

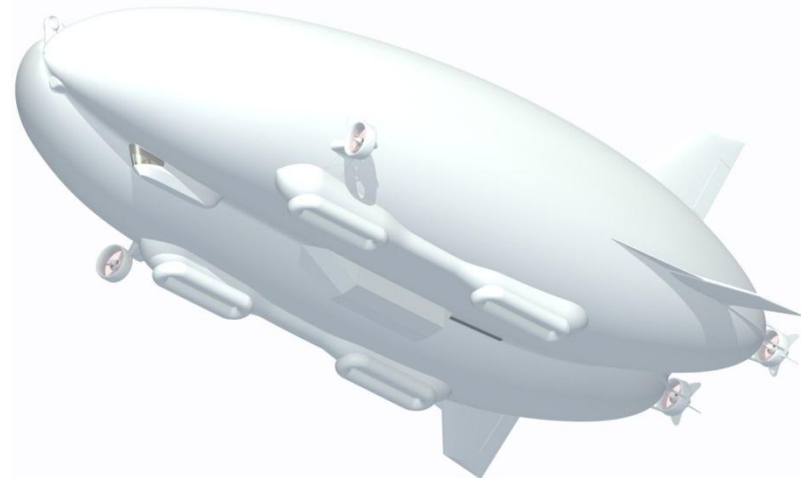


AIRSHIPS: GET READY FOR THE FUTURE
Seattle – December 2011



Hybrid Air Vehicles Ltd.

- Custodian of a long legacy of airships and a **pioneer** in the **development of hybrid aircraft**.
 - Team has taken the first steps in the creation of a major new, low carbon emission aerospace business, focusing initially on **surveillance** and **heavy lift** opportunities.
 - Company has developed a range of revolutionary hybrids with **global market potential** – demand is being driven, in particular, by changing defence & environmental requirements.
- LEMV is real and de-risks heavy lift.
- Team of circa 100 people, 2/3rds of which are engineers, with considerable **aerospace experience, building and certifying airships**.
- In June 2010, partnered with Northrop Grumman, the team won a contract with the **US Army** to develop the Long-Endurance Multi-intelligence Vehicle (LEMV).
- Commercial Heavy Lift Program established for the sale to the commercial aviation sector of heavy lift Hybrid Air Vehicles with 20 and 50 tonne payloads.



Discovery Air



Specialised Aviation Solutions for demanding customers in the harshest environments.

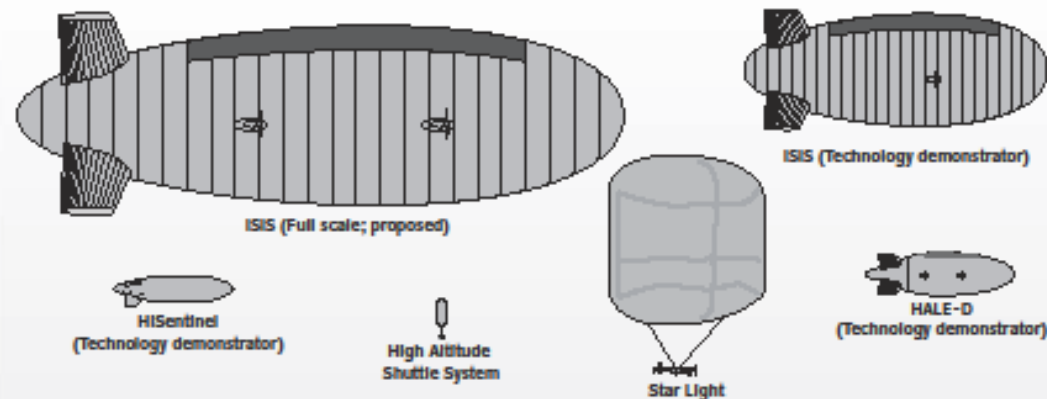
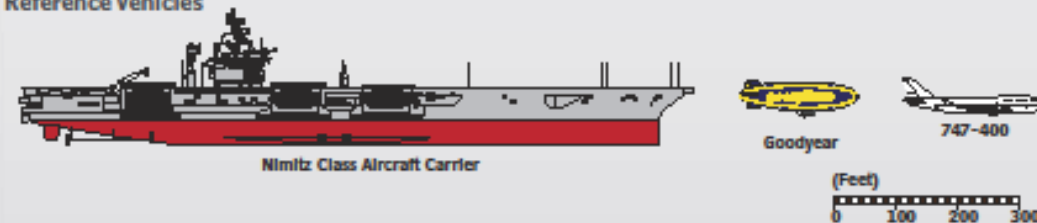
Discovery Air Inc. Operating Units

- Air Tindi Ltd.
- Discovery Mining Services
- Top Aces Inc.
- Discovery Air Innovations Inc.
- Hicks and Lawrence Ltd.
- Discovery Air Technical Services Inc.
- Great Slave Helicopters Ltd.



History



Exhibit 1.**Illustrations of Airships****High-Altitude ISR****Low-Altitude ISR****Airlift****Reference Vehicles**

Source: Congressional Budget Office based on data provided by manufacturers.

Note: ISR = intelligence, surveillance, and reconnaissance; ISIS = Integrated Sensor Is the Structure; HALE-D = High-Altitude Long-Endurance Demonstrator; LEMV = Long-Endurance Multi-Intelligence Vehicle.

Airship programs that have been proposed or that are being pursued today range in technical maturity. Some are concepts on paper, others are being developed to demonstrate technical feasibility, and a few are based on well-established technologies that could be quickly put to use in the field. In this document, the Congressional Budget Office (CBO) analyzes airships designed for intelligence, surveillance, and reconnaissance (ISR) missions and for airlift of cargo. They range in size from roughly that of a Goodyear blimp to about the size of an aircraft carrier. CBO has not analyzed aerostats—tethered, unmanned airships commonly used for observation.

The airships discussed in this study fall into three operational regimes: high-altitude ISR, low-altitude ISR, and airlift. In this exhibit, six designs, including both subscale demonstration models intended to test new technologies and full-scale aircraft capable of conducting actual operations, show aircraft proposed for operation at high altitudes. High-altitude operation is preferred when large fields of view or long viewing ranges are needed, for example, when looking deep within a country's border while remaining outside its airspace. Four of those high-altitude vehicles are conventional airships, and two—the Star Light and the High Altitude Shuttle System—are payload-return airships. (Upon completion of a mission, the payload detaches from the gas envelope and returns to base, and the envelope is not recovered.) Three designs show aircraft that would operate at low altitudes. Full-motion video sensors are commonly carried by the low- to medium-altitude ISR aircraft flown today, and would probably be used on airships operating at similar altitudes. Finally, three designs show aircraft proposed for the transportation of cargo. ♦

Military lead

*USA Senate Armed Services Committee: {FY2012 Defence budget} The committee is concerned ...of the level of technical and programmatic oversight that the Office of the Assistant Secretary of Defense for Research and Engineering is **providing for this emerging field** ... Hence, the committee directs the Department to designate a senior official who will be responsible for the coordination and oversight of the various airship-related programs across the Department to ensure that unnecessary duplication of efforts is avoided and that a technical “community of interest” is established to ensure cross-fertilization of technologies across the programs as appropriate.*

*Canada DRDC (2010): The study indicates that airships could potentially improve the sustainability of CF Northern operations. **Significant potential cost avoidance and response time reduction** could be realized on sustainment lift by using airships versus fixed and rotary wing aircraft...**potential cost avoidances of up to 60%** would be realized on the sustainment lift by using airships instead of the current transportation approach...In addition to the cost avoidance and the response time reduction, **airships would have the potential to significantly reduce fuel consumption and greenhouse gas emissions, which would confer substantial environmental benefits.***

USTRANSCOM: [Airships]would constitute a valuable third mode of strategic transportation for USTRANSCOM with speed much better than a ship and economics much better than an airplane.

*Winnipeg Free Press - PRINT EDITION
Floating alternative to winter roads. Airships cost far less than constructing permanent roads
By: Adam Wazny 12/10/2010 1:00 AM*



The Commercial Opportunity



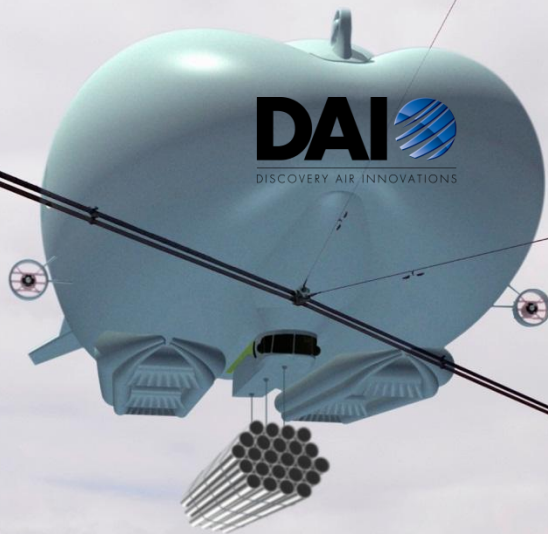
LEADERSHIP

- Promotion
- Industry relationships
- Development, investment, research
- People – attract, develop, retain
- Operational – standardisation, best practice
- Safety, security and environmental

Summary



Questions...

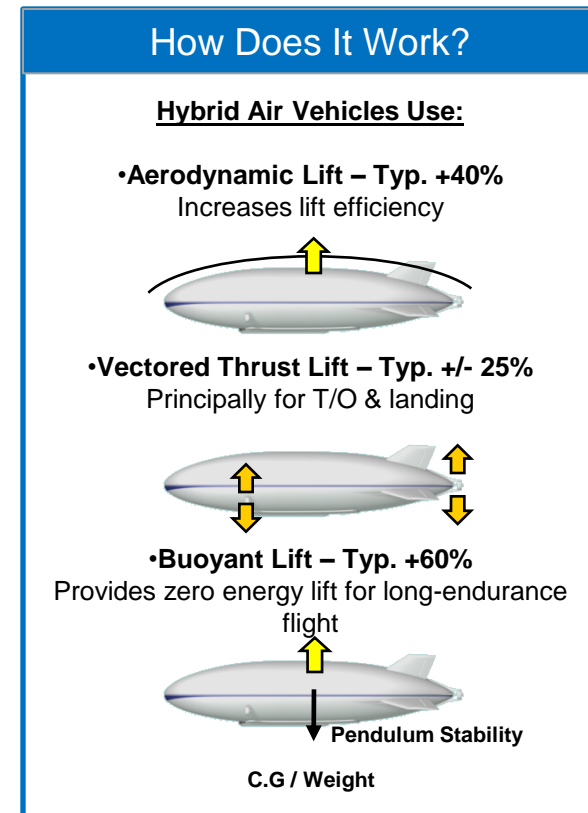


END



How does the hybrid air vehicle work?

- **Combines buoyant, aerodynamic and propulsive lift** to provide extended endurance in a vehicle that is easier to operate than traditional lighter-than-air aircraft.
 - About **60% of the lift is aerostatic**, from helium buoyancy, and the remaining **40% is aerodynamic**, from the vehicle's shape.
 - Additionally, **powered lift is used during takeoff and landing** by vectoring the thrust from four ducted propulsors.
 - This minimizes ballasting and allows transfer and winching of heavy logistics, landing on unprepared surfaces, and enhanced stability on the ground.
- Full hover craft landing system, **allowing operations from austere fields and providing amphibious capability.**



HYBRID AIR VEHICLES

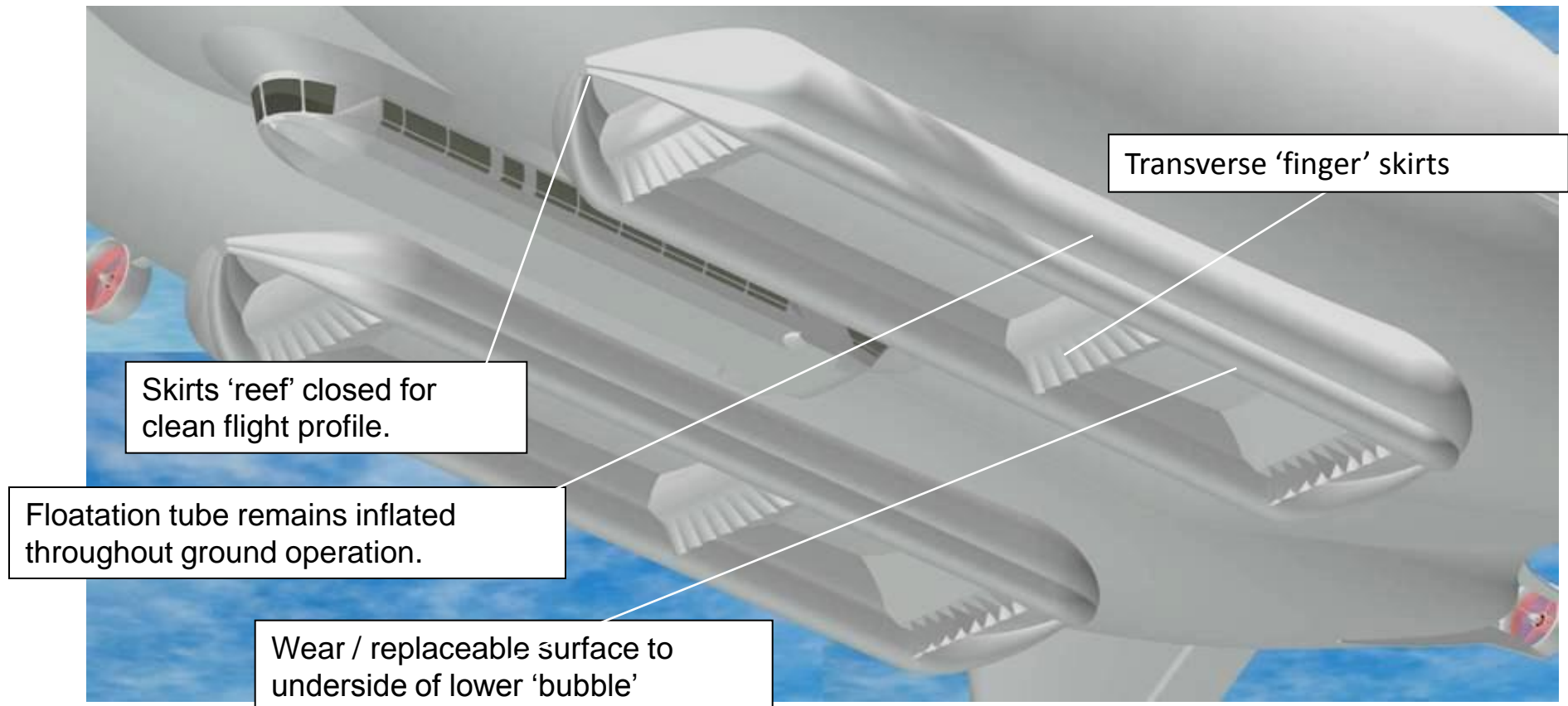




Heavy lift Hybrid Air Vehicle

- **Tri-lobe** – Heavy Lift optimised
- **Multi surface ops** (rough land, sea snow)
- **End to end delivery**

Provides air-bearing during landing / taxiing and can be 'reversed' to 'suck down' when on ground.



The Heavy Lift trilobe vehicles are designed for volume-rich heavy payload lift and transportation

	Capabilities				Main Uses
	Payload (lbs)	Max. Range (n. miles)	Max. Altitude (ft)	Max. Speed (KTAS)	
HAV 266	20 tonne	5,200	9,000 ¹	92	<ul style="list-style-type: none"> • Short-haul passenger transport. • Re-supply of hardware, consumables, fuel / oil, personnel etc. palletized or loose equipment. • Commercial point-to-point cargo / freight short haul operations.
HAV 366	50 tonne	6,000	9,000 ¹	104	<ul style="list-style-type: none"> • On / off shore oilfield support. • “Crane” / winch type ops - vertical lift, precision hover • Roll on / roll off loading and unloading + winch and craneage. • Humanitarian aid delivery: unprepared runway ops. • Military-type logistics support. • AEW / MCM • Special events / tourism, etc.
HAV 606	200 tonne	6,500	9,000	90	<ul style="list-style-type: none"> • Delivery of balanced fighting units, ammunition transportation. • Commercial long-range and outsize cargo / freight delivery. • Roll on / roll off loading and unloading. • “Crane” / winch type ops - vertical lift, precision hover. • Humanitarian aid delivery: recce, rescue / evacuation, mobile field hospital. • “Cruise liner” type operations.

1) Up to 18,000 feet under special circumstances.



Heavy Lift vehicles capabilities and operational benefits

Load / Lift Capacity

- **Volume rich lift** (does not volume out).
- Winches **vertical loads**, larger than any other air vehicle can do.
- **Loiter, precision hover and craneage** of heavy loads capabilities.
- **Roll on / roll off** loading and unloading.
- Primary load area developed as an **'industrial' rather than 'aerospace' structure.**

- Up to **105 knots airspeed** with high reliability.
- **-50C to +55C temperatures, wind speeds of up to 50 knots.**

Reliable

Low Cost

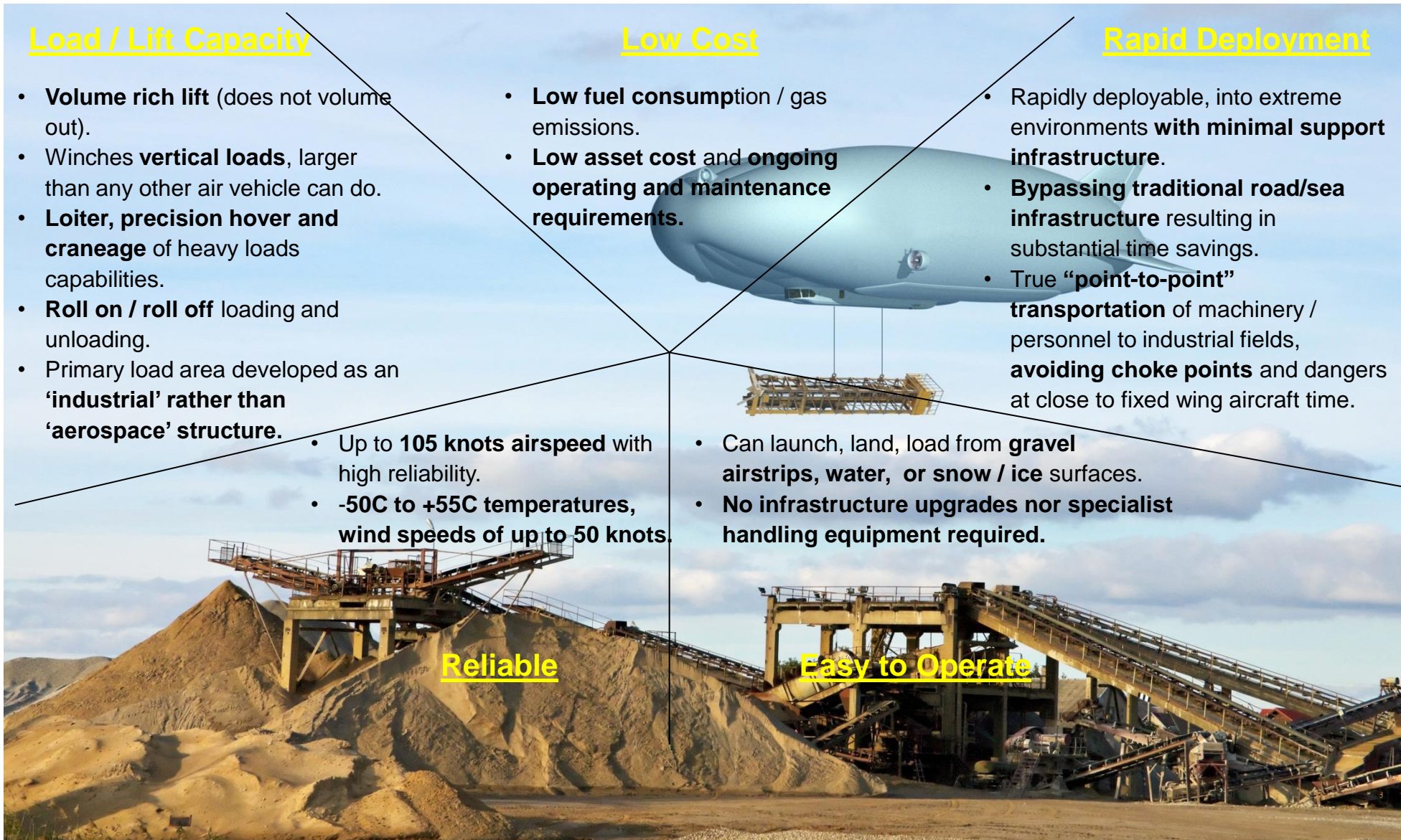
- **Low fuel consumption / gas emissions.**
- **Low asset cost and ongoing operating and maintenance requirements.**

- Can launch, land, load from **gravel airstrips, water, or snow / ice surfaces.**
- **No infrastructure upgrades nor specialist handling equipment required.**

Easy to Operate

Rapid Deployment

- Rapidly deployable, into extreme environments **with minimal support infrastructure.**
- **Bypassing traditional road/sea infrastructure** resulting in substantial time savings.
- True **"point-to-point" transportation** of machinery / personnel to industrial fields, **avoiding choke points** and dangers at close to fixed wing aircraft time.





Workshop issues

- Requirements for hangar, take-off, landings and ground handling.
- Operations on water and wetlands.
- De-risking and demonstration of the technology.
- Altitude and mountainous terrain.
- Ice, snow and slush.
- Wind speed issues.
- Optimal fleet size.
- Helium supply and price.
- Ballast.
- Oil spill and other slower airspeed applications.
- Range.
- Operating Cost.
- Financing.

LINER WASN'T SUNK BY THE TITANIC



AEROPLANE WASN'T GROUNDED BY THE COMET

