



Australian Government

Australian Transport Safety Bureau

Flight below minimum altitude involving an Avro 146, VH-NJW

near Granny Smith Airport, Western Australia, on 23 June 2015

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Addendum

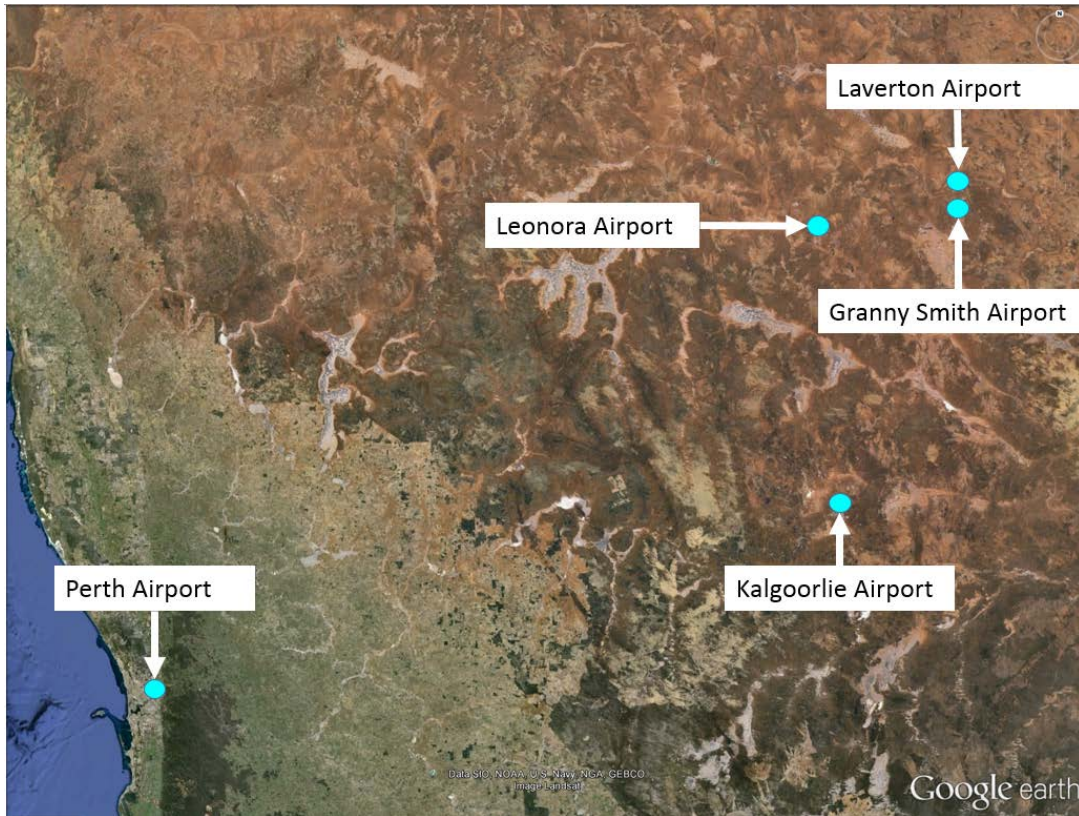
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Flight below minimum altitude involving an Avro 146, VH-NJW

What happened

On 23 June 2015, at about 0420 Western Standard Time (WST), the captain and first officer of an Avro 146 aircraft, registered VH-NJW, and operated by National Jet Express, signed on to conduct a scheduled return flight from Perth to Granny Smith Airport, Western Australia (Figure 1). The flight crew reviewed the weather forecast, including the aerodrome forecast (TAF)¹ for Leonora, which was the closest available TAF to Granny Smith. The TAF indicated broken² cloud 1,000 ft above ground level (AGL). The weather report (METAR) current at Leonora at that time indicated nil cloud detected (NCD). The forecast also included cloud at 1,500 ft AGL clearing at 0900 WST. Based on the weather forecast, the crew were required to plan for an alternate aerodrome,³ and the captain planned sufficient fuel to return to Perth if they were unable to land at Granny Smith.

Figure 1: Selected aerodromes in Western Australia



Source: Google earth annotated by the ATSB

- ¹ Aerodrome Forecasts are a statement of meteorological conditions expected for a specific period of time, in the airspace within a radius of 5 NM (9 km) of the aerodrome.
- ² Cloud cover is normally reported using expressions that denote the extent of the cover. The expression few indicates that up to a quarter of the sky was covered, scattered indicates that cloud was covering between a quarter and a half of the sky. Broken indicates that more than half to almost all the sky was covered, while overcast means all the sky was covered.
- ³ Alternate minima are specified weather conditions or facilities for a particular aerodrome such that, if the weather conditions or facilities are less than the alternate minima, the pilot in command must provide for a suitable alternate aerodrome.

The first officer conducted the take-off and climb from Perth, and handed control of the aircraft to the captain after reaching the top of climb. In accordance with company procedures, the captain was required to conduct the landing at Granny Smith airport, due to the unsealed runway surface.

When established in the cruise, the flight crew received a weather report for Laverton indicating cloud at 800 ft AGL. The first officer spoke to the aerodrome reporting officer (ARO) at Granny Smith Airport, who reported that there were patches of blue sky above the aerodrome. The flight crew elected to continue to Granny Smith. They planned to overfly the aerodrome at the lowest safe altitude of 3,300 ft above mean sea level (AMSL), and if the weather was suitable, descend and join the circuit on downwind for runway 16. If they were unable to obtain the required visual reference for the aerodrome, the crew planned to divert to Laverton Airport, and conduct an area navigation (RNAV) approach and land there. The flight crew also discussed the option of conducting an RNAV approach at Laverton and, if suitable conditions for visual flight existed, they could then transit across to Granny Smith Airport, about 9 NM south of Laverton.

When the aircraft arrived overhead Granny Smith, the conditions were overcast. The flight crew elected to divert to Laverton, and advised the ARO that if they were able to establish visual reference at Laverton they would track from there to Granny Smith. The aircraft descended to the minimum sector altitude of 3,100 ft AMSL and the flight crew conducted the RNAV approach to runway 25. The crew configured the aircraft for the approach into Laverton, selecting gear down and flap 24, prior to arrival at the initial approach fix. When about 2.5 NM from the runway threshold and at about 2,150 ft AMSL, the aircraft became clear of cloud but the captain could not see the runway ahead at Laverton. The captain then disconnected the autopilot and turned the flight director off, in accordance with the standard company procedure for conducting a visual approach.

The weather to the south towards Granny Smith was clear, so the captain elected to divert to Granny Smith and turned the aircraft towards it, with the aircraft still configured for the approach with gear down and flap 24. The flight crew were able to maintain visual contact with the ground and reported about 8 km of visibility. The first officer had set the altimeter bug to 2,130 ft prior to commencing the descent, which was the minimum descent altitude (MDA) of 2,080 ft plus 50 ft as required by the company procedures. The wind was from 160° at 12 kt, and the captain planned to establish the aircraft on a straight in approach for runway 16.

The captain observed the radio altimeter (RADALT) indicating 500 ft and the electronic ground proximity warning system (EGPWS)⁴ called '500', both indicating the aircraft was 500 ft AGL. Shortly afterwards, the crew received an EGPWS 'DON'T SINK' warning. The first officer observed the RADALT indicating 380 ft and the vertical speed indicator showing about 100 ft per minute descent. The captain immediately applied nose-up pitch and increased the thrust, in accordance with the standard response. The aircraft climbed towards cloud and the captain levelled the aircraft off to remain clear of cloud. The crew then received a second 'DON'T SINK' warning (see 'Don't Sink' section below). The first officer noted the RADALT indicating 410 ft and the captain immediately initiated a go-around, climbing to 4,000 ft AMSL.

Due to the time spent operating with the aircraft in the approach configuration, and the possibility of holding required in Perth, the captain then elected to divert to Kalgoorlie and refuel. After arrival in Kalgoorlie, the captain contacted the company flight operations manager. The manager queried whether the captain was fit to continue to operate the aircraft, to which the captain replied in the affirmative. After communicating with the company, at about 0900, the aircraft departed and tracked to Granny Smith. The conditions were still overcast at Granny Smith Airport, and the flight crew elected to track to Laverton, and conduct the RNAV approach. When at about 2,500 ft AMSL

⁴ The aircraft was fitted with an integrated terrain and traffic collision avoidance system that incorporated a number of functions, including a terrain awareness warning function (TAWS), a ground proximity warning function, and a traffic alert and collision avoidance function (TCAS).

the aircraft encountered visual meteorological conditions.⁵ The flight crew then elected to track to Granny Smith Airport, where the aircraft landed. The crew subsequently conducted the return flight to Perth.

Don't Sink

According to the flight crew operating manual (FCOM), the EGPWS Mode 3 provides protection against loss of altitude after take-off or during a go-around. The amount of altitude loss is assessed against the height of the aircraft above the terrain. If the loss of altitude becomes significant for the height, a 'Don't Sink, Don't Sink' aural alert is given and the amber (terrain) 'TERR' caution lights illuminate. In response to a 'Don't Sink' caution, the FCOM specified one memory action: adjust the pitch attitude and thrust to restore a positive rate of climb.

Pilot comments

The captain had limited sleep in the preceding three weeks. In the 24 hours prior to signing on for duty, the captain had about three hours' sleep. The captain reported feeling irritable, with poor concentration, heavy eyes, and slow thinking processes. The captain believed that the captain's decision-making had been affected by lack of sleep. The captain advised the first officer prior to the flight of having had little sleep.

Both the captain and the first officer had been on leave for three weeks prior to the incident flight.

The first officer reported that they had made the decision to transit to Granny Smith, based on the understanding that a visual segment could be flown as the aircraft was within 30 NM of the aerodrome, clear of cloud and in sight of the ground with visibility greater than 5 km. However, that applied, according to Aeronautical Information Publication Australia (AIP) ENR 1.5-12 section 1.15 *Visual Approaches*, when the aircraft was 'at an altitude not below the lowest safe altitude [LSALT] /minimum sector altitude [MSA] for the route segment'. The minimum sector altitude was 3,300 ft.

Flight data

The aircraft operator analysed the flight data (Figure 2). The data showed that during the transit from Laverton to Granny Smith, EGPWS 'DON'T SINK' alerts were triggered when the aircraft's altitude reduced to 346 ft AGL, and again 1 minute later at 529 ft and then 520 ft AGL.

⁵ Visual Meteorological Conditions is an aviation flight category in which visual flight rules (VFR) flight is permitted—that is, conditions in which pilots have sufficient visibility to fly the aircraft maintaining visual separation from terrain and other aircraft.

Figure 2: Plan view of the incident flight from the recorded flight data



Source: Aircraft Operator

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.

Aircraft operator

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

Fitness to fly

The head of flying operations (HOFO) for the aircraft operator sent a notice to all company flight crew. The notice stated that fitness to fly was critical for their daily functions. The HOFO reminded flight crew that their personal health and safe operations of company aircraft were of the highest priority. Company pilots were advised not to work if they did not feel 'up to the task'. The notice also provided contact information for the company's recommended employee assistance program.

Safety notice

The company immediately issued an operational notice to all flight crew, titled *Operations to airfields without instrument approach procedures*. The notice stated the following:

On arrival at the destination, descent below the LSALT is only permitted if, within 5 NM of the airfield, conditions exist to permit a visual approach as per the runway approach profiles specified in the applicable Operations Notice or the OM-C1.

For reference, **OM-A2 1.5.3 Lowest Safe Altitude**

An aircraft may only be operated below the LSALT when:

- Departing the prescribed circling area and operation above the MSA
- Carrying out a published instrument approach
- Carrying out a minimum weather circuit within the circling area and not below the circling altitude
- In the process of taking off or landing in accordance with approved departure or arrival procedures
- Visual conditions exist, utilising criteria laid down in the *Jeppesen Airway Manual – Air Traffic Control – General Flight Procedures*
- Being radar vectored.

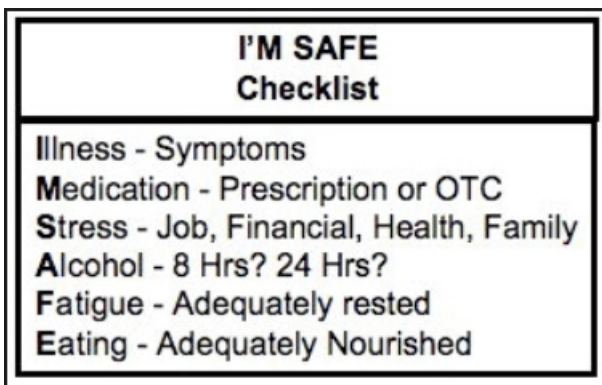
It is not permitted to conduct an instrument approach at a nearby airfield to gain visual reference, and then transit to the destination airfield below LSALT.

Safety message

The captain noted that in hindsight their decision-making was impaired by lack of sleep. Research (Thomas and Ferguson, 2010) has shown that prior sleep is a critical fatigue-related variable. Less than 6 hours' sleep in the previous 24 hours was found to be associated with degraded operational performance and increased error rates.⁶

[Civil Aviation Advisory Publication \(CAAP\) 48-1\(1\)](#), states that 'determining fitness for duty has always been a complex and challenging task...and substantial fatigue research has demonstrated that humans are quite poor at determining how fatigued they actually are.' In addition, flight crewmembers 'who are fatigued will have impaired decision-making and they will have poorer judgment in terms of how fatigued they are and whether they are actually fit for duty'.

Prior to flight, it is important for pilots to assess their fitness to fly. The following checklist provides a quick reference. A description of aeromedical factors is available in the US Federal Aviation Authority [Pilot's Handbook of Aeronautical Knowledge](#).



⁶ Thomas, M.J., and Ferguson, S.A. (2010). *Prior sleep, prior wake and crew performance during normal flight operations*, in *Aviation, space and environmental medicine*, 81(7):665-70.

General details

Occurrence details

Date and time:	23 June 2015 – 0700 WST	
Occurrence category:	Incident	
Primary occurrence type:	Flight below minimum altitude	
Location:	near Granny Smith Airport, Western Australia	
	Latitude: 28° 45.80' S	Longitude: 122° 26.27" E

Aircraft details

Manufacturer and model:	British Aerospace Avro 146-RJ85	
Registration:	VH-NJW	
Operator:	National Jet Express	
Serial number:	E2329	
Type of operation:	Air transport high capacity – Passenger	
Persons on board:	Crew – 5	Passengers – 67
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB 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.