Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT

Aviation Occurrence Investigation – AO-2007-048

Final

Breakdown of separation
7 km SW of Sydney Airport, NSW
21 September 2007
VH-EKX
SAAB Aircraft AB, SF-340B
VH-CKO
Eurocopter EC120

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Abstract

On 21 September 2007, a SAAB Aircraft AB, SF-340B (SAAB) registered VH-EKX was inbound to Sydney, NSW on a scheduled passenger service from Wagga Wagga, NSW. The crew was cleared by air traffic control to track direct to short final runway 16R at Sydney Airport. The last assigned altitude issued to the SAAB crew was 2,500 ft. A Eurocopter EC120 helicopter registered VH-CKO had departed Sydney Airport on a Georges River 1 departure and, when identified on radar by air traffic control, was cleared to track direct to Kingsgrove at 1,500 ft for aerial work. Air traffic control had coordinated the positions and intended tracks of both aircraft and established a 1,000 ft vertical separation standard.

At 1058.08 Eastern Standard Time, the short term conflict alert activated on the display consoles of the air traffic controllers. Two seconds later, the copilot of the SAAB reported that they were responding to a resolution advisory from the aircraft's traffic advisory and collision avoidance system (TCAS). Radar analysis indicated that the separation between the two aircraft reduced to 200 ft vertically and 0.5 NM horizontally. There was an infringement of the vertical separation standard of 1,000 ft.

The helicopter pilot had climbed to 2,000 ft and later reported that he had been distracted from monitoring his assigned altitude by a focus on meeting the client's photographic requirements. The pilot in command and the copilot of the SAAB both reported that they believed that they had been cleared by air traffic control to make a visual approach and had descended their aircraft to 2,000 ft.

The investigation established that there was a safety issue in that there is no requirement for a controller to confirm that descent below a previously assigned altitude has not been given in a clearance to a circuit position that does not include a visual approach clearance. Airservices Australia is examining options to address this safety issue.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal bureau within the Australian Government Department of Infrastructure, Transport, Regional Development and Local Government. ATSB investigations are independent of regulatory, operator or other external organisations.

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.

Purpose of safety investigations

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

It is not the object of an investigation to determine blame or liability. However, 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.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.

About ATSB investigation reports: How investigation reports are organised and definitions of terms used in ATSB reports, such as safety factor, contributing safety factor and safety issue, are provided on the ATSB web site www.atsb.gov.au.

FACTUAL INFORMATION

Sequence of events

On 21 September 2007, a SAAB Aircraft AB, SF-340B (SAAB), registered VH-EKX, was inbound to Sydney, NSW on a scheduled passenger service from Wagga Wagga, NSW. On board were the pilot in command, the copilot, one flight attendant and 25 passengers. When the SAAB was about 15 km west of the airport on descent to 2,500 ft, the crew was cleared by air traffic control to track direct to short final runway 16 Right (16R) at Sydney Airport.

There is no requirement for a controller to confirm that descent below a previously assigned altitude has not been given in a clearance to a circuit position that does not include a visual approach clearance. The controller did not reiterate that the crew had to maintain 2,500 ft while tracking to short final.

A Eurocopter EC120 helicopter, registered VH-CKO, had departed Sydney Airport on a Georges River 1 Departure[1] and, when identified on radar by air traffic control, was cleared to track direct to Kingsgrove[2] at 1,500 ft for aerial work. On board the helicopter were the pilot in command, a photographer and two passengers.

The weather was fine with good visibility; cloud cover was limited to about 1 to 2 oktas[3], the cloud base was about 3,400 ft with 3 to 4 oktas at 4,500 ft. The wind was 13 kts from the south-south-east and was gusting occasionally to 20 kts. Temperature was 16^{O} Celsius.

The pilot of the helicopter was being managed by the Departures South controller and the SAAB was being managed by the Director West controller. While the projected flight paths of the aircraft would place them in close proximity, the controllers had coordinated the positions and intended tracks of both aircraft with each other and had established a 1,000 ft vertical separation standard as a part of their air traffic management plan. According to the Manual of Air Traffic Services (MATS) 4.3.1.1, effective 31 Aug 2006:

> Vertical separation shall be obtained by requiring aircraft using prescribed altimeter settings to operate at different levels, expressed in terms of flight levels or altitudes.

At 1057:16 Eastern Standard Time[4], the SAAB was passing 2,600 ft and the copilot asked the Director West controller if runway 07 was available for landing. An

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1 Georges River 1 – Outbound. Track via the western shore of Botany Bay to Dolls Point, remaining over water at all times; ALT 500ft; then via the Georges River to Picnic Point. West of Captain Cook Bridge climb to 1000ft. From Picnic Point track to Choppers South (intersection of two creeks enclosing a sewerage treatment works, 2.1 NM south of Bankstown). *AIP Australia, ERSA FAC S-30 dated 30 August 2007*.

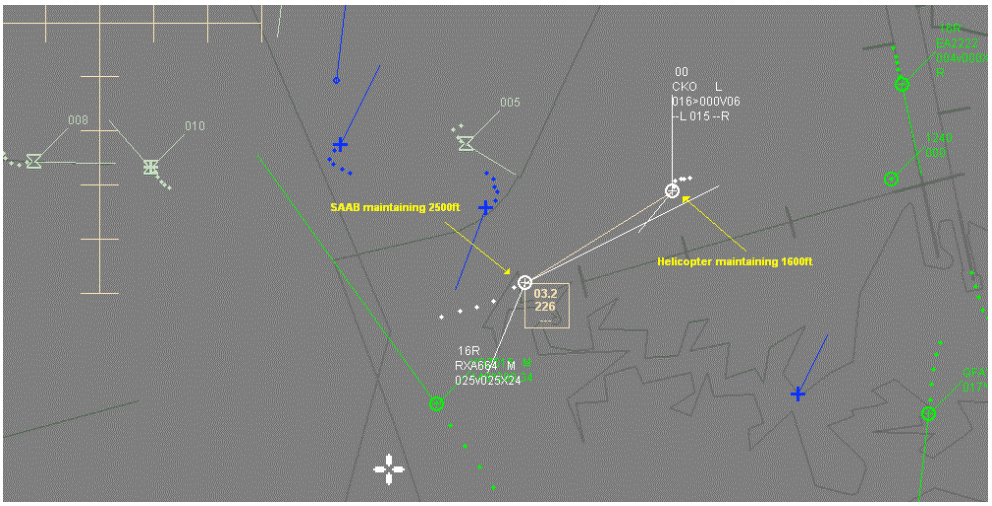
2 Kingsgrove is a suburban area about 8 km to the west of Sydney Airport.

3 Okta – unit of sky area equal to one-eighth of total sky visible to celestial horizon. *The Cambridge Aerospace Dictionary, 2004.*

4 The 24-hour clock is used in this report to describe the local time of day, Eastern Standard Time (EST), as particular events occurred. Eastern Standard Time is Coordinated Universal Time (UTC) +10 hours.

approach to runway 07 would allow the SAAB to fly directly to Sydney with very little manoeuvring required for a straight in approach, because the aircraft was already positioned on the extended centreline for that particular runway. The controller advised that runway 07 was not available due to the presence of the helicopter, which was in the vicinity and about to be overflown by the SAAB. At 1057:28, the copilot acknowledged the controller's advice and reported seeing the helicopter (Figure 1).

Figure 1: Air situation display depicting aircraft positions at the time the SAAB crew reported seeing the helicopter



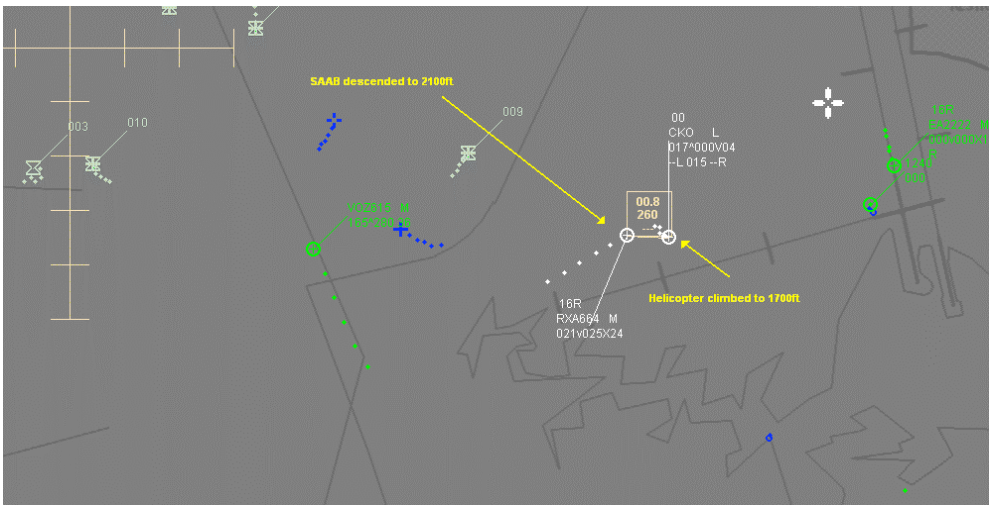
The pilot in command of the SAAB was the handling pilot and was flying with the autopilot system engaged. The pilot in command stated at interview that generally, he always flew an approach on autopilot and would usually dial in the last assigned altitude on the altitude pre-alert (APA). Once a visual approach was authorised by air traffic control, he would dial in 1,600 ft on the APA and use the heading bug to direct the aircraft where to fly.

At 1058:08, the short term conflict alert activated on the air traffic control air situation display consoles (Figure 2). Two seconds later, the copilot of the SAAB reported that they were responding to a resolution advisory[5] (RA) from the aircraft's traffic alert and collision avoidance system (TCAS) that directed the crew to climb the aircraft for collision avoidance. Radar analysis indicated that the separation between the two aircraft reduced to 200 ft vertically and 900 m[6] horizontally. There was an infringement of the vertical separation standard of 1,000 ft.

5 Verbal or display indication recommending increased vertical separation relative to an intruding aircraft.

6 Radar analysis determined horizontal radar separation reduced to 0.5 NM.

Figure 2: Air situation display depicting aircraft positions at the time controllers were alerted to the conflict.



The Departures South controller then asked the helicopter pilot to confirm that his aircraft was at 1,500 ft. The pilot apologised and advised that the helicopter had climbed to 2,000 ft, but was now descending. The pilot later reported that he was not aware of the proximity of the SAAB and had been distracted from monitoring his assigned altitude. The distraction was a result of a task focus on meeting the client's photographic requirements.

The Aeronautical lnformation Publication (AIP) specifies pilot responsibilities and in particular:

> AIP ENR 1.1 -1 paragraph 3.2 states - The pilot is responsible for obtaining a clearance and, once obtained, must not amend a planned route, deviate from the cleared track , or change level without obtaining ATC approval.
>
> AIP ENR 1.1-20 paragraph 11.1.8 states - Approach Control will provide instructions for progressive descent and specify any change in route, clearance limits and holding instructions.
>
> ENR 1.1-21 paragraph 11.4.1 states - Aircraft cleared for a visual approach or instrument approach procedure will not be assigned a level restriction.

The pilot in command and the copilot on the SAAB both reported that they believed that they had been cleared by air traffic control to make a visual approach and had descended their aircraft from 2,500 ft to 2,000 ft. The controller stated that the last assigned altitude issued to the SAAB crew prior to the incident was 2,500 ft. The pilot in command stated at interview that he recalled air traffic control saying '…you're number one for 16R, make visual approach for short final'. A review of the audio recording of the radio communication between the Director West controller and the crew of the SAAB confirmed that the last assigned altitude was indeed 2,500 ft and no clearance to descend had been issued. The crew were told to '…turn left as required, track direct to short final 16R, you're number one'.

While the controller was not required to restate a previously assigned altitude to a pilot, an option was available for a controller to convey to the pilot that further descent can be expected at some later stage or position (eg ... expect further descent in 2 miles').

Generally, there should be no loss of separation between two aircraft if some form of separation assurance is being provided. MATS 4.1.1.4, effective 17 March 2005 stated:

> Tactical Separation Assurance places greater emphasis on traffic planning and conflict avoidance rather than conflict resolution. This is achieved through:
>
> 1. the proactive application of separation standards to avoid rather than resolve conflicts;
> 2. planning traffic to guarantee rather than achieve separation;
> 3. executing the plan so as to guarantee separation; and
> 4. monitoring the situation to ensure that plan and execution are effective.

Both controllers stated, and analysis of the controllers' input traces confirmed, that they had been monitoring the tracks of their respective aircraft. Nevertheless, the rapid and unexpected change in altitudes for both aircraft resulted in a critical situation. Because of the rapid and unexpected loss in separation, neither controller had time to issue a safety alert to the pilots of the aircraft involved.

MATS 5.1.11.1, effective 7 June 2007 stated:

> A Safety Alert shall be issued to an aircraft when a controller is aware the aircraft is in a situation which is considered to place it in unsafe proximity to terrain, obstructions, or other aircraft. The controller must remain vigilant for the development of such situations and issue a Safety Alert when the situation is recognised.

MATS 5.1.11.8, effective 7 June 2007 stated:

> When a controller is aware that an aircraft is in unsafe proximity to another aircraft, a Safety Alert shall be issued as follows:"(Call sign) TRAFFIC ALERT (position of traffic if time permits), [SUGGEST] TURN LEFT/RIGHT (specific heading, if appropriate), and/or [SUGGEST] CLIMB/DESCEND (specific altitude if appropriate), IMMEDIATELY".

Previous Occurrences

Due to anecdotal evidence that pilots often had been reported in the past for descending without a clearance when tracking for a position in the circuit area, a search was conducted of the ATSB's OASIS[7] aviation safety database and the SIIMS[8] database for the 3-year period from 1 October 2004 to 1 October 2007. The OASIS data was from 1 October 2004 until 14 April 2007 and the SIIMS database provided data from 15 April 2007 until 1 October 2007. All incidents involving altitude deviations in or around the circuit area were considered and analysed.

The analysis was intended to ascertain the frequency of incidents involving aircraft descending below the assigned altitude when the pilots were cleared direct to a circuit position, without a reiteration to the crew of the last assigned altitude.

The data from OASIS, which covered an earlier period of about 2 years and 6 months, provided three confirmed occurrences and three possible events. The three

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7 OASIS – Occurrence Analysis Safety Information System.

8 SIIMS – Safety Investigation Information Management System. The system was commissioned on 15 April 2007 to replace the OASIS aviation safety database.

possible events had insufficient data in the incident report to provide an assurance that altitude deviations had occurred.

The data from the SIIMS database covered the more recent and much shorter period of 5 and a half months. This data provided examples of 10 occurrences. An example is provided below of one of these occurrences, which involved a high capacity air transport aircraft inbound to Perth:

> (Callsign 1) inbound via the 156R was instructed to descend to A040 and track for downwind runway 21. The aircraft was given traffic on departing B737 (Callsign 2) who had been given runway heading and M30 [maintain 3,000 ft] off RWY 21. (Callsign 1) was observed descending through 4000'. (Callsign 1) was challenged and advised they thought they were given a visual approach. Traffic was passed again and the F50 advised traffic was in sight and he would maintain own separation. (Callsign 1) was assigned a visual approach. In excess of the radar separation standard was maintained at all times.

ANALYSIS

Actions of air traffic control.

The Director West controller had assigned 2,500 ft to the crew of the SAAB Aircraft AB, SF-340B (SAAB). When the crew were recleared from their current position direct to short final, the assigned altitude of 2,500 ft was not restated as there is no requirement for a controller to confirm that descent below a previously assigned altitude has not been given in a clearance to a circuit position that does not include a visual approach clearance. Had the controller included the altitude to maintain or provided some advice as to descent expectation in addition to the tracking details of the new clearance, it is probable that the crew would not have descended the aircraft below the assigned altitude.

The sudden loss of separation between the two aircraft had surprised both controllers. While both of the controllers had been closely monitoring their respective air situation displays, the loss of vertical separation had occurred when the two aircraft were in the same locality and the crews of both aircraft had not maintained their assigned altitudes.

Normally, when a pilot of an aircraft does not comply with an assigned altitude, there would be time for air traffic control to correct the altitude deviation with the pilot. The non-compliance with a clearance would be recognised and actioned before aircraft came into conflict and a resultant loss of the separation standard eventuated. Because the crews of both aircraft had not maintained their assigned altitudes while they were in the same vicinity, the rate of closure between the aircraft had doubled, resulting in a sudden loss of the separation standard with minimal time available for the controllers to correct the error or issue an altitude alert.

Actions of the helicopter pilot

The pilot of the helicopter acknowledged that he was distracted from the task of flying the aircraft due to his focus on the task of meeting his client's needs by positioning the aircraft for the on-board photographer. Distraction is well known as a factor that interferes with human performance.

Actions of the SAAB crew

Both of the technical crew members of the SAAB believed that they had been cleared for a visual approach to runway 16R. They were aware of the helicopter and had seen it visually when it was reported to them by air traffic control. Because they had seen the helicopter, this may have reduced their threat assessment and lowered their awareness of risk.

Earlier, the crew had been instructed to descend to 2,500 ft. When they were told to track direct to short final, although they did not descend the aircraft below 2,500 ft at that time, the instruction may have influenced their mental model of the approach profile. They then asked for tracking for runway 07, which was denied due to the location of the helicopter. Once the aircraft was clear of the helicopter, radar

analysis showed that the crew recommenced descent below the last assigned altitude of 2,500 ft, and descended the aircraft to 2,000 ft.

The handling pilot had dialled 2,500 ft into the altitude pre-alert (APA), which would have been a memory prompt for the crew to remain at that altitude. However, because the crew thought that they had been cleared for a visual approach when they were given the tracking instructions for runway 16R, 1,600 ft had been dialled into the APA.

There have been several instances of other pilots descending below their assigned altitude when cleared by air traffic control direct to a circuit position. The increased frequency of these types of events is of concern. The reason for the increase is not understood, but may be as a result of the increased efficacy of the search function of the SIIMS database or an improvement to the safety incident reporting culture.

FINDINGS

From the evidence available, the following findings are made with respect to the breakdown of separation between the SAAB Aircraft AB, SF-340B (SAAB) and the Eurocopter EC120 (EC120) helicopter and should not be read as apportioning blame or liability to any particular organisation or individual

Contributing safety factors

- The EC120 helicopter pilot did not monitor that the aircraft was maintaining the assigned altitude while manoeuvring.
- The crew of the SAAB descended their aircraft without a clearance to do so.
- The crew of the SAAB did not maintain the previously assigned altitude when issued a tracking clearance to a circuit position that did not include an altitude.
- The vertical separation between the EC120 and the SAAB 340B reduced below the applicable vertical separation standard of 1,000 ft.

Other safety factors

- There is no requirement for a controller to confirm that descent below a previously assigned altitude has not been given in a clearance to a circuit position that does not include a visual approach clearance. *[Safety issue]*
- The EC120 helicopter pilot was distracted by another task while manoeuvring in the area of the occurrence.

SAFETY ACTION

The safety issues identified during this investigation are listed in the Findings and Safety Action sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety action, rather than to issue formal safety recommendations or safety advisory notices.

All of the responsible organisations for the safety issues identified during this investigation were given a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

Airservices Australia

Confirmation of an assigned altitude

Safety issue

There is no requirement for a controller to confirm that descent below a previously assigned altitude has not been given in a clearance to a circuit position that does not include a visual approach clearance.

Response from Airservices Australia

The Australian Transport Safety Bureau briefed Airservices Australia on the outcomes of the investigation including the safety issue above. The following advice in relation to the safety issue was received by the ATSB on 15 April 2008 as part of Airservices' response to the draft report:

> The common thread to this investigation and the other incident referred to in the body of the report is that this non-compliance occurred when given circuit entry and manoeuvring instructions. In both cases the crews believed they had been issued with a visual approach, apparently as a consequence of these instructions, when in fact no such clearance had been issued.
>
> This is also part of a wider issue regarding flight termination that includes visual approach clearances being issued to flights following a STAR procedure.
>
> Discussions in respect of the [safety issue] are ongoing within Airservices as a part of developing a best practice response.

The ATSB will monitor progress on Airservices Australia's response to the safety issue.