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ATSB TRANSPORT SAFETY REPORT
Aviation Occurrence Investigation AO-2008-020
Final

# Procedures-related event
# Launceston Airport, Tas. – 12 March 2008



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## Abstract

On 12 March 2008, an Airbus A320-200 aircraft, registered VH-VQY, was being operated on a scheduled passenger service from Launceston, Tas. to Sydney, NSW. While the crew were preparing for the flight, the control tower closed and the airport lighting switched over to a pilot activated lighting system. The aircraft subsequently departed without the airport lighting being turned on. A number of situational factors were probably associated with the crew not activating the airport lights before the departure. Several similar incidents have previously occurred in Australia and overseas.

## FACTUAL INFORMATION

### History of the flight

#### *Sydney to Launceston*

On 12 March 2008, an Airbus A320-200 aircraft, registered VH-VQY, was operated on flights from Sydney, NSW to Launceston, Tas. and return. The first flight was scheduled to depart Sydney at 1830 Eastern Daylight-saving Time[1] and arrive at Launceston at 2010. The return flight was scheduled to depart Launceston at 2040 and arrive back in Sydney at 2215.

The pilot in command (PIC) and copilot had been rostered on standby that day from 0500 to 1700. Due to the unavailability of other pilots, they were contacted by the operator at about 1626 to conduct the flights. The crew accepted the assignment, after first obtaining an understanding that they would be unable to depart by the scheduled time. The PIC reported for duty at 1737 and the copilot reported for duty soon after.

Upon arrival at the aircraft, it was noted that the flight deck switches and flight log were consistent with the aircraft being a 'cold ship' (that is, secured at the completion of a day's operations). Although there were other indications that the aircraft had been used that day, the PIC requested that the crew conduct pre-flight checks as though it was the first flight of the day.

After dealing with some minor technical issues, the aircraft took off from Sydney at 1858, with the PIC as the handling pilot. The aircraft landed on runway 32 left (32L) at Launceston at 2026, and completed taxiing to the passenger operations apron at 2029.

#### *Events at Launceston prior to departure*

After the aircraft vacated the runway at Launceston, the aircraft's electronic centralised aircraft monitor (ECAM) indicated a compressor vane fault on the right engine. The crew informed the operator's local engineer of the problem. It was determined that the relevant maintenance procedures required a high-power assurance test (engine run) on the right engine before departure.

The PIC liaised with engineering personnel and the operator's operations centre to determine the most appropriate course of action. The copilot, who was the handling pilot for the return flight, commenced flight preparations.

1 The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight-saving Time, as particular events occurred. Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

As it was unlikely that the return flight would arrive at Sydney before the Sydney Airport curfew time of 2300, the operations centre applied for a dispensation to arrive at Sydney up until 2320. A written request was submitted to the Department of Infrastructure, Transport, Regional Development and Local Government at 2102. After the Department obtained further information to ensure the circumstances met the relevant criteria, a curfew dispensation was granted at 2115.

At 2112, the crew commenced taxiing the aircraft to the threshold of runway 32L to conduct the required engine run. The procedure was completed successfully and the aircraft arrived back at the terminal at 2125. At about this time, the operations centre advised the crew that a dispensation had been approved until 2320 for landing at Sydney. They were also advised that if they were not ready to push back by 2155, then they were not to proceed with the flight.

After advising ground staff to commence passenger boarding, the flight crew conducted preparations for the flight to Sydney. Extra fuel was taken on board to ensure that the aircraft could divert to Melbourne if it could not land at Sydney by 2320.

At 2130, the crew requested an airways clearance from the Launceston aerodrome controller (ADC) for the flight to Sydney. The controller asked the crew when they expected to depart, and the crew advised that they expected to start taxiing by 2155. The controller stated that he would be closing the tower at 2145 (the published closing time) and that the crew would need to obtain their clearance from Melbourne centre.

The crew reported that they discussed the implications of the tower closure in terms of its impact on their departure and entry into controlled airspace. They subsequently contacted the tower controller at 2133 to obtain a squawk code in order to facilitate their later communications with Melbourne centre.

Due to the weight of the aircraft and length of the runway, the crew were aware that they would need to use the take-off - go-around (TOGA) thrust setting for the takeoff. As this was a relatively uncommon procedure, it was discussed by the crew during their pre-take-off briefing.

At 2135, the ADC turned off the airport lighting. At that point, the lighting became controlled by a pilot activated lighting (PAL) system (see *Airport information*).

At 2143, the Launceston automatic terminal information system (ATIS) was changed to information Zulu, which stated:

> Tower closed until [0600 local time]. Class [C and D] airspace 8,500 and below is reclassified class [G]. CTAF procedures and pilot activated lighting apply on 118.7. Aerodrome weather information service available on VOR audio 112.6.

The ADC made an all stations broadcast at 2145 which stated:

> All stations 118.7 this is [Launceston] tower. The tower is now closed. Launceston class [C and D] airspace Flight Level 125 and below as defined in ERSA is reclassified class [G]. CTAF procedures apply on 118.7, aerodrome weather information service available on VOR audio 112.6.

When the tower closed, the tower frequency changed to a common traffic advisory frequency (CTAF).

### *Taxi and takeoff at Launceston*

After all the passengers had boarded and pre-flight preparations had been finalised, the PIC broadcast on the CTAF at 2151 that the aircraft was about to taxi for a runway 32L departure. The copilot commenced taxiing soon after, with the nose lights selected to the taxi position. During the initial part of the taxi, the crew focussed their attention on ensuring adequate separation from another aircraft parked on the passenger operations apron. The crew then conducted the flight control checks.

As the aircraft approached the end of the taxiway, the PIC made a broadcast on the CTAF that the aircraft was about to line up and start rolling. He then switched on the aircraft's landing lights and runway turn-off lights, and switched the nose lights to the take-off position.

The crew reported that they both confirmed that they were approaching the correct runway, and that they were both ready to conduct a rolling takeoff. The aircraft turned onto the runway at 2155 and took off shortly after.

At about 2156, the Launceston airport operations officer on duty at the airport was contacted by two

independent witnesses who had observed the aircraft take off with the runway lights not activated. The operations officer then activated the PAL, and observed that the airport lighting immediately illuminated.

The flight proceeded to Sydney without further incident. After some track shortening provided by air traffic control, the aircraft landed at Sydney at 2307.

## Personnel information

### *Operational experience*

The PIC had 6,565 hours total flying experience. He had 1,586 hours experience on the A320, including 943 hours as PIC.

The copilot had about 3,900 hours total flying experience, most as PIC of multi-engine aircraft. He had about 300 hours experience as a copilot on the A320.

Both pilots reported that they had significant experience using PAL systems, both prior to and since commencing employment with the operator. Both also reported that, during their employment with the operator, they had conducted flights to and from Launceston on several occasions. Although they had departed at night, they had never previously departed from Launceston after the tower had closed and therefore had not previously activated Launceston's PAL system.

### *Rosters and fitness*

After 5 days off duty, the PIC completed 10.1 hours duty on 10 March 2008 (2 days prior to the occurrence), commencing at 0520. He was rostered to commence duty on 11 March at 0530, but, after having difficulty getting the required sleep, he advised the operator late on the night of 10 March that he would be unfit for duty the next day. The PIC reported that, at the time of commencing duty on 12 March, he had received adequate rest. He also reported that he had experienced a cold in the days prior to the occurrence, but this was not affecting his performance by the time of commencing duty.

The copilot had the 2 days prior to the occurrence free of duty. He reported that he was well rested prior to commencing duty on 12 March, and had no recent or ongoing medical problems.

## Aircraft lighting information

The exterior lighting of the A320 included several lights which illuminated the ground in front of the aircraft. These included the landing lights, nose lights, and runway turn-off lights.

The landing lights provided substantially more illumination in front of the aircraft than the other lights. They consisted of two retractable lights located under each wing, near to the fuselage. The lights were aimed below the horizontal.

The nose lights included the taxi light and the take-off light. The taxi light provided a beam of light directly in front of the aircraft's nose, and the take-off light provided a narrower beam also directly in front of the aircraft, which extended further than the taxi light. The nose lights could be set to the OFF, TAXI or T.O. (take-off) positions. When in the take-off position, both the taxi and take-off lights were on. The runway turn-off lights provided illumination from the nose of the aircraft out to the front and side of the aircraft.

Observations of A320 aircraft at Launceston indicated that the landing lights provided noticeable illumination on the runway for about 150 m in front of the aircraft. The taxi lights provided noticeable illumination on the taxiway for about 50 m in front of the aircraft.

## Airport information

Launceston Airport had one runway suitable for A320 operations, runway 14R/32L. The runway was 1,981 m long and 45 m wide. A taxiway ran parallel to the runway. Figure 1 shows the basic layout of the airport.

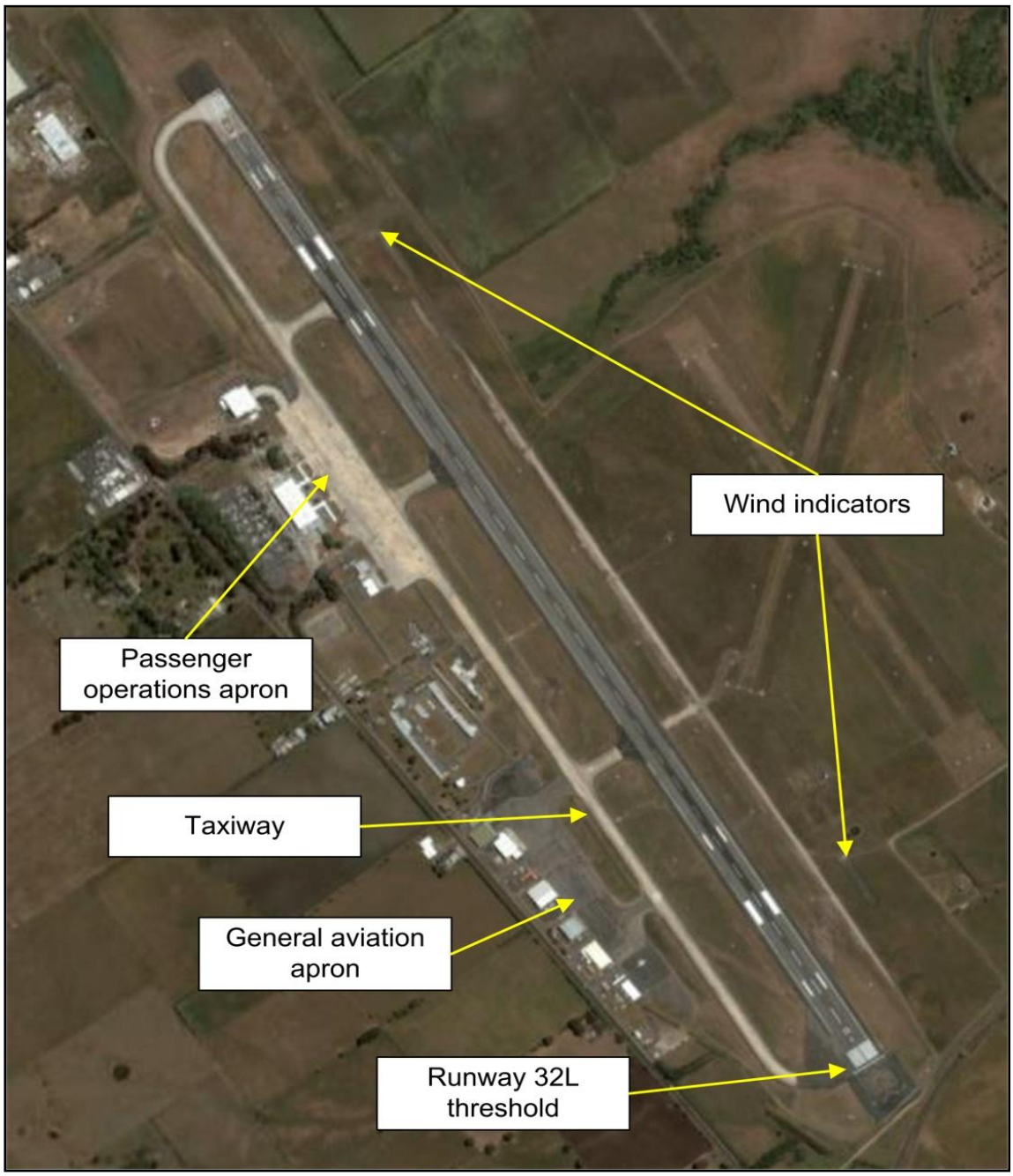
### *Airport lighting*

The airport lighting system consisted of runway lighting, taxiway lighting, approach lighting, obstruction lighting and lights on the wind indicators. The runway and taxiway lighting and markings conformed to relevant regulatory requirements.

Runway lighting consisted of white lights every 60 m on the edges of the runway, and red lights positioned at the ends of the runway. At normal brightness settings (stage 1 to 3), the runway edge lights were omni-directional, and were easily detectable at night from the passenger operations apron and the taxiway. Both ends of runway 32L

sloped down to the centre of the runway. All runway lights were visible from the flight deck of an A320 positioned at the threshold of runway 32L. The runway had white painted edge markings and centreline markings. There was a relatively high contrast between the markings and the runway surface.

Figure 1: Launceston airport[2]




2 Courtesy of Google Earth Pro.

Taxiway lighting consisted of green guide-line lighting on the centreline of the taxiways. Taxiway markings consisted of a constant yellow line with a black line each side to enhance contrast.

There were two illuminated wind indicators, located to the east of the runway and near each end of the runway.

### *Airport lighting operation*

When the air traffic control tower was open, the airport lighting was controlled by tower personnel. Outside of tower hours, the lighting was controlled by a PAL system that was combined with an AFRU (aerodrome frequency response unit). To activate the lights, pilots were required to make a sequence of three transmissions on the CTAF. Each transmission was to have a maximum duration of 1 second, with the break between transmissions being a maximum of 1 second. On receipt of the appropriate transmission, the AFRU broadcast an automatic message 'Launceston lighting activated' on the CTAF.

Once the PAL system was activated, the airport lighting would remain on, with the brightness level at stage 2, for 30 minutes. If it was reactivated during this period, the lighting would remain on for 30 minutes from the time of reactivation. At 10 minutes prior to the end of a 30-minute activation period, the wind indicator lights would commence flashing to warn users that the airport lighting was about to extinguish. In addition, an automated message would be transmitted on the CTAF to state there was 10 minutes remaining. If the airport lighting was turned off by tower personnel, no such indications were provided.

Airport personnel reported that the present lighting system had been installed about 3 years before the occurrence, and there had only been one serviceability problem since the installation. There was no indication that the system was not functioning appropriately on the night of the occurrence.

### *Airport operations*

The airport operator reported that the airport's operations officers had no defined responsibility to monitor aircraft movements and ensure the PAL was on for each aircraft movement after tower hours. However, operations officers advised that they did monitor aspects of aircraft operations at night whenever it was possible to do so. They reported that occasionally pilots had difficulty activating the 'PAL plus ARFU' system because they did not use the appropriate transmission sequence.[3] In such cases they would assist the pilots and activate the lighting. None of the officers interviewed had observed a case where the flight crew had forgotten to activate the PAL prior to taxiing.

The operations officer on duty on 12 March 2008 reported that, at the time of the A320 taxiing out for its departure to Sydney, he was assisting with a problem in the airport car park. He was called by a passenger security agent regarding the A320 departing without airport lighting at about 2156. The fire control centre called soon after to report the same problem. By the time he returned to the apron area the aircraft had departed.

### *Control tower operations*

The published tower hours were from 0600 to 2145. The local instructions for the tower stated that the officer in charge was allowed to extend the tower hours by up to 15 minutes to avoid changeover of facilities and procedures 'at a critical stage of flight for aircraft operating on, or in the vicinity of, the aerodrome at the nominal closing time'.

The controller on duty at the time the tower closed reported that, given there was no aircraft in a critical stage of flight, he closed the tower at the normal time.

The local instructions for the tower specified the procedures to follow for closing the tower. These procedures included informing the airport operations officer and fire control centre of known regular public transport movements after tower closure, recording information Zulu on the ATIS, switching the airport lighting to PAL control, and making an all stations broadcast on the tower frequency regarding the tower closure. Switching the airport lighting to PAL control prepared the lights so they could be activated by a radio transmission. It did not provide any confirmation that the PAL would function correctly.

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3 Some aerodromes had a PAL system not combined with an AFRU, which required a different transmission sequence (three transmissions of between 1 and 5 seconds duration).

Airservices Australia advised that there were no procedures in place at any non-continuous tower to switch PAL on specifically for aircraft arriving or departing soon after the published closing time. Most tower closing procedures, though not all, specified that the PAL was to be checked prior to closing and, if found to be faulty, the lights would be left on. Some towers activated the PAL prior to closing, whereas other towers (such as Launceston) did not. There was no national standardisation policy on this issue. Airservices also noted that use of PAL was a pilot procedure rather than an ATC procedure.

### *Fire control centre operations*

The fire control centre was located between the passenger operations terminal and the general aviation apron. An officer from the fire control centre reported that he and another officer observed the A320 taxi past the fire control centre without the taxiway lights or runway lights being activated. As the aircraft was approaching the runway 32L threshold, they contacted the airport duty officer to report the problem but the duty officer's phone was engaged. He succeeded in contacting the duty officer after the aircraft had departed.

The fire control centre officer reported that the fire control personnel monitored radio transmissions on the tower frequency / CTAF. Although they had the capacity to make a transmission on the CTAF and to activate the PAL, it was not within their operational procedures to do so. However, they would assist in situations where it was clear that a crew was having difficulty making the appropriate transmissions to activate the PAL.

## Environmental conditions

The ATIS current during the aircraft's arrival and prior to the tower being closed, stated that runway 32L was the duty runway. The wind was 5 to 10 kts from 320 degrees and conditions were CAVOK (ceiling and visibility okay). Witness reports were consistent with the ATIS.

At the time of the occurrence, the moon was 3 below the horizon. The moon phase was 2 days prior to the first quarter.

Pilots reported that the airport was known to have bright apron lighting, but was relatively dark around the threshold and to the east of runway 32L.

A site visit confirmed that external lighting at the passenger operations terminal clearly illuminated the whole apron area. However, minimal illumination reached the runway (located about 200 m from the apron lighting). Lighting was also present on several buildings near the general aviation apron, but this lighting was further from the runway and much less powerful than the lighting at the passenger operations apron. Minimal illumination from the general aviation apron reached the taxiway parallel to the runway.

Travelling down runway 32L, there were many terrestrial lights visible to the left of the runway. These were located at the general aviation apron, the passenger operations terminal, between the general aviation apron and passenger operations terminal, and to the north of the passenger operations terminal. There were a small number of light sources visible just to the right of the extended runway centreline and beyond the end of the runway. There was no terrestrial lighting of any significance to the south or east of the runway.

## Recorded information

The aircraft's quick access recorder (QAR) showed that the taxi speeds of the aircraft for the departure were similar to the taxi speeds used when the aircraft was taxied to and from the threshold of runway 32L for the engine run. They were also similar to the speeds recorded on the flight data recorder for previous flights.

The QAR also showed that there was no unusual variability in directional control or other aspects of the take-off roll at Launceston.

The airport operator had two independent systems for monitoring the functioning of the airport lighting. Both of these monitoring systems provided consistent results for the night of the occurrence. The lighting was turned off by tower personnel at 2135 and the lighting was next activated (using the PAL) at 2157.

The audio recording of the tower frequency / CTAF confirmed that the lights were activated by radio transmissions at about 2157. There was no recording on the frequency of any attempt to activate the lighting between 2135 and 2157.

A camera mounted on the passenger terminal building showed movements of the aircraft consistent with the QAR information. The aircraft taxied off the apron along the taxiway at 2114 and returned to the apron at 2124.[4] Runway and taxiway lighting were visible at both of these times. The camera also showed the aircraft taxi off the apron at 2152 with its taxi lights on, and then depart soon after with its landing lights on. Runway and taxiway lighting were not visible during the departure.

## Flight operations aspects

The operator's *Operations Manual* (Volume 1 – Administration) included a section on operations at non-towered aerodromes. The section stated that 'PAL should be activated on departure prior to taxiing'. The section also stated the importance of at least one pilot maintaining a constant lookout, with the emphasis on looking out for other aircraft traffic.

Another volume of the operator's operations manual, the *Route Manual Supplement*, included a requirement that 'Pilots shall observe the primary wind indicator prior to takeoff and landing to determine if at least 10 minutes of illumination remains'. This requirement was included in a general section applicable to operations at locations within Australia.

The operations manual (Volume 1) stated that briefings should be interactive, concise, relevant, logical and timely. The general topics to be covered in each type of briefing were outlined in the manual. None of the items for the departure briefing referred to airport lighting, although the last item was 'any other features of particular importance'.

The operator's *Flight Crew Operating Manual* (FCOM) for the A320 included checklists and procedures for each phase of flight. The checklists and procedures in the FCOM focussed on activities relevant to operating the specific type of aircraft.

The FCOM checklist for normal operations only included those items that could directly impact flight safety and efficiency. Checklist items were completed from memory. The crew then read the checklist and each pilot confirmed the completion of each item. As there were only a small number of critical items for each phase of flight, the checklist did not include reference to airport lighting.

The FCOM also included a sequence of procedures to be followed, from memory, for each phase of flight. These procedures did not refer to airport lighting or CTAF broadcasts.

The operator's *Flight Crew Training Manual* for the A320 provided a detailed timeline of activities that should occur during each phase of flight. The timeline summarised the duties of the pilot flying and pilot not flying for each phase. The timeline did not specifically refer to airport lighting. The operator's pilots reported that there was no consistent practice regarding exactly when during pre-taxi activities at airports without operating towers the PAL would be activated.

The operator reported that, at the time of the occurrence, it was investigating the potential of introducing briefings based on threat and error management principles.

## Additional information from the crew

The crew reported that, after being informed that the tower was closing, they considered and discussed the implications that the closure would have on their departure. However, they could not recall whether or not they had activated the PAL, or whether they had discussed the PAL during their preparations. They could also not recall hearing the ADC provide the all stations call regarding the tower closure.

Both pilots advised that, during the taxi and take-off roll, they did not notice anything unusual or problematic with the airport lighting or environmental conditions at the airport. They also reported that nothing appeared to be different relative to when they taxied out to and back from runway 32L for the engine run. In addition, they reported that they had no difficulties navigating at the airport or maintaining directional control during the takeoff. Both pilots also noted that the aircraft's lights provided a substantial amount of illumination during a takeoff.

The PIC reported that he could not recall looking for the wind indicators prior to or when taxiing for departure. As the crew had a recent ATIS, and had recently taxied out to the threshold of runway 32L and returned and observed the wind indicators at

4 These times have been calibrated with the aircraft's QAR.

that time, he did not see a need to obtain additional weather information.

The crew reported that they were not aware of the occurrence until they were notified about it the next day. The PIC advised that, shortly after departure, he heard the AFRU message that the lights had been activated. He assumed at the time that they had been reactivated by another crew preparing for departure.

The crew stated that they had specifically discussed the importance of not rushing their preparations for the return flight to Sydney and ensured they conducted their planning and briefing activities in a thorough manner. Although the day's workload had been higher than normal, they believed that it had been manageable. They also advised that they had been under no pressure from the operator or had any personal reasons that required them to return to Sydney that night.

## Previous occurrences

### *ATSB occurrence database*

A review of the ATSB occurrence database was conducted for occurrences between January 1988 and February 2008 where it was reported that an aircraft had taken off at night without the runway lights being activated. Seven incidents involving aircraft with a maximum take-off weight (MTOW) greater than 5,700 kg were identified.

All of the reported incidents occurred at an aerodrome with pilot activated lighting in operation. None of the incidents were investigated by the ATSB or its predecessor organisation (Bureau of Air Safety Investigation) and consequently few details were available.[5] Basic details are provided below. Information regarding the moon position and phase was based on the reported time of the incident.

- 1992; Fokker F28; Gove, NT. Witness reported it occurred soon after last light. Moon was above horizon and moon phase was at the first quarter.
- 1996; Saab SF340; Dubbo, NSW. Witness reported it occurred at about first light and in overcast conditions. The moon was below the horizon.
- 1997; British Aerospace BAe146; Launceston, Tas. Witness reported it occurred about 90 minutes after last light. Aircraft used runway 32L. The moon was below the horizon.
- 1998; SA226; Townsville, Qld. Witness reported it occurred about 80 minutes prior to first light. The moon was above the horizon and close to the new moon phase.
- 2001; Boeing B737; Launceston, Tas. Witness reported it occurred about 3 hours after last light. Aircraft used runway 32L. Reporter advised there was rain present and a broken cloud base of 2,000 ft. The moon was above the horizon and the moon phase was at the first quarter. Subsequent information from the operator indicated that the crew believed that the runway lights were illuminated during the takeoff.
- 2002; de Havilland DHC-8; location not specified. Reported to have occurred about 3 hours after last light. Subsequent information indicated that the event occurred at Mildura, Vic., and the crew were not aware of the occurrence until it was reported to them by a witness. Exact date and moon phase unknown.
- 2004; SA227; Townsville, Qld. Crew reported it occurred about 50 minutes prior to first light. The crew noticed the lights were off late in the take-off roll. The moon was below the horizon.

The ATSB has received anecdotal evidence that additional incidents have also been observed by witnesses.

### *Aviation Safety Reporting System*

A review of the US Aviation Safety Reporting System (ASRS) database was conducted for occurrences in the US between January 1988 and February 2008 where aircraft had taken off at night without the runway lights being activated. ASRS notifications are confidential notifications, generally provided by flight crew.

Fourteen occurrences involving air transport aircraft were identified. On six of these occasions, the runway lights were known to be unserviceable

[5] The 2001 occurrence was independently reported to the Civil Aviation Safety Authority, which subsequently conducted an enforcement investigation.

and the crew considered that the environmental conditions were safe for takeoff. For the other eight occurrences, the crew did not notice the problem until during or just after takeoff.

ASRS reports provide crew descriptions of events and the perceived factors involved. Based on these descriptions, common factors associated with the eight occurrences where the crew did not notice the problem prior to commencing the takeoff were:

- sufficient illumination being present to conduct the takeoff, from ambient illumination from the moon or lighting on or near the airport (six events) and/or the aircraft's landing lights (five events)
- distractions prior to or during taxiing (four events), such as delays due to maintenance, an unusual aircraft configuration required for takeoff, completing checklists, or waiting for another aircraft to clear a taxiway
- lighting not under the control of the pilots and other parties had not activated the lights or informed the crew that the lights were not on (three events)
- another aircraft had just departed from the same runway (two events)
- fatigue (three events).

#### *Other events*

On 31 October 2000, a Boeing 747 crashed during a night takeoff in Taiwan. The takeoff was attempted on runway 5R (which was partially closed due to construction work) instead of the assigned runway 5L. There were many factors involved in the accident, including the crew not noticing that the lights on runway 5R were (most likely) not on.

On 27 August 2006, a Bombardier CL-600 crashed during a night takeoff at Lexington in the US. Instead of using the assigned runway 22, the takeoff was attempted on a closed runway of insufficient length (runway 26). There were many factors involved in the accident, including the crew not noticing that the lights on runway 26 were not on.

There have been several other occurrences recorded around the world of air transport aircraft taking off or attempting to takeoff from taxiways or closed runways without edge lights.

## ANALYSIS

### Purposes of airport lighting

Runway and taxiway lighting serves many important functions for a departing aircraft. For example, it provides:

- Navigational guidance around the airport to help ensure the aircraft enters the correct runway for takeoff. In this case, the layout of the airport was relatively simple and the operator had clearly defined procedures for ensuring that the aircraft was entering the correct runway for takeoff.
- Directional guidance during the take-off roll. The combination of bright aircraft landing lights and high contrast centreline markings on the runway would minimise the potential risks in not having runway lights. In this case, there was no evidence of the crew having difficulty maintaining directional control.
- An indication of the location of the end of the runway during the take-off roll. Aircraft operate at runways and in weather conditions where the end of the runway is not always visible. In addition, operators have clearly defined procedures for making decisions regarding whether to reject a takeoff, and these are dependent on aircraft speed rather than sighting the end of the runway.
- Necessary guidance for approach and landing if required due to an emergency shortly after takeoff. There would often be other personnel at an airport who would be able to assist and activate the lighting in a case where the crew workload was such that they could not notice the problem and activate the lights themselves in a timely manner. In this case, several parties noticed the problem and the lights were activated shortly after the takeoff.

In summary, although taking off without runway and taxiway lighting at night increases safety risk, the increase in risk in this case was probably not substantial. Nevertheless, identifying the factors involved in the occurrence is important to determine if there are any safety issues to address.

## Crew performance

### *Activating the airport lighting*

The flight crew have the primary responsibility for ensuring the airport lighting is on at night at an airport where there is no tower or the tower is closed. In this case, the flight crew did not activate the pilot activated lighting (PAL) prior to departure, and then they did not notice that the airport lights were not on during the taxi and takeoff.

In terms of activating the PAL, the crew were aware that the tower was closing, and they discussed the implications that this had on their departure. However, this discussion occurred a significant time prior to taxiing and well before when they would need to activate the PAL. At the time it became relevant to activate the PAL, the crew forgot to do the task.

The activation of the PAL is a relatively routine activity for a flight crew which operates to non-towered airports. Omissions in routine activity are often associated with distractions or disruptions to the normal sequence of activities. In this case, the crew's normal preparations for the departure had been disrupted by both the engine run and the closure of the tower.

The specific circumstances associated with the occurrence may have resulted in the crew being less aware of the need to activate the PAL. They had not expected or been required to use the PAL prior to landing, and had not previously used the PAL at Launceston. The fact that the crew had already taxied out to the runway and back for the engine run, with the airport lights on, may have contributed to an assumption that the airport conditions were suitable for the subsequent departure. The relatively bright lighting on the apron at Launceston could also have reinforced this assumption.

### *Detecting the absence of airport lighting*

Having not activated the PAL, there was still an opportunity to detect and correct the problem prior to commencing the takeoff. Exactly why the crew did not notice the absence of runway and taxiway lighting cannot be determined. However, recent research in the field of visual attention has shown that phenomena such as change blindness and inattention blindness are not uncommon (Wickens and McCarley, 2008).

Change blindness occurs when a person does not notice that something is different about the visual environment relative to before the change. Research has shown that in some cases, quite dramatic changes are not detected, particularly if changes occur when the observer is not looking at the relevant part of the visual environment at the time. In this instance, the crew did not notice the difference between the airport lighting when they were conducting the engine run versus when they taxied out for departure. At the time the airport lighting was turned off, the aircraft was parked on the apron and the crew were facing away from the lighting.

Inattention blindness occurs when a person does not notice an object which is fully-visible, but unexpected, because their attention is engaged on another task. In this instance, the absence of airport lighting was clearly noticeable (if looked for), and the crew probably had an assumption or expectation that the lighting was on. There were also several tasks which were attracting the crew's attention during the taxi and take-off phases. Normal tasks included flight control checks, monitoring instruments, looking out for other traffic and looking where the aircraft was going. Additional tasks in this case included avoiding the other aircraft on the apron, reviewing the take-off - go-around (TOGA) setting for takeoff, and monitoring the time associated with their departure. It is also possible that, because of the absence of taxiway lighting, the crew were paying more attention than normal to the task of maintaining directional control during taxiing without fully being aware that this was occurring.

Several factors affect the likelihood that a change or object will be detected. In addition to the extent that attention is directed to other tasks, a key factor is the salience of the change or object. In general, motion and onsets (such as flashing lights) are very salient. The size of the object, and colour and contrast differences relative to the rest of the visual environment, can also be important. Of particular relevance in this case, research has shown the absence of something is more difficult to detect than the presence of something (for example, Thomas and Wickens, 2006). Therefore, although the presence of the airport lights provided a high contrast difference relative to

their background, the absence of the lights was not necessarily a salient cue.

Another factor influencing the degree to which a change or object is noticed is the relevance of the change or object to the observer's tasks. Any visual signal is more likely to capture an individual's attention if the observer is looking for it or looking for something similar to it. For example, car drivers often do not detect they have forgotten to turn on their headlights when they are driving in a well lit environment. However, such an error is quickly detected when the ambient conditions are darker and the headlights are needed to conduct the driving task.

In this case, the flight crew's 'attentional set' when looking around the airport was probably focussed on looking for other traffic or the path where they were travelling. The airport lights were probably not needed for navigation purposes, as the crew were already familiar with the airport layout and how to get to the threshold of runway 32L, particularly as they had recently taxied there. In addition, there was no operational need to specifically look for the wind indicators as the crew had recent weather information.

Research has shown that people overestimate their ability to detect changes or objects in the visual environment (for example, Levin et al, 2000). When asked whether they can detect a particular type of change or object, many people say they can. However, actual detection rates are much lower than these expectations. Therefore, although the absence of runway and taxiway lighting may seem obvious to someone who knows that it is absent, it is not necessarily salient to someone who does not know it is absent.

In summary, the absence of runway and taxiway lighting at night at Launceston would be easily detectable to a person who was looking specifically to see whether the lighting was on. However, in a situation where attention is focussed on other tasks, where the presence of runway and taxiway lighting is not specifically looked for and there is sufficient illumination to do the required tasks, it is conceivable that the absence of the lighting would not always be noticed.

### *Time pressure and workload*

In addition to the normal workload for the flight crew on departure, on this occasion there were additional demands associated with determing a course of action in response to the electronic centralised aircraft monitor (ECAM) message, conducting the engine run, and dealing with the effects of the tower closing. There was also a deadline to start taxiing by 2155 and then to land at Sydney by 2320.

Time pressure has many affects on human performance. Research has shown time pressure leads to a reduction in the number of information sources accessed, and the frequency or amount of time these sources are checked (Staal, 2004).

Time pressure and disruptions are common in air transport operations. In this case, there was no evidence that the crew were receiving undue pressure from the operator to complete the flight. However, it is reasonable to expect that most crews will do what they reasonably can to complete a scheduled flight.

In this case, the crew reported they were aware of the potential effects of time pressure and made a conscious effort not to rush their activities. The taxi speeds were not excessive, and there was no indication that any other pre-flight tasks were omitted or incomplete. However, the influence of time pressure can be difficult to manage. A recent study has shown that pilots under time pressure were just as confident in the accuracy of their judgements in diagnosing situations as pilots who were not experiencing time pressure. However, the pilots under time pressure searched for less information and were less accurate in their judgements (Mosier et al., 2008).

In summary, the nature of the errors made by the crew were consistent with their attention being influenced by time pressure and the disruptions associated with the departure.

## Review of previous occurrences

There have been several previous occurrences of aircraft taking off without runway lights being activated, including two previous reported events at Launceston. The investigation identified no specific aspect of the visual environment at Launceston that would indicate why occurrences are more likely there than other locations. It is possible that Launceston has a relatively high rate

of air transport aircraft departing outside of tower hours compared to many locations, and/or there are more potential witnesses to identify and report such events.

The statistics indicate that these types of occurrences are relatively rare. However, given that most are noticed by witnesses rather than flight crew, it is likely that there have been more events which have occured, but were not noticed. It is also likely that the event could be more noticable or unusual to a witness than the operating crew, particularly in dark night conditions such as those at Launceston or those associated with most of the previous reported events in Australia.

## Risk controls

### *Flight operations procedures*

The operator's procedures included requirements to operate the PAL prior to taxi and to also check that the wind indicators were not flashing prior to takeoff. Although pilots would be familiar with PAL requirements, defining a specific place for PAL tasks in the crew's sequence of procedures, such as when the pre-taxi CTAF call is made, could potentially ensure more reliability in performing these tasks.

The operator's procedures emphasised the importance of looking out for threats such as other traffic and entering the wrong runway. Although these are critically important threats to manage, there may also be benefit in enhancing procedures and training to specifically encourage crews to have a broad 'attentional set' when looking for potential threats prior to and during taxiing. The use of threat and error management briefings could assist in this regard.

### *Other risk controls*

There are other measures that could be taken to reduce the likelihood of this type of occurrence. These include requiring an airport operations officer to be present for each aircraft movement outside of tower hours, requiring fire personnel to activate the airport lighting or notify the crew if they notice a similar situation, requiring operators' ground staff to confirm that airport lighting is on prior to dispatching the aircraft, and keeping control towers open until after scheduled passenger services are completed. All of these options are associated with costs or implementation problems.

The most effective way of minimising this type of occurrence is to provide a very salient indication to the flight crew that the lights are not on. Rather than the absence of a cue (that is, no lights), this would be the presence of a highly salient signal, such as a flashing light in a highly visible location. This option would also be associated with significant costs.

One potential change relevant to this occurrence that is more practicable is in terms of the transition from tower operations to PAL. In the present case, there was a scheduled passenger service intending to depart about 10 minutes after the tower closure time. Had the PAL been activated by the tower controller when the tower closed, then the occurrence would not have happened. In addition, by activating the PAL, crews also receive additional prompts of the airport lighting being turned off, including an aural alert as well as flashing lights for 10 minutes on the wind indicators. Activating the PAL would also provide confirmation that the system was operating normally.

Even though it is a pilot responsibility to ensure the airport lights are on outside of tower hours, the investigation considers that more prominance could be given to assistng crews of aircraft which would be departing soon after tower closure. This could include activating the PAL when there is an aircraft likely to depart within the next 30 minutes, or specifically asking the flight crew involved whether they would like the lighting to be activated.

Although the lack of a specific procedure in this area is a safety issue, the investigation considers that the overall risk associated with the issue is minor. For reasons discussed earlier, the risk associated with this type of occurrence would normally not be substantial. In addition, the present occurrence is the only one known to have occurred in Australia that has been associated with the transition from a towered to a non-towered airport.

# FINDINGS

## Context

On 12 March 2008, an A320 aircraft departed Launceston at night without the airport lights being activated.

From the evidence available, the following findings are made with respect to the occurrence and should not be read as apportioning blame or liability to any particular organisation or individual.

## Contributing safety factors

- The crew did not activate the airport lighting prior to departing Launceston outside of the air traffic control tower hours.
- The crew did not detect that the airport lighting was not on during the taxi and takeoff.
- The flight crew's attention regarding airport lighting matters was probably reduced by time pressure and distractions prior to takeoff.
- The control tower procedures did not require that the pilot activated lighting (PAL) be switched on for aircraft that would be departing or arriving soon after the tower was closed. (*Minor safety issue*)

## Other safety factors

- The operator's procedures and training did not specify a time in the sequence of pre-departure activities for flight crews to turn on pilot activated lighting. *(Minor safety issue)*

# SAFETY ACTION

The safety issues identified during this investigation are listed in the Findings and Safety Actions 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.

## Aircraft operator

***Pilot activated lighting procedures***

### Safety Issue

The operator's procedures and training did not specify a time in the sequence of pre-departure activities for flight crews to turn on pilot activated lighting. (Minor safety issue)

### Action taken by the aircraft operator

The operator has included the following specific items in its section on departure briefings in its *Operations Manual (Volume 1 – Administration):*

- Taxi routing and airport conditions /NOTAMS/OEB review
- Lights ON and check, wind sock lights NOT flashing, wind direction and speed at line up at NON-TOWERED airports.

## Airservices Australia

***Tower closure procedures***

### Safety Issue

The control tower procedures did not require that the pilot activated lighting be switched on for aircraft that would be departing or arriving soon after the tower was closed. (Minor safety issue)

### Action taken by Airservices Australia

Airservices Australia advised that they will review tower closing procedures with a view to standardising the procedure and confirming the operation of pilot activated lighting (PAL). Any change in procedure will be included in the National Air Traffic Control Procedures Manual.

## SOURCES AND SUBMISSIONS

### Sources of information

Information was obtained from the flight crew, the aerodrome controller, Airservices Australia, Launceston Airport personnel, the aircraft manufacturer and the operator.

### References


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### Submissions

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

A draft of this report was provided to the flight crew, the aircraft operator, the airport operator, the Civil Aviation Safety Authority (CASA) and Airservices Australia.

A submission was received from Airservices Australia. The submission was reviewed and where considered appropriate, the text of the report was amended accordingly.