

Valdeira-1

PRELIMINARY TECHNICAL OVERVIEW



MISSION PROFILE / COMPONENTS

1 MISSION PROFILE

The reference mission is composed of three phases: payload delivery, payload drop-off, and return to the ground station. The actual range and flight speed values depend on the mass of the payload and weather conditions.

PARAMETER	PRELIMINARY VALUE	CONDITIONS / BASIS	STATUS
Control method	Remote controller	Manual landing	Design intent
Cruise speed	55 km/h	Horizontal speed, no-wind condition	Target
Cruise altitude	50 m	Operating height above sea level	Target
Landing area	3 m × 3 m concrete pad	Full footprint incl. propellers inside	Target
Control-link range	At least 2.5 km	Environment, margin and test method TBD	Target
Hover noise	≤ 50 dB(A) at 5 m	Vertically below UAV; test protocol TBD	Target
Weather	Dry-weather operation only	Day/night and operating-area limits TBD	Design intent
Maximum payload	5 kg	During first leg cruise	Target
Battery configuration	12S 33Ah	Fully charged battery	Design intent
Mission distance target	2 km	Dry weather only	Target
Max leg-time target	10 min	During delivery and return	Target

2 TECHNICAL SPECIFICATIONS

Preliminary engineering specification

2.1 The structures

PARAMETER	TARGET / DESIGN LIMIT	UNIT	STATUS
A · Vehicle structure			
Top-level constraints and structural layout.			
Minimum payload envelope	0.50 × 0.50 × 0.50	m	TARGET
Frame footprint excluding propellers	≤ 1.00 × 1.00	m	TARGET
Overall footprint including propeller sweep / wing	≤ 1.75 × 1.75	m	TARGET
Overall vehicle height	≤1.0	m	TARGET
Structural assembly mass	22	kg	ESTIMATION
B · Cargo box and payload retention			
Geometry, construction, attachment and protection of the 5 kg payload.			
Cargo box dimensions	0.50 x 0.50 x 0.50	m	TARGET
Cargo box maximum empty mass	2	kg	ESTIMATION
Cargo box material / grade	Aluminium	—	TO SELECT
Wall thickness	5	mm	TBD
C · Arms and landing gear			
Specify structural arms independently from propeller aerodynamic specifications.			
Number of rotor-support arms	4	—	TARGET
Arm length	485	mm	ESTIMATION
Sweep angle	0	deg	TBD
Arm diameter	45	mm	TBD
Arm material / grade	CFRP	—	TO SELECT
Mass of one arm	140	g	ESTIMATION
Number of landing supports / contact points	4	—	TARGET
Landing gear material / grade	CFRP	—	TO SELECT
Landing gear total mass	[TBD]	kg	TO CALCULATE
Landing gear overall height	700	mm	TBD

PARAMETER	TARGET / DESIGN LIMIT	UNIT	STATUS
D · Wing and aerodynamic load-bearing structure			
Complete only if the fixed-wing / hybrid concept is selected. Envelopes still apply.			
Overall deployed wing span	1.75	m	TARGET
Wing planform area	0.96	m ²	ESTIMATION
Aspect ratio	3.19	—	ESTIMATION
Taper ratio	1	—	ESTIMATION
Root chord	0.55	m	ESTIMATION
Sweep	0	deg	ESTIMATION
Root airfoil	NACA0012	—	ESTIMATION
Tip airfoil	NACA0012	—	ESTIMATION
Wing structural mass	1.2	kg	ESTIMATION

2.2 Battery

The selected battery is the Tattu 330Wh/kg 33000mAh 12S1P 44.4V 10C (SKU: TARBG3333K12S10X), as it fulfils all the requirements set for the power subsystem, when it comes to discharge and charge rate. It is also optimized for the highest mass-specific energy capacity. The following table presents all the most important properties of the battery, taken from the manufacturer datasheet.

Parameter	Value	Unit	Source
Energy capacity	1465.2	Wh	Manufacturer
Battery mass	4.7	kg	Manufacturer
Mass-specific energy capacity	314	Wh/kg	Manufacturer
Maximum constant discharge rate	1.5	C	Manufacturer
Peak discharge rate	10	C	Manufacturer
Gravimetric energy density	1.188–1.260	MJ/kg	Manufacturer
Nominal voltage	44.4	V	Manufacturer
Charge cutoff voltage	50.4	V	Manufacturer
Discharge cutoff voltage	30.0	V	Manufacturer
Discharge temperature range	-20~60	°C	Manufacturer
Internal resistance	≤15	mΩ	Manufacturer
Dimensions	212x91.5x117.2	mm	Manufacturer

2.3 Propulsion

PARAMETER	TARGET / DESIGN LIMIT	UNIT	STATUS
A · REQUIRED PERFORMANCE			
Specified at maximum take-off mass (MTOM) unless another condition is noted.			
Combined hover thrust at MTOM	≥ 235.4	N	CALCULATED TARGET
Required hover thrust per rotor	≥ 58.9	N	CALCULATED TARGET
Combined maximum static thrust	≥ 565.1	N	CALCULATED TARGET
Required maximum static thrust per rotor (two rotors only)	≥ 141.4	N	CALCULATED TARGET
Overall maximum thrust / weight ratio	2.4	—	TARGET
Hover rotor speed	1800	rpm	SUPPLIER-RATED
Rotor speed at maximum static thrust	2800	rpm	SUPPLIER-RATED
Maximum permitted continuous rotor speed	2800	rpm	TO BE VERIFIED
Hover shaft power per rotor	511	W	SUPPLIER-RATED
Maximum required shaft power per rotor	2269	W	SUPPLIER-RATED
Rotor acoustic contribution in hover at 5 m	<50	dB(A)	Target
B · PROPELLER GEOMETRY			
Document geometric dimensions for the propeller revision under evaluation.			
Number of lifting rotors, N	4	—	CONFIGURATION
Propeller outer diameter	711.2	mm	SUPPLIER-RATED
Geometric pitch at 75% radius	508	mm	SUPPLIER-RATED
Pitch-to-diameter ratio (P/D)	1.4	—	SUPPLIER-RATED
Blades per propeller	4	—	SUPPLIER-RATED