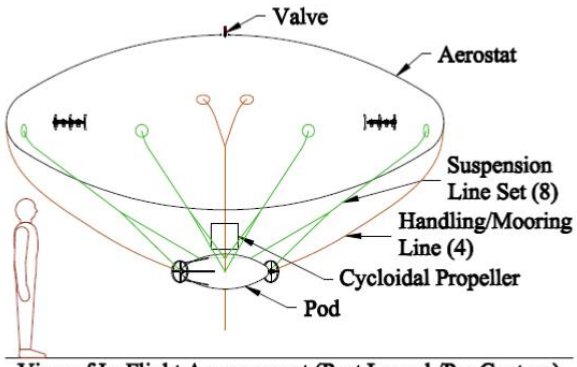
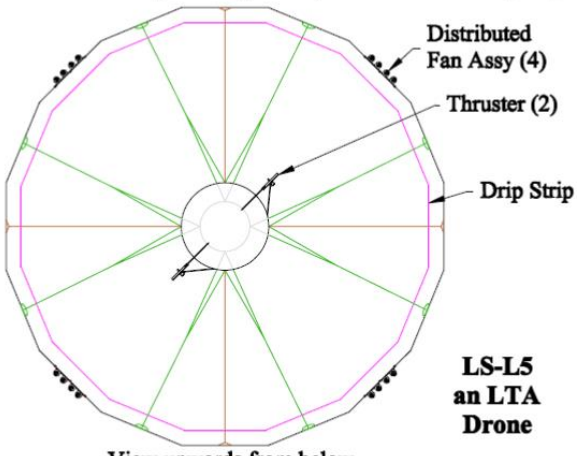
# LS-L5 an LTA Drone

Shown right, the LS-L5 is a new lighter-than-air (LTA) technology drone (an unmanned buoyant aircraft) for long endurance/range aerial duties as a carrier of various things. It was designed for safe steady low-energy automated operation enabling various unmanned air mobility (UAM) services such as: package delivery, survey and air support.



View of In-Flight Arrangement (Post Launch/Pre Capture)



View upwards from below

**Key Aspects – simple, safe, quiet, versatile:**

- An omni-directional (O-D) buoyant aircraft for simple operation like helicopters (always upright).
- Low drag soft variable-geometry lenticular aerostat.
- Quiet operation, able to routinely fly silently as an un-powered free balloon with similar safe characteristics.
- Stable flight with pseudo VTOL capability and autonomous or R/C operation.
- Able to hold position, course, attitude, height & heading against variable winds.
- Doesn't need aerodynamic stabilisers, elevators or rudders – controlled with thrust.
- Reactive vectored thrust, able to switch to any direction at full power in a moment.
- Fixed when moored and easily cloaked for protection when parked.
- Compact – smaller than unidirectional (UD) airships.

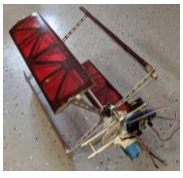
**Role:** The LS-L5 was arranged as a drone for aerial duties carrying disposable loads up to 10 kg. Propeller thrust is used for position holding, orientation, height & flight control purposes. A lower central line system is used to pick-up, port and set payloads of say 7 kg down. It also may be fitted with cameras and sensors to suit other roles and can be a carrier plus charging station for small nonbuoyant drones deployed and recovered in flight.

**General specification:**

| | |
|---|---|
| Gas fill / Overall aerostat volume | 22 cu m (776.9 cu ft) / 24 cu m (847.6 cu ft) |
| Aerostat principal dimension across | 5 m (16.404 ft) |
| Aerostat height when full | 2 m (6.562 ft) |
| Overall aircraft height | 3 m (9.84 ft) |
| Payload / Disposable load | 7 kg (15.43 lb) / 10 kg (22.04 lb) |
| Propulsion | Electrically driven cycloidal propeller, thrusters and vertical fans |
| Altitude | Up to 121.92 m (400 ft) above ground arrangements |
| Endurance/Range | Min 5 hours/200 km - unlimited as a free balloon |

**Operation:**

The LS-L5 is an unmanned O-D mini airship for various aerial duties without assistance. It thus is a free flying aircraft using buoyancy from the atmosphere to mainly support all-up weight. A single cycloidal propeller (CP, shown right) mounted axially atop the lower suspended pod as a propulsion unit provides 360º rapid response vectored thrust via a computerised control system. This enables flight in, or position to be held against gusts from, any horizontal direction. Low suspended weight pendulum stability (as for balloons) dominates to keep it upright. Lift (up or down) is caused by 4 equi-spaced distributed airflow fan units around the aerostat, which control height and attitude (pitch & roll) enabling payloads to be picked up or set down vertically. Twin pod mounted thrust units then control orientation (yaw) and boost airspeed underway.



The fan units also may be used to counter any differences between all-up weight and buoyancy experienced. Otherwise, during flight with airspeed, the propeller/fan systems may be used to control attitude (pitch and/or roll) for aerodynamic lift development on the aerostat (up or down).

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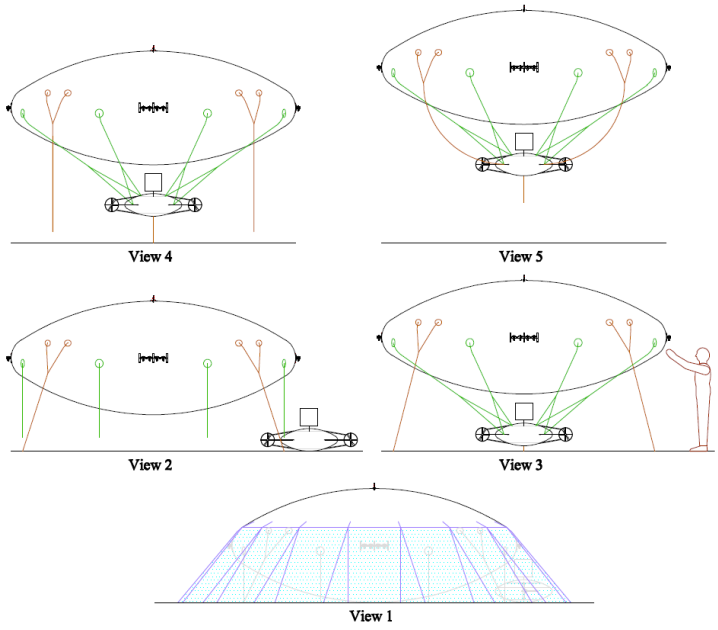
Under power the LS-L5 thus functions like helicopters or multi-rotor drones, but with all-up weight primarily countered by buoyancy – also enabling flotation in the atmosphere (as a gas balloon) without power. Power (an $H_2$ fuel cell) thus mainly is only needed for translation and control, enabling significantly longer endurance while underway than is possible for most nonbuoyant aircraft.

At ground level it will be moored by four lines, as shown right (view 3), fixing it. The mooring lines also may be used to elevate or haul the aerostat down against aerostatic lightness, enabling pod installation or removal (view 2) and subsequent cloaking (view 1) for protection next to the ground. In addition, the mooring arrangement safely enables secured inflation with LTA gas or deflation without a net.




After adjusting all-up weight (adding or removing ballast) to the value desired for flight (usually near equilibrium) and since the LS-L5 already will be mainly airborne (so floating) launch is a simple matter of releasing the mooring lines (view 4), stowing them and releasing it into flight (view 5). Launch thus may be with or without power, applied subsequently (as desired) to control flight.

Capture is undertaken by causing the LS-L5 to descend to a level within reach and then catching a handling line, when it then may be held for subsequent mooring or re-launch. If for any reason it won't descend for capture then, by remote operation of a valve atop the aerostat, some gas may be vented to reduce atmospheric displacement and thus buoyancy (causing an aerostatically heavy state) when it will descend as free balloons do due to excess weight. Descent will be like a parachute in a gentle way.

Operators may expect a practical, easily maintained, durable aircraft with low acquisition and operating costs that also works as a parasol or umbrella. It should allow them to expand their services and create new markets. It will be quick to set up and deploy (less than 1 hour out of the box), easy to manage on the ground (1 person) and simple R/C operation (like existing drones). It's not a toy but will be a joy!

It should also be noted that the design scales up easily for much bigger versions.

**Current status**

From the drawings in this leaflet, it should be clear that the design and concept of operation have been established. We also have built and ground tested a prototype (Belinse) as shown right. We thus are ready for flight test to further evaluate, rationalise and prove the design for series manufacture plus gain approval from the authorities as well as potential customers/operators. The prototype also includes the world's first commercial CP and incorporates new unique Net Zero e-systems, leading the way for sustainable minimum energy aviation.

**LS-L5-1 (Belinse)**

The design also has pedigree, where it's based on experience gained from previous arrangements. Further types already tested are shown in the below website.

Being a relatively small unmanned aircraft, the LS-L5 is readily doable as a garage project within a short time without great cost. It's intended for business purposes with hundreds produced to enable sustained growth and bigger types, also as outlined in the below website.

To participate in the development, invest, enquire or register interest and discuss requirements, contact us as below.

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