

H120-P60 PANORAMA AIRSHIP

Bank & Investor Pre-Feasibility Portfolio

Helium lift | 60 panoramic seats | Hamburg-Sylt flagship | Short-route battery derivative

Recommended architecture: 120 m x 25 m semi-rigid helium airship with hydrogen fuel-cell electric propulsion for 150-350 km routes. Battery-electric is retained as a separate <=100 km derivative.

Bank headline	Base planning case
Development programme	EUR 0.52-0.74 bn ROM; not proposed as conventional senior bank debt
First low-rate commercial aircraft	EUR 55-65m target
Mature serial aircraft	EUR 40-50m target
Hamburg-Sylt	195 km planning distance; H2-FC; target average fare roughly EUR 230-280 depending utilisation
Helsinki-Tallinn	85 km planning distance; battery derivative; target average fare roughly EUR 115-140
Commercial launch capital	Illustrative EUR 285m for four aircraft + terminals + spares + working capital

1. Executive summary

The H120-P60 is a proposed 60-seat premium regional airship built around a semi-rigid helium lifting system, an outer panoramic passenger ring, one WC, a dedicated baggage volume, and distributed electric propulsion. It is intentionally not a 1:1 scaled copy of the H350 rigid airship: for this size class, the Zeppelin NT demonstrates that a lightweight semi-rigid structure can carry the main systems efficiently. Zeppelin publishes 75 m length, 8,425 m³ hull volume, 8,050 kg maximum take-off mass, 1,900 kg payload, 125 km/h maximum speed and approximately 1,100 kg load-bearing structure mass. [2][3]

The financing case works only if the project is treated as an aircraft-development programme first and an asset-finance transaction second. Conventional bank debt becomes realistic after certification evidence, supplier pricing, route agreements and insurance/residual-value support exist.

- Base long-route architecture: helium for lift; 120 kg compressed renewable hydrogen feeding ~600 kW aviation fuel cells; ~200 kWh buffer battery; fully electric propulsors.
- Battery-only is rejected as the base Hamburg-Sylt solution because a wind-resilient 195 km mission drives the pack toward ~2.7 MWh and ~12 t in the current conservative screen.
- Battery-electric is attractive on approximately 80-100 km routes. Helsinki-Tallinn is therefore modelled as a separate ~1.3 MWh battery derivative.
- Hamburg-Sylt is a premium flagship route, but current Sylt source-market data make it risky as the sole utilisation base. Helsinki-Tallinn has far stronger volume economics.

2. Product concept and technical screen

Parameter	H120-He60 base case
Configuration	Semi-rigid helium airship; panoramic perimeter seating
Length / diameter	120 m / 25 m
Hull volume	36,596 m ³
Helium allocation	32,205 m ³ (88% screening allocation)
Net helium lift @35 C	31.8 t
Net helium lift @50 C	30.3 t
Preliminary gross mass target	27.8 t incl. 2.0 t growth/operating margin
Seats	60 passengers + 2 crew planning
Cabin	Every passenger has direct outside view; service core contains WC, baggage and systems
Cruise target	~100 km/h on premium regional route

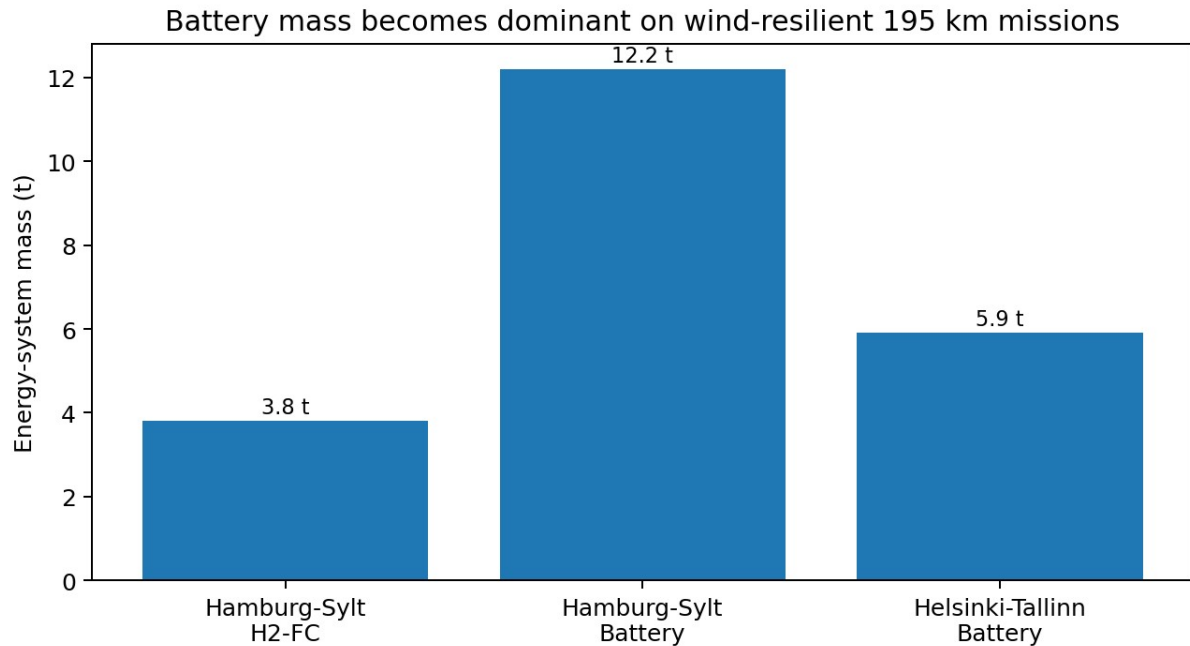
Parameter	H120-He60 base case
Maximum-speed target	~125-130 km/h, subject to CFD / control / power closure

The buoyancy calculation uses the same ideal-gas / 250 Pa overpressure screening logic used in the internal H350 v1.3 theory-closure model, but substitutes helium for hydrogen lift gas. It is a pre-feasibility calculation, not a certified buoyancy or envelope design. [1]

Preliminary mass group	t
Semi-rigid primary structure / keel	3.8
Envelope, ballonets, gas-management	3.4
Tail and controls	1.2
Panorama cabin, seats, WC, baggage structure	3.6
60 passengers + 2 crew + baggage	6.2
Motors, pods, props, inverters	1.3
H2 hybrid energy system	3.8
Avionics, safety, electrical	0.9
Mooring / landing / ground handling equipment	0.8
Water / waste service mass	0.3
Wiring / integration / miscellaneous	0.5
Growth and operating margin	2.0

The mass budget is intentionally benchmarked against the Zeppelin NT rather than obtained by simple cubic scaling from H350. The envelope, panoramic cabin, distributed propulsion, hydrogen tanks and 60-seat evacuation architecture still require independent design verification; a bank should treat the 27.8 t value as a target, not as established aircraft mass.

3. Propulsion decision: battery vs hydrogen



Criterion	H2 fuel-cell hybrid	Battery-only
Hamburg-Sylt 195 km	Recommended	Not recommended as base case
Energy-system mass	~3.8 t base allocation	~12.2 t in 30 km/h headwind + reserve sizing
Base hull	120 x 25 m	Iterates toward ~120 x 28 m+ to recover hot-day lift margin
Energy cost	Higher: ~EUR 600-850/leg at EUR10/kg H2 depending wind	Lower: roughly EUR 175-250/leg at EUR0.15/kWh
Turnaround	Fast refuel target; aviation H2 station required	High-power charging and battery thermal/cycle management
Certification challenge	H2 tanks, leak detection, fuel-cell integration	Large traction battery, thermal runaway containment
Best role	150-350 km regional missions	Dedicated <=100 km shuttle

For Hamburg-Sylt, the no-wind mission is approximately 1.16 MWh electrical. With a 30 km/h headwind and a 30-minute cruise-power reserve, the planning requirement rises to about 1.93 MWh usable. At an 80% usable state-of-charge window this implies roughly 2.4 MWh before allowing for the larger battery hull; iterating the larger hull and drag pushes the screen to about 2.7 MWh and 12 t at 220 Wh/kg pack level.

The H2 case carries 120 kg compressed hydrogen. DOE system studies show large 350-bar systems in the 5-7% gravimetric-capacity range; the bank model deliberately uses 6%. ZeroAvia reported >1.0 kW/kg net full-system fuel-cell specific power including thermal management in 2025. [10][11][12]

Hydrogen combustion is not the preferred third option. It keeps the hydrogen storage and safety burden but sacrifices the electrical efficiency and distributed-electric architecture advantages. Airbus publicly presented a fully electric fuel-cell hydrogen concept in 2025, reinforcing the direction of travel for zero-emission hydrogen propulsion. [15]

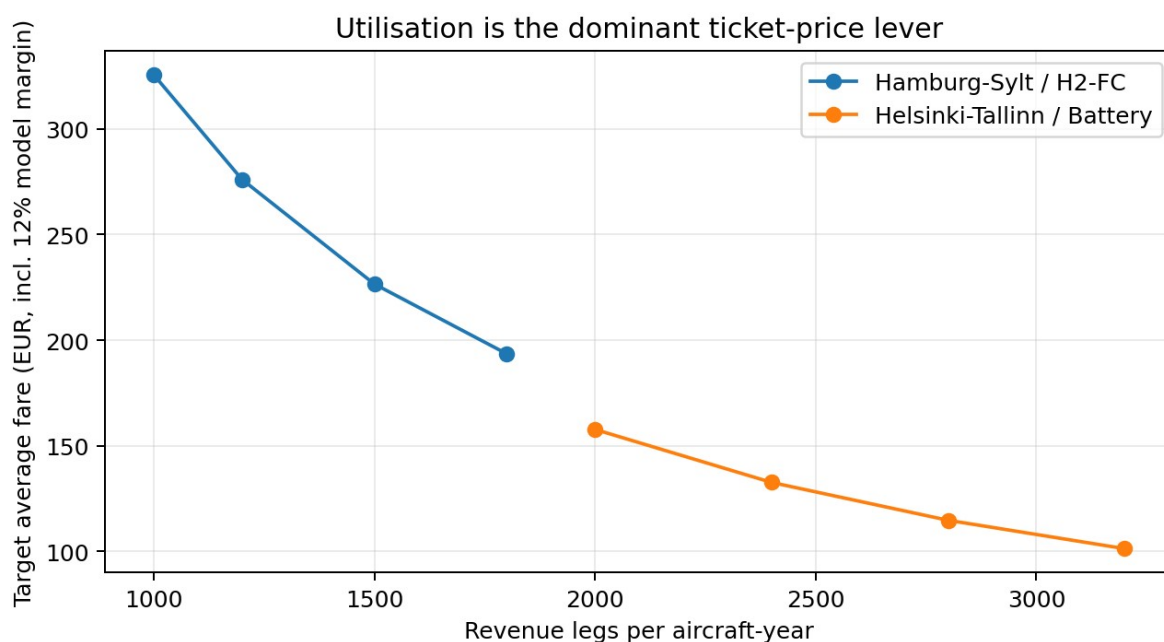
4. Route portfolio

Route	Market evidence	Energy	Fare screen	Bank interpretation
Hamburg-Sylt	Sylt recorded 918,668 guests in 2024; Hamburg represented 8.1% of published domestic source markets. Train is about 3 h; fastest published connection ~3 h 10 min. [4][5]	H2-FC	EUR 230-280	High-yield flagship; standalone demand capture is the main weakness
Helsinki-Tallinn	7.5m route passengers in 2025; Tallink crossing 2 h and up to six departures each way/day. [6][7]	Battery	EUR 115-140	Strongest first high-utilisation bank case
Stockholm-Visby	1.758m Gotland ferry passengers in 2025. [8]	H2-FC	EUR 190-230	Strong island corridor; airline competition needs primary research
Hamburg-Helgoland	Tourism / seasonal corridor	H2-FC	EUR 160-220	Showcase and utilisation filler rather than core underwriting route

5. Hamburg-Sylt flagship economics

The model uses 195 km planning distance (above the roughly 185 km straight-line city-to-city distance) and 100 km/h airspeed. The direct flight is about 1.95 h in still air before terminal manoeuvring. A 30 km/h headwind increases airborne time to about 2.79 h, which is why the propulsion decision cannot be based on a still-air battery calculation alone.

Revenue legs / aircraft-year	Passengers @75% LF	All-in model cost	Break-even avg fare	Target avg fare
1,000	45,000	EUR 12.7m	EUR 284	EUR 326
1,200	54,000	EUR 13.0m	EUR 240	EUR 276
1,500	67,500	EUR 13.4m	EUR 197	EUR 227
1,800	81,000	EUR 13.8m	EUR 168	EUR 194



Recommended bank fare assumption for Hamburg-Sylt: use EUR 250-270 average realised fare until the operator demonstrates >1,400 revenue legs per aircraft-year. Do not underwrite the route at EUR 180-200 in the first financing case.

Demand is the bigger issue than energy. At 1,200 legs/year and 75% load, one aircraft needs 54,000 passenger segments (about 27,000 round trips). Compared only with the published Hamburg-origin share of Sylt guests, this implies a high capture rate. The route becomes more credible if the catchment includes transfers into Hamburg, premium day-trip demand, charter work and a second North Sea route.

6. Helsinki-Tallinn volume economics

Helsinki-Tallinn is the cleaner bank story. The 2025 route carried about 7.5 million passengers. A single 60-seat aircraft flying 2,400 legs/year at 75% load carries 108,000 passenger segments - only about 1.4% of the existing route volume. [6]

Revenue legs / aircraft-year	Passengers @75% LF	All-in model cost	Break-even avg fare	Target avg fare
2,000	90,000	EUR 12.7m	EUR 137	EUR 158
2,400	108,000	EUR 12.9m	EUR 115	EUR 133
2,800	126,000	EUR 13.2m	EUR 99	EUR 115
3,200	144,000	EUR 13.5m	EUR 87	EUR 101

Recommended bank fare assumption for Helsinki-Tallinn: EUR 125-135 average realised fare at ~2,400 legs/year. This is a premium to ferry pricing and therefore requires a willingness-to-pay study, but the market-share requirement is small.

7. Cost structure and what drives the ticket price

Input	Bank model base	Comment
Mature H2 aircraft price	EUR 55m	Sensitivity should include EUR 45m / 65m
Battery short-route aircraft price	EUR 52m	Concept-stage ROM
Capital recovery charge	10.5% of aircraft price / year	Proxy for blended debt/equity/lease economics
Delivered renewable H2	EUR 10/kg	Sensitivity EUR 7 / 10 / 14; EU renewable production average was EUR 6.71/kg in 2024 before delivery/compression. [10]
Terminal electricity	EUR 0.15/kWh	Sensitivity EUR 0.10 / 0.15 / 0.25
2025 generic Li-ion pack price	\$108/kWh average	Not an aviation-certified pack price; aviation integration will be materially higher. [9]
Load factor	75%	Sensitivity 65-85%
Distribution / payment	4% of passenger revenue	Model assumption

The model intentionally does not sell the project on cheap energy. At mature utilisation, aircraft capital recovery, insurance, maintenance, staffing and terminal utilisation dominate. Fuel price is second-order compared with dispatch reliability and annual revenue legs.

8. Financing strategy and bank ask

A conventional bank should not be asked to finance the entire new-aircraft development programme as ordinary senior debt. The financing should be split into development capital and post-certification asset / route finance.

Development workstream	ROM low	ROM high
Certification-basis / digital engineering / subscale	EUR 25m	EUR 40m
Full-scale technology demonstrator	EUR 80m	EUR 120m

Development workstream	ROM low	ROM high
Conforming prototypes + ground/flight test	EUR 180m	EUR 250m
Certification engineering / organisation / suppliers	EUR 100m	EUR 140m
Industrialisation, tooling, production readiness	EUR 90m	EUR 130m
Programme contingency	EUR 40m	EUR 60m
Total	EUR 515m	EUR 740m

A credible first bank meeting would therefore request an indicative financing framework, not a EUR 500m unsecured loan. Early development capital should be predominantly sponsor/strategic equity, public R&D support and industrial partner capital. Senior debt becomes meaningful after type-certification risk has fallen.

Illustrative post-certification launch fleet	EURm
4 low-rate aircraft (3 revenue + 1 reserve)	220
Two terminal pairs / initial ground infrastructure	35
Spares, training, tooling at bases	10
Working capital / ramp reserve	20
Total	285

Illustrative capital stack	Share	EURm
Senior debt / aircraft lease	45%	128.2
Strategic / sponsor equity	30%	85.5
Public support / guarantees / grants	15%	42.8
Vendor / subordinated / other	10%	28.5

Bank-facing ask: discuss up to ~45% senior debt / aircraft lease for the post-certification fleet, subject to certification, insurance, route rights, supplier contracts and minimum-revenue / offtake evidence. Keep development financing outside that senior-debt case.

9. Certification and development roadmap

EASA lists airships under CS-30 / CS-31HA product material and maintains the Zeppelin LZ N07-100 type certificate. Novel electric/hybrid propulsion is covered through SC E-19, and unusual design features can trigger Part-21 special conditions. The combination of a large semi-rigid passenger airship, high-voltage electric propulsion and hydrogen fuel therefore requires early authority engagement rather than assuming an off-the-shelf certification path. [13][14]

Phase	Objective	Duration planning	Gate
A	Independent aero/mass closure; certification basis; P100/P20 demonstrators	18-24 mo	Independent design review + authority pre-application
B	Full-scale structural, envelope, propulsion and mooring rigs	18-30 mo	Critical Design Review
C	First full-scale technology demonstrator	24-36 mo	Flight envelope expansion
D	Conforming aircraft / certification campaign	30-48 mo	Type certificate + production approval path
E	Low-rate production and route proving	12-24 mo	Commercial entry into service

10. Principal bank risks and mitigations

Risk	Why it matters	Bank mitigation / evidence required
Mass growth	Buoyant aircraft have a hard lift ceiling; a few tonnes can erase hot-day margin	Independent mass-properties audit; 15% subsystem margin through CDR; supplier-weight guarantees
Wind / dispatch	Headwind materially changes block time and energy; crosswind drives ground handling	12-month route wind study; demonstrated mooring limits; conservative schedule completion assumptions
Certification	Novel H2-electric passenger airship lacks a simple precedent	Early EASA certification-basis agreement and staged special-condition closure
Demand / yield	Hamburg-Sylt needs a meaningful premium passenger share	Independent willingness-to-pay survey; pre-sales / tour operator agreements; route diversification
Residual value	New airframe class has no established secondary market	OEM buyback / lessor support / ECA or guarantee; conservative amortisation
Hydrogen supply	Price and station availability are not yet airline-standard	Long-term delivered-H2 contract; dual supplier design; on-site buffer storage
Helium supply	Helium is inert and reusable but globally constrained	Multi-year supply contract, envelope leak-rate guarantee, recovery during maintenance

Risk	Why it matters	Bank mitigation / evidence required
Production scale	Low-rate aircraft may cost far above target	Fixed-price supplier LOIs and production learning curve validated before debt draw

11. Recommended bank case

Do not pitch "a 60-seat zeppelin replacing buses" as the bank case. Pitch a premium regional mobility platform with two energy variants and a staged certification / asset-finance structure.

- Product: H120-P60, 120 m x 25 m H2-FC base, semi-rigid helium lifting system, 60 panoramic seats, WC and baggage.
- Flagship: Hamburg-Sylt, target average realised fare EUR 250-270 initially, supported by charter / North Sea utilisation rather than treated as the sole route.
- Volume proof: Helsinki-Tallinn battery derivative, target average realised fare EUR 125-135 and <2% share of the existing 7.5m-passenger market at the modelled utilisation.
- Financing: EUR 0.52-0.74bn development programme financed mostly by equity, public support and industrial partners; senior bank/lease capital applied mainly to certified revenue aircraft and terminals.
- Immediate next gate: independent pre-feasibility study that closes mass, drag, wind dispatch, evacuation, ground handling and certification basis before any debt solicitation.

References

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Important limitation

This portfolio is a pre-feasibility financing model, not a certified aircraft design, supplier quotation, valuation, investment recommendation or credit approval. No full CFD, nonlinear structural analysis, evacuation demonstration, wind-tunnel campaign, full-scale prototype flight test, EASA certification-basis agreement, insurance quotation or route willingness-to-pay survey has yet been completed for H120-P60. All ROM costs and mass allocations must be independently verified before external financing is sought.