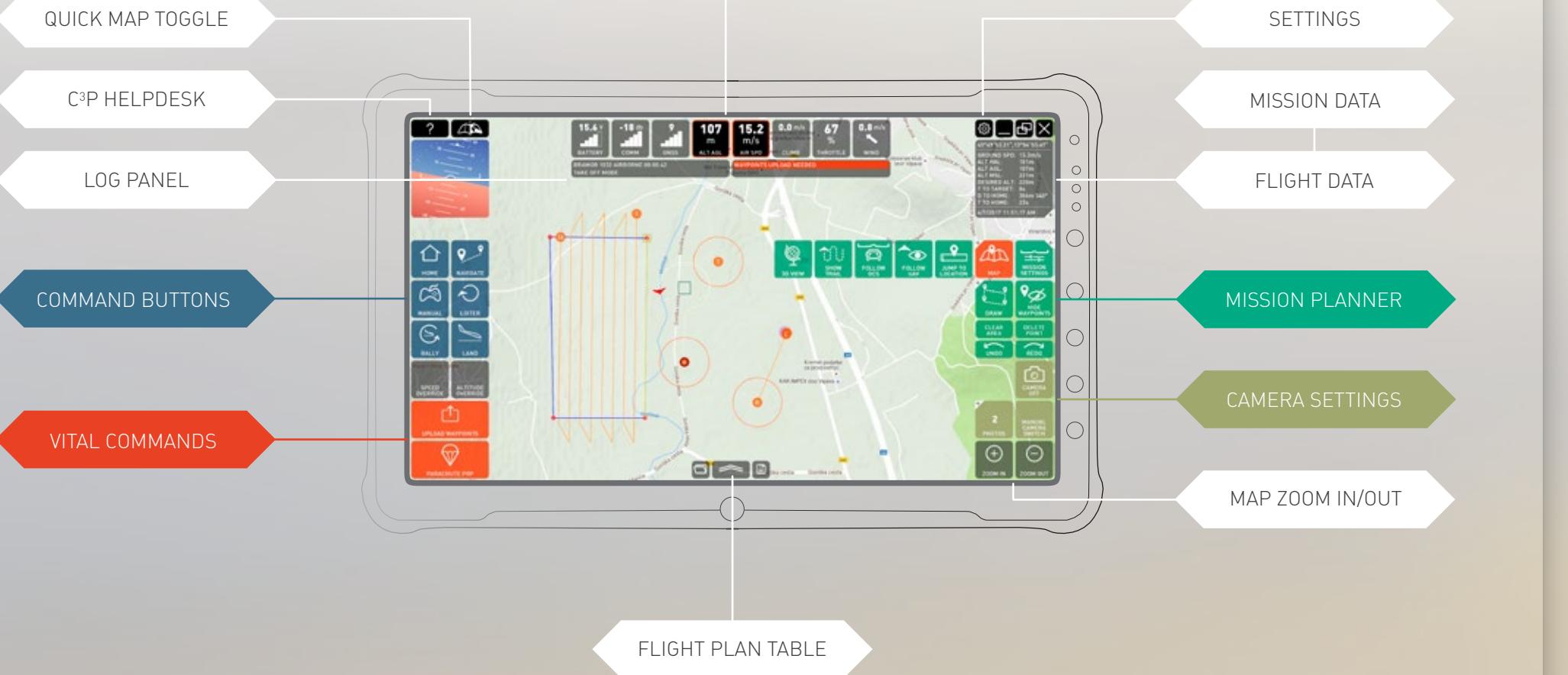
REAL-TIME IN-FLIGHT SYSTEMS MONITORING





# C-ASTRAL C<sup>3</sup>P Software Features

## ONE SOFTWARE – MULTIPLE PLATFORMS





# BRAMOR ppX

## FEATURES

- ✓ Accuracy down to 0,6 cm
- ✓ Fast initialization
- ✓ RTK datalink independent
- ✓ Up to 3,5 h flight time\*
- ✓ 100% Autonomous
- ✓ Exchangeable sensors
- ✓ Imaging control computer



## GNSS SURVEY GRADE RECEIVER

POWERED BY



## ppX BASE STATION<sup>OPTIONAL</sup>

POWERED BY



## C-ASTRAL C<sup>3</sup>P

- ✓ Mission planning
- ✓ Command, Control & Communications
- ✓ Real-time system health monitoring
- ✓ Failsafes management

\* Flight endurance measured at ICAO standard atmosphere conditions  
[15 °C / 1013,25 hPa / winds calm], depends on UAS configuration/system weight.



# BRAMOR ppX Sensor Options



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

\* Flight endurance measured at ICAO standard atmosphere conditions (15 °C / 1013,25 hPa / winds calm), depends on UAS configuration/system weight.  
\*\* Standard accuracy of post processed product

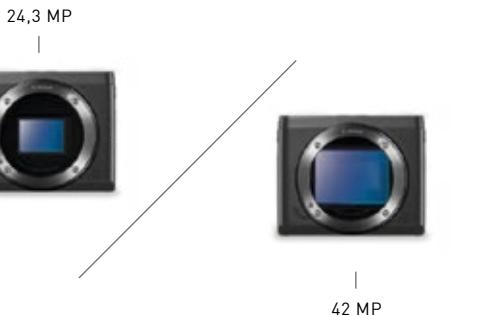
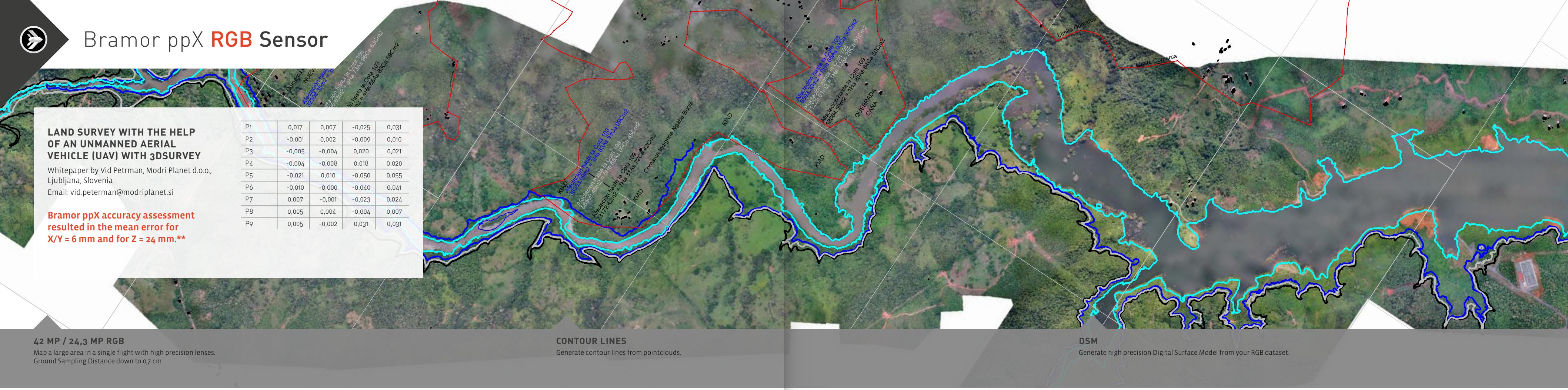
PRODUCT IMAGES ARE FOR ILLUSTRATIVE PURPOSES ONLY AND MAY DIFFER FROM THE ACTUAL PRODUCT.

“We would not have been able to map more than 300 km of a remote railway line in Ethiopia in a week without Bramor’s capability to acquire data without a preplaced grid of ground control points.”

JAN ZOREC, KOBALE SURVEYING SERVICES



- DIMENSIONS**
- Wind resistance 30 knots
  - Compatible with RINEX Base data
  - Wingspan: 230 cm
  - Length: 96 cm
  - Central module length: 67 cm
  - T/O Weight: 4,7 kg
- One flight coverage estimation**
- 32 km<sup>2</sup> / 800 m AGL / 10,0 cm GSD
  - 2 km<sup>2</sup> / 200 m / 2,6 cm GSD
- ppX Specifications**
- 100% Autonomous
  - Automatic parachute landing
  - Orography capable flight planning with GSD maintenance over slopes, hills and valleys
  - Safe catapult launch
  - UV location accuracy down to 0,6 cm.
  - Onboard survey grade L1&L2 GNSS receiver
  - GPS, GLONASS, Optional: BeiDou, Galileo ready



The Fullframe **RGB 42 megapixel sensor or 24,3 MP sensor** enable precise visible light survey grade mapping, aero-photogrammetry and dense point cloud data acquisition for digital terrain models, digital surface models, volume and stockpile calculations.

\*\* Standard accuracy: 2xGSD Horizontal, 3xGSD Vertical achieved with proper planning (80% overlap, 80% sidelap, good light conditions).

PRODUCT IMAGES ARE FOR ILLUSTRATIVE PURPOSES ONLY AND MAY DIFFER FROM THE ACTUAL PRODUCT.

**PROJECT:**  
Quantification of the plots of land affected by the flood level of Barro Blanco hydroelectric dam - Republic of Panama.

**PROJECT MANAGER:**  
Surveyor Juan Maggi Company: Geomap Inc. - Ingenieria del Territorio - Panamá

**Mission area coverage estimation and ground sampling distances for the BRAMOR ppX**

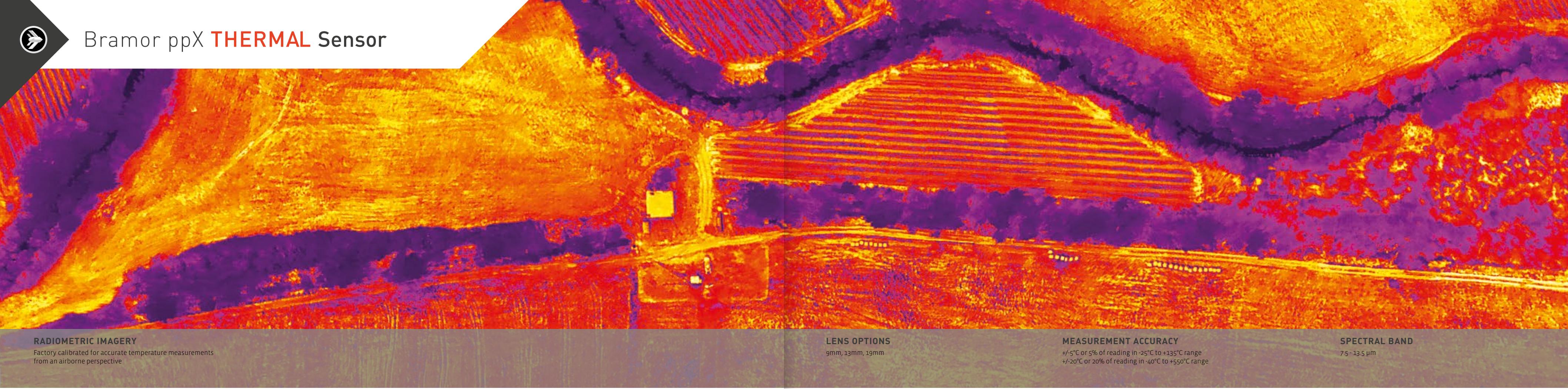
100	1,3	2,5
200	2,6	5,0
300	3,9	7,5
400	5,2	10,0
500	6,5	12,5
600	7,8	15,0

**APPLICATIONS**

**ppX** SURVEYING AND REMOTE SENSING, INFRASTRUCTURE CONTROL, PRECISION AGRICULTURE, FLOOD MONITORING, OPEN PIT MINING, CLASSICAL ISR, SEARCH AND RESCUE, IED CHANGE DETECTION, WILDFIRE MANAGEMENT, CIVIL DEFENSE, FIRE CONTROL, ECOLOGICAL MONITORING AND SENSING



# Bramor ppX **THERMAL** Sensor



## RADIOMETRIC IMAGERY

Factory calibrated for accurate temperature measurements from an airborne perspective

## FLIR DUO PRO R



The **Thermal Sensor** is suitable to gather accurate, non-contact temperature measurements from an aerial perspective. Every still image contains calibrated temperature data embedded in every pixel, resulting in decision making support for precision agriculture, forestry, building and roof inspections, power grid inspections, infrastructure analysis, and public safety.

## LENS OPTIONS

9mm, 13mm, 19mm

## MEASUREMENT ACCURACY

+/-5°C or 5% of reading in -25°C to +135°C range  
+/-20°C or 20% of reading in -40°C to +550°C range

## SPECTRAL BAND

7.5 - 13.5 µm

## FLIR DUO PRO R FEATURES

- ↳ Airborne dual sensor thermal and video imaging and recording in a single component
- ↳ On-board GPS receiver, IMU, temperature, humidity, and altitude sensors
- ↳ Hot Spot Detection
- ↳ Spectral Band 7.5 – 13.5 µm
- ↳ Geo-referenced data material
- ↳ Thermal Frame Rate 30 Hz
- ↳ Resolution: 640 x 512 pixel (thermal) | 4000 x 3000 pixel (visual)

## THERMAL FUSION FEATURES

- ↳ Digital thermal radiometric and visual data stored on microSD card
- ↳ Per pixel temperature measurements
- ↳ Hot Spot Detection
- ↳ Geo-referenced data material
- ↳ Thermal Frame Rate 9 Hz
- ↳ Resolution: 640 x 512 pixel (thermal) | 1600 x 1200 pixel (visual)

## APPLICATIONS

- ppX SURVEYING AND REMOTE SENSING, PRECISION AGRICULTURE, OPEN PIT MINING, SEARCH AND RESCUE, WILDFIRE MANAGEMENT, CIVIL DEFENSE, DAMAGE ASSESSMENT, ECOLOGICAL MONITORING AND SENSING, SECURITY OPERATIONS, HIGH LEVEL INDUSTRIAL INSPECTIONS

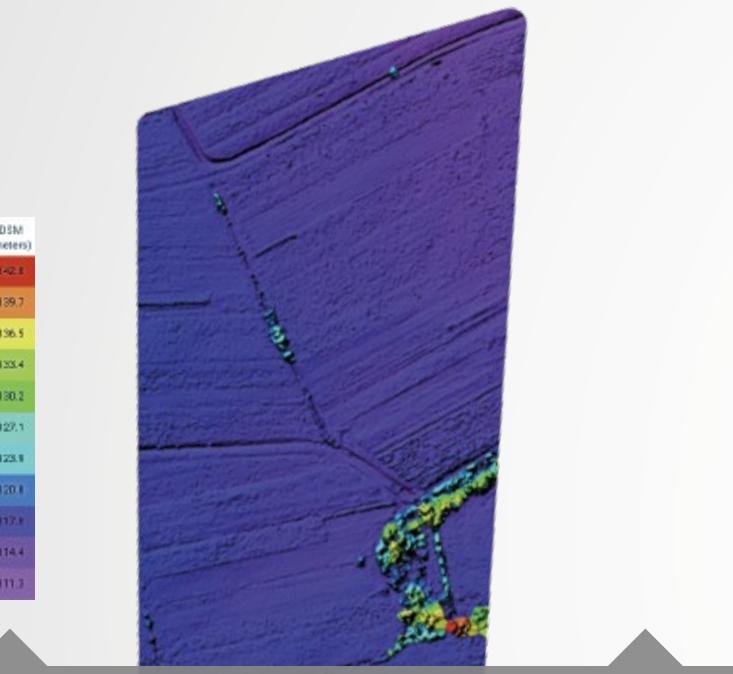


## Bramor ppX Multispectral sensors



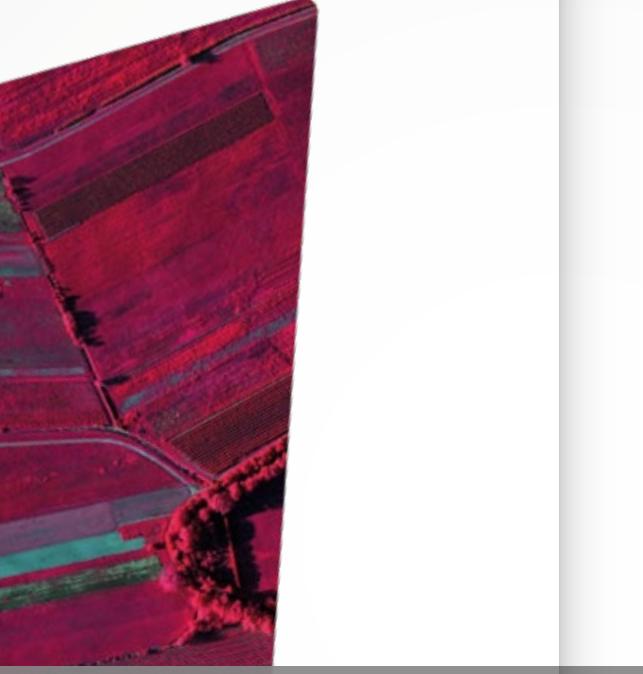
RGB

Red Green Blue: This is a true color representation of the studied (field) area.



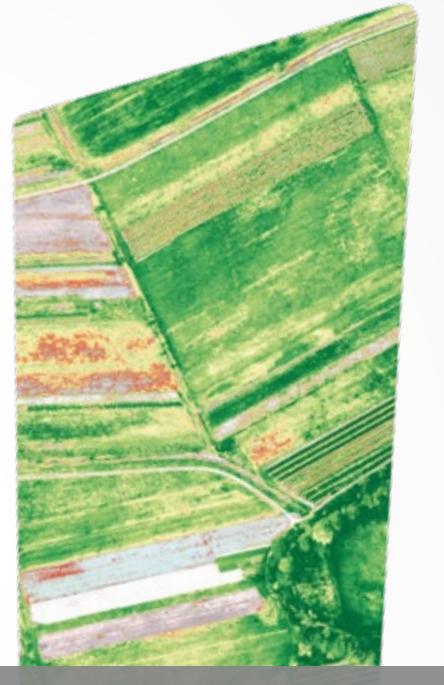
DSM

Digital Surface Model can be used to visualize changes in topography or measure the height of plant / tree above the surrounding terrain.



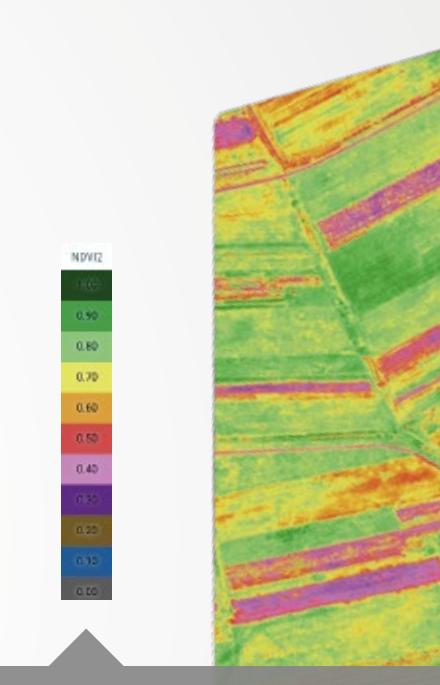
CIR

Color Infrared (or Near Infrared) layer helps you to visualize the amount of infrared light reflected.



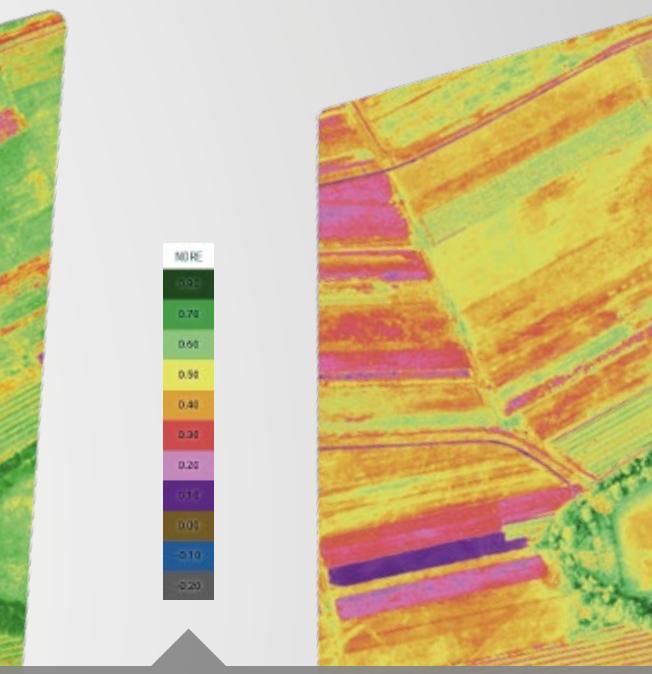
NDVI

Normalized Difference Vegetation Index is an index for visualizing vegetation health. Areas with NDVI values greater than 0,5 are colored using a red/yellow/green color scale. The NDVI reveals variability in plant vigor and biomass, often times not visible in standard RGB color imagery.



NDVI2

Normalized Difference Vegetation Index 2 is a new color scale applied, in which values below 0,5 are not hidden, like they are in the NDVI layer. This allows to visualize all NDVI values within the studied field.



NDRE

Normalized Difference Red Edge Index can be a valuable index when collecting data and monitoring stress /health over mature plants. The advanced vegetation indices like NDRE are more sensitive to changes in leaf chlorophyll content and provide information about plant nutrient status.



The **BRAMOR ppX** mounted multispectral sensors simultaneously capture five discrete spectral bands, enabling the creation of tailored indices for high end vegetation mapping. The new **ALTUM** sensor enables the synchronization of thermal and multispectral imagery combining three calibrated sensors in one. The BRAMOR ppX with the ALTUM is the most powerful precision agriculture remote sensing tool on the market, capable of covering more than 2000 ha in one flight with dramatically reduced post processing times.

**"This is a revolutionary vegetation vision instrument. We can map 1500 hectares in a single flight."**

### MS-RE FEATURES

- ↳ 5 spectral bands: Blue, green, red, red edge, near IR
- ↳ Calibrated for precise, repeatable measurements
- ↳ Ground Sample Distance: 8,0 cm per pixel at 120 m AGL
- ↳ Capture Rate: 1 per second
- ↳ Narrowband optical filters provide full imager resolution for each band
- ↳ 32GB Memory: Single SD card stores all images with geotags
- ↳ Wi-Fi capable device web-based interface

### ALTUM

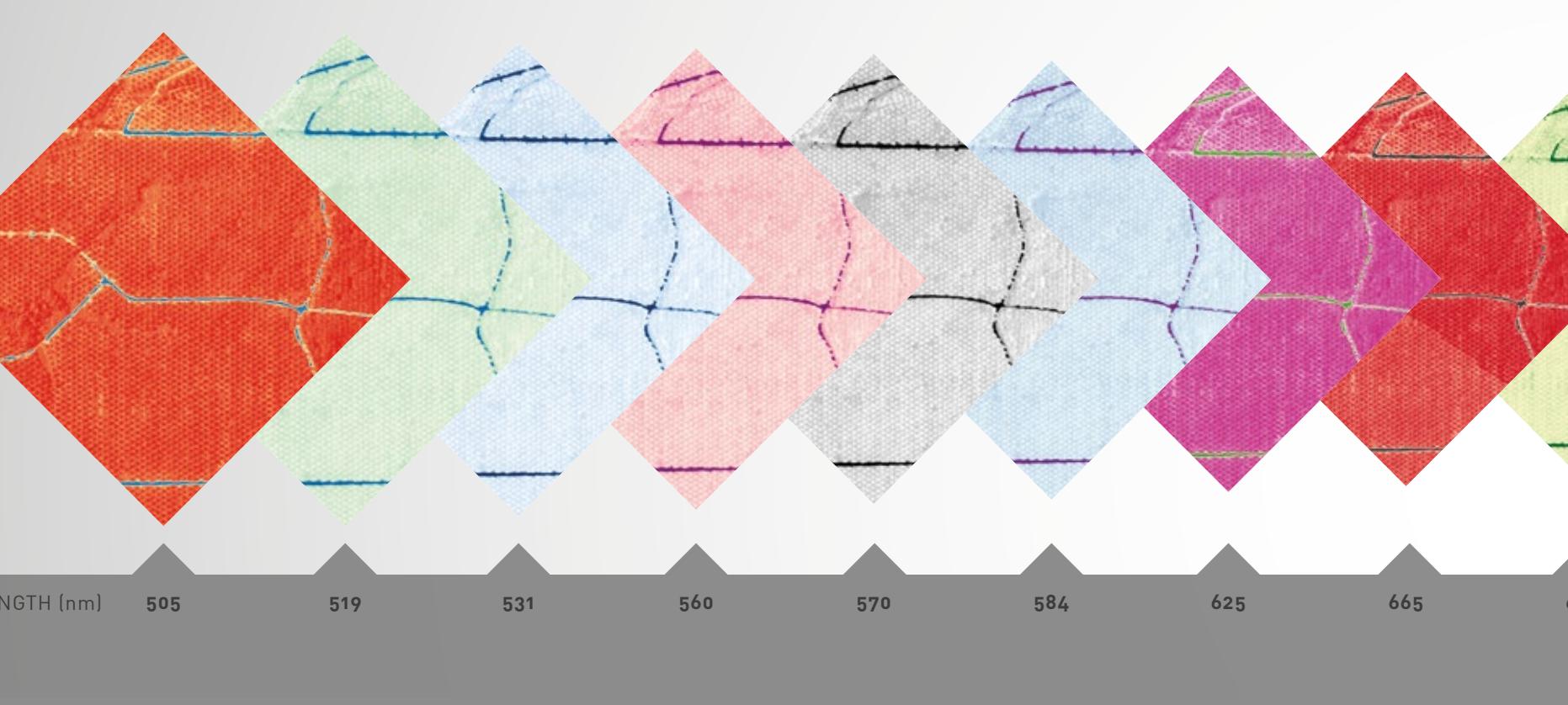
- ↳ Spectral bands: EO: Blue, green, red, NIR
- ↳ LWIR: thermal infrared 11 um
- ↳ Ground Sample Distance: 5.2 cm per pixel (per EO band) at 120 m (~400 ft) AGL 81cm per pixel (thermal) at 120m
- ↳ Capture Rate: 1 capture per second1 (all bands), 12-bit RAW
- ↳ High capacity USB 3.0 storage
- ↳ Digital light sensor with integrated GPS

### APPLICATIONS

- **ppX** SURVEYING AND REMOTE SENSING, INFRASTRUCTURE CONTROL, PRECISION AGRICULTURE, FLOOD MONITORING, OPEN PIT MINING, CLASSICAL ISR, SEARCH AND RESCUE, IED CHANGE DETECTION, WILDFIRE MANAGEMENT, CIVIL DEFENSE, FIRE CONTROL, ECOLOGICAL MONITORING AND SENSING
- **GSD Resolution: 12,4 cm Monoband 2,7 cm RGB**



## Bramor ppX gHY Sensor



The **gHY sensor** creates 2D spectral information in VIS-VNIR spectral range with single exposure and enables mosaicking with photogrammetric software. The sensor provides real response in each pixel without interpolation. This high end sensor is, due to its spectral range, especially suitable for uses in agriculture, forestry and water research for unrivaled results and precision.

### FEATURES

- ↳ Hyperspectral imager
- ↳ VIS-VNIR snapshot
- ↳ F-number: ~ 2,8
- ↳ Focal length: 9 mm
- ↳ Ground pixel: 6,5 cm at 100 m altitude
- ↳ Default spectral range: 500-900 nm
- ↳ Other ranges: 400 - 700, 450 - 800, 550 - 950 nm
- ↳ Spectral resolution:  $\uparrow$ 10 nm, FWHM
- ↳ Spectral step: 1 nm
- ↳ Spectral bands: ~ 380 max
- ↳ FOV: 37 degrees
- ↳ Dynamic range: 12 bits
- ↳ Exposure time: integration time 5 - 15 ms / band, 30 bands / s (1010\*648 pixels)
- ↳ Frame rate: 30 frames / s
- ↳ Max Image dim: 1010 x 1010 pix

Location: Indonesia

Area: 2 km<sup>2</sup>

Flight time: 60 min

Flight altitude AGL: 100 m

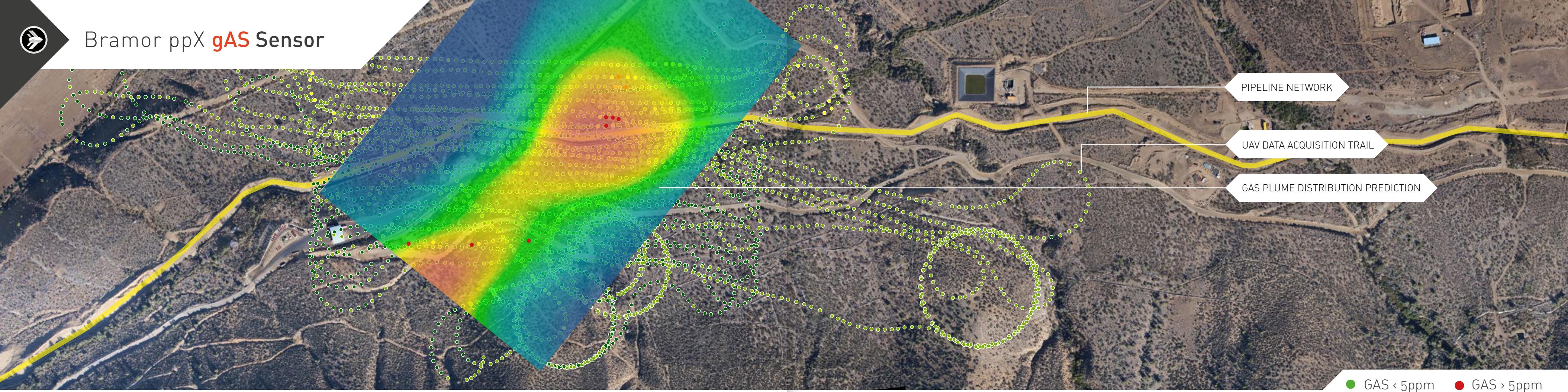
GSD Resolution: 6,5 cm

"The world's smallest and most lightweight system with a functional hyperspectral camera."



### APPLICATIONS

- SURVEYING AND REMOTE SENSING, INFRASTRUCTURE CONTROL, PRECISION AGRICULTURE, FLOOD MONITORING, OPEN PIT MINING, CLASSICAL ISR, SEARCH AND RESCUE, IED CHANGE DETECTION, WILDFIRE MANAGEMENT, CIVIL DEFENSE, FIRE CONTROL, ECOLOGICAL MONITORING AND SENSING



The **gAS sensor** option on the ppX aircraft is a unique and extremely capable high resolution, excellent selectivity long range methane leak detection system, based on a proven DFB tunable diode laser absorption spectroscopy system adapted to UAS use from larger manned platforms. Developed in collaboration with gas detection industry leaders Boreal Laser and C-ASTRAL partners Ventus Geospatial, this system revolutionizes pipeline, oil and gas well and other methane and noxious gases detection and compliance operations.

## FEATURES

- ↳ Remote molecular level gas detection down to 0,05 ppm CH<sub>4</sub>
- ↳ 2,5h flight time
- ↳ 110km operational range
- ↳ Plume estimation and mapping
- ↳ 1 reading per second, default alarm 10ppm
- ↳ No consumables, minimum sensor maintenance
- ↳ Additional multispectral and 16MP RGB sensor option
- ↳ ADS-B transponder option
- ↳ Long range solar power extended range option

## APPLICATIONS

- ppX** SURVEYING AND REMOTE SENSING, INFRASTRUCTURE CONTROL, PRECISION AGRICULTURE, FLOOD MONITORING, OPEN PIT MINING, CLASSICAL ISR, SEARCH AND RESCUE, IED CHANGE DETECTION, WILDFIRE MANAGEMENT, CIVIL DEFENSE, FIRE CONTROL, ECOLOGICAL MONITORING AND SENSING

Location: South America

Area: 8 km<sup>2</sup>

Flight time: 45 min

Flight altitude AGL: 65 m

Accuracy: < 0,05 ppm [CH<sub>4</sub>]



# Bramor System Package

ppX

## Basic Bramor ppX system package consists of:

- ↳ BRAMOR ppX airframe
- ↳ Micro GCS SX101 stand-alone magnetic GCS unit
- ↳ Rugged mission planning and command and control computer
- ↳ Flight case transportation system
- ↳ CAT 1 elastic launching system
- ↳ Recovery parachute (2 units) with protective packs
- ↳ Set of basic spares (carbon tubes, accessories, 1 extra propeller)
- ↳ Battery charger (including cables for GCS and Li-Po)
- ↳ Training in Slovenia (excluding lodging & transportation costs)
- ↳ Documentation & Manuals



## ppX TRANSPORTATION SYSTEM



### AIRFRAME/GCS CASE

- ↳ Interlockable with catapult case
- ↳ External size (LxWxH):  
122 x 52 x 28 cm



### CATAPULT CASE

- ↳ Wheels for single man transportation
- ↳ External size (LxWxH):  
122 x 52 x 28 cm

C4EYE

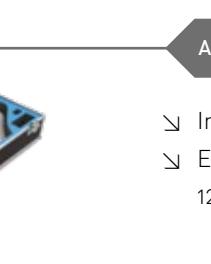
## Basic Bramor C4EYE system package consists of:

- ↳ BRAMOR C4EYE airframe
- ↳ KJ-200 rugged GCS
- ↳ Flight case transportation system
- ↳ CAT 1 catapult launcher
- ↳ ASTRALTRACK-M antenna
- ↳ Emergency Beacon Locator
- ↳ Recovery parachute (2 units) with protective packs
- ↳ Set of basic spares (carbon tubes, accessories, 1 extra propeller)
- ↳ Cat 2 Pneumatic launching system
- ↳ ASTRALTRACK-M antenna
- ↳ NAV / STROBE lights
- ↳ Visibility stickers
- ↳ Documentation & Manuals



- ↳ OPTIONAL ENHANCEMENTS:
  - ↳ GCS - ADV2X Portable dual screen ground control station and other configurations
  - ↳ Touchscreen option with composite video input
  - ↳ AC/DC adapter
  - ↳ Power supply, external VGA option for portable GCS
  - ↳ RADICAL-40X automatic high power antenna GCS/combination
  - ↳ NAV / STROBE lights
  - ↳ Visibility stickers
  - ↳ 2x Water resistant backpack

## C4EYE TRANSPORTATION SYSTEM



### AIRFRAME/GCS CASE

- ↳ Interlockable with catapult case
- ↳ External size (LxWxH):  
122 x 52 x 28 cm



### CATAPULT CASE

- ↳ Wheels for single man transportation
- ↳ External size (LxWxH):  
122 x 52 x 28 cm



## Optional enhancements



### CAMERA MOUNTED IMU

The VN-100 incorporates an assortment of inertial sensors, including a 3-axis accelerometer, 3-axis gyroscope, 3-axis magnetometer, and a barometric pressure sensor.

- ↳ 0.5° Static Pitch/Roll
- ↳ 5°/hr Gyro In-Run Bias (typ.)
- ↳ 1.0° Dynamic Pitch/Roll
- ↳ 800 Hz IMU Data



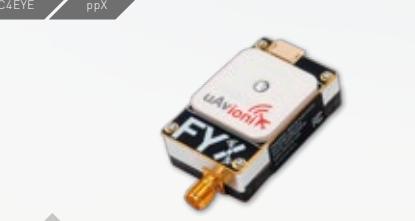
### EMERGENCY BEACON LOCATOR

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



### NAV / STROBE LIGHTS

- ↳ Anti collision strobe lights
- ↳ Navigational lights



### ADS-B S-MODE TRANSPONDER

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



### CAT 2 PNEUMATIC LAUNCHING SYSTEM

- ↳ For cold weather operations (-20°C).
- ↳ Aluminum lightweight folding pneumatic catapult including a compressor & an electronic valve.



### VISIBILITY STICKERS

- ↳ Make your UAV more visible with the fluorescent sticker scheme

Modularity, adaptation and system flexibility are the key features of the **C-ASTRAL BRAMOR UAS** family.



### RADICAL-40X ANTENNA SYSTEM

- ↳ Automatic tracking technology (auto-orientating)
- ↳ Compatible with analog or digital C-Astral communication links
- ↳ Compatible with analog or digital C-Astral communication links
- ↳ Weather resistant
- ↳ Tripod / mast / vehicle or roof mounted

### ASTRALTRACK - M ANTENNA

- ↳ Manual tracking technology
- ↳ Compatible with analog or digital C-Astral communication links
- ↳ Lightweight

### MANET RADIOS

- ↳ High-speed wireless IP networking
- ↳ Network relay to send and receive IP data
- ↳ 1775-1815 MHz, 2200-2250 MHz
- ↳ MIL-STD-810G
- ↳ TSM™ waveform
- ↳ SOCOM approved
- ↳ Barrage relay™ routing
- ↳ Constant envelope modulation
- ↳ IPv4, IPv6, Unicast, Multicast, Broadcast, TCP, UDP IP support
- ↳ 8 Mbps throughput per channel

### WATER RESISTANT BACKPACK

- ↳ Heavy duty whole system water resistant carrying backpack for ppX and C4EYE systems
- ↳ Detachable system for up to 3 airframes



# Bramor UAS Technical data

COMMERCIAL DESIGNATION	BRAMOR C4EYE	BRAMOR ppX
SENSING TECHNOLOGY	C-Astral EYE-X    EYE-XHD2	24.3 MP RGB <b>42 MP FULLFRAME RGB [AVAILABLE NOW!]</b> Multispectral and combined MS + Thermal    gAS  24.3 MP CIR/NDVI    FLIR Pro R Duo / Thermal Fusion    Hyperspectral
WINGSPAN		230 cm
LENGTH		96 cm
AIRCRAFT TYPE & AIRFRAME	Fixed wing, Blended Wing Body configuration, Kevlar™ reinforced carbon and Vectran™ composite airframe	
AVIONICS	Lockheed Martin	Lockheed Martin and C-ASTRAL ORTHOelectronics
PROPELLUTION	C-Astral brushless electric	
MTOW		3,8 - 4,7 kg
PAYOUT		0,6 - 1,0 kg
CRUISE SPEED		16 m/s
Vne		30 m/s
TAKEOFF SYSTEM	ELASTIC LAUNCHER / PNEUMATIC LAUNCHER	
LANDING AREA	<b>30 m x 30 m</b>	
LANDING	PARACHUTE	
SERVICE CEILING	demonstrated up to 5000m ASL	
VIDEO & DATALINK RANGE	<b>Up to 40 km LOS with the C-Astral directional antennas</b>	
ENDURANCE*	up to 3 hours (demonstrated)	up to 3,5 hours (demonstrated)
T/O READINESS	System T/O ready in less than 5 minutes	
TRANSPORT	2 MILSPEC backpacks and / or rugged transportation cases	
OPERATOR REQ	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	custom arrangement	<b>5 day training in Slovenia, special training arrangements are possible</b>



**"There is no better system on the market that can achieve this accuracy, productivity and flexibility that Bramor can do for us."**

Jose Marcos Perez Diaz, UAS manager at Airdrone 3D



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**"BRAMOR ppX delivers a staggering 3.5 hours of flight endurance - more than double of most other UAVs."**

ASTRON ENVIRONMENTAL SERVICES PTY LTD





C - A S T R A L  
AEROSPACE Ltd.

ENDURING - PRECISION!

**C-Astral** is an aerospace solutions provider based in Ajdovscina, Slovenia, the “hub” of advanced aerospace development and integration in this part of Central Europe.

The company is a global market leader with established reputation in the specialized, fixed wing small Unmanned Aircraft Systems (UAS) manufacturing and services field, with a specific focus on high productivity, endurance, surveying and remote sensing. C-Astral's customer base is diversified between the commercial UAS operators, larger institutional networks, scientific users as well as government entities. Currently, C-Astral systems are flying with six sovereign entities on force protection, border protection, fire control and surveillance operations on four continents and more than 100 commercial and scientific operators globally. C-Astral established a multidisciplinary software and hardware laboratory for aerodynamics and systems integration work and a prototyping CAD/CAM workshop facility for composite materials manufacturing and modeling. The founders of C-Astral have been active in aerospace since 1999 and have been pioneering UAS integrated solutions ahead of the market curve. C-Astral systems are now flying over all continents, including extreme environments such as high altitude open-pit mines, deserts, mountains, Antarctica, over the Arctic and global agricultural lands.



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