Advanced Technologies Group (ATG) StratSat

Peter Lobner, 21 December 2020

1. Introduction

The UK firm Airship Industries manufactured conventional airships from 1970 to 1990 and was based in giant purpose-built hangars at Cardington, Bedford, which is a site historically associated with British airship production. Airship Industries went into receivership in 1990, with the new firm Airship Technologies emerging as the successor company, but not for long. Airship Technologies soon folded and was succeeded by the firm Advanced Technologies Group (ATG), which was led by Jeffery R (Roger) Munk. ATG became well known for two advanced airship projects:

- A hybrid, heavy lift airship known as the Sky Catamaran, or "SkyCat" for short, started in about 1999.
- A stratospheric High Altitude Platform (HAP) named "StratSat" for delivering a range of communications and surveillance services from geo-stationary positions in the stratosphere started in 2001.

Both advanced projects led to the development and testing of sub-scale prototype airships and advanced designs for full-scale airships. ATG also offered a range of conventional, non-rigid blimps, but only built one small AT-10 airship.

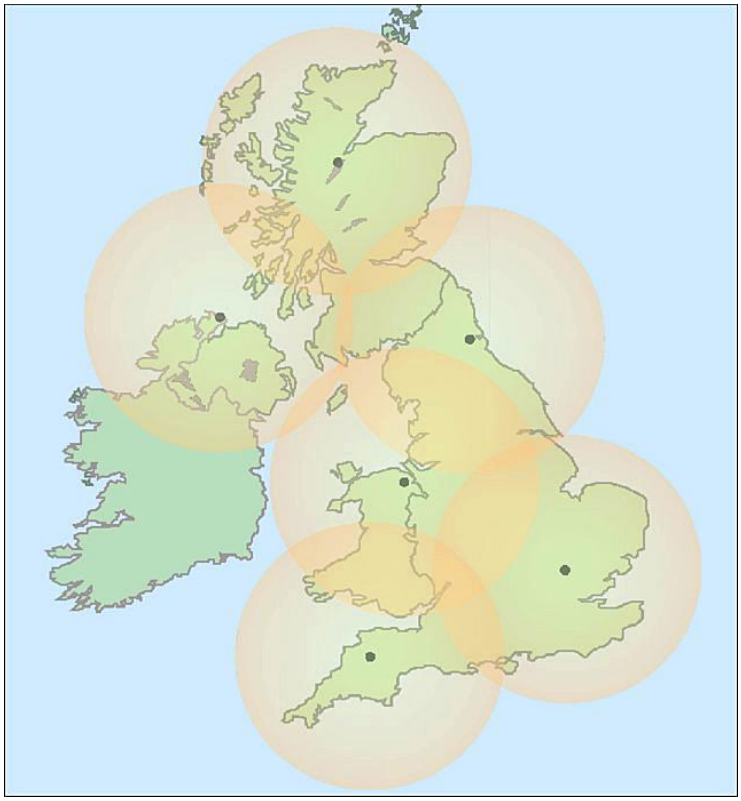
World SkyCat Ltd. was created as the marketing and operating associate of ATG for the SkyCat range and was intended to be the launch customer for the first SkyCat 20.

In spite of promising business prospects for the SkyCat on the US WALRUS and HULA heavy cargo airship programs, ATG and World SkyCat failed to generate the financial commitments needed for SkyCat production. Similarly, ATG failed to capitalize on their first StratSat business opportunity in Malaysia. As a consequence, ATG went into administration in 2005. ATG's hybrid airship business was acquired by SkyCat Group in 2006 and then in 2007 by Hybrid Air Vehicles (HAV). StratSat business was discontinued in 2005.

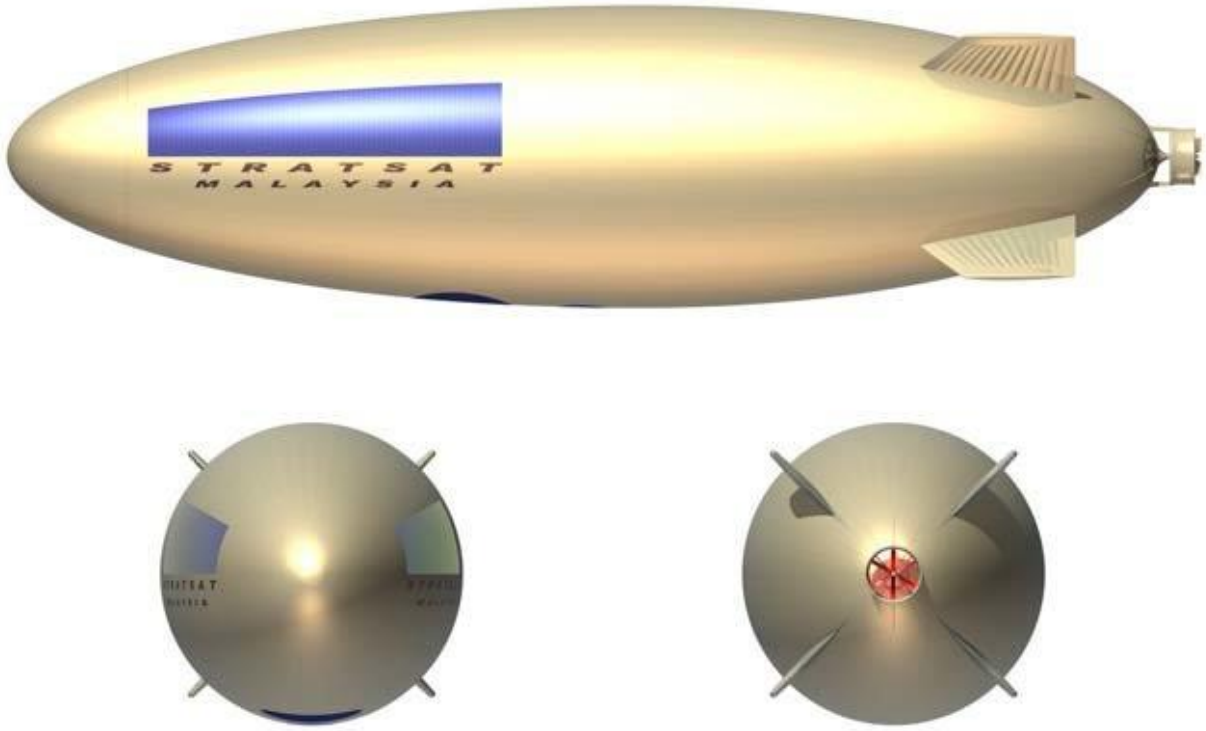
This article addresses the StratSat stratospheric airship developed Roger Munk and ATG. The SkyCat is the subject of a separate article.

2. The StratSat High Altitude Platform (HAP)

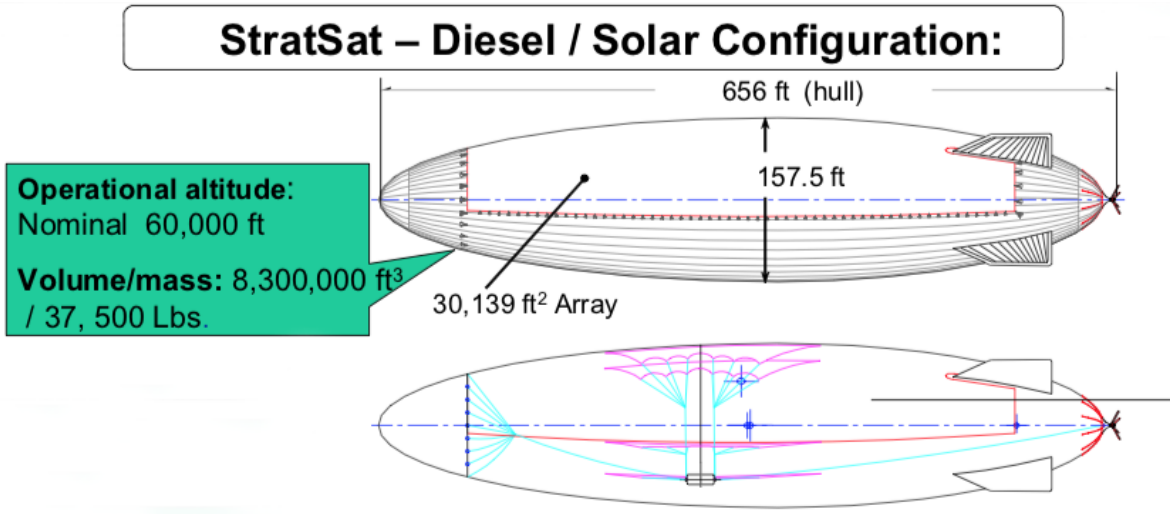
ATG planned to use high-altitude airships to provide wide geographic coverage for cellular, wide-band data and high-definition television at a fraction of the cost of satellites and without the many thousands of towers required by a terrestrial cellular phone / data system. ATG planed to lease the airship, or sell its services, to telecom companies. ATG believed it could make a profit selling multimegabit data service, with the telcom operators who would add their own charges to the customer's service bill.



Example of regional coverage for the UK with 6 HAP airships stationed at 20 km altitude with line-of-sight propagation between HAPs. Source: T. Tozer & D. Grace (2001)



General arrangement of the StratSat stratospheric airship.
Source: ATG



Source: Naval Research Advisory Committee, Report NRAC 06-02, April 2006

Design characteristics of the full-scale StratSat airship:

- Type: Ellipsoidal, semi-rigid
- Length: 200 m (656 ft)
- Diameter: 47.9 m (157 ft)
- Lift gas: Helium
- Volume: 235,029 cubic meters (8,300,000 cubic feet)
- Operating altitude: 20 km (65,600 ft)
- Station keeping capability: 0.5 km of target location at 35 m/s wind (126 kph, 78 mph)
- Payload: 2 metric tons (2.2 tons)
- Power source:
    - Hybrid electric system with a 2,700 square meter (30,139 sq ft) solar array on the hull for power during the day and regenerative batteries or fuel cells for power at night.
    - Also a diesel generator for supplementary power for high-speed “sprint” or responding to gusty wind conditions.
    - ATG also investigated generating onboard power by transmitting microwave energy from the ground to a receiver on the airship.
- Propulsion & control:
    - Provided solely by vectored thrust from the single rear mounted propulsor, which was described as a “contra-rotating coned rotor.”
    - The fins on the hull were fixed and did not function as conventional ruddervators.
- Mission duration: 5 years

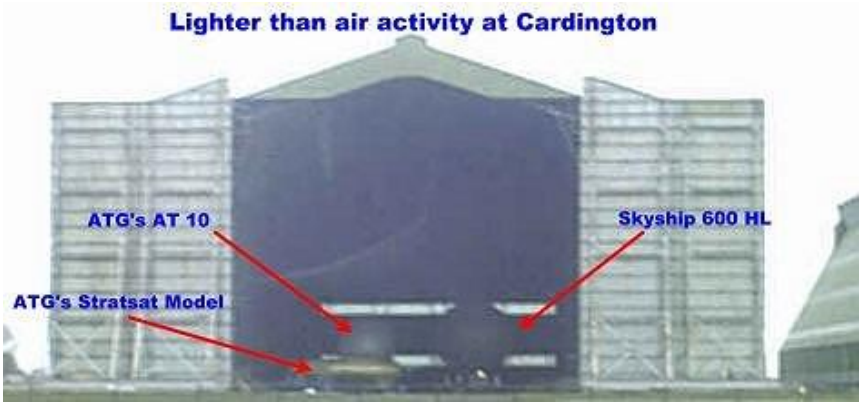
ATG developed a proprietary launch technique in which the StratSat airship was launched vertically through the open roof of its hanger, thereby minimizing the time the airship was close to the ground.

The StratSat was designed for autonomous operation after launch and would fly itself to a prescribed geostationary position in the stratosphere. From there, StratSat would deliver services for up to five years. Continuous online monitoring of airship and payload systems enabled personnel at a ground control station to take remote remedial actions or recall the StratSat for servicing back at the ground.

3. The StratSat sub-scale prototype

The sub-scale prototype airship had a length of 120 m (394 ft) and closely resembled the overall shape of the full-size StratSat. The prototype was designed to operate at an altitude of 10 – 12 km (32,800 – 39,400 ft), substantially lower than the 20 km (65,600 ft) operating altitude of the full-size StratSat.

StratSat's bare helium filled envelope was held down by heavy concrete blocks in a hanger at Cardington. The many triangular anchor points on the envelope mark locations that may carry a load. Source: Grahame Wilson via The Airships at Cardington, UK



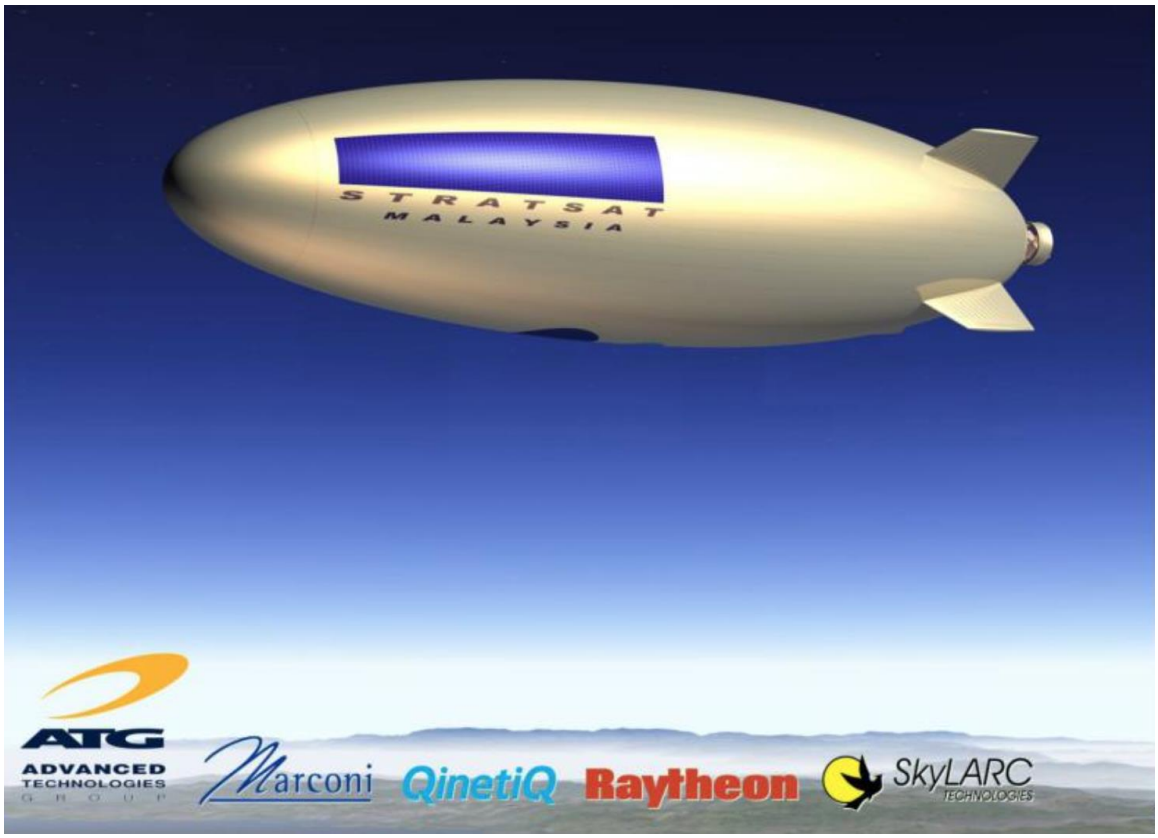
ATG's StratSat prototype and two other airships in the Hanger #1 at Cardington. Source: The Airship Heritage Trust

ATG's StratSat prototype in the hanger at Cardington.
Source: BBC News, 27 Feb 2002

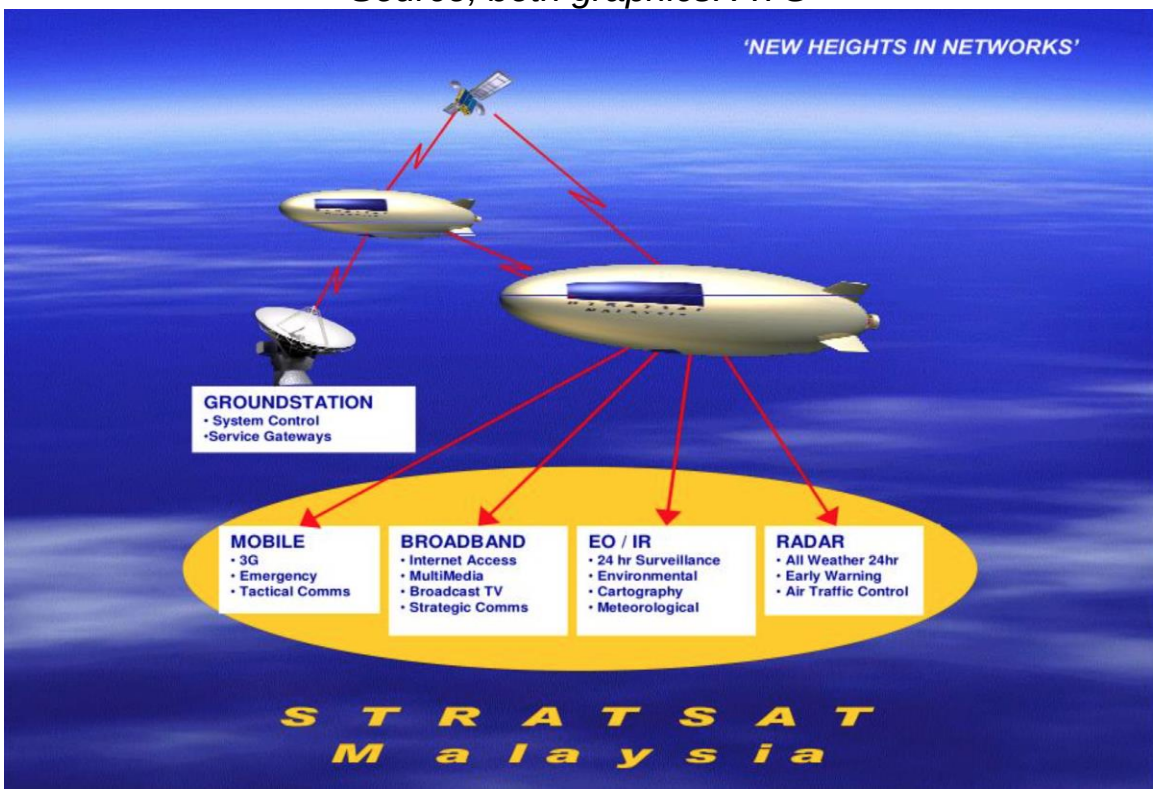
The Airship Association reported, "The StratSat model test programme has enabled the flying qualities to be significantly improved from the original design. A further test programme is planned to systematically assess the vehicle performance and stability and control characteristics."

4. StratSat Malaysia

This was a UK-led project funded by a Malaysian investment fund to deploy a network of StratSat HAPs to deliver a range of telcom services on Malaysia and neighboring nations, as shown in the following graphics. The consortium members were ATG, Marconi, QinetiQ, SkyLARC and Raytheon (from the US).



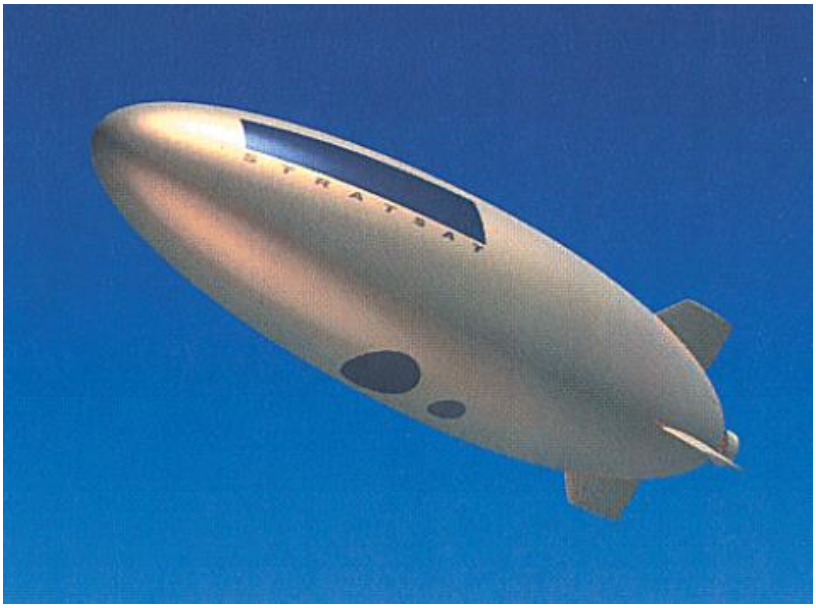
Source, both graphics: ATG



The project consisted of two phases to be conducted over 4.5 years:

- Phase 1 - Demonstrator System (DS):
  - Performance objectives: Fly to an operational altitude of 60,000 ft (18.3 km) and deliver services on station for 3 months.
  - Period of performance: 2 years
  - Cost: $160M
- Phase 2 - Objective System (OS):
  - Performance objectives:
    - Develop the OS payload & improve airship capability margins.
    - Build out & deploy the system in Malaysia with StratSats capable of remaining on station for 5 years.
    - Commence service expansion into neighboring nations.
  - Period of performance: 2.5 years
  - Cost: $400M

While ATG expected the StratSat to be field tested at an altitude of 20 km (65,600 ft) by the end of 2006, the development schedule continued to slip and was cut short when ATG went into receivership in 2005. Ultimately no such tests were accomplished with the StratSat.



Source: ATG

5. For more information:

- T. Tozer & D. Grace, “USE-HAAS, WP2, 1st Deliverable - Analysis of works and underway programmes,” Creative Technologies Israel Ltd., 27 July 2005: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.607.291&rep=rep1&type=pdf
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- “ATG Unveils Revolutionary New StratSat - The world's first Stratospheric Mobile Telecommunications Platform,” Yenra, 12 July 2001: https://yenra.com/advanced-technologies-group-atg-stratsat/
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- Grahame Wilson, “The Airships at Cardington, UK,” http://members.ozemail.com.au/~p0gwil/AIRSHIPS-CARDINGTON/AIRSHIPS-Introduction.htm