

How High-altitude Propellers Allow Mapping of Large Areas with High Accuracy



Wingtra is introducing high-altitude propellers which enable a professional mapping drone to capture data more than 2,500m (8200ft) above mean sea level (AMSL) with unprecedented accuracy and coverage. Customers in South America, China, Central Europe and other regions with high altitudes can now map high terrain at down to 1cm ground sample distance (GSD).

Specifically, the new high-altitude propellers and supporting software allow take-off at altitudes of up to 4,800m (15,700ft) AMSL and flight at altitudes of up to 5,000m (16,400ft) AMSL.

"It's a game-changer for our customers to fly and gather data on terrain that has so far been challenging to reach," said Maximilian Boosfeld, co-founder and CEO

of Wingtra.

While [WingtraOne](#) is priced as an inclusive bundle – with payload, software, base station and everything you need out of the box – these propellers are sold separately according to specific needs.

How does altitude affect flight, and how does VTOL overcome that?

As air becomes thinner at higher altitudes, the ability of standard propellers to generate enough thrust to lift an aircraft is compromised. Their shape must change to lift through these conditions. As it is a VTOL drone, WingtraOne relies on this upward lift only for the take-off and landing portion of its flight. The rest of its flight time, in cruise mode, is where its advantages become obvious.

High altitudes are often associated with tougher, rougher conditions and extreme challenges to performance. But in this case, the fixed-wing design of the WingtraOne enables it to fly faster while only slightly reducing the range. This is because [VTOL](#) allows it to carry heavier and higher-quality cameras, including the RX1R II payload.

"Down here, I can run a flight and it takes me 25 minutes to cover 200ha at 3cm GSD," Boosfeld said. "Up around 4000m (13,000ft), you can still cover that same 200ha in less time – 20 minutes. So it's safe to say that if you don't have a project of more than 200ha, you're actually flying and acquiring data up to 20% faster."



Testing site: WingtraOne UAV equipped with high-altitude propellers at an elevation of 4818m.

Multirotors and fixed-wings at high altitudes

To understand this unique offering in the new high-altitude propellers, it helps to look at multirotor and fixed-wing drones and how they perform in these conditions.

Specifically, the limited space multirotors can cover is even further compromised by the thin air of high altitudes. Some types of multirotors may offer special propellers to handle this. But no matter what, they will use more energy in thinner air to stay in flight. In this case, customers would not only experience very short flight times and limited coverage, but also a lot of setup and processing overheads to run multiple flights for even a relatively small area like 100ha.

As for fixed-wing drones, the terrain at altitudes above 3000 m (9840 ft) lacks grass and has few, if any, large, soft areas where they can

belly land. Even if there is somewhere for them to land, fixed-wings face limits on the quality of the payloads they can carry, so images may be compromised when the cruise flight speed picks up.

Details from mapping images and resulting [Pix4D](#)-generated point cloud near San Pedro de Atacama, Chile, at 4740m (15,500ft) AMSL, taken by WingtraOne flying at 4900m (16,000ft) AMSL with its Sony RX1R II payload and a GSD of 2.2cm/px.



Pix4D-generated point cloud based on UAV mapping near San Pedro de Atacama, Chile.

Guidance and safety

The new propellers are available for sale now as an accessory to any WingtraOne and are easy to distinguish by a ring system. A software update released in tandem with their first shipping date this month provides guidance and a safety feature. That is to say, any flight planned above 2500m (8200ft) will not take off unless the high-altitude propellers are attached. Normal WingtraOne propellers can then be replaced when flying below 2500m (8200 ft) as they enhance efficiency in lower altitudes. Flight times and battery state of charge will be monitored by new, sophisticated algorithms that also account for altitude.



WingtraPilot enables easy identification of which propeller is which.

<https://www.gim-international.com/content/article/how-high-altitude-propellers-allow-mapping-of-large-areas-with-high-accuracy>
