

Egan Airships - PLIMP drone and Model J

Peter Lobner, updated 10 March 2022

1. Introduction

Seattle-based Egan Airships was founded in 2012 by James Egan with support from his twin brother Joel, with the goal of designing and building a winged blimp; a vehicle with dynamic wings that would fly like a semi-buoyant airplane. They collaborated with Dr. Dan Raymer, an aerospace engineer widely recognized as an expert in aircraft conceptual design, design engineering, and configuration and layout. Dr. Raymer had previously had worked with Ohio Airships to help develop their designs for the Dynalifter semi-buoyant aircraft. From this collaboration, Egan Airships produced the semi-buoyant, plane-blimp hybrid known as the PLIMP airship ("Plimp" is a trademark of



Egan Airships). A key safety feature of a PLIMP airship is its "plummet proof" ability to descend gently to the ground if propulsion power is lost in flight.

In an interview, CEO James Egan said, "I believe the novel PLIMP airship has value worldwide for offering a stable platform that comes down slowly if unpowered, is highly visible to other aircraft and to people on the ground, ...(carries) large payloads, and can travel over 100 mph and cruise at 80mph.....Because of the slow descent, high visibility, non-flammable lifting gas and bullet-indifferent skins, applications include military, border patrol, search and rescue, organ transplant delivery, cargo delivery, advertising, cell phone data relay, and more." Helicopters will be the primary competition for PLIMP airships in these markets, where the significantly lower purchase price and operating cost of a PLIMP airship should be an advantage.

The Egan Airships website is here: <https://plimpairships.com>

An Egan Airships promotional video, with actual video clips of its currently-flying PLIMP Model D drone airship and animations of the upcoming Model J passenger-carrying airship, is at the following link: https://www.youtube.com/watch?v=NNnRnwJ_KEQ

2. Egan patents

The PLIMP airship is a new class of airship that is covered by 14 patents. The key patent is US 2016/0137281 A1, “Hybrid VTOL vehicle,” which you can read here:

<https://patents.google.com/patent/US20160137281>

Besides U.S. patent protection, Egan Airships has established patent protection in Japan, China, Europe, Brazil and Australia, with other regions pending.

Patent US 2016/0137281 A1 describes a PLIMP as follows:

“A hybrid VTOL vehicle having an envelope configured to provide hydrostatic buoyancy, a fuselage attached to the envelope and having at least one pair of wings extending from opposing sides thereof to produce dynamic lift through movement, and a thrust generation device on each wing and configured to rotate with each wing about an axis that is lateral to a longitudinal axis of the envelope to provide vertical takeoff or landing capabilities. Ideally, the envelope provides negative hydrostatic lift (is semi-buoyant) to enhance low-speed and on-the-ground stability.”

The general configuration of a PLIMP (100) is shown in Patent US 2016/0137281 A1 Figures 2, 3, 5 & 10. The aerostatic lift from helium in the gas envelope (102) provides about 60% of total lift. Ballonets (136) within the main hull function like the ballonets in a conventional blimp, and are used to adjust overall buoyancy or fore-and-aft trim.

Propulsive lift and horizontal thrust are provided by two electrically-driven propulsors (122) mounted amidships on vectorable stub wings (104 & 106).

Aerodynamic lift in forward flight is generated by the stub wings and the horizontal stabilizer (114).

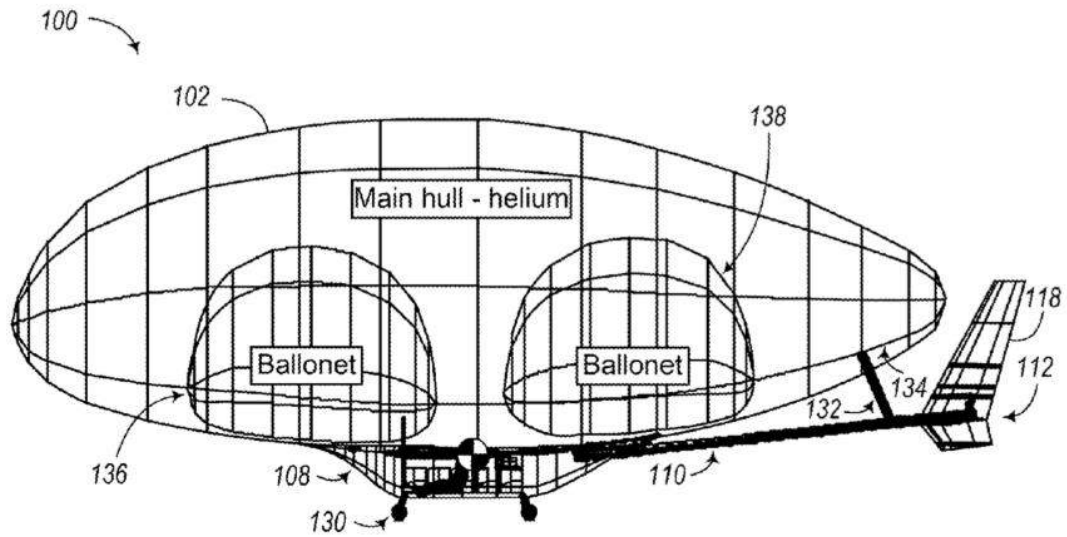


FIG. 2

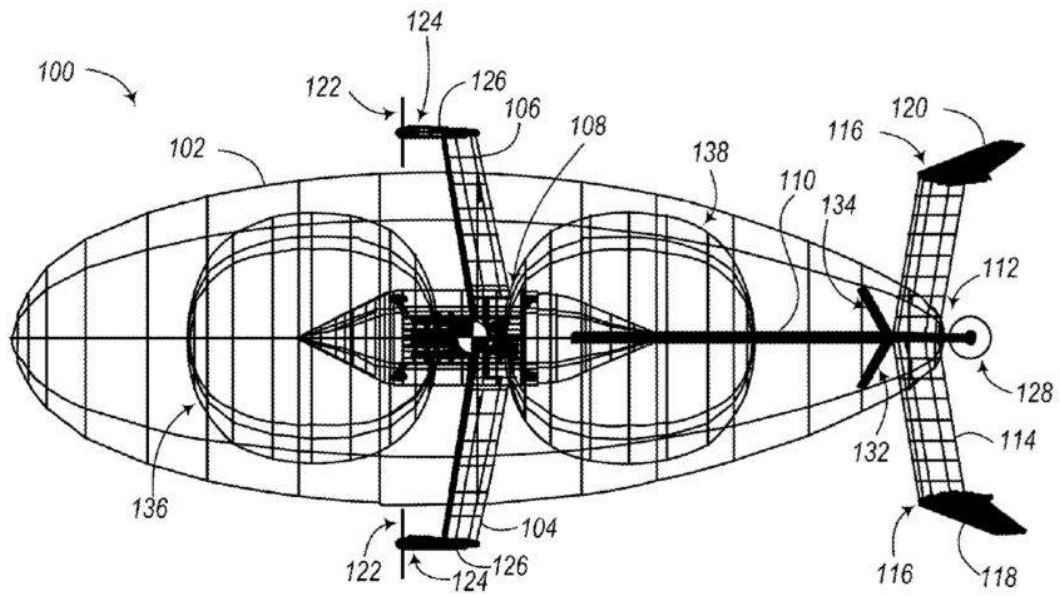


FIG. 3

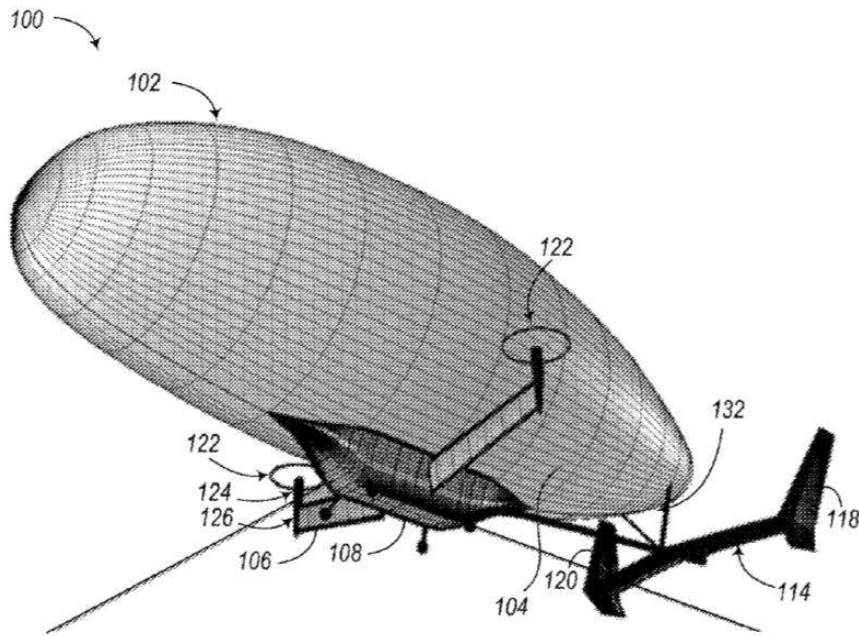


FIG. 5

An orbital tail rotor (128) is mounted to rotate about a horizontal axis as well as pivot about a transverse axis to aid in controlling directional movement of a PLIMP airship about all three axes of control (pitch, roll, and yaw).

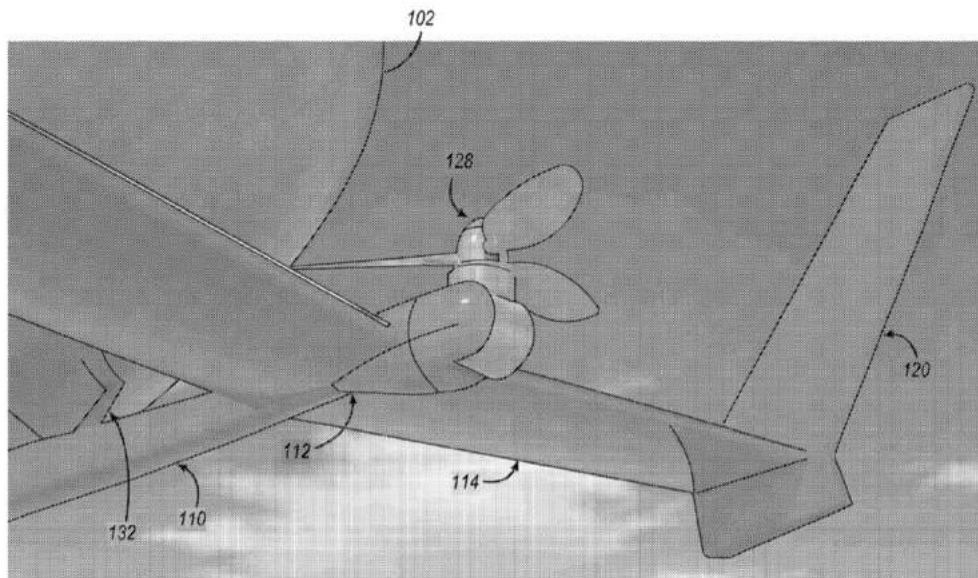


FIG. 10

3. The PLIMP Model D semi-buoyant drone airship

The Model D drone is a small, remotely-piloted, semi-rigid, semi-buoyant, hybrid airship intended for conducting a wide variety of relatively short range surveillance missions that can be accomplished under FAA line-of-sight flight rules. The Model D drone was announced in September 2017 and made its debut in September 2018 at the InterDrone exhibition in Las Vegas, NV. The Model D drone's mission flexibility is enhanced by a standard payload interface for a variety of sensor packages, such as:

- Electro-optical (EO) / Infrared (IR) cameras
- Multispectral camera systems
- Communication relays
- Sensors for agriculture, pipeline, and power transmission line inspection



PLIMP Model D drone airship in flight. Source: Egan Airships

The Model D drone's gas envelope supports about half the weight of the semi-buoyant drone. The envelope is constructed from Tedlar (polyvinyl fluoride) material, which is stiff enough to maintain its shape at high speeds, is puncture resistant and resilient to deterioration from ultraviolet (UV) rays and inclement weather.

The Model D drone's lightweight airframe is made of carbon composite materials. Propulsion and vertical lift are provided by means of two electrically-powered vectorable, shrouded propulsors mounted amidships on stub wings that rotate along with the propulsors.

General characteristics of the Model D drone airship

Parameters	Plimp Model D
Length	28 feet (8.5 m)
Diameter, gas envelope	7 ft (2.1 m)
Weight	55 lb (25 kg)
Power source	Lithium-ion rechargeable batteries
Speed, cruise	30 mph (48 kph)
Speed, maximum	40 mph (64 kph)
Speed, power-off descent	9 mph (14.5 kph)
Payload, max	14 lb (6.4 kg)
Endurance	1 hour at cruise speed with a 5 lb (2.3 kg) payload
Altitude, max	500 ft (152 m)
Range, max	Line-of-sight up to 3 miles (4.8 km); total distance flown up to 20 miles (32 km)

The Model D drone is in the process of FAA approval and should be registered by the FAA under the Small Aircraft Regulations (Part 107). Exemptions for FAA approval to operate over people and at night also are in process.

You can watch short videos of the Model D drone in flight on the Egan Airships website at the following link:

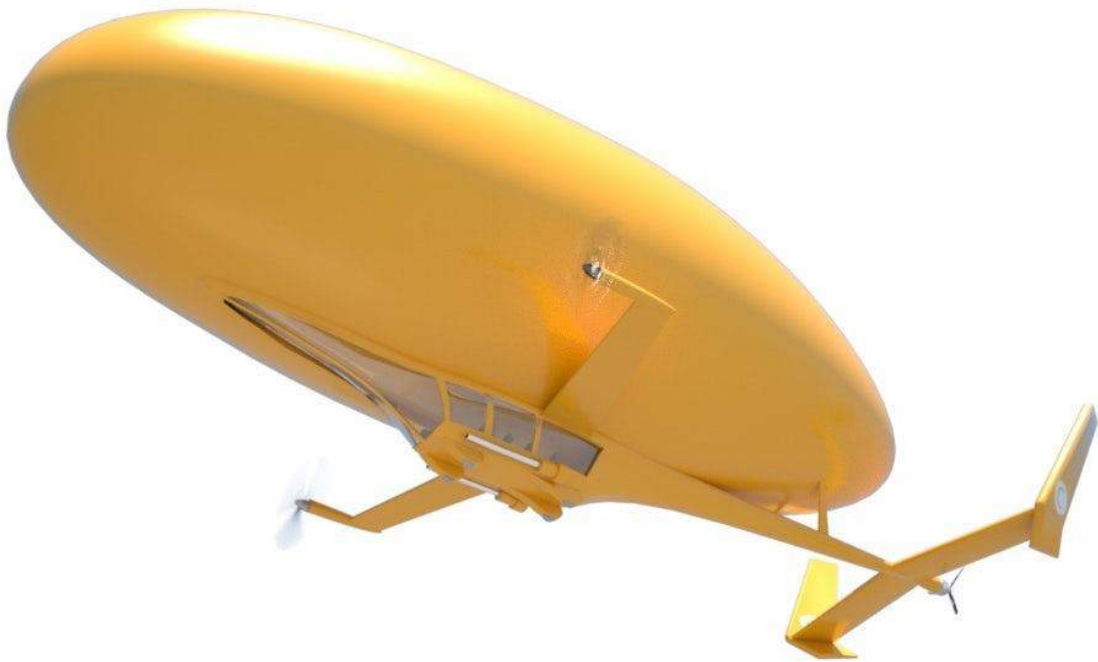
<https://plimp.com/videos/>

The basic design of PLIMP airships is scalable from the Model D drone to larger air vehicles.

4. The PLIMP Model J semi-buoyant passenger airship

In November 2018, Egan Airships announced that the firm, in collaboration with Dr. Raymer, was developing a scaled-up, passenger-carrying version of the PLIMP airship, to be known as the Model J. Egan Airships describes its Model J as follows:

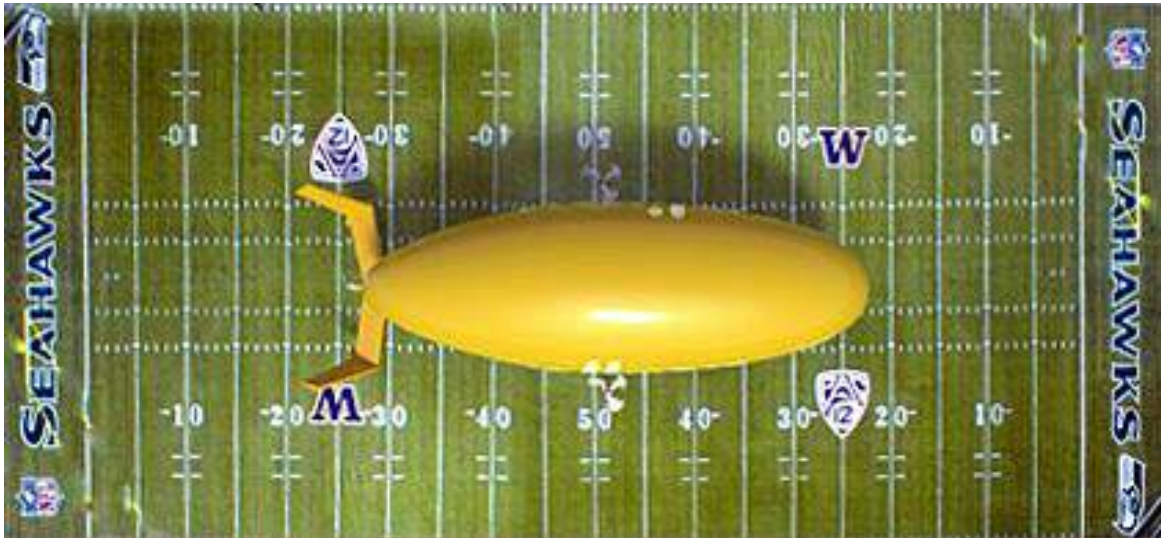
“...It can carry up to 8 passengers or 2,000 lbs (of cargo) in its spacious cabin, which can easily be reconfigured to enable any number of tasks or payloads. The nature of this aircraft is to provide a smooth and quiet ride; it is literally floating on air. This airship can travel fully laden at over 80 mph and offers an aloft cruising time of over five hours with a range of over 320 miles. With its vertical takeoff and landing it can lift off or touch down just about anywhere. Although the envelope is filled with helium, the Model J is heavier than air and won't just float away. In addition, the envelope provides buoyancy, so if you do turn the engines off the Model J gently floats down to the ground. Plus, operational costs are minimal when compared to a traditional helicopter.”



PLIMP Model J airship. Source: Egan Airships

General characteristics of the Model J passenger airship

Parameters	Plimp Model J
Length	169 feet (51.5 m)
Wingspan	61 ft (18.6 m)
Height	54 ft (16.5 m)
Power source	Hybrid gas / electric system
Speed, cruise	63 mph (101 kph)
Speed, maximum	93 mph (150 kph)
Speed, power-off descent	9 mph (14.5 kph)
Payload, max	10 people (2 crew + 8 passengers) or 2,000 lb (907 kg) of cargo; designed to carry a standard LD3 container (standard airline half-width, lower deck container)
Endurance, full payload	3 hours at 86 mph (138 kph), or 5 hours at 65 mph (105 kph)
Endurance, empty	More than 20 hours
Range, max	Up to 1,300 miles (2,092 km)



Scale of a Model J airship. Source: Egan Airships

The Model J airship has a gross weight of about 9,500 lb (4,309 kg). When the gas envelope is inflated with helium, the aerostatic lift provides about 58% of the total lift, making the net weight of the semi-buoyant airship about 4,000 lb (1,814 kg) on the ground. For vertical takeoff and landing (VTOL) and hovering, the additional lift required is provided by two electric motor-driven propellers mounted amidships

on vectorable stub wings that have been rotated vertically. In forward flight, the stub wings are rotated horizontally and the propellers generate thrust for forward flight. During horizontal cruise flight, the stub wings and the horizontal tail surface generate aerodynamic lift to keep the airship airborne.

The takeoff profile for a PLIMP is described in Fig. 14 of Patent US 20160137281 A1, which is reproduced below.

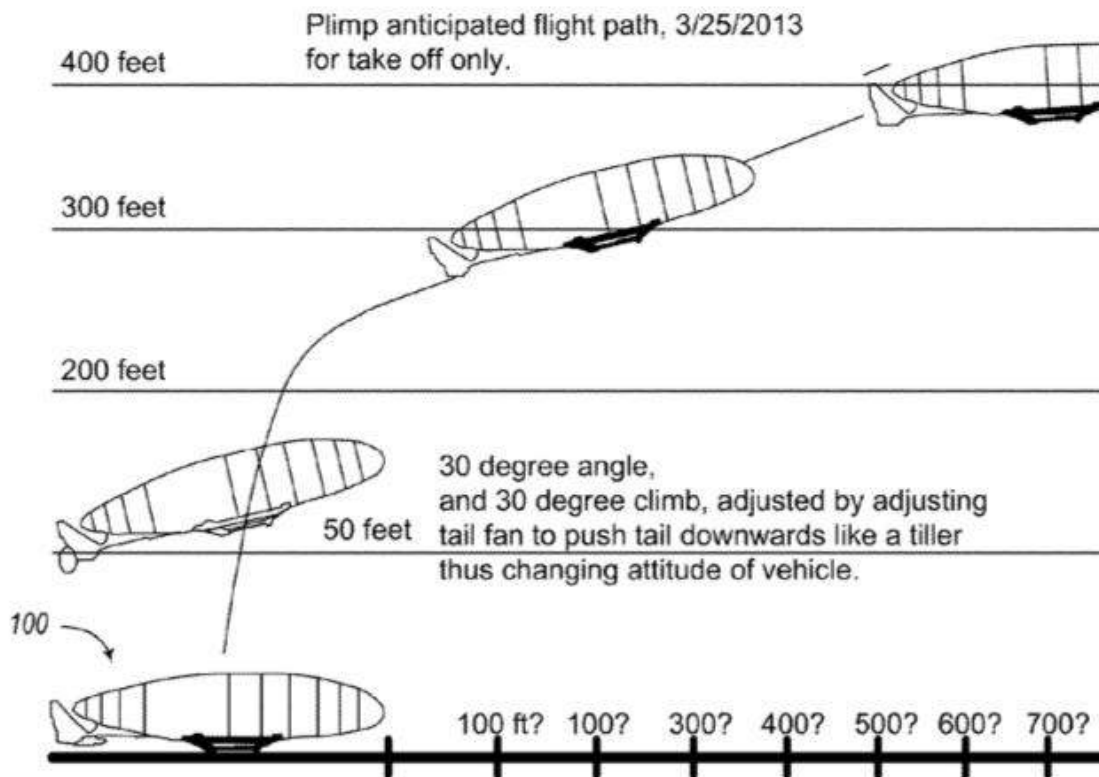


FIG. 14

For landing, the pilot would reduce power, allowing the Model J to descend and slow down. Once the vehicle nears its landing spot, the pilot would reduce power further and allow the aircraft to settle vertically to the ground.

If propulsion power is lost in flight, the Model J is designed to gently glide back to the ground at a power-off descent speed of 9 mph (14.5 kph), flare out like an airplane, and make a soft landing.

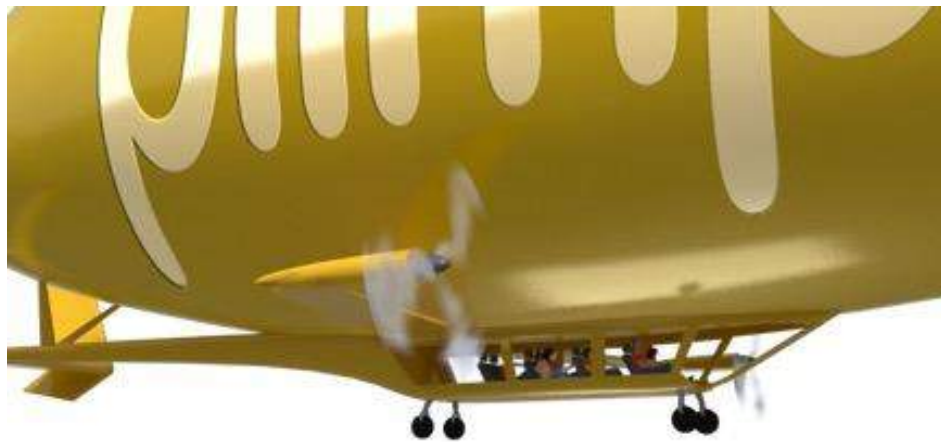
The Model J is expected to operate at hover to about 100 mph (161 kph) at altitudes of 1,000 feet (305 meters) or less, which is well below the altitude of commercial air traffic and above possible small drone activity.

The Model J is designed to operate without ground infrastructure. With a net weight of about two tons on the ground, the semi-buoyant Model J is relatively secure on the ground in light to moderate wind. The Model J would need to be secured in high winds. It is not intended for operation in bad weather.

The price of a Model J is expected to be between \$4 - 6 million US dollars once in production, with carbon composite structures and highly-automated avionics. As of August 2019, the Model J has not yet started the FAA certification process. Egan Airships states that delivery of the first production unit could come as soon as four years after initial orders have been placed.



*The Model J is scalable and configurable for a variety of missions.
Source: Egan Airships*



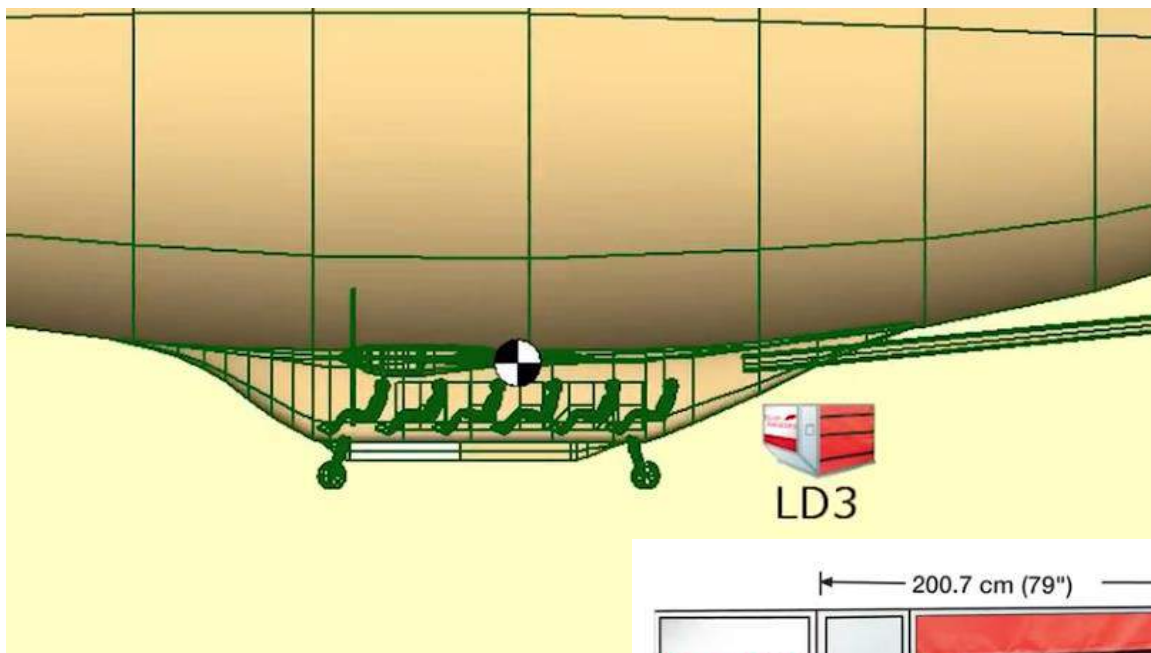
Passenger version of the Model J. Source: Egan Airships



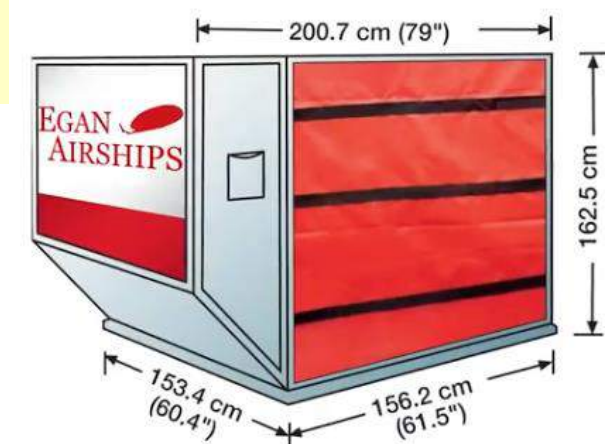
A proposed military version of the Model J. Source: Egan Airships



Advertising version of the Model J. Source: Egan Airships



*Scale of an LD3 cargo container.
Source: Egan Airships*



5. For more information

- Alan Boyle, “Egan Airships floats a sales campaign to get its Plimp hybrid aircraft off the ground,” GeekWire, 7 November 2018: <https://www.geekwire.com/2018/egan-airships-floats-sales-campaign-get-plimp-hybrid-aircraft-off-ground/>
- Laura Geggel, “While You Weren't Looking, Engineers Combined a Plane and a Blimp to Make a Plimp Airship,” LiveScience, 29 November 2018: <https://www.livescience.com/64186-plane-blimp-plimp-aircraft.html>
- “The Plimp airship-aeroplane hybrid is now available to pre-order,” Finn – The Aviation Industry Hub, 30 November 2018: <https://www.wearefinn.com/topics/posts/the-plimp-airship-aeroplane-hybrid-is-now-available-to-pre-order/>
- Phil Barker, “This is Plimp, the hybrid aircraft that could make airships take off again,” Red Bull, 4 February 2019: <https://www.redbull.com/us-en/plimp-airship-and-plane-hybrid-prototype>

Patents

- USD713320S1, “Hybrid VTOL vehicle,” filed 27 June 2013, granted 16 September 2014: <https://patents.google.com/patent/USD713320S1/en?q=D713320>
- USD727242S1, “Hybrid VTOL vehicle,” filed 30 April 2014, granted 21 April 2015: <https://patents.google.com/patent/USD727242S1/en?q=+D727242>
- US9856007B2, “Hybrid VTOL vehicle,” filed 26 June 2014, granted 2 January 2018: <https://patents.google.com/patent/US9856007B2/en?q=9856007>
- US2016/0137281A1, “Hybrid VTOL vehicle,” filed 26 June 2014, granted 2 January 2018: <https://patents.google.com/patent/US20160137281A1/en?q=20160137281>

- US2018/0079479A1, “Hybrid VTOL vehicle,” filed 28 November 2017, granted 19 January 2021:
<https://patents.google.com/patent/US20180079479A1/en?q=20180079479>
- US10894591B2, “Hybrid VTOL vehicle,” filed 28 November 2017, granted 19 January 2021:
<https://patents.google.com/patent/US10894591B2/en?q=10894591>

Other *Modern Airships* articles

- *Modern Airships - Part 1*: <https://lynceans.org/all-posts/modern-airships-part-1/>
- *Modern Airships - Part 2*: <https://lynceans.org/all-posts/modern-airships-part-2/>
- *Modern Airships - Part 3*: <https://lynceans.org/all-posts/modern-airships-part-3/>