Australian Government
Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT
Aviation Occurrence Investigation 200601453
Final

Rejected takeoff, Brisbane Airport, Qld
19 March 2006
VH-QPB
Airbus A330-303

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Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office location: 15 Mort Street, Canberra City, Australian Capital Territory
Telephone: 1800 621 372; from overseas + 61 2 6274 6440
Accident and serious incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6247 3117; from overseas + 61 2 6247 3117
E-mail: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

ISBN and formal report title: see 'Document retrieval information' on page iii.

DOCUMENT RETRIEVAL INFORMATION

Report No.	Publication date	No. of pages	ISBN
200601453	5 February 2008	20	978-1-921165-77-1

Publication title

Rejected takeoff - Brisbane Airport, Qld - 19 March 2006 - VN-QPB, Airbus A330-303

Prepared by

Australian Transport Safety Bureau
PO Box 967, Civic Square ACT 2608 Australia
www.atsb.gov.au

Reference No.

Feb2008/Infrastructure 8017

Acknowledgements

Figure 1. Jeppesen Sanderson, Inc.
Figure 2. Airbus S.A.S

Abstract

At 1350 Eastern Standard Time on 19 March 2006, an Airbus A330-303 aircraft, registered VH-QPB, commenced takeoff on runway 19 at Brisbane Airport, Qld, on a scheduled passenger service to Singapore. The pilot in command (PIC) was the pilot not flying (PNF) and the copilot was the pilot flying (PF) for the sector. Visual meteorological conditions prevailed at Brisbane.

During the take-off roll, the flight crew noticed a significant discrepancy between the PF and PNF's airspeed indications and the PIC assumed control of the aircraft and rejected the takeoff. The PIC elected to not use reverse thrust and attempted to manually disconnect the autobrakes via brake pedal deflection during the rejected takeoff.

Shortly after vacating the runway, the flight crew noted increased brake temperatures and selected the brake cooling fans ON. During the taxi, the brake temperatures continued to rise and became excessive. The fusible plugs on six of the eight main landing gear wheels melted and the respective tyres deflated. There were no injuries to the crew or passengers.

A post-flight engineering inspection of the aircraft found what appeared to be wasp-related debris in the PIC's pitot probe and the operator determined that the contamination was a probable contributory factor in the incident.

The operator and airport owner undertook a number of safety actions to minimise the risk of future wasp activity at Brisbane Airport.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal Bureau within the Australian Government Department of Infrastructure, Transport, Regional Development and Local Government. ATSB investigations are independent of regulatory, operator or other external bodies.

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.

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The object of a safety investigation is to enhance safety. To reduce safety-related risk, ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not the object of an investigation to determine blame or liability. However, 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 proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.

About ATSB investigation reports: How investigation reports are organised and definitions of terms used in ATSB reports, such as safety factor, contributing safety factor and safety issue, are provided on the ATSB web site www.atsb.gov.au.

ABBREVIATIONS

ADR	Air Data Reference
BSCU	Braking and Steering Control Unit
ECAM	Electronic Centralised Aircraft Monitoring
EST	Eastern Standard Time
E/WD	Engine Warning Display
FCOM	Flight Crew Operations Manual
FCTM	Flight Crew Training Manual
GSE	Ground Support Equipment
IAS	Indicated Airspeed
P/BSW	Push button selector switch
PF	Pilot flying
PIC	Pilot in command
PNF	Pilot not flying
RTO	Rejected takeoff
SD	System/Status Display
SOP	Standard Operating Procedure
UTC	Coordinated Universal Time

FACTUAL INFORMATION

Reported information

The information presented below, including any analysis of that information, was prepared principally from information supplied to the Bureau.

Sequence of events

On 19 March 2006, an Airbus A330-303 (A330) aircraft, registered VH-QPB, was positioned at Brisbane Airport, Qld for a scheduled passenger service from Brisbane to Singapore. A 55-minute turn around was planned and the aircraft was parked at gate 82 of the International Terminal.

Following pushback, the aircraft was cleared to taxi for departure from runway 19, which required an extended taxi from the international apron to the runway threshold (Figure 1). The brake temperatures were within specified limits prior to takeoff.[1]

The flight crew commenced the take-off roll from runway 19 at 1350 Eastern Standard Time[2]. The pilot in command (PIC) was the pilot not flying (PNF) and the copilot was the pilot flying (PF) for the sector.

During the take-off roll, the flight crew noticed a significant discrepancy between the PF and PNF's airspeed indications. In particular, the PNF's airspeed indication was 70 kts while the PF's airspeed indication was 110 kts.[3] In response, the PIC assumed control of the aircraft and rejected the takeoff. The aircraft's ground spoilers extended normally and the PIC elected to not use reverse thrust. The recorded data indicated that the power levers were retarded to flight idle at 116 kts groundspeed. The data also indicated that the maximum groundspeed during the event was 122 kts.

During the rejected takeoff[4] (RTO), the PIC was satisfied that sufficient runway length remained for the application of a more gradual braking rate. The PIC initially attempted to manually disconnect the autobrakes via brake pedal deflection but that attempt was not successful. The PIC then elected to press the autobrake 'Max-push

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1 The indicated brake temperatures immediately prior to takeoff were approximately 100°C. The Flight Crew Operations Manual (FCOM) limits the indicated brake temperature for the commencement of takeoff to 300°C. That ensures that any hydraulic fluid that may come into contact with the brake units will not be ignited in the wheelwell after the retraction of the landing gear after takeoff.

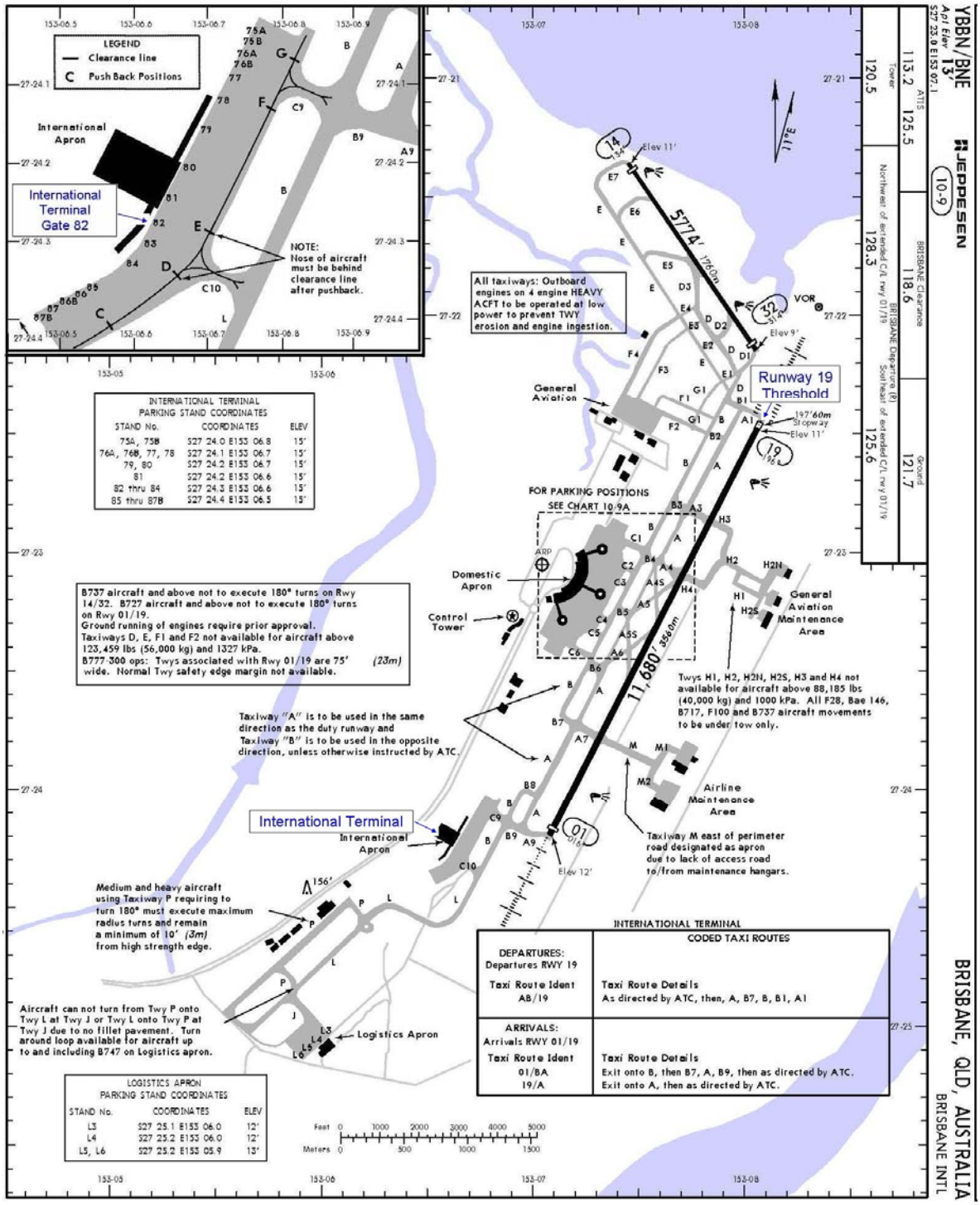
2 The 24-hour clock is used in this report to describe the time of day, Eastern Standard Time (EST), as particular events occurred. Eastern Standard Time was Coordinated Universal Time (UTC) + 10 hours.

3 One of the normal procedures during takeoff is for the PNF to announce when the indicated airspeed is '100 KT', to which the PF replies 'CHECKED'.

4 A takeoff that is aborted between brakes-release and the relevant decision point. Also referred to as an acceleration stop.

button selector switch' (P/BSW) to disconnect the autobrakes. By that time, the aircraft's speed had reduced to approximately 20 kts. The time interval between the RTO and the deactivation of the autobrake was about 20 seconds.

Figure 1: Brisbane International Airport



Shortly after the aircraft vacated the runway, the flight crew noted that the indicated brake temperature had increased to 300°C and selected the brake cooling fans ON. The aircraft was cleared for a return taxi to gate 82. During that taxi, the brake

temperatures continued to rise, with temperatures of up to 685°C[5] being noted by the flight crew.

It was reported that smoke was seen coming from the main landing gear area and, as a precautionary measure, the airport rescue and fire fighting service attended. As the aircraft taxied along the apron toward the gate, six of its eight main landing gear tyres deflated. The aircraft was brought to a stop and the passengers were disembarked using portable stairs. None of the passengers or crew were injured.

A post-flight engineering inspection of the aircraft found what appeared to be wasp-related debris in the PIC's pitot probe[6]. In addition, the fusible tyre plugs on wheel numbers 3, 4, 5, 6, 7 and 8 had melted, deflating those wheels' tyres.

Aircraft systems information

The aircraft had a current maintenance release and there were no known maintenance deficiencies prior to the takeoff.

Electronic Centralised Aircraft Monitoring System

An Electronic Centralised Aircraft Monitoring System (ECAM) was located on the centre instrument panel (Figure 2) and provided the flight crew with information about the status of the aircraft's systems. That information was presented on two displays. The upper display presented engine/warning (E/WD) information and the lower display presented system/status (SD) information.

The E/WD displayed primary engine indications, fuel quantity, flaps and slats positions, warnings, cautions, alerts and memos. The SD displayed synoptic diagrams of aircraft systems, status messages, and permanent flight data. When a system warning was triggered, the SD automatically displayed the relevant system page.

5 Due to heat shielding and variable ambient conditions, that equated to an actual brake temperature in excess of 800°C.

6 Also termed pitot tube in other aircraft types.

Figure 2: ECAM system layout

No ECAM warnings/cautions were reported by the flight crew to have activated during the takeoff.

Pitot probe

A pitot probe is an open-ended tube attached to the nose area of an aircraft, facing forwards into the airflow. The pitot/static system is an instrumentation system that is fed by a combination of pitot pressure and local static pressure, the difference of which is used to calculate an aircraft's airspeed. That information is presented to the pilot on an airspeed indicator in the form of a digital speed tape and/or an analogue gauge, measured in knots.

The operator primarily operated a mixed fleet of Boeing Co 747 (B747) and 767 (B767) and Airbus A330-type aircraft for international operations. The pitot probes' dimensions on those aircraft varied as follows:

- The A330 pitot probe opening was 7.6 mm and remained relatively symmetrical along its length. The length of the A330 pitot probe from its opening to the electronic sensor was shorter than in the B747/B767.
- The B747/B767 pitot probe opening was 6.8 mm and narrowed to 5 mm.

Brake system

The Braking and Steering Control Unit (BSCU) is a digital, dual-channel computer in the A330 that controls and monitors normal braking, anti-skid, autobrakes, nose wheel steering command processing, and brake temperature signal processing.

The aircraft's braking system included normal and alternate braking systems.

Whereas the normal system provided anti-skid protection and the autobrake function, the alternate system did not provide autobraking. However, anti-skid protection was available from the alternate system under certain conditions. Braking commands originated from the brake pedals or from the autobrake system.

The autobrake function had LO, MED, and MAX P/BSWs, which were used to select the desired deceleration rate and delay time. The MAX program provided the maximum braking available without delay.

Automatic braking was activated by the ground spoiler extension command. In addition, for MAX mode, the 'nose landing gear compressed' signal was required. The operator's Flight Crew Training Manual (FCTM) noted that, in the event of an RTO at less than 72 kts, the spoilers would not deploy, and that the automatic braking would not function.

The selected autobrake program was cancelled if:

- the selected autobrake was pressed again (OFF)
- another autobrake P/BSW was selected (ON)
- the brake pedal(s) were depressed to a position greater than specified values, or when the aircraft had come to a stop at the completion of an RTO
- the parking brake was set
- the spoilers were retracted.

After landing during normal operations, flight crews routinely disconnected the autobrakes before the aircraft reached 20 kts. The primary technique used to disconnect the autobrakes after landing was via brake pedal deflection. The amount of pedal deflection required to disconnect the autobrakes at the MAX setting was approximately two and one half times that required for disconnecting the autobrakes at the LO setting.

Brake temperatures and tyre deflation

Brake temperature indications were presented to the flight crew on the ECAM display's 'wheel' page.

The main landing gear tyres were fitted with fusible plugs[7] that prevented the tyres from bursting during an overheat situation. The fusible plugs were designed to melt when the maximum temperature of the respective tyre reached 206°C. Due to heat shielding and variable ambient conditions, that could equate to an actual brake temperature of up to 800°C.

Reverse thrust

Reverse thrust was obtained by deploying the engines' pneumatically-actuated translating cowls rearward to deflect each engine's fan air stream forward. The re-directed engine thrust acted to assist the deceleration of the aircraft.

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7 Fitted to the aircraft's main landing wheels. If a wheel's temperature rose to a dangerous value (at which a tyre could burst) after excessive braking, the affected tyre's fusible plug melted and released pressure in a controlled manner.

Ground spoilers

Ground spoilers assist in the deceleration of an aircraft during an RTO or during the landing roll by increasing the aerodynamic drag affecting the aircraft, and reducing the lift created by the aircraft's wings.

The A330 had six hydraulically-operated ground spoiler panels on each wing, which also acted as speed brakes. The ground spoilers were armed by the pilot pulling the speed brake control lever to the ARMED position. The conditions for the automatic deployment of the ground spoilers during an RTO included that:

- the speed brake control was armed; and
- the aircraft's wheel speed was greater than 72 kts and both thrust levers were selected to IDLE; or
- reverse thrust was selected on at least one engine with, if reverse thrust was only selected on one engine, the other engine at IDLE.

Operational information

The reported weather at Brisbane Airport included a surface wind velocity of 110 degrees true at 8 kts, that the visibility was 10 km with few[8] clouds, a temperature of 28°C, and a QNH of 1017.

Runway 19 at Brisbane was 45 m wide and had a usable take-off length of 3,560 m.

Tests and research

The insect-related debris found in the PIC's pitot probe was recovered by the operator for examination by a forensic entomologist. Although the insect group to which that specimen belonged could not be determined with absolute certainty, the remains were found by the examining entomologist to probably be that of a wasp.

Organisational and management information

Operator

The operator provided its operations personnel with an Operations Manual, in compliance with CAR 215. The A330 operating techniques, instructions, standard operating procedures (SOP) and limitations in the operations manual that affected the conduct of an RTO included that:

- the RTO decision, including if there was an IAS differential between the pilots' airspeed indicators of greater than a particular value,[9] and its execution, was to be made by the aircraft captain[10]

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8 Few meaning 1 to 2 oktas. An okta is the unit of measurement that is used to report the total sky area that is visible to the celestial horizon. One okta is equal to 1/8th of that visible sky area.

9 At 100 kts IAS, the PNF makes a 100 kts call to cross check that pilot's indicated airspeed against the PF's airspeed indicator.

- although not critical, and designed to assist in the decision-making process, when below 100 kts, a captain should seriously consider discontinuing the takeoff in response to any ECAM warnings/cautions
- between 100 kts and V_1[11,12] the captain should be 'Go-minded' if unaffected by the main failures that were listed in the manual (eg. fire warning or severe damage; sudden loss of engine thrust; malfunctions or conditions that give unambiguous indications that the aircraft will not fly safely; and so on)
- if the aircraft's braking response seemed inappropriate for the runway condition, full manual braking should be applied and maintained
- if an RTO was initiated and MAX autobrake decelerated the aircraft, the captain was to avoid pressing the brake pedals
- the potential for flight crews to disarm the autobrake by instinctively applying manual braking was highlighted as a common error
- the primary technique in normal operations for brake disconnection was by brake pedal deflection
- MAX autobrake was to be selected before takeoff
- during an RTO, the minimum stopping distance was achieved by bringing the aircraft to a complete stop before releasing the brake pedals
- the captain's RTO procedure was to include calling STOP, and to simultaneously move the thrust levers to IDLE and select MAX AVAIL reverse thrust. The Abnormal and Emergency Operating Techniques noted that full reverse thrust could be used until coming to a complete stop. Alternately, if there was sufficient runway available at the end of the initial deceleration, it was preferable to reduce reverse thrust when passing through 70 kts. That contrasted with the requirements of the operator's A330 Power Plant Operating Limitations, which stated that reverse thrust should not be used below 70 kts, but that IDLE reverse thrust was allowed until the aircraft stopped.

The operator's A330 type endorsement training and recurrent simulator training provided flight crews with exposure to high speed RTOs (approaching V_1). Flight crews did not receive simulator training for RTOs in the low-to-intermediate speed range.

Operator's maintenance procedures

The operator's A330 aircraft maintenance manual contained advice on the fitment of the pitot probe covers as part of the aircraft arrival routine and stated that staff should:

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10 The operator's documentation referred to the PIC as Captain.

11 The internationally accepted standard definition of V_1 is the Airspeed Indicator reading that defines a decision point during a takeoff at which, should a critical engine fail, a pilot can elect to abandon or continue the takeoff.

12 In this instance, V_1 was defined by the operator as the airspeed by which stopping action must have commenced.

> Install pitot probe covers as necessary if the ground time exceeds 12 hours, or less at the discretion of the certifying engineer.

The advice for the removal of the pitot probe covers, as part of the engineer's walk around inspection, included that:

> This inspection would normally occur before the pilots conduct their pre-flight inspection (approximately forty five minutes prior to the scheduled departure time).

On 5 February 2006, the Brisbane duty maintenance manager distributed an email to all line maintenance staff providing an overview of the recent wasp-related problems, including an instruction to:

> Fit pitot probe covers as soon as possible and remove them as close as possible to departure.

Following receipt of that email, a survey of Brisbane line maintenance staff was conducted, in part, to ascertain the level of compliance with that instruction. The results of that survey indicated that there were different interpretations of the email. Some engineers stated that pitot probe covers should be fitted if the aircraft's turn around time[13] exceeded 3 hours, whereas other engineers commented that fitment was dependant on the level of wasp activity present on the day.

The aircraft's technical log contained entries relating to the fitment and removal of the pitot probe covers in order to ensure their removal prior to departure. The pitot probe covers were reported to not be fitted to the occurrence aircraft because the turn around time was expected to be less than 1 hour (55 minutes).

Airport owner

The airport owner engaged a pest control contractor to inspect the international apron for wasp activity. The heaviest concentration of wasp activity was found amongst the operator's ground service equipment (GSE), which included:

- in the fuel bowser area
- in the wash bay area
- in the container racking structures area
- amongst the operator ground handling equipment.

Additional information

Previous events

Table 1 presents a summary of the airspeed–related occurrences between January and March 2006 where wasp-related activity was identified by the operator as a probable contributory factor. Those occurrences included five RTOs, all of which involved A330 aircraft. No wasp-related activity was recorded in the operator's Boeing fleet of aircraft.

13 Expected on-ground time for the affected aircraft.

Table 1: Airspeed–related A330-300 occurrences between January and March 2006 where wasp activity at Brisbane Airport was identified by the operator as the likely contributor

Date (2006)	23 January	3 February	5 February	18 March	19 March
Registration	VH-QPG	VH-QPH	VH-QPF	VH-QPE	VH-QPB
Problem	Pitot system fault during takeoff	Pitot system fault during takeoff	Pitot system fault during takeoff	Pitot system fault during takeoff	Pitot system fault during takeoff
Outcome	Rejected takeoff at Brisbane	Rejected takeoff at Brisbane	Flight continued to Singapore	Flight continued to Singapore	Rejected takeoff at Brisbane
				Rejected takeoff in Singapore	
				Second rejected takeoff in Singapore	
Turnaround Time	Standard 4/5 hours	Standard 4/5 hours	Standard 4/5 hours	Standard 4/5 hours	Non-standard 55 minutes

The flight crews of the aircraft involved in the 5 February occurrence and of the affected aircraft on 18 March 2006 continued the takeoff at Brisbane. In each case, the flight crew, once airborne, actioned an instrument switching, non-normal procedure and cleared the fault. The flights continued as planned to their destination of Singapore.

The pitot system of the aircraft that was involved in the 5 February occurrence was inspected on arrival in Singapore and no foreign matter was found. However, wasp activity was suspected by the operator as the reason for the airspeed discrepancy during the takeoff from Brisbane.

Similarly, the pitot system of the aircraft that was involved in the 18 March occurrence at Brisbane was inspected on its arrival in Singapore and no foreign matter was found. However, wasp activity was suspected as the reason for the airspeed discrepancy during the takeoff from Brisbane.

At low speed during the take-off roll on the return flight from Singapore on 18 March, the flight crew noticed an ECAM IAS caution and rejected the takeoff. An engineering inspection at Singapore found no foreign matter in the aircraft's pitot system and the aircraft was returned to service. During the subsequent takeoff, the crew again rejected the takeoff as a result of a further airspeed discrepancy. The fault was suspected by the operator's maintenance staff to be the result of a prior pitot probe contamination migrating to the aircraft's Air Data Module.

A review by the operator did not indicate any problems as a result of wasp activity at any of its other ports.

ANALYSIS

Overview

The pilot in command (PIC) rejected the takeoff in response to a significant airspeed discrepancy during the take-off roll. Reverse thrust was not selected and, on completion of the rejected takeoff (RTO), the brake temperatures were high and continued to rise. As the aircraft taxied to the parking bay at the international apron, six of the aircraft's eight main landing gear tyres deflated. There was no further damage to the aircraft.

The airspeed discrepancy was identified by the operator to have been as a result of wasp-related debris that was found in the PIC's pitot probe.

As in the case of other safety critical events, RTOs require crews to make timely decisions and to utilise correct handling techniques consistent with standard operating procedures (SOP) to ensure a successful outcome. Crew resource management, aerodrome configuration, and environmental conditions are also important considerations.

Flight operations

The PIC's decision to reject the takeoff in response to the airspeed discrepancy was consistent with the operator's SOPs. The execution of the RTO is examined in the following discussion.

During the take-off roll, the copilot's (pilot flying (PF)) airspeed indication would have indicated 100 kts before the pilot in command's (pilot not flying (PNF)) airspeed indicator read 70 kts. Moreover, the PNF's airspeed indicator never reached 100 kts. The result was that, in accordance with the operator's SOPs, the PNF did not initiate the 100 kts airspeed check. The absence of a 100 kt call by the PNF as the PF's indicated airspeed passed through 100 kts, and continued to increase beyond 110 kts, alerted the PF that there was a problem. The PIC subsequently intervened and rejected the takeoff.

In the absence during the takeoff of any of the operator's defined main aircraft failures, the discretionary nature of the 100 kts decision-making guidance was operative. Given the uncertainty of whose airspeed indication was accurate, and given the authority of the PIC to decide if an RTO was necessary, it was reasonable for the PIC to make the decision based on his instrumentation, and to have rejected the takeoff.

The PIC's decision to disconnect the autobrakes, and to not bring the aircraft to a complete stop via that capability, was not consistent with the operator's SOPs governing the use of autobrakes during an RTO. In any event, the PIC's initial attempt to disconnect the autobrakes appeared to have been unsuccessful because of insufficient brake pedal deflection. That may have been a result of the PIC's workload at that time, and/or unfamiliarity with the amount of pedal deflection required. Ultimately, the PIC successfully disconnected the autobrakes at approximately 20 kts via the autobrake push button selector switch.

It appeared that the PIC might have been attempting to apply manual braking to disconnect the autobrakes, with the intent of minimising the risk of excessive brake temperatures developing. Given the surplus runway available and the dry environmental conditions, the PIC might have considered that there was no operational reason for the application of MAX autobrake, for full manual braking or for the use of maximum available reverse thrust. Given the absence of RTO training in the low-to-intermediate speed range, and the relatively benign conditions during the takeoff, the flight crew may have reasonably thought that the RTO SOP was more applicable to high speed or critical RTO situations and was not appropriate in this case. Nonetheless, from a safety perspective, the SOPs required the setting of MAX autobrake and the use of maximum available reverse thrust.

The conflicting information in the operations manual in regard to the possible use of maximum reverse thrust below 70 kts had the potential to confuse flight crews about its use. In any event, had the crew employed reverse thrust at all during the RTO, the reduced energy imparted to the brakes during the deceleration would have lessened the risk of excessive brake temperatures.

The deflation of six of the aircraft's eight main landing gear tyres was consistent with the anticipated actual brakes temperature normally associated with the indicated brakes temperature that was noted by the flight crew.

Wasp Control

The wasp control measures that were introduced by the airport owner and aircraft operator at Brisbane Airport appeared to have initially been ineffective and slow in regaining control of the wasp infestation. In addition, it appeared that the wasps were more suited to inhabiting the A330 pitot probe, even when aircraft turn around times were less than 1 hour.

The operator's engineering department recognised additional control measures were required. However, the amended procedure that was circulated to the engineering staff at Brisbane regarding the fitment of pitot probe covers was interpreted in different ways by a number of staff, and did not effectively reduce the risk of wasps inhabiting the pitot probes.

The operator's subsequent enhanced pest eradication program was eventually successful in controlling the wasp activity (see Safety Actions below).

FINDINGS

From the evidence available, the following findings are made with respect to the rejected takeoff (RTO) involving Airbus A330-303, registration VH-QPB, that occurred at Brisbane Airport, Qld on 19 March 2006. They should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing safety factors

- Wasp-related debris contaminated the pilot in command's pitot probe, leading to an airspeed discrepancy during takeoff. In response, the flight crew rejected the takeoff.
- The operator's and airport owner's initial wasp eradication programs did not prevent wasp infestation of the aircraft's pitot probe.

Other safety factors

- The crew's RTO technique may have contributed to the development of excessive brake temperatures, and resulted in the deflation of six of the aircraft's eight main landing gear tyres.
- The operator's procedures relating to the fitment of pitot probe covers did not adequately protect its A330 aircraft from wasp activity at Brisbane Airport.
- Brisbane Airport's international apron was subject to substantial wasp activity.
- The design of the A330's symmetrical pitot probe was susceptible to wasp activity.
- The flight crew did not adhere to the operator's RTO standard operating procedures.
- There was inconsistent information in the operator's A330 documentation suite regarding the use of maximum reverse thrust.
- The operator's flight crews did not receive simulator training for RTOs in the low-to-intermediate speed range.

Other key finding

- The action of the fusible plugs to deflate six of the eight main landing gear tyres was consistent with their specification.

SAFETY ACTIONS

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.

Depending on the level of risk of the safety issue, the extent of corrective action taken by the relevant organisation, or the desirability of directing a broad safety message to the aviation industry, the ATSB may issue safety recommendations or safety advisory notices as part of the final report.

Aircraft operator

On 5 February 2006, prior to this incident, following a third airspeed–related occurrence involving an A330 where wasp activity was suspected, the operator's engineering department initiated the following actions:

- A property fault report was raised requesting urgent action be taken to remove mud wasp infestations on the operator's ground support equipment (GSE) that was located at the Brisbane Airport international apron. In response to that fault report, a contractor was employed to inspect and spray the operator's portable equipment. During the process, a wasp nest was found and removed from one set of portable stairs.
- An arrangement was put in place for the quarterly inspection and spraying of all ground equipment.
- An email was distributed to all line maintenance staff at Brisbane that included an overview of the wasp-related problems, and an instruction to fit pitot probe covers as soon as possible after an aircraft's arrival, with their subsequent removal as close as possible to the aircraft's departure.
- As a precautionary measure, the operator inspected all pitot lines throughout its A330 fleet. No foreign matter was found in those aircraft's lines.[14]

In May 2006, the operator assumed responsibility for the ongoing wasp inspection/eradication program in their GSE area. The following schedule was established:

- weekly inspections/eradication took place until the end of June 2006
- monthly inspections/eradications were invoked from July to September 2006 (the period of least expected wasp activity)
- a weekly program was to be reinstated from 1 October 2006 (the perceived time of greatest wasp activity).

In addition, the operator promulgated information to flight crews in order to alert them of the potential hazards of wasp activity at Brisbane Airport.

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14 The operator's A330-200 series aircraft did not operate from the Brisbane Airport international apron.

In October 2006, the operator implemented a formal Local Area Procedure at Brisbane, which provided more detailed guidance than the maintenance instruction manual for the fitment of pitot probe covers to A330 aircraft as follows:

- when aircraft ground time exceeded 2 hours, pitot covers were to be fitted and a Technical Log item raised to reflect their fitment
- when the aircraft were on the ground for less than 2 hours, and at the discretion of the certifying Licensed Aircraft Maintenance Engineer (LAME), pitot probe covers were to be fitted and a Technical Log item raised as necessary to reflect their fitment
- if wasp activity increased during the summer months, the less than 2 hour option should be adopted.

Finally, the operator also planned to introduce low-to-intermediate speed range rejected takeoffs (RTOs) to the company's recurrent simulator training program.

Airport owner

The airport owner engaged a pest control contractor to inspect for and eradicate wasps in the vicinity of the Brisbane Airport international apron. Approximately 25 to 30 wasp nests were removed during April 2006, with the heaviest concentration of wasp activity located in the southern GSE area.

After that initial inspection, a weekly program of inspection/eradication was implemented. The airport owner's pest control contractor reported reducing the number of wasp nests on the terminal buildings and aerobridges during April 2006. The airport owner has continued their wasp inspection/eradication program on a weekly basis with the aim of reducing to a monthly schedule, depending on wasp activity.