



Australian Government

Australian Transport Safety Bureau

Airspace incursion involving unmanned airship, Airship 11

2.7 NM E of Moorabbin Airport, Victoria, 28 October 2012

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Airspace incursion involving unmanned airship, Airship 11

What happened

On 28 October 2012, at about 1410 Eastern Daylight-saving Time¹, an unmanned airship² (callsign Airship 11) departed Keysborough, Victoria on a 30 minute test flight. The remote crew of the airship consisted of a pilot in command (PIC), an observer and a software engineer. The PIC used a portable radio-controlled transmitter as the data link to operate the airship.

The purpose of the flight was to assess the airship's centre of gravity and manoeuvrability characteristics with a new tail configuration. As a facility to conduct tethered flight³ was not available, the crew planned to operate the flight below 200 ft above ground level (AGL) and within 100-200 m of their location, with the airship remaining clear of the Moorabbin Class D control area⁴.

Shortly after takeoff, the crew noticed that the airship's centre of gravity was rearward, resulting in a nose-up attitude. The PIC corrected the attitude by adjusting the elevator trim setting.

About one minute later, when at about 130 ft, the PIC realised that he could not turn the airship to the left, but there were no restrictions with right turns.

The PIC elected to land the airship, however, the rearward centre of gravity resulted in the airship climbing. The PIC also noted that the airship's elevator controls were not responding. When climbing through 200 ft, the PIC determined that control of the airship had been lost although the data link was still functioning. The PIC reduced engine power to the idle position (the flight termination procedure⁵), but the airship continued to climb and track in a north-westerly direction toward the Moorabbin control area (Figure 1).

The PIC attempted to contact the Moorabbin control tower via radio to advise of the situation, but was unsuccessful. The PIC and software engineer then transferred the portable radio-controlled transmitter for Airship 11 to a support vehicle and followed the airship by road. The observer remained at Keysborough and contacted the Moorabbin control tower and emergency services via telephone⁶.

At about 1428, the air traffic controllers at Moorabbin observed the airship about 2 NM to the south-east at about 1,000 ft. This was also confirmed by the pilot of an aircraft operating in the Moorabbin circuit.

Airship 11



Source: Airship operator

¹ Eastern Daylight Saving Time was Coordinated Universal Time (UTC) + 11 hours.

² The airship was classified as an unmanned aircraft system (UAS), where the aircraft and its associated elements are operated with no pilot on board.

³ Refers to a flight that it is flown within limits imposed by a restraining device, which attaches the airship to the surface.

⁴ In Class D airspace, all aircraft must obtain an airways clearance and communicate with air traffic control. Instrument flight rules (IFR) aircraft are positively separated from other IFR aircraft and are provided with traffic information on all visual flight rules (VFR) aircraft. VFR aircraft are provided with traffic information on all other aircraft. Moorabbin Airport was about 3 NM from the operating area.

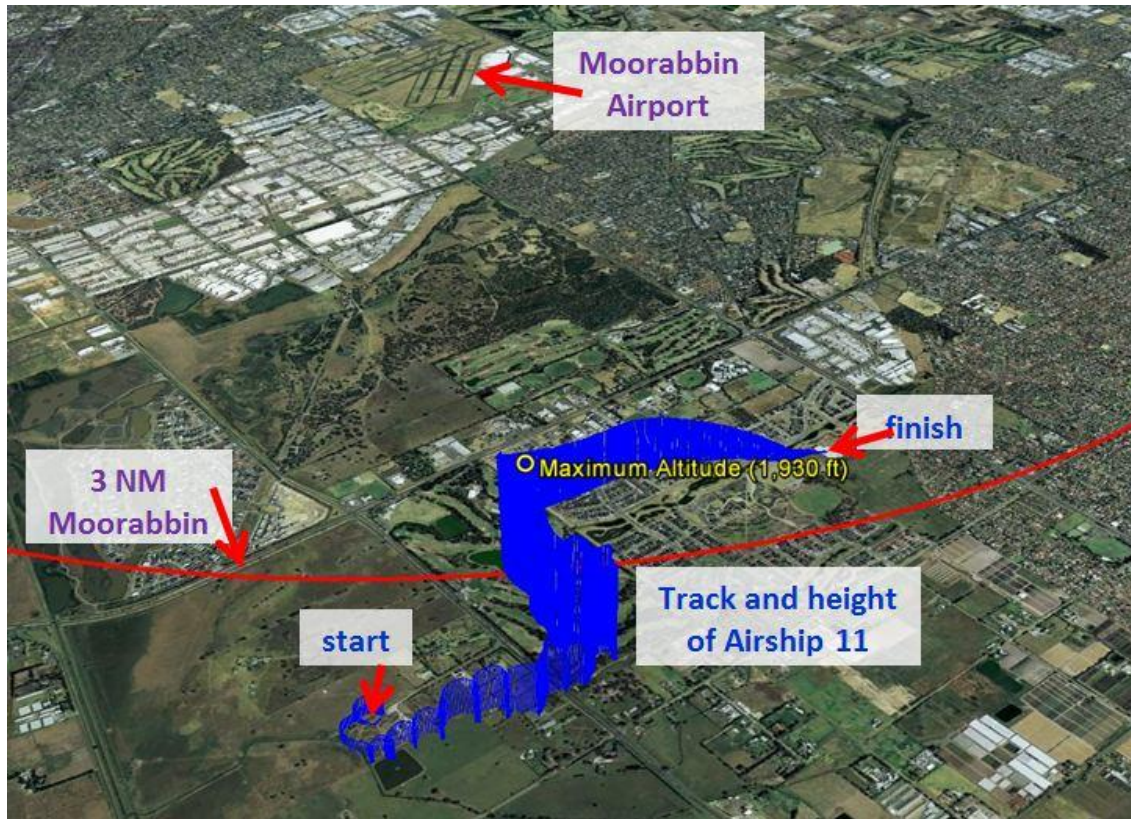
⁵ Reducing engine power to idle was intended to cause the airship to lose height and land.

⁶ The observer reported that it took some time to establish contact with the Moorabbin control tower as he did not have a contact number.

At about 1500, the airship landed on the roof of a commercial building. The airship sustained minor damage.

Data provided to the ATSB by the airship operator indicated that the airship reached an altitude of 1,930 ft and, at its closest, was 2.7 NM from Moorabbin Airport.

Figure 1: Track and height of Airship 11



Source: Google Earth and Airship operator

Airship information

The airship consisted of a 10 m long envelope (balloon), a gondola suspended below the envelope, and the tail surfaces. The envelope and gondola were manufactured in China and together weighed less than 7.6 kg. The airship's two piston engines were attached to the gondola, which also contained the autopilot, a payload box, batteries and the fuel tank. The airship was controlled by the PIC using a portable radio-controlled transmitter and was not fitted with a transponder, nor was one required.

The tail surfaces of the airship had been recently changed from a cruciform (+) to an X configuration.

Pre-flight preparations

Ground testing

Ground testing had been conducted prior to the flight, with all control surfaces responding correctly. However, the placement of the gondola on the envelope and the resulting centre of gravity could not be accurately determined prior to the test flight. In addition, the manoeuvrability characteristics of the X-tail were not known.

Documentation and training

A pre-flight checklist had not been completed as it had not been developed at the time. Furthermore, the manufacturer of the airship had provided the operator with basic documentation and no training.

Operating area

Flight testing with other airships had been conducted by the operator at a more remote location away from controlled airspace. However, on this occasion the operator decided to conduct the flight closer to the company's workshop.

Airservices Australia notification

While not required, on the morning of the flight, the PIC went to Moorabbin control tower with the intention of providing the air traffic controllers with details of the proposed test flight. The PIC reported that the controllers were not concerned with the proposed flight as it was intended to remain outside controlled airspace.

Operator investigation

The airship operator conducted an investigation into the incident and identified the following:

- **Control rod failure:** The loss of control was due to one of the tail-fin control rods becoming detached from a ball link. The rod had been incorrectly threaded into the housing when installed. A quality assurance check of the installation was not conducted.
- **Centre of gravity:** The crew had insufficient experience in setting up the airship and the manufacturer did not provide documentation for centre of gravity calculations.

Applicability of civil aviation regulations

The Civil Aviation Safety Regulations (CASRs) Part 101 *Unmanned aircraft and rockets*⁷ (CASR 101) sets out the requirements for the operation of unmanned aircraft (including airships). As the envelope capacity of the airship of 36 cubic metres was less than 100 cubic metres, registration of the airship was not required and the airship was not subject to the airworthiness and flight crew qualification requirements of the Civil Aviation Regulations 1988 (CARs).

The Civil Aviation Safety Authority (CASA) advised the ATSB that the unmanned aircraft was allowed to operate below 400 ft, not in controlled airspace, not over a populous area and not within 3 NM of an airport without CASA approval. The remote crew of Airship 11 had intended to comply with these requirements.

In July 2011, CASA commenced a project to provide more comprehensive guidance on the regulatory requirements and approval processes for the commercial operation of unmanned aircraft systems (UAS) in Australia. The guidance will consider the long term integration of UAS into normal aviation operations in all classes of airspace. However, CASA advised that this particular operation type would still need to meet the requirements of CASR 101 and the intention of the project is to provide enhanced guidance material on all UAS flying related matters, including test flight activities.

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Airship operator

As a result of this occurrence, the airship operator has advised the ATSB that they are taking the following safety actions:

- source an airship from another manufacturer that will provide training and documentation;
- develop a safe method for tethered air testing;

⁷ See Volume 3 of the Civil Aviation Safety [Regulations](#) 1998.

- develop a simulator for a small X-tail airship;
- locate a suitable site for flight testing away from populated areas;
- install the ground control station in the support vehicle;
- develop a pre-flight checklist; and
- develop a change management process to consider risks when changes are made to hardware or processes.

General details

Manufacturer and model:	China Advertising Balloons Co Ltd	
Type of operation:	Other	
Occurrence category	Incident	
Primary occurrence type:	Airspace incursion	
Location:	2.7 NM south-east of Moorabbin Airport, Victoria	
	Latitude: S 38° 00.50'	Longitude: E 145° 14.50'
Damage:	Minor	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; and fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.