Australian Government
Australian Transport Safety Bureau

Operational event – Airbus A380-800, VH-OQE

Los Angeles International Airport | 8 October 2011

Investigation

ATSB Transport Safety Report
Aviation Occurrence Investigation
AO-2011-151
Final

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ATSB TRANSPORT SAFETY REPORT

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Airbus A380-800

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

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Postal address: PO Box 967, Civic Square ACT 2608
Office: 62 Northbourne Avenue Canberra, Australian Capital Territory 2601
Telephone: 1800 020 616, from overseas +61 2 6257 4150
Accident and incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6247 3117, from overseas +61 2 6247 3117
Email: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

SAFETY SUMMARY

What happened

On 8 October 2011, the flight crew of an Airbus A380-800, registered VH-OQE, was preparing for departure from Los Angeles International Airport, United States of America.

Prior to takeoff, the captain changed the departure runway that was entered in the aircraft's flight management system. The procedure for completing that task was not followed exactly, resulting in the take-off speeds not being displayed on the flight instruments.

During the take-off roll, the flight crew, becoming aware that the take-off speeds were not displayed, called out the speeds from their notes instead and proceeded with the takeoff.

What the ATSB found

The ATSB found that the captain was distracted from initially updating the runway change in the aircraft's navigation systems prior to the aircraft taxiing for the runway. Twice prior to takeoff the aircraft's systems displayed a message to check take-off data. The first officer cleared the first message on the understanding that the take-off data would be checked and in the second instance, believing that it had been checked. There were no other warnings in place to alert the crew that they were commencing the takeoff without the take-off speeds in the aircraft's navigation systems.

What has been done as a result

Qantas has advised that the aircraft manufacturer has updated the aircraft's warning systems as part of a planned upgrade program. This upgrade will issue a warning if takeoff is commenced without the take-off speeds having been entered into the aircraft's systems. They also advised that their standard operating procedures have been updated to avoid any misinterpretation regarding the required actions in the case of a runway change.

Safety message

This incident highlights the problem of distraction during critical stages of flight preparation. It also highlights the importance of good flight crew communication to ensure a shared understanding of the aircraft's systems status.

CONTENTS

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau 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 safety factors related to the transport safety matter being investigated. The terms the ATSB uses to refer to key safety and risk concepts are set out in the next section: Terminology Used in this Report.

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 appropriate, or to raise general awareness of important safety information in the industry. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

TERMINOLOGY USED IN THIS REPORT

Occurrence: accident or incident.

Safety factor: an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, current risk controls and organisational influences.

Contributing safety factor: a safety factor that, had it not occurred or existed at the time of an occurrence, then either: (a) the occurrence would probably not have occurred; or (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or (c) another contributing safety factor would probably not have occurred or existed.

Other safety factor: a safety factor identified during an occurrence investigation which did not meet the definition of contributing safety factor but was still considered to be important to communicate in an investigation report in the interests of improved transport safety.

Other key finding: any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which 'saved the day' or played an important role in reducing the risk associated with an occurrence.

Safety issue: a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.

Risk level: the ATSB's assessment of the risk level associated with a safety issue is noted in the Findings section of the investigation report. It reflects the risk level as it existed at the time of the occurrence. That risk level may subsequently have been reduced as a result of safety actions taken by individuals or organisations during the course of an investigation.

Safety issues are broadly classified in terms of their level of risk as follows:

- **Critical** safety issue: associated with an intolerable level of risk and generally leading to the immediate issue of a safety recommendation unless corrective safety action has already been taken.
- **Significant** safety issue: associated with a risk level regarded as acceptable only if it is kept as low as reasonably practicable. The ATSB may issue a safety recommendation or a safety advisory notice if it assesses that further safety action may be practicable.
- **Minor** safety issue: associated with a broadly acceptable level of risk, although the ATSB may sometimes issue a safety advisory notice.

Safety action: the steps taken or proposed to be taken by a person, organisation or agency in response to a safety issue.

FACTUAL INFORMATION

At about 0012 Pacific Daylight Time[1] on 8 October 2011, the flight crew of an Airbus A380-800 (A380), registered VH-OQE and operating as Qantas Flight 94, commenced takeoff on runway 25L at Los Angeles International Airport (LAX), United States of America. The flight was a regular public transport flight from Los Angeles to Melbourne Airport, Victoria. The flight crew consisted of the captain, who was the pilot not flying (PNF), the first officer (FO), who was the pilot flying (PF), and two second officers.

The preparation for the takeoff was commenced while the aircraft was at the gate. The flight crew had planned to use runway 24L for the takeoff; however, the wind speed was varying and the crew were conscious that performance limitations required the tailwind component to be 5 kts or less to conduct a takeoff on 24L. The aircraft was at maximum take-off weight and the pre-flight calculations were completed for a maximum take-off weight, full thrust takeoff from 24L.

As the wind speed was variable, the flight crew discussed the option of using runway 25L for the takeoff. That runway provided for a longer take-off distance and allowed for a departure if the tailwind exceeded 5 kts. The flight crew decided to obtain the current wind strength as they were being pushed back from the gate, at which time they would make the decision about which runway to use for departure.

As they were pushed back, and while being towed along taxiway 'Charlie' to taxiway 'Romeo' (Figure 1), an updated ATIS (Automated Terminal Information Service)[2] was received that indicated the tailwind component on runway 24L was above 5 kts. As a result, the crew decided to use runway 25L and the captain started to modify the pre-flight take-off calculations in the aircraft's navigation systems.

As the captain was about to change the runway in the aircraft's flight management system (FMS)[3], the cabin crew called the flight deck to advise that they were having a problem arming a passenger cabin door. As that problem could require a return to the gate for engineering assistance, the captain delayed changing the departure runway in the FMS. A short time later, the door arming problem was resolved without the need to return to the gate.

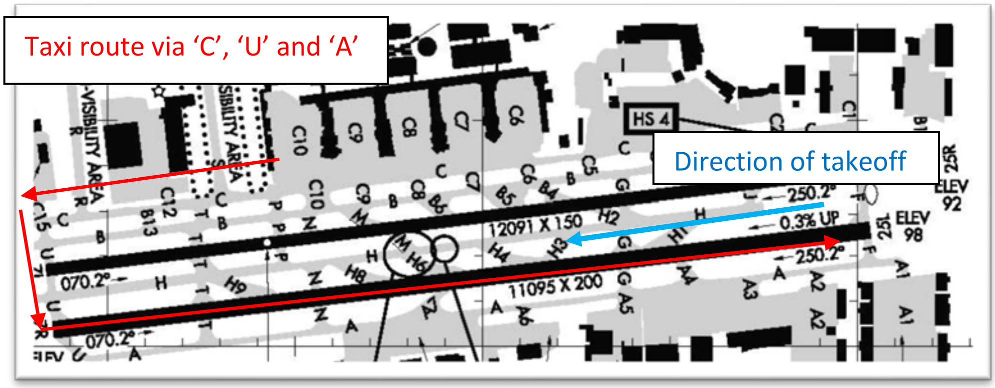
At that point, the aircraft was positioned at taxiway 'Romeo' and the captain advised air traffic control (ATC) of the need to depart from runway 25L. ATC cleared the aircraft to taxi to 25L, holding short of taxiway 'Uniform' and runways 25R and 25 L, before taxiing along taxiway 'Alpha' to the threshold for runway 25L.

1 Pacific Daylight Time was Coordinated Universal Time (UTC) – 7 hours.

2 An automated pre-recorded transmission indicating the prevailing weather conditions at the aerodrome and other relevant operational information for arriving and departing aircraft.

3 An aircraft computer system that contained data used by the aircraft to guide it along a pre-planned route, altitude, and speed profile.

Figure 1: Taxi route



© Federal Aviation Administration (FAA)

As a result of the extended taxi, the flight crew decided to revise the take-off performance calculations during that time. In addition, two changes of ATIS information during the taxi necessitated modification of the initial take-off performance figures.

The FO reported that during the taxi, and before the flight crew had finalised the take-off performance calculations, a 'CHECK T.O [takeoff] DATA' message was noted on the multi function display (MFD[4], Figure 2). The FO reported that it was normal to see that message when the flight plan was first loaded and it was routine to then clear it. Knowing that the performance calculations had not yet been finalised, he cleared the message.

Once the captain had updated the performance figures in his onboard information system (OIS)[5], he took over taxiing the aircraft while the FO conducted his own calculations. The crew then crosschecked their figures, which matched.

While still on taxiway 'Alpha', and approaching the holding point for runway 25L, one of the second officers alerted the crew to the fact that the departure runway had not been changed in the FMS. The captain changed the departure runway in the FMS to 25L, switched his MFD to the flight plan page and confirmed that the standard instrument departure (SID) details were still loaded and valid for the departure. The FO also switched his MFD to the flight plan page to confirm these details.

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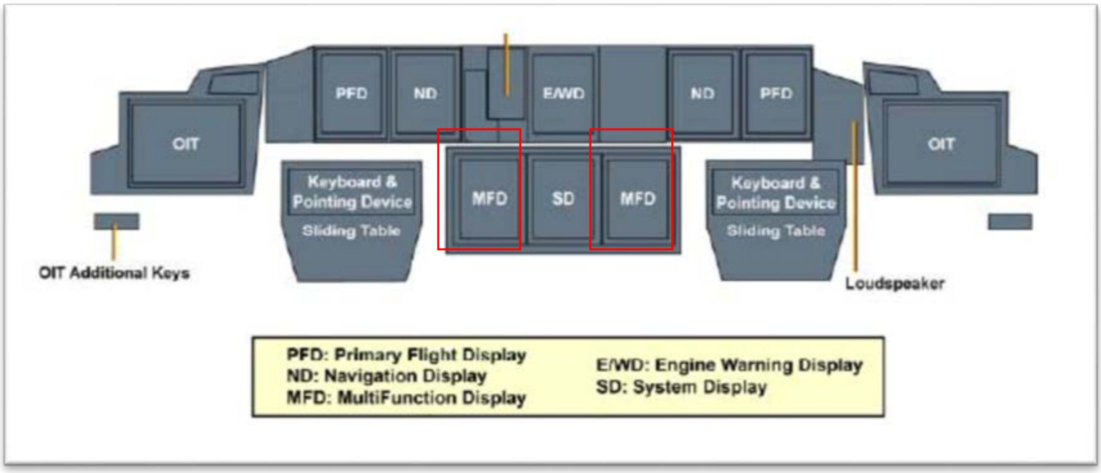
4 An interactive display that provides access to the FMS textual data. On the A380 there are two MFDs, one for the captain and one for the FO.

5 The OIS is comprised of two systems: an avionics system that hosts applications and manuals primarily for maintenance; and a flight operations system that is used by flight crew and contains operational applications and manuals, such as the necessary airport charts and performance software to calculate take-off and landing performance.

Figure 2: Flight deck instrument panel – MFDs highlighted in red



During that time the flight crew were cleared to line up on the runway and both reported that, at that time, their attention was focussed on accurately positioning the aircraft on the taxiway. This included using the taxi camera that was able to be selected to display on their primary flight displays (PFD) and the onboard airport navigation system (OANS) that was able to be selected to display on their navigation displays (ND). This contrasted with the operator's procedures, which stated that at this point, the first officer's MFD should have been set to the performance page.

As they entered the runway, the flight crew were cleared for takeoff and switched off the OANS information, restoring their NDs. A rolling takeoff was carried out, which entailed continuing the turn onto the runway and immediately commencing the takeoff by setting take-off thrust. Both flight crew turned their camera display off at this time, restoring their PFDs to displaying their flight instruments.

The FO reported again noticing the 'CHECK T.O DATA' message on the MFD at that time. Knowing that the crew had just crosschecked the take-off data, he again cleared it, thinking he had not cleared it properly previously.

As the aircraft was accelerating along the runway, the flight crew noticed a lack of flight mode annunciations that should have been displayed on the PFD, including MAN TOGA (manual take-off thrust), SRS (speed reference)[6] and A/THR (in blue, meaning autothrust arm mode). In this instance, only the runway annunciation (RWY) showed (Figure 3). The FO had previously been involved in an event in which a similar lack of annunciation had occurred due to an autothrust failure. Both the captain and FO believed the same failure had occurred during this takeoff.

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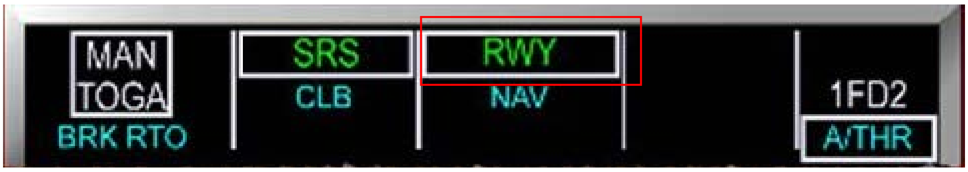
6 A managed vertical mode that is used during takeoff. The aircraft's flight directors use SRS to provide accurate pitch guidance information on the PFD (see the following discussion).

Figure 3: Expected flight mode annunciations – runway annunciation highlighted here by a red rectangle



The FO queried whether or not the takeoff should continue. In response, the captain confirmed they were continuing as the engine thrust setting was at full thrust and there were no warnings or indications of a serious problem.

Once the aircraft reached 100 kts, the captain realised they did not have the take-off speeds displayed on the PFD. The captain and one of the second officers had previously made a written note of the V speeds[7] for the takeoff. The second officer called the V_1 (decision) speed and both the second officer and captain called the V_r (rotation) speed. The FO rotated and the aircraft responded normally, lifting off at around 159 kts.

The take-off performance figures for the departure were calculated as V_1 = 128 kts, V_r = 151 kts and V_2 = 158 kts and were correct for a runway 25L departure. The recorded data shows that the aircraft climbed at around 165 kts after takeoff.

The FO reported that after rotation, he noted that the speed symbol displays on the PFD were not as expected, with no green circle to indicate the rotate speed and the triangle against the V_2 speed displaying as blue instead of magenta. In addition, he reported the that flight director (FD)[8] pitch bar was flashing, and not displaying the reference pitch angle as would be expected for this stage of flight.

The flight crew decided to climb to 3,000 ft before changing the aircraft's configuration and engaging the autothrust and autopilot. Normally these actions are carried out passing 1,500 ft.

The flight continued to Melbourne without incident.

Pilot information

Captain

The captain held an Air Transport Pilot (Aeroplane) Licence (ATPL(A)) that was issued in 1987 and had accumulated a total aeronautical experience of about

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[7] V speeds are used for takeoff as follows:

- V_1: the critical engine failure speed or decision speed. Engine failure below this speed shall result in a rejected takeoff; above this speed the take-off run should be continued.
- V_R: the speed at which the aircraft rotation is initiated by the pilot.
- V_2: the minimum speed at which a transport category aircraft complies with those handling criteria associated with climb, following an engine failure. It is the take-off safety speed and is normally obtained by factoring the minimum control (airborne) speed to provide a safe margin.

[8] The flight director (FD) computes and displays the necessary pitch and bank angles required in order for the aircraft to follow a selected flight path.

21,218 flying hours, with about 486 hours on the A380. He held a valid Class 1 medical certificate. Prior to transitioning to the A380, the captain had accumulated significant experience flying the Boeing 747-400 (B744).

First Officer

The FO held an ATPL(A) that was issued in 1992 and had accumulated a total aeronautical experience of about 10,030 flying hours, with about 1,238 hours on the A380. He held a valid Class 1 medical certificate. Prior to transitioning to the A380, the FO had accumulated significant experience flying the Boeing 747-200/300 (B747).

Second officers

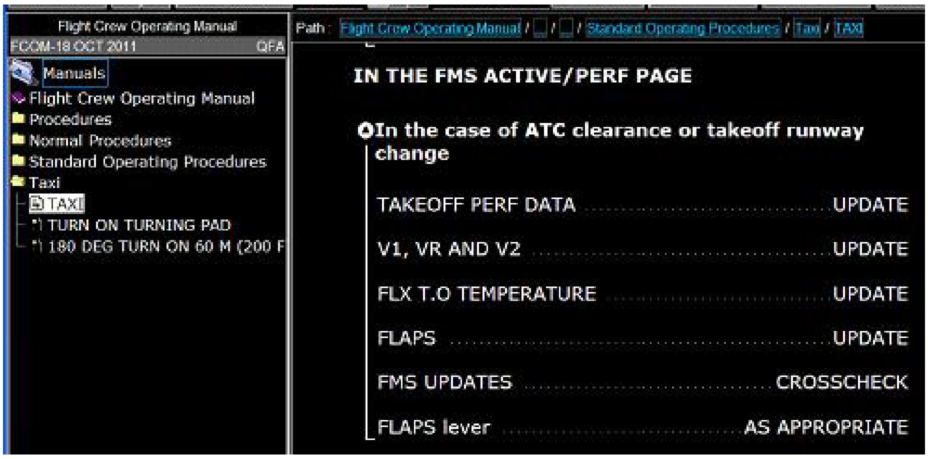
The second officer 1 (SO1) held an ATPL(A) that was issued in 1996 and had accumulated a total aeronautical experience of about 8,432 flying hours with 499 hours on the A380. SO2 held a Commercial Pilot (Aeroplane) Licence that was issued in 2001 and had accumulated a total aeronautical experience of about 3,767 flying hours with 665 on the A380. Each held a valid Class 1 medical certificate.

Standard Operating Procedure

Runway change procedure

The standard operating procedure (SOP) in the A380 Flight Crew Operating Manual (FCOM) for a runway change was to update the take-off performance data, take-off speeds, flex temp (thrust setting)[9], flaps and to crosscheck the FMS updates (a visual representation of those checks is at Figure 4).

Figure 4: A380 FCOM runway change procedure



There was also an SOP in the FCOM for task sharing between flight crew during taxi, which outlined the actions to be conducted if the take-off data or conditions

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9 An assumed temperature or FLEX temperature for Airbus aircraft, used in the aircraft's FMS to allow a reduced thrust takeoff, which reduces the amount of thrust the engines deliver, thereby reducing wear on the engines.

changed. Those were, in part, for the PNF to revise/compute the take-off performance and update the FMS with the new data (if any). The PF was then required to crosscheck those actions before the PNF set the appropriate flap and revised or checked the flight plan, including the SID and transition altitude requirements.

The FO reported that the crew's actions for changing the runway in the FMS were not in accordance with the SOPs and that he had not previously appreciated the need to follow the procedure exactly. He stated that this was in part due to his previous experience on the B747, which did not require the procedure to be done in a strict order to achieve the desired outcome.

The FCOM also explained the relationship between the take-off speeds and the availability of SRS mode, specifically that SRS would not be available at takeoff without the prior entry of the V_2 speed.

CHECK T.O DATA message

The 'CHECK T.O DATA' message was generated automatically and displayed on the MFD in black text over an amber background. That type of alert, a type II message, was used to inform flight crew of a situation or to prompt action from the crew. While some type II messages also display on the PFD or ND, this message only displayed on the MFD.

The triggering conditions for the 'CHECK T.O DATA' message to be displayed when the take-off data had already been entered in the FMS included: changes to the take-off runway, to the flap setting, or if the secondary flight plan was activated. The FCOM outlined the necessary actions in response to the message as:

> If the Flight Crew has already entered the takeoff speeds, and then changes the takeoff runway, the takeoff speeds need to be confirmed again, or changed if necessary:
>
> • The FMS Message Area displays CHECK T.O DATA to alert the Flight Crew.
>
> • On the T.O panel, the old takeoff speeds are displayed in yellow next to the entry fields. The Flight Crew can accept these speeds by clicking on the CONFIRM T.O SPDs button. If the take-off speeds have changed, the Flight Crew enters the new values in the entry fields.

Human Factors

Distraction, interruptions and prospective memory

Distraction and interruptions have been identified in previous pre-flight data entry occurrences as an influence on either an error or the non-detection of an error or abnormal indication. Specific research into the disruptive effect of interruptions and their effect on task resumption has found that people may 'think they have completed the step, and upon resumption actually skipped that step' and that 'in some workplace situations, the primary task is never actually resumed.'[10]

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[10] Trafton, J.G. & Monk, C.A. (2008). *Task interruptions* in Review of Human Factors and Ergonomics, Volume 3, Human Factors and Ergonomics Society.

Closely related to distractions and interruptions is the subject of prospective memory. Prospective memory can be defined as the intention to perform an action in the future, coupled with a delay between recognising the need for action and the opportunity to perform it.[11] A distinguishing feature of prospective memory is the need for an individual to remember that they need to remember something. Crew often rely on prospective memory when they are interrupted and in many cases they have no cues in the cockpit to indicate where they were up to at the time of the interruption. Studies have shown that people often fail to resume a task when interrupted if their attention is quickly diverted to a new task before they can resume the interrupted task.

The captain reported that there were a number of distractions and interruptions from the time they were pushed back from the gate, until the takeoff commenced. These included: the problem with the passenger cabin door; holding at the runway holding points when crossing runways 07L and 07R; the confusing taxi guidance lights on runway 07R; the changed take-off environmental conditions during the taxi with the need to twice recalculate the take-off data; and taxiing the aircraft while the FO calculated the revised take-off performance data. He reported that his workload was a little higher than normal due to those factors.

The captain and FO reported that during the taxi to runway 25L their attention was on the taxi manoeuvre, specifically the confusing runway lights which could be interpreted as leading onto the active runway instead of the taxiway. They also reported that as they approached the runway for takeoff, their attention moved between looking outside and monitoring inside by looking at the taxi camera on the PFD, in order to check that the aircraft's alignment was correct. The FO indicated that his workload was about normal, in part because he was taxiing the aircraft and felt he could control the taxi speed to give the crew more time if needed.

The captain reported feeling that had they stopped at the holding point prior to entering the runway, he would have had enough time to notice the lack of V speeds in the system.

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[11] Dismukes, K. (2006). *Concurrent task management and prospective memory: pilot error as a model for vulnerability of experts.* In Proceedings of the Human Factors and Ergonomics Society 50th Annual Meeting – 2006, 909-913.

ANALYSIS

Pre-flight preparation

The pre-flight preparation was reported as normal until the aircraft was pushed back from the gate. It was during the pushback that the flight crew decided they would need to conduct a runway 25L departure due to the 5 kts of tailwind, which exceeded the limit for a 24L departure. This increased the crew's workload during the subsequent taxi.

The call about the problem with the passenger cabin door interrupted the captain when he was about to amend the runway in the aircraft's flight management system (FMS). This interruption adversely affected the captain's prospective memory to the extent that he forgot to change the runway. The resolution of the door problem during the early pushback and tow negated the captain's initial plan to amend the runway information while at the gate, and the action by the first officer to twice clear the CHECK T.O DATA message removed the only relevant cues in the cockpit that may have returned the captain's attention to that point in the procedures.

Subsequently, the complexity of the taxi, and repeated need to change the take-off performance calculations further increased the flight crew's workload. This increased the likelihood that the captain would not return to the intention to apply the runway change.

Takeoff

The first indication that the takeoff was not normal was the lack of the expected annunciations on the primary flight display (PFD). The lack of MAN TOGA (manual take-off thrust), SRS (speed reference) and A/T (autothrust) annunciations were initially interpreted by both flight crew as being due to an autothrust failure, rather than to their incorrect application of the operator's runway change standard operating procedure (SOP). This was explained in part by the first officer's (FO) experience of a previous autothrust failure event.

The decision to continue the takeoff was based on the normal performance of the aircraft engines and the lack of warnings that there was a problem with the aircraft. The verbalisation of the V speeds by the second officer mitigated the risk of their unavailability on the PFD. Given the aircraft's speed and position at the time, this allowed the flight crew to continue the takeoff and rotate at the correct speed, before climbing at close to the required climb speed until correcting the aircraft's configuration and engaging the autopilot at 3,000 ft.

Standard operating procedures

Runway change procedure

The operator's standard operating procedures (SOP) included the required flight crew actions in response to a runway change and flight crew interaction when amending an aircraft's take-off performance should that occur. This included revising/computing the take-off performance data and updating this data in the FMS, crosschecking and setting the flaps and revising/checking the flight plan. However, the action by the flight crew in this instance to update the runway in the FMS after they had entered and crosschecked the V speeds meant that confirmation of these speeds relied on their pressing the 'confirm' button in the FMS. The crew did not take that action, meaning that the speeds were not displayed. Application by the flight crew of the operator's SOPs to the runway change would have ensured the availability of the necessary speeds and other guidance for the takeoff.

CHECK T.O DATA message

The FO reported twice seeing the 'CHECK T.O DATA' message displayed on the Multi Function Display (MFD) and that it was normal to see this message during the pre-flight preparation stage. While he recognised that this was less common after leaving the gate, he was also aware that the captain had updated the performance figures in his onboard information system (OIS), while he had yet to update his OIS. As such, seeing the message and then clearing it from the MFD was reasonable to the FO at this time.

The second time the 'CHECK T.O DATA' message was observed by the FO was when the aircraft had entered the runway for takeoff. At this point, the FO thought that because they had just checked and crosschecked the data, the check had been carried out but that he may not have cleared the message properly. In response, the FO cleared it again. This action was reasonable according to the FO's understanding of the situation. However, at neither time did the FO verbalise the message to the rest of the flight crew, thereby removing a chance that any flight crew member might detect that the message was due to the lack of V speeds in the aircraft's systems.

There were no other warnings available at the time to inform the flight crew that they had not inserted the take-off speeds into the aircraft's systems.

FINDINGS

From the evidence available, the following findings are made with respect to the operational event involving Airbus A380-800 aircraft, registered VH-OQE, at Los Angeles International Airport, United States of America on 8 October 2011 and should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing safety factors

- The runway change procedure was not entered in the aircraft's flight management guidance system in accordance with the operator's standard operating procedures, which resulted in the take-off speeds not being displayed during the take-off roll.
- The flight crew did not detect the lack of speeds on their primary flight displays until later in the takeoff, probably due to a combination of the cockpit display settings used and their focus being on taxiing onto the runway.
- The message 'CHECK T.O DATA' was displayed on the aircraft's multi function display prior to the aircraft entering the runway and again after entry, but was cleared on both occasions by the first officer without reference to the other crew members.
- The captain was distracted from changing the runway in the aircraft's flight management system and this was not detected until the aircraft was nearing the runway due to the flight crew's focus on the taxi to the runway.

Other key findings

- The take-off performance figures were accurately calculated and crosschecked for a runway 25 departure at Los Angeles.

SAFETY ACTION

The safety issues identified during this investigation are listed in the Findings and Safety Actions sections of this report. However, whereas an investigation may not identify any particular safety issues, relevant organisation(s) may proactively initiate safety action in order to further reduce their safety risk.

All of the relevant organisations identified during this investigation were given a draft report and invited to provide submissions. Although no safety issues were identified during this investigation, the following proactive safety action was advised by the aircraft operator.

Qantas Airways

Electronic Centralised Aircraft Monitor alert

The operator advised that, in response to this occurrence, they contacted the aircraft manufacturer to query the availability of an alert or warning in the aircraft's systems in the event of there being no take-off speeds in the aircraft's flight management system (FMS). Subsequent operator/manufacturer correspondence determined that just prior to the event, the manufacturer had introduced a new abnormal electronic centralised aircraft monitor (ECAM) procedure in respect of this possibility.

The new ECAM warning is triggered prior to 80 kts when take-off thrust is set and there are no take-off speeds in the aircraft's FMS. This modification has been retrofitted to all of the operator's A380s.

Flight Crew Operating Manual procedure modification

The operator also contacted the aircraft manufacturer in respect of the wording in the Flight Crew Operating Manual (FCOM) in the case of updates to an aircraft's flight plan. In response, the manufacturer amended the FCOM to make it clear that in such cases the flight plan was to be updated prior to the take-off speeds being entered into the aircraft's FMS (Figure 5).

Figure 5: Modified A380 FCOM runway change procedure

IN THE FMS ACTIVE PAGES

In the case of ATC clearance or takeoff runway change:

Update the FMS in accordance with the new results of the takeoff performance computation: I.e. update the FMS ACTIVE F-PLN page and the T.O panel of the FMS ACTIVE/PERF page.

F-PLN/DEPARTURE .... UPDATE

If the flight crew anticipated the runway change in a secondary flight plan, activate this SEC F-PLN.

V1, VR AND V2 .... UPDATE

FLX T.O TEMPERATURE .... UPDATE

FLAPS .... UPDATE

FMS UPDATES .... CROSSCHECK

The PF crosschecks the new FMS inputs.

FLAPS lever .... AS APPROPRIATE

Set the FLAPS for takeoff.

APPENDIX A: SOURCES AND SUBMISSIONS

Sources of Information

The sources of information during the investigation included the:

- flight crew
- aircraft operator
- aircraft manufacturer
- aircraft's digital flight data recorder
- Civil Aviation Safety Authority (CASA).

References

Trafton, J.G. & Monk, C.A. (2008). Task interruptions in *Review of Human Factors and Ergonomics*, Volume 3, Human Factors and Ergonomics Society.

Dismukes, K. (2006). Concurrent task management and prospective memory: pilot error as a model for vulnerability of experts. In *Proceedings of the Human Factors and Ergonomics Society 50th Annual Meeting* – 2006, 909-913.

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, the aircraft operator, the Civil Aviation Safety Authority (CASA), the French Bureau d'Enquétes et d'Analyses pour la sécurité de l'aviation civile (BEA), the European Aviation Safety Agency (EASA) and the aircraft manufacturer.

Submissions were received from some of the flight crew, the aircraft operator, the aircraft manufacturer and EASA. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

24 Hours 1800 020 616
Web www.atsb.gov.au
Twitter @ATSBinfo
Email atsbinfo@atsb.gov.au

Investigation

ATSB Transport Safety Report
Aviation Occurrence Investigation
Operational event - Airbus A380-800, VH-OQE,
Los Angeles International Airport, 8 October 2011
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