



Australian Government

Australian Transport Safety Bureau

Mid-air collision involving Eurocopter EC130B4, VH-XH9, and Eurocopter EC130B4, VH-XKQ

Main Beach, Gold Coast, Queensland on 2 January 2023



ATSB Transport Safety Report

Aviation Occurrence Investigation (Defined)

AO-2023-001

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Postal address: GPO Box 321, Canberra, ACT 2601
Office: 12 Moore Street, Canberra, ACT 2601
Telephone: 1800 020 616, from overseas +61 2 6257 2463
Accident and incident notification: 1800 011 034 (24 hours)
Email: atsbinfo@atsb.gov.au
Website: www.atsb.gov.au

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Addendum

Page	Change	Date

Preliminary report

This preliminary report details factual information established in the investigation's early evidence collection phase, and has been prepared to provide timely information to the industry and public. Preliminary reports contain no analysis or findings, which will be detailed in the investigation's final report. The information contained in this preliminary report is released in accordance with section 25 of the *Transport Safety Investigation Act 2003*.

The occurrence

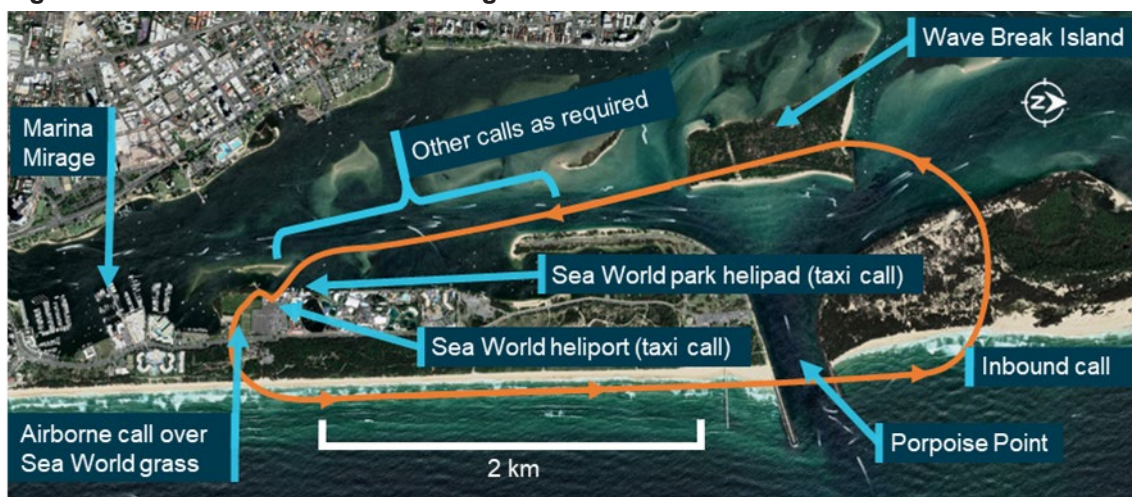
On 2 January 2023, Sea World Helicopters was conducting a series of scenic flights under the visual flight rules from its base at Sea World on the Gold Coast, Queensland. The operator was using 2 Eurocopter¹ EC130B4 helicopters, registered VH-XH9 (XH9) and VH-XKQ (XKQ). The helicopters were operating from separate helipads about 220 m apart. These were pad 3 at the operator's heliport and the park helipad inside the theme park. Both pilots flew in the morning, then had a lunch break before commencing more flights.

The first flight after lunch for the pilot of XH9 was a 10-minute scenic flight, which landed at about 1346 local time. Around the same time, the pilot of XKQ conducted a 10-minute scenic flight, landing at about 1350.

At about 1351:40, XH9 departed pad 3 at the operator's heliport for a 5-minute scenic flight, with the pilot and 5 passengers on board. The 5-minute scenic flight climbed over an area known locally as 'Sea World grass' before tracking northbound coastal over water at 500 ft. Figure 1 shows the standard route and radio calls for the operator's 5-minute flights.

At about 1353:40, the pilot of XH9 made an inbound radio call from near Porpoise Point stating their position, height of 500 ft and intention to track to Sea World via the Broadwater by making a left turn.

Figure 1: Standard 5-minute scenic flight route and radio calls



Source: Google Earth, annotated by the ATSB

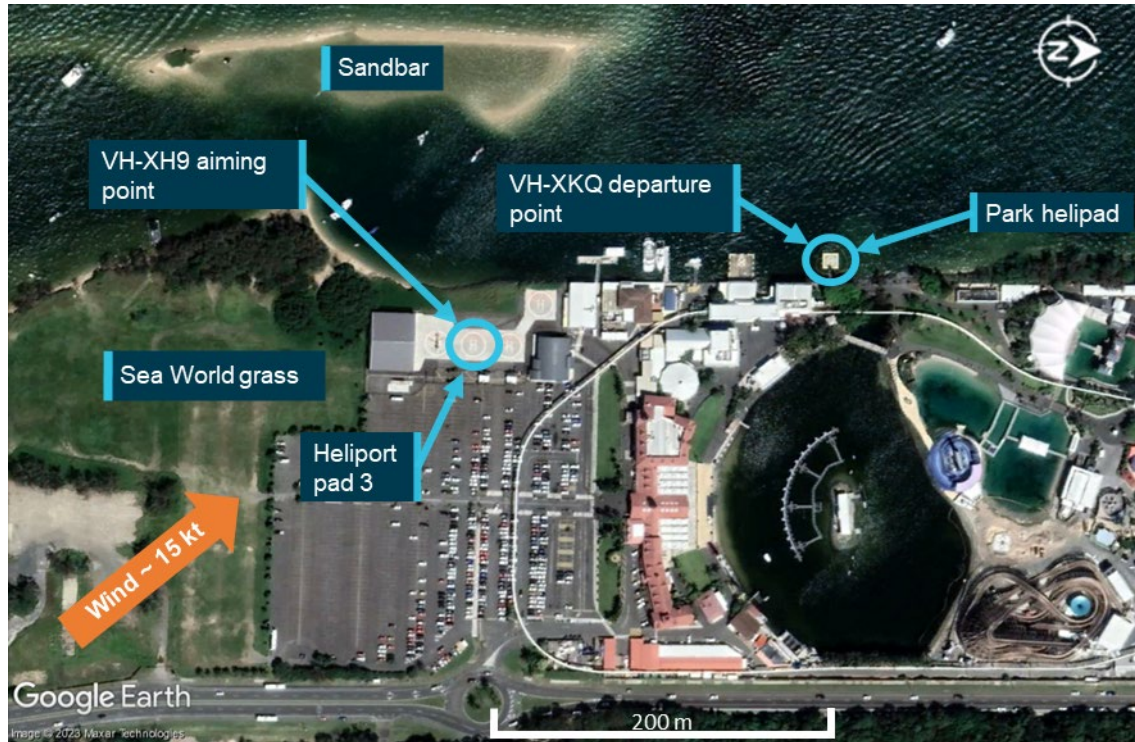
Concurrently, at a separate helipad within the theme park (park helipad), 2 ground crew were loading passengers into XKQ in preparation for departure (Figure 2). The flight was also planned

¹ Eurocopter became Airbus Helicopters in 2014. The Eurocopter EC130 series is now sold as the Airbus Helicopters H130.

as a 5-minute scenic flight, with the pilot and 6 passengers on board. The first passenger entered the aircraft at about 1353:35.

The ground crew assisted passengers into XKQ, fastened the passengers' seatbelts and helped with the passengers' headsets. The ground crew reported that they completed a final visual check of the helicopter, which included checking all the doors were closed and ensuring the surrounding area was free from hazards, and signalled to the pilot that XKQ was ready for departure. They then went to prepare passengers and information for the next flight. The ground crew later reported that they had not seen any other aircraft before giving the signal for the pilot to depart.

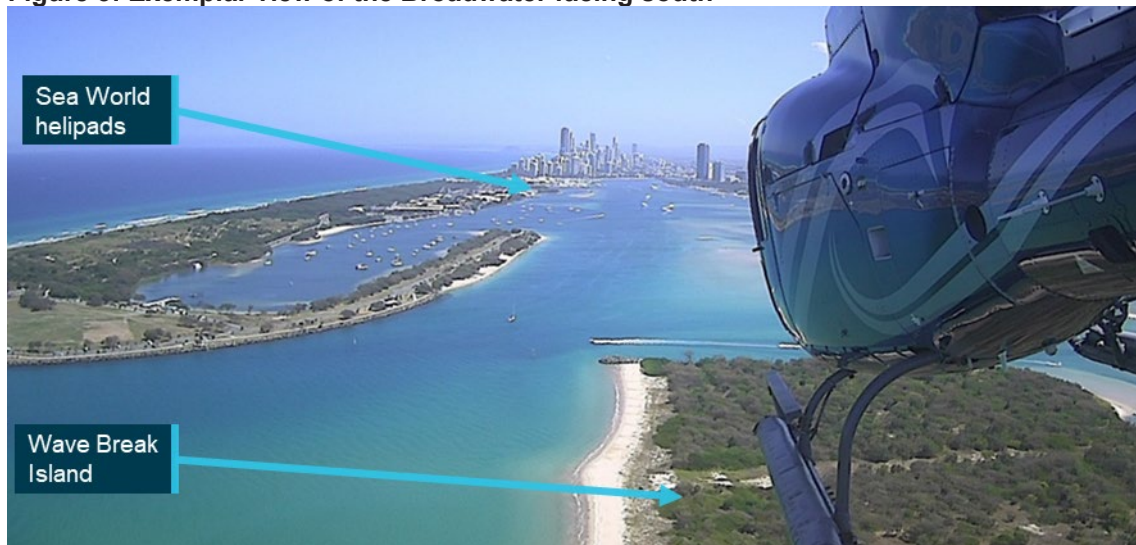
Figure 2: Helipad configuration at Sea World on 2 January 2023



Source: Google Earth, annotated by the ATSB

On the return leg of the scenic flight in XH9, the track southbound along the Broadwater provided a clear view of the helipads at Sea World (Figure 3). The pilot of XH9 stated that, while transiting the Broadwater, they saw passengers being loaded into XKQ and the doors of XKQ closing. The pilot of XH9 recalled that their assessment at the time was that they would be clear of XKQ and that it would pass behind them.

Figure 3: Exemplar view of the Broadwater facing south

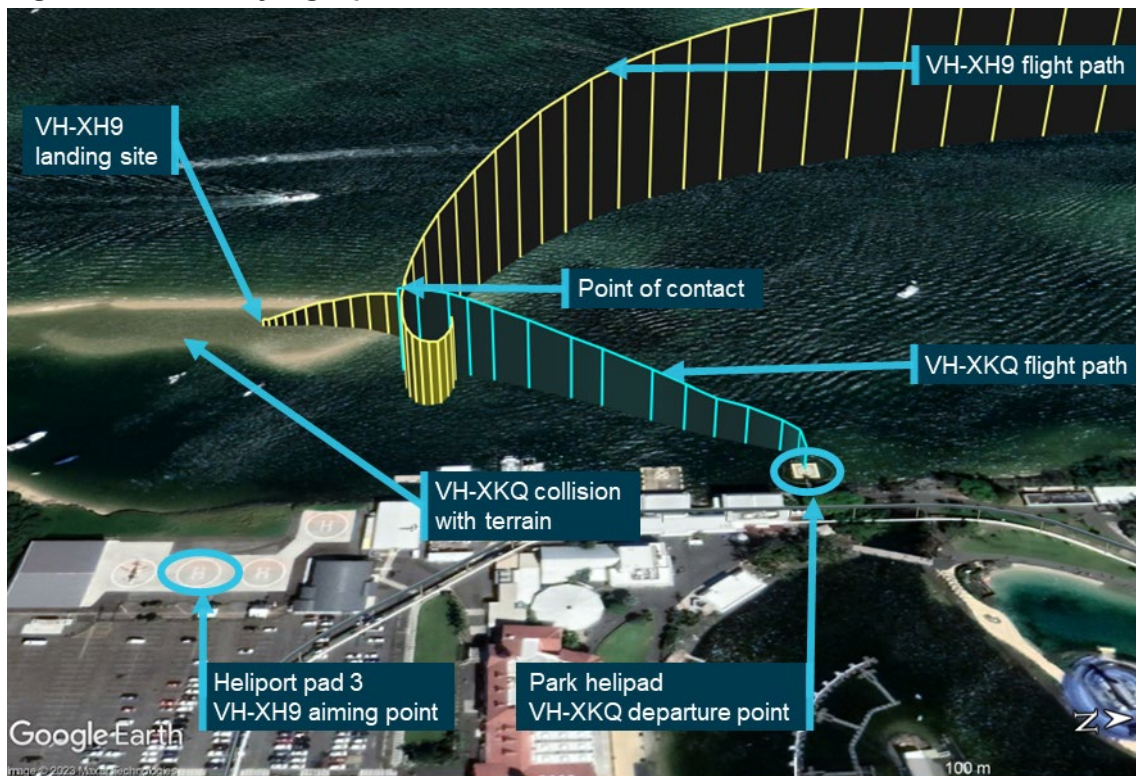


Source: Sea World Helicopters, annotated by the ATSB

At 1355:42, the pilot of XKQ commenced their scenic flight and was climbing over water in the direction of the sandbar near the helipad (Figure 4). The pilot of XH9 reported that they did not hear a taxi call over the radio from the pilot of XKQ. This does not necessarily mean that a taxi call was not made and this topic will be subject to detailed analysis by the ATSB investigation. The pilot of XH9 also reported that they did not see XKQ depart from the park helipad.

At about 1355:47, the pilot of XH9 turned left onto a final approach path for pad 3. The pilot of XH9 reported that at this time they were focussed on the landing site, and on managing rotor downwash to avoid a pleasure craft crossing their approach path.

Figure 4: Preliminary flight path reconstruction of VH-XH9 and VH-XKQ



Source: Google Earth, annotated by the ATSB

Video footage taken by passengers in both helicopters on mobile phones contained images of the other helicopter (Figure 5). This does not mean that the helicopters were visible to either pilot from their positions in the helicopter, or even the passenger filming, and this aspect will be subject to detailed analysis by the ATSB investigation.

At about 1355:59, 2 passengers on board XH9 sighted XKQ. Understanding the helicopter would only get closer, at least one passenger attempted verbal guidance to the pilot. As the verbal guidance did not work, and anticipating a potential collision, one passenger physically alerted the pilot. The pilot of XH9 later recalled being alerted to the other helicopter by a passenger, but the pilot did not see XKQ approaching prior to the collision.

At 1356:05, 23 seconds into XKQ's flight, at a height of about 130 ft, the helicopters collided (Figure 4 above).

Figure 5: Images captured simultaneously from each helicopter at about 1355:55



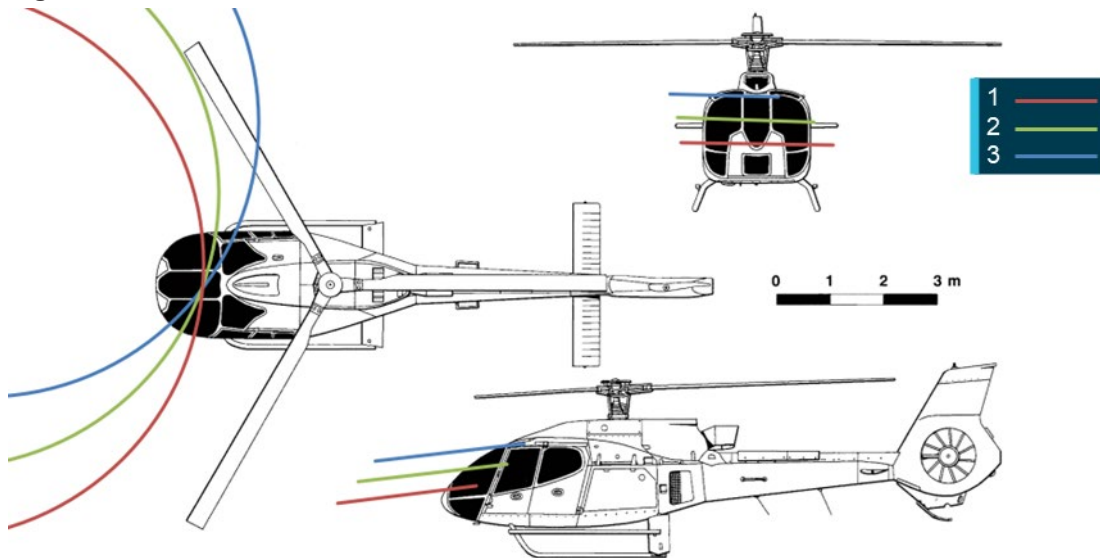
Source: Google Earth, Supplied, annotated by the ATSB

The main rotor blades of XKQ entered the forward cabin of XH9 (Figure 6). XKQ broke apart in mid-air and impacted shallow water next to the sandbar. The pilot and 3 passengers were fatally injured, and 3 passengers were seriously injured. The helicopter was destroyed.

Helicopter XH9 had significant damage to the forward cabin, instrument console, and main rotor blades. The impact turned XH9 to the left, and the pilot continued with the momentum of that

movement, completing a 270° descending turn to land on the sandbar below them near to XKQ. The pilot and 2 passengers were seriously injured, and 3 other passengers had minor injuries.

Figure 6: Indicative main rotor strikes to cabin of VH-XH9



Source: Drawing database, annotated by the ATSB

Context

Operator information

Sea World Helicopters' primary business was conducting scenic flights. These flights were generally on pre-determined routes and of 5-, 10-, 15- or 20-minute durations. The operator's air operator certificate, which enabled these flights, was reissued in July 2022 by the Civil Aviation Safety Authority for 5 years.

The operator changed ownership in late 2018, with a new chief executive officer and chief pilot then appointed. It subsequently developed new heliport and park helipad facilities (Figure 2).

The operator primarily utilised 2 Eurocopter AS350 helicopters for its flights with occasional use of another EC130 until December 2022, when VH-XH9 (XH9) and VH-XKQ (XKQ) were also introduced into service. It employed 3 full-time pilots and 2 part-time pilots.

The operator was an independent entity to the Sea World theme park and held a concession for use of the land and brand.

Pilot information

The pilots of both aircraft involved in the collision were experienced helicopter pilots with extended responsibilities within the operator. Both were qualified for the role and held valid class 1 aviation medical certificates and valid flight reviews for the Eurocopter EC130. Additionally, both pilots were experienced flight instructors, meaning they were experienced in flying helicopters from both a left or right seat position.²

The pilot of VH-XKQ (XKQ) held an Air Transport Pilot Licence (helicopter) and was a grade 1 flight instructor. The pilot's logbook showed a total flight time of about 6,200 hours. This pilot was

² In most light helicopters, including the AS350, the pilot is seated in the front right seat. In the EC130, the pilot is seated in the front left seat.

also the helicopter operator's chief pilot and head of airworthiness and maintenance control, and had managerial duties within the organisation.

The pilot of VH-XH9 (XH9) held a Commercial Pilot Licence (helicopter) and was a grade 2 flight instructor. The pilot's logbook showed a total flight time of about 3,150 hours. This pilot was also the helicopter operator's safety manager.

Helicopter information

General information

The Eurocopter EC130 is a single turbine engine helicopter, with a Fenestron tail rotor and 2 rows of seats for a pilot, seated front left, and 6 passengers. The helicopter type had 2 main variants, the B4 (available from 2001) and the T2 (released in 2014). At the time of the accident there were 39 EC130s on the Australian civil aircraft register, comprising 21 B4 and 18 T2 variants.

VH-XKQ

XKQ, an EC 130B4 serial number 4639, was manufactured in France in 2008 and had 2,267.5 hours total time in service. It was imported into Australia from Indonesia in September 2022, and first registered in Australia as VH-XKQ on 2 November 2022. It was issued a certificate of airworthiness on 9 December 2022 and entered service with Sea World Helicopters on 13 December 2022, commencing scenic flights on 26 December. It had flown about 9.2 hours since entering service with the operator.

XKQ was equipped with pop-out emergency floats. Emergency floats were an operator-imposed requirement for operating from the park helipad.

The maintenance release for XKQ, and maintenance tracking system did not indicate that any outstanding maintenance was required.

VH-XH9

XH9, an EC 130B4 serial number 3845, was manufactured in France in 2004 and had 6,785 hours total time in service. Most recently operating in New Zealand, it was first registered in Australia as VH-XH9 on 3 November 2022.

Following inspection for issuance of an Australian certificate of airworthiness, it was released to service on 1 December 2022. XH9 entered service with Sea World Helicopters on 3 December 2022, it was used for scenic flights on 4 December before commencing regular scenic flights on 16 December. It had flown about 35.0 hours since entering service with the operator.

Maintenance conducted in the helicopter following release to service included:

- engine seal replacement
- throttle switch replacement
- transponder troubleshooting (see also *Transponder systems*).

Wreckage and impact information

At the time of the accident (1356:05), the sandbar near Sea World was exposed. A high tide of 1.05 m at 1706 partially covered XKQ and the next high tide was 1.49 m at 0605 the following day. The ATSB attended the accident site and recorded and recovered evidence on the sandbar in the time available. Queensland Police Service, on behalf of the Coroner, recovered the helicopters and transported them to a secure facility. The ATSB made extensive examination of both helicopters at that facility.

Damage to the nose of XH9 indicated that the main rotor blades of XKQ passed through the front of the cabin of XH9, severing several windshield and door frames. The windshield panels and

several instruments in the pedestal were destroyed. The main rotor blades of XH9 showed damage and skin delamination, likely due to contact with debris passing through the main rotor system.

A review of recorded video footage indicated that, following the mid-air collision, XKQ's rotor system, engine, and tail rotor system separated from the airframe as it fell and came to rest in a group, about 95 m from the fuselage impact point. A review of video footage and the wreckage indicated that the helicopter impacted shallow water adjacent to the sandbar at a steep angle. The nose had rotated away from the direction of travel, and the helicopter had rolled approximately 70° to the right at point of impact. Following the impact, the helicopter rolled to the left, coming to rest on its roof on the sandbar.

Helipad and airspace information

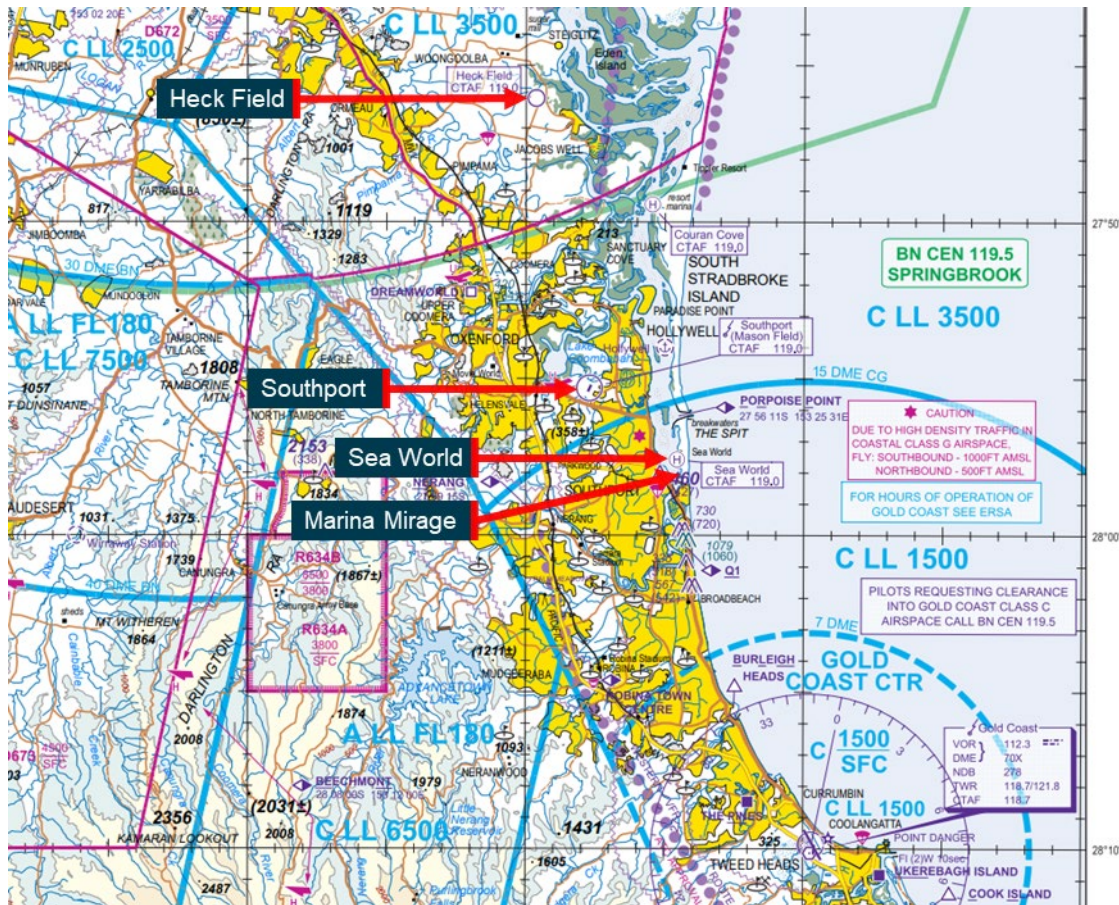
The operator's helicopters were operating from 2 separate helipad facilities about 220 m apart, with both managed by the operator. A separate operator also conducted frequent helicopter operations from another helipad, Marina Mirage, about 900 m to the south (Figure 1).

The airspace above the helipads is uncontrolled (Class G airspace) to a height of 1,500 ft (Figure 7). Communication between aircraft in the area takes place on a common traffic advisory frequency (CTAF). The same VHF frequency (119.0) services Southport Aerodrome, about 9 km to the north-west, and Heck Field Aerodrome, about 27 km north-north-west. A CTAF has no defined boundary, however a pilot inbound for a CTAF must make an inbound call by about 10 NM (18.5 km) from the landing site.

A large volume of diverse aviation operations take place in the area of the CTAF, including tourist charter, private sightseeing, flight training, military operations, Surf Life Saving, police operations and parachuting.

Although there can be a large volume of radio traffic on the local CTAF, the volume of traffic at the time of the accident was low. There were 2 helicopters operating from Sea World and 2 helicopters operating from Marina Mirage.

Figure 7: Gold Coast Visual Terminal Chart extract



Source: Aircservices Australia, annotated by the ATSB

Scenic flight procedures

The operator's pilots implemented common approach and departure paths to the helipads and used standard radio calls on the CTAF. Flight paths were chosen to maximise the availability of forced landing areas, and could be altered to the north or south depending on wind. The approach path of XH9 and the departure path of XKQ were both within the normal envelope of previous flight paths flown from those locations.

Standard radio calls on the CTAF for the 5-minute flights were (Figure 1):

- a taxi call just prior to lifting from the pad
- an airborne call while departing over the 'Sea World grass' to track north
- an inbound call past Porpoise Point turning to track south.

Pilots advised that they would broadcast additional calls on the CTAF for coordination of traffic if it was considered necessary to do so. Additional calls were also made on longer flights at turning points and as required.³ The operator did not have, and was not required to have, a dedicated VHF frequency for additional communication between its pilots.

³ The longer flights all ended with the same flight path as a 5-minute flight (north to Porpoise Point and then a left turn and return to Sea World).

Ground crew reported, in line with procedure, that they would communicate with pilots prior to a departure via hand signals and, where available, UHF radio.⁴ These hand signals would indicate the type of scenic flight the pilot was to fly, and confirmation that a visual check of the aircraft and surrounds had taken place. The visual check included:

- doors are secured
- nothing hanging outside the doors
- the area is clear behind the helicopter and on any adjoining helipads.

Ground crew stated that clearing the area behind the helicopter involved alerting a pilot to objects behind them, such as birds, tall-masted vessels, and other aircraft.

Review of recorded radio transmissions

Communications on the local CTAF were recorded at Southport Aerodrome. Due to the distance from this location, not all communications made on the frequency at or near Sea World or Marina Mirage were recorded, particularly those made close to the ground. A review of recordings and related information identified the following:

- no taxi calls from helicopters at Sea World or Marina Mirage were recorded (consistent with the helicopters' low height)
- the pilot of XKQ made an inbound call on their previous (10-minute) flight at about 1348:40 (indicating they were on the correct frequency at that time)
- the pilot of XH9 made an airborne radio call at about 1352:00 (passing over the Sea World grass) and an inbound call at 1353:40 (just north of Porpoise Point), during which time XKQ was on the park helipad
- one of the Marina Mirage helicopters departed the marina at about 1354:00, heading south-west
- the other Marina Mirage helicopter was at the coast near Sea World heading northbound over water, and the pilot made an inbound call at about 1356:30
- the pilot of one of the Marina Mirage helicopters recalled hearing the XH9 pilot's inbound call but did not recall hearing a taxi call from the pilot of XKQ, whereas the other Marina Mirage pilot could not recall hearing calls from either of those pilots in the period prior to the collision
- no calls were recorded on the CTAF from about 1354:00 to 1356:30
- no other pilots were identified to be at a location that would hear a taxi call from a helicopter at Sea World and known to be listening on the frequency in the period prior to the accident
- based on recorded radio calls and known traffic in the area, no pilot was expected to be making a radio call on the CTAF in the period before XKQ became airborne (1355:42) (indicating it is unlikely that any calls from VH-XKQ were over-transmitted at the time a taxi call would be expected to be made).

Airborne collision avoidance systems

The operator was not required to equip its helicopters with an airborne collision avoidance system (ACAS).

The operator's AS350 aircraft were fitted with a traffic collision avoidance system (TCAS), a type of ACAS. Both XKQ and XH9 were also fitted with a TCAS. However, pilots reported that the systems had not been fully integrated in XH9 and XKQ and both were only providing auditory alerts with no visual information. The operator's pilots reported that for the type of operations they

⁴ The operator's AS350 aircraft had a UHF radio, which pilots used to communicate with ground crew. XHQ and XH9 were not configured for UHF communication at the time of the accident.

conducted the systems were useful while cruising straight and level, but of limited benefit manoeuvring close to or on the helipads.

The pilot of XH9 advised that they heard no auditory alert prior to the collision.

Transponder systems

A review of radar and surveillance data of the accident flight and previous flights showed that the transponder on XKQ was correctly transmitting the aircraft's position and altitude (with the code 1200 selected). The pilot of XH9 reported that the transponder on XH9 had been selected on with the code 1200 selected. However, the transponder on XH9 was not transmitting secondary surveillance radar responses that were detected by radar surveillance equipment for the accident flight or previous flights. The operator was aware that there was a problem with the aircraft's transponder and that the aircraft was not able to be used in controlled airspace until it was rectified. Efforts to diagnose and address the transponder problem were ongoing.

A review of all avionics and pilot assistance systems, and radar and surveillance information, is ongoing.

Meteorological information

In the 3 hours leading up to, and at the time, of the incident, a ridge of high pressure extended up the south-east Queensland coast. Surface winds in the vicinity of the accident site were moderate south-easterly about 15 kt with gusts up to 20 to 25 kt possible.

Near the accident site, there was scattered cloud with bases at about 3,500 ft above mean seal level (AMSL) and cloud tops at about 6,000 ft AMSL. No rainfall was recorded during this period and radar imagery did not indicate any signs of showers in the vicinity.

Safety action

The operator reported that it intended to address elements of aircraft visibility and aids to traffic detection. This included:

- high visibility paint on rotor blades
- additional strobe lighting on helicopters
- introduction of helipad controllers who can provide traffic advice to pilots
- use of live radar data displayed on an iPad in the cockpit.

Further investigation

To date, the ATSB has conducted, and/or is conducting the following activities:

- interviews of the surviving pilot and adult passengers, eyewitnesses, and other pilots operating in the area at the time
- interviews with ground crew, other pilots/operators conducting similar operations, and maintenance personnel
- review of the operator's procedures and practices for operating scenic flights in the Sea World area, and those of similar operators
- examination of the wreckage of both helicopters
- examination of components of avionics systems of both aircraft (including radios and related equipment and transponders)
- review of the maintenance and operational records of both helicopters and the process for implementing the helicopters into scenic flight operations

- review of the radio calls made on the Southport common traffic advisory frequency (CTAF) for these flights and previous flights
- review of radar and surveillance data for helicopter operations near Sea World for these flights and previous flights
- review of GPS data for these flights and previous flights
- review of CCTV and witness videos and images
- review of videos and images taken by the passengers on both helicopters
- reconstruction of the flight paths of each helicopter
- a visibility study to determine the extent to which each helicopter was visible from the pilot's seat of the other helicopter
- review of the aircrafts' traffic collision avoidance system (TCAS) functionality and similar technologies
- review of pilot training records, medical information, recent history and post-mortem reports
- review of passenger injuries and post-mortem reports
- analysis of survivability and forces through seat and restraint systems
- a review of the regulatory surveillance of the operator and similar operators.

Should a critical safety issue be identified during the investigation, the ATSB will immediately notify relevant parties so appropriate and timely safety action can be taken.

A final report will be released at the conclusion of the investigation.

Acknowledgements

The ATSB acknowledges the assistance of Maritime Safety Queensland, Queensland Police Service, and the Queensland Coroner in supporting the ATSB's on-site investigation team, and providing information and support through the evidence collection phase of the investigation.

General details

Occurrence details

Date and time:	02 January 2023 – 1356:05 EST	
Occurrence class:	Accident	
Occurrence categories:	Collision, Collision with terrain, Forced / Precautionary landing	
Location:	24 km 341° from Gold Coast Airport	
	Latitude: 27° 57.645' S	Longitude: 153° 25.395' E

Aircraft 1 details

Manufacturer and model:	Eurocopter EC130B4	
Registration:	VH-XKQ	
Operator:	Sea World Helicopters Pty Ltd	
Serial number:	4639	
Type of operation:	Charter	
Activity:	Commercial air transport-Non-scheduled-Joyflights / sightseeing charters	
Departure:	Sea World, Main Beach Qld	
Destination:	Sea World, Main Beach Qld	
Persons on board:	Crew – 1	Passengers – 6
Injuries:	Crew - 1 (fatal)	Passengers - 3 (fatal) 3 (serious)
Aircraft damage:	Destroyed	

Aircraft 2 details

Manufacturer and model:	Eurocopter EC130B4	
Registration:	VH-XH9	
Operator:	Sea World Helicopters	
Serial number:	3845	
Type of operation:	Charter	
Activity:	Commercial air transport-Non-scheduled-Joyflights / sightseeing charters	
Departure:	Sea World Helicopters, Main Beach Qld	
Destination:	Sea World Helicopters, Main Beach Qld	
Persons on board:	Crew – 1	Passengers – 5
Injuries:	Crew - 1 (serious)	Passengers - 2 (serious) 3 (minor)
Aircraft damage:	Substantial	

Australian Transport Safety Bureau

About the ATSB

The ATSB is an independent Commonwealth Government statutory agency. It is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers.

The ATSB's purpose is to improve the safety of, and public confidence in, aviation, rail and marine transport through:

- independent investigation of transport accidents and other safety occurrences
- safety data recording, analysis and research
- 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, as well as participating in overseas investigations involving Australian-registered aircraft and ships. It prioritises investigations that have the potential to deliver the greatest public benefit through improvements to transport safety.

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

Purpose of safety investigations

The objective of a safety investigation is to enhance transport safety. This is done through:

- identifying safety issues and facilitating safety action to address those issues
- providing information about occurrences and their associated safety factors to facilitate learning within the transport industry.

It is not a function of the ATSB to apportion blame or provide a means for determining 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. The ATSB does not investigate for the purpose of taking administrative, regulatory or criminal action.

Terminology

An explanation of terminology used in ATSB investigation reports is available on the ATSB website. This includes terms such as occurrence, contributing factor, other factor that increased risk, and safety issue.