



Australian Government  
Australian Transport Safety Bureau

# Weather-related event involving Super Puma helicopter, VH BHK

Barrow Island area, WA | 15 February 2013



Investigation

**ATSB Transport Safety Report**  
Aviation Occurrence Investigation  
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#### **Addendum**

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# Safety summary

## What happened

On 15 February 2013, the crew of a Super Puma helicopter (VH-BHK) was returning to Barrow Island after conducting some night deck landing practice to an offshore vessel. At about halfway the helicopter entered cloud with severe turbulence and lightning. The crew steered away from Barrow Island and descended to the lowest safe altitude to try and escape the conditions, but after 10 minutes turned back towards the island.

With insufficient fuel to divert to a suitable night landing alternate or to safely conduct a published instrument approach, the crew of the twin-engine helicopter were compelled to shut down an engine to conserve fuel and to descend below the lowest safe altitude in instrument meteorological conditions. The crew eventually descended to 250 ft over water and visual contact was made with lights in vicinity of the island. To minimise distraction and conserve fuel, the crew did not restart the engine and landed in winds gusting to 50 kt. Fuel remaining was 300 lb (170 L), which was less than the stipulated fixed reserve.

## What the ATSB found

The ATSB found that the crew departed Barrow Island for the night training flight with sufficient fuel to return and land with standard reserves intact as allowed by the aerodrome forecast, but encountered unforecast severe weather on the return sector that prevented a routine visual or instrument approach.

The validity of the Barrow Island aerodrome forecast had been extended to cover the duration of the flight, but the forecast did not include any reference to severe weather, and was not amended when the adverse trend became evident because the forecaster on duty at the time was unaware of the extended validity.

## What's been done as a result

The Bureau of Meteorology compiled a report of the meteorological aspects of the occurrence which recommended the development of a handover checklist to be followed by all forecasters, including the handover of any non-routine forecasts. The report also recommended that all forecasters read the report and sign a reading register to indicate understanding of the importance of handing over critical information.

## Safety message

Although a flight plan notification was not required and might not have made a difference in this occurrence, the non-submittal of an instrument flight rules notification to air traffic services was a missed opportunity to receive directed weather hazard alerts and reduce weather-related risk.

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## The occurrence

An Aerospatiale AS332L ‘Super Puma’ helicopter, registered VH-BHK, was being operated on a night training flight from Barrow Island, Western Australia to offshore vessel ‘Lorelay’ and return on 15 February 2013. This flight was for two qualified pilots to maintain instrument flying and night deck landing recency under the supervision of a line training captain acting as pilot in command.

In preparation for the flight the crew requested an aerodrome forecast (TAF) for Barrow Island with validity that extended beyond the standard expiry of 1800 local time. Accordingly, the Bureau of Meteorology issued a TAF valid from 1300 to 2200, which indicated a small amount of cloud at 1,800 ft with good visibility and a light westerly wind. This was the TAF received by the crew when they requested weather information at 1747. At the same time, they accessed the applicable area forecast, valid from 1300, which indicated isolated showers and thunderstorms over land, extending offshore after 2000. Also in the briefing were the current TAFs for Onslow and Karratha, which indicated 30 per cent probability of intermittent thunderstorms with rain and strong winds after 1700 and 1800 respectively.

As per standard procedure, the crew completed a flight record that included route details and fuel calculations. No intermediate refuelling was planned, so the minimum fuel load ex Barrow Island was predicated on the projected total flight time plus reserves with allowances for approaches, ground running, and miscellaneous fuel usage at the vessel. It did not include fuel for diversion to an alternate after return to Barrow Island, nor was such fuel required. The recorded fuel on board exceeded the calculated minimum fuel figure by 446 lb (253 L), equivalent to 30 minutes holding.

While the helicopter and crew were capable of operation under the instrument flight rules, the flight record indicated the flight was to be conducted under the visual flight rules. As permitted under those rules, the crew did not submit a flight notification to air traffic services. Search and rescue alerting was provided by the operator’s flight-following service based on the mainland.

The region was under the influence of a broad surface trough that had generated rain showers and thunderstorms from early afternoon. After 1800, a squall line of thunderstorms developed inland of Barrow Island.

At 1900 the crew departed Barrow Island aerodrome to rendezvous with ‘Lorelay’, approximately 40 NM (74 km) to the north-west of the aerodrome. The crew observed the weather to be fine with no significant cloud. Transit to the vessel was uneventful and the helicopter arrived at 1921, close to the end of civil twilight (last light). The training captain conducted night deck landing practice with each pilot in turn with the vessel underway at 10 kt.

At about 2000 the line of thunderstorms moved over the coast south of Barrow Island. These thunderstorms developed further over the ocean and continued to move north-west, producing wind gusts at Barrow Island aerodrome from 2054 (Figure1).

The crew departed ‘Lorelay’ at 2057 on climb to 3,500 ft and tracked southward to a waypoint 25 km south-west of the Barrow Island aerodrome. This waypoint was the initial approach fix for the intended instrument approach to runway 03. To the south-east, lightning was visible in the distance but otherwise the night appeared to be clear. The on-board weather radar showed a large return corresponding to the landmass of Barrow Island but nothing at that stage to concern the crew.



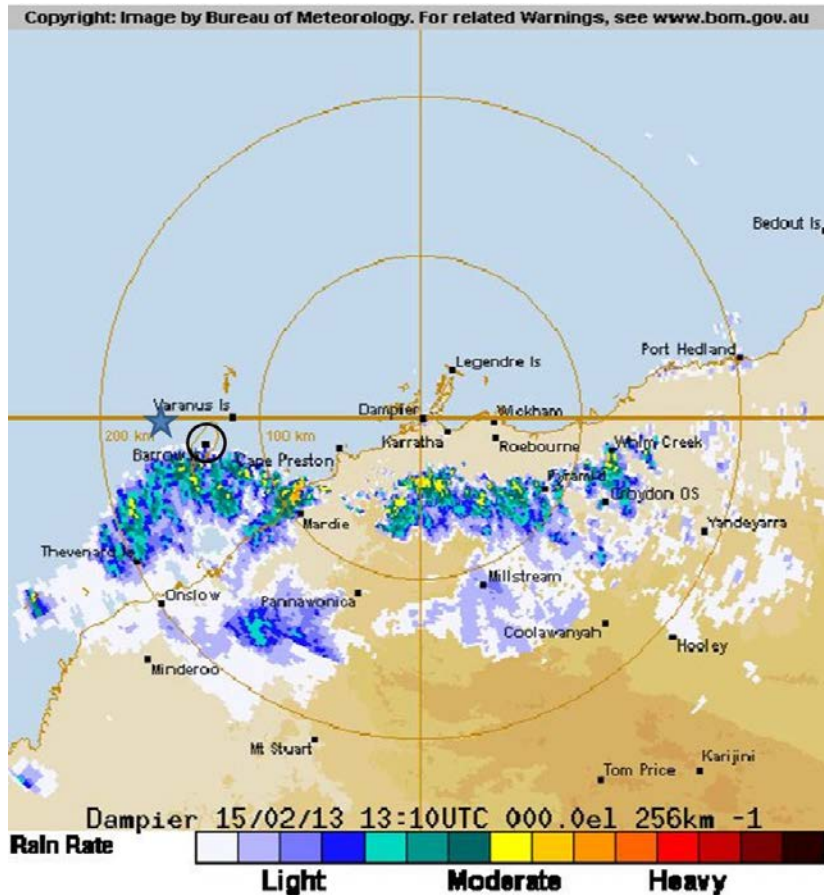
Figure 1: Ground-based weather radar image at 2100, soon after departure 'Lorelay' (Helicopter position represented by star and destination circled)



Source: Bureau of Meteorology

Nearly halfway to the approach fix, the crew noticed the weather radar returns were changing from light to heavy before the helicopter entered cloud and was subject to severe turbulence and significant ambient lightning (Figure 2). The crew turned to the west (away from Barrow Island) soon after 2110 and descended to the lowest safe altitude of 2,000 ft, seeking to get around or under the weather. They tracked generally westward for 10 minutes in continuing severe turbulence and lightning activity.

**Figure 2: Ground-based weather radar image at 2110, when the crew turned west (Helicopter position represented by star and destination circled)**



Source: Bureau of Meteorology

No way was found around or through the weather and the fuel state became a concern. The crew turned around soon after 2121 and tracked to the north of Barrow Island to position for an instrument approach to runway 21. With the helicopter on a north-easterly heading the groundspeed dropped significantly, observed to be as low as 36 kt. The crew now calculated that the fuel required to conduct the approach would not leave any margin on arrival, so at 2130 when 40 km to the west of the aerodrome, they tracked towards the aerodrome. The crew had descended below the lowest safe altitude and was on descent to 500 ft in an attempt to establish the helicopter in visual meteorological conditions before crossing the island coastline. It then became apparent to the crew that continuing with the two engines operating would leave little to no fuel remaining on arrival. So, in accordance with a fuel emergency procedure, the crew shut down one of the two engines to conserve fuel.

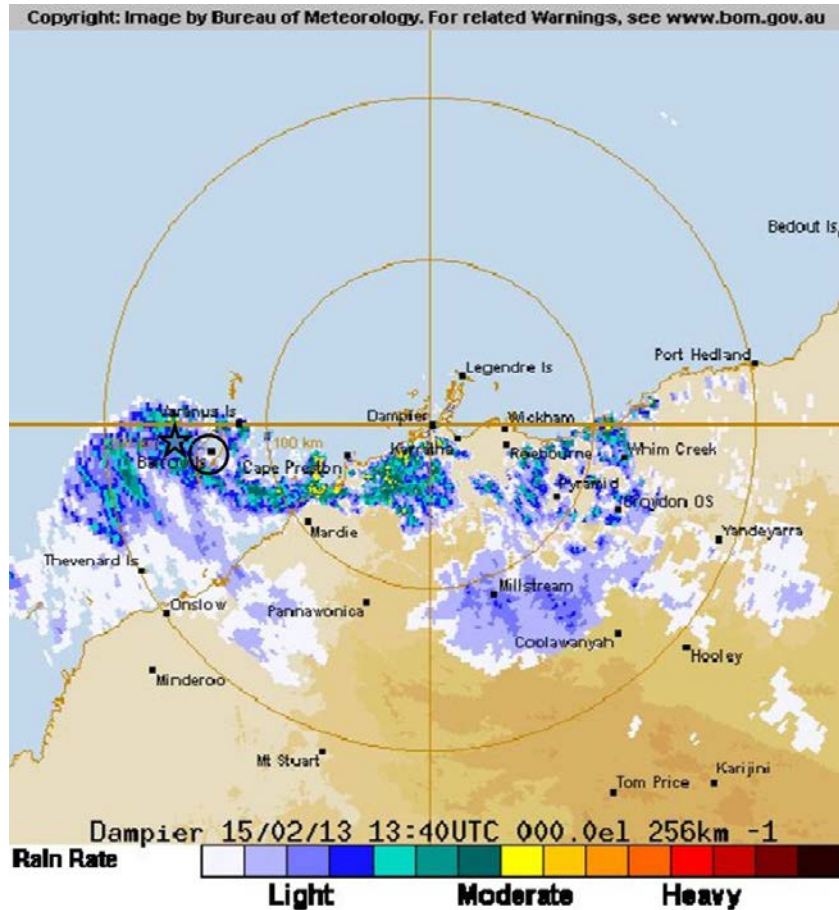
By 2137, the helicopter was at about 500 ft and 16 km from the Barrow Island coastline. The crew maintained altitude for a short period but found no breaks in the weather with little prospect of becoming visual. Severe turbulence continued to buffet the helicopter.

The crew decided to descend to 250 ft with the assistance of the on-board radar altimeter and weather radar while still over water. At 2139 the helicopter was at about 250 ft and 10 km from the coastline. At or soon after this time the area was illuminated by lightning and the terrain and aerodrome were momentarily visible. The flight path was now confirmed free of obstacles and low cloud and soon after the crew sighted aerodrome lighting.

Visibility below the cloud was still poor and the crew found that considerable attention ahead was required to maintain visual reference. As such the crew considered that starting the engine would distract from the landing task and also consume precious fuel reserves so they decided not to

restart the engine. The crew conducted a single engine landing, cross runway, in winds gusting to 50 kt. They taxied to the hardstand and the aircraft was shut down at 2148. Fuel remaining was 300 lb, which was less than the stipulated fixed reserve of 400 lb. The fuel remaining equated to 20 minutes flight time on one engine and 15 minutes on two engines.

**Figure 3: Ground-based weather radar image at 2140, at about the time the crew became visual (Helicopter position represented by star and destination circled)**



Source: Bureau of Meteorology



# Context

## Aviation weather forecasting

Meteorological information for aviation purposes is produced by the Bureau of Meteorology (BoM). The BoM routinely issues aerodrome forecasts (TAFs) for a number of locations according to the type and amount of traffic using the facility. Barrow Island was a Category D aerodrome with a routine TAF service determined by the BoM after consultation with clients.

Routinely, one TAF was issued daily for Barrow Island and that was valid from 0500 to 1800. During the validity period of a TAF, the duty aviation forecaster was tasked with maintaining a watch over meteorological conditions affecting flight operations and with amending the TAF as required.

On the day of the occurrence, when the duty aviation forecaster issued the non-routine TAF at 1313, it was assessed that thunderstorms would not affect Barrow Island aerodrome during the validity period. During the routine monitoring of weather for the remainder of the shift the forecaster did not change the thunderstorm assessment.

Between 1900 and 1920, the duty forecaster completed the shift and handed over to the night-shift forecaster. No mention of the non-routine Barrow Island TAF was made and the incoming forecaster did not notice the validity of the TAF extended beyond the routine expiry of 1800.

At 1936, the night-shift forecaster issued an AIRMET alert that indicated a change to isolated showers and thunderstorms throughout the area with an amended area forecast to follow. The amended forecast, issued at 1941, effected only minor change to the offshore outlook.

At 2003, the area forecast was further amended to include areas of low cloud over ocean areas that included Barrow Island. The forecaster noticed the line of thunderstorms move off the coast towards Barrow Island but, being unaware of the active Barrow Island TAF, did not amend it.

For severe weather, such as thunderstorms in a squall line over 185 km in length, the BoM were expected to issue a SIGMET warning. No SIGMET was issued for the thunderstorms that affected Barrow Island.

## Provision of weather information

As the official aeronautical information service provider, Airservices Australia was the conduit for the aviation-related observations, forecasts and warnings produced by the BoM. Pre-flight, this information was available from the Pilot Briefing Office.

In-flight, Air Traffic Services (ATS) provided advice and information useful for the safe and efficient conduct of flights through a flight information service. As part of this service, ATS offered pertinent operational information to pilots including meteorological conditions and the existence of non-routine meteorological products within 1 hour of the condition or the destination. In the case of amended area forecasts, this information was broadcast at intervals over the area frequency. For a sudden change in conditions not described in a current meteorological product, having an immediate and detrimental effect on the safety of an aircraft, air traffic control used the prefix Hazard Alert.

In addition to the ATS-initiated flight information service, pilots were expected to request the information necessary to make operational decisions. This could be done over air traffic control frequencies or on dedicated FLIGHTWATCH frequencies.

# Safety analysis

## Introduction

In this incident the crew were initially prevented from landing at their destination by unforeseen severe weather. In difficult circumstances which precluded normal operations, the crew managed the risks inherent in the nonconforming arrival to land with fuel remaining. The analysis following will look at the conduct of the flight and the provision of weather information.

## Conduct of the flight

The crew complied with the requirements for pre-flight briefing and planning and departed with the required fuel plus an additional 30 minutes of holding fuel as a precaution. However, the fuel planning was based on benign conditions at Barrow Island that did not hold for the duration of the flight.

At the same time the crew were departing the ship to track to Barrow Island, the line of thunderstorms was starting to affect conditions at the aerodrome. The crew were not aware of this encroaching severe weather until they encountered it en route. Although the helicopter and crew were capable of instrument flight, the severe weather in the vicinity of the aerodrome initially prevented a visual or instrument approach.

Given the fuel state and the distance to suitable night landing sites, the crew were in an emergency situation with few options. The crew used their discretion to conserve fuel by shutting down an engine and descending below lowest safe altitude in instrument meteorological conditions. Although the descent was not in accordance with accepted criteria, it was done over water with due regard for obstacle avoidance. Fortunately, the conditions allowed for a low-level visual approach and a landing with fuel remaining.

## Weather forecasting and advisement

When the duty forecaster issued the non-routine aerodrome forecast (TAF) for Barrow Island there was no perceived threat of thunderstorms throughout the validity period. This remained the case until the forecaster shift change after 1900, which was coincident with the helicopter departure from Barrow Island.

However, a line of thunderstorms was developing and by 2000 it was apparent that the thunderstorms would affect Barrow Island. In normal circumstances the extant TAF would have been updated but it wasn't on this occasion because the night-shift forecaster was unaware the non-routine TAF had been issued. This highlighted the importance of the shift handover to ensure that all relevant information was communicated to the incoming forecaster.

The non-amendment of the TAF increased risk but was not considered contributory because the crew might not have learned of such a change from air traffic services. Without a flight notification in the system, air traffic control was not necessarily aware of the helicopter's movements and therefore not able to provide a flight-specific information service. The crew was then reliant on the monitoring of broadcasts and applying the information in their operational context.

Any broadcast of the amended area forecasts would have had limited effect on the crew because they made little change to the general offshore outlook. Had a SIGMET warning been issued by BoM and duly broadcasted by the controller, there was increased likelihood of the crew learning of the developing situation in time to develop contingency plans.

# Findings

From the evidence available, the following findings are made with respect to the weather-related event involving Super Puma helicopter, registered VH-BHK, which occurred in the Barrow Island area, Western Australia on 15 February 2013. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

## Contributing factors

- The crew departed Barrow Island for a night training flight with sufficient fuel to return and land with standard reserves as allowed by the aerodrome forecast, but encountered unforecast severe weather on the return sector that prevented a routine visual or instrument approach.
- With insufficient fuel to divert to a suitable night landing alternate or to conduct the published instrument approach, the crew of the twin-engine helicopter were compelled to shut down an engine to conserve fuel and to descend below the lowest safe altitude in instrument meteorological conditions until visual contact was made with the aerodrome lights.

## Other factors that increased risk

- Although a flight plan notification was not required and might not have made a difference in this occurrence, the non-submittal of an instrument flight rules notification to air traffic services was a missed opportunity to receive flight-specific weather hazard alerts and reduce weather-related risk.
- The validity of the Barrow Island aerodrome forecast had been extended to cover the duration of the flight, but the forecast did not include any reference to severe weather, and was not amended when the adverse trend became evident because the forecaster on duty at the time was unaware of the extended validity.

## Other findings

- In difficult circumstances where unforeseen severe weather precluded normal operations, the crew managed the risks inherent in the nonconforming arrival to land with fuel remaining.

# Safety issues and actions

The ATSB did not identify any organisational or systemic issues that might adversely affect the future safety of aviation operations. However, the following proactive safety action was reported in response to this occurrence.

## Proactive safety action

### ***Bureau of Meteorology***

The Bureau of Meteorology compiled a report of the meteorological aspects of this occurrence which recommended the development of a handover checklist to be followed by all forecasters, including the handover of any non-routine forecasts. The report also recommended that all forecasters read the report and sign a reading register to indicate understanding of the importance of handing over critical information.

### ***Helicopter operator***

The helicopter operator performed an event analysis and came up with recommendations for event prevention strategies:

- For night deck landing practice or revenue night flights, flight crew to plan to carry fuel for 60 minutes holding if the area forecast contained thunderstorms, even though the aerodrome forecast may not require it.
- At the operator's Barrow Island base, the radio room to be manned for all night flight operations and the radio operators to advise aircraft crews of any weather changes at the airport.
- For night deck landing practice and other inbound night flights, flight crew to request an actual weather assessment from the Barrow Island base before leaving overhead a facility or when within very high frequency radio range.

On 18 April 2013, the helicopter operator issued a *Pilots To Read* document to all pilots based at Barrow Island to advise of the event and implementation of the event prevention strategies as recommended.

Separately, on 3 March 2013, the helicopter operator conducted a desktop emergency response exercise based on this occurrence but with a ditching 5 NM (9 km) west of Barrow Island as the outcome. Some recommendations came from this exercise with most relating to communication.

# General details

## Occurrence details

Date and time:	15 February 2013 – 2125 WST	
Occurrence category:	Serious incident	
Primary occurrence type:	Weather-related event	
Location:	Barrow Island, Western Australia	
	Latitude: 20° 51.9' S	Longitude: 115° 24.4' E

## Helicopter details

Manufacturer and model:	Aerospatiale Industries AS 332L Super Puma	
Registration:	VH-BHK	
Serial number:	2096	
Type of operation:	Training	
Persons on board:	Crew – 3	Passengers – 0
Injuries:	Crew – Nil	Passengers – Nil
Damage:	None	



# Sources and submissions

## Sources of information

The sources of information during the investigation included the:

- flight crew and operator of VH-BHK
- Bureau of Meteorology.

## Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the flight crew and operator of VH-BHK, the Civil Aviation Safety Authority, the Bureau of Meteorology, and Airservices Australia. Submissions were received from members of the flight crew, the helicopter operator and the Bureau of Meteorology. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

# Australian Transport Safety Bureau

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; 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.

## Purpose of safety investigations

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

## 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 initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

## Investigation

### **ATSB Transport Safety Report** Aviation Occurrence Investigation

Weather-related event involving Super Puma helicopter, VH BHK  
Barrow Island area, WA, 15 February 2013

AO-2013-034

Final – 12 December 2013

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