UESE AEROMOBILITY

UAC-01 | TECHNICAL RFQ KIT

Documentazione tecnica bilingue IT/EN per richiesta preventivi

Bilingual IT/EN technical package for supplier quotation

DESIGN BASELINE: configurazione approvata e congelata. Il presente kit definisce requisiti, interfacce, prove e deliverable per lo sviluppo di prototipi, senza autorizzare modifiche estetiche non approvate.

DESIGN BASELINE: approved and frozen configuration. This kit defines requirements, interfaces, tests and deliverables for prototype development without authorizing unapproved styling changes.

REV A - 22 September 2026 - RFQ / Concept Engineering

Stato del progetto e design freeze
Project status and design freeze

ITALIANO

Configurazione approvata. Il veicolo UAC-01 mantiene integralmente il principio e l’identità visiva approvati: piattaforma monoposto per conduzione in piedi, quattro pod di propulsione protetti, stelo frontale con display integrato, livrea graphite/anthracite con accenti electric blue e safety orange, marchio UESE in grigio 50% sul telaio e sul casco.

Freeze estetico. Il costruttore non può cambiare sagoma, numero dei pod, geometria visibile dello stelo, posizione del pilota, palette, branding o proporzioni senza una Engineering Change Request formalmente accettata da UESE.

Freeze funzionale. Restano obbligatori: controllo GPS, modalità manuale, assisted/autopilot, auto-livellamento, anti-roll/anti-tip, stabilizzazione anticaduta, hover hold, minima vibrazione, gestione fault e ritorno/atterraggio assistito.

ENGLISH

Approved configuration. UAC-01 retains the approved principle and visual identity: single standing rider platform, four protected propulsion pods, front stem with integrated display, graphite/anthracite finish with electric-blue and safety-orange accents, and 50% grey UESE branding on frame and helmet.

Styling freeze. The supplier may not change silhouette, number of pods, visible stem geometry, rider position, palette, branding or proportions without a formally approved UESE Engineering Change Request.

Functional freeze. Mandatory functions remain: GPS control, manual mode, assisted/autopilot modes, self-leveling, anti-roll/anti-tip, anti-fall stabilization, hover hold, low vibration, fault management and assisted return/landing.

Nota: i valori prestazionali del precedente concept board sono illustrativi. I target RFQ di questo documento prevalgono per la quotazione e devono essere validati dal costruttore.

ITALIANO

UAC-01 è impostato come dimostratore tecnologico VTOL elettrico monoposto con sviluppo progressivo e fortemente strumentato. L’obiettivo della richiesta di preventivo non è ottenere un velivolo “chiavi in mano” sulla base di un’immagine, ma selezionare un partner capace di completare sizing, CAD, analisi strutturali, propulsion engineering, power system, avionica, software di controllo, HIL, costruzione e campagna prove.

La quotazione deve essere separata in NRE, materiali/componenti, attrezzature, prototipi, software, test e documentazione. Ogni assunzione deve essere dichiarata; ogni impossibilità tecnica deve essere evidenziata con proposta di soluzione che preservi il design approvato.

ENGLISH

UAC-01 is defined as a single-person electric VTOL technology demonstrator developed through progressive, highly instrumented phases. The RFQ objective is not to obtain a turnkey aircraft from a picture, but to select a partner capable of completing sizing, CAD, structural substantiation, propulsion engineering, power system, avionics, flight-control software, HIL, prototype manufacturing and test campaign.

The quotation shall separate NRE, materials/components, tooling, prototypes, software, testing and documentation. All assumptions shall be stated; any technical infeasibility shall be raised together with a solution proposal that preserves the approved design.

Controllo documento e istruzioni RFQ

Document control and RFQ instructions

Field / Campo	Value / Valore
Project / Progetto	UESE Aeromobility Concept UAC-01
Document	Master Technical RFQ Kit - IT/EN
Revision	A - RFQ baseline
Date	22 September 2026
Owner	UESE ITALIA S.p.A. / UESE Aeromobility
Design status	Approved visual baseline / engineering pre-design
Use	Budgetary + technical supplier quotation
Not for	Manufacturing release, human flight approval, certification approval
Change control	Written UESE approval required for all external design changes

Missione, profilo d’uso e assunzioni
Mission, operating profile and assumptions

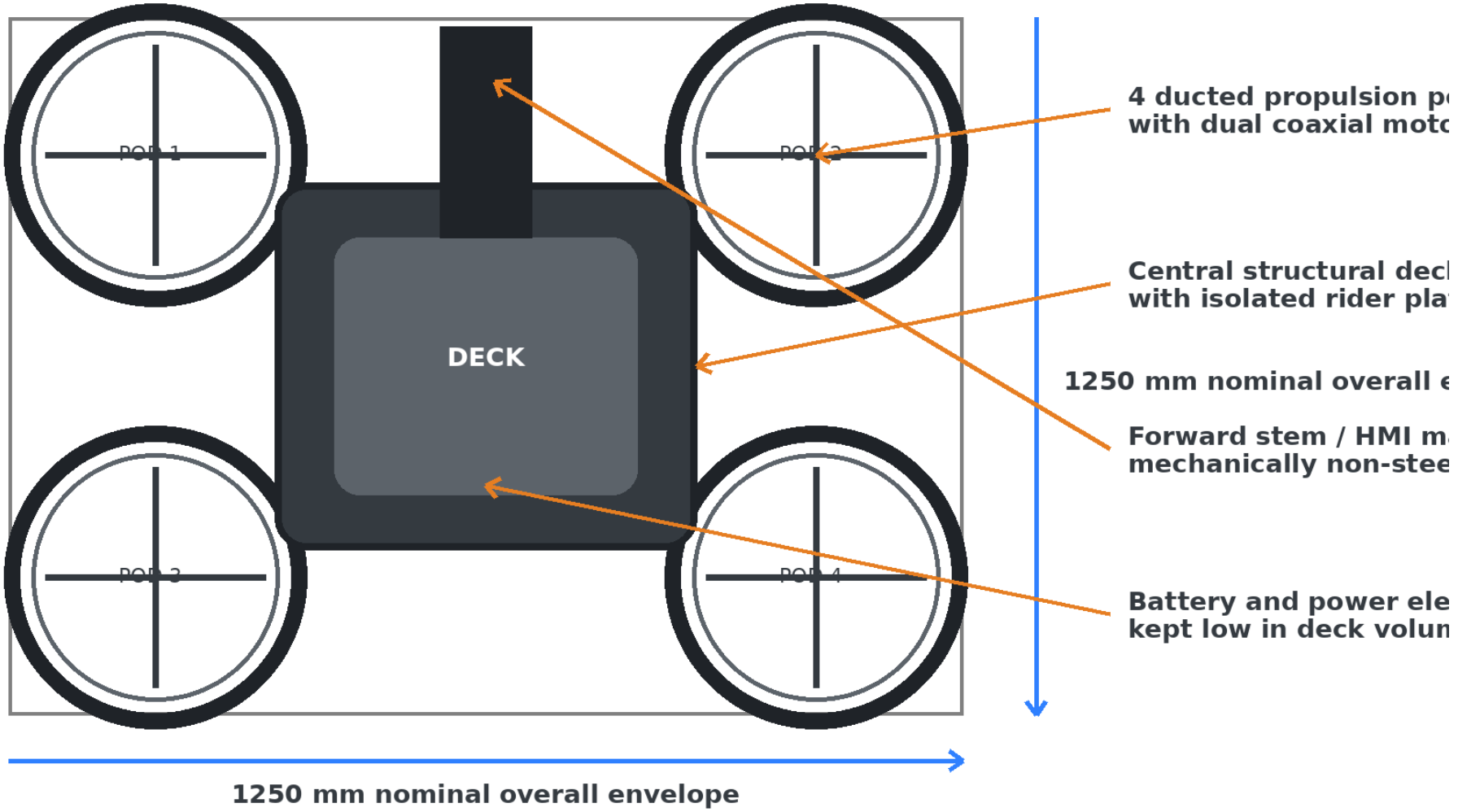
ITALIANO

• Dimostratore di mobilità aerea personale a decollo/atterraggio verticale.
• Conduzione in piedi con interfaccia manubrio/display; comandi fly-by-wire.
• Prima fase in area di prova privata e controllata, quota e velocità software-limitate.
• Non è assunto alcun impiego stradale o omologazione come veicolo terrestre.
• Primo obiettivo: stabilità, controllabilità, ridondanza e qualità vibrazionale; prestazioni massime vengono dopo.
• Piano di sviluppo: banco -> HIL -> tether -> unmanned/ballast -> eventuale manned test.

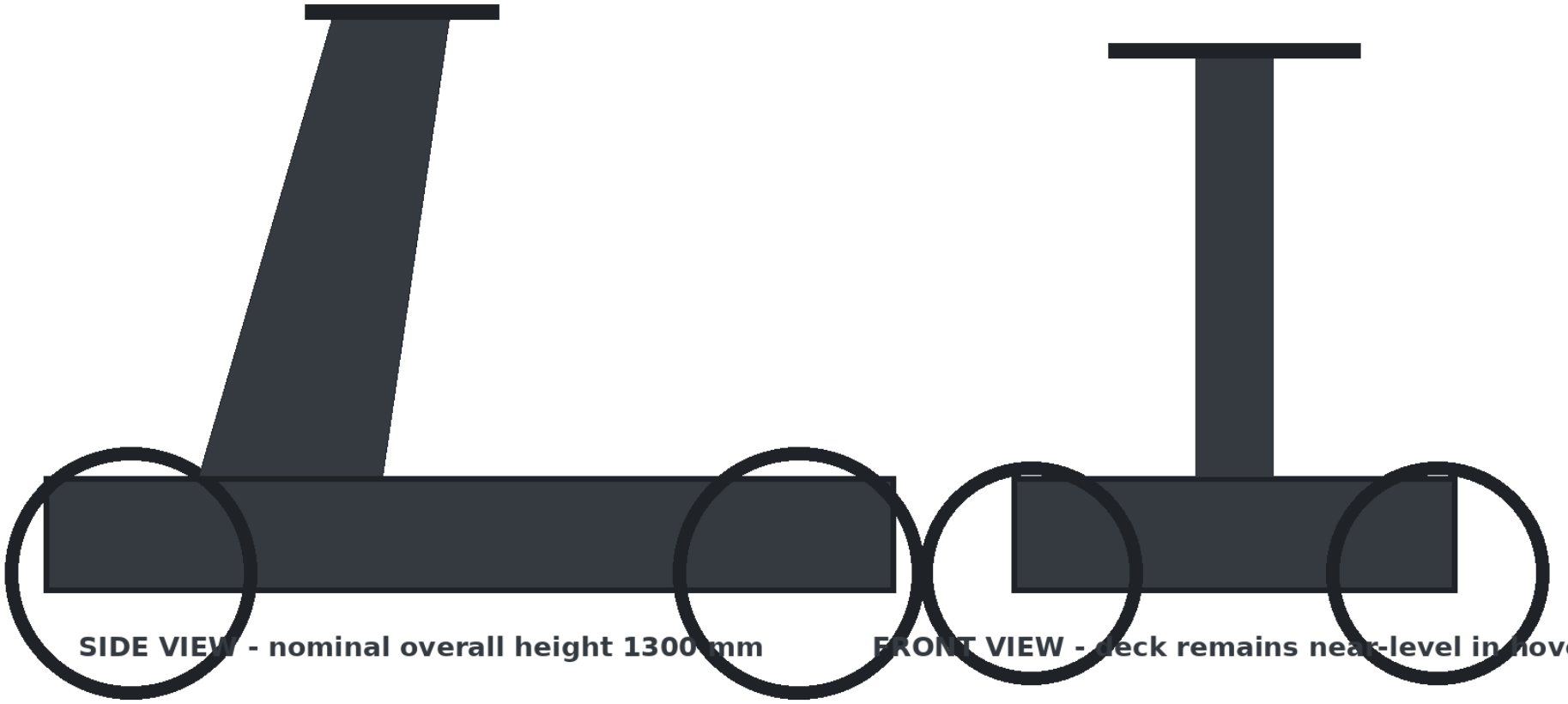
ENGLISH

• Personal air-mobility VTOL technology demonstrator.
• Standing rider with handlebar/display interface; fly-by-wire controls.
• First phase in private controlled test area with software-limited altitude and speed.
• No road-use homologation is assumed.
• First objective is stability, controllability, redundancy and vibration quality; maximum performance comes later.
• Development path: bench -> HIL -> tether -> unmanned/ballast -> possible manned test.

UAC-01 - GENERAL ARRANGEMENT / TOP VIEW



UAC-01 - GENERAL ARRANGEMENT / SIDE + FRONT



SIDE VIEW - nominal overall height 1300 mm

FRONT VIEW - deck remains near-level in hover

RFQ dimensions are nominal and must be confirmed by supplier 3D packaging. Exterior styling and visu

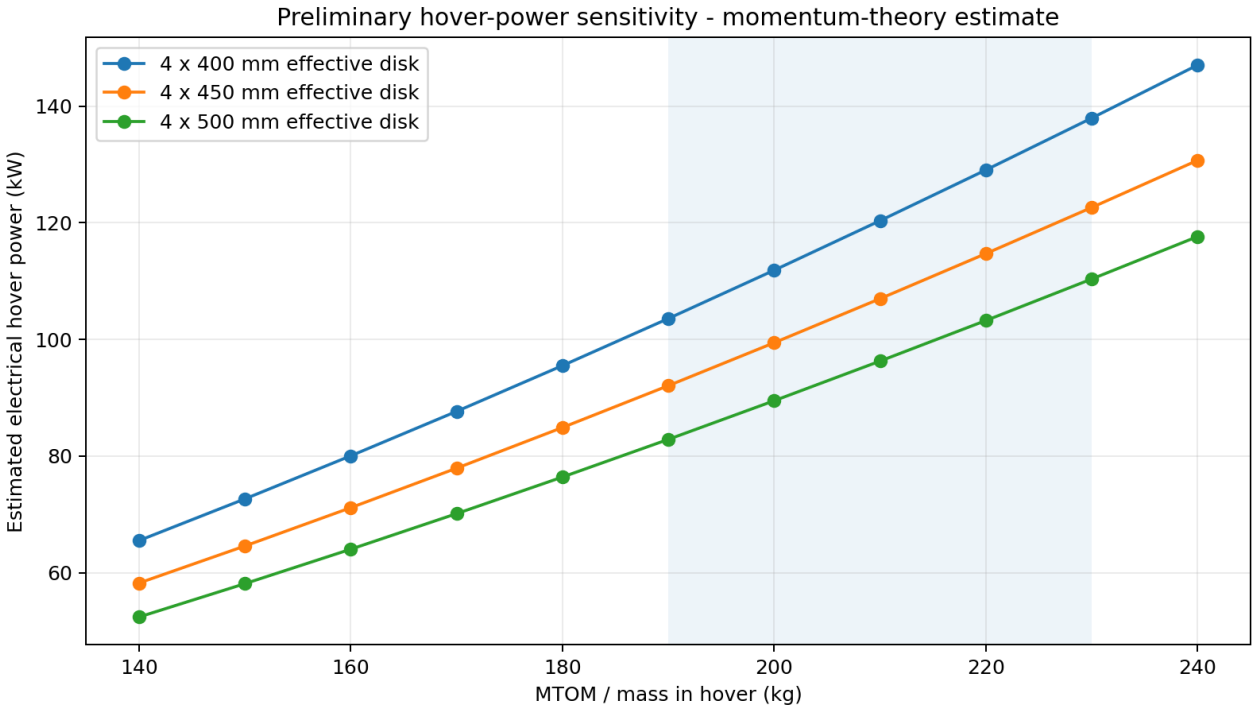
Target prestazionali RFQ

RFQ performance targets

Parameter	RFQ target	Supplier evidence
Envelope	1,250 x 1,250 x 1,300 mm nominal	Supplier 3D confirmation; ECR for deviation
User payload	100 kg max	Including PPE
MTOM	<=230 kg target	Mass budget required
Development speed	30 km/h software limit	60 km/h future objective only
Development altitude	10 m AGL initial	Geofenced
Endurance	6-10 min incl. >=20% reserve	Quote higher endurance as option
Peak T/W	>=1.50 target	Bench verified
Continuous T/W	>=1.30 target	Thermally sustainable
Hover attitude	±1.5 deg nominal roll/pitch	Low-speed near-level mode
Nominal wind initial	<=5 m/s	Envelope expansion later

Feasibility: potenza di hover

Feasibility: hover power sensitivity



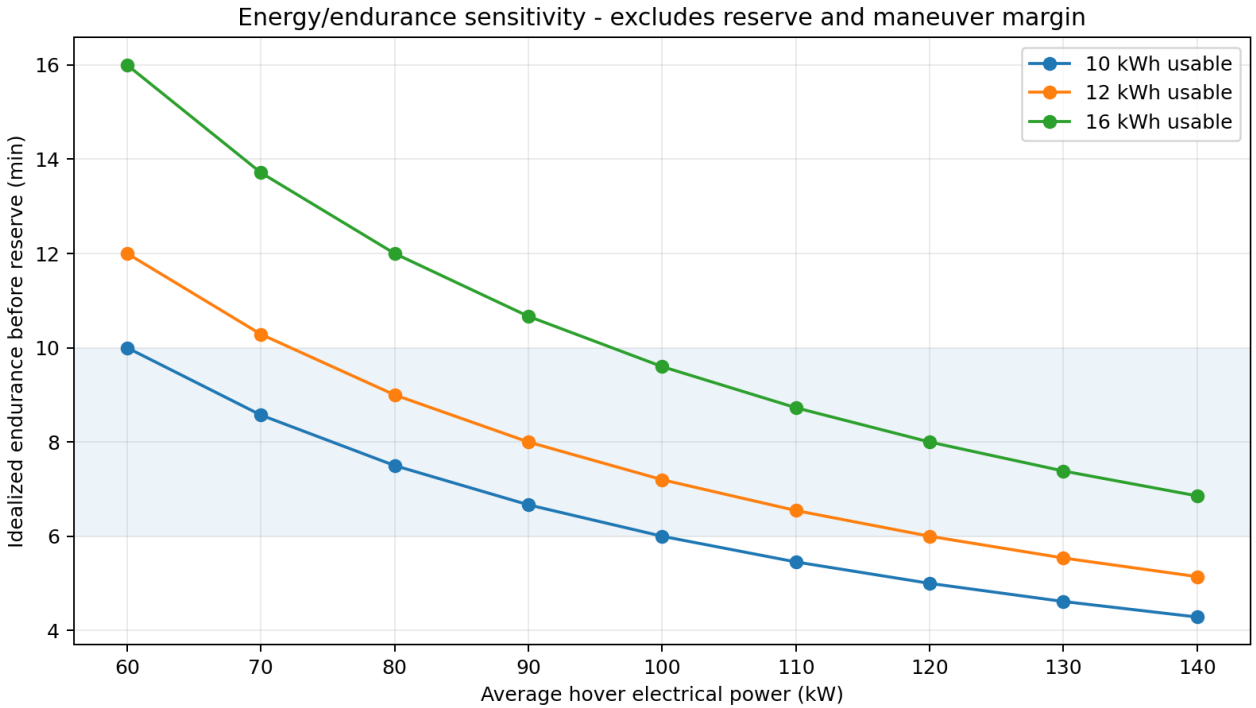
Interpretazione IT. La potenza di hover cresce rapidamente con la massa e con il disk loading. Per questo la quotazione deve includere un gate di fattibilità propulsion/energy prima del congelamento CAD. L’obiettivo non è “forzare” 20-30 minuti dentro l’inviluppo, ma definire un prototipo fisicamente credibile e sicuro mantenendo il design esterno.

EN interpretation. Hover power rises rapidly with mass and disk loading. The quotation shall therefore include a propulsion/energy feasibility gate before detailed CAD freeze. The objective is not to force 20-30 minutes into the envelope, but to define a physically credible and safe prototype while preserving the external design.

Estimate uses simple momentum theory with 70% overall figure-of-merit assumption. It is a sizing aid only; supplier CFD/bench data takes precedence.

Feasibility: energia e autonomia

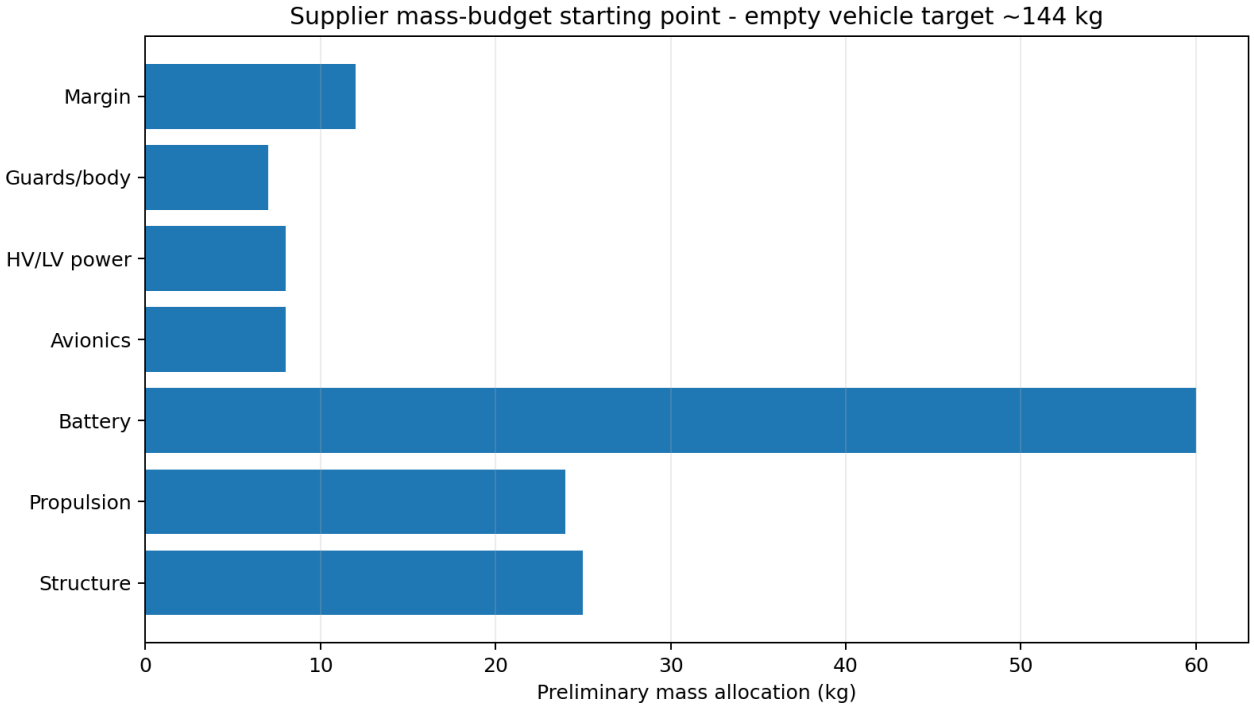
Feasibility: energy and endurance



RFQ rule. Supplier shall provide at least three energy configurations with mass, hover power, thermal limits, reserve policy and expected endurance. Quoted endurance shall include reserve and shall distinguish bench-calculated, simulated and flight-demonstrated values.

Regola RFQ. Il fornitore dovrà presentare almeno tre configurazioni energetiche con massa, potenza hover, limiti termici, politica di riserva e autonomia prevista. L’autonomia quotata dovrà includere la riserva e distinguere valori calcolati, simulati e dimostrati in volo.

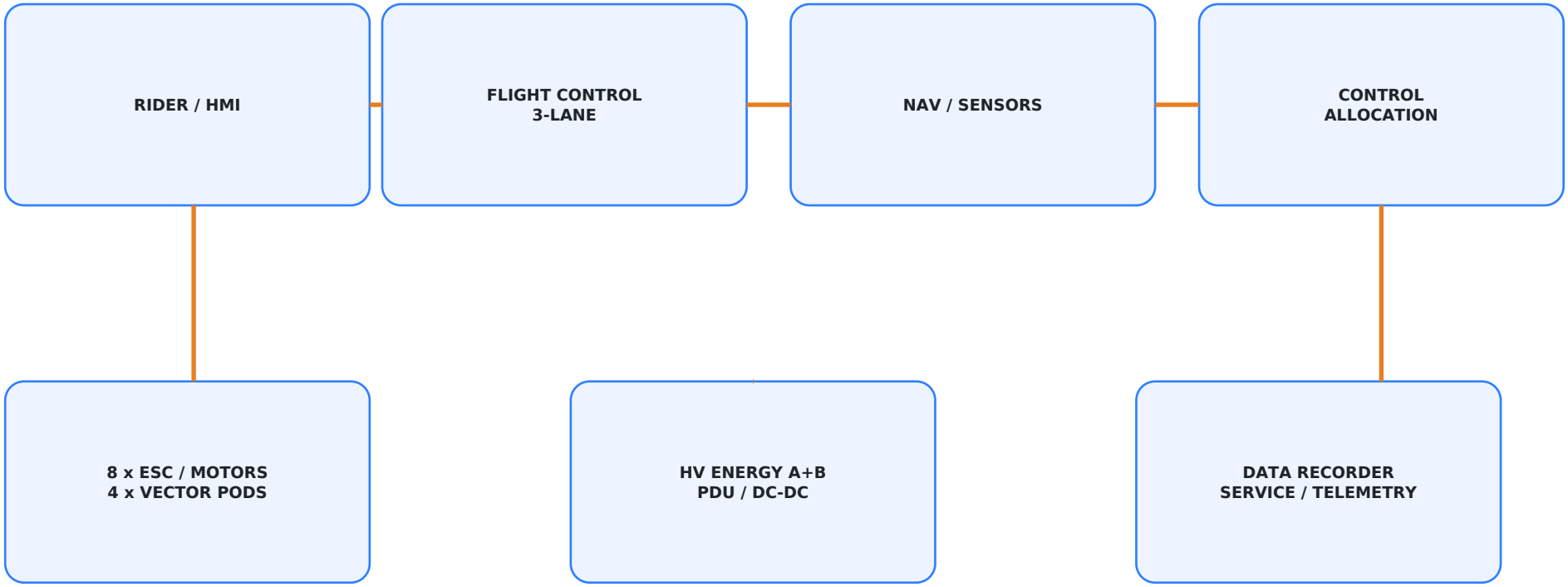
Budget di massa preliminare
Preliminary mass budget



Il budget mostrato è un punto di partenza per il supplier sizing, non una specifica di produzione. La massa batteria domina la fattibilità: ogni aumento di massa richiede più potenza e quindi più energia. Il costruttore deve consegnare un mass statement con margini e CG per ogni revisione PDR/CDR.

The shown budget is a supplier-sizing starting point, not a production specification. Battery mass dominates feasibility: more mass requires more power and therefore more energy. The supplier shall issue a mass statement with margins and CG at each PDR/CDR revision.

Architettura di sistema
System architecture



Architettura preliminare da trasformare in ICD (Interface Control Documents) dal costruttore. Tutte le interfacce safety-critical devono avere owner, protocollo, timing, alimentazione, failure state e metodo di verifica.

Preliminary architecture to be converted by the supplier into Interface Control Documents. Every safety-critical interface shall define owner, protocol, timing, power, failure state and verification method.

Struttura primaria e chassis
Primary structure and chassis

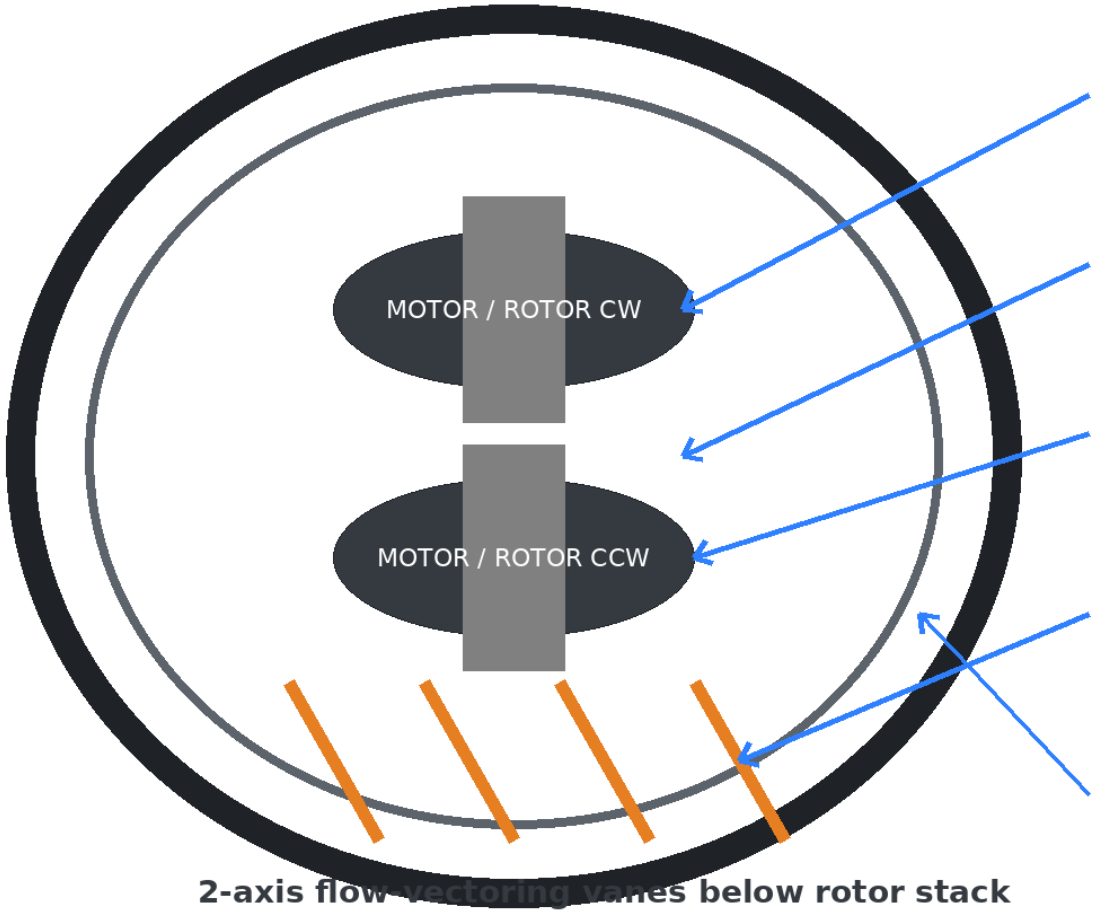
ITALIANO

- Telaio centrale rigido con quattro nodi pod sostituibili e stelo integrato.
- Battery/PDU in volume basso; accessi di manutenzione dal sottoscocca.
- Pedana “floating” isolata dal telaio ma con fail-safe mechanical stops.
- Zone di carico pilota rilevate tramite 4 load cell.
- Analisi FEM: statico, modale, fatica, attacchi pod, stelo, landing impact e tether anchor.
- Nessun bordo o elemento strutturale deve creare rischio di taglio/impigliamento.

ENGLISH

- Rigid central frame with four replaceable pod nodes and integrated stem.
- Battery/PDU in low volume; maintenance access from underside.
- Floating rider deck isolated from frame with fail-safe mechanical stops.
- Pilot load zones sensed by four load cells.
- FEA: static, modal, fatigue, pod joints, stem, landing impact and tether anchor.
- No structural edge or feature shall create cutting/entanglement hazards.

PROPULSION POD - DUAL CHANNEL / VECTORED THRUST CONCEPT



Independent HV inverter/ESC per m

Contra-rotating pair cancels net rea

Independent speed/temperature se

Fail-neutral vane actuators; angle f

Shroud / fragment containment to k

2-axis flow-vectoring vanes below rotor stack

Propulsione e controllo spinta
Propulsion and thrust control

ITALIANO

L’architettura RFQ preferita mantiene i quattro pod visibili ma introduce due canali indipendenti per pod, così da evitare che il guasto di un singolo motore o inverter equivalga alla perdita completa di un quarto della portanza. Il costruttore deve valutare coppie coassiali controrotanti, efficienza del duct, rumorosità, interaction losses e contenimento frammenti.

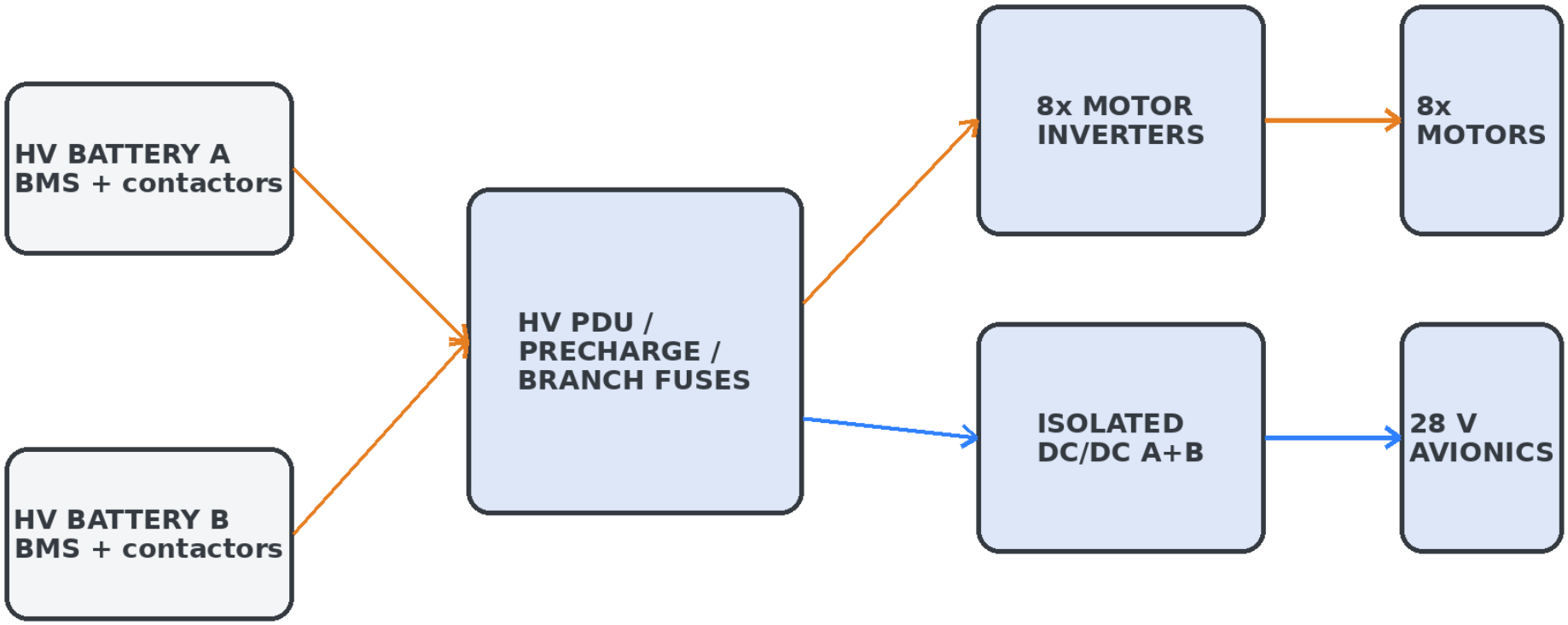
La traslazione orizzontale senza inclinare sensibilmente la pedana richiede vettorazione della spinta. La soluzione proposta è una serie di vanes/palette a valle del flusso, comandate su due assi e fail-neutral. Sono ammesse soluzioni equivalenti interne al pod purché non alterino l’estetica congelata.

ENGLISH

The preferred RFQ architecture keeps the four visible pods but introduces two independent channels per pod so that a single motor or inverter failure does not equal total loss of one quarter of lift. The supplier shall evaluate coaxial contra-rotating pairs, duct efficiency, noise, interaction losses and fragment containment.

Horizontal translation without materially tilting the deck requires thrust vectoring. The proposed concept uses downstream two-axis vanes with fail-neutral actuation. Equivalent internal pod solutions are acceptable if they do not alter the frozen exterior styling.

HIGH-VOLTAGE / LOW-VOLTAGE POWER ARCHITECTURE



HVIL, service disconnect, insulation monitoring, pack thermal monitoring and fault-containment are mand

Batterie, protezioni e gestione termica
Battery, protection and thermal management

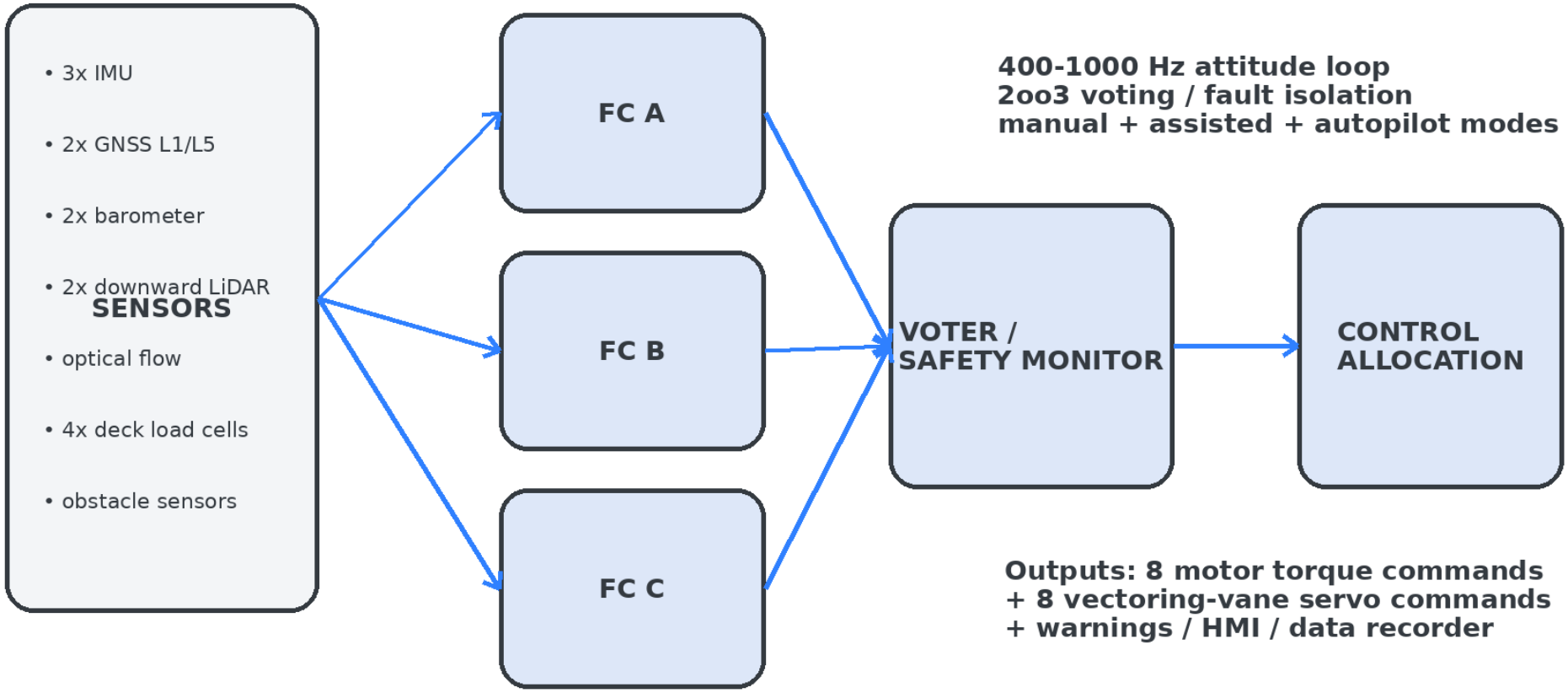
ITALIANO

• Due sorgenti/segmenti energetici fault-tolerant, non un singolo punto di guasto.
• BMS con SOC/SOH, cell voltages, temperature, current, insulation and event logs.
• HVIL, service disconnect, precharge, contactors e branch fuses.
• Thermal barriers e sfogo lontano dal pilota; sensori smoke/temperature indipendenti.
• Riserva software minima 20%; low-energy mode prima dell’esaurimento.
• Carica solo a rotori disarmati e con interlock; procedure storage/transport dedicate.

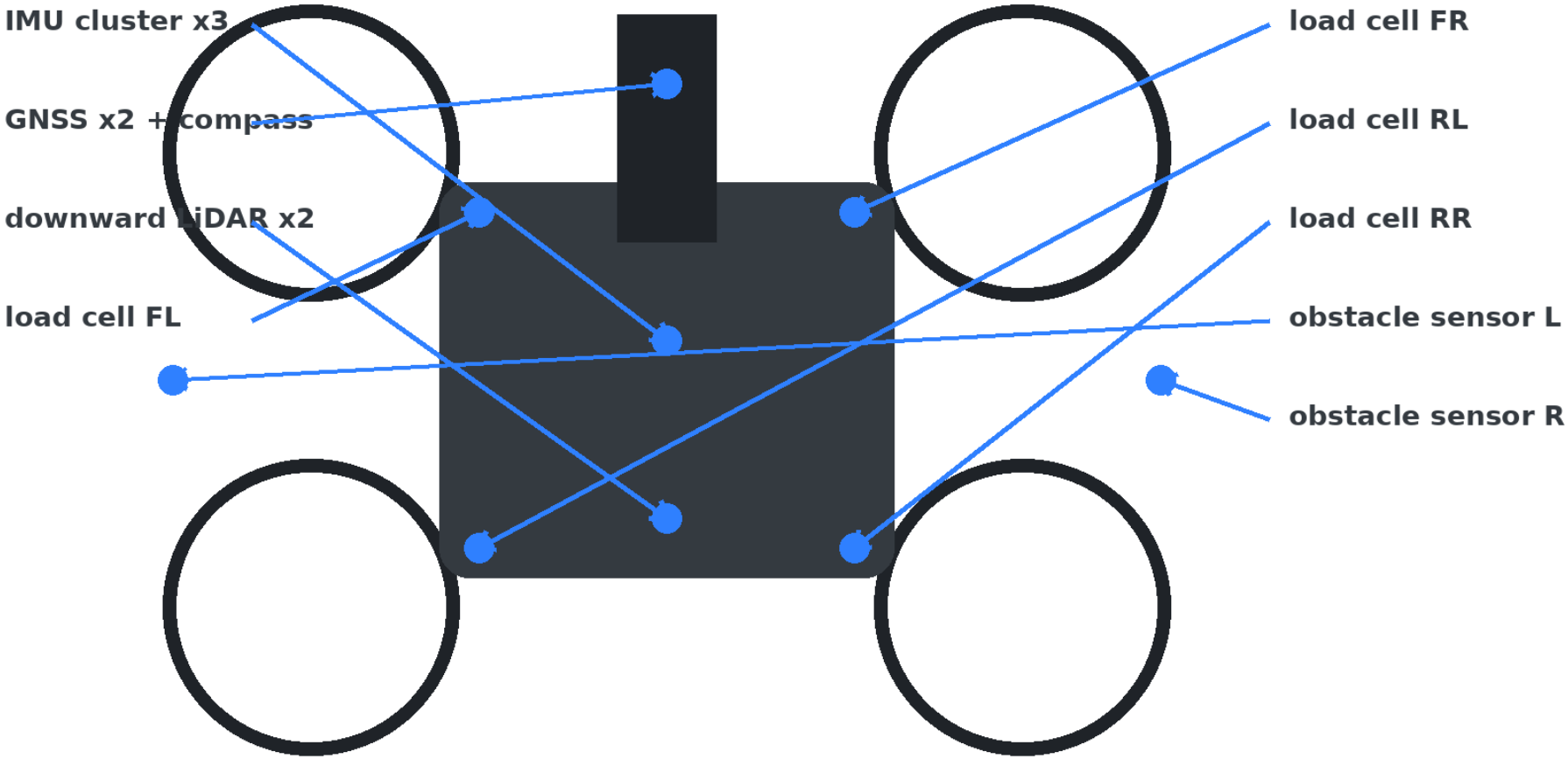
ENGLISH

• Two fault-tolerant energy sources/segments rather than a single point of failure.
• BMS with SOC/SOH, cell voltages, temperatures, current, insulation and event logs.
• HVIL, service disconnect, precharge, contactors and branch fuses.
• Thermal barriers and venting away from rider; independent smoke/temperature sensors.
• Minimum 20% software reserve; low-energy mode before depletion.
• Charging only with rotors disarmed and interlocked; dedicated storage/transport procedures.

FLIGHT CONTROL & NAVIGATION ARCHITECTURE



SENSOR PLACEMENT / RIDER-INTERACTION MAP



Four deck load cells provide rider center-of-pressure feed-forward to the stabilisation controller.

Interfaccia display approvata - zoom
Approved flight display interface - zoom

Contenuti minimi. GPS/map, Manual/Assisted/Autopilot, speed, AGL altitude, heading, attitude horizon, SOC/reserve, propulsion channel status, thermal warnings, geofence, RTH and flight-state messages.

Minimum contents. GPS/map, Manual/Assisted/Autopilot, speed, AGL altitude, heading, attitude horizon, SOC/reserve, propulsion channel status, thermal warnings, geofence, RTH and flight-state messages.

Comandi manuali e logica pilota
Manual controls and pilot logic

ITALIANO

I comandi sono fly-by-wire. Il manubrio è un supporto ergonomico e non costituisce sterzo meccanico in volo. La proposta prevede controller Hall ridondanti sulle impugnature, dead-man monitorato, pulsante landing/emergency protetto, selettore Manual/Assisted/Autopilot e arming a due azioni.

In caso di rilascio del dead-man o perdita input, il sistema non deve tagliare potenza: passa a hover stabilizzato, poi ad atterraggio assistito secondo quota, energia e sensor health. Un vero “hard stop” HV è previsto solo a terra/manutenzione.

ENGLISH

Controls are fly-by-wire. The handlebar is an ergonomic support and not a mechanical steering mechanism in flight. The concept uses redundant Hall control sensors on the grips, monitored dead-man input, guarded landing/emergency command, Manual/Assisted/Autopilot selector and two-action arming.

If dead-man or pilot input is lost, power shall not be cut: the vehicle transitions to stabilized hover and then assisted landing according to altitude, energy and sensor health. A true HV hard stop is for ground/maintenance only.

Autopilota e navigazione GPS
Autopilot and GPS navigation

ITALIANO

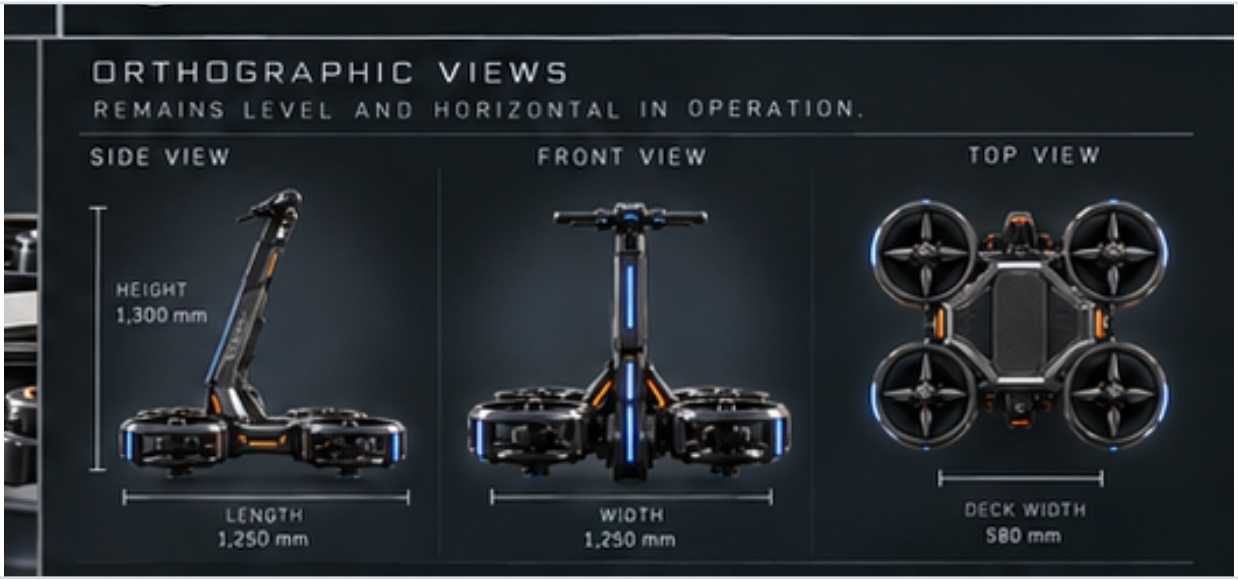
- Assisted take-off e landing con quota bassa limitata.
- Hover hold, altitude hold, heading hold e position hold.
- Waypoint navigation solo in test area controllata e dentro geofence.
- Return-to-Home con verifica energia/reserve e alternate landing point.
- Perdita GNSS: passaggio a optical flow/downward ranging e hover degradato.
- Ogni cambio modalità annunciato visualmente, acusticamente e nei log.

ENGLISH

- Assisted take-off and landing with low-altitude limit.
- Hover hold, altitude hold, heading hold and position hold.
- Waypoint navigation only in controlled test area and within geofence.
- Return-to-Home with energy/reserve check and alternate landing point.
- GNSS loss: transition to optical flow/downward ranging and degraded hover.
- Every mode change indicated visually, audibly and in logs.

Stabilizzazione, auto-livellamento e antiribaltamento

Stabilization, self-leveling and anti-roll



ITALIANO

Il requisito centrale UAC-01 è che la pedana appaia e rimanga quasi orizzontale in hover e nella traslazione a bassa velocità. Questo non può essere ottenuto unicamente con differenziale di spinta se i rotori sono fissi; perciò il progetto RFQ include vettorazione del flusso nei pod. Il controller fonde IMU, GNSS, LiDAR, optical flow e centro di pressione del pilota.

Target iniziali: ±1,5° roll/pitch in hover nominale; ±3° nei transitori ordinari; attitude hard limit configurabile e ridotto nelle prime prove. Anti-tip non è una funzione separata ma un insieme di control allocation, limitazione input, CoP feed-forward, thrust reserve e fault detection.

ENGLISH

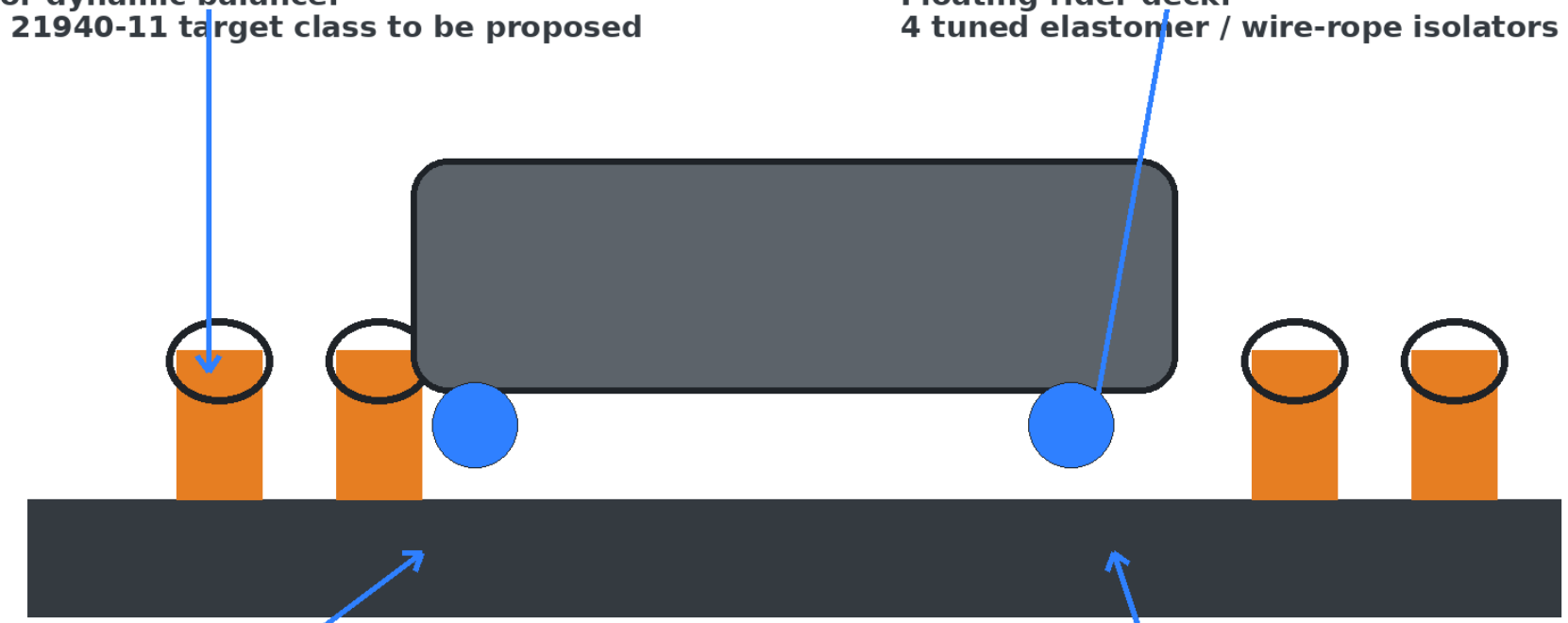
The core UAC-01 requirement is for the deck to appear and remain near horizontal in hover and low-speed translation. This cannot be achieved by differential thrust alone with fixed rotors; therefore the RFQ architecture includes pod flow vectoring. The controller fuses IMU, GNSS, LiDAR, optical flow and pilot center-of-pressure data.

Initial targets: ±1.5° roll/pitch in nominal hover; ±3° ordinary transients; configurable hard attitude limit, reduced during early tests. Anti-tip is not a separate function but a combination of control allocation, input limiting, CoP feed-forward, thrust reserve and fault detection.

VIBRATION CONTROL - POD ISOLATION + FLOATING DECK

Rotor dynamic balance:
ISO 21940-11 target class to be proposed

Floating rider deck:
4 tuned elastomer / wire-rope isolators



Control-law active damping:
notch filters at blade-passing frequencies

Acceptance target:
weighted deck & hand vibration measured in hove

Strategia NVH - minima vibrazione
NVH strategy - minimum vibration

ITALIANO

• Rotor matching e balancing prima dell’installazione; serializzazione rotori/hub.
• Analisi blade-passing frequencies e separazione dalle frequenze proprie del telaio/pedana.
• Isolatori tra pod e chassis + pedana floating con fine corsa meccanico.
• Notch/adaptive filters nel controllo attitudine dove compatibili con stabilità.
• Misura triassiale pedana, stelo e impugnature durante thrust-stand e hover.
• Target indicativo <=0,5 m/s² RMS pesato sulla pedana in hover nominale, da validare.

ENGLISH

• Rotor matching and balancing before installation; rotor/hub serialization.
• Blade-passing-frequency analysis and separation from chassis/deck natural modes.
• Pod-to-chassis isolators plus floating deck with mechanical fail-safe stops.
• Notch/adaptive filtering in the attitude controller where stability permits.
• Tri-axial measurement on deck, stem and grips during thrust-stand and hover.
• Indicative weighted deck target <=0.5 m/s² RMS in nominal hover, to be validated.

Modalità degradate ed emergenza
Degraded and emergency modes

Failure / Event	Required response	Design intent
Single motor/ESC fault	Reallocate thrust within pod and across 8 channels; land	No uncontrolled yaw/roll
Battery string fault	Isolate failed string; power-limited controlled landing	Preserve avionics power
Single IMU fault	2oo3 vote; isolate lane	No mode loss
GNSS loss	Optical-flow/LiDAR degraded position hold	Pilot warning
Display fault	Retain flight-control/autopilot; basic LEDs/haptic; land	Display not flight-control computer
Pilot input lost	Hover then assisted landing	No rotor power cut
Overtemp motor/ESC	Derate channel; reallocate; land if threshold exceeded	Logged fault
Low energy	Progressive warnings; RTH/land; protected reserve	Reserve >=20% target
Data-bus lane fault	Switch/reconfigure redundant bus	Deterministic recovery
Complete pod loss	Emergency descent/recovery per safety case	Do not assume normal hover

ITALIANO

• Flight-critical logging >=200 Hz; system/thermal data >=20 Hz.
• Event marker automatici per mode change, limit, fault, E-stop ground e landing.
• Timebase monotona e sincronizzata; export per analisi engineering.
• Telemetry non safety-critical separata dalla rete di controllo.
• Registratore protetto e removibile, con checksum e configuration ID.
• Dashboard engineering per test con trend di rpm, current, temperature, attitude e vibration.

ENGLISH

• Flight-critical logging >=200 Hz; system/thermal data >=20 Hz.
• Automatic event markers for mode changes, limits, faults, ground E-stop and landing.
• Monotonic synchronized timebase; export for engineering analysis.
• Non-safety-critical telemetry segregated from control network.
• Protected removable recorder with checksum and configuration ID.
• Engineering test dashboard showing rpm, current, temperature, attitude and vibration trends.

Cybersecurity e software configuration

Cybersecurity and software configuration

ITALIANO

Il prototipo integra GNSS, telemetria, update firmware e service interfaces: il fornitore deve trattare la cybersecurity come requisito di safety. Richiesti secure boot, immagini firmate, controllo accessi per ruolo, chiavi protette, logging amministrativo, segregazione rete, disabilitazione debug in flight configuration e procedura di recovery controllata.

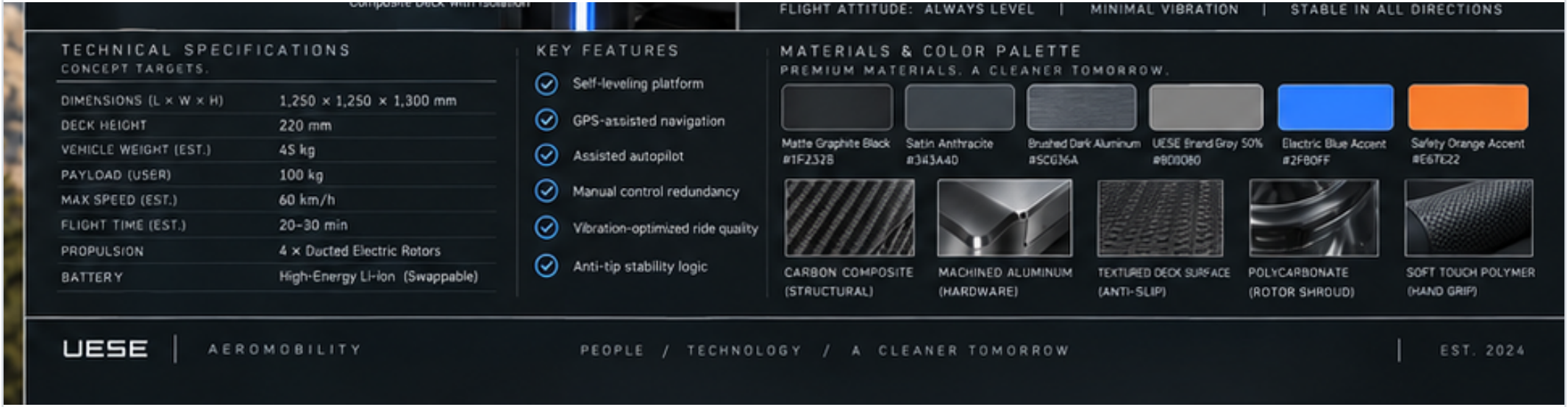
Il software deve avere versioning immutabile per ogni test card: firmware FC, HMI, BMS, ESC, map/geofence database e calibration set sono parte della configurazione del volo.

ENGLISH

The prototype integrates GNSS, telemetry, firmware update and service interfaces: the supplier shall treat cybersecurity as a safety requirement. Secure boot, signed images, role-based access, protected keys, admin logging, network segregation, debug disabling in flight configuration and controlled recovery procedures are required.

Software shall have immutable versioning for each test card: FC, HMI, BMS, ESC firmware, map/geofence database and calibration set are part of the flight configuration.

Color	Code	Application
Matte Graphite Black	#1F2328	Primary body / chassis
Satin Anthracite	#343A40	Secondary panels
Brushed Dark Aluminum	#5C636A	Visible hardware accents
UESE Brand Gray 50%	#808080	Frame + helmet logo
Electric Blue Accent	#2F80FF	System/ready lighting
Safety Orange Accent	#E67E22	Caution/edge/maintenance accents



Requisiti ambientali preliminari
Preliminary environmental requirements

ITALIANO

• Temperature storage target -20/+55 °C; operating initial 0/+40 °C unless supplier substantiates wider range.
• Humidity/condensation assessment; splash protection for deck electronics.
• Ingress/IP rating to be proposed for display, controls, PDU and battery enclosures.
• EMC/EMI qualification plan based on airborne-environment guidance as applicable.
• Vibration/shock qualification derived from measured vehicle spectrum, not copied blindly from generic standards.
• Corrosion protection for outdoor use and dissimilar-metal isolation.

ENGLISH

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• Corrosion protection for outdoor use and dissimilar-metal isolation.

Industrializzazione e processi produttivi
Industrialization and manufacturing processes

ITALIANO

La richiesta è per prototipi ingegnerizzati, non per un mock-up. Il fornitore deve definire processo per chassis, duct, deck, machining, compositi, incollaggi, cablaggi HV/LV, finitura e assemblaggio, con jigs e inspection plan. Parti critiche richiedono serializzazione, material certs, special-process records, torque records e as-built configuration.

Per il primo lotto sono preferibili processi a basso tooling cost (CNC, sheet/plate fabrication, composite tooling soft/modular) mantenendo un percorso chiaro verso una successiva industrializzazione.

ENGLISH

The request is for engineered prototypes, not a mock-up. The supplier shall define manufacturing processes for chassis, ducts, deck, machining, composites, bonding, HV/LV harnesses, finishing and assembly, including jigs and inspection plan. Critical parts require serialization, material certificates, special-process records, torque records and as-built configuration.

For the first lot, low-tooling-cost processes are preferred (CNC, sheet/plate fabrication, soft/modular composite tooling) while retaining a clear path toward later industrialization.

ITALIANO

- Preferenza per QMS EN/AS9100 o equivalente.
- FAI su parti critiche secondo AS9102C/EN9102 equivalent.
- Balloon drawing e characteristic accountability.
- Material certificates e CoC; special processes approved/traceable.
- Calibration status di strumenti e test equipment.
- Nonconformance/MRB process e change-control con UESE.
- Serial number per pod, motor, ESC, battery, flight computer e critical structure.

ENGLISH

- Preference for EN/AS9100 or equivalent QMS.
- FAI on critical parts to AS9102C/EN9102 equivalent.
- Balloon drawing and characteristic accountability.
- Material certificates and CoC; approved/traceable special processes.
- Calibration status of instruments and test equipment.
- Nonconformance/MRB process and UESE change control.
- Serial number for pod, motor, ESC, battery, flight computer and critical structure.

Manutenibilità e serviceability
Maintainability and serviceability

ITALIANO

La macchina deve essere progettata perché pod, ESC, batteria, PDU, flight computer e display siano sostituibili senza smontare l’intero veicolo. I connettori devono essere keyed, etichettati e protetti da inversione. Ogni attività HV deve essere coperta da lockout/tagout e verifica assenza tensione.

Il fornitore deve consegnare maintenance task cards, torque table, inspection intervals, life-limit assumptions, firmware update procedure, calibration procedure e spare list. I pod devono essere line-replaceable modules nel contesto del prototipo.

ENGLISH

The vehicle shall be designed so pods, ESCs, battery, PDU, flight computers and display can be replaced without dismantling the complete vehicle. Connectors shall be keyed, labeled and protected against reversal. All HV service shall use lockout/tagout and absence-of-voltage verification.

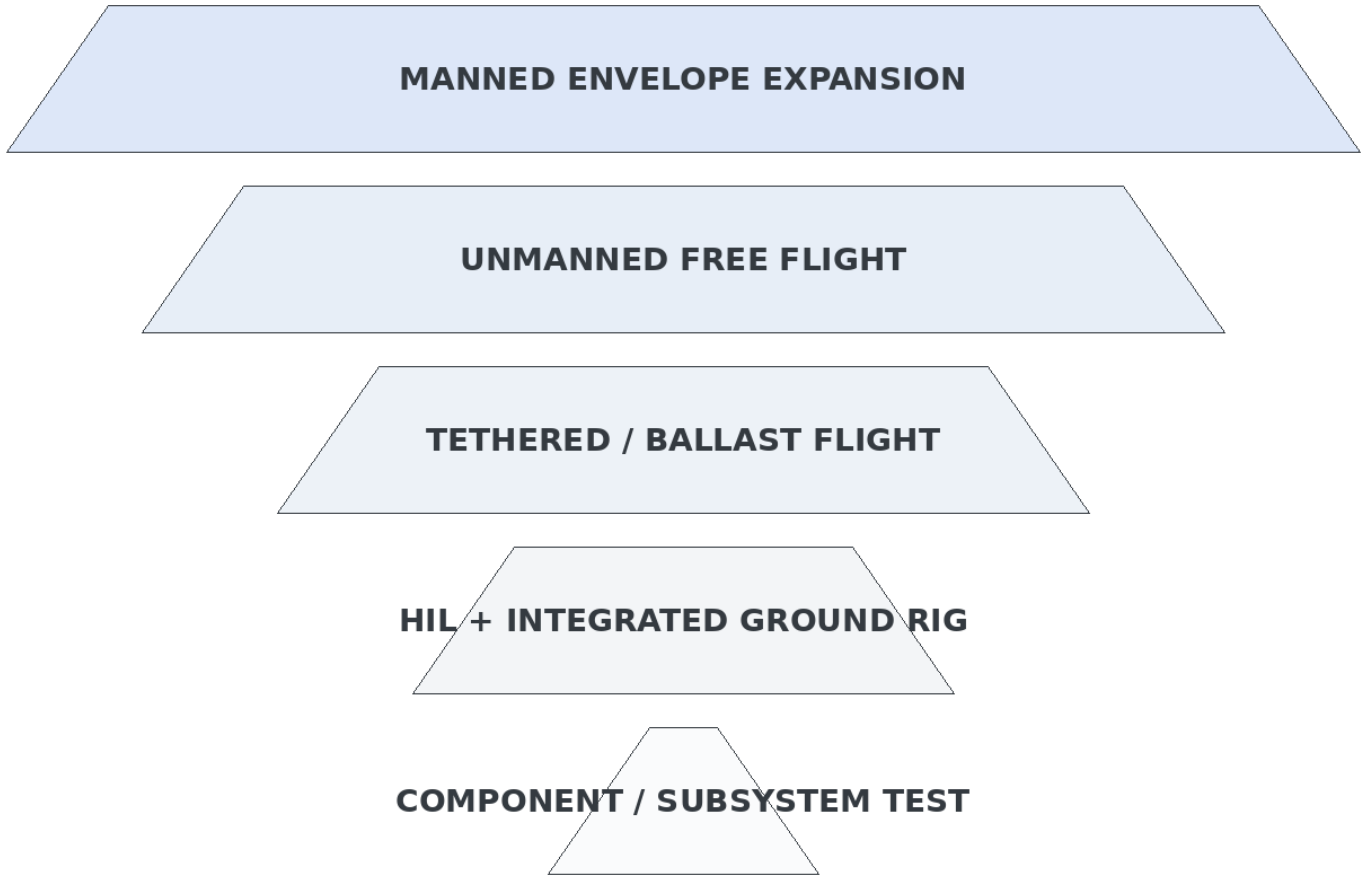
The supplier shall deliver maintenance task cards, torque table, inspection intervals, life-limit assumptions, firmware update procedure, calibration procedure and spare list. Pods should be line-replaceable modules for prototype operations.

Strategia prototipi e gate

Prototype strategy and gates

Phase	Name	Scope	Exit gate
P0	Feasibility & sizing	Mass/CG, propulsion, energy, duct/downwash, safety concept	Design gate
P1	Detailed design	CAD, FEA, schematics, software architecture, ICDs	PDR/CDR
P2	Subsystem rigs	Propulsion stand, battery/PDU bench, HIL	Bench acceptance
P3	Integrated ground prototype	No lift / constrained operation	Ground readiness
P4	Tethered lift	Ballast, constrained envelope	Tether gate
P5	Unmanned free flight	Geofenced low altitude	Flight readiness
P6	Manned envelope expansion	Only after authorization and independent safety gate	Separate authorization

VERIFICATION PYRAMID / FLIGHT-TEST GATES



No human carriage before formal completion of preceding gates, independent safety review, test-area auth

ID	Test	Evidence	Gate
PROP-T01	Single pod thrust map	Thrust, power, rpm, temp across operating map	Before integration
PROP-T02	Pod endurance	Thermal steady-state and bearings	Before tether
PROP-T03	Motor/ESC failure injection	Residual thrust + controller response	Before tether
PWR-T01	Pack discharge power	Voltage sag, temp, current limits	Before integration
PWR-T02	Contactor/precharge/HVIL	Fault-safe sequencing	Before integration
FCS-T01	HIL normal modes	Manual/assisted/autopilot transitions	Before lift
FCS-T02	HIL sensor faults	IMU/GNSS/LiDAR/baro failures	Before lift
NVH-T01	Modal survey	Frame/deck natural frequencies	Before lift
NVH-T02	Instrumented thrust vibration	Pod/chassis/deck spectrum	Before lift
STR-T01	Static proof	Primary structure/tether anchor/landing loads	Before human carriage

ID	Test	Purpose	Acceptance intent
FLT-01	Tether hover 0.2 m	Ballast, attitude hold, current margin	Pass: stable, no limit exceedance
FLT-02	Tether step input	Small manual pitch/roll/yaw/vertical commands	Pass: no overshoot beyond limits
FLT-03	Motor fault emulation	Command one channel degraded	Pass: controlled response/landing
FLT-04	GNSS loss	Switch to degraded position hold	Pass: maintain controlled hover
FLT-05	Low-energy landing	Trigger reserve threshold	Pass: annunciation + landing logic
FLT-06	Unmanned 1-3 m AGL	Geofenced free hover/translation	Pass: position/attitude limits
FLT-07	Unmanned vectoring	Low-speed translation with level deck	Pass: deck near-level target
FLT-08	Manned first hover	Separate authorization and test card	Not included in base fixed-price unless quoted

ID	Hazard	Prelim. severity	Primary controls
HAZ-01	Loss of total thrust	Catastrophic	Dual energy architecture, 8 channels, controlled landing/recovery, preflight health
HAZ-02	Uncommanded roll/pitch	Catastrophic	3 IMUs, voting, attitude limits, fault monitor, vector authority
HAZ-03	Battery thermal event	Hazardous/Catastrophic	Segregation, barriers, venting, detection, landing logic
HAZ-04	Rotor fragment / contact	Hazardous	Duct/shroud containment + guarding + test exclusion zones
HAZ-05	Pilot falls from deck	Hazardous	Self-leveling, input limits, deck CoP sensing, test harness/tether
HAZ-06	False autopilot command	Hazardous	Mode annunciation, manual override, geofence, software assurance
HAZ-07	GNSS spoof/loss	Major/Hazardous	Multi-sensor nav, plausibility checks, degraded mode
HAZ-08	Vibration-induced fatigue	Major/Hazardous	Balance, modal analysis, isolation, inspection/life monitoring

FMEA preliminare - estratto

Preliminary FMEA - excerpt

Item	Failure mode	Effect	Mitigation	Verification
Motor	Open/short/overtemp	Loss/reduction thrust one channel	ESC isolate; 7-channel reallocation	Bench/HIL
ESC	Gate/control fault	Uncommanded or lost torque	Fast monitor; isolation; torque plausibility	HIL
IMU	Bias/freeze	Attitude error	2oo3 vote + cross-check	Fault injection
GNSS	Loss/spoof	Position error	Plausibility + optical flow/LiDAR	Flight test
Battery string	Open/contactor trip	Power reduction	Other string + controlled landing	Power test
Display	Blank/freeze	Loss of pilot information	Flight control independent + alert/land	HIL
Vector servo	Stuck	Asymmetric lateral force	Fail-neutral design + angle feedback	Bench/HIL
Load cell	Drift/fail	Bad rider CoP feed-forward	Plausibility and ignore failed cell	HIL

Reference	Current relevance	Use in UAC-01
EU 2018/1139	Common rules in civil aviation; current consolidated version accessed 02 Aug 2026	Applicable legal framework to be confirmed with authority
EASA SC-VTOL-02 Issue 2	Special Condition for small-category VTOL-capable aircraft, 10 Jun 2024	Primary airworthiness reference for person-carrying VCA
EASA MOC-4 SC-VTOL Issue 2	Final fourth publication, 11 Jul 2025	Means of Compliance reference
EASA MOC-5 SC-VTOL	2025 publication/consultation material; status to be rechecked at project launch	Additional MoC material
RTCA DO-160G	Environmental Conditions and Test Procedures for Airborne Equipment	Environmental/EMI reference as applicable
RTCA DO-178C / ED-12C	Software considerations in airborne systems	If certification credit is pursued
RTCA DO-254 / ED-80	Airborne electronic hardware design assurance	If certification credit is pursued
SAE ARP4754B	Development of civil aircraft and systems, revised Dec 2023	Systems development framework
SAE ARP4761A	Safety assessment process, revised Dec 2023	Safety process framework
UN Manual Tests & Criteria 38.3	Lithium battery transport testing	Battery shipping/transport
IEC 62619:2022	Industrial lithium battery safety	Reference only; aviation-specific requirements take precedence
ISO 21940-11:2016 + Amd 1:2022	Rotor balancing procedures and tolerances	NVH manufacturing reference
ISO 2631-1:1997 + Amd 1:2010	Whole-body vibration evaluation	Ergonomic reference; revision underway in 2026
ISO 5349-1:2001	Hand-transmitted vibration; confirmed current 2026	Handle vibration reference
AS9102C / EN9102 equivalent	First Article Inspection	Prototype/production quality evidence

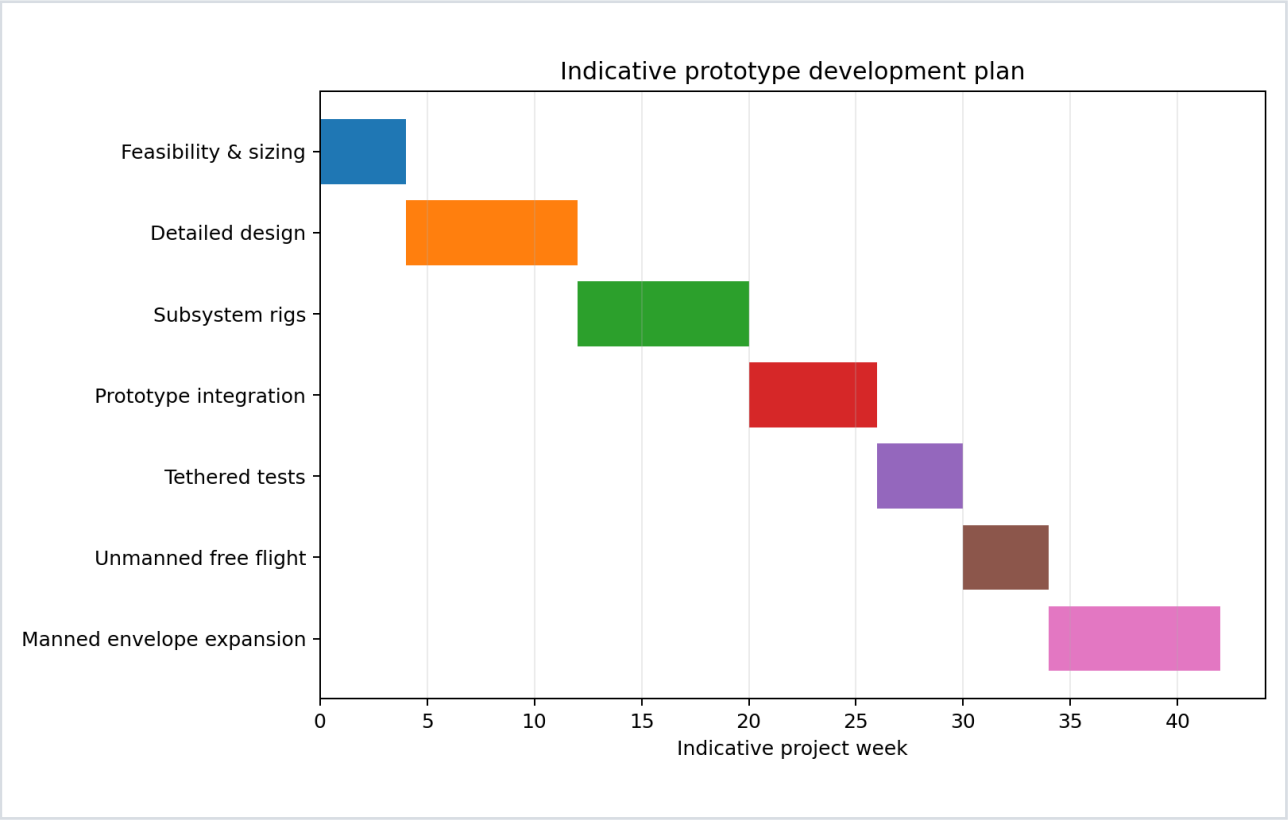
Deliverable richiesti al costruttore

Required supplier deliverables

ID	Deliverable	Minimum content	Gate
D01	Feasibility report	Mass/CG, thrust/power, disk loading, endurance, thermal, risks	P0
D02	3D CAD master	Native + STEP; full assembly with service clearances	P1
D03	2D drawing set	PDF/DXF; dimensions, GD&T;, materials, finishes	P1
D04	Structural substantiation	FEA, modal, proof-test plan	P1/P2
D05	Electrical design	HV/LV schematics, cable sizing, protection coordination	P1
D06	Harness drawings	Connector pinouts, lengths, labels, routing	P1
D07	Flight-control design	Architecture, control laws, FDIR, mode logic	P1
D08	Software/config index	Versions, hashes, calibration set, build environment	Each build
D09	Safety package	FHA/PSSA/FMEA/FTA as appropriate; hazard log	P1-P6
D10	Test procedures/reports	Bench, HIL, tether, unmanned flight	P2-P5
D11	As-built BOM	Manufacturer, P/N, serial, revision, quantity	Delivery
D12	Manuals	Operation, maintenance, charging, emergency response	Delivery
D13	Quality dossier	FAI, material certs, CoC, calibration, NCR/MRB	Delivery
D14	Source code/escrow option	Commercial option: source/configuration rights	Quote separately

Programma indicativo e milestone

Indicative schedule and milestones



Milestone suggerite: M0 kick-off; M1 feasibility review; M2 PDR; M3 CDR; M4 propulsion/battery bench acceptance; M5 integrated ground readiness; M6 tether readiness; M7 unmanned flight readiness; M8 final prototype acceptance.

Suggested milestones: M0 kick-off; M1 feasibility review; M2 PDR; M3 CDR; M4 propulsion/battery bench acceptance; M5 integrated ground readiness; M6 tether readiness; M7 unmanned flight readiness; M8 final prototype acceptance.

Struttura richiesta del preventivo

Required quotation breakdown

WBS	Cost element	Price format	Status
1	NRE feasibility / preliminary design	Fixed fee	Mandatory
2	Detailed mechanical/electrical design	Fixed fee	Mandatory
3	Flight-control software + HIL	Fixed fee + licenses	Mandatory
4	Tooling/jigs/test rigs	Itemized	Mandatory
5	Ground engineering prototype P0/P3	Per unit	Quote 1
6	Flight prototype P1/P2	Per unit	Quote 2
7	Critical spares package	Itemized	Mandatory
8	Bench/tether/unmanned test campaign	Fixed/weekly rate	Mandatory
9	Manned test support	Separate option	Optional / approval dependent
10	Certification support / authority liaison	Separate option	Optional
11	Source-code / IP licensing	Separate option	Optional
12	Warranty / post-test support	Months + rate	Mandatory to state

Accettazione, deviazioni e change control
Acceptance, deviations and change control

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Il preventivo deve includere una Compliance Matrix riga per riga rispetto ai requisiti del kit: Comply / Partial / Deviate / Not quoted, con nota tecnica e costo/tempo dell’eventuale deviazione. Nessuna assunzione del fornitore prevale sul design freeze se non esplicitamente accettata da UESE.

La consegna prototipo non è accettata sulla sola base dell’aspetto: servono as-built BOM, serializzazione, test evidence, configuration index, log prove, NCR chiuse o accettate e report finale mass/CG. Ogni modifica flight-critical deve aggiornare software, drawings, hazard log e test regression.

ENGLISH

The quotation shall include a row-by-row Compliance Matrix against this kit: Comply / Partial / Deviate / Not quoted, with technical note and cost/schedule effect. No supplier assumption overrides the design freeze unless expressly accepted by UESE.

Prototype delivery is not accepted on appearance alone: it requires as-built BOM, serialization, test evidence, configuration index, test logs, closed/accepted NCRs and final mass/CG report. Every flight-critical change shall update software, drawings, hazard log and regression tests.

Matrice requisiti 1/6

Requirements matrix 1/6

ID	Area	Italian requirement	English requirement	Verification
SYS-001	System	La configurazione estetica e architetturale approvata è congelata: piattaforma monoposto in piedi, quattro pod circolari, stelo frontale/HMI, palette e branding UESE. Nessuna modifica esterna senza Change Request approvata.	The approved visual and architectural configuration is frozen: single standing platform, four circular pods, front stem/HMI, UESE palette and branding. No external change without approved Change Request.	Design review + 3D overlay
SYS-002	System	Ingombro nominale RFQ 1.250 x 1.250 x 1.300 mm (L x W x H). Il costruttore deve confermare il packaging 3D e dichiarare ogni scostamento.	RFQ nominal envelope 1,250 x 1,250 x 1,300 mm (L x W x H). Supplier shall confirm 3D packaging and declare any deviation.	CAD check
SYS-003	System	Portata utente: 100 kg massimi inclusi DPI e oggetti personali; massa pilota nominale di progetto 85-90 kg.	User payload: 100 kg maximum including PPE and personal items; nominal design pilot mass 85-90 kg.	Weight & balance
SYS-004	System	MTOM target preliminare <=230 kg. Il costruttore deve fornire mass budget aggiornato, margine almeno 8% a PDR e 5% a CDR.	Preliminary target MTOM <=230 kg. Supplier shall provide updated mass budget with at least 8% margin at PDR and 5% at CDR.	Mass report
SYS-005	System	Velocità di sviluppo iniziale limitata software a 30 km/h; obiettivo evolutivo 60 km/h solo dopo espansione inviluppo e verifiche.	Initial development speed software-limited to 30 km/h; future 60 km/h objective only after envelope expansion and verification.	Flight test
SYS-006	System	Autonomia prototipo libero target 6-10 min inclusa riserva energetica minima del 20%; eventuali obiettivi superiori devono essere quotati come opzione.	Free-flight prototype endurance target 6-10 min including minimum 20% energy reserve; higher endurance shall be quoted as an option.	Energy analysis + flight test
SYS-007	System	Quota di sviluppo iniziale 10 m AGL max con geofence; inviluppo successivo solo con piano prove approvato.	Initial development altitude max 10 m AGL with geofence; later envelope only under approved test plan.	Software + test
SYS-008	System	Operatività di prototipo: ambiente asciutto, vento <=5 m/s per primi voli; successiva estensione da qualificare.	Prototype operation: dry environment, wind <=5 m/s for initial flights; later extension to be qualified.	Test procedure
STR-001	Structure	Telaio primario in lega aeronautica lavorata/saldata o composito equivalente, con tracciabilità materiale e calcoli FEM.	Primary frame in aircraft-grade alloy machined/welded or equivalent composite, with material traceability and FEA substantiation.	FEA + material certs
STR-002	Structure	Piattaforma pilota con superficie antiscivolo, drenaggio, bordi non taglienti e zone di appoggio definite.	Pilot deck with anti-slip surface, drainage, non-sharp edges and defined foot zones.	Inspection + slip test
STR-003	Structure	Baricentro componenti pesanti il più basso possibile; batterie e PDU sotto piano pedana salvo motivata eccezione.	Heavy components located as low as practicable; batteries and PDU below deck plane unless justified.	CAD CG report

Matrice requisiti 2/6

Requirements matrix 2/6

ID	Area	Italian requirement	English requirement	Verification
STR-004	Structure	Attacchi pod e stelo dimensionati ai carichi combinati, vibrazione e fatica; fattori di sicurezza coerenti con la base di certificazione da concordare.	Pod and stem attachments sized for combined loads, vibration and fatigue; safety factors consistent with agreed certification basis.	Stress report
STR-005	Structure	Protezione delle unità rotanti da contatto e frammenti ad alta energia integrata nell'inviluppo visivo esistente.	Protection from rotating-unit contact and high-energy fragments integrated within the existing visual envelope.	Analysis + test
PROP-001	Propulsion	Quattro pod di spinta. Architettura preferita: due canali motore/rotore indipendenti per pod, coassiali controrotanti, totale 8 canali.	Four thrust pods. Preferred architecture: two independent motor/rotor channels per pod, coaxial contra-rotating, total 8 channels.	Design review + bench test
PROP-002	Propulsion	Rapporto spinta/peso di picco target >=1,50 a MTOM e continuo >=1,30, da confermare con prove su banco.	Peak thrust-to-weight target >=1.50 at MTOM and continuous >=1.30, to be confirmed by thrust-stand testing.	Thrust stand
PROP-003	Propulsion	Potenza elettrica complessiva di progetto da dimensionare indicativamente 100-140 kW continua e 160-200 kW di picco, subordinata al sizing definitivo.	Total electrical propulsion to be sized indicatively at 100-140 kW continuous and 160-200 kW peak, subject to final sizing.	Power sizing + bench
PROP-004	Propulsion	Ogni canale deve disporre di inverter/ESC indipendente, misura corrente, tensione, temperatura e velocità.	Each channel shall have independent inverter/ESC and current, voltage, temperature and speed sensing.	Bench + HIL
PROP-005	Propulsion	Bilanciatura dinamica rotori secondo ISO 21940-11 o metodo equivalente concordato; obiettivo di bassa vibrazione documentato.	Dynamic rotor balancing to ISO 21940-11 or agreed equivalent; documented low-vibration objective.	Balance report
PROP-006	Propulsion	Controllo vettoriale di spinta tramite palette/vanes o soluzione interna al pod che consenta traslazione mantenendo la pedana quasi orizzontale.	Vectored thrust via vanes or internal pod solution enabling translation while keeping deck near level.	Bench + flight
PROP-007	Propulsion	Attuatori di vettorazione fail-neutral con feedback posizione ridondante; corsa iniziale di progetto ±10-12°.	Fail-neutral vectoring actuators with redundant position feedback; initial design travel ±10-12°.	Bench test
PWR-001	Power	Sistema HV nominale da proporre nell'intervallo 350-450 Vdc, con segregazione fisica e HV interlock.	Nominal HV system to be proposed in 350-450 Vdc range, with physical segregation and HV interlock.	Electrical design
PWR-002	Power	Due stringhe batteria indipendenti o architettura equivalente fault-tolerant; una singola avaria non deve provocare spegnimento incontrollato.	Two independent battery strings or equivalent fault-tolerant architecture; a single failure shall not cause uncontrolled power loss.	FMEA + HIL

Matrice requisiti 3/6

Requirements matrix 3/6

ID	Area	Italian requirement	English requirement	Verification
PWR-003	Power	Energia utilizzabile preliminare 10-16 kWh ad alta potenza; riserva software >=20% per atterraggio.	Preliminary usable high-power energy 10-16 kWh; software reserve >=20% for landing.	Battery sizing + test
PWR-004	Power	BMS con monitoraggio cella, isolamento, temperatura, corrente, SOH/SOC e data logging; protezioni contattori e precharge.	BMS with cell, insulation, temperature, current, SOH/SOC monitoring and data logging; contactor and precharge protection.	Bench + logs
PWR-005	Power	Gestione propagazione termica e sfiato orientato lontano dal pilota; nessun percorso di gas caldi verso impugnature o arti.	Thermal propagation management and venting away from pilot; no hot-gas path toward grips or limbs.	Abuse test + inspection
PWR-006	Power	DC/DC ridondanti per bus avionica 28 Vdc e batteria tampone/hold-up per controllo e registrazione durante transitori HV.	Redundant DC/DC for 28 Vdc avionics bus and hold-up supply for control and recording during HV transients.	Power interruption test
FCS-001	Flight control	Tre unità IMU indipendenti e logica di voto 2oo3 o architettura equivalente; rilevazione fault e isolation.	Three independent IMUs with 2oo3 voting or equivalent architecture; fault detection and isolation.	HIL + fault injection
FCS-002	Flight control	Anello attitudine >=400 Hz; sincronizzazione sensori e latenza end-to-end documentata.	Attitude loop >=400 Hz; documented sensor synchronization and end-to-end latency.	HIL measurement
FCS-003	Flight control	Assetto hover target: roll/pitch entro ±1,5° in condizioni nominali; transitori normali entro ±3°.	Hover attitude target: roll/pitch within ±1.5° nominally; normal transients within ±3°.	Flight test
FCS-004	Flight control	Modalità low-speed con pedana quasi orizzontale, ottenuta tramite vettorazione spinta; inclinazioni maggiori solo se esplicitamente autorizzate dal controllo.	Low-speed mode with near-level deck using thrust vectoring; larger attitudes only when explicitly commanded/authorized by control logic.	Flight test
FCS-005	Flight control	Allocazione controllo capace di compensare guasto singolo motore/ESC e comandare atterraggio controllato con margine residuo.	Control allocation capable of compensating a single motor/ESC failure and commanding controlled landing with residual margin.	Fault injection + flight/tether
FCS-006	Flight control	Perdita completa di un pod deve attivare modalità emergenza e logica di discesa/recupero definita dal safety case; non assumere continuazione volo nominale.	Complete loss of one pod shall trigger emergency mode and descent/recovery logic defined by the safety case; nominal continued flight shall not be assumed.	Safety analysis + test
NAV-001	Navigation	Doppio GNSS multibanda L1/L5, predisposizione RTK, compass/magnetometro ridondante e cross-check con IMU.	Dual multiband L1/L5 GNSS, RTK-ready, redundant compass/magnetometer and IMU cross-check.	Bench + flight

ID	Area	Italian requirement	English requirement	Verification
NAV-002	Navigation	Doppio altimetro di prossimità verso il basso (LiDAR/radar) più barometri indipendenti per hover/landing.	Dual downward proximity altimetry (LiDAR/radar) plus independent barometers for hover/landing.	Bench + flight
NAV-003	Navigation	Position hold degradato senza GNSS tramite optical flow/vision o tecnologia equivalente a bassa quota.	Degraded GNSS-denied position hold through optical flow/vision or equivalent low-altitude technology.	GNSS-denied test
HMI-001	HMI	Display centrale 7-8 pollici, alta luminosità >=1000 nit, antiriflesso, utilizzabile con guanti, grado IP da quotare.	Central 7-8 inch display, high brightness >=1000 nit, anti-glare, glove-operable, supplier to quote IP rating.	Inspection + sunlight test
HMI-002	HMI	Visualizzare almeno: mappa/GPS, modalità, velocità, quota AGL, heading, orizzonte, SOC, autonomia/reserve, stato 8 canali propulsion, warnings.	Display at minimum: map/GPS, mode, speed, AGL altitude, heading, horizon, SOC, reserve/endurance, 8 propulsion channel status, warnings.	HMI test
HMI-003	HMI	Comandi manuali fly-by-wire con sensori Hall ridondanti; nessun collegamento meccanico di sterzo in volo.	Manual fly-by-wire controls with redundant Hall sensors; no mechanical airborne steering linkage.	Bench + HIL
HMI-004	HMI	Dead-man/occupant acknowledgement su impugnatura; perdita comando non deve spegnere i rotori ma portare a hover/landing assistito secondo stato volo.	Dead-man/occupant acknowledgement on grip; loss shall not shut rotors down but transition to hover/assisted landing according to flight state.	HIL + test
HMI-005	HMI	Comando di emergenza in volo = richiesta controlled landing. Arresto potenza immediato solo manutenzione/terra con interlock.	In-flight emergency command = controlled landing request. Immediate power cut only for maintenance/ground with interlock.	HMI + safety test
AUTO-001	Autopilot	Modalità assistite: attitude hold, altitude hold, hover hold, heading hold, position hold, assisted take-off/landing.	Assisted modes: attitude hold, altitude hold, hover hold, heading hold, position hold, assisted take-off/landing.	HIL + flight
AUTO-002	Autopilot	Navigazione waypoint e Return-to-Home disponibili nel prototipo ma software-limited e subordinate a geofence e autorizzazioni test.	Waypoint navigation and Return-to-Home available in prototype but software-limited and subject to geofence and test authorizations.	Software review + flight
AUTO-003	Autopilot	Passaggio Manual/Assisted/Autopilot senza discontinuità di comando e con chiara indicazione sul display.	Manual/Assisted/Autopilot transitions without command discontinuity and with clear display indication.	HIL + human factors
SAF-001	Safety	Quattro load cell sotto pedana per rilevare presenza, massa e centro di pressione pilota; dato usato come feed-forward stabilizzazione.	Four deck load cells to detect presence, mass and pilot center of pressure; data used as stabilization feed-forward.	Calibration + HIL

ID	Area	Italian requirement	English requirement	Verification
SAF-002	Safety	Sistema anticaduta per prove: tether/harness quick-release collegato ad ancoraggio strutturale dedicato; carico di prova da definire e certificare.	Test anti-fall system: quick-release tether/harness connected to dedicated structural anchor; proof load to be defined and substantiated.	Proof load test
SAF-003	Safety	Geofence 3D, limite quota/velocità, no-fly zones e configurazione protetta da ruolo tecnico.	3D geofence, altitude/speed limits, no-fly zones and role-protected configuration.	Software test
SAF-004	Safety	Obstacle awareness frontale/laterale/inferiore con allarmi; collision avoidance automatico da quotare come funzione separata e validare.	Front/lateral/down obstacle awareness with alerts; automatic collision avoidance to be quoted separately and validated.	Bench + flight
SAF-005	Safety	Strobe e segnalazioni acustiche/visive di arm/disarm, fault HV e rotori attivi.	Strobe and audible/visual indication of arm/disarm, HV fault and active rotors.	Inspection
NVH-001	Vibration	Pedana disaccoppiata tramite isolatori accordati; frequenze proprie separate dalle principali blade-passing frequencies.	Deck isolated by tuned mounts; natural frequencies separated from principal blade-passing frequencies.	Modal test
NVH-002	Vibration	Obiettivo preliminare di vibrazione pesata pedana <=0,5 m/s² RMS in hover nominale, da misurare e concordare secondo ISO 2631-1 come riferimento ergonomico.	Preliminary weighted deck vibration objective <=0.5 m/s² RMS in nominal hover, to be measured and agreed using ISO 2631-1 as ergonomic reference.	Instrumented hover
NVH-003	Vibration	Vibrazione alle impugnature da caratterizzare secondo ISO 5349-1 come riferimento; nessuna risonanza percepibile sostenuta.	Handle vibration to be characterized using ISO 5349-1 as reference; no sustained perceptible resonance.	Instrumented test
DATA-001	Data	Registrazione sincrona >=200 Hz dei parametri flight-critical e >=20 Hz dei dati sistema, con timestamp monotono e export CSV/binary.	Synchronous recording >=200 Hz for flight-critical parameters and >=20 Hz for system data, with monotonic timestamp and CSV/binary export.	Log audit
DATA-002	Data	CAN-FD o Ethernet deterministico per rete primaria; segregazione avionica da telemetria/service.	CAN-FD or deterministic Ethernet for primary network; segregation of avionics from telemetry/service.	Network test
CYB-001	Cybersecurity	Secure boot, firmware firmato, controllo accessi service, audit log e disabilitazione interfacce debug in configurazione volo.	Secure boot, signed firmware, service access control, audit log and debug interfaces disabled in flight configuration.	Security review
MFG-001	Manufacturing	Fornitore con QMS aerospaziale preferibilmente EN/AS9100 o equivalente; dichiarare certificazioni e scope.	Supplier preferably with aerospace QMS EN/AS9100 or equivalent; declare certifications and scope.	Supplier audit

Matrice requisiti 6/6

Requirements matrix 6/6

ID	Area	Italian requirement	English requirement	Verification
MFG-002	Manufacturing	FAI su parti/assiemi critici secondo AS9102C/EN9102 equivalente, con balloon drawing e tracciabilità caratteristiche.	FAI on critical parts/assemblies to AS9102C/EN9102 equivalent, with balloon drawing and characteristic traceability.	FAI review
MFG-003	Manufacturing	Material certificates 3.1 ove applicabili, special process certificates, torque records e serializzazione componenti critici.	Material 3.1 certificates where applicable, special-process certificates, torque records and serialization of critical components.	Quality records
MFG-004	Manufacturing	Tutti i componenti safety-critical con configuration control e lista approved supplier/manufacturer.	All safety-critical items under configuration control with approved supplier/manufacturer list.	Configuration audit
TST-001	Testing	Prove banco motore/rotore/ESC con mappa spinta-potenza-rpm-temperatura e endurance test prima dell’integrazione.	Motor/rotor/ESC bench tests with thrust-power-rpm-temperature map and endurance test before integration.	Test report
TST-002	Testing	HIL con fault injection: IMU, GNSS, motore, ESC, batteria, bus dati, display, sensore quota e comandi pilota.	HIL with fault injection: IMU, GNSS, motor, ESC, battery, data bus, display, altitude sensor and pilot controls.	HIL report
TST-003	Testing	Prima prova di portanza senza persona: rig vincolato / tether con zavorra antropomorfa e protezioni perimetrali.	First lift test without person: restrained/tether rig with anthropomorphic ballast and perimeter protections.	Witnessed test
TST-004	Testing	Volo libero unmanned/ballast prima del volo con pilota; gate di sicurezza firmato da responsabile prove indipendente.	Unmanned/ballast free flight before piloted flight; safety gate signed by independent test authority.	Go/no-go record
TST-005	Testing	Volo con persona solo dopo autorizzazioni, risk assessment, test card, area controllata, rescue plan e PPE definiti.	Human flight only after authorizations, risk assessment, test card, controlled area, rescue plan and defined PPE.	Flight authorization
DEL-001	Deliverables	Fornire CAD 3D nativo + STEP, disegni 2D PDF/DXF, schemi elettrici, harness drawings, software configuration index e BOM as-built.	Provide native 3D CAD + STEP, 2D PDF/DXF drawings, electrical schematics, harness drawings, software configuration index and as-built BOM.	Document review
DEL-002	Deliverables	Fornire analisi massa/CG, FEM, termica, propulsion sizing, safety assessment, FMEA e V&V; matrix.	Provide mass/CG, FEA, thermal, propulsion sizing, safety assessment, FMEA and V&V; matrix.	Document review
DEL-003	Deliverables	Fornire manuale uso prototipo, manutenzione, charging/storage, emergency response e limiti operativi.	Provide prototype operating, maintenance, charging/storage, emergency response manuals and operating limitations.	Document review

Fonti normative e link
Reference sources and links

Source	URL
Regulation (EU) 2018/1139	https://eur-lex.europa.eu/eli/reg/2018/1139/oj
EASA SC-VTOL and MoC hub	https://www.easa.europa.eu/en/document-library/product-certification-consultations/special-condition-vtol
EASA SC-VTOL Issue 2 PDF	https://www.easa.europa.eu/en/downloads/139945/en
EASA MOC-4 SC-VTOL Issue 2	https://www.easa.europa.eu/en/downloads/142240/en
RTCA DO-160	https://www.rtca.org/do-160/
RTCA DO-178C / DO-254	https://www.rtca.org/do-178/
SAE ARP4754B	https://saemobilus.sae.org/standards/arp4754b-guidelines-development-civil-aircraft-systems
UNECE UN Manual Tests and Criteria Rev.8	https://unece.org/transport/publications/un-manual-tests-and-criteria-rev8-2023
IEC 62619:2022	https://webstore.iec.ch/en/publication/64073
ISO 21940-11	https://www.iso.org/standard/54074.html
ISO 2631-1	https://www.iso.org/standard/7612.html
ISO 5349-1	https://www.iso.org/standard/32355.html
SAE AS9102C	https://doi.org/10.4271/AS9102C

ITALIANO

Il presente documento deve essere letto insieme al Technical Drawing Pack e alla Distinta Ordine/BOM. Il costruttore è invitato a rispondere con: (1) compliance matrix; (2) preventivo economico itemizzato; (3) programma tempi; (4) team e certificazioni; (5) assunzioni/deviation list; (6) proposta P0-P6; (7) elenco rischi tecnici; (8) condizioni IP e garanzia.

Regola fondamentale: nessun volo con persona è implicito nella semplice costruzione del prototipo. La transizione al test manned richiede un gate separato, autorizzazioni applicabili, revisione indipendente della sicurezza e test card approvata.

ENGLISH

This document shall be read together with the Technical Drawing Pack and the Order List/BOM. The supplier is requested to respond with: (1) compliance matrix; (2) itemized commercial quotation; (3) schedule; (4) team and certifications; (5) assumptions/deviation list; (6) P0-P6 proposal; (7) technical risk list; (8) IP and warranty terms.

Core rule: human flight is not implied by prototype construction. Transition to manned testing requires a separate gate, applicable authorizations, independent safety review and approved test card.

RFQ issue: Rev A, 22-09-2026. External design frozen. Engineering parameters subject to supplier substantiation.