Australian Government
Australian Transport Safety Bureau

Airspeed management occurrence involving Airbus A320, VH-JQG

Sydney Airport, New South Wales | 25 June 2013

Investigation

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Addendum

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Safety summary

What happened

On 25 June 2013, the flight crew of an Airbus A320-232 aircraft, registered VH-JQG and operated by Jetstar Airways (Jetstar), was conducting an instrument landing system approach with autoland training at Sydney Airport, New South Wales.

During the approach, the training captain (pilot flying) disconnected the autothrust system by retarding the thrust levers to the IDLE STOP, and asked the first officer to assess the effect on the proposed approach. After briefly referring to the Quick Reference Handbook, the crew extended the landing gear and wing flap, and finalised the pre-landing checklist. The flight crew then became involved in a discussion about the requirements in the handbook for the proposed approach.

With engine thrust at idle and the aircraft in a high drag configuration, the airspeed quickly reduced to below the minimum approach speed. The captain was in the process of applying thrust when the aircraft's alpha-floor protection system activated. Take-off/go-around thrust was automatically commanded by this system and the flight crew conducted a missed approach.

What the ATSB found

The ATSB found that during an autoland training exercise with the autothrust disengaged, both pilots were distracted by their consideration of a training scenario. As a result, they did not identify the airspeed reducing below the target approach speed in sufficient time to prevent activation of the aircraft's alpha-floor protection system.

The ATSB also found that during the autoland training exercise, the training captain directed the first officer to set hypothetical minima/decision heights in the autoflight system in support of the training scenario. These heights were not applicable to the instrument approach being flown and the practice was not approved by Jetstar. The resulting increased workload impacted on the first officer's capacity to effectively fulfil the pilot monitoring role.

What's been done as a result

As a result of this occurrence, Jetstar issued a memo to its check and training pilots highlighting the requirements for autoland training. The memo reiterated that flight crew must only use the minima for the approach being flown.

Safety message

This occurrence demonstrates the risks associated with conducting training exercises during periods of high workload. Training pilots need to be cognisant of trainee experience and capability and ensure that the training exercise never compromises the primary task of monitoring/flying the aircraft.

Contents

The occurrence

On 25 June 2013, an Airbus A320-232 aircraft, registered VH-JQG, was being operated by Jetstar Airways on a scheduled passenger flight from Sydney to Ballina and return, New South Wales. The flight crew comprised a training captain, operating as pilot flying,[1] and a trainee first officer (FO).

The FO was undergoing further line training and was assigned to the captain for this training. The occurrence took place on the second day of the training. The planned training included two autolands, the first of which was completed the previous day. The second autoland was planned on arrival at Sydney.

After arrival at Ballina, and with the benefit of a longer than usual turnaround time, the captain briefed the FO for the return flight to Sydney. The brief included:

- that the captain would be the pilot flying
- that although the weather forecast did not require it, they would conduct an instrument landing system (ILS)[2] approach with autoland into Sydney
- a review of the A320 Quick Reference Handbook (QRH) in relation to the required equipment for low visibility approaches
- discussion of the captain's intent to verbally introduce various scenarios during the approach. In response, the FO was to advise the effect of these scenarios on the approach category[3] and consequent minima (decision height and required visibility).

Prior to commencing descent into Sydney, the captain conducted an approach briefing for an ILS approach to runway 16 right (16R). While that ILS approach was category (CAT) I, the captain indicated that for training purposes they would treat the approach as if low visibility conditions existed and the infrastructure was CAT IIIB capable. CAT IIIB approaches typically have no decision height and require a runway visual range (RVR) of 175M. The intent was that during the approach, the crew would enter the applicable scenario-based decision height in the aircraft's flight management guidance computer (FMGC). The captain reiterated that he would announce some equipment failure scenarios, and asked the FO to have the QRH opened at the relevant page.

The crew commenced the runway 16R ILS approach at about 1015 Eastern Standard Time[4]. At that time the aircraft was descending through 3,000 ft and the airspeed was reducing through 200 kt. The target landing speed was 130 kt.

At or about 2,000 ft, the captain asked the FO to assess how a flight control computer failure would affect the approach category. After consulting the QRH, the FO advised that they could continue with the autoland but the applicable approach category would change to CAT IIIA. In

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1 Pilot flying (PF) and pilot monitoring (PM) are procedurally assigned roles with specifically assigned duties at specific stages of a flight. The PF does most of the flying, except in defined circumstances; such as planning for descent, approach and landing. The PM carries out support duties and monitors the PF's actions and aircraft flight path.

2 A standard ground aid to landing, comprising two directional radio transmitters: the localizer, which provides direction in the horizontal plane; and the glideslope, for vertical plane direction, usually at an inclination of 3°. Distance measuring equipment or marker beacons along the approach provide distance information.

3 The ILS approach category (CAT) was primarily dependant on the approach lighting systems installed and as such dictated the minimum weather conditions required for landing. Additional information is provided in the section titled *Context*.

4 Eastern Standard Time (EST) was Coordinated Universal Time (UTC) + 10 hours.

response, the captain directed the FO to set the decision height in the FMGC to the RWY 16R CAT IIIA minima.[5]

On descent through 1,500 ft, the flight crew noted the runway in sight, with light rain showers in the area. At about this time, the captain retarded the thrust levers to idle. This had the intended effect of disconnecting the autothrust system and activating the master caution. After confirming autothrust disconnection with the FO, the captain asked if the ILS approach could be continued using manual thrust.

The FO's initial assessment was that a go-around was required. The captain disagreed but further discussion was suspended to allow the crew to extend the remaining flap and action the landing checklist. The captain then asked the FO to consult the QRH again, after which the FO correctly assessed that the approach could be continued to the CAT II landing minima.

The FO went on to read out the applicable visibility and lighting requirements but the captain focussed on getting the FO to re-set the scenario-based decision height in the FMGC prior to 1,000 ft. At this time, the airspeed was nearing the landing speed of 130 kt and still reducing at about 1 kt/sec.

When the captain returned to scanning the flight instruments, he observed that the speed was quite low and advanced the thrust levers accordingly. As the thrust increased the aircraft's alpha-floor (speed protection) system activated, which commanded take-off/go-around thrust. At about the same time the FO recalled hearing the 'SPEED SPEED SPEED' synthetic voice warning (see the section titled *Aircraft flight envelope protection*).

The approach was no longer stable and the crew conducted a go-around before returning to land on the same runway. At the time of the alpha-floor activation the aircraft was about 800 ft above ground level and the airspeed had reduced to 114 kt.

[5] The applicable landing minima reduces as the CAT changes from CAT I, to CAT II and then to CAT IIIA/B. See the section titled *Instrument landing system (ILS) criteria*.

Context

Pilot information

Training captain

The captain held an Air Transport Pilot (Aeroplane) Licence and a valid Class 1 Medical Certificate. The captain had a total of 19,600 hours aeronautical experience including 11,900 hours on the A320.

The captain commenced employment with Jetstar Airways (Jetstar) in May 2008 as a direct-entry captain on the A320 and was appointed as a training captain in January 2012.

About 4 weeks prior to the occurrence, the captain completed low visibility operations training in the simulator followed by the line training component (including autoland training) in the aircraft.

The captain noted that the occurrence flight was the fifth early morning (about 0500) start in a row and that their sleep in the nights before the occurrence was 'broken'. The captain reported obtaining about 5 hours sleep the previous night and that the time free of duty prior to the occurrence flight was about 15 hours. There were no fatigue concerns or health issues reported to Jetstar in relation to the occurrence flight.

Trainee first officer

The first officer (FO) held an Air Transport Pilot (Aeroplane) Licence and a valid Class 1 Medical Certificate. The FO had a total of 3,300 hours aeronautical experience, including 125 hours on the A320.

The FO commenced employment with Jetstar in February 2013 and, at the time of the occurrence, was in the final stages of line training.

About 3 months prior to the occurrence, the FO completed low visibility operations training in the simulator as part of the A320 type endorsement.

The FO reported obtaining about 8 hours of sleep the previous night and having been free from duty for about 20 hours. There were no fatigue or health issues reported to Jetstar in relation to the occurrence flight.

Instrument landing system (ILS) criteria

At the time of this occurrence, runway 16 right (16R) at Sydney Airport was equipped with an instrument landing system (ILS) that allowed for operations to CAT I minima. CAT II and CAT III operations were not available primarily because the required approach and other lighting facilities were not installed. The landing minima for a CAT I approach include:

- a decision height (DH) of 200 ft above threshold elevation
- visibility equal to or greater than 800m
- runway visual range (RVR) 550m.

By comparison, CAT II and CAT III approaches are designed to permit flight to lower or zero DHs and/or reduced RVR conditions. Commensurate with such DHs, flight crew control of the aircraft along the ILS beam and at the correct speed is required to a very high level of accuracy.

At the time of the occurrence, the only ILS in Australia that provided for CAT II or CAT III approaches was the runway 16 ILS at Melbourne Airport, Victoria. The landing minima for that approach are listed at Table 1.

Table 1: CAT II and CAT III A/B landing minima for the Melbourne runway 16 ILS

Category		Melbourne ILS Runway 16
CAT II	DH	100 ft
	RVR	300m
CAT IIIA	DH	50 ft
	RVR	175m
CAT IIIB	DH	No DH
	RVR	75m

Aircraft flight envelope protection

Autothrust

The A320 is equipped with an autothrust system that automates the applicable thrust requirements and provides the crew with visual indications of the aircraft's energy state. Indications including speed, acceleration, deceleration and relevant speed limitations are displayed on the primary flight display.

Autothrust is activated by positioning the thrust levers between the IDLE STOP and CLB (climb) detent. One of the methods to disconnect autothrust is to retard the thrust levers to the IDLE STOP.

Jetstar recommended that autothrust be used during approach as it provides accurate speed control. However, the pilot flying was required to keep a hand on the thrust levers and be prepared to manually control the thrust. If the pilot flying wished to perform an approach or landing using manual thrust, that selection was to be made prior to 1,000 ft above ground level.

Low-energy warning

An aural 'SPEED SPEED SPEED' warning is available when the aircraft is configured with flap 2, 3, and FULL. The warning is repeated every 5 seconds and advises the pilot that:

- the aircraft's energy level (aircraft speed/angle-of-attack) is reducing below the required threshold
- thrust must be increased.

Alpha-floor protection

The A320 is equipped with an alpha-floor protection system that is designed to protect the aircraft from entering a low-energy state. If the aircraft's airspeed reduces such that the angle-of-attack reaches the alpha-floor threshold, the system commands take-off/go-around thrust regardless of the autothrust condition or thrust lever position. This protection was available from lift-off to 100 ft on approach.

Operator procedures

Jetstar described low visibility operations as those to less than the CAT I ILS minima. Autolands were required for CAT III operations and preferred for CAT II operations.

Jetstar's A320 Flight Crew Training Manual stated that practice autoland training required prior approval and could only be conducted in CAT I or better conditions. When conducting autoland training, the manual required use by crews of the actual minima for the approach being flown.

Most of the aircraft systems relevant to an ILS approach are automatically monitored and the effect of any failures processed with the optimum approach category displayed to flight crew. There were a number of other failures that required the flight crew to reference the Quick Reference Handbook to establish the relevant approach category.

Jetstar conducted low visibility training in the A320 simulator. In addition to that training, each pilot was required to conduct a low visibility approach and autoland in not less than CAT I conditions:

- in the aircraft with a check/training pilot
- during normal line operations.

As a consequence of this occurrence, Jetstar:

- issued a memo to their check and training pilots highlighting the requirements for autoland training
- reiterated to its flight crew that they must only use the actual minima for the approach being flown.

Related occurrences

A search of the ATSB occurrence database covering the previous 10 years identified one other alpha-floor activation during approach. This occurred on 7 September 2013, when the flight crew of an Airbus A320, registered VH-VFJ, were on descent into Auckland Airport, New Zealand.[6] Passing about 4,200 ft, the aircraft's autoflight system sequenced to final approach mode but exited that mode when the crew levelled the aircraft at 3,000 ft to comply with a company speed restriction.

The crew's subsequent manipulation of the autoflight system resulted in the inadvertent engagement of open climb mode, an increase in engine thrust, and aircraft acceleration. To avoid exceeding a speed limitation the captain retarded the thrust levers to the IDLE STOP, inadvertently disconnecting the autothrust system. The crew resumed the approach but were unaware that the autothrust system was disengaged.

The aircraft decelerated and soon after the final stage of flap was selected, the aircraft's flight management guidance system generated a low-energy warning. The crew were in the process of responding to the low-energy warning when the alpha-floor autothrust mode engaged.

A search of the United States National Transportation Safety Board, Federal Aviation Administration and National Aeronautics and Space Administration databases identified a number of alpha-floor activations, the vast majority of which resulted from incorrect configuration changes. Those activations were generally associated with the conduct of a go-around and involved the inadvertent selection of the aircraft's flaps to zero or to a position less than required for the existing airspeed.

[6] ATSB investigation AO-2013-159: *Flight envelope protection event*. Available at www.atsb.gov.au.

Safety analysis

Introduction

During an autoland training exercise with the autothrust disengaged, the aircraft's airspeed reduced below the minimum approach speed. The reduction was not detected by the crew and resulted in the activation of the aircraft's alpha-floor protection system and the associated take-off/go-around thrust. In response to the associated low-energy warning the flight crew initiated a go-around for a routine approach and landing. The following analysis will examine the conduct of the training scenario and the factors that led to the undetected airspeed reduction.

Airspeed reduction

The training captain reported retarding the thrust levers to idle during the approach with two goals in mind. The first was to reduce the airspeed to the final approach speed in line with normal procedures. The second was to disconnect the autothrust, which is a consequence of retarding the thrust levers to the IDLE STOP. This action was announced to the first officer (FO) to simulate the loss of autothrust function, prompting the FO to refer to the Quick Reference Handbook (QRH) as normal.

With the thrust levers at the IDLE STOP the airspeed was reducing, a trend that was exacerbated by the extension of landing gear and wing flap. A discussion followed by the crew on the applicable approach category and associated visibility requirements for an autoland without autothrust functionality. During the discussion, the FO initially misinterpreted the QRH. The captain explored the issue further with the FO, distracting the crew from monitoring the aircraft's performance. As a consequence, neither identified the airspeed reducing below the target approach speed in sufficient time to prevent activation of the aircraft's alpha-floor protection system.

Autoland training

The training captain considered that to conduct autoland training effectively, low visibility scenarios should be incorporated into training autoland approaches. In the absence of suitable published approach minima (Category II and III) at Sydney Airport, and in visual conditions, the captain decided to use hypothetical minima as the criteria for the training scenario. These minima were entered into the aircraft's autoflight system. However, the use of different minima to those published for the approach was not approved by Jetstar Airways (Jetstar). In addition, the requirement for the FO to consult the QRH and enter hypothetical minima into the autoflight system elevated the FO's workload. This moved their attention away from monitoring the aircraft's position, performance and systems.

The Jetstar guidelines indicated that low visibility training was not to be conducted in the actual aircraft. However, the training captain believed that autoland training, which was authorised in the aircraft, was enhanced by the discussion of low visibility and its effect on the approach category, and the simulation of equipment failures. This was consistent with the captain's recent simulator training.

In this regard, the training captain's understanding that a manual thrust autoland approach was approved was correct. However, given that the loss of autothrust was presented as a simulated failure, Jetstar viewed this as non-normal training, which should only occur in the simulator. Irrespective of the training captain's understanding, the decision to introduce and discuss various failure scenarios during the approach increased the FO's workload.

A high workload can reduce an individual's capacity to attend to various sources of information and associated tasks (Harris, 2011). In this occurrence, it is likely that the FO's focus of attention on the QRH as a result of the training scenarios reduced the FO's capacity to effectively fulfil the pilot monitoring role.

Findings

From the evidence available, the following findings are made with respect to the airspeed management occurrence involving Airbus A320, registered VH-JQG and operated by Jetstar Airways, which occurred during an instrument approach to Sydney Airport, New South Wales on 25 June 2013. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing factors

- During an autoland training exercise with the autothrust disengaged, both pilots were distracted by their consideration of a training scenario, and did not identify the airspeed reduce below the target approach speed in sufficient time to prevent activation of the aircraft's alpha-floor protection system.
- The introduction of multiple training scenarios required the first officer to consult the Quick Reference Handbook to consider and set hypothetical minima/decision heights in the aircraft's autoflight system. This increased the first officer's workload and impacted on their capacity to effectively fulfil the pilot monitoring role.

Safety issues and actions

Additional safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence

Proactive safety action taken by Jetstar

Jetstar advised that in response to this occurrence they issued a memo to all check and training captains reminding flight crew that:

> Only normal operations are permitted in the aircraft and that all abnormal and emergency procedures may be conducted in the simulator only.
>
> When conducting Low Visibility Operations training, flight crew must only set the minima for the actual approach being flown.

General details

Occurrence details

Date and time:	25 June 2013 – 1018 EST	
Occurrence category:	Incident	
Primary occurrence type:	Unstable approach/alpha-floor occurrence	
Location:	On approach to land, Sydney Airport, New South Wales	
	Latitude: 33° 56.77' S	Longitude: 151° 10.63' E

Pilot details – Captain

Licence details:	Airline Transport Pilot (Aeroplane) Licence
Medical certificate:	Class 1, valid to October 2013
Aeronautical experience:	Approximately 19,600 hours
Experience on type - A320:	Approximately 11,900 hours
Last flight review:	August 2012

Pilot details – First officer

Licence details:	Airline Transport Pilot (Aeroplane) Licence
Medical certificate:	Class 1, valid to November 2013
Aeronautical experience:	Approximately 3,300 hours
Experience on type - A320:	Approximately 125 hours
Last flight review:	June 2013

Aircraft details

Manufacturer and model:	Airbus A320
Registration:	VH-JQG
Operator:	Jetstar Airways
Serial number:	2169
Type of operation:	Air Transport High Capacity
Damage:	Nil

Sources and submissions

Sources of information

The sources of information during the investigation included the:

- flight crew of VH-JQG
- Jetstar Airways
- aircraft flight data recorder
- Airbus.

References

Harris, D 2011. *Human Performance on the Flight Deck,* Ashgate, Surrey, England.

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the 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 of VH-JQG, Jetstar Airways and the Civil Aviation Safety Authority. Any submissions from those parties will be reviewed and where considered appropriate, the text of the draft report will be 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.

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Investigation

ATSB Transport Safety Report
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