TOPCON

Aerial Mapping

Solutions

Topcon Solutions

The global construction, geospatial, and agricultural industries are rapidly changing thanks to quantum leaps in communication and measuring technologies that literally transform our perspectives of time and space. These advancements are reshaping the way things are designed, built, grown, and managed.

Topcon works to stay a step ahead of customers' needs by creating solutions that embrace and extend these advancements into the way they work, everywhere they work. Our high-accuracy positioning, high-speed imaging, cloud-based information management, and down-to-earth simplicity creates higher productivity and better results with lower environmental impact.

YOUR PRODUCTIVITY.
TECHNOLOGY.

High-Accuracy
Using RTK, the Sirius Pro reaches 2-5 cm accuracy without ground control points.

Aerial Mapping Solutions

High-Flexibility

Choose a Sirius Pro with an internal base for the highest convenience or an external base for maximum flexibility.

Fast Delivery

Deliver orthophotos and three-dimensional elevation models.

Easily Upgradable

Sirius Basic brings all the features of a professional survey tool. With a simple software upgrade and antenna, it can be easily upgraded to a Sirius Pro and include RTK functionality.

Aerial Mapping Solutions

The Sirius Pro delivers highly accurate aerial mapping results using GNSS-RTK. Achieving 2-5 cm accuracy without ground control points (GCP) means an increase in productivity when compared to other solutions.

In the traditional approach, placing and measuring GCPs can account for more than 50% of the whole project time. Without enough GCPs it was hard to match the accuracy requirements set by your customer – rendering projects uneconomical.

Instead of GCPs, Sirius Pro uses GNSS RTK in combination with precision timing technology to determine the exact location for each of the positions at which a photo is taken. This precise positioning technology allows the image locations to be used as the equivalent of GCPs.

The Sirius Basic brings all advantages of the Sirius Pro, except for GNSS-RTK. A simple upgrade is possible as soon as your business requires the increased accuracy or productivity of the PRO.


MAVinci Desktop 3.2
Window Session
Edit Flight plan Post processing Other
Flight
Landing
Return Home
2D
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Land.P Mode:Stay Airborne Altitude:100m Yaw:
UAV
General Display Options
Maps selected in Map Layer Manager
Ground Overlays
Matchings
Search
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flight time≈24:57
distance≈22.9km
image count≈481
total coverage≈ true ortho 1.47km² / pseudo ortho 1.68km²
AOI coverage≈ true ortho 100% / pseudo ortho 100%
84.6ha
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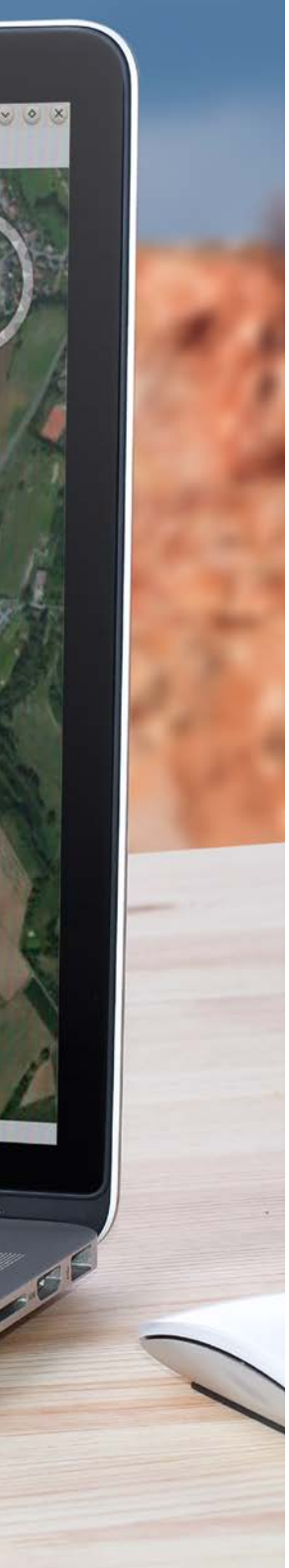
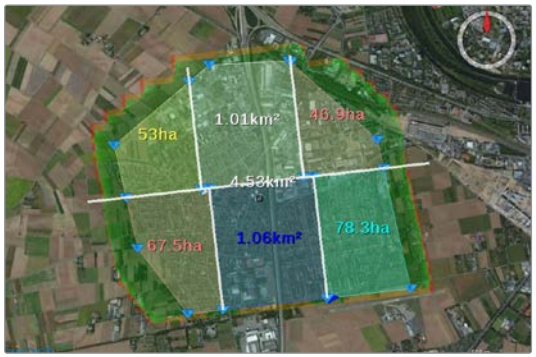


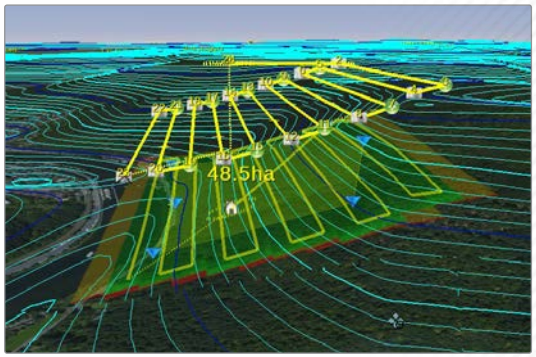
Flight Planning

Unmanned Aerial System

After quick assembly of the Sirius UAS the operator defines the area of interest and the desired Ground Sampling Distance (GSD). The flight planning software MAVinci Desktop automatically creates an optimized flight plan and can change the flight plan even when the UAS is currently in the air. Advanced flight planning options are available for mountainous areas. As the terrain elevation changes, the flight altitude and will automatically adjust.

For automatic take off, the operator launches the Sirius by throwing it into the air without any additional catapult or bungee rope. The hand launch is easy and comfortable. During the completely automatic flight the Sirius follows the predetermined flight plan. If the coverage area requires more than 1 flight due to its size, the flights are automatically split and data will be rejoined during post-processing.





‡ *Use of the Sirius Unmanned Aerial System (UAS) is subject to the local rules and regulations governing UAS products in your country of use.*

Imaging, Landing, and Data Export

Aerial images are taken with a 16 MP mirrorless camera and are stored automatically on-board. The Sirius is able to land fully automatically or, if obstacles or the small size of the area prohibit automatic landing, the operator can easily land manually with autopilot assistance. The UAS is stabilized by the autopilot and manually controlled by simple up/down, left/right commands. In addition an entirely manual landing is also possible.

Export the image data with MAVinci's one-click post-processing interface. After landing the photo log data (GPS positions and time stamps of the images etc.) will be copied wirelessly from the Sirius to MAVinci Desktop.

Data can be exported to third-party software to generate DEMs, orthophotos, 3D models, 4D reconstruction, polygonal models and point clouds.

Workflow

Sirius gets the job done when other UAS's struggle

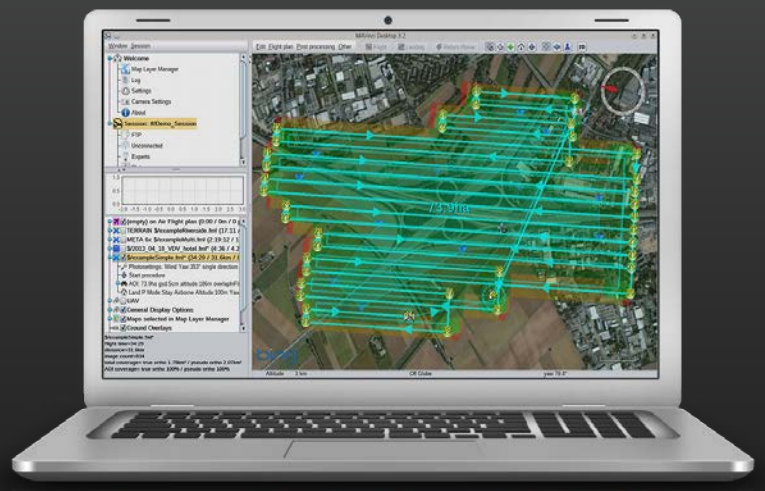
The Sirius Pro is the world's first UAS with integrated GNSS RTK. The workflow for obtaining aerial imagery has been streamlined by eliminating the need for setting out ground control points. Instead, the Sirius Pro places 1,000 equally distant RTK control points in the air for accurate mapping.

- Simple automatic flight planning
- Automatic operation from take off to landing
- Autopilot assisted manual control
- Safety and emergency actions
- Fully operational up to 50-65 km/h wind

Flight Planning

Flight planning with Sirius consists of finding your mission site, selecting your area of interest and setting your ground sampling distance. The plan is created automatically and transmitted directly.

- Session management
- Off-line mission planning
- Forecast of the ground coverage before flying
- Advanced flight planning for mountainous areas
- Multi-flight planning for optimized coverage of large areas



MAVinci Desktop

Image Acquisition

Typically, 1,400 photos are taken during a photogrammetric flight with a 3 cm GSD.

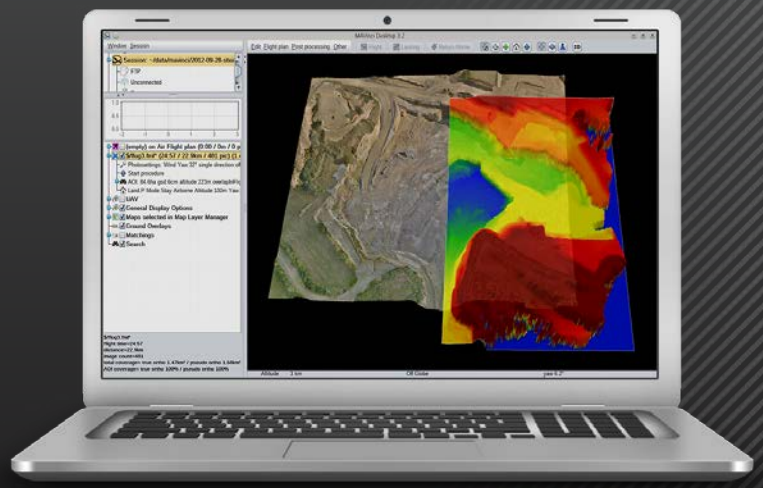
- Simple hand launch
- Automatic operation from take off to landing
- Autopilot assisted manual control
- Safety and emergency actions
- Low operation cost

Sirius / Panasonic GX1

Post Processing

A rapid data check is done in the field to confirm all areas have been covered. After landing, the photo log data (GPS positions and time stamps of the images, etc) will be copied wirelessly from the Sirius to MAVinci Desktop for post processing.

- High-resolution Orthophotos and DEMs
- One click interface from MAVinci Desktop to processing software
- Connects to fully automatic standalone processing software



MAVinci Desktop

Planes and Cameras

The Sirius UAS combines a Topcon survey grade dual constellation GNSS receiver with a 16 MP digital camera for ultimate accuracy and project time savings. The plane is built of a lightweight foam material with a folding propeller for easy transport to the project site and ultimate usability.

Flight times are up to 50 minutes and the plane has a long life cycle of up to 200 landings. Flights can be made in almost any weather condition and even in the rain.

Panasonic GX1

The Panasonic GX1 camera is combined with a Panasonic 14 mm f/2.5 lens. The focal length of the lens is fixed to increase the quality of the post-processing results. The calibration of the camera with the lens is optional. The software allows the operator to verify the quality of the data collected within minutes, while still in the field.

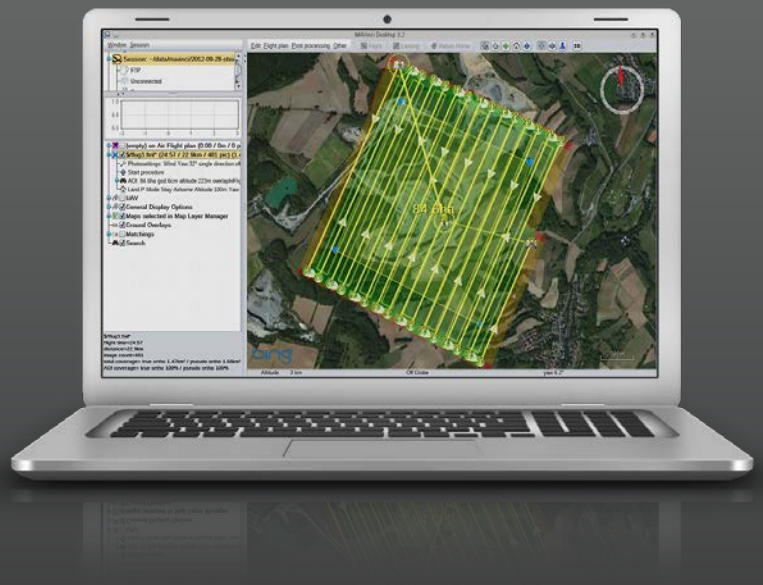
Sirius Pro / Basic

- **Advanced Flight Planning** – Flight plan can automatically adapt to an elevation model.
- **Cover Large Areas** – Flight plan splits up automatically and rejoins for post-processing.
- **Cost Efficient** – More than 200 landings with one body leading to low operation costs.
- **Auto or Assisted Landing** – Land in areas where automatic landing is impossible. Sirius is stabilized by the autopilot and manually controlled by simple up/down, left/right commands.
- **GNSS RTK** – L1/L2 GPS and GLONASS with RTK for highest accuracy (Sirius Pro only).
- **Excellent Result Quality** – Best image quality and georeferencing accuracy.
- **Weather Conditions** – Operate the system with hot or cold outdoor temperatures from -20°C to 45°C and in rain.
- **Fly With A Strong Wind** – The UAS is fully operational with wind of up to 50 km/h (7B ft.) with gusts up to 65 km/h (8B ft.).
- **Simple Hand Launch** – No catapult is necessary.
- **Safety** – Get flight permissions in many countries.
- **Cruise Speed** – 65 Km/ h

MAVinci Desktop

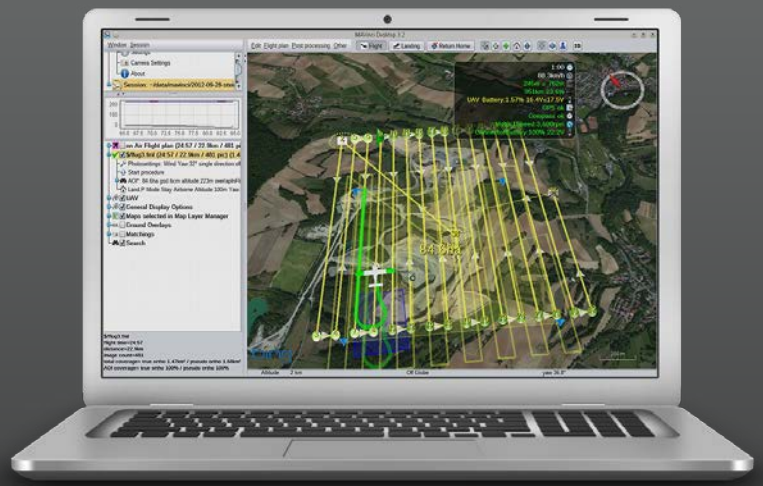
MAVinci Desktop handles all UAS related tasks from flight planning to control. It also functions as an easy one-click interface to several post processing sofware solutions.

MAVinci Desktop simplifies the UAS workflow, as many tasks are automated. During flight planning, data coverage is checked automatically. For large areas, the flight is split automatically and data is rejoined for post-processing. Overlap is reduced and project time and costs are reduced, accordingly.



Choose your area of interest and your ground sampling distance, the flight plan will be calculated automatically.

For large areas that cannot be covered in one flight, the flight is split and data will be rejoined automatically before post-processing. Store the flight plan or transmit it directly to Sirius. Check the expected ground coverage indicated by the green, yellow and red color before the flight. Monitor your flight status of the UAS live and in full 3D.



With MAVinci Desktop you can display small preview images of your area of interest. You may monitor your flight live and in full 3D. The flight plan can be changed even while the UAS is in the air. With the quality check function, you can verify within minutes the quality of the data set the you acquired directly on the field. This function checks the overlap of the single images and indicates sufficient overlap with a green color.

During the flight, MaVinci Desktop shows the status of the Sirius; RC link state, GPS state, position of UAS and battery levels. After the flight and post-processing is complete, import your DEM and orthophoto as a basis for your next flight plan or for basic measurements.

Import your DEM and orthphoto after post-processing as a basis for your next flight plan or for basic measurements. Set up display options such as viewing contour lines, compass, scale bar, control points, and environmental factors such as the sun, sky and stars.

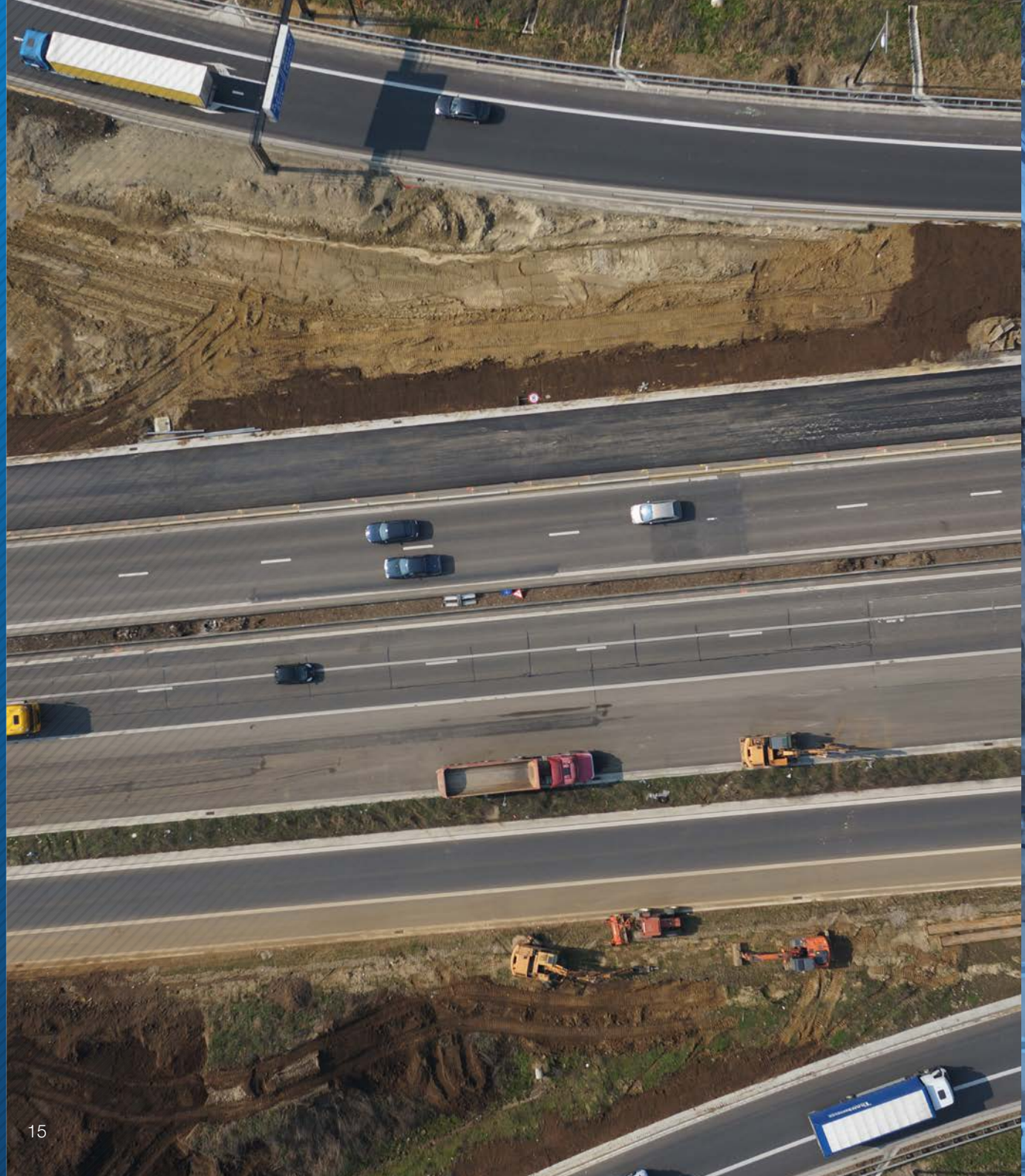


Image Acquisition

Any UAS payload should be as small and light as possible but deliver high quality data at the same time. To this end, we incorporate the Panasonic GX1 camera with a 16 MP live MOS sensor and a Panasonic 14 mm f/2.5 lens. The focal length of the lens is fixed to increase the quality of the post-processing results. The calibration of the camera with the lens is optional. Next to the visible range camera, an NIR camera option is available. This camera provides relative NDVI: a graphical indicator for analysis of vegetation conditions and photosynthetic capacity.

The area that can be covered during one flight with Sirius depends on the GSD. In one 45 minute flight one can cover the following areas:

GSD	AGL		Side / In-Flight Overlap	
			65 / 85%	20 / 80%
1.6 cm	54.9 m	195 ft.	0.7 km^2	1.62 km^2
2.6 cm	96.5 m	317 ft.	1.13 km^2	2.65 km^2
3.2 cm	119 m	390 ft.	1.42 km^2	3.20 km^2
5.0 cm	186 m	610 ft.	2.25 km^2	5.12 km^2
10 cm	371 m	1217 ft.	4.54 km^2	9.97 km^2
20 cm	743 m	2438 ft.	8.67 km^2	18.20 km^2

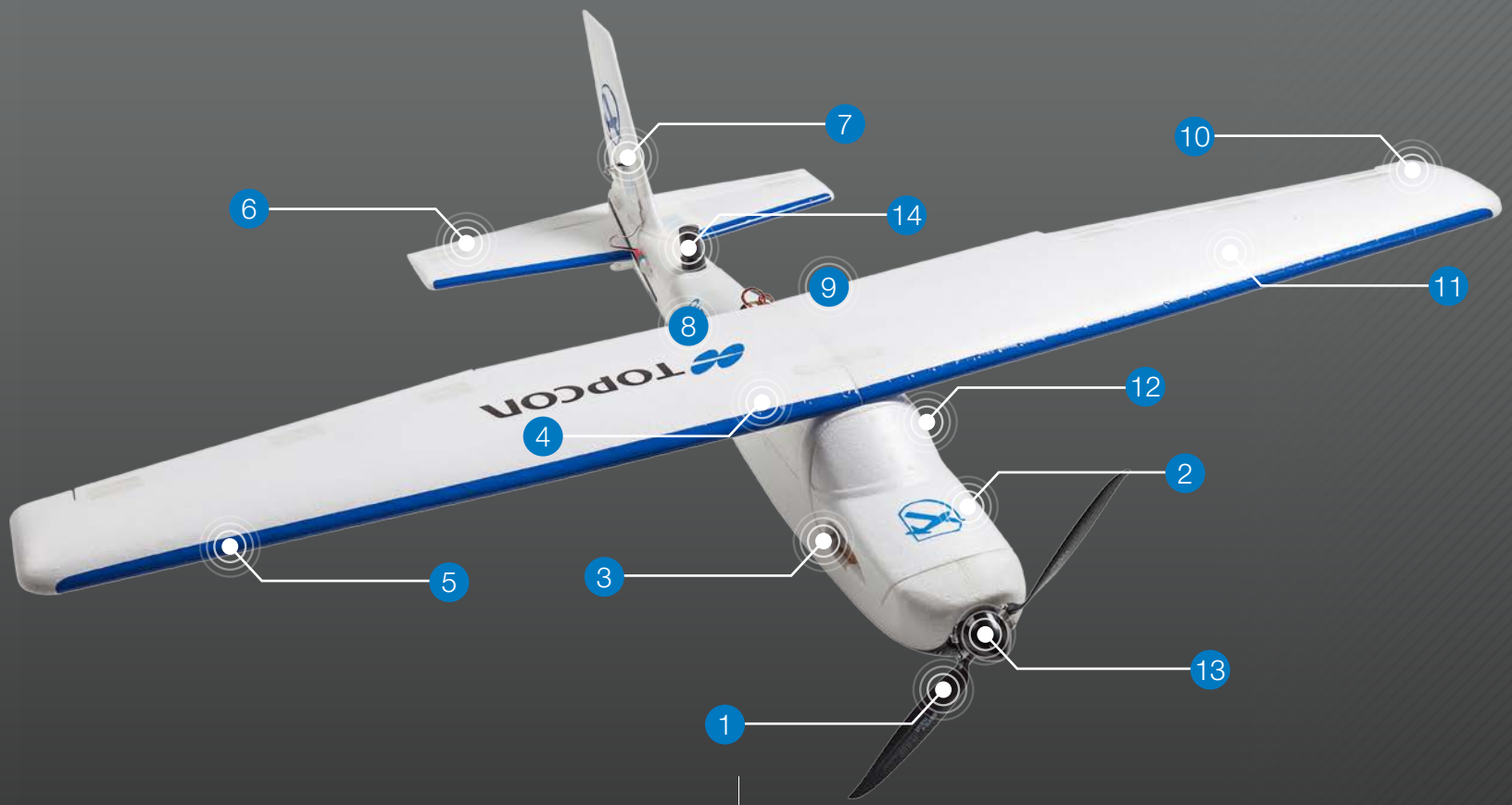
Kit Components

- Sirius UAS, powered by MAVinci, with MAVinci Autopilot System
- Camera kit
- Ground station
- MAVinci Desktop software
- Transport box for the UAS

Optional Accessories

- Base station kit (Sirius Pro only)
- Spare parts kit
- Training and support

** Laptop PC for field connectivity not included*



1. Folding propeller (protection for landing)
2. Single battery-powered UAS
3. Calibrated camera with large sensor
4. MAVinci autopilot
5. Flashing lights below the wings
6. Detachable tail rudders
7. Special long-life actuator
8. Adaptive active cooling of autopilot electronics
9. Security switch for engine control
10. Extremely lightweight foam material
11. White color prevents overheating
12. Access to camera storage card
13. Electric brush-less motor
14. GNSS Antenna

Safety and Specifications

To increase safety, the UAS performs special emergency actions if necessary:

- In case of engine failure (e.g. low battery level): autopilot stabilizes the UAS altitude and descends.
- The operator can send a “return home“ command. The UAS will then return to the ground station.
- If GPS signal is lost the UAS will circle in waiting position.

Airframe Hardware			
Build Material	Elapor		
Wingspan	163 cm		
Length	120 cm		
Weight	2.7 kg with camera		
Battery	Lithium-polymer (18.5V, 30C, 5300 mAh)		
Propulsion	Electric brush-less 680W engine		
Actuators	Long life		
GNSS Component			
Number of Channels	226 Universal Channels		
Signals Tracked	GPS L1 C/A, L2C, L2 P(Y) GLONASS L1/L2 Galileo E1		
RTK Accuracy (Kinematic)	Horizontal: 10 mm + 1.0 ppm x baseline Vertical: 5 mm + 1.0 ppm x baseline		
Test Data Accuracy	**GSD**	**X/Y**	**Z**
Agricultural Area 1	1.6 cm	2.4 cm	3.1 cm
Stone Pit	2-3 cm	4.4 cm	0.8 cm
Agricultural Area 2	3.5 cm	5.1 cm	3.2 cm
Agricultural Area 3	10 cm	7.2 cm	8.6 cm

Flight Information	
Flight Time	Up to 55 minutes with camera
Orthophoto Flight Altitude	59 - 750 m
Max Flight Altitude	2600 m ASL
Operators	Single
Max Wind-speed Operation	50 km/h, gusts up to 65 km/h
Operating Temperatures	-20ºC to 45ºC
Rain Operation	Yes
Typical Cruise Speed	65 km/h
Autopilot	
Automatic Navigation	GPS/IMU aided, includes compass for improved navigation under strong winds
Flight Modes	Automatic / Autopilot supported / Full manual
Takeoff / Landing	Automatic
Landing	
Methods	Automatic / Autopilot supported / Full manual belly landing
Autopilot supported	UAS is controlled by simple up/down, left/right commands to avoid obstacles that prohibit automatic landing

RC Links	
EU / CE Regulations	2.4 GHz up to 2 km line-of-sight range
FCC / IC Regulations	2.4 GHz up to 4 km line-of-sight range
All Countries	2.4 GHz for manual backup control up to 3 km
Autopilot Security and Failsafe Features	
Overheating prevention	
Engine security button	
Return home function	
Multiple RC links	
GPS tracker recovery (optional)	
UAS fly-away protection	
Emergency landing	
UAS health data display on MAVinci Desktop	
Camera (Panasonic GX1)	
Mega Pixels	16
Lens	Fixed focus 14 mm f/2.5
Sensor	Micro four-thirds
Memory	360º

TotalCare

This online resource comes with real live people ready to help. Get expert training from Topcon University's large collection of online materials, and expert help directly from Topcon Technical Support.

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