

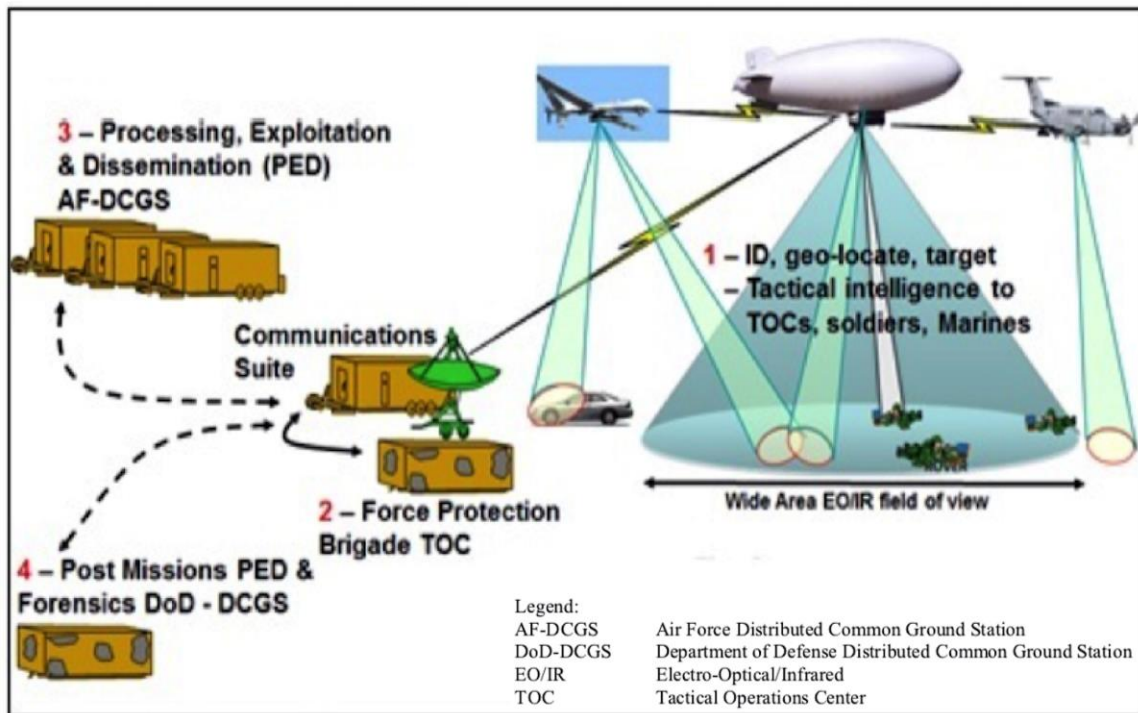
Blue Devil Block 2 (BD2)

Peter Lobner, 21 December 2020

1. Introduction

The Blue Devil Block 2 (BD2) airborne platform was a conventional non-rigid airship (a blimp) equipped to deliver persistent (24/7) intelligence, surveillance, and reconnaissance (ISR) and communications capabilities that filled important gaps in the capabilities available from satellites and aircraft / drones. The BD2 mission package included a powerful onboard computer system capable of processing up to 300 terabytes of data per hour. Users on the ground, including troops in the field, could query a server on the airship and download just the specific processed information they needed. This approach greatly reduced the communications bandwidth requirements needed to deliver ISR products to the user. The goal was to deliver the desired information to users in less than 15 seconds.

This basic concept of operations is shown in the following diagram.



The Blue Devil Block 2 concept of operations. Source: USAF/A2Q



Artist's concept of an operational Blue Devil Block 2 airship showing the two under-slung gondolas. Source: Mav6

2. Blue Devil Block 2 program startup and realignment

Blue Devil Block 2 development was initiated in August 2010 under a contract for a Wide Area Surveillance Platform (WASP) issued by the Army Corps of Engineers Research and Development Center (ERDC) on behalf of the Air Force Air Headquarters (HAF) / A2Q (Air Force ISR Innovations Division). The original goal was to send a prototype persistent surveillance airship to Afghanistan in 2011 for a one-year trial.

The Vicksburg, Mississippi-based firm Mav6 LLC, founded in 2007, was the prime contractor for the Blue Devil Block 2 program. Subcontractor TCOM LP, an established manufacturer of modest-sized tethered blimps headquartered in Columbia, Maryland, was responsible for manufacturing the gas envelope for the Blue Devil Block 2 airship (also known as an M1400 airship). Mav6 LLC no longer has an active website. The TCOM LP website is at the following link: <https://tcomlp.com/our-company/>

The Blue Devil Block 2 program duplicated many of the ISR and communications capabilities that the Army was developing at the same time in their Long Endurance Multi-Intelligence Vehicle (LEMV) program. The LEMV platform was a semi-rigid hybrid airship developed by the team of Northrop-Grumman and airship manufacturer HAV. The Government Accountability Office provided the following comparison of the BD2 and LEMV programs.

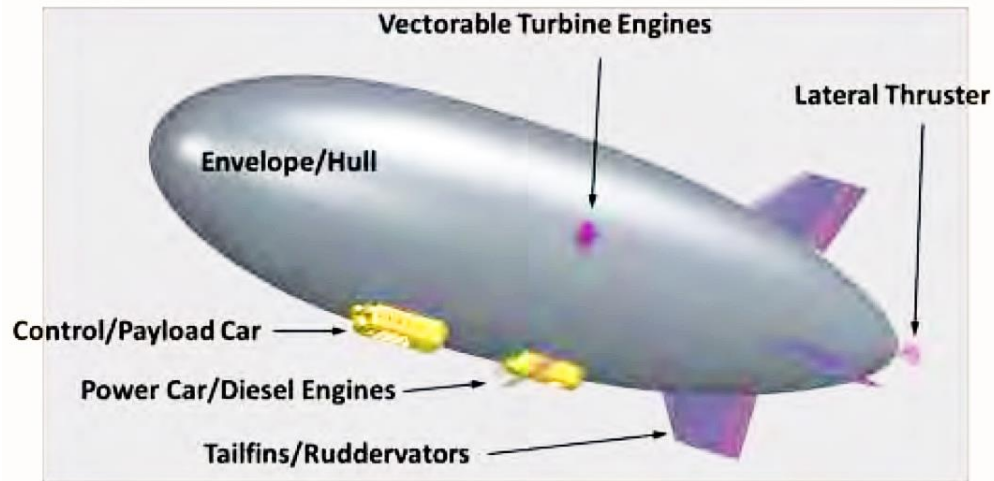
Table 2: Comparison of LEMV and Blue Devil Block 2 Capabilities as of June 2012^a

Airships	Long Endurance Multi-Intelligence Vehicle^b	Blue Devil Block 2
Payload weight capacity (pounds)	2,500	2,500
Operational altitude (feet above mean sea level)	20,000 ^c	20,000
Envelope volume (cubic feet)	1,342,000	1,400,000
Sensor type		
Electro-optical/infrared full motion video cameras	x	x
Wide area surveillance sensor		x
Signals intelligence sensor	x	x
Ground motion target indicator radar	x	
Communications relay system	x	x

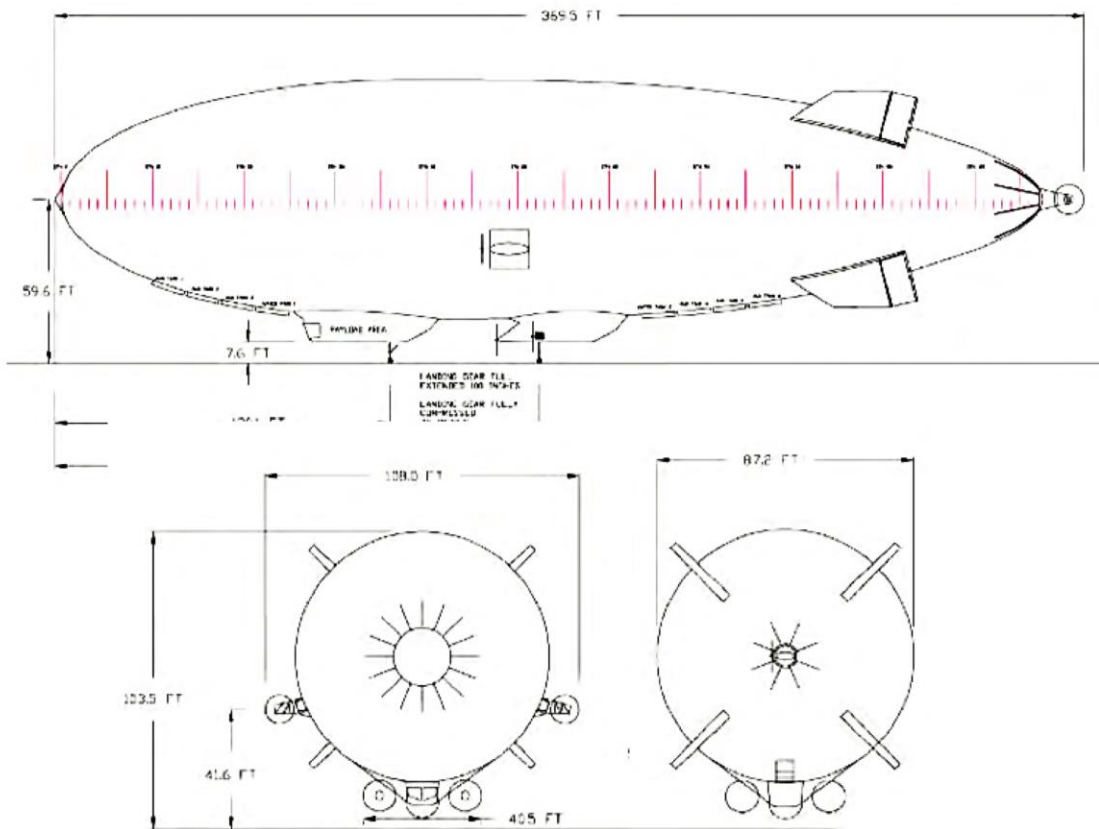
Source: GAO-13-81

In March 2011, the Blue Devil Block 2 program was realigned under a contract issued by the Air Force 645th Aeronautical Systems Group (aka “Big Safari”), which was responsible for a variety of Air Force ISR programs, but none of them involving lighter-than-air craft. As it turned out, Big Safari was not a proponent of the Blue Devil Block 2 program.

3. Blue Devil Block 2 airship design



*Blue Devil Block 2 airship general arrangement.
Source: USAF/PM645*



*Blue Devil Block 2 airship 3-view drawing.
Source: USAF/PM645*

Basic characteristics of the Blue Devil 2 unmanned sensor platform are summarized below:

- Lightweight, cigar shaped, non-rigid (blimp) hull with a round cross-section
- Length: 370 feet (123 meters)
- Diameter: 87.2 feet (26.6 meters)
- Gas envelope volume: 1.4 million ft³ (39,643 m³), making this the largest airship envelope manufactured in more than 50 years; about 7 times the volume of a Goodyear Blimp
- Cost to fill with helium (2012 prices): \$350,000 - \$400,000
- Payload: 2,500 pounds (1,134 kg)
- Electrical power for payload: 30 kW
- Propulsion: Six engines, with three providing directional thrust.
- Speed: 80 mph (129 kph) cruise; 100 mph (161 kph) maximum
- Operational altitude: 20,000 feet (6,096 meters)
- Two under-slung gondolas:
 - Control/payload car housing airship controls, including controls for an optional human pilot, and mission sensor, communications and computer systems.
 - Power car housing three diesel engines and the electrical systems.
- Sensor systems:
 - Multiple camera systems for day / night wide area surveillance, originally intended to include Defense Advanced Research Projects Agency's (DARPA) Autonomous Real-Time Ground Ubiquitous Imaging System (*Argus*), which was designed to provide wide-area surveillance coverage of 64 square kilometers.
 - Ground Moving Target Indicator (GMTI) package
 - Electronic eavesdropping systems such as the "Pennant Race" signal-intelligence (SIGINT) collector.
- Mission duration: Up to one week



Front view of the M1400 airship and the control / payload car (the forward gondola). Source: Mav6



Rear quarter view of the M1400 airship prototype floating in its hanger. The power car (the aft gondola), with three diesel engines, is in the foreground. One of the flank-mounted vectorable turboprop engines can be seen attached near the mid-plane of the hull.

Photo: Alex Washburn via Wired 6 Jul 2012



One of two vectorable turboprops engines mounted amidships via a structural framework that distributes loads into the fabric hull. Source: David Axe via Wired 6 Jul 2012

4. Program issues leading to delays and cancellation

The unrealistically short BD2 development cycle did not proceed well. While TCOM LP completed the gas envelope for the airship in August 2011, program milestones slipped to a planned first flight in late 2011 and an initial deployment to Afghanistan in February 2012. Mav6 reported that the USAF caused programmatic delays and cost increases by repeatedly changing system requirements and belatedly requiring Federal Aviation Administration certification of the airship before a human pilot could be on board for initial tests.

Various technical problems also caused the program schedule to slip and cost to increase. For example:

- The airship as a whole was overweight by more than 10,000 pounds (4,536 kg), which reduced airship performance.
- The tail fins were overweight and failed initial structural load testing, rendering the airship not flyable.
- The flight control software experienced problems due to issues related to scaling.
- The inability to integrate the original wide-area surveillance Argus camera system with other systems resulted in the adoption of the much less capable Angel Fire camera system, which provided coverage of only four square kilometers (1/16th of the coverage of the Argus camera system).

In the fall of 2011, the Air Force cancelled the planned 2012 test deployment to Afghanistan. The Air Force estimated the cost of that deployment would have been between \$100 to 120 million. The project continued to unravel in the spring of 2012, culminating with the USAF issuing a programmatic stop work order on 23 May 2012, with directions to “deflate and crate” the M1400 by 30 June 2012. At that time, the M1400 airship was largely complete, inflated and tethered in its hanger in Elizabeth City, North Carolina. FAA tests on the redesigned tail fin had been completed successfully at 50 mph airspeed in early May, and a test at 80 mph was scheduled at the end of May. The updated flight control software was scheduled for delivery by the end of May. Mav6 estimated that they had completed 90 – 95% of the development work.

The M1400 airship never made its first flight. The huge gas envelope was deflated and its entire helium inventory was vented to the atmosphere. The envelope, the six engines and the two gondolas were dismantled, packed into shipping containers and transported to an Air Force storage facility. This disposition cost was about \$2.6 million.

In 2013, the U.S. Department of Defense Inspector General issued their report DODIG 2013-128, "*Air Force and Army Corps of Engineers Improperly Managed the Award of Contracts for the Blue Devil Block 2 Persistent Surveillance System.*" In their conclusions, the IG found that the USAF had "wasted \$149 million on the uncompleted Blue Devil Block 2 system."



*Artist's concept of the M1400 airship prototype in flight.
Source. Mav6 via Naval Airship Association Summer 2012.*

5. For more information:

- "US Air Force Funds \$86M Blue Devil 2 Demonstration Airship," USA Vision, 4 November 2011:
<https://www.uasvision.com/2011/04/11/us-air-force-funds-86m-blue-devil-2-demonstration-airship/>

- Richard Dudley, “U.S. Air Force Deflates the Blue Devil II Airship,” Defense Update, 29 May 2012: https://defense-update.com/20120529_blue-devil-2-airship-deflated.html
- David Axe, “Check Out This Giant Spy Blimp Before the Air Force Kills It,” Wired, 6 July 2012: <https://www.wired.com/2012/06/deflated-mega-blimp/>
- “M1400 (Blue Devil 2) Airship Fact Sheet,” Mav6, May 2012: https://www.slideshare.net/robbinlaird/m1400-airship-factsheet25may12v2?from_action=save
- Naval Airship Association, *Noon Balloon*, Issue 94, pp. 13 – 14, Summer 2012: https://650a8e8c-0be3-466b-9728-1ece39a725e3.filesusr.com/ugd/fbd712_941b6ecaafd74c008b85012556572df4.pdf
- GAO-13-81, “Defense Acquisitions - Future Aerostat and Airship Investment Decisions Drive Oversight and Coordination Needs,” Government Accountability Office, October 2012: <https://www.gao.gov/assets/650/649661.pdf>
- Report to Congress, “Summary Report of DoD Funded Lighter-Than-Air-Vehicles,” DoD Office of the Assistant Secretary of Defense for Research and Engineering, 1 November 2012: <https://www.hsdl.org/?view&did=728733>
- DODIG 2013-128, “Air Force and Army Corps of Engineers Improperly Managed the Award of Contracts for the Blue Devil Block 2 Persistent Surveillance System,” U.S. Department of Defense Inspector General, 19 September 2013: <https://media.defense.gov/2013/Sep/19/2001713309/-1/-1/1/DODIG-2013-128.pdf>