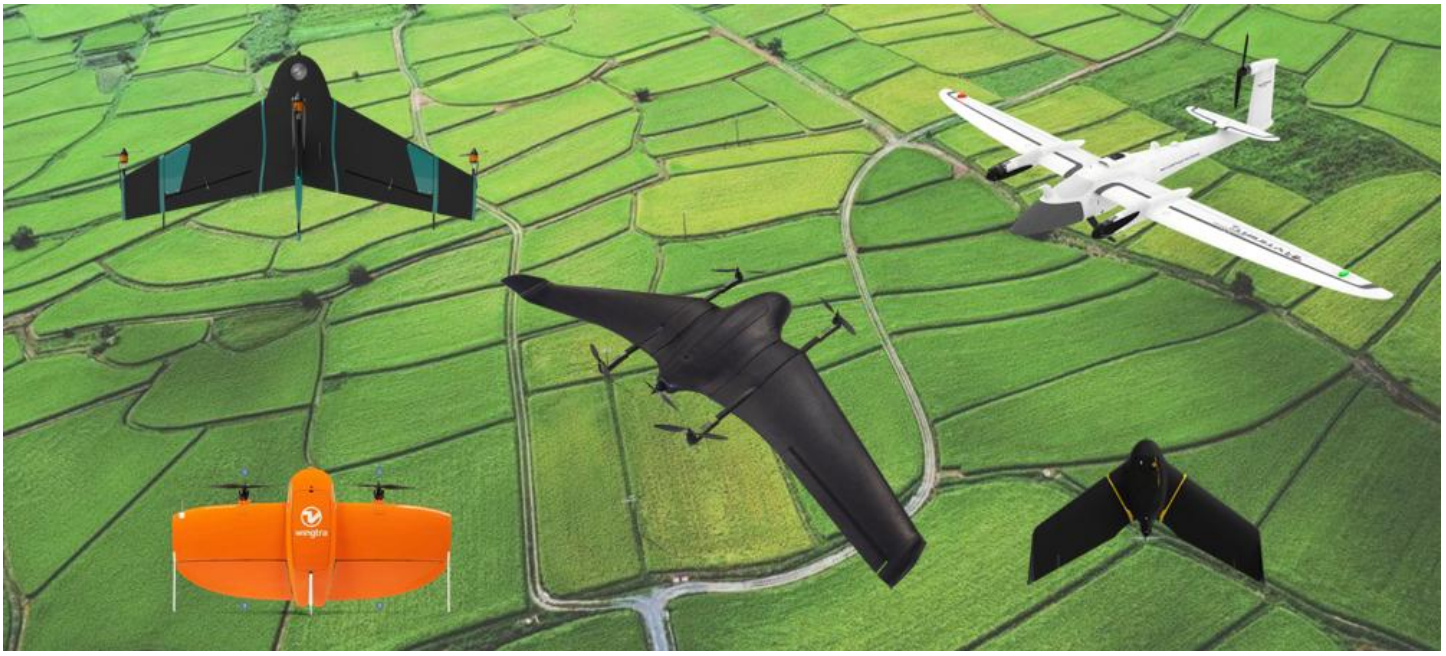
An In-depth Comparison Of Mapping Drones



When acquiring a mapping or surveying drone, the choice is quickly narrowed to a fixed-wing airplane combined with Vertical Takeoff and Landing (VTOL) for its vastly greater range, versatility and ease of use. Within this segment, there are several commercial-grade solutions of European origin. But comparing their capabilities and limitations can be difficult.

The following comparison was made to provide a detailed insight into the characteristics of the leading suppliers in this field. The data has been verified across multiple sources. Several aspects have been calculated to provide a consistent representation of the data. The calculation methods and sources are provided at the bottom of this article.

The platforms chosen for this comparison are:

- The DeltaQuad Pro #MAP by Vertical Technologies
- The WingtraOne by Wingtra
- The Trinity F90+ by Quantum Systems
- The Marlyn by AtmosUAV
- The eBee X by SenseFly

In the first section, you will find a quick overview of the most critical aspects relevant to any mapping or surveying solution. After that, you will find a full list comparing every known and relevant specification. Finally, the analysis includes a list of sources and references so that you may verify the objectivity of this comparison.

Key Features

A quick rundown of the most critical aspects that are relevant to mapping.

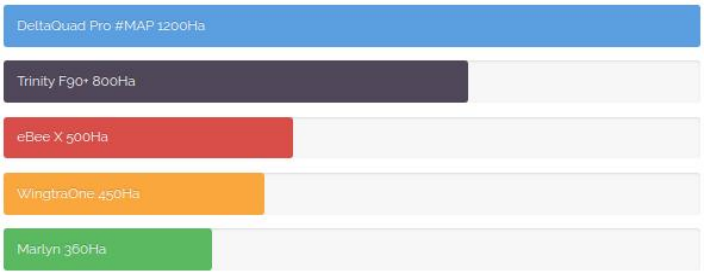
	DELTAQUAD PRO #MAP	WINGTRAONE	TRINITY F90+	MARLYN	EBEE X
Max. Flight Time	110 minutes	59 minutes	90 minutes	50 minutes	60/90 minutes
Coverage At 3CM/PX	1200 hectares	450 hectares	800 hectares	360 hectares	220/500 hectares
Max Control Range	50 KM & Unlimited	10 KM	7 KM	20 KM	8 KM
Maximum Resolution Megapixel	61 MP	42 MP	42 MP	42 MP	24 MP
Live Video	✓	X	X	X	X
Swappable Payloads	✓	✓	✓	X	✓
Comparative Package Price	€ 19.593	€ 29.600	€ 21.990	€ 29.450	€ 22.550

- ★ *Max flight time is calculated at sea level with camera payload.*
- ★ *The coverage is calculated by multiplying the maximum flight distance by the maximum camera resolution. It is based on 3CM per pixel with an overlap of 50%.*
- ★ *To compare pricing a package was selected for each model that most closely resembles: 42MP camera, <1CM PPK, 2 Batteries, Standard radio, GCS (if available).*

Maximum surveying area in Hectares

The maximum area that can be mapped in a single flight is determined by several factors such as camera resolution, cruise speed, endurance, and lens options.

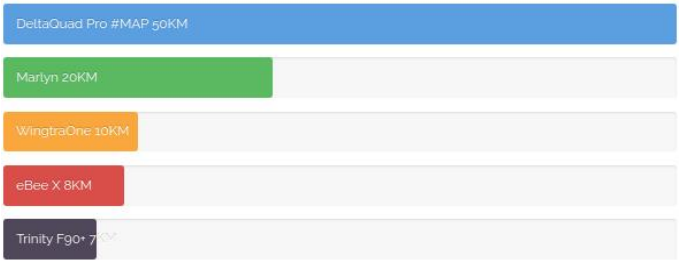
This comparison is based on the highest resolution offered for each platform, combined with the maximum flight distance. The values have been calculated based on 3cm per pixel resolution and a 50% image overlap. The values have then been compensated to account for the camera's minimum trigger interval.



Maximum telemetry range

The maximum range at which the UAV can be controlled. Long-range communications is important for corridor-type surveys such as power lines, pipelines, railways, and roads.

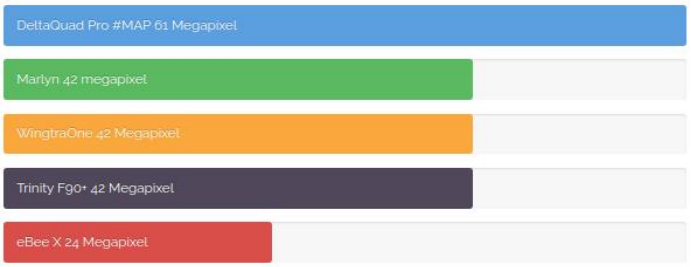
The indicated ranges are the maximum radio range as specified by the supplier. Nominal ranges can be lower.



Maximum image resolution

The maximum image resolution in Megapixels is the total number of pixels that make up a single image. This can be an important factor for a fixed-wing/VTOL UAV.

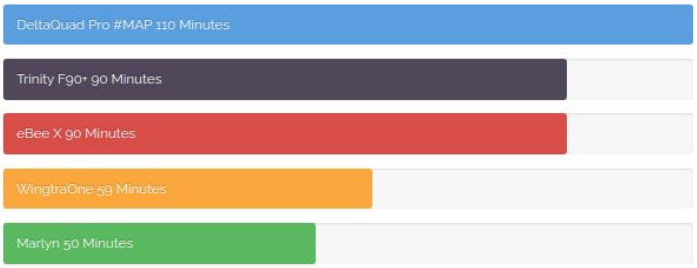
A higher resolution allows:
– Covering larger areas
– Flying at higher altitudes
– Producing higher resolution end results
– Better post-processing performance with more accuracy



Maximum flight time

The maximum flight time for fixed-wing UAV depends on the altitude above sea level. As the altitude increases, the UAVs need to fly faster due to a lower air density. However, the lower air density also provides less drag, therefore in most cases the maximum flight distance remains the same at all altitudes.

The indicated maximum flight times are at sea level while carrying a regular camera payload.



In-depth comparison

In this section, all aspects of the selected platforms are compared. Most aspects are based on the published specifications by the manufacturers. Some aspects were derived or calculated. At the bottom of this article you will find an explanation of the calculation methods.

Platform Specifications

	DELTAQUAD PRO #MAP	WINGTRAONE	TRINITY F90+	MARLYN	EBEE X
Country Of Origin	The Netherlands	Switzerland	Germany	The Netherlands	Switzerland
Platform Type	Redundant Vtol	Vtol Tailsitter	Vtol Tiltrotor	Vtol Tailsitter	Fixed-wing
Cruise Speed	16m/S	16m/S	17m/S	14m/S	11m/S
Max. Flight Time	110 Minutes	59 Minutes	90 Minutes	50 Minutes	60/90 Minutes
Max. Flight Distance (Cruise * Time - 10%)	100km	50km	90km	40km	55km
Payload Capacity	1200g	800g	700g	800g	800g
Radio Range	20km/30km/50km LTE (Unlimited)	10km	7km	7km/20km	8km
Live Mapping Video	✓	X	X	X	X
Zero Pre-flight Calibrations	✓	X	X	X	✓
4G/LTE Support	✓	X	X	X	X
FPV Video Support	✓	X	X	X	X
Swappable Payloads	✓	✓	✓	X	✓
Supported Cameras	61MP Sony A7R-IV 42MP Sony A7R-III 42MP Sony RX1R-II 24MP Sony A6000 Micasense Rededge Mx Micasense Altum Flir Duo Pro R	20MP Sony QX1 42MP Sony RX1R II Micasense Rededge-mx Micasense Altum	20MP Sony UMC 42MP Sony RX1R II Micasense Rededge-mx Micasense Altum	42MP Sony RX1RII 42MP A7C Micasense Rededge-mx Micasense Altum	24MP AREAX 20MP SODA Parrot Sequoia Micasense Rededge Mx

Mapping Performance

	DELTAQUAD PRO #MAP	WINGTRAONE	TRINITY F90+	MARLYN	EBEE X
Maximum Image Resolution	61 Megapixel	42 Megapixel	42 Megapixel	42 Megapixel	24 Megapixel
Coverage At 3CM/PX	1200 Ha	450 Ha	800 Ha	360 Ha	220ha/500 Ha
Maximum Corridor Length	50 Km	5 Km	7 Km	20 Km	8 Km
Lowest GSD	0.4 CM/PX	0.7 CM/PX	0.7 CM/PX	0,85 CM/PX	1.0 CM/PX

RTK/PPK Setup

	DELTAQUAD PRO #MAP	WINGTRAONE	TRINITY F90+	MARLYN	EBEE X
GPS Band	L1 & L2	L1 & L2	L1	L1 & L2	L1
Precision	<1cm	<1cm	>3cm	<1cm	>3cm
Base Station Available	✓	X	✓	X	✓

Software Features

	DELTAQUAD PRO #MAP	WINGTRAONE	TRINITY F90+	MARLYN	EBEE X
Smart Mission Planning	✓	✓	✓	✓	✓

Smart Mission Plan Validation	✓	X	X	X	X
Flight Simulator	✓	X	X	X	✓
Terrain Following	✓	✓	✓	X	✓
Automated Takeoff & Land	✓	✓	X	✓	X

Safety Features

	DELTAQUAD PRO #MAP	WINGTRAONE	TRINITY F90+	MARLYN	EBEE X
Redundant Flight System	✓	X	X	X	X
ADS-B	✓	✓	✓	X	✓
Live Nose Camera (FPV)	✓	X	X	X	X

Tolerances

	DELTAQUAD PRO #MAP	WINGTRAONE	TRINITY F90+	MARLYN	EBEE X
Maximum Wind	45 Km/H	40 Km/H	43 Km/H	45km/H	35 Km/H
Max. Takeoff & Landing Wind	33 Km/H	30 Km/H	33 Km/H (25km/H above 1500m)	45km/H (Unverified)	35km/H
Max. Takeoff Altitude	4000m	2500m	4000m	4000m	5000m
Temperature Range	-20 To +45 C	-10 To +40 C	-12 To +50 C	-10 To +40 C	-15 To + 40c

Handling

	DELTAQUAD PRO #MAP	WINGTRAONE	TRINITY F90+	MARLYN	EBEE X
Setup Time	1 Minute	5 Minutes	7 Minutes	5 Minutes	10 Minutes
Control Type	Integrated Touch-screen Controller with Mission Planning, Live video, and Manual Control Joysticks	Analog Controller	Analog Controller	Analog Controller	Analog Controller
Ground Control Station Options	Integrated Controller Tablet Field Laptop Command Center Integration	Tablet	Not Included A Laptop Is Required To Operate	Not Included A Laptop Is Required To Operate	Not Included A Laptop Is Required To Operate
Autonomy	Full Mapping Takeoff Landing	Full Mapping Takeoff Landing	Semi Mapping Takeoff	Full Mapping Takeoff Landing	Semi Mapping
Manual Override	Assisted Manual Control In Fixed Wing And Hover Flight	Manual Control In Fixed Wing And Hover Flight	Manual Control In Hover Flight Only	Manual Control In Fixed Wing And Hover Flight	Manual Control In Fixed Wing Only
Takeoff Weight	6.2 Kg	4.5 Kg	5.0kg	6.7kg	1.6kg
Wing Span	235 Cm	125 Cm	239cm	160cm	116cm
Transport case	Rugged Flightcase	Backpack	Soft Case	Soft Case Rugged optional	Soft Case

Costs Comparison

Pricing for the most resembling packages

	DELTAQUAD PRO #MAP	WINGTRAONE	TRINITY F90+	MARLYN	EBEE X
Package Contents	UAV 2 Batteries 1cm PPK 42mp RX1RII 20km Radio Link Tablet	UAV 2 Batteries 1cm PPK 42mp RX1RII 10km Radio Link Tablet	UAV 2 Batteries 3cm PPK 42mp RX1RII 7km Radio Link	UAV 2 Batteries 1cm PPK 42mp RX1RII 7km Radio Link	UAV 2 Batteries 3cm PPK 24mp Areax 8km Radio Link

Comparative Package Price	€ 19.593,00	€ 29.600,00	€ 21.990,00	€ 29.450,00	€ 22.550,00

Options & Pricing

	DELTAQUAD PRO #MAP	WINGTRAONE	TRINITY F90+	MARLYN	EBEE X
Platform Price	€ 9.999,00	€ 15.755,89	€ 15.900,00	€ 16.950,00	€ 14.000,00 (90KM)
Battery	€ 499,00	€ 420,00	€ 640,00	unknown	€ 400
PPK 3cm	€ 899,00	not available	included	not available	€ 4.950
PPK 1cm	€ 1.299,00	included	not available	+- € 7.500	not available
PPK Base Station	€ 2.600,00	not available	not available	not available	€ 5.350
Transmission System	20KM+Tablet: € 1.299 30KM + integrated controller: € 3.499 50KM + integrated controller: € 5.499	10KM+Tablet: included	7KM: included	7KM: included 20KM: unknown	7KM: included
Live Mapping and FPV Video	Included with integrated controller option	not available	not available	not available	not available
4G/LTE Control and Video	Included with integrated controller option	not available	not available	not available	not available
61mp Sensor (Sony A7R4)	€ 6.699,00	not available	not available	not available	not available
42mp Sensor (Sony RX1RII)	€ 5.299,00	€ 6.500,00	€ 5.450,00	+- € 7.000	not available
20mp/24mp Sensor	€ 1.299,00	€ 2.100,00	€ 2.290,00	not available	€ 3.600
Micasense Rededge MX With DLS & Calibration Panel	€ 7.299,00	€ 5.900 (without DLS)	€ 6.890,00	+- € 8.000	+- € 8.000
Micasense Altum With DLS & Calibration Panel	€ 12.999,00	€ 12.100,00 (without DLS)	€ 12.750,00	+- € 13.000	not available
Flir Duo Pro R	€ 7.900,00	not available	not available	not available	not available
Lidar + Software	not available	not available	€ 60.100,00	not available	not available

SOURCES

	DELTAQUAD PRO #MAP	WINGTRAONE	TRINITY F90+	MARLYN	EBEE X
Pricing	DeltaQuad configurator	Wingtra Configurator	Price list	Quotation Reseller	Reseller
Specifications	DeltaQuad specifications	Wingtra specifications	User manual	Spec list GeoMatching	SenseFly specs

Calculation methods

Maximum flight time

The maximum flight time is based on flying at sea level. The DeltaQuad, Wingtraone and eBee X indicated their flight time is based on carrying the standard mapping payload. The Trinity F90+ and Marlyn did not specify this.

Maximum flight distance

The maximum flight distance is calculated by multiplying the cruise speed by the max flight time, and reducing the value by 10% to accomodate for takeoff and landing. The calculation was done this way as not all manufacturers use the same method for specifying the maximum flight distance.

Maximum surveying Area

This comparison is based on the highest resolution offered for each platform, combined with the maximum flight distance. The values have been calculated based on 3cm per pixel resolution and a 50% image overlap. The values have then been compensated to account for the camera’s minimum trigger interval.

Setup time

Assembly and pre-flight calibration time was either specified and/or determined by watching operation videos for different platforms.

Maximum wind

The maximum wind was calculated based on the supplier specification. It was then limited by cruise speed, and reduced with 5 meters per second to allow sufficient forward flight for mapping.

This value should be based on sea level as wind tolerance increases at higher altitudes. It seems that not all suppliers are listing these values at sea level.

Comparative package price

A price was requested for all platforms based on the Following specifications:

- 42MP camera
- 1CM PPK (if available)
- 2 Batteries
- Standard radio solution
- Ground Control Station (if available)

The Trinity F90+ and eBee X do not provide <1CM PPK
The Trinity F90+, Marlyn and eBee X do not provide a Ground Control Station
The Trinity F90+ comes with a 3CM PPK base station included

Disclaimer

The data in this comparison has been carefully verified across multiple sources, nevertheless inaccuracies can occur. Please verify all aspects with the platform suppliers. This article is for information purposes only, no rights can be derived from this data.