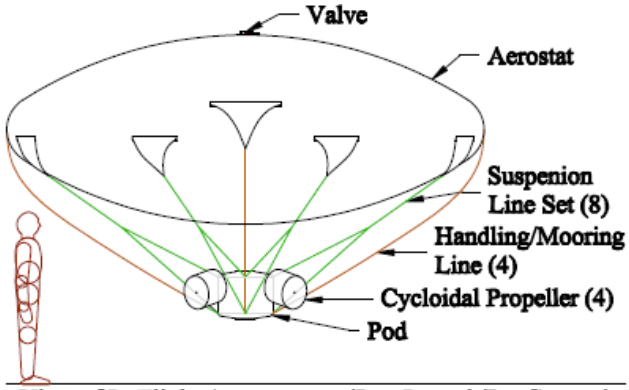
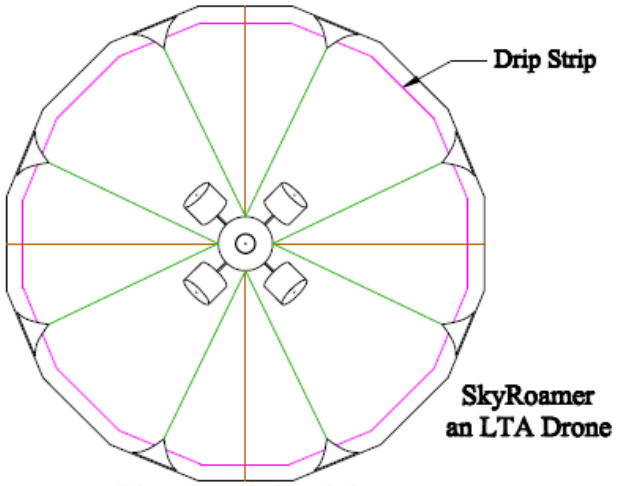
LS-L5 an LTA Drone

Introduction

Depicted right, the LS-L5 is a new LTA drone for aerial services similar to HTA drones, but with long endurance and capability as a carrier of them. It was designed for safe operation to provide interest and lasting coverage at events.



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



View upwards from below

Key Aspects – simple, safe, quiet, versatile:

- An omni-directional motorised gas balloon for simple operation like helicopters (always upright).
- Low drag variable geometry lenticular aerostat.
- Quiet operation, able to routinely fly silently as an un-powered free balloon.
- Stable flight characteristics with pseudo VTOL capability and autonomous or R/C operation.
- Able to hold station, altitude, attitude and heading against light 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 or storage.
- Compact (smaller than unidirectional airships).

Role: Configured with a variable geometry lenticular aerostat (no main chamber ballonet), the LS-L5 was arranged as a drone for light aerial duties carrying disposable loads up to 10 kg. Propeller thrust is used for position holding, orientation, height & flight control purposes. A lower line system may be installed to pick-up, port and set small payloads of say 2 kg down. It also may be fitted with cameras and sensors to suit other roles, and may be used as a carrier for small heavier-than-air 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	4 electrically driven cycloidal propellers
Altitude	Up to 121.92 m (400 ft) above ground arrangements
Endurance	Min 5 hours

Operation:

The LS-L5 is an omni-directional unmanned mini airship as a drone to fulfil aerial duties without assistance. With a lenticular aerostat it therefore is a free flying lighter-than-air aircraft using buoyancy from the atmosphere to primarily support all-up weight. Four cycloidal propellers radiating equi-spaced around its lower suspended pod function together as a single propulsion method via a computer system, providing full control over all possible six degrees of freedom movement. Pendulum stability from low suspended weight (as for balloons) dominates to keep it upright. The propulsion system is used to propel it in any direction in a similar way to space craft. The propellers also may be used to counter any differences between all-up weight and buoyancy experienced. Otherwise, during flight with airspeed, the propulsion system may be used to control attitude (pitch and/or roll) for aerodynamic lift development on the aerostat (up or down).

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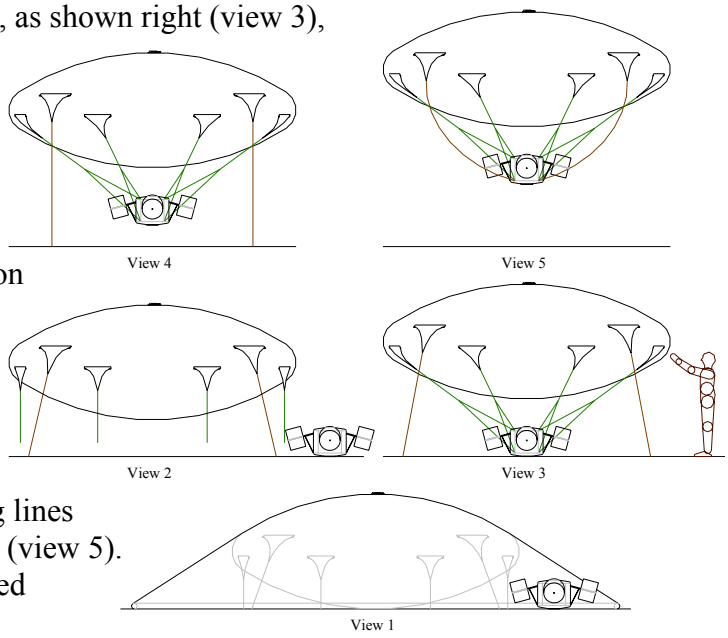
The LS-L5 thus will fly in a similar way to helicopters or multi-rotor drones, but with all-up weight primarily countered by buoyancy – also enabling flotation in the atmosphere (as a gas balloon) without power. Power thus mainly is only needed for translation and control, enabling significantly longer endurance while underway than is possible for most heavier-than-air aircraft with equivalent weight.

At ground level it will be moored using 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 may be held for subsequent mooring or re-launch. If for any reason it cannot be made to descend for capture then, by remote operation of the valve atop the aerostat, 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 then will be like a parachute in a gentle way.

Operators may expect a practical, easily-maintained 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 similar to existing drones. It's not a toy, but will be a joy!

Current status

From the drawings in this leaflet it should be clear that the basic design and concept of operation have been established, so ready to be taken up for development through production of prototypes to test, evaluate, rationalise for series manufacture and enable approval or acceptance by the authorities plus potential customers & operators. The design also has pedigree, where it's based on experience already gained from previous arrangements such as the LS-L2 (depicted right). Further types already tested are shown in the below website.

LS-L2-1

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