Walden Aerospace / LTAS - Electro-kinetic (EK) propulsion airships

Peter Lobner, Updated 3 April 2021

1. Introduction

In 1976, Michael K. Walden founded Lighter Than Air Solar (LTAS) Corp. in Nevada, where he served as Chief Technology Officer (CTO). In 1997, the firm was rebranded as LTAS / CAMBOT LLC, and in 2003, to LTAS Holdings LLC and LTAS International LLC. Michael Walden and the LTAS firms developed and demonstrated an impressive range of technologies and design concepts for lighter-than-air (LTA) craft, including a range of intriguing electro-kinetic (EK) airship design concepts. In these LTA craft, the EK systems were based on the Biefeld-Brown effect, which claims to generate thrust in capacitor configurations exposed to high voltage. The EK systems were intended to control the airflow boundary layer to reduce drag and eventually evolve into a primary propulsion system.

After leaving LTAS in 2005, Michael Walden founded Walden Aerospace where he is the President and CTO, building on the creative legacy of his work with the former LTAS firms. The Walden Aerospace website is here: http://walden-aerospace.com/HOME.html

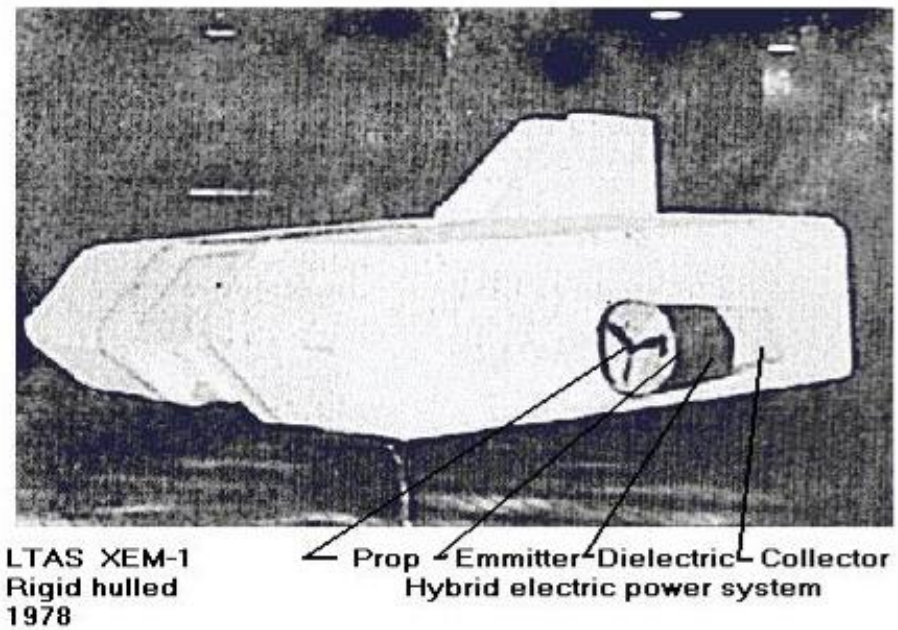
In this article, we'll take a look at two unique Walden / LTAS EK proof-of-concept demonstrators that flew 20+ years apart and three advanced EK airship design concepts.

- Demonstrators:
  - XEM-1 hybrid EK drive demonstrator (1974)
  - EK-1 skin integrated EK drive demonstrator (2003)
- Concepts:
  - EK panel airship, MK-4 skin integrated EK drive
  - Big Black Delta (BBD), MK-5 integrated hull panel EK drive
  - Sub-Orbital Solar Collection and Communications Station (S.O.S.C.S) with EK drives for high altitude station keeping

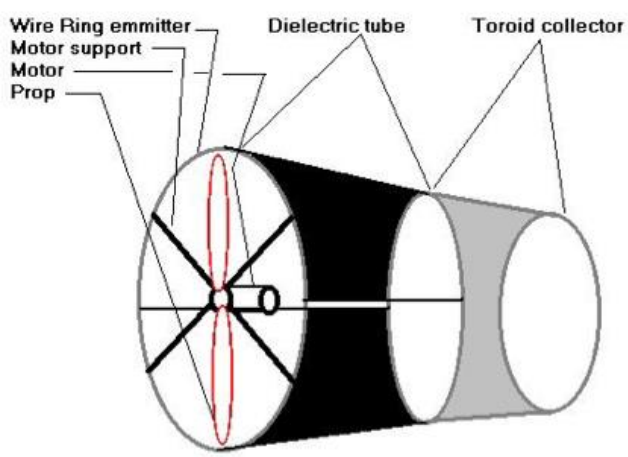
Special thanks to Michael Walden for his thoughtful input for this article.

2. XEM-1 rigid hull airship model with the MK-1 ionic airflow (IAF) hybrid EK drive (1974 – 1977)

The XEM-1 was built in 1974 as a subscale proof-of-concept demonstrator for a solar-powered, ionic airflow electro-kinetic (IAF/EK) propulsion system for a rigid airship. It was 5.5 feet (1.7 m) long, 4.5 feet (1.4 m) wide and 2 feet (0.6 m) tall with a gross weight 1.8 pounds (0.8 kg). The MK-1 IAF/EK ducts on the sides of the airship model had 10 inch (3.9 cm) “bent tip” propellers and were a little over 1 foot (4.7 cm) long.



XEM-1 (above), MK-1 ionic IAF/ EK drive (below). Source, both graphics: LTAS / Walden Aerospace.



XEM-1 originally was tethered by cable to an external control unit and later was modified for wireless remote control operation. In this latter configuration, XEM-1 demonstrated the use of a hybrid EK propulsion system in a self-powered, free-flying vehicle.

Walden described the MK-1 IAF EK drive as follows:

> "The duct included a 10 inch 'bent tip' 3-bladed prop running on an electric motor to create higher pressures through the duct, making it a 'modified pressure lifter'…. The duct also had a circular wire emitter, a dielectric separator and a toroidal collector making it a 'toroid lifter'."

The later MK-2 and MK-3 IAF / EK drives had a similar duct configuration. In all of these EK drives, the flow of ions from emitter to collector imparts momentum to neutral air molecules, creating usable thrust for propulsion. You'll find more information on the MK-1 IAF EK drive and later versions on the Walden Aerospace website here: https://lynceans.org/wp-content/uploads/2020/12/Walden-EK-drive-comparison.png

The XEM-1 was demonstrated to the Department of Defense (DoD) and Department of Energy (DOE) in 1977 at Nellis Air Force Base in Nevada. Walden reported,

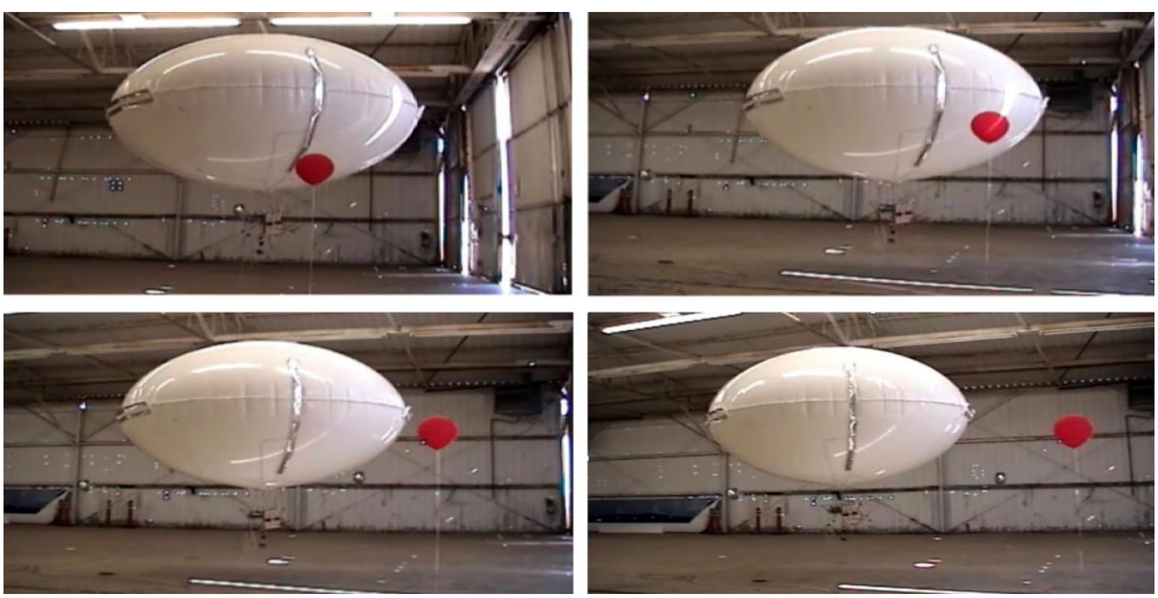
> "We flew the first fully solar powered rigid airship in 1974, followed by a US Department of Defense and Department of Energy flight demonstration in August 1977"…. " DoD was interested in this work to the extent that some of it is still classified despite requests for the information to become freely available."

Walden credits the XEM-1 with being the first fully self-contained air vehicle to fly with a hybrid ionic airflow electro-kinetic propulsion system. This small airship also demonstrated the feasibility of a rigid, composite, monocoque aeroshell, which became a common feature on many later Walden / LTAS airships.

3. EK-1 skin-integrated electro-kinetic (EK) drive airship (2003)

The EK-1 was a remotely controlled, self-powered, subscale model of a lenticular airship with a skin-integrated EK drive installed on the outer surface of the hull. The Biefield-Brown Effect was used to control the boundary layer, reduce drag, and provide electronically steered propulsion in any direction with no external aerodynamic surfaces and no moving parts.

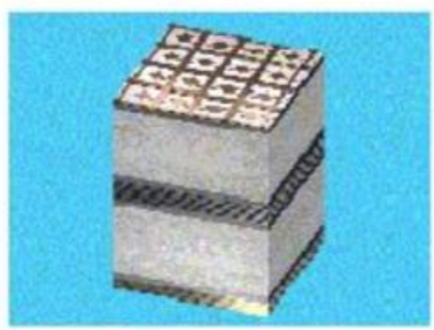
EK-1 aloft in the hanger. Source: LTAS / Walden Aerospace



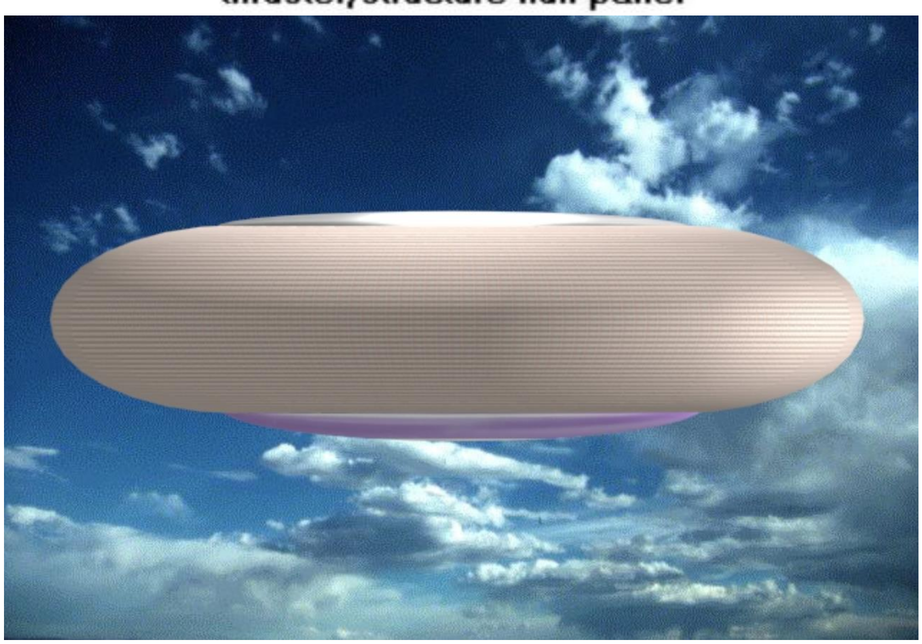
EK-1 with a skin-integrated propulsion system moving during hanger test flight in 2003. Source: LTAS / Walden Aerospace

In June 2003, LTAS rented a hangar at the Boulder City, NV airport to build and fly the EK-1. Testing the EK-1 was concluded in early August 2003 after demonstrating the technology to National Institute for Discovery Science (NIDS) board members.

Based on the EK-1 design, a full-scale EK airship would have a rigid, aeroshell comprised largely of LTAS MK-4 lithographic integrated thruster / structure hull panels. As with other contemporary Walden / LTAS airship designs, the MK-4 panel airship likely would have implemented density controlled buoyancy (DCB) active aerostatic lift control and would have had a thin film solar array on the top of the aeroshell.



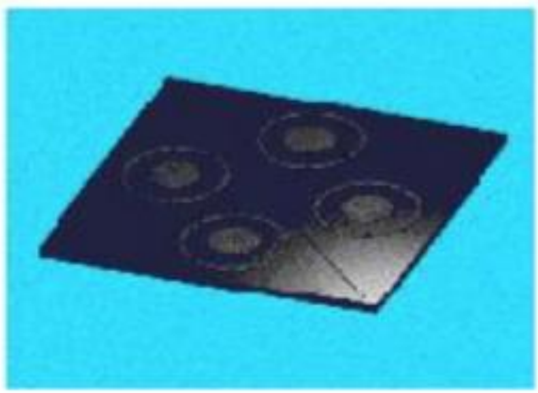
LTAS MK-4
Lithographic Integrated
thruster/structure hull panel



Artist's concept of a MK-4 panel airship.
Source, both graphics: LTAS / Walden Aerospace

4. Big Black Delta (BBD) design concept

Walden developed a design concept for a more advanced hybrid EK airship / aircraft with a rigid, composite aeroshell comprised of MK-5 encapsulated panels installed on the craft's rigid, geodesic internal structural frame. The MK-5 EK system was intended to provide omnidirectional thrust as well as boundary layer control for drag reduction. The design of the rigid aeroshell and the power of the propulsion system were expected to enable flight at much higher speeds than typically associated with a hybrid airship / aircraft.



LTAS MK-5
Encapsulated panel

Walden identified the following attributes of a craft with a MK-5 EK system:

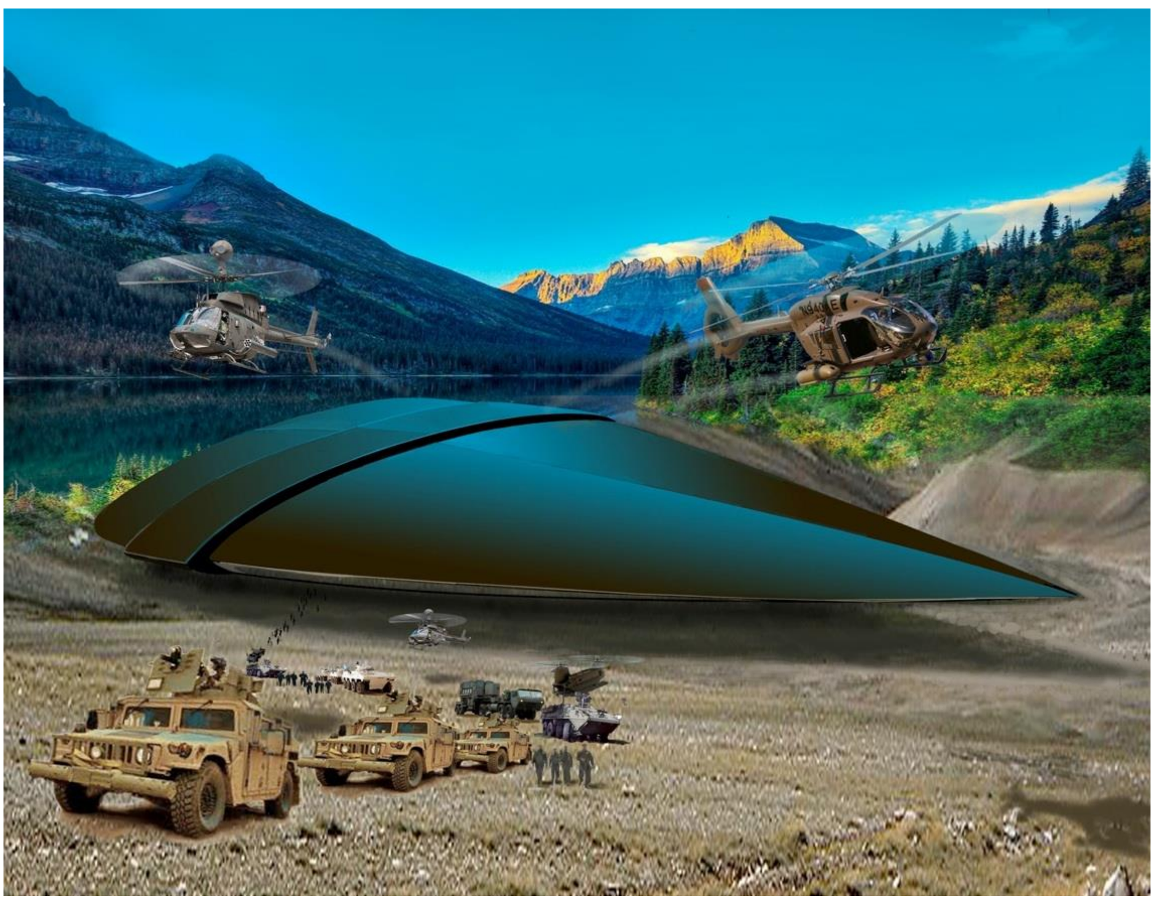
- Nearly silent operation.
- At lower speeds or when hovering, the EK drive allows the craft to maneuver without the need for external aerodynamic surfaces or moving parts.
- Drag reduction and boundary layer control enable the craft to quickly accelerate.
- Reduces or eliminates the sonic pressure shockwave when operating at very high speeds (i.e., transonic or above).

The MK-5 EK airship would include Walden's DCB active aerostatic lift control system and a mass transfer unit (MTU) for non-aerodynamic pitch / roll stability control. As with other Walden / LTAS airships with DCB, the MK-5 EK airship / aircraft was designed for vertical takeoff and landing (VTOL) operations.

The resulting circa 2002 design concept has become known as the Big Black Delta (BBD). The vehicle was intended to support a variety of applications, including low altitude heavy cargo missions and high altitude weapons, communications, and sensor platform missions. Key operational characteristics for the BBD cargo variant included:

- With the DCB system, the ship can takeoff and land vertically, including at remote sites with unprepared surfaces.
- BBD VTOL operations does not create hazardous prop wash / jet blast commonly associated with VTOL aircraft operations.
- DCB system enables rapid load transfers without exchanging external ballast while heavy cargo is loaded or unloaded.
- Ground support requirements are greatly reduced or eliminated.

These BBD capabilities exceeded DARPA’s Project WALRUS requirements issued two years later, in 2004.



Rendering of a BBD on a cargo mission at an unprepared site.
Source: Walden Aerospace

Above: Rendering of a BBD hovering near the ground.

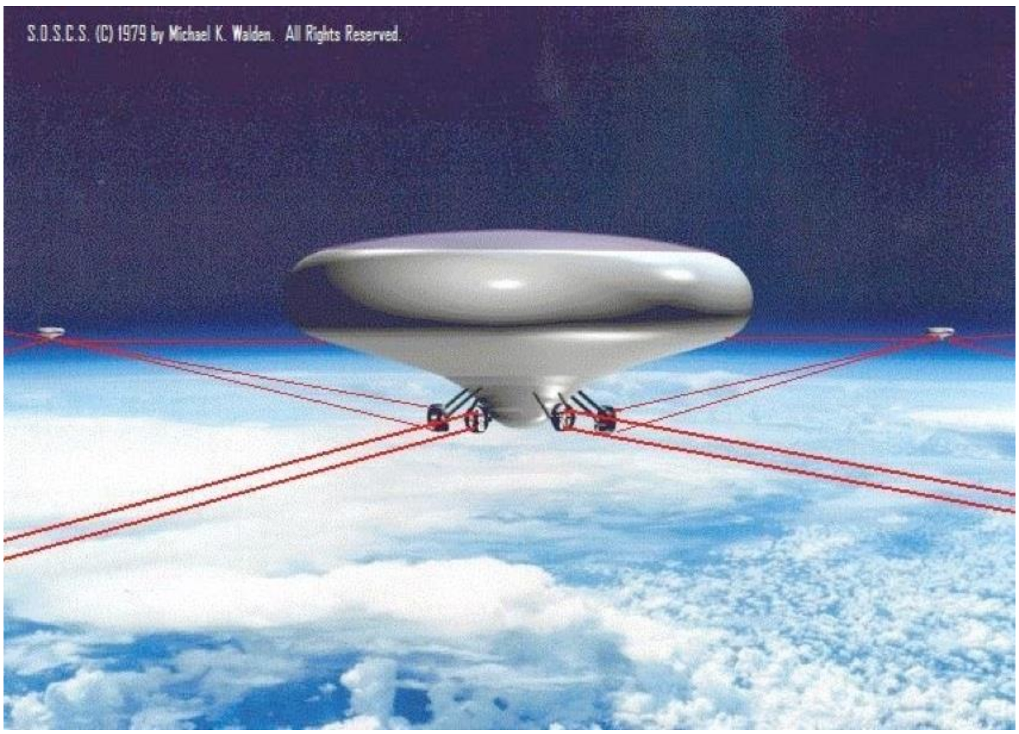
Below: Rendering of a BBD on a high-altitude weapons, communications, or sensor platform mission.

Source: Walden Aerospace

There is some mystery surrounding the BBD…was it real or not. A July 2002 NIDS paper, with input from Michael Walden, doesn't answer that question, but it tells an intriguing tale. You can read that paper here: https://lynceans.org/wp-content/uploads/2021/03/NIDS_July-2002_Illinois_triangle-hypothesis.pdf

5. Sub-Orbital Solar Collection and Communications Station (S.O.S.C.S.)

S.O.S.C.S. is a concept for an unmanned, geostationary, stratospheric, solar powered telecommunications aerostat. Development started in the early 1970s based on Walden's characteristic rigid, lenticular airship design. The basic design is described in my article "Walden Aerospace / LTAS, Part 1."



Artist's concept circa 1979 of S.O.S.C.S. stations at high altitude. The red lines represent line-of-sight laser optical data links among distant S.O.S.C.S. stations operating as part of an integrated communications network. Source: Walden Aerospace

S.O.S.C.S. is designed to operate on long-duration missions at altitudes between 100,000 to 120,000 feet (18.9 to 22.7 miles, 30.5 to 36.6 km). In this altitude range, propellers are ineffective, and other means are needed to maintain the airship at a prescribed geo-location. Therefore, S.O.S.C.S. uses an ionic airflow (IAF) electro-kinetic (EK) propulsion system that is well suited for operating in the very low-density air at high altitude. The S.O.S.C.S. EK propulsion system builds on experience with EK systems demonstrated by LTAS during subscale test flights.

6. For more information

- Tim Matthews, “UFO Revelation – The secret technology exposed?” Chapter 12, “Lighter than air,” ISBN-13 : 978-0713727333, Blandford, 1999; or see an excerpt at the following link: https://lynceans.org/wp-content/uploads/2020/12/Matthews_UFO-Revelation_Ch-12-excerpt.pdf
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