WingtraOne

The professional VTOL drone for mapping & surveying

wingtra

Swiss quality standard of each WingtraOne drone is ensured by engineers who design and assemble drones at Wingtra's production facility in Zurich.

About Wingtra

Wingtra is the world's leading VTOL drone producer, headquartered in Switzerland. Since its market entry in early 2017, Wingtra has partnered with more than 40 of the biggest surveying equipment dealers across the globe such as RDO Equipment in the US.

Wingtra is based in the heart of Zurich, Switzerland. In a 1 000 m^2 (10 800 ft^2) office, the company houses 50+ employees, out of which more than 20 focus on R&D. Wingtra's engineers are graduates from the world's 7th best university, ETH Zurich (Top-universities, 2018). The same engineers design and assemble drones inhouse and form Wingtra's support team, reachable all year round in English, German and Mandarin.

Wingtra's drone WingtraOne is rooted in years of robotics research at the Autonomous Systems Lab—one of the world's best drone laboratories. Several of Wingtra's employees have grounded their doctoral and master projects in exploring VTOL technology and still continue to do so.

Among other media mentions, Wingtra's founders were featured by Forbes 30 under 30, and IEEE Spectrum, which covered Wingtra's pitch to German chancellor Angela Merkel.

WINGTRA FEATURED IN

CeBIT   Forbes   REUTERS   COMMERCIAL UAV NEWS   xYHT   IEEE SPECTRUM   siliconrepublic   GPS WORLD

Switzerland, The Drone Hub

Since the 20th century, Switzerland has been known as one of the world's most advanced economies. It also ranked first in the World's Global Innovation Index rating (2017).

Nowadays, Switzerland and especially Zurich, its largest city, houses the biggest players in the tech and drone industries. Not only Wingtra, but also Google, Facebook Oculus, Leica Geosystems, Pix4D, Auterion, PX4, Sensefly and Flyability— are all headquartered inside the Swiss borders. And that is the reason why Switzerland is often referred to as "The Hub of Drones" or "The Silicon Valley of Robotics."

WINGTRA IN NUMBERS

7+
years of scientific research

60+
employees

40+
distribution partners

No. 1
world's leading VTOL drone producer

The region between Zurich and Lausanne attracts the biggest tech players in the world. The Zurich area is also called The Silicon Valley of robotics because of its strong presence in the field.

Why VTOL drones are replacing fixed wings?

WingtraOne is a vertical take-off and landing drone—a VTOL. We already see that VTOL drones are replacing fixed wings, especially in professional surveying and mapping applications. Why? There are many reasons. Let us discuss a few.

A marine research group from Murdoch University, Australia, is navigating WingtraOne from a boat. "Without WingtraOne's ability to land in confined areas we wouldn't have been able to execute our research", commented Dr. Amanda Hodgson—the lead researcher.

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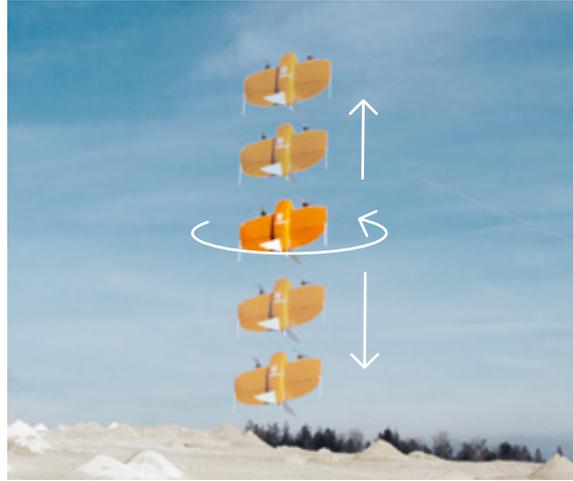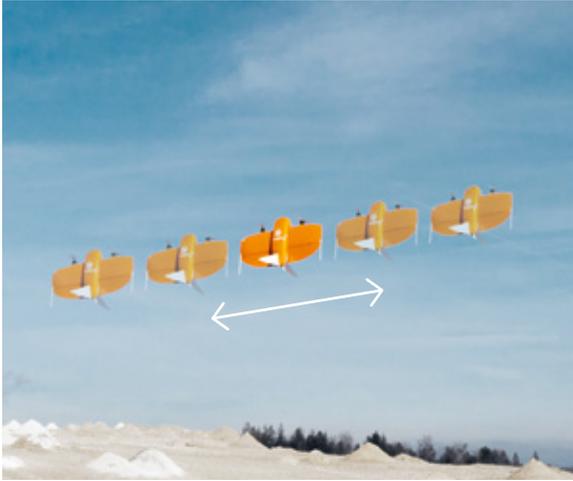
As a VTOL drone, WingtraOne can fly in two modes: hover and forward flight. While hovering, WingtraOne can be manually operated to fly in any direction like a helicopter: up and down, back and forward, and to both sides.

WingtraOne vs. other fixed wing drones

|	WingtraOne	Other fixed wing drones
Space needed for take-off and landing	Very little space is needed	Large area for take-off and landing is needed
Durability during take-off and landing on a difficult terrain	Each landing is safe even on gravel over many landings	Drone deteriorates with each landing and risks breaking on rocky terrain
Safety at take-off and landing	Always safe distance	Operator and environment in danger
Manual adjustments	Easy like with a multicopter	Fixed wing piloting skills needed
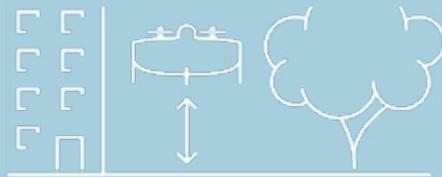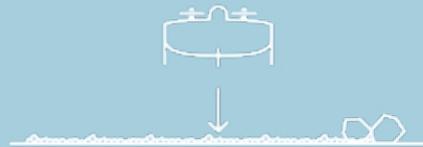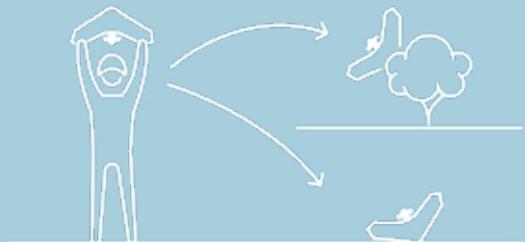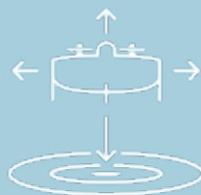
VTOL is not a choice, it's the only option

Vertical take-off

Contrary to fixed wings, the VTOL WingtraOne takes off automatically and at a safe distance from the drone operator. This means that there are no more "hand throwings," and no more being close to rotors and risking a painful cut.

Besides, vertical take-off allows for much better obstacle avoidance. During a hand or a catapult launch, there is always a risk of misjudging the distance to trees, buildings or mountains. With VTOL, such risks disappear. WingtraOne soars straight to the sky with no barriers in its way.

Forward flight and hover modes

WingtraOne switches to a forward flight mode by tilting 90° in the air. After entering the plane-like flying mode, WingtraOne flies at an airspeed of 16 m/s (35.8 mph) as efficiently as a fixed-wing aircraft.

No piloting skills are needed to fly the WingtraOne drone—missions are fully autonomous and operated by an advanced autopilot. However, there is always a possibility to take over and fly the WingtraOne manually, both in hover and cruise modes.

In the hover mode, the drone operator can navigate WingtraOne in all possible directions. This functionality is especially useful to adjust landing in moving/changing environments like boats or recently-parked cars.

Vertical landing

The VTOL WingtraOne lands smoothly without the threat of damaging high-end sensors and the expensive drone itself on the contrary. A fixed-wing drone basically performs controlled crash landings while "falling" on its belly. This causes great threat to the drone, its camera and the environment. Such landings also lead to frequent damages, and lots of reliability issues are caused by continuous shocks.

Moreover, belly landings are impossible in many environments. Rough and gravel terrain, limited spaces or bushy fields pose a great risk: not just of damage but of complete breakage of the fixed wing drone or the camera it is carrying.

The VTOL WingtraOne can land safely on gravel, between the bushes, in forest aisles or wherever needed, without any risk to the expensive equipment.

VTOL advantages in short

+ Fully autonomous vertical take-off
+ Safe for the operator
+ Obstacle avoidance during take-off and landing
+ Take-off and landing in confined areas
+ Increased equipment lifetime and reliability
+ Hover mode for special situations
+ Safeguarding of the cameras
+ Smooth landing on a rough terrain
+ Ability to adapt to moving environment

Map Info

GSD	1 cm/px (0.4 in/px)
Absolute accuracy	1.3 cm (0.5 in)
Coverage	130 ha (320 ac)

THE ALL-IN-ONE WINGTRAONE DRONE

With a GSD of
1 cm/px (0.4 in/
px) you can clearly
identify and locate
tiny objects that are
as small as a coin.

In this particular example from Switzerland, the WingtraOne drone surveyed a quarry the size of 130 ha (320 ac) in less than an hour's flight. The final map had 1.3 cm (0.5 in) absolute accuracy and a GSD of 1 cm/px (0.4 in/px).

All in One: large coverage, high resolution and accuracy

Imagine a coin lying on the grounds of a quarry the size of 240 American football fields.

WingtraOne can map this quarry in an hour's flight. The resolution of the final map allows you to zoom in and see this very coin lying on the ground. And what is best is that it's possible to know the exact coordinates of the coin down to an absolute accuracy of 1 cm (0.4 in).

With such unprecedented functionality, WingtraOne PPK can offer something that has never been seen before—broad coverage, brilliant resolution and ultra-high accuracy—all in one mapping device.

# Reaching 1 cm (0.4 in) absolute accuracy

Latest tests in the USA and Switzerland prove that the VTOL WingtraOne drone repeatedly reaches best-in-class 1 cm (0.4 in) absolute accuracy. This is approximately 3x higher accuracy than what other fixed-wing drones can achieve.

## 3x higher absolute accuracy with WingtraOne

0.7 CM (0.3 IN) ACCURACY	1 CM (0.4 IN) ACCURACY	3 CM (1.2 IN) ACCURACY
BEST ACCURACY MEASURED	ACCURACY IN OPTIMAL CONDITIONS	ACCURACY IN OPTIMAL CONDITIONS
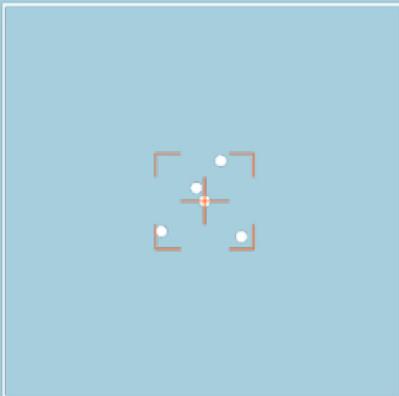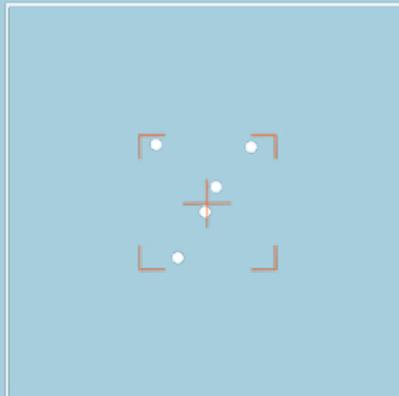
DRONE
WingtraOne PPK
CAMERA
Sony RX1RII

DRONE
WingtraOne PPK
CAMERA
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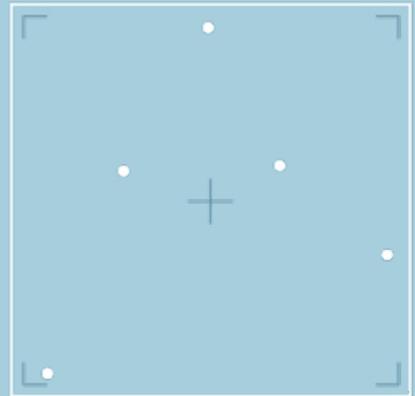
DRONE
Other fixed wing drones
CAMERA
some 20 MP camera

(i)

To access raw data of the accuracy tests please directly download it from an open drive folder here:
https://goo.gl/1EVdMW

SWIPOS station

In order to verify 1 cm (0.4 in) accuracy, Wingtra partnered with RDO Integrated Controls, one of the largest Topcon dealers and the largest Wingtra distributor in the US. In Switzerland, Wingtra worked with ETH Zurich, one of the top science universities in the world (Top universities, 2018).

Why VTOL equals better accuracy?

As a vertical takeoff and landing drone, WingtraOne takes off and lands smooth even on gravel. It does not perform dangerous belly landings as other fixed-wing drones. That enables WingtraOne to carry heavier thus more powerful cameras and ensures not only the safety of the drone and its operator but also of the onboard camera.

The WingtraOne's flagship 42 MP Sony RX1RII camera takes high-resolution images where the number of total pixels is more than double than with a usual 20 MP camera.

High density of pixels greatly affects the accuracy as during the post processing, the coordinates are defined for each pixel on the map. The more pixels there are, the more accurate the final map or 3D model is.

In addition to that, the Wing-traOne PPK drone has a built-in PPK GNSS antenna from Septen-trio. It ensures best-in-class image geotag correction after the flight with only 3 GCPs needed to verify the accuracy of the project.

To learn more about how to achieve 1 cm (0.4 in) drone survey accuracy, visit our blog.

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Key facts with WingtraOne PPK and Sony RX1RII

+ Down to 1 cm (0.4 in) absolute accuracy
+ No further orthomosaic correction required
+ 5 min pre-flight setup
+ 3 GCPs needed to verify the accuracy

Cover 400 ha (~1000 ac) in an hour's flight

With the WingtraOne, it is finally possible to accept mapping projects you had to decline in the past. Vast forest areas, mountain ranges and even the biggest mines in the world can be mapped in a few flights in just a few hours of time.

In one flight* WingtraOne can map 400 ha (1000 ac), which is almost three times more than what any fixed-wing drone can do and 40 times more (!) the average multicopter. This makes WingtraOne literally the only drone that can perform exceptionally large projects, that were once only possible with manned aircrafts.

* With a GSD of 3 cm/px (1.2 in/px)

MWH Geo-Surveys Ltd. are using WingtraOne for a gold exploration project in the north of Finland. So far, they have surveyed an area bigger than 750 km^2 (190 000 ac) and have already gathered around 500 000 images.

Coverage: WingtraOne vs. other drones

= 20 ha (50 ac)

WingtraOne
400 ha (1000 ac)
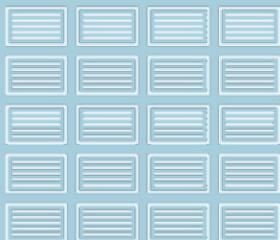
Other fixed wing drones
140 ha (346 ac)

Multicopters
15 ha (37 ac)

3 cm/px (1.2 in/px) GSD

3 cm/px (1.2 in/px) GSD

3 cm/px (1.2 in/px) GSD

Map Info

Coverage	1000 ha (2500 ac)
GSD	5 cm/px (2 in/px)
Mapping time	2.5 hours

1 cm/px (0.4 in/px) GSD means more reliable map reconstruction

Both accuracy and ground sampling distance (GSD) of the map highly depend on the resolution of the pictures the drone collects. The better the resolution, the more pixels are in the image. That leads to better GSD and higher accuracy.

Other 20 MP camera

Sony RX1RII 42 MP camera (with a WingtraOne drone)

What is GSD?

The Ground Sampling Distance (GSD) is the distance between two consecutive pixel centers measured on the ground. The bigger the value of the image GSD, the lower the spatial resolution of the image and the less visible the details. The GSD is related to the flight height: the higher the altitude of the flight, the bigger the GSD value (Pix4D, 2018).

WingtraOne has a high payload capacity and carries a wide range of high-end cameras. In addition, smooth vertical landings eliminate the risk of damaging the expensive cameras even in rough and complicated environments.

The flagship camera of WingtraOne is a Sony RX1RII. This 42 MP full-frame camera takes high resolution pictures, which are incredibly detailed. Such pictures allow much more reliable reconstruction of orthomosaic maps and 3D models. It works especially well with grass fields, sand, forests or similar homogeneous patterns. When using a drone with a lower resolution sensor, it happens very often that map generation fails.

The high resolution that the Sony RX1RII camera ensures means more pixels in the images. During the post processing, the coordinates are defined for each pixel in the map. Thus the more pixels there are, the more accurate the final map. E.g., if you fly with a GSD of 3 cm/px (1.2 in/px), this is also the best possible accuracy. In contrast, the WingtraOne drone and the Sony RX1RII offer 1 cm/px (0.4 in/px) and lower GSDs in optimal conditions. This allows absolute accuracy down to 1 cm (0.4 in).

Modular WingtraOne payloads: RGB and specialty cameras

The WingtraOne can be equipped with a range of cameras and lenses for diverse aerial surveying applications. The payloads are easy to swap, so one drone can be used for different use cases.

Sony RX1RII—the highest quality payload for 1 cm (0.4 in) accuracy and 1 cm/px (0.4 in/px) GSDs

Sony QX1—professional payload for surveying

Sony QX1 15 mm (0.6 in)— a high quality lens for 3D reconstruction

Technical specification	40 MP Full-frame sensor 35 mm (1.4 in) lens	20 MP APS-C sensor 20 mm (0.8 in) lens	20 MP APS-C sensor Voigtlander lens 15 mm (0.6 in) lens

MicaSense RedEdge-M—multispectral payload for precision farming, forestry and environmental research

FLIR Duo Pro—payload for thermal mapping and monitoring

Technical specification	5.5 mm (0.22 in) lens 5 individual custom sensors multispectral	FLIR Duo Pro R 640/13 mm thermal (7.5–13.5 μm) and visible spectrum

What are the use cases?

A wide range of WingtraOne applications

© GeoplanTeam
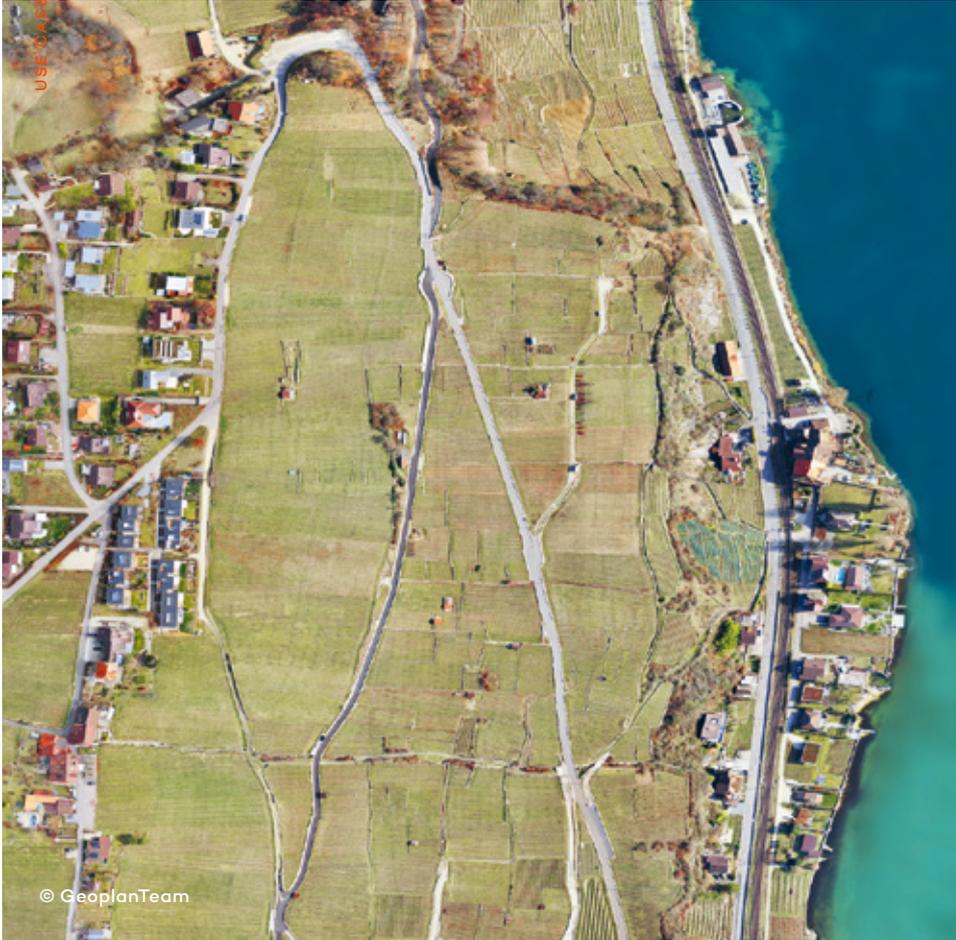
Orthomosaic maps

2D orthomosaic maps contain the location (exact X, Y coordinates) and color information of each point in the map. These maps can be used for linear (distance) and surface calculations and, alteration monitoring.

Wingtra's customer Geoplan Team have used orthomosaic maps to maintain and organize the merger of vineyards in Western Switzerland.

"The vertical take-off and landing capability as well as the good airspeed were ideal for efficiently completing this task on the steep northern shore of Lake Biel."

Lukas Hurni, GeoplanTeam, Switzerland

© Strydom & Associates

"The main advantage with the WingtraOne was the high-quality images from the camera. The Sony RX1RII camera with 35 mm lens makes it possible to cover the area efficiently at a high altitude."

Herman Strydom, Strydom & Associates, Namibia

3D reconstruction

Collected 3D data can be turned into 3D models, point clouds, digital surface and terrain models, elevation maps, photorealistic reconstructions and more. These outcomes are used to calculate volume, distance, surface area and elevation, as well as to depict typography and create photo-realistic models.

Strydom & Associates used WingtraOne to collect aerial imagery over the largest Uranium mine in Africa. They created 3D models, digital elevation and topo-graphical maps in order to monitor the processes in the mine and perform volumetric calculations.

© Pix4D
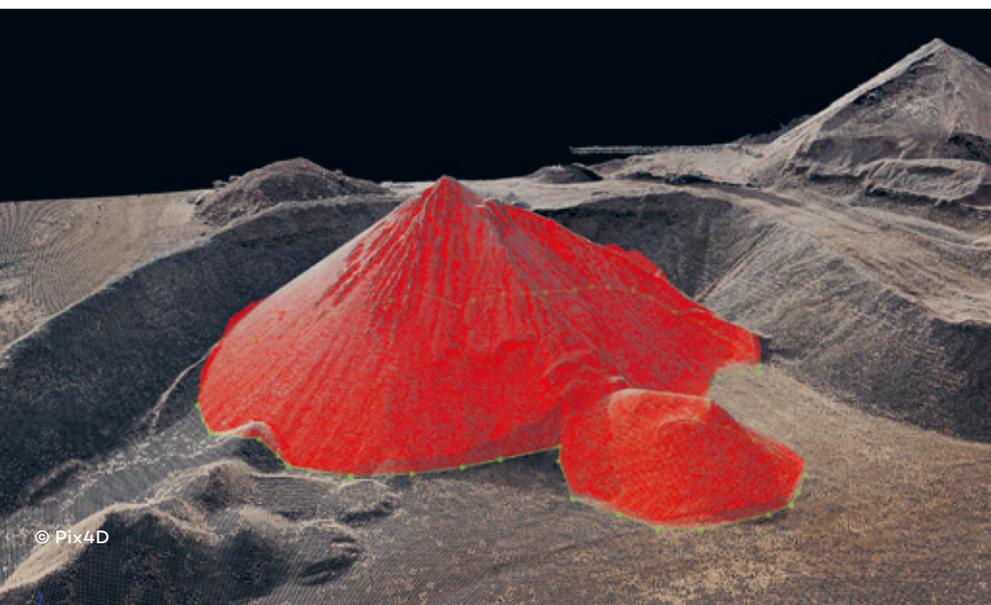
© Murdoch University

"Without Wingtra's ability to land in confined areas, we wouldn't have been able to execute our research. We operated the drone from a boat."

Amanda Hodgson, Murdoch University, Australia

Single Images

Single aerial images collected by the WingtraOne are used in various research areas. Combined with machine learning algorithms, these images can transport massive amounts of information.

A marine research group from Murdoch University is using WingtraOne to collect single images over a vast region in the ocean. This information is used to monitor Dugongs, as vulnerable sea mammals, and ensure better protection of the threatened species.

"We chose WingtraOne because of its versatility: the ability to take off and land accurately on a small piece of land without damaging the camera; switch payloads, and map big fields in windy weather conditions."

Romain Cruse , CARIGE, Martinique

Multispectral imagery

With a RedEdge-M camera that WingtraOne carries, it is possible to collect multispectral data and turn it into chlorophyll maps, NDVI layers, digital surface models or RGB images. These outcomes can be used for monitoring plant health and vigor, as well as evaluating surface properties, water flow and much more.

In Martinique, Wingtra's customers at CARIGE use multispectral imagery to produce chlorophyll maps of sugarcane farms. The data helps them to identify unhealthy plants and ensure better crop quality.

© MicaSense
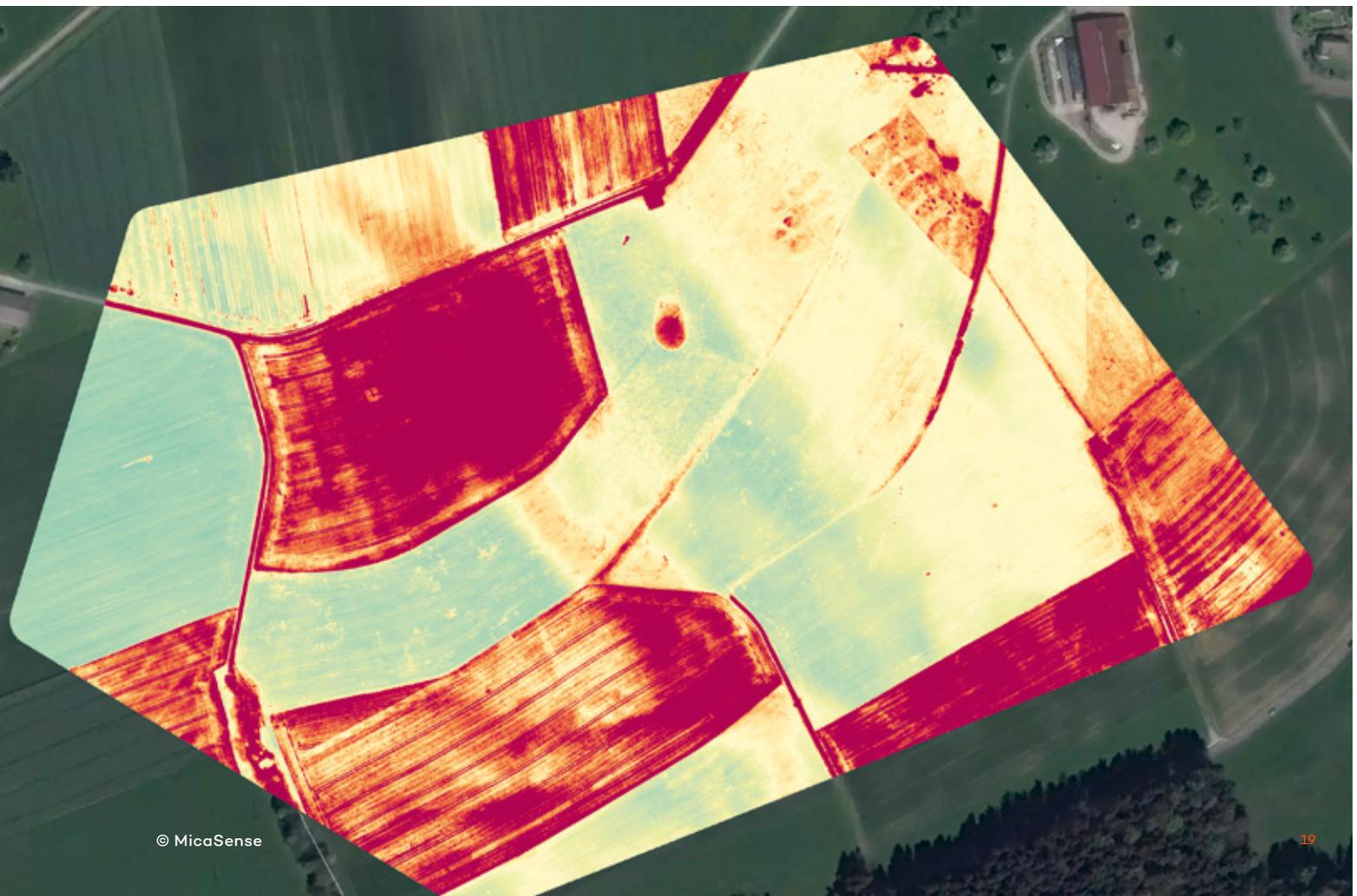
Where to buy?

WingtraOne is available through a global distribution network

At Wingtra, we work with the best partners around the world to offer advanced products and wide-ranging services to WingtraOne owners. We are constantly looking for partners that help us thrive in product and service quality. To locate the Wingtra distributor closest to you, visit www.wingtra.com

BILL EDMONSON
LEAD MAPPING PRODUCT SPECIALIST
RDO, UNITED STATES

"Our unique portfolio of commercial UAV's is complete with Wingtra as our fixed-wing mapping solution. The decision to carry this system is based on flexibility and outstanding data deliverables. VTOL expands useability as it opens up a variety of opportunities that were impossible with our previous large acreage mapping offering."

VELJKO FUSTIC
CEO
VEKOM GEO, SERBIA

"We are glad that we can finally offer a solution that's able to map large areas with high accuracy. Integration of the VTOL concept in fixed-wing UAVs is something revolutionary in the field of aerial data acquisition. A partnership with Wingtra is important for us, because it will bring to our customers a reliable system which will help them to make better decisions in the fields of mapping, agriculture, forestry and mining."

ROBERT KENNEDY
DIRECTOR
CR KENNEDY, AUSTRALIA

"For CR Kennedy, the Wingtra organization and the WingtraOne product range are perfect partners. In choosing our products and partners, certain things are very important to us. This includes a unique and high-end product that genuinely brings something new and exciting to our customers, and one that allows our customers to operate with the highest degree of reliability and professionalism."

MARIO CASTRO
CEO
TTQ DE MONTERREY, MEXICO

"WingtraOne and especially the newly launched high-precision PPK drone is a great fit to our high-demand portfolio covering mining, agriculture, construction and surveying equipment. The combination of VTOL and PPK technologies make WingtraOne finally fill the gap between multirotor and fixed-wing drones."