



NEXT GENERATION  
LIGHTER-THAN-AIR  
HYBRID AIR VEHICLES  
THE FUTURE IS  
**AIRLANDER**

HYBRID Air  
Vehicles

**AIRLANDER**™

Andy Barton  
Business Development Director

An Introduction to Airlander 50  
Nunavut Mining Symposium – April 2015

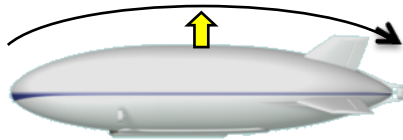
- Hybrid Air Vehicles Ltd is a privately-owned British company
- We exist to design and assemble the latest generation of hybrid aircraft, taking the best of aeroplanes, airships and helicopter technology and creating an efficient, low emissions aircraft with ground-breaking capabilities
- We are following a civil certification path with EASA
- We see Canada as a key launch market and are keen to work with Transport Canada, Canadian operators and end users



## How Does It Work?

### Hybrid Air Vehicles Use:

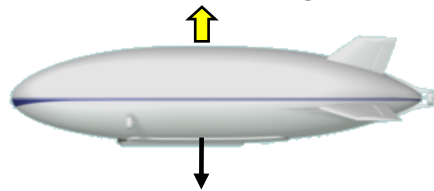
**Aerodynamic Lift – Typ. +40%**  
Increases lift efficiency



**Vectored Thrust Lift – Typ. +/- 25%**  
Principally for T/O & landing



**Buoyant Lift – Typ. +60%**  
Provides zero energy lift for long-  
endurance flight



**Pendulum Stability**

**C.G / Weight**

- Multi-hull airship concept invented and patented by HAV to provide aerodynamic lift
- Powerful Vectored thrust enables VTOL and CTOL
- Buoyancy makes the economics of flying compelling
- Ground handling simplified as aircraft is heavy
- Weathervanes used to control turning circle
- Proven in 55 knots of wind and capable to 80 knots



Patented hovercraft-like **Air Cushion Landing System** produces a very effective cargo aircraft

- US Army LEMV program funded the Airlander 10



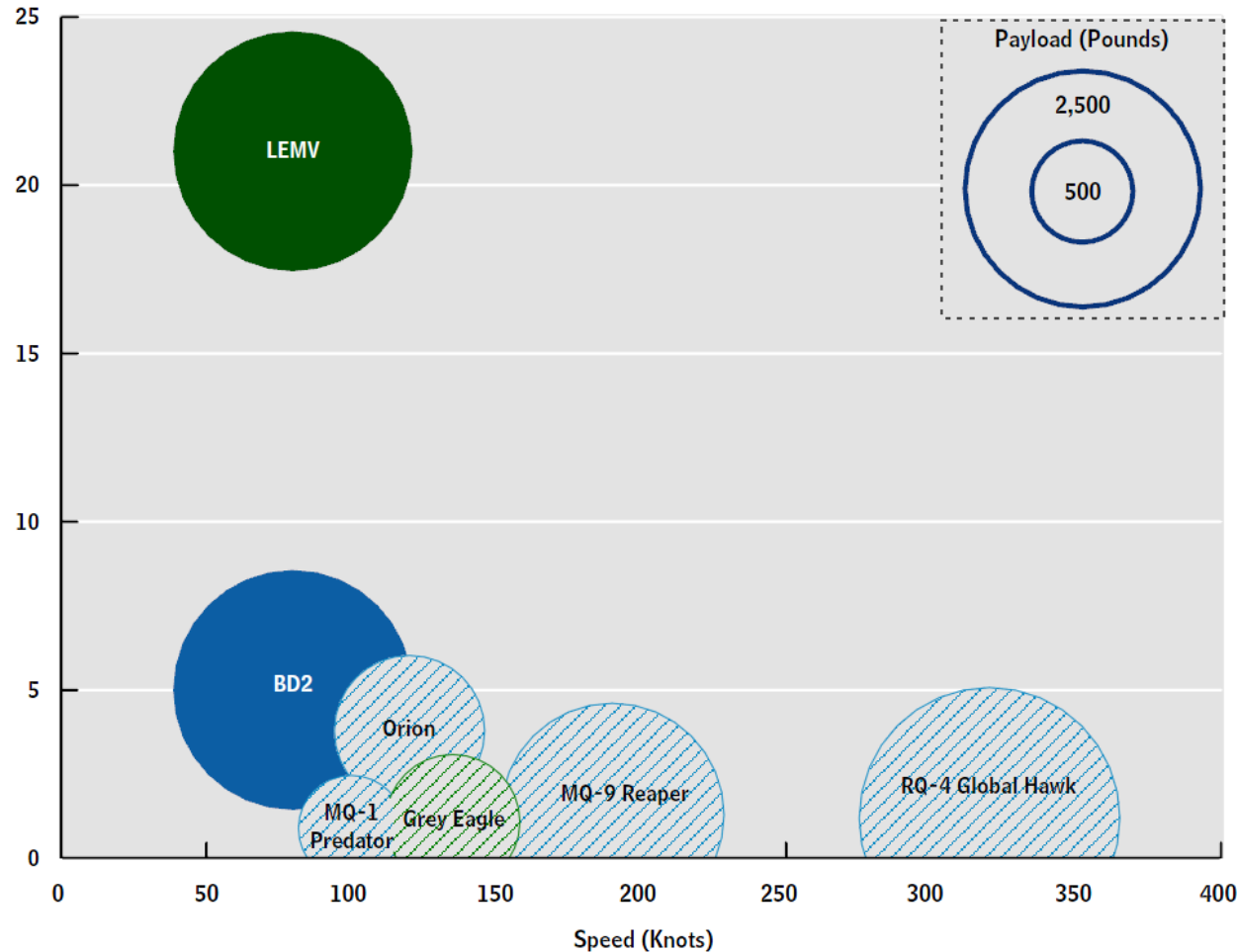
- **CONTRACT AWARDED –  
JUNE 2010**

- **FIRST FLIGHT  
– AUGUST 7th 2012**

- Defence spending cuts of \$454 billion, LEMV cancellation - Feb 2013.
- HAV buys back Aircraft – Sep 2013
- Commodity jurisdiction granted by US State Department – May 2014

## Payload, Endurance, and Speed of Low-Altitude Airships and Fixed-Wing Aircraft

(Endurance, days)

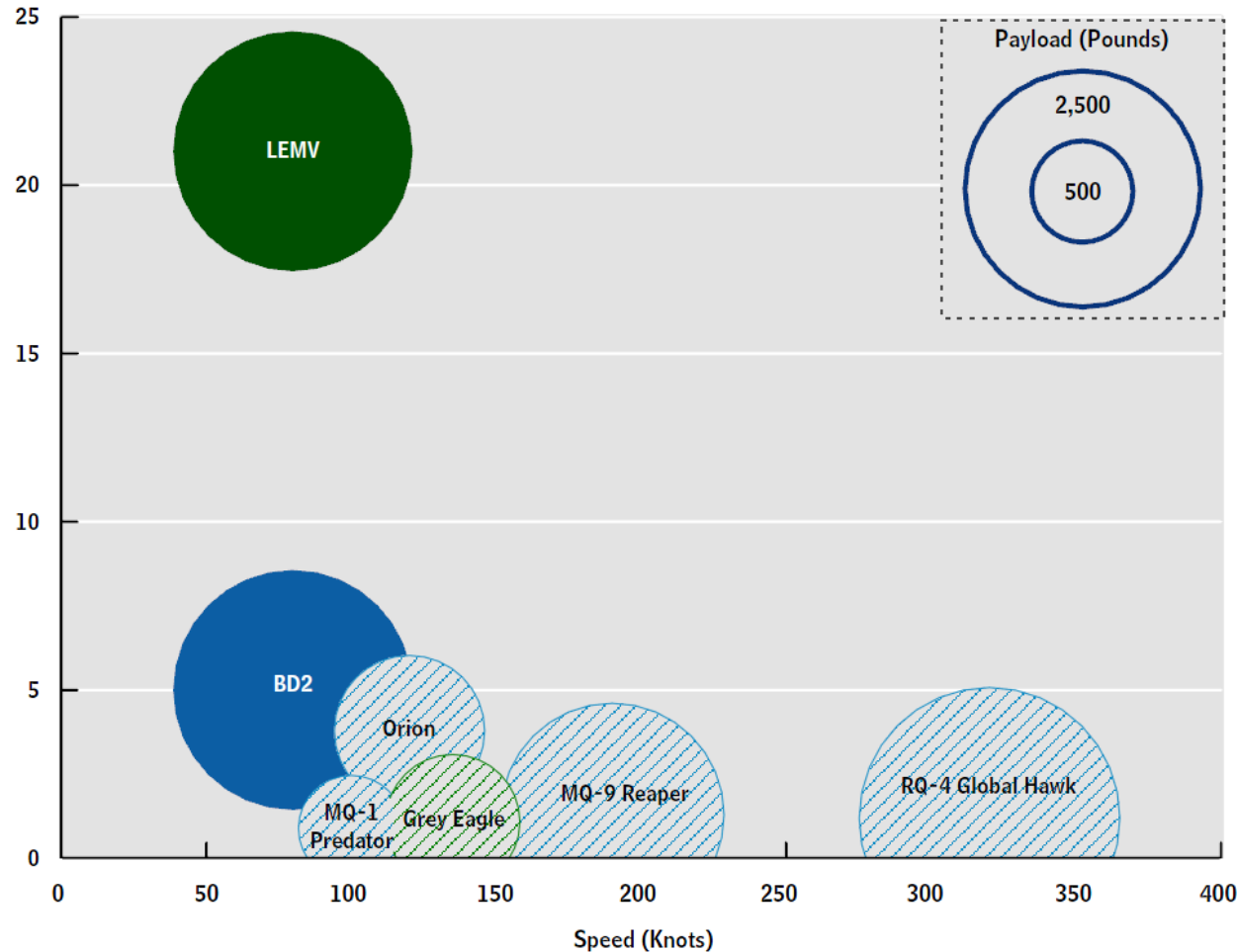


- US CBO report comparing endurance of various platforms
- LEMV endurance is **21 days** with 2,500 lbs of payload
- **10x greater** than the best UAV
- The multiple of endurance and payload was **80x better** than any existing platform



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1970's	1980's	1990's	2000's
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**Aerospace Developments**

- Shearwater Hybrid Gas Balloon Development Program
- World altitude record for hot air balloons
- AD500, the world's first modern technology airship

**Airship Industries**

- SkyShip 500 and Heavy Lift Hybrid Airship (HAWK) by Goodyear Aerospace Corp. Canada certified
- SkyShip 600 - 500,000 lbs. payload, 100,000 hours engine life demonstrated
- US Navy ODM Airship Program (ODM-1000) awarded to \$200m contract
- Sentinel 1000 - FAA Transport Category certified

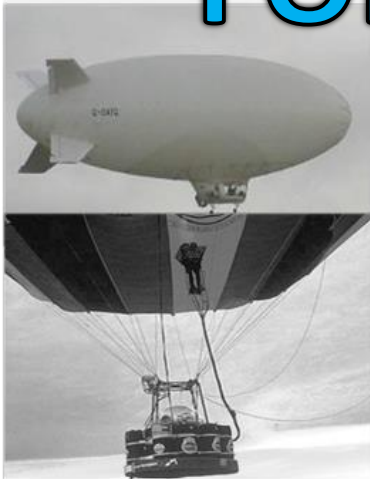
**Westinghouse Airship / ATG**

- Design, manufacture & certify SkyShip 600P
- Phoenix UAV engine test program for BAE Systems completed
- Design, build and certify AT-10 airship

**ATG & HAV**

- Design of patented StratCat UAV high altitude long endurance flight testing of reduced scale demonstrator
- Design of patented SkyCat heavy lift Hybrid Air Vehicle concept and flight testing of reduced scale UAV demonstrator
- LEMV contract award – design and build of HAV 304 surveillance hybrid air vehicle

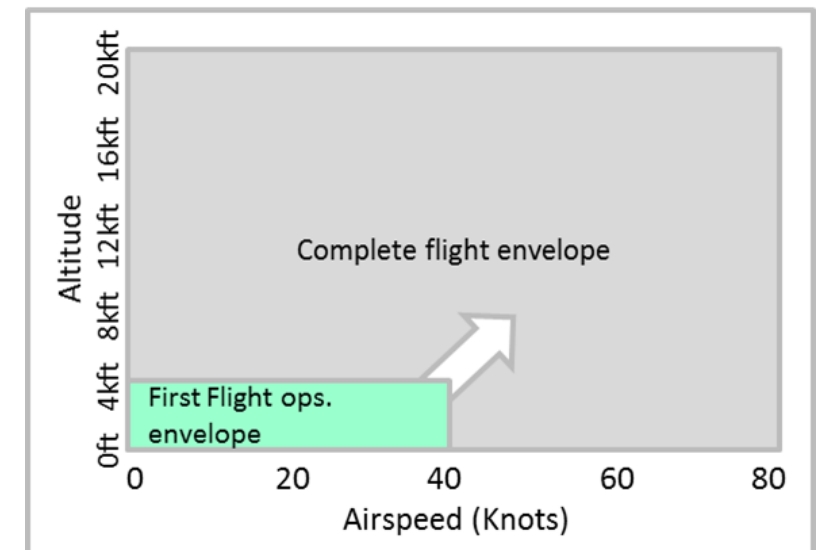
**OVER 20 AIRSHIPS DESIGNED, BUILT AND CERTIFIED FOR PASSENGER FLIGHTS**



For video footage see <<http://hybridair.vertouk.com>>



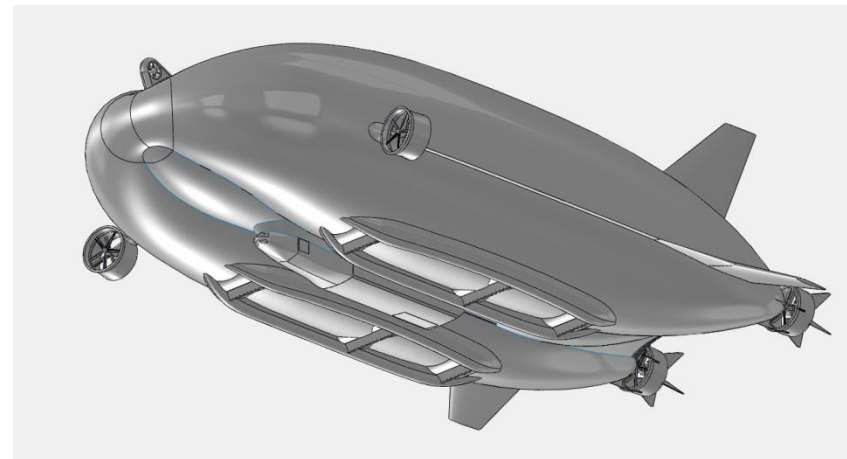
- **Airlander 10**, now solely manned aircraft
- **From concept to LEMV flight**, HAV responsible for the 92 m (300ft) Airlander 10 with Northrop Grumman responsible for the Mission System
- **Airlander 10 Aircraft 001:**
  - 3-4 days endurance 8,000ft (14 days 16,000ft unmanned).
  - 3,000kg & 40-80kW payload
  - 20 - 70 knots flight speed
- **Airlander 10 Aircraft 002 onwards:**
  - 5-6 days (manned)
  - Greater payload capacity
  - UAV/RPV capability (with investment), endurance of 21 days at 20,000ft with a 2,500lbs & 16kW payload
- **Airlander 10 Flight Testing** will restart in the next year.



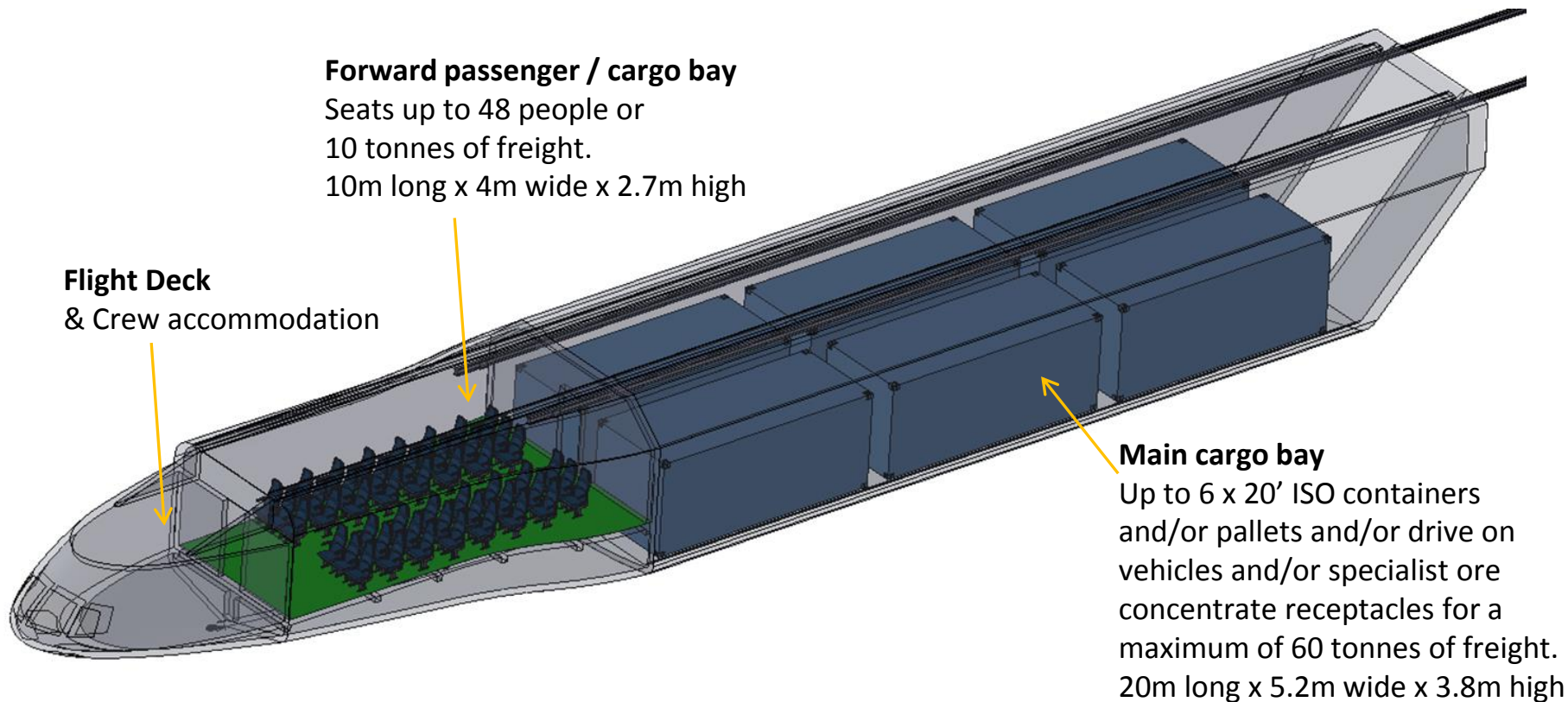
## Airlander 10



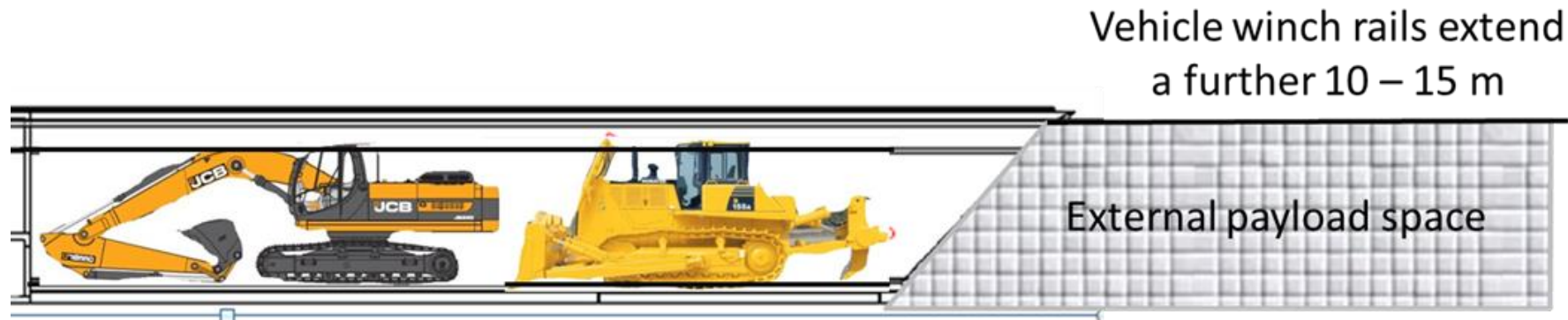
## Airlander 50



	Airlander 10	Airlander 50
Length (m)	92	120
Volume (m <sup>3</sup> )	38,500	103,000
Top Speed (kts)	80	110
Max Payload (kg) / Cargo	10,000	65,000 / 6x20' ISO containers
Passengers	50	200
Max Endurance (days)	21	5
Max Altitude (ft)	20,000	10,000



- Twin pilot operation + load master.
- Forward and main bay floor configured for freight movement/tie-down.
- Overhead gantry system (extending 10m to the rear of the module) with 2 cranes.
- Cranes have 7.5 tonnes capacity each or 10 tonnes combined.
- Full width rear cargo door, 2 x fwd 2m x 2m access doors.
- Main freight floor 1m above ground level for loading/unloading.



- Airlander 50 has a capacious main cargo bay (20m long x 5.2m wide x 3.8m high) and is able to carry up to 60 tonnes in one trip of up to 1,800 km.
- Either a JCB JS330 Excavator (33,280 Kg) or a Komatsu D2155AX Crawler Dozer (41,700 Kg) can be carried - drive-on, drive-off.
- For seriously outsize loads up to 40 metres long, weighing less than 60 tonnes, Airlander 50 can be fitted with an appropriate external/underslung load e.g. by keeping rear door open and utilising external winch rails as per hatched area above with up to 15 tonnes in the external area.
- HAV would be pleased to work with the mine operators to determine how best to transport existing equipment.

# Comparative Freight Costs – Airlander 50

Summary level freight cost per tonne / km by transport mode.



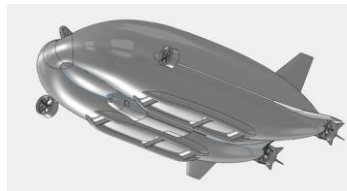
\$0.05  
Sea freight



\$0.10  
Freight Rail



\$0.20  
Road – (US freeway)



\$0.50  
Airlander 50



\$0.80  
Road – (Ice / unsealed roads) using distance “as the crow flies”



\$1.50  
Lockheed C130



\$3.00  
Sikorsky S92





- ~ 90% of planning permission challenges are linked to the environmental impact of access infrastructure.
- The Airlander overcomes these by overflying sensitive habitats rather than disturbing wildlife.
- Airlander 50 has a lower cost per tonne-km than ice roads and is cost effective hauling supplies and/or medium value ore concentrates up to 350 km.
- Airlander 50 has lower capital and maintenance costs than all-weather roads or pipelines in remote locations, has no removal costs and can be redeployed.
- It is fully amphibious, capable of take-off / landing / transitioning from water and land (snow, ice, marsh, tundra, muskeg etc.). It has no need for conventional or gravel airfields.
- Airlander 50 can operate in both conventional and helicopter modes.
- It carries up to 65 tonnes of payload and fuel with a conventional take-off run.
- It can take off and land vertically with 20 tonnes of freight on board.



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**AIRLANDER™**

**Hybrid Air Vehicles Limited**  
Hangar 1, Cardington Airfield  
Shortstown, Bedfordshire,  
MK42 0TG, United Kingdom

**T** +44(0)1234 336400

**E** [contact@hybridairvehicles.net](mailto:contact@hybridairvehicles.net)

**W** [www.hybridairvehicles.com](http://www.hybridairvehicles.com)



2014  
Sir Barnes Wallis  
Award



2014  
Best of What's New  
Award in Aerospace