

# Sirius UAS



## Advanced flight planning and mission control software

- Simple automatic flight planning
- Session management
- Offline mission planning
- Forecast of ground coverage before flying
- Different flight patterns for various applications
- Use shape files, KML, GeoTiff, WMS as basis for your flight plan
- One-click interfaces to processing software

[Find more details on page 14-15.](#)



## Simple and flexible use

- Simple hand launch
- Automatic operation from take-off to landing
- Automatic or assisted landing
- Operational in rain and from -20° C to 45°C
- Full surveying functionality in wind up to 50 km/h (ca. 7Bft) and gusts up to 65 km/h (ca. 8Bft)
- Interchangeable camera payloads
- On-the-field quality check
- Low operation costs
- Rugged transport box
- SIRIUS basic: software upgradable to SIRIUS pro
- SIRIUS pro: mapping of inaccessible sites with high accuracy

[Find more details on page 16-17.](#)



## Excellent results and high accuracy

- Camera payload with fixed focal length and very large sensor
- MAVinci precision timing
- Inherently stable design allows for stabilization on all three axis
- Correct image overlap and photogrammetric flight pattern
- Very precise navigation by MAVinci Autopilot
- 100 Hz Topcon sub-centimeter RTK receiver
- Different data sets match due to high accuracy
- >2000 images in one flight

[Find more details on page 20-27.](#)

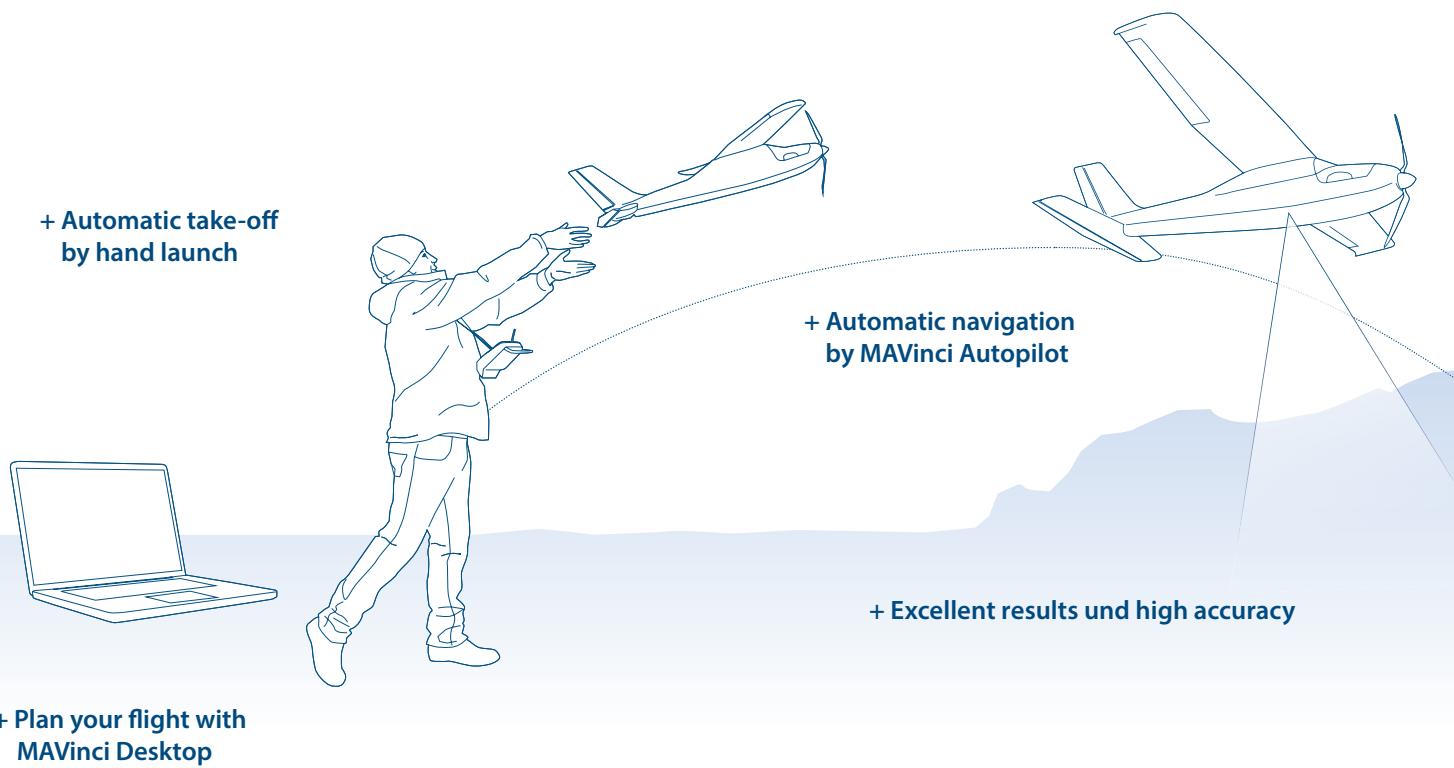


## Safety first

- Safe over-head hand launch
- MAVinci Autopilot safety features
- Assisted flying and manual interaction by safety pilot
- Air traffic monitoring system
- Overview of local airspace regulations
- Obtain flight permissions in many countries
- Electric engine safety button

[Find more details on page 18-19.](#)

# Mission Work Flow



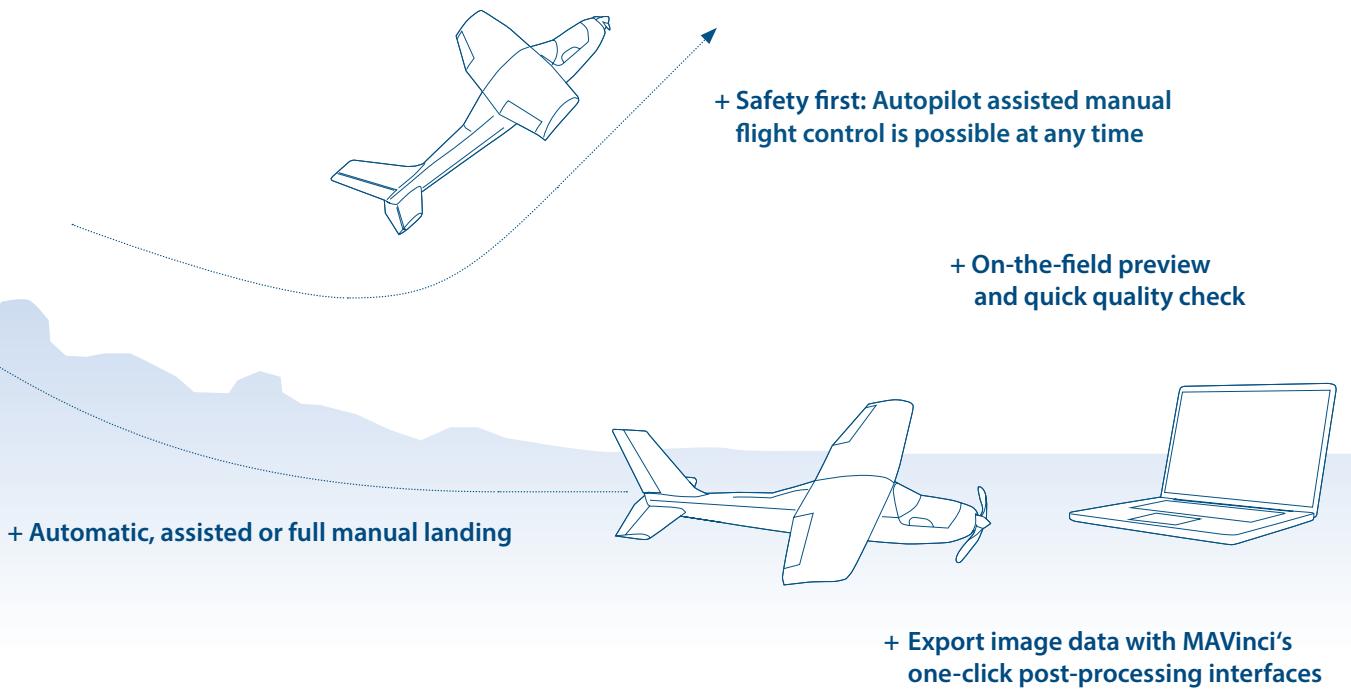
Get an short overview and explore more details on the following pages!

After quick setup of the SIRIUS UAS, the operator chooses his area of interest and the desired Ground Sampling Distance (GSD). The **flight planning** software MAVinci Desktop automatically creates an individual flight plan. The flight plan can be calculated quickly in the field or even in the office before the mission starts. In addition, MAVinci Desktop has the ability to change the flight plan even when the UAV is currently flying.

One click in MAVinci Desktop transfers the flight plan wirelessly to the SIRIUS. For **automatic take-off**, the operator launches the SIRIUS by throwing it into the air without any additional catapult or bungee cord. The **hand launch** is safe, easy and comfortable.

During the **completely automatic flight** the SIRIUS follows the predefined flight plan. Aerial images are automatically stored on board.





The SIRIUS is able to **land fully automatically**. Alternatively, if obstacles or a small landing area prohibit automatic landing, the operator can easily land manually with autopilot assistance. The UAV is stabilized by the autopilot and manually controlled by simple up/down, left/right commands. In addition, a full manual landing is also possible.

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.



# SIRIUS UAS



	CLASSIC	BASIC	PRO
MAVinci Autopilot	+	+	+
MAVinci Desktop updates	+	+	+
Topcon GPS receiver		+	+
Upgradable to pro via internet		+	
GPS/GLONASS/L1/L2 RTK			+
100Hz GPS update rate			+
External RTK base station			+
NTRIP			+

## Available add-ons

NIR camera payload	+	+	+
Air traffic monitoring system	+	+	+
Internal RTK base station			+

Survey grade accuracy  
 when using GCPs      Survey grade accuracy  
 when using GCPs & flexible upgrade to  
 SIRIUS pro      Accuracy down to 1.6 cm in x,y/  
 2.7 cm in z without GCPs

## The SIRIUS UAS includes

- SIRIUS UAV with MAVinci Autopilot System
- Camera kit
- Ground station
- Remote control set
- Permanent license for MAVinci Desktop
- MAVinci Connector
- Accessories kit
- Ground station battery
- Plane battery
- Battery charger
- UAS Transport box (<20 kg, 118.2 x 38.5 x 41.2 cm)
- Spare parts
- Spare parts transport box (<20kg, 90.2 x 49.5 x 37.9 cm)
- Optional: Post processing software
- Optional: Analysis software
- Optional: Survey grade antenna + tripod

## NIR camera payload

The NIR camera provides relative NDVI indices from minimum to maximum values in the image. It is a modified version of the MAVinci visible range GX1 camera system achieving the same high resolution images and high accuracy results. Single images can be processed into high accuracy ortho-photos and 3D models.

The Normalized Difference Vegetation Index (NDVI) is a graphical indicator for analysis of vegetation conditions and photosynthetic capacity.

This camera can also capture images with green, red and near infrared (CIR) channels.

## Air traffic monitoring system

ADS-B and FLARM are industry standards for portable collision avoidance systems for manned airplanes. They alert pilots if they get too close to another airplane or skydiver etc. also using ADS-B or FLARM. The MAVinci air traffic monitoring system supports ADS-B, FLARM, MODE-S and MODE-C. It visualizes the positions of other nearby airplanes that are using ADS-B, FLARM, MODE-S or MODE-C in MAVinci Desktop and alerts the UAS Operator in case other air traffic participants enter the UAS operation area.

## SIRIUS pro: internal base station

As an alternative to an external RTK base station the SIRIUS pro UAS can be upgraded to an internal base station via internet upgrade. This allows the MAVinci connector to be used as an RTK base station in conjunction with the SIRIUS pro. The connector then has the ability to transfer RTCM messages to other rovers.



# Form Follows Function



Length 1.22 m



Wingspan 1.63 m



Take off weight 2.7 kg



MAVINCI  
AUTOPILOT



# Technical Data

Wingspan	163 cm
Length	120 cm
Take off weight	2.7 kg
Battery	Lithium-polymer 18.5 V 30 C 5300 mAh (98 Wh)
Propulsion	Electric brushless motor (900 W peak)
Max. total flight time	45 min
Launch method	by hand
<b>Landing methods</b>	Automatic / autopilot supported / full manual belly landing Autopilot supported: In this mode the UAV is controlled by simple up/down, left/right commands to avoid obstacles that prohibit automatic landing. In addition full manual landing is also available.
Typ. orthophoto flight altitude	59 - 750 m
Max. flight altitude	tested up to 4000 m ASL
Number of operators	1
Max. windspeed for operation	50 km/h (7Bft), gusts up to 65 km/h (8Bft)
Operation temperatures	-20° C to +45°C
Rain	Operation in rain
Typical cruise speed	65 km/h
Payload: Camera	Panasonic GX1 with a 14 mm f/2.5 lens, fixed focus, calibrated, 16 MP, large micro four thirds sensor
Special long life actuators	Yes
<b>Autopilot</b>	GPS/IMU aided, includes compass for improved navigation under strong wind automatic, autopilot supported, full manual
Automatic take-off, landing	Yes
<b>RC links</b>	<ul style="list-style-type: none"> <li>· EU / CE regulation: 2.4 GHz for up to 2 km line-of-sight range</li> <li>· FCC / IC regulation: 2.4 GHz for up to 4 km line-of-sight range</li> <li>· all countries: RC: 2.4 GHz for manual backup control up to 3 km range</li> <li>· FCC / IC, Anatel, Australia regulation: 900 MHz for up to 6 km line of sight range</li> </ul>
<b>Autopilot security and failsafe features</b>	<ul style="list-style-type: none"> <li>· Overheating prevention</li> <li>· Engine security button</li> <li>· Return home functionality</li> <li>· Multiple RC links</li> <li>· GPS tracker recovery (optional)</li> <li>· UAV fly-away protection</li> <li>· Emergency landing <i>(If engine fails: The autopilot stabilizes the UAV attitude and descents.)</i></li> <li>· UAV health data display by MAVinci Desktop</li> <li>· Customizable actions to be performed in case of emergency</li> </ul>

<b>Typical GSD</b>	1.6 - 20 cm
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#### **Area coverable in one flight \***

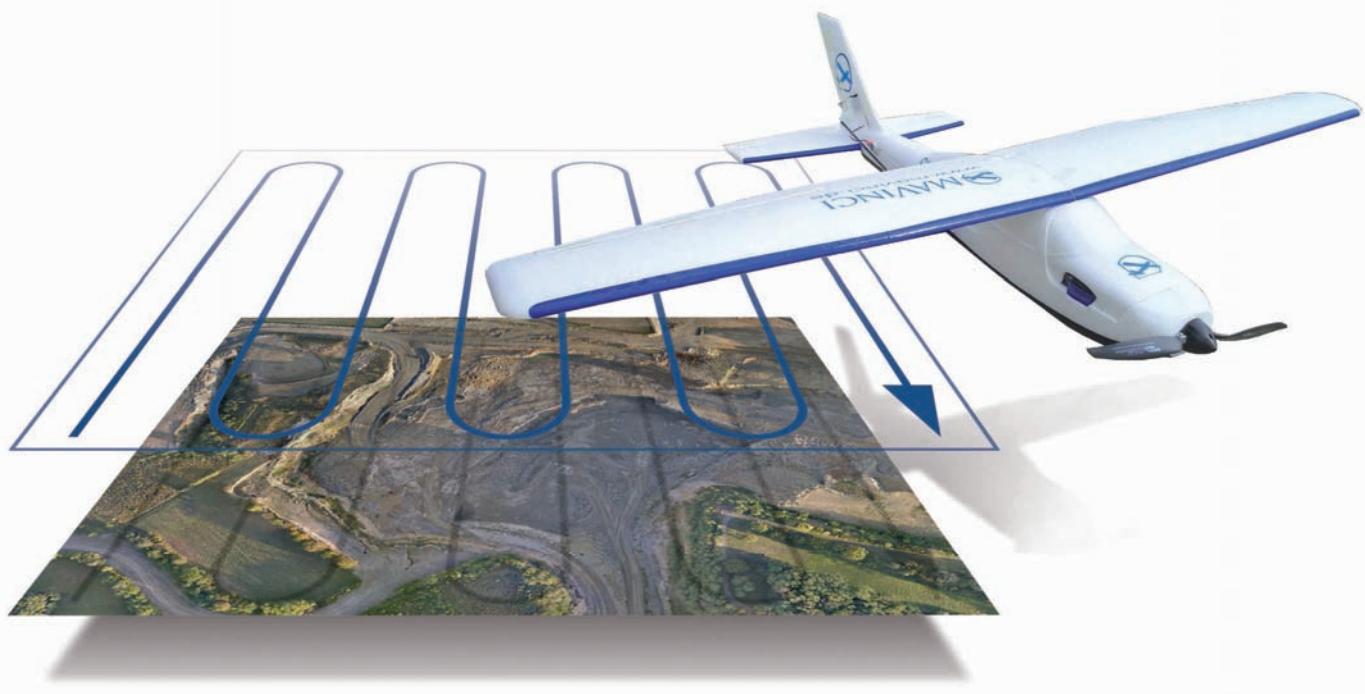
at 45 min flight time, aspect ratio approx. 2

<b>GSD</b>	<b>AGL / m / ft</b>	<b>side overlap / in flight overlap</b>	<b>65 / 85 %** 20 / 80 %</b>	
			<b>65 / 85 %**</b>	<b>20 / 80 %</b>
1.6 cm	59.4 m	195 ft	0.7 km <sup>2</sup>	1.62 km <sup>2</sup>
2.6 cm	96.5 m	317 ft	1.13 km <sup>2</sup>	2.65 km <sup>2</sup>
3.2 cm	119 m	390 ft	1.42 km <sup>2</sup>	3.20 km <sup>2</sup>
5.0 cm	186 m	610 ft	2.25 km <sup>2</sup>	5.12 km <sup>2</sup>
10 cm	371 m	1217 ft	4.54 km <sup>2</sup>	9.97 km <sup>2</sup>
20 cm	743 m	2438 ft	8.67 km <sup>2</sup>	18.20 km <sup>2</sup>

\* Values are given for single flights. If the area exceeds the range of one flight, it will be split, which increases the capacity up to 30 %, due to reduction of the overlap on the border between flights.

\*\* The area actually imaged is larger. The values given refer to the area that can be processed at full 3D accuracy. Values given are for optimal 3D quality. Areas typ. 20% larger can be covered with compromises in 3D quality if the border of the image is included.

<b>Demo data sets</b>	<a href="ftp://mavinci.de">ftp://mavinci.de</a>
<b>Cross-validation Error</b> (Sirius classic and basic when using GCP)	General rule of thumb for overall accuracy: twice the ground sampling distance (GSD) in x and y directions and 3 times GSD in altitude of the 3D model. See also page 24-25.
<b>True Error</b> (Sirius pro, without GCPs)	Down to 1.6 cm in x,y / 2.7 cm in z



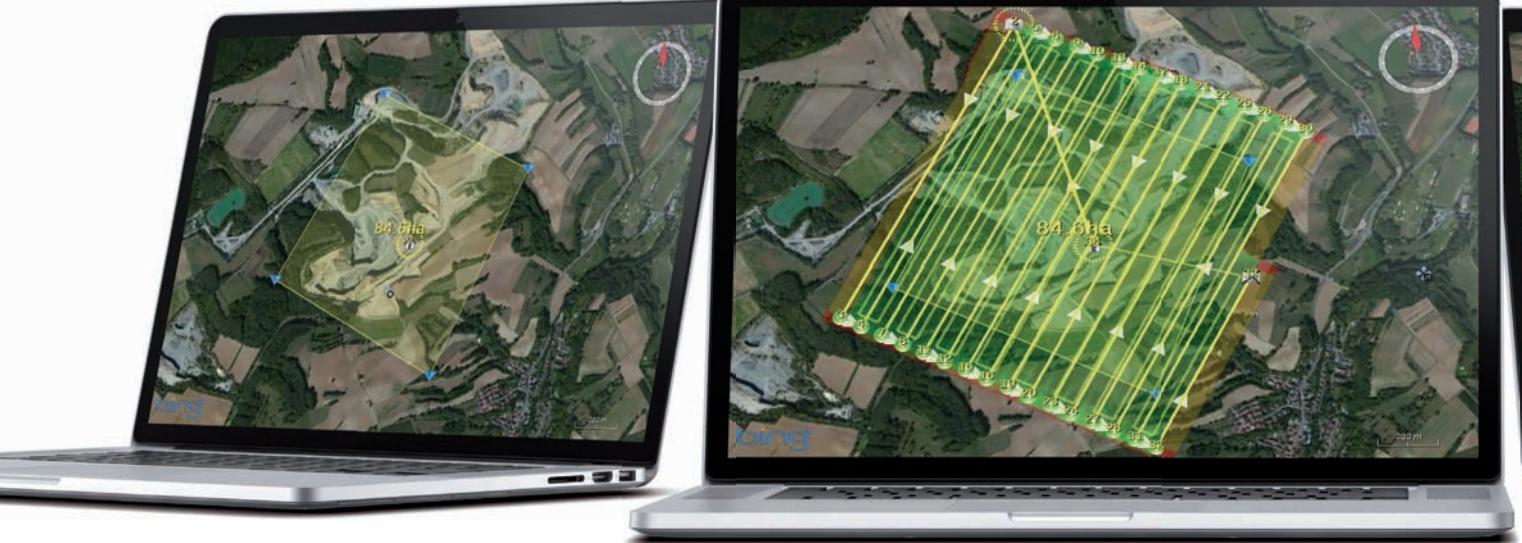




# Software

## 2. auto flightplan

### 1. select



## Advanced Flight Planning and Mission Control Software

MAVinci Desktop is a professional software program that handles all UAV related tasks from flight planning to UAV control. It also functions as an interface to several post processing software solutions. With MAVinci Desktop you can handle all jobs from simple to complex projects intuitively and time efficiently.

### Easy flight planning

Once you choose your area of interest and a ground sample distance, the flight plan will be calculated automatically. Check the expected ground coverage indicated by the green, yellow and red colors before the flight.

### Visualization & Measurement

- Import your DEM and orthophoto after processing as a basis for your next flight plan or for basic measurements
- Enhance the world-wide base map with high resolution maps (WMS, geoTIFF) and annotations (KML, Airspace Restrictions, Shapefiles)
- Measure simple distances and areas and store them to KML
- Integrated global SRTM / ASTER digital elevation data, locally extendable via geoTIFF
- Animated live rain radar data
- Fully 3D and 2D views
- Contour lines
- Layer transparency
- Graticules

### Other highlights

- Offline mission planning
- Coordinate systems / projections (choose from a large selection of predefined systems or customize your own)
- Metric, imperial or ICAO units
- NDVI, CIR: Near infra red image data post-processing
- MAVinci Agisoft Photoscan Pro Plugin to get best results the simplest way: single click and batch processing
- Interfaces to various post-processing software solutions and cloud providers
- NTRIP client for RTCM correction data for SIRIUS pro
- Input RTCM message from 3rd party base stations / Output RTCM message to 3rd party rovers
- Translated into: English, Spanish, Portuguese, German, Chinese, Thai
- Compatible with Windows®, Linux® and Mac®
- Support solutions: simple upload of projects and built in remote help desk
- Session management

### 3. control



### 4. check



#### Monitor your flight live and on full 3D globe

- Edit or restart your flight plan while the UAV is already in the air, or skip and repeat individual parts of it
- Monitor all relevant flight parameters and receive automatic warnings about e.g. low battery voltage
- Distance to a controlled airspace is visualized
- Optional: Live air traffic warning  
(See page 18-19 for details.)
- Record and replay sessions

#### On-the-field quality check

- Verify the quality of the data set you have acquired immediately after copying the image data
- Check the overlap of the individual images (sufficient overlap: green color).
- Zoom: Even tiny details are visible in the preview



#### Work in mountain areas

Flight plan is automatically adapted to elevation model in order to stay on a constant and safe distance from the ground.

#### Cover areas that require more than one flight

Flight plan automatically splits up and rejoins for post-processing.

# Simple and flexible use



## Hand launch

Simply hold the SIRIUS UAS above your head, release the engine and let the UAS start its mission. Using this way of hand launching the system you are far away from the turning engine and you do not need any additional equipment such as a catapult or bungee cord.

## Automatic operation from take off to landing

The SIRIUS UAS can be operated completely automatically without any interaction by the pilot from take off to landing. In addition the operator has the ability to land in areas where automatic landing is impossible via autopilot-assisted landing. SIRIUS is stabilized by the autopilot and manually controlled by simple up/down, left/right commands.

## Completely flexible in severe weather conditions

Operate the system with hot or cold outdoor temperatures from -20° C to 45°C and fly in rain and strong wind: The UAS is fully operational in wind of up to 50 km/h (approx. 7Bft) and gusts up to 65 km/h (approx. 8Bft).

## Cost efficient

The SIRIUS UAS has a long life cycle, performing more than 200 landings with one body. The maximum flight time of 45 min enables the operator to cover large areas in one flight and minimize down time between flights. Individual parts of the system can be replaced on demand instead of replacing the whole plane. Low operation costs of only 18 € per flight and the possibility of using the system with only one operator further increases cost efficiency.

## Interchangeable sensors

Switch between the visible range GX1 camera payload and the Near-Infra-Red GX1 payload between flights.

## Upgrade SIRIUS basic to pro via internet

SIRIUS basic is upgradable to SIRIUS pro via internet upgrade; no additional hardware changes are necessary. This gives our customers full flexibility to start the business with a professional reliable tool and upgrade later to SIRIUS pro, for example for mapping inaccessible sites with high accuracy without the need for GCPs.

## On-the-field quality check

Some of the jobs you will do with the UAV may be in remote areas. A long journey used to be necessary to reach your area of interest. With our quality check function you can verify within minutes the quality of the data set you have acquired directly on the field. This function checks the overlap of the individual images and indicates sufficient overlap with green color. Even tiny details are visible in the preview. In addition, you can process a quick preview image and DEM if you want to analyze the data more thoroughly before heading back to your office.

## Transport

The SIRIUS UAS is a light-weight system with a small pack size. All equipment fits into one single box with a total weight of about 20 kg. The transport box is made of robust aluminum and especially designed for permanent commercial use. It protects the UAS perfectly during transport and is resistant to corrosion, weather and temperature influences.



# Safety first

Ensuring the safety of the system is one of our main objectives.

Therefore we have implemented several features to protect you and the people around you:

## Air traffic monitoring system

ADS-B and FLARM are industry standards for portable collision avoidance systems for manned airplanes. They alert pilots if they get too close to another airplane or skydiver etc. also using ADS-B or FLARM. The MAVinci air traffic monitoring system supports ADS-B, FLARM, MODE-S and MODE-C. It visualizes the positions of other nearby airplanes that are using ADS-B, FLARM, MODE-S or MODE-C in MAVinci Desktop and alerts the UAS Operator in case other air traffic participants enter the UAS operation area.



## Electric engine safety button

Before the UAS is launched, the electric engine is locked and unable to start accidentally. A special release button on the side of the UAV body enables the operator only - and no other person - to release the electric engine and activate it shortly before launching. After landing a push on the safety button again locks the engine and secures the system.

## Airspace Maps

As a supplement to traditional ICAO airspace maps printed on paper, MAVinci Desktop visualizes digital airspace maps. They indicate by color whether it is legal to fly in this airspace. MAVinci Desktop alerts the UAS operator that the SIRIUS UAS is nearing a restricted airspace.

## Security features and emergency actions

SIRIUS has a wireless data link for up to 4 km line-of-sight range (actual frequency and range depends on your local regulations) and an additional RC transmitter with a 2.4 GHz ISM link for manual backup control with a range of up to 3 km. The manual backup control link is independent of the autopilot to minimize the risk of radio link failure. The flight planning software MAVinci Desktop shows status data of the UAV during the flight for example RC link state, GPS state, position of the UAV and battery levels. In addition the altitude of automatic operation can be limited (e.g. to 150 m).

To minimize possible damage to the UAS and to increase the safety of the system, the UAS performs special emergency actions if necessary:

- In case of engine failure (e.g. due to low battery level), the autopilot continues to stabilize the UAV attitude and descents to prevent a crash.
- The operator can send a "return home" command. The UAV will then come back to the ground station.
- Actions to be performed in case of emergency (e.g. GPS loss or link loss) can be configured via MAVinci Desktop: The SIRIUS UAS will e.g. return to takeoff position on RC-link loss or circle down to leave the airspace on GPS loss.



### Autopilot assisted manual control

Automatic take-off, flight and landing are innovative and very useful features. When using the UAS in the field, unpredictable things such as rescue helicopters passing your flight area, can occur. It is therefore very important that the operator is able to interrupt the automatic flight of the UAV at any time to steer the UAV manually.

Our autopilot assisted manual control mode enables the operator to control the UAV assisted by the autopilot. In this mode the UAV is stabilized by the autopilot. The controller steers the UAV with simple up/down, left/right commands. The autopilot assisted control is very easy to use and can be learned within minutes. In addition the UAV always stays in the range of sight when in this control mode. Some countries do not permit the operation of UAS without the option of manual control. The assisted manual control mode enables you to operate your UAS legally in these countries without learning full manual UAV control.

**Watch SIRIUS live  
during the flight!**



### Terrain awareness

During flight planning MAVinci Desktop checks your flight plans for potential collisions with the underlying terrain model. If possible, it optimizes the flight plan in order to stay a constant and safe distance from the ground.

All these security measures enable our customers to obtain flight permissions in many countries.

**Fly safely with  
air traffic monitoring!**

# High Quality Results



## Advanced Panasonic GX1 camera

Any UAV payload should be as small and light as possible but deliver high quality data at the same time. For this reason we integrated the Panasonic GX1 camera into our UAS. It is small and lightweight and has a 16 MP Live MOS sensor. The sensor's area is about 9 times larger than the 1/2.5" sensors typically used in compact digital cameras. We mounted a Panasonic 14mm f/2.5 lens on the Panasonic GX1 camera. 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.

## Inherently stable UAV design

The SIRIUS UAS is shaped like a real airplane. This means it has three rudders for stabilization on 3 axes: elevator, side rudder, aileron. In this way the whole plane acts as a camera gimbal to stabilize the camera in flight and increase the quality of the images.

In addition, the MAVinci autopilot navigates the SIRIUS UAS precisely along the predefined flight lines. This ensures the correct overlap between the individual images, and a photogrammetric flight pattern.

## Area coverable in one flight \*

at 45 min flight time, aspect ratio approx. 2

GSD	AGL / m / ft	side overlap / in flight overlap		
		65 / 85 %**	20 / 80 %	
1.6 cm	59.4 m 195 ft	0.7 km <sup>2</sup>	1.62 km <sup>2</sup>	
2.6 cm	96.5 m 317 ft	1.13 km <sup>2</sup>	2.65 km <sup>2</sup>	
3.2 cm	119 m 390 ft	1.42 km <sup>2</sup>	3.20 km <sup>2</sup>	
5.0 cm	186 m 610 ft	2.25 km <sup>2</sup>	5.12 km <sup>2</sup>	
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\* Values are given for single flights. If the area exceeds the range of one flight, it will be split, which increases the capacity up to 30 %, due to reduction of the overlap on the border between flights.

\*\* The area actually imaged is larger. The values given refer to the area that can be processed at full 3D accuracy. Values given are for optimal 3D quality. Areas typ. 20% larger can be covered with compromises in 3D quality if the border of the image is included.





### High resolution geo-information products

The area that can be covered during one flight with SIRIUS depends on the GSD. Due to the plane's low flight altitude high resolutions of 1.6 - 20 cm GSD are typically achieved. Flight planning with MAVinci Desktop and the precise navigation of the MAVinci Autopilot ensure correct image overlap and a photogrammetric flight pattern.

### Number of pictures per flight

The SIRIUS UAS delivers more than 2000 images in one flight, so that each point on the ground is covered by an average of 15 individual images. A large quantity of pictures contains a large amount of information, which further improves processing quality and accuracy.

### Post Processing

Benefit from Fully Automatic Standalone Processing Software & powerful Processing Service Providers.





# Resolution is not Accuracy!

## Ground Sample Distance (GSD)

The GSD is the distance between the centers of two neighboring pixels in an aerial image measured on the ground (e.g. 10 cm GSD means the centers of two neighboring pixels are 10 cm apart from each other, when measured on the ground).

## Optical image resolution

Optical resolution describes the ability of an imaging system to resolve details in the object being imaged. Each component of the system (lens etc.) contributes to the optical resolution of the system, as does the environment in which the imaging is done.

The MAVinci SIRIUS UAS has an optical resolution of up to 1.8 cm at a GSD of 1.6 cm. This difference corresponds to the natural limits set by the laws of physics.



The diameter is 100 cm in the original size.

## Relative vs. absolute accuracy

Relative accuracy expresses the error of measurements (e.g. length, volume) within an elevation model independently of the absolute orientation of the 3D model in the global coordinate system.

Absolute accuracy expresses the position error of a reference Ground Control Point (GCP) and its corresponding coordinate in the 3D model. This error can be expressed in three ways:

## Calibration error

Calibration error expresses the difference between a reference Ground Control Point (GCP) used during processing and its corresponding coordinate in the 3D model. Calibration errors underestimate true errors because GCPs are not independent validation points, since they are used during processing of the UAV data and estimation of accuracy.

## Cross-validation error

In cross-validation, a 3D model is calculated by leaving out one GCP. This procedure is iterated many times, each time leaving out another GCP. During each iteration the discarded GCP is used as an independent validation point to calculate the accuracy of the 3D model. The resulting cross-validation error is a reliable measure of accuracy.

## True error

True error expresses the difference between a reference Ground Control Point (GCP) that has not been used during processing and its corresponding coordinate in the 3D model. To determine true error, a set of reference GCPs are needed that are used only to measure errors, and that have not been used as supplementary information during post-processing at all.

## How do we define accuracy in our data sets?

For SIRIUS classic or basic data sets in which no RTK was used, we specify the cross-validation error. When we analyze SIRIUS pro RTK data sets we specify the true error because no GCPs have been used during processing.



Example with 1.6 cm GSD.

# Sirius UAS and Accuracy

During photogrammetric orthophoto and DEM computation, the location of the GPS receiver of the UAV is used for geolocating the final model if no ground control points are available. Depending on the region of operation, the error of the GPS ranges between 2.5m (with SBAS available, e.g. Europe, USA) and 15m (no SBAS, e.g. South America, Africa) in X and Y and about 50% more in Z. This error will also be present in the final model. This means the final DEM can be shifted, stretched, rotated, and twisted by this number of meters.

All of these errors can be reduced to the range of centimeters by using ground control points. This is how you work with SIRIUS classic and basic. The rule of thumb for accuracy in this case is: Accuracy is in the order of twice the Ground Sampling Distance (GSD) in x and y directions and three times GSD in the altitude of the 3D model.

However, sometimes it is too much effort to use GCPs, or it may be impossible for some missions, whether because entry to the mission site is restricted, or placing GCPs would interfere with the activity on that site or it is simply too dangerous to enter the site.

For these situations MAVinci has developed SIRIUS pro. Its absolute accuracy is down to 1.6 cm in x,y/ 2.7 cm in z depending on the GSD. Combining MAVinci's precision timing technology with Topcon's sub-centimeter grade L1/L2 GPS/ GLONASS RTK receivers allows us to measure the camera position of each image so precisely that they can serve a function similar to GCPs.

Imagine that you add 1000 GCPs to a project – uniformly distributed over the entire area. You determine their positions and elevations to within a few centimeters and add them to post-processing. Averaging over one thousand centimeter-accurate points will give you amazing results. We are placing those one thousand points in the air - so you do not have to place them on the ground.

## MAVinci's precision timing technology

Besides GNSS accuracy the main factor influencing the accuracy of the final DEM and orthophoto is knowledge of the exact point in time when an image was taken. Since SIRIUS flies (without wind) at a speed of about 18 m/s, even a small timing inaccuracy of about 100ms would cause an additional error of 1.8 m. For this reason the SIRIUS pro UAS benefits from the combination of the MAVinci precision timing technology and the new Topcon GNSS receiver which results in a sub-millisecond timing accuracy.

## Different data sets match due to high accuracy

Another benefit of the high accuracy of SIRIUS pro is that different data sets from two different flights and even two different sensor payloads will match perfectly.

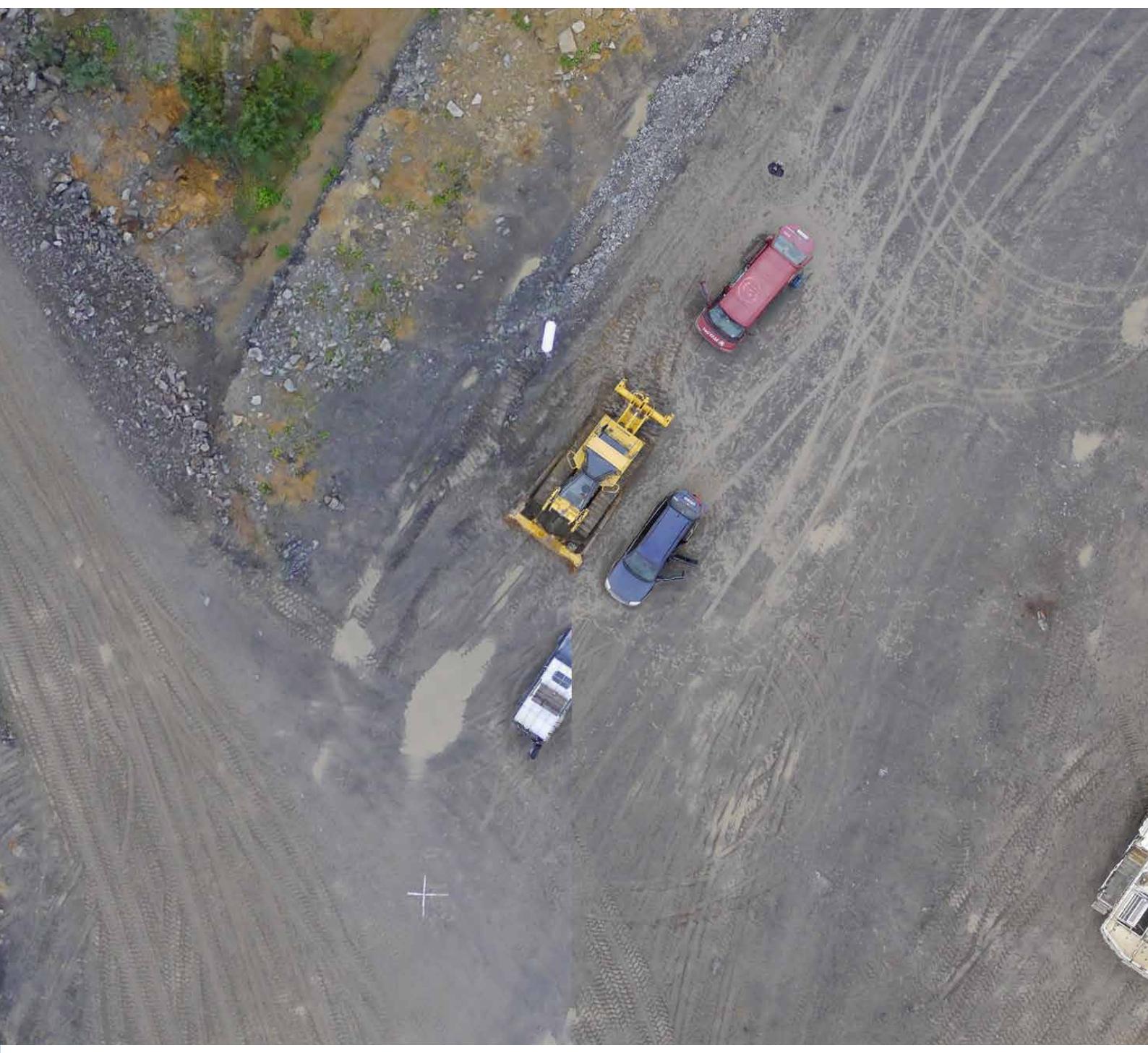
## Sirius pro Accuracy

All values shown in cm. All datasets at 1.6 cm GSD.

Dataset	x error	y error	z error
1	2.15	1.69	2.34
2	1.11	1.54	1.17
3	1.25	0.75	2.21
4	1.33	2.05	4.61
5	1.29	2.05	4.12
6	2.02	2.10	3.16
7	2.62	1.48	2.86
8	0.94	1.96	1.81
9	1.81	0.77	3.23
10	0.96	2.23	1.68
Average	1.55	1.66	2.72

All datasets are available online for review:

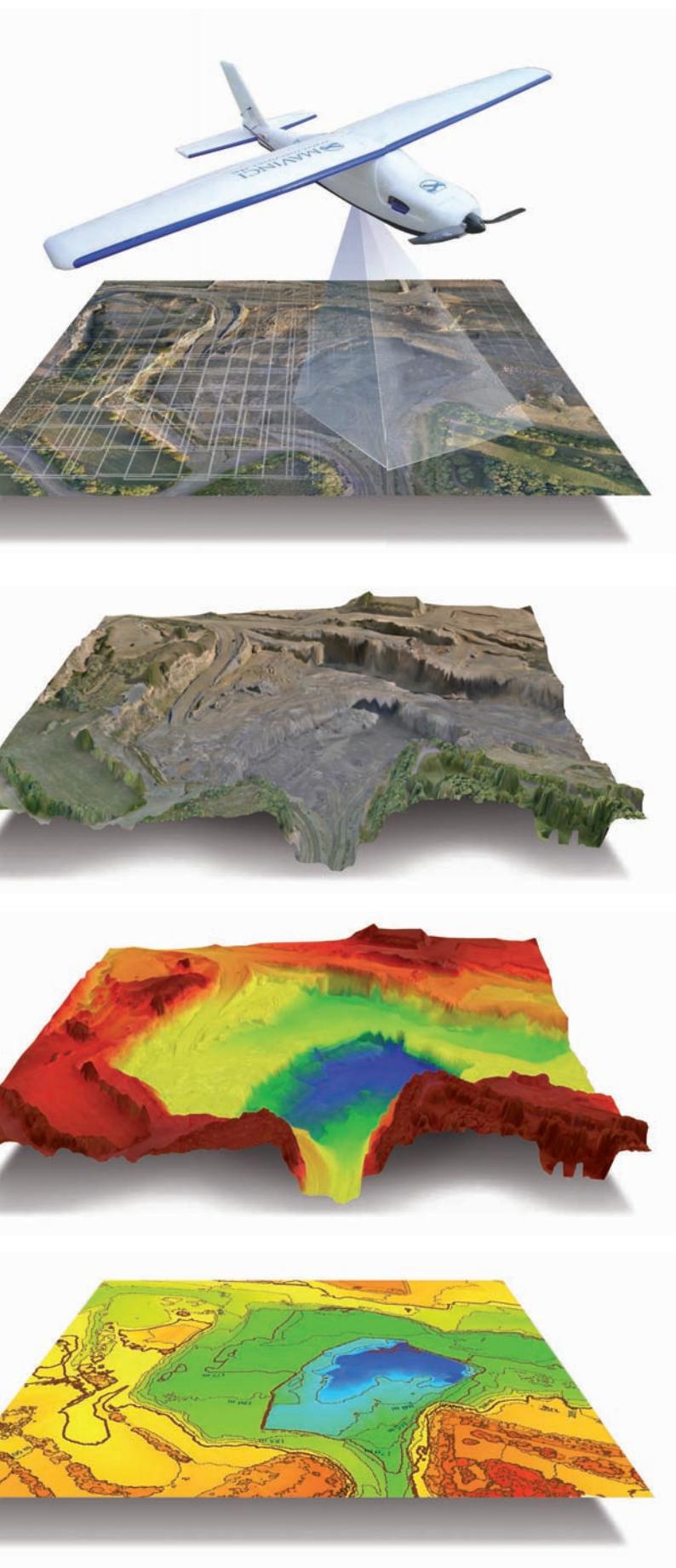
<ftp://mavinci.de/SIRIUS-PRO/>



Flight A

Flight B

# Analysis and Visualization



## Analysis and Visualization

Virtual Surveyor easily links UAV data with traditional geodetic surveying. It handles the large volumes of data that come with UAV orthophotos and elevation models by bringing them together in a virtual environment:

- Fast visualization
- Draw break lines and reference points in a 3D environment
- Perform volume analysis
- Real time calculation of elevation contour lines, slopes and slope directions
- Direct export to CAD

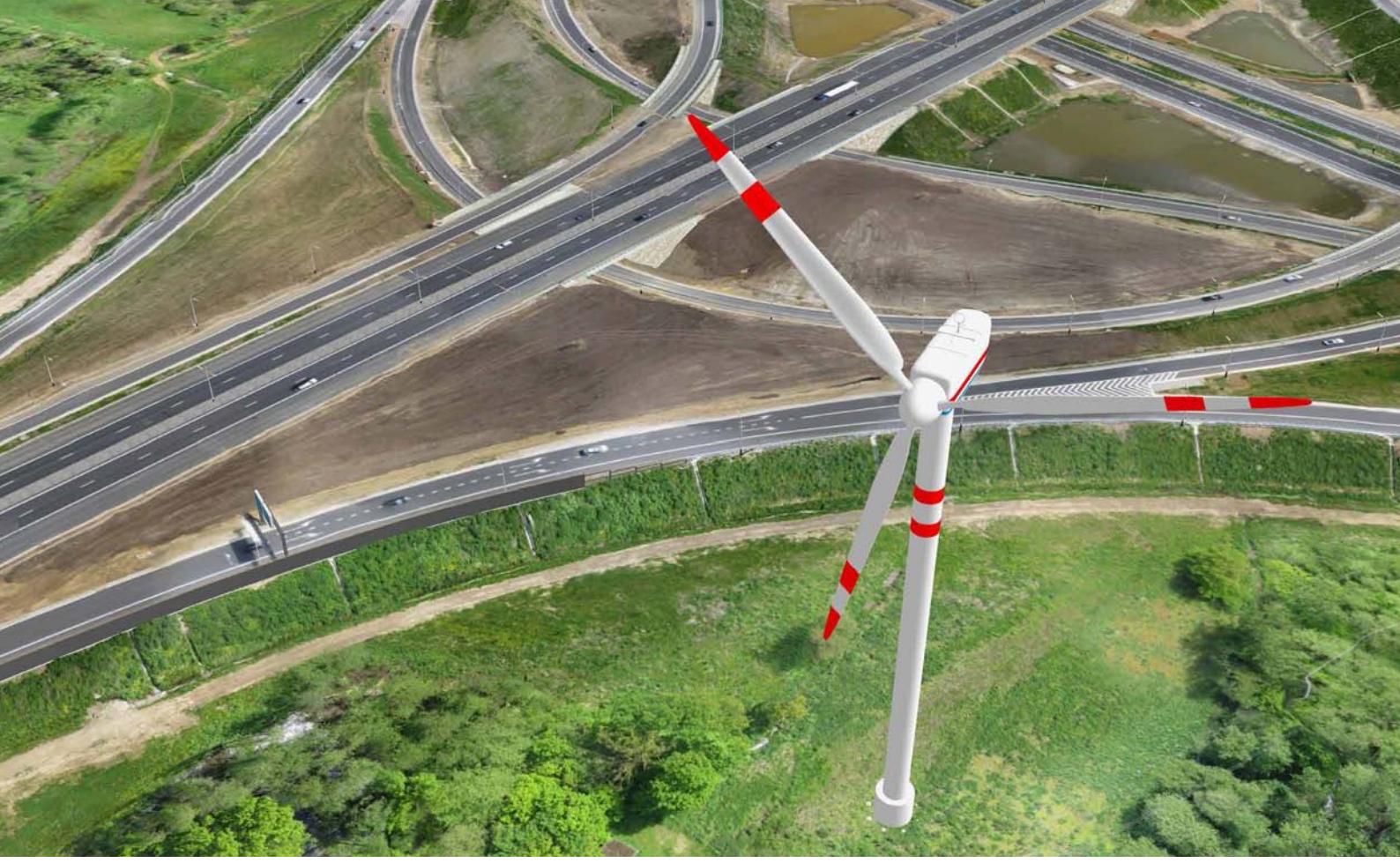
## Virtual measurement

Surveyors scan the terrain they want to measure and search for lines and specific points that allow them to describe the topography. These lines and points are carefully chosen, and the process is very difficult to automate. With Virtual Surveyor you can execute this process in a virtual environment. Thus you can use your surveyor's expertise and choose the points and lines that describe topography best.

## Volume analysis

Virtual Surveyor allows you to use all points in a UAV elevation model and to perform volume calculations. Start by delineating the area of which the volume is to be reckoned, then let the software perform a fast and accurate calculation.





## Receive a detailed and walk-through 3D model

### Fast visualization

Instead of reverting to standard communication strategies such as sketches, stills and pre-rendered animations, you can communicate your projects using an interactive 3D visualization. Orthophotos and elevation models can be combined into a 3D environment using Virtual Surveyor software. The pictures below show models of planned noise barriers as well as road furniture (guard rails, lights) that were imported and correctly positioned along the highways. In the resulting 3D environment, users can choose to navigate freely to any viewing point or fly or drive along predefined routes.



# Sirius UAS - Operator Training



## **Our customers can attend our UAS operator training. It has the following content:**

- Basic knowledge of aerodynamic aircraft
- Basic knowledge of how to read and understand Aeronautical Charts ICAO
- Battery handling
- Assembly and disassembly of the SIRIUS
- Exchange of damaged parts
- Inspection
- Flight planning, mission work flow with check lists
- Basic knowledge of wind conditions
- Influence of wind on flight planning and operation
- Behavior in case of malfunction or emergency
- Technical limits of the SIRIUS (payload, weather conditions, flight time, etc.)
- Equipment storage

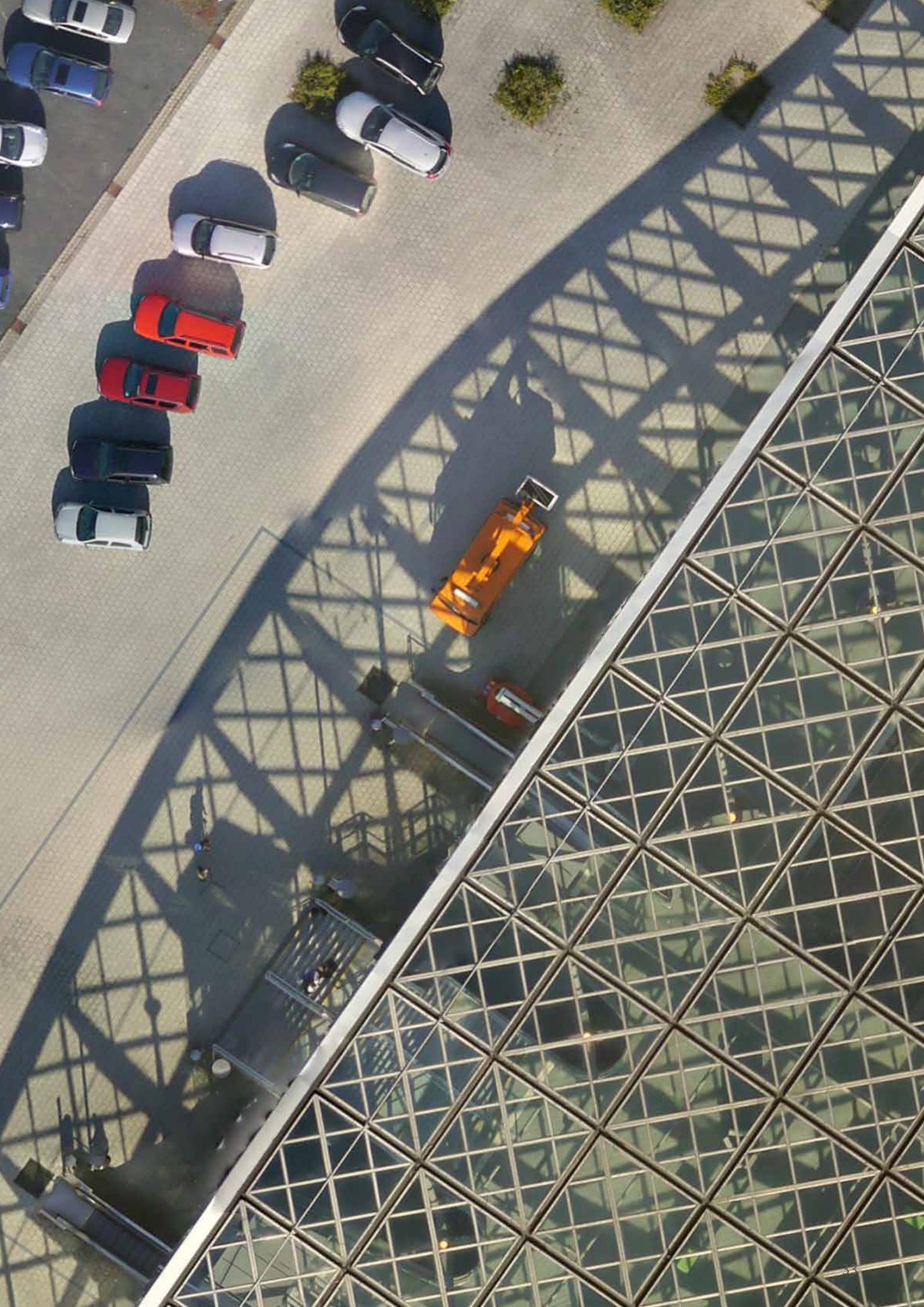
### **Take off, flight and landing training**

- Controlling the SIRIUS in normal operation
- Assisted mode: launch, flight, landing (with and without side wind)
- Emergency situations: flight and landing
- Instructions on how to practice UAV control in general and landing in more difficult areas

### **Optional: Post processing training**







# Where to buy?

Discover our worldwide distributor network.



T: +49 (0) 6227 398 1212

F: +49 (0) 6227 398 2757

E: [contact@mavinci.de](mailto:contact@mavinci.de)

[www.mavinci.de/en/distributors](http://www.mavinci.de/en/distributors)

The following ten statements are the basis of our business ethics. Everything we do reflects these principles. They are the framework from which we build strong relations with our customers.

#### **1. Build trust by telling the truth**

We advertise our products and services with true facts proven in real cases of use. Our customers trust in our integrity, because we are truly honest and take responsibility for what we say and do.

#### **2. Standing on our own feet**

We offer deeply integrated products and the best possible solutions because the MAVinci autopilot has been developed by us. Our deep insight into the technology enables us to quickly integrate newly emerging technologies into our products in order always to deliver cutting edge technology. This makes MAVinci the innovation leader in the field of surveying and mapping UASs.

#### **3. Long product life due to high product quality**

Because nothing can replace high quality, we use durable material and set a high value on product quality. Every UAS is tested in flight before delivery. Even after hundreds of flights our UASs are still ready for operation.

#### **4. Keep high-tech simple and easy to use**

We want to save your time. Therefore operating our UAS is highly efficient. Its straightforward architecture minimizes ground time between the flights. Every detail is optimized for practical handling. In addition the UAS consists of only the necessary parts, which makes transportation easier.

#### **5. Form follows function**

Our focus lies on the functionality of our products. They are designed to work in the field even under difficult conditions. Our customers rely on the high performance of our products and benefit from the irpractical handling.

#### **6. Security comes first**

Our products support many security features to ensure safe operation of the UAS. In our UAS Operator Training we educate our customers to become responsible and well-trained UAS operators.

#### **7. Global thinking**

With our worldwide distribution network we expand our business around the globe. Our distributors support customers in their local languages and professionally represent MAVinci in other countries.

#### **8. Individual solutions for everyone**

Although many of our customers share the need for aerial images, their cases are individual. We want to give you the freedom to address all possible uses when doing business, so we provide different post-processing solutions.

#### **9. Challenges are opportunities**

We like to accept the challenges our customers give us, because they are opportunities to demonstrate the extensive capabilities of our UAS technology. We recognize the diverse needs of our customers and do our utmost to satisfy them.

#### **10. Passion for technology**

We like to deliver high quality products and service to our costumers. Our curiosity and passion for technology and science drives us to develop innovations and manufacture cutting edge UASs.

## Contact

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October 2014  
Disclaimer: Subject to change without notice

**[www.mavinci.de](http://www.mavinci.de)**