QUEENSLAND COURTS

# OFFICE OF THE STATE CORONER

# FINDING OF INQUEST

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| CITATION: | **Inquest into the deaths of**<br>Alan Bernie DUCKETT<br>Bruce William JOHNSON<br>Allen John HUGHES<br>Katharine Anne THOMPSON |
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| FINDINGS OF: | Mr Michael Barnes, State Coroner |
| CATCHWORDS: | CORONERS: Inquest, aircraft crash, CASA staff training, automatic recording of engine parameters. |

REPRESENTATION:

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|---|---|
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| Mr Bruce Tindall: | Mr Scott Lynch<br>(i/b Bernays Lawyers) |
| Johnson Family | Mr Peter Mylne<br>(i/b Davidson and Sullivan) |
| Pratt & Whitney Canada Aust Pty Ltd & Mr David Marais: | Mr Sean Cooper<br>(i/b Allens Arthur Robinson) |

# Findings of the inquest into the deaths of Alan Bernie Duckett, Allen John Hughes, Bruce William Johnson and Katharine Anne Thompson

## Table of contents

The *Coroners Act 1958* provides in s43(1) that after considering all of the evidence given before a coroner at an inquest the coroner shall give his or her findings in open court. What follows are my findings in the inquest held into the deaths of Alan Bernie Duckett, Allen John Hughes, Bruce William Johnson and Katharine Anne Thompson.

# Introduction

At about 8.36am on 27 November 2001, a Beech Aircraft Corporation King Air C90 aircraft took off from runway 29 at Toowoomba aerodrome for a flight to Goondiwindi. On board were the pilot, Mr Bruce William Johnson, and three Queensland Health employees, Mr Alan Bernie Duckett, Dr Katharine Anne Thompson and Dr Allen John Hughes. The aircraft remained airborne for only about 20 seconds before it lost altitude, struck powerlines, and crashed about 560 metres from the end of the runway. An intense fuel-fed fire erupted immediately. The aircraft was destroyed by the force of impact and the post-impact fire. All those on board died almost instantly.

These findings seek to explain how the crash occurred, whether it could have been prevented and consider whether any changes to maintenance procedures or safety regulations would reduce the likelihood of similar incidents in future.

# The Coroner's jurisdiction

Before turning to the evidence, I will say something about the nature of the coronial jurisdiction.

## *The basis of the jurisdiction*

Although the inquest commenced in 2005, as the deaths being investigated occurred before 1 December 2003, the date on which the *Coroners Act 2003* was proclaimed, they were each a "*pre-commencement death*" within the terms of s100 of that Act and the provisions of the *Coroners Act 1958* (the Act) are therefore preserved in relation to them.

Because the police to whom the incident was reported considered the resulting death of each of those on board the aircraft to be "*a violent or unnatural death"* within the terms of s7(1)(a)(i) of the Act, they were obliged by s12(1) to report the deaths to a coroner. Section 7(1) confers jurisdiction on a coroner to investigate such deaths and s7B authorises the holding of an inquest into them.

## *The scope of the Coroner's inquiry and findings*

A coroner has jurisdiction to inquire into the cause and the circumstances of a reportable death.

The Act, in s24, provides that where an inquest is held, it shall be for the purpose of establishing as far as practicable:-

- the fact that a person has died,
- the identity of the deceased,

- when, where and how the death occurred, and
- whether anyone should be charged with a criminal offence alleging he/she caused the death.

After considering all of the evidence presented at the inquest, findings must be given in relation to each of those matters to the extent that they are able to be proved.

An inquest is not a trial between opposing parties but an inquiry into the death. In a leading English case it was described in this way:-

> *It is an inquisitorial process, a process of investigation quite unlike a criminal trial where the prosecutor accuses and the accused defends… The function of an inquest is to seek out and record as many of the facts concerning the death as the public interest requires.* [1]

The focus is on discovering what happened, not on ascribing guilt, attributing blame or apportioning liability. The purpose is to inform the family and the public of how the death occurred with a view to reducing the likelihood of similar deaths. As a result, the Act authorises a coroner to make preventive recommendations[2], referred to as "*riders*" but prohibits findings being framed in a way that appears to determine questions of civil liability or suggests a person is guilty of any criminal offence.[3]

In *Queensland Fire and Rescue Authority v Hall* [1998] 2 QdR 162, Lee J observed in relation to s 7 of the Act:

> *"It may be noted that s. 7 first refers to 'the cause of the death' itself as the ultimate focus of the inquiry, i.e., the death, but there is the added requirement of '… and the circumstances of the death'. The death is the actual event and the cause of it is the process of happening which brought the death about and is the cause of it, whereas 'the circumstances' obviously covers a much wider area of inquiry as the word itself conveys and as the various sections of the Act referred to indicate. Circumstance means 'time, place, manner, cause, occasion, etc, surroundings, of an act or event;': Concise Oxford Dictionary."*

In *Atkinson v Morrow & Anor* [2005] QSC 92, Mullins J noted at [27]:

> *"Section 43(5) of the Act permits the coroner to express an opinion in a rider which is designed to prevent the recurrence of similar occurrences. Subject to the power to add a rider, s 43(5) of the Act prohibits the coroner from expressing an opinion on any matter outside the scope of the inquest. Section 43(5A) of the Act expressly states that a rider shall not be or be deemed to be part of the coroner's finding, but it may be recorded if the coroner thinks fit. The recognition that the coroner may express an opinion in a rider which is not part of the findings does not enlarge the scope of the inquest."*

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[1] *R v South London Coroner; ex parte Thompson* (1982) 126 S.J. 625
[2] s43(5)
[3] s43(6)

In the same case, at [26], Mullins J said:

> *"The coroner is specifically required under s 43(2) of the Act when publishing the findings of the inquest concerning the death of a person to commit for trial any person to be charged with any of the offences set out in s 24(1)(d) of the Act. Apart from the specific jurisdiction given to a coroner to commit for trial, s 43(6) of the Act prohibits the coroner from framing a finding in such a way as to appear to determine any question of civil liability or as to suggest that any particular person is found guilty of any indictable or simple offence. This prohibition makes it clear that the fact finding inquiry of the coroner should not be used for any ancillary purpose for which the coroner has no jurisdiction. The prohibition does not preclude the coroner from exploring facts for the purpose of making the findings required under s 43(2) of the Act which may also incidentally have a bearing on civil or criminal liability: see Jamieson[4] at 24."*

## *The admissibility of evidence and the standard of proof*

Proceedings in a coroner's court are not bound by the rules of evidence because s34 of the Act provides that "*the coroner may admit any evidence the coroner thinks fit"* provided the coroner considers it necessary to establish any of the matters within the scope of the inquest.

This flexibility has been explained as a consequence of an inquest being a fact-finding exercise rather than a means of apportioning guilt: an inquiry rather than a trial.[5]

A coroner should apply the civil standard of proof, namely the balance of probabilities, but the approach referred to as the *Briginshaw* sliding scale is applicable.[6] This means that the more significant the issue to be determined, the more serious an allegation or the more inherently unlikely an occurrence, the clearer and more persuasive the evidence needed for the trier of fact to be sufficiently satisfied that it has been proven to the civil standard.[7]

It is also clear that a coroner is obliged to comply with the rules of natural justice and to act judicially.[8] This means that no findings adverse to the interests of any party may be made without that party first being given a right to be heard in opposition to that finding. As *Annetts v McCann*[9] makes clear that includes being given an opportunity to make submissions against findings that might be damaging to the reputation of any individual or organisation.

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[4] *R v Coroner for North Humberside and Scunthorpe, Ex parte Jamieson* [1995] QB 1
[5] *R v South London Coroner; ex parte Thompson* per Lord Lane CJ, (1982) 126 S.J. 625
[6] *Anderson v Blashki* [1993] 2 VR 89 at 96 per Gobbo J
[7] Briginshaw v Briginshaw (1938) 60 CLR 336 at 361 per Sir Owen Dixon J
[8] *Harmsworth v State Coroner* [1989] VR 989 at 994 and see a useful discussion of the issue in Freckelton I., "Inquest Law" in *The inquest handbook*, Selby H., Federation Press, 1998 at 13
[9] (1990) 65 ALJR 167 at 168

# The investigation

There were numerus people in the vicinity of the accident site and police and emergency services were immediately called. The attempts made to rescue the occupants of the aircraft are detailed later in these findings.

## *Police investigation*

At approximately 8.45am Senior Constable Shayler of the Toowoomba District Traffic Branch and a member of the Toowoomba Accident Investigation Squad, who were performing mobile traffic duties at the time, were directed to attend the scene. When they arrived shortly after 9.00am, other police and two fire units from the Queensland Fire and Rescue were attempting to douse the flames coming from the wreckage and also to stop the flames from igniting gas cylinders at a nearby business. Senior Constable Shayler observed there to be no sign of life in the plane wreckage and in view of the extent of the fire, correctly surmised that the pilot and any passengers were deceased.

The police investigation included the interviewing of various witnesses who saw the aircraft before take off and who heard and/or saw it crash. They arranged for the bodies of the victims to be taken to the mortuary and notified next of kin of the deaths. The police officers did not attempt to undertake an investigation of the factors that led to the aircraft crashing as they did not have the requisite expertise and they were aware that the accident would be investigated by a specialist body, the Australian Transport Safety Bureau (the ATSB). Officers from the Disaster Victim Identification Squad gathered evidence to allow me to make findings as to the identity of the deceased.

## *Australian Transport Safety Bureau investigation*

The causes of the accident were investigated by the ATSB in accordance with Part 2A of the *Air Navigation Act* 1920 (Cth). The nature and scope of that investigation is explained by Section 19CA of the Act which sets out the object of Division 3:

> ***Division 3 – Investigation of accidents, serious incidents, incidents and safety deficiencies***
> ***19CA Object of Division***
> *The object of this Division is, by the establishment of a system of investigation for determining the circumstances surrounding any accident, serious incident, incident and safety deficiency, to prevent the occurrence of other accidents, serious incidents, incidents and deficiencies. It is not part of this Division:*
> *(a) to provide the means of apportioning blame for the occurrence of an accident, serious incident, incident or safety deficiency; or*
> *(b) to provide the means of determining the liability of any person in respect of an accident, serious incident, incident or safety deficiencies.*

The aircraft crash was an "*accident*" within the meaning of the term as it is used in Part 2A, as defined in Section 19AA.

The current legislation providing for aircraft accident investigations is the *Transport Safety Investigation Act* 2003 (Cth) which commenced on 1 July

2003. Part 2A of the *Air Navigation Act* 1920 (Cth) was repealed as from that date by Section 3 and Schedule 1 of the *Transport Safety Investigation (Consequential Amendment) Act* 2003 (Cth) (No. 19 of 2003), but Schedule 1 provides that "that Part continues to apply in relation to any investigation commenced under that Part before the repeal (including an investigation that had been completed)".

The Bureau produced a final report into the investigation, Aviation Safety Investigation 200105618, dated June 2004, which was released under the provisions of Section 19CU of Part 2A of the Air Navigation Act 1920 (Cth). As part of its investigation the ATSB consulted the Canadian Transport Safety Board and the manufacturer of the aircraft's engines, Pratt & Whitney, Canada Ltd. Extensive technical analysis and input from metallurgists, flight operations experts, power plant experts and human factors specialists informed the report.

## The inquest

A directions hearing was held on 19 June 2005. Mr Hamlyn-Harris was appointed counsel assisting and leave to appear was granted to the family of the pilot of the aircraft, the ATSB, CASA, Pratt & Witney Canada, the operator of the aircraft, Eastland Air, and the maintenance controller at the relevant time.

The inquest commenced on 26 September 2005 and proceeded for three days before being adjourned until 21 November when evidence was heard for a further three days at which time, as a result of considering opinions expressed by a CASA witness, the ATSB determined that further investigation into the cause of the apparent engine failure on the aircraft was necessary. The inquest therefore adjourned to allow this to happen. Unfortunately, the production of that further investigation material took considerably longer than had been expected: the supplementary report was not published until August 2006. As a result the inquest did not resume until 27 November 2006 when a further five days of evidence was heard. In total there were 11 sitting days during which 13 witnesses gave evidence and 187 exhibits were tendered.

It was then necessary to await the production of transcript and the exchange of submissions. As a result of the drawn out investigation and inquest proceedings, these findings are being delivered over five years after the deaths occurred. That is an unacceptable delay and it behoves all of those involved in the relevant processes, including this court, to reflect upon the factors that contributed to it.

## The evidence

I turn now to the evidence. I can not, of course, even summarise all of the information contained in the exhibits and transcript and in view of the extensive material contained in the two ATSB public reports there would be little point in attempting to do so. However I consider it appropriate to record in these reasons the evidence I believe is necessary to understand the findings I have made.

## *The occupants of the incident aircraft*

Bruce William Johnson was the pilot of the plane. He had held a commercial pilot's license since 1994 and he had worked continuously in general aviation and flight training since that time. He had flown a total of 3,840 hours at the time of the crash.

Mr Johnson commenced with the operator of the flight, Eastland Air, in August 2000. Soon after, he gained his first endorsement on a turbine engine aircraft and by 27 November 2001 he had flown 479.8 hours on the type of aircraft involved in the crash. Most of his recent flying had been in that aircraft. Mr Johnson was known to be fit and healthy. There is no basis to conclude that any ill- health contributed to the crash.

Also on board the aircraft were three Queensland Health employees, Alan Bernie Duckett, Katharine Thompson and Allen John Hughes who were going to Goondiwindi to service a rural mental health clinic as part of the Toowoomba Outreach Service. They were also to have provided some professional supervision and training to the local mental health staff in the area.

Mr Duckett had been employed as a psychologist with Toowoomba Mental Health Service since 31 January 1995.

Dr Thompson was employed as a Principal House Officer with the Toowoomba Health Service District. She commenced employment in October 2000 as an intern, and had progressed through the medical levels at this District. As an intern, Dr Thompson worked in most areas of speciality with the district, before choosing to concentrate on mental health.

Dr Hughes had been employed as a staff specialist with Toowoomba Mental Health Service since he arrived from the United Kingdom in August 2000.

The death of these relatively young and productive people has had a lasting impact on their families, friends and the communities they served. I offer my sincere condolences to those who have suffered this terrible loss.

## *The location of the crash and eye witness accounts*

At about 8:36am on 27 November 2001 the Beach Aircraft King Air registered as VH-LQH took off in a westerly direction from runway 29 at the Toowoomba aerodrome. It was a clear sunny day. There was a light breeze of about 7 knots blowing from the west.

The aerodrome is surrounded by commercial and industrial buildings many of which were occupied at the time of the incident. Consequently numerous witnesses saw the fateful flight. One of those witnesses reported hearing three noises from one of the plane's engines when it was approximately 600 meters down the runway and just before it had lifted off the ground. Another heard what he described as a "banging" noise just after the aircraft lifted off. A third witness says she saw the aircraft just clear the fence at the end of the runway.

Numerous witnesses say that after it took off the left wing of the plane dipped suddenly and severely before the pilot managed to momentarily re-establish a level flight path; the left wing then again dipped severely and the plane banked gradually to the left.

There are various estimations as to the height of the plane but none of the witnesses think that the plane gained more than 150 feet of altitude before the left bank angle increased abruptly and the plane struck power lines and cart wheeled into the ground.

Later examinations showed that crash site to be 557 meters from the end of the runway. The occupants of an industrial building just outside the aerodrome fence reported hearing what sounded like gravel being thrown on the roof just before the crash. The sounds were later established to have been made by metal fragments from the plane's engine.

When the plane hit the ground it slid some distance across a roadway before coming to rest against a chain wire fence. The wing and parts of the tail section were broken off. A fire erupted almost immediately.

Numerous people ran from the industrial sheds near the accident site and two of them unrolled a fire hose and played it on the ever increasing flames.

All of the witnesses say they saw no movement from within the cockpit.

Numerous members of the public called emergency services and fire crew and police were quickly on the scene. It took some time before the fuel fed flames were extinguished. It was immediately apparent that none of those within the plane survived the accident.

The Queensland Police Services Accident Investigation Squad attended and took statements from some of the witnesses. Their other main role was securing the scene.

Officers from the ATSB also attended and commenced the detailed investigation referred to earlier.

Officers from the Queensland Police Disaster Victim Identification Squad attended and retrieved the bodies from the plane's wreckage. The bodies were then transported to the John Tonge Centre in Brisbane where on 30 November autopsies were undertaken.

## *Investigation findings*

The pathologist who undertook the autopsy expressed a view that Mr Johnson and Dr Hughes died from multiple injuries while Dr Thompson and Mr Duckett died from smoke inhalation. In relation to these latter two victims, it is important to note that although the finding of smoke inhalation indicates that they may have survived the initial crash, they were almost certainly deeply unconscious and would not have experienced any pain after the crash.

The identity of each of the bodies was established by reference to dental records and personal effects in accordance with international disaster victim identification protocols.

An analysis of the blood of the pilot detected no alcohol or drugs.

Having regard to the descriptions of the aircraft before and at the time of impact, when considered in conjunction with the result of the investigations and examinations carried out on the engine and other wreckage by the ATSB and Pratt and Whitney, Canada Ltd, I am satisfied that the left engine of the aircraft failed or seriously malfunctioned, resulting in significant power loss during, just prior to, or at about the time, the aircraft became airborne. This engine malfunction resulted in the aircraft having insufficient power to climb away from the aerodrome; it crashed when the pilot could not control its flight path due to the loss of power from the left engine.

The ATSB investigation and the inquest focused on trying to establish why this occurred, whether it could have been anticipated and prevented and whether the pilot had responded in an appropriate manner to this loss of power. The circumstances of the crash also call into question the efficacy of CASA's discharge of its role as the aviation safety regulator.

## *Cause of engine malfunction*

The expert witnesses disagree on what was the initiating event that led to the engine failure. The initial ATSB report and the evidence of Mr Kels, a senior investigator with the Bureau with extensive experience in aeronautical engines, suggested that it was probably a result of a problem in the cold section of the engine. This view was based on the examination of fractured compressor turbine blades which indicated that they had been exposed to higher than normal operating temperatures in the period leading up to accident. This view was said to be supported by ECTM data (Engine Condition Trend Monitoring) indicating that a significant problem had been developing in the cold section of the engine in the month preceding the crash. On the first occasion that he gave evidence at the inquest Mr Kels said that a 20 degree increase in inter-turbine temperature may have affected the microstructure of the compressor turbine blades leading to their failure.

CASA's principle power plane expert, Mr Lion's was also of the view that the engine failure was precipitated by the fracture of compressor turbine blades but he rejected this suggestion that this was caused by the effect of increased inter-turbine temperature in the preceding month. He was of the view that the damage to the blades was more likely caused by a single over temperature event such as a "*hot start*" but he concluded "*we will probably never know the real cause of the blades failing."*

This dispute between the experts led to the ATSB commissioning a supplementary report which came to a very different conclusion. In that report a metallurgist retained by the agency, Dr Arjen Romeyn, wrote that he had detected "*fatigue crack growth*" in the power turbine blades which he says indicated thermal fatigue. That report postulated a problem in the hot section of the engine damaging the power turbine blades which released under load

and caused damage to the cold section, including the compressor turbine blades, which had previously been construed as the primary failure components. Mr Kels, when recalled, said he now favoured that explanation for the engine failure although he agreed that the evidence in support of it was not conclusive; he went no further than to say that this second explanation was "*reasonably convincing*."

Pratt and Whitney technical experts also undertook extensive engineering and metallurgical examinations of the failed engine and its components. Their views were contained in reports tendered in these proceedings and they were commented on and explained by the company's investigation manager, Mr Giancarlo Masciotra. Even after reviewing the ATSB's supplementary report, and re-examining the power turbine blades, Pratt and Whitney remained of the view that the engine failure was more likely due to compressor turbine blades releasing. However, while they postulated theories as to why this failure may have occurred, they considered the reasons could not be determined with any certainty.

This is a very brief of summary of the evidence on this issue. The transcript of the evidence of the experts who were called in relation to the issue occupies hundreds of pages, but after considering all of it I do not believe I can be sufficiently certain to prefer one body of opinion over the other. There is evidence supporting both theories but due to the damage done to the engine by its failure and the subsequent fire I consider I could not be satisfied to the requisite standard that one explanation should be preferred over the other. Nothing, therefore, is to be gained by reproducing that evidence here. Regrettably, I am unable to make a finding as to the initiating event that led to the loss of power from the left engine.

## *Was the crash preventable?*

The question of whether the crash was preventable, in my view requires consideration of a number of subsidiary questions, namely:-

- Did the operator have in place an adequate system of maintenance for the incident aircraft?
- Did Mr Tindall adequately discharge his responsibilities as maintenance controller?
- Did any maintenance deficiencies contribute to the subject accident?
- Was the pilot's response to the engine failure adequate?

## *ECTM*

Before seeking to answer those questions it may be helpful to briefly explain the purpose of the engine condition trend monitoring system (ECTM) that was being used on the incident aircraft as much of the evidence given during the inquest related to it.

ECTM is a process that predicts the values of certain engine operating parameters and compares them with actual values recorded during the engine's operation. A computer program is used to analyse deviations between the predicted values and the actual values to track an engine's performance and detect early signs of deterioration. It is a predictive tool that

when used with other information and maintenance practices allow an operator to undertake corrective and preventative maintenance.

Because of the ability the system gives an operator to understand changes in engine performance without dismantling the engine, operators using the ECTM system can significantly extend the time between overhauls (TBO) in some circumstances.

The operator of the incident aircraft was permitted to increase the time between major overhauls of its engine from 3,600 hours to 5,000 hours only if its continuing airworthiness was assessed by a system of maintenance that included engine condition trend monitoring. The problem engine had exceeded the number of hours since its last overhaul that would have been permissible had ECTM not been in use.

## *Did the operator have in place an adequate system of maintenance for the incident aircraft?*

The holder of the Air Operators Certificate pertaining to the aircraft, Eastland Air, was required under civil aviation regulations to have in place a proper system of maintenance. It discharged the obligation by having an approved maintenance controller to oversight the maintenance of the aircraft which was undertaken by the holder of the appropriate Certificate of Approval to conduct aircraft maintenance. However, changes to the individuals and organisations occupying these positions and discharging these roles in the months leading up to the crash may have, in my view, contributed to the crash occurring.

Some history: Mr Michael Bannister worked for Eastland Air from early in 2000 to August 2001. When he commenced, the maintenance for the fleet, including the incident aircraft, was being done by an external provider and he was appointed to the position of maintenance controller to manage the scheduling of maintenance and to check that it was carried out in accordance with the applicable regulations.

Mr Bannister had the necessary qualifications to collate and analyse the ECTM data that the pilots were instructed to collect and record. The analysis of these data assisted Mr Bannister schedule various non routine maintenance tasks. He then gave appropriate instructions to the maintenance provider.

In March 2001, the operator created its own maintenance organisation. To do this it employed a licensed aircraft maintenance engineer (LAME), a Mr Bruce Tindall, and an apprentice. CASA ratified this arrangement and issued the necessary Certificate of Approval to the organisation.

On 3 August 2001, some twelve weeks before the fatal crash, Mr Bannister resigned from the position of maintenance controller and left the company. In his letter of resignation he said;

*“I consider that I cannot administer and uphold my responsibilities under the regulations without putting the company and myself at unnecessary risk.”*

He explained in evidence that the workload of the position and the added stress of having to deal with financial pressure within the company led him to leave.

When Mr Bannister resigned, he was not replaced: instead the LAME from the operator's maintenance organisation, Mr Bruce Tindall, assumed responsibility for both roles: engineering manager within the maintenance organisation and maintenance controller within the operator company.

However, Mr Tindall was not qualified to interpret ECTM data. Consequently, an informal arrangement was entered into whereby Mr Tindall was to forward the data to Mr David Marais an employee of Pratt and Whitney based in Toowoomba on the understanding that Mr Marais would monitor and analyse the data and inform Mr Tindall of any maintenance action that it indicated was necessary. A CASA officer facilitated the brokering of this arrangement which Mr Marasi described as something that the company did not normally do and one he entered into "*reluctantly*." Pratt and Whitney did not charge Eastland Air for the service and Mr Marais said he made it clear that it would be Mr Tindall's responsibility to send the data, and that he, Mr Marais, would "*not chase them if they did not."* Indeed, there were no mechanisms in place to ensure the data was transmitted appropriately, and perhaps not surprisingly, it was not.

I accept the evidence of Mr Marais that he did not receive data for the incident aircraft after 12 September 2001 and even before that the information was not sent as regularly as the regulations stipulated. As a result there was no analysis of ECTM data for the incident aircraft for two and a half months leading up to the crash. Consequently no maintenance was carried out in response to what that data might have shown.

The failure of Mr Tindall to collate and transmit the ECTM data as arranged was a serious failure on his part. It is likely that it was caused by his minimal understanding of the critical importance of the system and his high workload.

After the incident CASA reviewed Mr Tindall's performance and issued to him a "Notice of formal counselling" which found that as a result of the pressures of his multiple roles Mr Tindall had made mistakes. The CASA officer who issued that notice, Mr Purdie, said in evidence that Mr Tindall was *"totally overworked".* I concur with this assessment and it leads me inevitably to the conclusion that Eastland Air did not have an adequate system for the maintenance of the incident aircraft in place after Mr Bannister resigned on 3 August 2001.

My conclusion in this regard is buttressed by the evidence indicating the operator's maintenance documents were inadequate in that the ATSB investigators were unable to determine when either the compressor turbine blades or the power turbine blades were installed in the left engine of the incident aircraft. This is a deficiency that makes the aircraft technically unserviceable. In the case of the compressor turbine blades, this may not have been crucial as their fitness for service is determined by regular inspection and there is no evidence that they exhibited any sign of

unacceptable wear. In the case of the power turbine blades, however, the absence of such records was more serious as those components had a stipulated time life and it could not be determined whether that life had been exceeded.

### Did any maintenance deficiencies contribute to the subject accident?

The ECTM data for the incident aircraft over the relevant period had been recorded in part and it was obtained and analysed by the ATSB as part of its investigation. Having heard evidence of various experts I am of the view that the ECTM data did demonstrate a developing problem in both engines but more particularly in the left engine. Had this information been considered as it should in the months preceding the crash, it is likely that some maintenance action would have been taken; indeed it is possible that the plane would have been grounded until the problems the ECTM data pointed to, but did not identify, had been resolved.

However, the assessment of what might have happened is complicated by the fact that it is by no means clear that the movement or trend in the ECTM parameters was generated by the same factors that caused the engine failure. In those circumstances, it can not be shown that had the engine condition trends been monitored assiduously, the crash would not have occurred, although there is a possibility that as part of the response to the ECTM deviation a deterioration of the compressor turbine blades may have been detected.

However, it is equally possible that investigation may have shown that the trend was being driven by, for example, a leak in the cabin pressurisation system. Fixing that would not have averted the engine failure. It is also pertinent that none of the maintenance responses called up by the change in the engine parameters are likely to have detected changes indicative of imminent turbine blade failure. Similarly, it can not be proven that sub-standard maintenance caused the problem to develop. For example, damage to compressor or power turbine blades could have been caused by a single over temperature event such as a “hot start” that the pilot may not have noticed and of which the maintenance personnel could not be aware unless told.

Accordingly, although I have found that there were deficiencies in the operators system of maintenance and substandard performance by a key maintenance person, I can not find that these failures contributed to the crash occurring.

### *Was the pilot’s response to the engine failure adequate?*

When assessing the performance of the pilot is important to recognise that he found himself in an extremely difficult situation because of the timing and extent of the engine malfunction.

If it only became obvious that there was a problem after the aircraft had passed the take off decision point, the pilot probably had no choice but to continue to attempt to fly away from the airstrip even if the aircraft had not

reached the speed for one engine inoperative flight because it was too late to abort the take off and the buildings at the end of the runway meant that ditching straight ahead was also not an option. The evidence in this case indicates that, in accordance with the operations manual, the pilot may have rotated at below this speed making it even more difficult to control the aircraft.

The other complicating factor was that the engine did not completely cease to operate and the pilot was placed in the invidious position of not knowing how much power he was going to be able to continue to extract from it. I accept the evidence that in those circumstances it was reasonable for the pilot to attempt to continue to fly the aircraft without immediately shutting down the left engine.

However, as the aircraft continued to struggle to gain altitude it should have become apparent that the left engine was not assisting. In those circumstances the propeller on the left engine should have been "feathered", that is adjusted so that the blades were rotated to present their smallest profile and produce the least drag. This was not done and nor did the automatic feathering system that should have been activated prior to take off cause it to happen. Similarly, by not retracting the undercarriage of the aircraft the pilot failed to take a step that may have, to some small extent, reduced the impact of the engine malfunction.

It is important to recall that the aircraft was only airborne for about 20 seconds and undoubtedly the pilot would have been devoting all his effort and attention to trying to maintain a level flight path in the hope of gaining sufficient altitude to find a place to land. All in the aircraft would have been acutely aware of the emergency that was enveloping them. In those circumstances I do not believe criticism of his performance is warranted. Further, it is most unlikely that any action of the pilot could have enabled him to gain sufficient control to fly away.

I am satisfied that the pilot's training and experience were in accordance with industry standards. For obvious reasons giving practical training to prepare pilots for engine failure so soon after take off is extremely difficult and I am satisfied that the issues are adequately discussed in pilot training and in aviation literature.

## *Did CASA adequately discharge its obligations in relation to the operator and the incident aircraft?*

I have found that the operator did not have an adequate system of maintenance and that a key maintenance person failed to adequately discharge his responsibilities. This naturally calls into question the efficacy of CASA's oversight of the operation.

I accept that it is not CASA's role to check or supervise the maintenance undertaken by an AOC holder or its maintenance organisation. Nor is it CASA's role to micro manage air operators by scrutinising their resource allocations and management performance. Its audits can not cover every aspect of an operator's documentation and systems.

However, CASA did approve the operator's internal maintenance organisation in early 2001. It is unclear on what basis CASA determined that the resources

the operator intended devoting to maintenance were adequate and there is a basis for questioning this assessment.

In August of that year CASA approved the organisation's chief engineer assuming the added role of maintenance controller for the operator. Again no objective or empirical assessment seems to have been undertaken of the workload this would result in that person having to discharge.

CASA was involved in the operator entering into an unusual and informal arrangement with Pratt and Whitney concerning the ECTM, an essential element of the program under which the operator was allowed to extend the TBO of the engines on the incident aircraft. It is salient that the scheme under which CASA approved operators extending TBO allowed them considerably more latitude and contained fewer safe guards than the equivalent scheme promulgated by the manufacturer. However CASA took no steps to ensure that it was adhered to even though its audit of the operator in August 2001 gave reason to question that the extent to which maintenance records were being updated and managed.

In those circumstances, I do not accept CASA's submission that it no basis to query whether the operator was diligently following the requirements relating to TBO extensions for the incident aircraft. I am of the view that CASA did have information that should have alerted it to the need to more thoroughly investigate Eastland Air's maintenance systems and to consider whether its key maintenance officer was so over burdened that he could not be relied on to properly discharge his dual roles. I also consider that it would have been prudent for CASA to focus on the ECTM procedures when auditing or conducting surveillance of operators who used it to extend TBO, particularly in the case of this operator as it had explicit knowledge of its limitations in this regard.

It is impossible to say that had CASA been more searching during the audit undertaken in the period 20 – 23 August 2001 that the problems that lead to the fatal crash would have been detected. Nonetheless the failure of CASA to make any further inquiries in relation to these aspects of the operator's maintenance systems and performance was, in my view, less than the public could reasonably expect of the authority.

## Findings required by s43(2)

I am required to find, so far as has been proved, who the deceased were and when, where and how they came by their deaths. As mentioned earlier, these are not criminal proceedings and I am therefore to apply the civil standard of proof when considering these issues. I am also required to consider whether any persons should be committed to stand trial in connection with having caused the death.

Having regard to all of the evidence presented to the inquest I make the following findings:-

**Identity of the deceased** – Alan Bernie Duckett

Allen John Hughes
Bruce William Johnson
Katharine Anne Thompson

**Place of death** – They all died in Toowoomba

**Date of death** – They all died on 27 November 2001

**Cause of death** – All died as a result of injuries sustained in an aircraft crash. In addition, Dr Thompson and Mr Duckett suffered severe smoke inhalation that also contributed to their deaths.

## Whether any person should be committed to stand trial

No person should be committed to stand trial on any of the charges listed in s41(1)(a) of the Act

## Riders

Pursuant to s43(5) of the Act I am authorised to make riders or recommendations designed to reduce the occurrence of similar deaths to the one investigated by this inquest.

Obviously I have no independent knowledge of matters impacting on safety in the aviation industry. I must base my recommendations on the expert reports put before me, the evidence of the witnesses who do have experience in the industry and the reports prepared by the specialist safety agencies.

I was greatly assisted in this regard by all of the aviation experts who gave evidence and whose reports were tendered in this inquest. As a result of considering that evidence I make the following recommendations.

### Recommendation 1 - Automatic recording of engine parameters

*As discussed earlier, the effectiveness of ECTM as a diagnostic tool can be negated if an over temperature event is not noted and reported by the pilot or if pilots fail to accurately record data in the correct circumstances. Apparently, there are now available systems that automatically record the relevant engine parameters so that destructive events such as a "hot start" can become known to maintenance personnel via ECTM.*

*I recommend that CASA consider rescinding the Airworthiness Directive that allows time between overhauls to be extended based on manual ECTM systems and stipulate instead that such extensions can only be accessed when monitoring of the engines' condition utilises automatic recording of relevant engine parameters.*

## Recommendation 2 – Auditing of ECTM compliance

*The time allowed between overhaul of the engine of the incident aircraft was extended from 3,600 to 5000 hours if the requirements of the relevant Airworthiness Directive were adhered to. ECTM is a crucial element of this arrangement. On this basis, the ATSB recommended that CASA review compliance with the relevant AD and in particular adherence to ECTM procedures. CASA declined to alter its audit system to give particular focus to this. In my view its refusal was misconceived and I recommend that they give further consideration to the issue.*

## Recommendation 3 – Guidance for CASA field staffing assessing maintenance resources

*CASA is required to oversight various aspect of an operators maintenance systems. For example, it must approve the appointment of key personnel such as the maintenance controller and must issue a certificate of approval before an individual or organisation can engage in maintenance of an aircraft.*

*Obviously, the experience and qualifications of individuals intending to undertake these roles is only one factor which is likely to impact on their standard of performance. The evidence given at this inquest demonstrates that workload is also important, yet the CASA officers involved in the various approval processes seem to have given scant attention to that issue CASA manuals do not give any guidance as to how they should undertake such assessments. CASA submits that its inspectors have extensive industry experience and can therefore adequately determine whether, for example, an organisation has adequate staff. I consider the evidence in this case shows that confidence is misplaced. Accordingly I recommend that CASA give further consideration to the development of tools designed to assist its inspectors undertake these assessments.*

This inquest is now closed

Michael Barnes
State Coroner
Brisbane
9 August 2007