



COMMONWEALTH OF AUSTRALIA

Official Committee Hansard

SENATE

RURAL AND REGIONAL AFFAIRS AND TRANSPORT
LEGISLATION COMMITTEE

Reference: Administration of ATSB/Whyalla Airlines

MONDAY, 1 DECEMBER 2003

CANBERRA

BY AUTHORITY OF THE SENATE

INTERNET

The Proof and Official Hansard transcripts of Senate committee hearings, some House of Representatives committee hearings and some joint committee hearings are available on the Internet. Some House of Representatives committees and some joint committees make available only Official Hansard transcripts.

The Internet address is: **<http://www.aph.gov.au/hansard>**

To search the parliamentary database, go to:
<http://parlinfoweb.aph.gov.au>

SENATE

RURAL AND REGIONAL AFFAIRS AND TRANSPORT LEGISLATION COMMITTEE

Monday, 1 December 2003

Members: Senator Heffernan (*Chair*), Senator Buckland (*Deputy Chair*), Senators Cherry, Colbeck, Ferris and O'Brien

Participating members: Senators Abetz, Mark Bishop, Boswell, Brown, Carr, Chapman, Coonan, Eggleston, Chris Evans, Faulkner, Ferguson, Harradine, Harris, Hutchins, Knowles, Lightfoot, Sandy Macdonald, Mackay, Mason, McGauran, McLucas, Murphy, Payne, Robert Ray, Santoro, Stephens, Tchen, Tierney and Watson

Senators in attendance: Senators Buckland, Colbeck, Ferris and Heffernan

WITNESSES

BILLS, Mr Kym Maynard, Executive Director, Australian Transport Safety Bureau	8
BLYTH, Mr Neville Robert, Senior Transport Safety Investigator, Australian Transport Safety Bureau	8
CAVENAGH, Mr Michael, Transport Safety Investigator, Australian Transport Safety Bureau.....	8
ELDER, Mr Robert Stephen, Executive Manager, Corporate Affairs, Civil Aviation Safety Authority.....	1
HINDER, Ms Nicola Allison, Manager, Government and Industry Relations, Civil Aviation Safety Authority	1
ILYK, Mr Peter, General Counsel, Civil Aviation Safety Authority	1
KELL, Mr Kenneth James, Senior Transport Safety Investigator, Australian Transport Safety Bureau	8
McINTYRE, Mr William John, Executive Manager, Aviation Safety Standards, Civil Aviation Safety Authority	1
PROBERT, Mr Neville, Head, Airworthiness Standards, Civil Aviation Safety Authority	1
ROMEYN, Dr Arjen, Team Leader, Technical Analysis, Australian Transport Safety Bureau	8
WALSH, Mr Julian Robert, Senior Transport Safety Investigator, Australian Transport Safety Bureau	8

Committee met at 4.01 p.m.**ELDER, Mr Robert Stephen, Executive Manager, Corporate Affairs, Civil Aviation Safety Authority****HINDER, Ms Nicola Allison, Manager, Government and Industry Relations, Civil Aviation Safety Authority****ILYK, Mr Peter, General Counsel, Civil Aviation Safety Authority****McINTYRE, Mr William John, Executive Manager, Aviation Safety Standards, Civil Aviation Safety Authority****PROBERT, Mr Neville, Head, Airworthiness Standards, Civil Aviation Safety Authority**

CHAIR—I declare open this public hearing of the Senate Rural and Regional Affairs and Transport Legislation Committee. The committee is inquiring into the administration of the Australian Transport Safety Bureau in relation to the crash of Whyalla Airlines aircraft VH-MZK on 31 May 2000.

The committee has authorised the recording, broadcasting and rebroadcasting of these proceedings in accordance with the rules in the order of the Senate of 23 August 1990 concerning the broadcasting of committee proceedings. I place on record that all committee witnesses are protected by parliamentary privilege with respect to their submissions and evidence. Any act by any person which may disadvantage a witness on account of their evidence is a breach of privilege.

While the committee prefers to hear evidence in public, the committee may take evidence confidentially. However, the committee may still publish or present confidential evidence to the Senate at a later date. The committee would consult the witness concerned before doing this. The Senate can also order publication of confidential evidence. Our first witnesses today are from the Civil Aviation Safety Authority. I understand, Mr Elder, that you want to make a short opening statement.

Mr Elder—Mr Chairman, with your permission and on behalf of CASA, I would like to recognise the retirement of the secretary of the committee, Mr Andrew Snedden, last week. A career spanning 28 years serving nine Senate committees is, I am sure you will agree, a significant achievement in itself. Andrew Snedden's contribution goes well beyond that achievement. He has been willing to share with witnesses his knowledge and experience of the protocols followed by parliamentary committees. Andrew's advice and insight has given us a better understanding of what is expected of witnesses appearing before these committees. His integrity, professionalism, patience and credibility have been an example to all of us. We will miss his wise counsel. On behalf of the many CASA officers who have had contact with Andrew, we wish him well and success in the future. Thank you, Mr Chairman.

CHAIR—Thank you very much, Mr Elder. I can only say that the committee members concur fully with your comments. We are very thankful that you have put them on the record. We accept them graciously and they will be conveyed to Andrew. Do you have an opening statement?

Mr Elder—No, we are happy to answer questions.

Senator BUCKLAND—I do not have a lot of questions for CASA at the moment, but we will see what develops. Quite often my last question becomes my 25th last question. For the record, can I say that when this airline disaster occurred, living in Whyalla as a resident of Whyalla, I believe that the manner in which CASA conducted itself with its media releases was exceptional. I think that should be put on the record. It was generally seen that CASA conducted itself most properly. I cannot say that I have heard a lot of complaint about that.

There are a couple of things I wanted to touch on. Firstly, I refer to the grounding of Whyalla Airlines that was reported on 11 June 2000—the decision by CASA to ground Whyalla Airlines. Was that solely done because of the audit that was carried out by CASA following the plane crash or was it a decision that was based on auditing that had been ongoing prior to the crash?

Mr Ilyk—I am trying to cast my mind back to that time; it is quite a while ago. I cannot recall all the relevant details but, as I recall it, CASA had been doing some investigations and was considering its options. I think the accident actually precipitated the final decision to issue a suspension.

Senator BUCKLAND—I remind you that the airline management had agreed to address the problems that you had highlighted but there were three in particular. I will quote from your press statement:

CASA's audit found Whyalla Airlines:

Placed a high workload on its pilots during ground turn-arounds;

May not have maintained accurate flight and duty time records; and

Allowed the chief pilot to carry out too many duties.

The audit of Whyalla Airlines was a previously scheduled annual audit carried out in-depth over the last week.

Based on that, I am assuming it was post disaster that the audit was really based on. But from my reading of the findings of the coroner and, as best as I can recall, those of ATSB, no real weight was put on the three items that you mentioned in that press release. I am wondering whether there had been audits like this ongoing prior to the airline crash.

Mr Ilyk—I would have to take that on notice because I would have to refresh my memory in relation to that particular period. I am happy to take that on notice and provide the committee with the relevant answers.

Senator BUCKLAND—I refer to a notice to all operators of Textron Lycoming and Teledyne Continental Motors piston engines with a take-off power rating greater than 250 horsepower, dated 7 January 2002, put out by Mr Neville Probert, who happens to be here today; and I am pleased that you are. Your reference for that particular document is 99/6907LL. In that notice you state:

Since August 2001, CASA has received 9 major defect reports relating to crankshaft and connecting rod bearing failures. Six of the failures occurred in Lycoming engines and three in TCM engines.

I assume all of these defects were detected after the Whyalla Airlines plane crashed; is that right?

Mr Probert—No, I do not think that is a correct assumption. I think the reference to the number of defect reports that you see in that letter covers a period of some years, not a period of 18 months. Could you tell me which page you are reading from?

Senator BUCKLAND—There are two pages and that appears in the very first paragraph.

Mr Probert—Clearly, that is since August 2001, which is about 15 or 16 months after the fatal accident. So, yes, those nine major defect reports are clearly in the period well after the accident.

Senator BUCKLAND—Do you have knowledge of such reports prior to the Whyalla Airlines crash? I do not know whether you can answer that right now. If you cannot, could you take that on notice for us?

Mr Probert—I can certainly take it on notice but I believe that paragraph is referring to failures in the bearing shells, and that arose because of the introduction into service of a new kind of bearing shell. I think they were not popular until 2000 and later. It is certainly an excellent question, and I am happy to find out some more details and advise the committee of that.

Senator BUCKLAND—I might be stretching your imagination or your knowledge too far here, but do you know if these bearing shells were the ones that were installed in the MZK engines?

Mr Probert—Yes, I believe the bearings that are suspected were installed in MZK at the time of the accident. Again, I will confirm that and let the committee know.

Senator BUCKLAND—That would be much appreciated. There is a lot in this document, but most of it I can find out for myself because it has been covered elsewhere. In the fourth paragraph, the last paragraph on that page, it says, 'Aggressive fuel mixture leaning may be relevant to the reported bearing defects.' Has that been substantiated?

Mr Probert—There has certainly been a lot of investigation into the fuel management policy of Whyalla Airlines. The press certainly reported evidence of less fuel being used than might have been normal, but I am not in a position to comment on the final conclusion of the investigations into Whyalla Airlines on that one.

Senator BUCKLAND—A lot of the questions that I will be asking may well be better directed to the ATSB because they are the people who do that. I ask for your patience in that regard. However, if there are some that you can help me with, certainly it may help later on. I do not fly an airplane and, quite frankly, I am happy to sit in the passenger seats. But my understanding with the leaning of the engines is that it is fine in cruise to lean the engines back for fuel economy provided you have sufficient fuel going through to keep the cylinders and the pistons cool; is that correct, to your knowledge?

Mr Probert—In general terms there is a lot of accuracy in that. The coolness of the engine is not related to the amount of fuel going through to cool the engine. The fuel is not a cooling agent. The air-fuel ratio, the mixture, has a significant impact on the heat of the engine because of the chemical reactions that are taking place. Where there is not as much fuel with the air as there should be, the combustion temperatures are high. In general terms, increasing the amount of fuel for the amount of air cools the reaction, cools the combustion, and

probably provides more power. It does control the temperature of the engine, so it is hazardous to run an engine at too lean a mixture.

Mr McIntyre—I might be able to contribute from a pilot's perspective. Mr Probert is an engineer and I am a pilot. It is true to say that it is standard operating procedure on almost every aero engine that you will have some degree of fuel leaning in the climb. It is the issue about how much. For these types of engines, there is a standard methodology to follow to lean the mixture during the climb. That sort of material is normally covered in the pilot's operating handbook for the aircraft.

In some of the simpler GA aircraft that is not done, but that is probably more to do with the training of the pilots than anything else. In these rather highly stressed, high performance engines, it is quite normal to have some degree of fuel leaning as the aircraft climbs. The reason is that, as the aircraft climbs, it is climbing into an area of less air pressure. There are less molecules of air as you go up; therefore you do not need as much fuel to get that mixture correct. You reduce the amount of fuel going into the engine to match the amount of oxygen that is in the air. That is standard.

Senator BUCKLAND—CASA has investigated a number of incidents relating to Whyalla Airlines over a number of years prior to the MZK disaster, and we do not need to visit those except if there were any that you investigated where there were reports of severe leaning or bad practice in relation to fuel management.

Mr Elder—I think we would have to take that on notice.

Senator BUCKLAND—Yes, I appreciate that, thank you.

CHAIR—How many hours do they put on the plane before you have a look at the bearings?

Mr McIntyre—It depends on the type of aircraft. Most generally, that would be looked at in the TBO for the engine, which could be as much as 1,500 hours or 2,000 hours in the case of some engines. I am not quite sure with the engine—

CHAIR—How many hours since the last bearing change did this engine have on it?

Mr McIntyre—I do not know the answer to that.

CHAIR—Surely someone would know.

Mr Probert—One of the engines was recently out of an overhaul. I think it was the engine that had the failed crankshaft, and that is the one where the bearings are suspect. So the answer is probably a very small number of hours.

CHAIR—I have seen and had it done to a cat engine: could it have been that they just did not get the bearing in right?

Mr Probert—You say 'could it have been that'; I guess it could have been that. I certainly could not say no.

CHAIR—The bearing spun, didn't it?

Mr Probert—I cannot answer that. CASA has had very little involvement with the engine. That was ATSB.

CHAIR—Okay.

Senator BUCKLAND—I imagine there will be quite a few questions raised later with ATSB relating to the bearing, oil and servicing of these engines. The engine that had the defective crankshaft and the bearing that we have just been speaking of was, in my understanding, a relatively new motor. It had had a number of oil changes, about three in the period of probably six weeks prior to the accident. Does CASA get involved in monitoring any reports of poor servicing or lack of servicing? Does CASA know when each aircraft engine is serviced, and is that recorded at all? Or is it left to the company to be honest and say, 'Yes, I serviced it yesterday'?

Mr Probert—CASA does not get involved in monitoring the day-to-day and week-to-week servicing of aircraft. That is left to maintenance organisations. CASA writes the rules and audits against the rules. CASA would only become aware of servicing of an aircraft or maintenance carried out on an aircraft in exceptional circumstances, such as discovery of a defect which precipitates the submission of a defect report. The routine servicing and maintenance of an aircraft is not reported to CASA. It does not have to be reported to CASA. We have maintenance organisations that do that.

CHAIR—Who is it reported to?

Mr Probert—The servicing of the aircraft is really a matter between the operator of the aircraft and the maintenance organisation which does the work.

Senator BUCKLAND—But if it is a commercial airline, how often would a company maintaining aircraft for an airline be audited by CASA?

Mr Probert—I cannot comment on that one, Senator.

Mr McIntyre—We would have to take it on notice to give you exact numbers but it is in the order of once a year. When we perform that auditing role, we are not actually going and auditing product.

Senator BUCKLAND—No, I understand that.

CHAIR—If you are an aircraft owner, whether it is commercial or not, and you run out of chips and you do not service it as you regularly as you should, can you get away with it?

Mr McIntyre—I think you will have to rephrase that for me.

CHAIR—This is a tough business. Don Kendall was brought up where I come from it and it is a very tough business running these small airlines. If you are short on funds and you think, ‘I will do another 200 or 300 hours on the engine before I put it in for a main service,’ can you get away with it? You could if you came to an arrangement—so isn’t that dodgy?

Mr McIntyre—It would be possible to do that.

CHAIR—Isn’t it a dodgy system?

Mr McIntyre—It would also be possible to falsify the records and it is possible to do that—

CHAIR—So you are not interested in that?

Mr McIntyre—Of course, we are. Yes, we are very interested in that. In fact, when we do an audit of an organisation, we check to ensure that things like the pilot’s record in his logbook and the hours that are recorded on the maintenance release of the aircraft tally.

CHAIR—How often do they not tally?

Mr McIntyre—Again, that is something that I would have to take on notice to give you an accurate figure, but generally in this country most operators abide by the rules.

CHAIR—Yes, but most aircraft keep flying and just an odd one crashes. I would describe myself as an old, worn-out pilot. You obviously are not a worn-out pilot; I am. The Knights airline operator at Narrandera used to service his own. I have often wondered whether it is possible that he really did not do what he should have been doing. Do many people have this in-house relationship where they service their own and fill out their own—

Mr McIntyre—A maintenance organisation in some ways is separate from the operational side of the business. So if an airline does their own maintenance, they are separately certified by CASA as a maintenance organisation. We would have a different group of people that would look at their activities as opposed to the group that would be looking at the flying operations aspects of their business.

CHAIR—But it would be a temptation, wouldn’t it, if you were doing it hard to get a few hundred hours extra on the engine?

Mr McIntyre—It is certainly a temptation.

Mr Elder—The industry is very incestuous. Competitors watch each other like a hawk. We have what we call a hotline so that if a pilot is forced to fly an aircraft that has not been maintained or an engineer is forced to do something on an aircraft that he is not happy with, they can make a confidential or anonymous report to us.

CHAIR—But sometimes the pilots do not like the prospect of the sack.

Mr Elder—That is true, but there are checks and balances in the system.

Mr McIntyre—CASA considers that type of breach, where you are failing to log the hours of the aircraft accurately, to be very serious, and we prosecute.

CHAIR—But you said earlier that these things often come to your attention when there has been some sort of failure.

Mr McIntyre—They do.

CHAIR—That is after the event as it were.

Mr McIntyre—They also come to our attention when we do audits.

CHAIR—What percentage do you audit—one in 1,000 or one in 100?

Mr McIntyre—We would need to have somebody from our compliance area to answer that accurately for you.

CHAIR—You might do that.

Mr Elder—We will certainly provide you with that on notice.

Senator BUCKLAND—What about if an engine servicing company detected a problem in the oil with small parts of metal or whatever? I only know from what they do on a car. When it is new, they always have a look to see if there is nothing in there. Is that a reportable thing? Obviously it would be reported to the owner but is it reportable to CASA? Is there a procedure for following through and saying, 'In this engine we found X, Y and Z'? What is the process there?

Mr Probert—There is certainly a requirement that any major defect must be reported to CASA. You are referring to finding debris in engine oil?

Senator BUCKLAND—Yes.

Mr Probert—If the engine maintenance organisation regards that as a major defect, they must report it to CASA. If they do not regard it as a major defect, it would almost certainly be because the engine manufacturer's maintenance program and maintenance manuals contain a procedure for dealing with that discovery. Merely finding fine debris in an engine is not necessarily an indication that the engine is about to fail. The engine manufacturer's procedures may well cover it adequately and simply advise perhaps replacement of oil or an inspection of a certain part of the engine. That is not a major defect. It is adequately covered in the maintenance instructions. When the lack of coverage of that failure in the maintenance instructions or some other reasoning leads the maintenance organisation to believe it is a major defect, the organisation must report it.

Senator BUCKLAND—With the type of engine that MZK had, a Textron Lycoming engine, that was found to have bearing defects, do you recall what the remedy for that was? Was it replacement or tightening?

Mr Probert—I do not recall the details but I believe signs of failure in the bearings would necessitate the bearing shells being replaced.

Senator BUCKLAND—Would there be a directive to that extent telling people to replace bearings?

Mr Probert—Not an Australian directive, no. I would expect that to be covered in the maintenance manuals and the maintenance instructions for the engine. Lycoming and Continental would regard that as one of the failures that would have to be expected from time to time in engines and they would have comprehensive coverage of that in their maintenance instructions.

Senator BUCKLAND—Just referring back to the nine major defect reports about the crankshaft and connecting rod bearing failures, would there be a special bulletin or notice? You have put out this document to all operators of that type of engine. Would a special bulletin be put out by the manufacturer?

Mr Probert—The bearings for those engines are, I believe, manufactured by companies other than Lycoming and Continental, so it would properly be their responsibility to alert their customers of a potential problem. But the thing that precipitated this letter is that we in Australia had received a significant number of major defect reports, nine of them, and we felt this was something that needed to be drawn to the attention of the aviation industry. Presumably that was because there was no similar coverage or adequate coverage coming from either of the major engine manufacturers. We saw a problem evolving in Australia and we took the step of distributing that letter. We do not often do that. It is a rather unusual course of action for CASA to distribute information of this kind. That suggests to me that we saw from those nine major defect reports that it was something emerging and that we needed to act in Australia rather than waiting and hoping for one or more of the US manufacturers to take action.

Senator BUCKLAND—That is particularly noteworthy. Do you know if you got any responses direct to CASA from operators of these engines?

Mr Probert—I believe we did receive feedback from engine maintenance organisations—certainly before this letter was written and probably after it as well. But I do not have details of precisely what they might have said.

Senator BUCKLAND—I do not want to cut over what has already been raised at hearings in the past, but it strikes me as odd that because the bearing manufacturer makes the things, therefore the engine manufacturer does not seem to be responsible for the parts that go into it. It strikes me as very odd. There does not seem to be any ownership of anything.

Mr Probert—There is certainly ownership of everything, in fact. The real question is: at what point should the manufacturer of a part react to emerging evidence of a problem with his part by publishing a service bulletin? Most manufacturers of parts publish service bulletins when they see a problem emerging. But there are times when manufacturers need to be prompted by their customers or a regulatory authority to acknowledge the emergence of a problem and publish a service bulletin.

Mr McIntyre—Senator, you raised an issue before which I am tempted to comment on briefly—that is, if the maintenance organisation finds a defect in your engine what are their responsibilities, and you were essentially asking about the mechanisms for reporting it. The maintenance organisation also has a responsibility to ensure that, when the aircraft is put back into service, it will actually meet the next period of serviceability and will continue to be airworthy. That is a responsibility of the person who works on the aircraft and of the maintenance organisation itself. It is that process which satisfies CASA that aviation is safe. To give you an example, if a major airline like Qantas in Australia found a problem on an aircraft that might have affected the airworthiness for the next given period, they either effected a repair or a replacement in accordance with the manufacturing company's recommended procedures. Unless it is the type of fault that would be covered by what we called an SDR, a service difficulty report, it would be quite normal for the aircraft to return to service and CASA would never know about it.

Senator BUCKLAND—Thank you for that. With respect to when engines are fitted to a plane, MZK had had refit engines. In fact, almost the entire fleet of Whyalla Airlines had had refit engines, from memory. Do they have a run-in time? If you have a new car, you do not go and flog it for the first few hundred kilometres.

Mr Probert—I do not believe there is a statutory run-in time. Engines installed in airplanes have to be able to develop take-off power for their first flight, obviously. There is not the luxury of saying, 'For the first 10 take-offs, don't use full take-off power.' That would present a problem of a different kind. I think the answer is no, there is no period of reduced power output or anything like that. The aircraft owner and operator may well advise his pilots to be particularly careful with the engines because they are new, but there is no mandatory run-in period.

Mr McIntyre—Most engine manufacturers place a downward limit on the power that you can operate the aircraft at. Most of them insist that you operate it at more than probably what you would normally operate it at. In Australia, or in fact worldwide, pilots operate generally around the 65 to 75 per cent power ranges for engines in the cruise. Some engine manufacturers will say that you should run the engine at higher power for the initial part of its life. This assists in the bedding-in process of the cylinders and rings.

There is also a procedure in place where a different type of oil is used for this period when the engine is running in, if you like, when the rings and the surfaces of the cylinders are bedding in to form a good seal. That is non-detergent oil. It is referred to in this country as red band, I understand, and that oil is used so that it does not scavenge the deposits out of the cross-hatching in the cylinders. After that period is over and the engine is bedded in, you use a different oil.

Senator BUCKLAND—What sort of time would you be looking at? It would be a bit hard to say, wouldn't it?

Mr McIntyre—It is about the first 50 hours, from my experience. It may be longer in some cases.

Mr Probert—One hundred hours, because an oil change is typically done at 100 hours.

Mr McIntyre—Yes, about that time. It is not very long in the life of an engine.

Senator BUCKLAND—It could be a long time in the life of a plane though. If it was a private plane, for instance, 100 hours is quite a long time.

Mr McIntyre—Yes, it could be.

Senator BUCKLAND—When you get notice such as you did in relation to the bearings, and you had the nine defect reports, what would precipitate CASA making a determination that planes operating with that type of engine should be grounded until something is done?

Mr Probert—We did not make that determination, of course. Are you asking how many more defects would we have had to find before grounding?

Senator BUCKLAND—Yes.

Mr Probert—That is a hypothetical question, of course. It is very rare for CASA to ground all aircraft of a type—very rare indeed. A regulatory authority such as CASA would only do that if there was a serious risk of a fatal accident. In fact, it happens so rarely that I really cannot speculate about the circumstances in which CASA would do it.

Senator BUCKLAND—So there are no pro forma guidelines for officers to make a determination that ‘This is so bad we should ground the whole fleet operating with these engines until such time as they have all been tested or we are confident that it is not something that is affecting all engines’? I ask that because I can recall two operators of the same type of aircraft with the same type of engine who sent their planes for an immediate service before continuing to operate. That was a different company but it was a precautionary thing following the crash.

Mr Probert—Aircraft that are used commercially all have to meet very detailed standards. They are not Australian standards; they are international standards. And these being US manufactured aircraft and engines, they would have to meet standards applied in the United States. There are occasions when CASA suspects that an aircraft type may not meet its design standards. That is certainly one situation in which CASA would be correct in grounding the fleet, grounding all aircraft of that type, as you describe it, when we believe that the claim that those aircraft meet their standards is no longer a valid claim.

Senator BUCKLAND—I do not have any further questions for these witnesses. However, I would say again: the action taken by CASA following the inquiry to implement the recommendations is also something that should be commended.

CHAIR—There being no further questions, I thank you very much for appearing today.

[4.42 p.m.]

BILLS, Mr Kym Maynard, Executive Director, Australian Transport Safety Bureau

BLYTH, Mr Neville Robert, Senior Transport Safety Investigator, Australian Transport Safety Bureau

CAVENAGH, Mr Michael, Transport Safety Investigator, Australian Transport Safety Bureau

KELL, Mr Kenneth James, Senior Transport Safety Investigator, Australian Transport Safety Bureau

ROMEYN, Dr Arjen, Team Leader, Technical Analysis, Australian Transport Safety Bureau

WALSH, Mr Julian Robert, Senior Transport Safety Investigator, Australian Transport Safety Bureau

CHAIR—I welcome the representatives of the Australian Transport Safety Bureau. If you want to make an opening statement, please do so and then we will hand over to Senator Buckland for questions.

Mr Bills—I do not have a written opening statement. There are a couple of issues of process I would like to canvass with the committee initially. The first is that, when I made some comments in the *Hansard* for the last committee hearing on 4 November, I said some nice things about Andrew Snedden, which I meant. I wanted to associate myself and ATSB with the remarks of Rob Elder and CASA. Secondly, in sending an email on that, I picked up Senator Ferris's suggestion about letters to the relatives in terms of notice about the supplementary report. Those apology letters were sent within a couple of days of the hearing.

Senator FERRIS—Thank you, Mr Bills.

Mr Bills—Previously I sent to Mr Snedden for the advice of the committee a response to some comments made by Mr Eriksen and Mr Kernahan on evidence I gave back in February. At this stage, my understanding is that that response that I made has not been made public. I would like to table it today, if that is possible, so that I can refer to it during this hearing. I understand that senators already have copies.

CHAIR—Is it the wish of the committee that that be published? There being no objection, it is so resolved.

Mr Bills—The final point is to say that the reason why we think it is important that the differences between our supplementary report and the coroner's report are given prominence is because of the importance in terms of safety action. We agree with all of the safety matters that the coroner has addressed, but we have gone further in a couple of areas. One is bearings and the other is pre-ignition and engine deposits. Because there are still safety issues out there, that is the most important reason why we still believe it is important that our sequence and analysis be addressed. I thought that was a useful summary. We are not here as a matter of pride or anything else; it is a matter of future safety action that is driving us. That is all, Mr Chairman.

CHAIR—How many airlines do run a few more hours on their engines than they should?

Mr Bills—We could not answer that. We look at the nasty end when something has happened. Sometimes there is a reason for that that relates to pushing the boundaries of what should be done. But because we only look at an accident or a serious incident when it has happened, we cannot give you an overall view.

CHAIR—Who allegedly is the person who does look at it?

Mr Bills—The regulator is the body that is responsible for the overall safety of the aviation system. The regulator does that through a number of means, including by ensuring that operators have good systems in place, ensuring that maintenance organisations have good systems in place, properly accredited personnel and so forth, and then from time to time auditing those systems. So that is really the way it works.

CHAIR—How often does someone get a surprise? How often do you come across an incident where there was poor maintenance?

Mr Bills—I do not think I could generalise from the 60 or so investigations we do each year to give you an overall view that would be meaningful. I think it would be more meaningful to wait for CASA's compliance area to come back to you and give you some data based on their audit process, because that would cover the whole industry.

CHAIR—But you do come across poor maintenance?

Mr Bills—From time to time, certainly.

Senator BUCKLAND—With respect to MZK though, at no time could you say that was not serviced regularly or on time, surely?

Mr Bills—We have not referred—

Senator BUCKLAND—No, but with what you were just saying, it could not be implied that MZK was not properly or regularly serviced. Just looking at the service leading up to the disaster, it indicates to me that it did not seem to ever be out of getting new oil.

Mr Bills—We documented all that servicing in our report and certainly we did not conclude that maintenance was a significant factor in the accident.

Senator BUCKLAND—No.

Senator FERRIS—Mr Bills, you said that ATSB come in on the nasty end; that is, the end where there has been a crash, and invariably, unfortunately, when there is a crash, there is loss of life and there are always coroners involved. I would just like to clarify a process question, if I may: you said, I think in July when we talked about this at an estimates hearing, that there had been an unnecessarily adversarial process here. In fact at that time I believe you were thinking about action in court. Can you tell us how this inquiry and the subsequent coroner's activities differed in a process sense from the way in which normal crash investigations and subsequent coroner's inquiries proceed?

Mr Bills—It is a big question, Senator.

Senator FERRIS—Yes, but I think it is an important one in terms of the framework of this whole issue.

Mr Bills—Yes. Let me just say that, of the roughly 60 investigations we will initiate this year, probably a third involve fatal crashes, another third involve accidents of some kind and the other third involve serious incidents. That is roughly right.

In terms of fatal accidents, normally we will produce a report and a coroner will consider the report. There may be a half-day hearing or a few days of hearing on that report, but generally it is accepted and the inquest is over in fairly short order. In this case it was a very large issue in South Australia, as you know better than I do, and independent experts were commissioned by those assisting the coroner. I guess we felt from an early stage that those experts were looking to find flaws in our report. That was the sense. It was quite adversarial, as you mentioned, and that was quite different from what we normally experience. There is a lot of detail in that document that I tabled a little while ago dealing with the actual problems that we had.

Senator FERRIS—One of the things I found interesting in the comments back in July was your view that, as distinct from a coroner's inquiry, ATSB look at something from a no-fault base; so you do not actually look to sustain a predetermined outcome. You are reported as having said in the *Advertiser* on 25 July:

Mr Bills downplayed evidence from a US firm commissioned by the victims' families as part of a civil damages claim which found evidence of a manufacturing fault.

It goes on to say, in your words:

“So obviously they were looking for a manufacturing fault which could lead to a settlement. I just don't think you can equate that sort of expert with our no blame approach where we've really got no axe to grind.”

I suppose what I am trying to unravel here is whether this is different in its approach to other investigations of this sort where a manufacturer may determine that this is the best outcome that can be achieved—that is, to accept some form of fault and make the payment. I think it is clear that, no matter what happens now, there is no way in which those families can receive any other payment of any kind. How often would this sort of approach occur when you are doing an investigation which includes a coroner? Does the coroner always have counsel assisting? Does the counsel assisting always play the same sort of role as this one did?

Mr Bills—It is often the case that an accident is the result of human error of one type or another, not necessarily by the pilot—

Senator FERRIS—Which I hasten to say nobody is suggesting was the case here.

Mr Bills—Correct.

Senator FERRIS—Quite the reverse, in fact.

Mr Bills—In the sense of any deliberate act. Whether there was an error by the pilot under stress, we will never know, so we did not blame the pilot. No-one has. In a case where there is a manufacturing defect, I would expect that people would be looking at their legal options in that regard. So this was a bit different in that respect. I have lost the second part of your question.

Senator FERRIS—I am just trying to unravel the role of the coroner's counsel assisting and whether you always have counsel assisting who play that sort of role. I notice that Mr Kurt Mackiewicz, who is the father of the pilot, was satisfied with the very first report that you put out. I have not seen any response from Mr

Mackiewicz to the coroner's report. I just note that he said he was satisfied that your original report was sustainable. It just seems to me, in the years that I have been associated with this committee and having regard to the interest I take in light aircraft crashes, because I travel on them pretty frequently, that I do not remember a circumstance like this involving a coroner. I am trying to establish whether it is something that happens frequently or infrequently.

Mr Bills—It does not happen frequently. Quite often, there is no counsel assisting. In fact, normally there would not be, more often than not, but I cannot give you a statistical analysis. There have been some problems before. So this is not the first instance, but it is certainly the most serious that I am aware of. In terms of Mr Mackiewicz, the team briefed him and his family on our investigation before the report was released. In fact, he came to the same conclusions that we did before we stated what our analysis was. But subsequently, during the inquest, he changed his view and really went the other way. He went along with where the coroner got to and was not happy with the ATSB.

Senator FERRIS—That is unfortunate. Why do you think the coroner and the counsel assisting played such an active role? Do you think that had anything to do with the fact that there was a financial outcome resting on it?

Mr Bills—I said last time, Senator, that I do not want to talk about motives.

Senator FERRIS—But you made the point in the *Advertiser* on 25 July that the ATSB operate from a position of no axe to grind and no fault. I am trying to understand whether that is the basis on which the other report was done.

Mr Bills—All I can say is that, as I said then, the experts in the United States were paid to assist with a case for damages. My experts—one of whom is sitting next to me—only have one role, and that is future aviation safety. There is no sort of legal axe to grind; there is no adversarial interest whatsoever. So I think that is an important distinction. That is really why we exist—to have that no blame approach to try to get to the bottom of complex safety accidents such as this one.

Senator FERRIS—Given the public and the families' sense of frustration at the length of time and the type of results that came out, do you have any view on whether this type of coronial inquiry, where it is possible to employ a manufacturer in the way that the manufacturer was employed, provides a confusing outcome? Is it the best way of establishing cause and effect?

Mr Bills—It can be difficult in some coronials where the evidence is very complex and technical. That would be so not only in aviation but in some other areas where, if you are not a professional in that field or experienced in the area, it may be very difficult to assess some of the complex evidence. I am not sure if that addresses where you are going.

Senator FERRIS—I suppose I am trying to look at this from the families' perspective because, as South Australians, I know Senator Buckland and I have both been in contact with the families.

Senator BUCKLAND—I would like to put it on the record that I have not been in contact with the families.

Senator FERRIS—They have been in contact with us.

Senator BUCKLAND—Well, certainly not me. I think it should be stated that I have very deliberately kept the family side of this hearing out. I do not want contact. I have been in touch with one of their go-betweens but not directly with any family, nor have they contacted me.

Senator FERRIS—They have not contacted me in relation to this particular issue but, over the last couple of years, it is fair to say the families have been in contact with members of this committee to express their frustration that, first of all, they were not briefed last time—and can I congratulate you on taking the initiative to send those letters. They have also been in contact to express their views, certainly to me, not about the outcomes of either of the reports or any of the reports but about the length of time involved in the process and the way in which the process operated, because I think it has been very stressful for them, particularly where young children have been concerned. I am trying to establish in my mind whether or not there is a better way for the process to have occurred; hence my questions to you in relation to this. I will come back to the question I asked earlier: do you have a preference for a more streamlined process for these situations to occur? How often has it been the case that you have had to revisit an inquiry, such as this one has been revisited, as a result of coronial inquests?

Mr Bills—I would hope that there is a better process than this one. This one has been enormously expensive, and it has been very stressful for my people as well. It has gone on for a long time—well, we are still going now. The coroner's report was 18 months after our report, which in turn was 18 months after the accident.

We have been talking to state coroners as representatives of all coroners—in fact, I last spoke to them at the beginning of November—and have been developing a memorandum of understanding. In large measure, knowing each other's business and knowing each other better is probably the most significant way forward. We have also been liaising with coroners early on in an accident investigation, taking a deliberate step to try to engage them and to seek to find out whether there is anything they want us to look at that we are not already looking at. Or, if we do not have the resources to do that or it is not relevant to the core investigation, to be clear that their investigator will take that up. I think maybe that groundwork and the MOU are really the way forward. I am confident that is progressing well. This one is going to be slightly difficult to get over, because it has been so emotional. I do not think we can say that tomorrow the relationship will be back to a great one but I am certainly keen to move on when we can.

Senator FERRIS—I appreciate that, and perhaps during future estimates we will be able to learn more about that memorandum of understanding. I do not think there is any doubt that the process that has occurred in South Australia has been a particularly unpleasant one for everyone concerned. I do apologise that I cannot stay any longer at this hearing. I would very much like to but I do have whip's duties; so please excuse me.

Senator BUCKLAND—I will continue from where we left off at the estimates hearing, if I can. Before going to that, you were present during the evidence of CASA earlier in the day when they were talking about the nine major defect reports about crankshafts and the connecting rod bearing failures. Have you gathered the data about each of those or any subsequent or earlier failures?

Mr Bills—Before asking Dr Romeyn to comment, I should say that we certainly looked at bearings very closely in our investigation and in relation to the left engine bearing slippage was the key factor in initiating the thermal fatigue crack. So that was something that was looked at very carefully. The coroner decided that bearings were not an issue. But in terms of those earlier bearings, I will hand over to Dr Romeyn.

Dr Romeyn—I have been looking at a whole series of engine failures to different extents, and a number of those involved the destruction of bearing inserts as the initiator of other component failures. In the course of doing this, I have also received not all nine of the CASA major defect reports but several of them. There was one in particular where a bearing insert with the aluminium tin layer partly removed had been cut and sent to the United States and subsequently returned. I have looked at that one. That event occurred in 1999, but I did not see that one until much later. So it forms part of the bigger picture I am working on.

Senator BUCKLAND—And what is that bigger picture?

Dr Romeyn—That is the issue of structural failure in high-power reciprocating engines. When I talk about structural failure, it is not restricted to bearings; it covers all of the components that form the power train of the engine. So that goes from cylinders and cylinder heads through pistons, connecting rods, crankshafts, cylinder attachment and crank cases.

Senator BUCKLAND—Without sounding too rude, Dr Romeyn, can you just remind me of your background and how long you have been doing this type of work for ATSB?

Dr Romeyn—Yes. I transferred from the Civil Aviation Authority in 1997. I have been doing what is known as engineering failure analysis at the bureau as a transport safety investigator across different modes. Prior to that, I started with the Department of Aviation in 1984, working on the investigation of major defects and also in that role assisting the Bureau of Air Safety Investigation, particularly looking at component mechanism failures.

Senator BUCKLAND—Is that from an engineering or metallurgical point of view? I am not quite sure of your discipline.

Dr Romeyn—I have degrees in applied science majoring in metallurgy, a master of science and a PhD all obtained through the school of metallurgy at the University of New South Wales. That course of study encompasses a wide range of topics going from chemistry, solid state physics, engineering issues, chemical engineering, heat transfer—a whole range of mechanical metallurgy. The topic or where I am now is what is known as engineering failure analysis and it is a cross-discipline area. You cannot study that at university. With material science, metallurgy, understanding how things fall apart and break is a core issue. The rest of it is how you interact with other engineering disciplines and other science disciplines.

CHAIR—Did you learn to weld?

Dr Romeyn—Yes, but you would need to practice to get good.

Mr Bills—Dr Romeyn is also a chartered professional engineer in the mechanical engineering division.

Senator BUCKLAND—I am sorry I had to ask that because I have read about your expertise. I might be getting tired but I could not recall the length of time you had been doing this work.

Mr Bills—Just on bearings, I should draw the committee's attention to two key references in our supplementary report. The first is section 9.2 on page 23 where we endorse the further work that CASA is doing on this issue and also note the follow-up to our recommendation in our investigation report. The second is figure 57 on page 154 which shows, as simply as Dr Romeyn could in the time available, the way we believe that the bearing back interfered with the crankshaft to initiate the fatigue crack in the left crankshaft of MZK.

Senator BUCKLAND—I think from memory I was going to get to that particular one later. If I can just continue on from where we were, I refer to the fact that this is adversarial—there was reference to that earlier. Basically I had thought it was all over until we got the supplementary report. I have to say I really wondered why it was put out. It had the effect of attracting criticism or indeed praise, whatever side looked at it. I just wondered about the need for it after ATSB said they were not going to appeal the findings of the coroner, because there seems to be so much difference in some of the opinions of the experts. And I am not an expert. You have heard me say a number of times that I cannot fly a plane and, to satisfy Senator Heffernan, I cannot ride a horse either. So I am stuck in the middle between pushbikes and cars.

Mr Bills—I can answer the question of why we had a supplementary report. Under the Air Navigation Act, which is the legislation we are operating under for this investigation, there is a requirement to reopen an investigation whenever there is significant new evidence. In this case, there was the significant new evidence of several service bulletins from the engine manufacturer which needed to be tested, so we were obliged to reopen the investigation. Having reopened the investigation, we were obliged to put out a report. I said on the day the coroner released his report and on other occasions that we would be doing that.

But as I said right at the start of this hearing, from our point of view, the absolute imperatives that we needed to reinforce in our supplementary report were the areas where the coroner does not believe there is a safety deficiency but we do, and we think there are implications for the safety of the worldwide fleet. The two key areas for that are pre-ignition and excessive engine pressures, and bearings and in particular the use of an anti-cooling compound. They are two issues where we recommended that further research was necessary via the FAA. We believe they need to be followed through. Dr Romeyn's discussion of his multi-engine study is part of that follow-through, but we are a tiny player compared with the might of the FAA. So we are hoping they will do some significant research.

Senator BUCKLAND—I note from the various findings that there is disagreement as to which engine failed. Looking at it from my point of view, it does not matter which went first—the plane crashed. It may have had some bearing—going back to a bit of schoolboy reading here—if it had been older planes where they had the propellers all going round the one way. But I am pretty certain that on these aircraft they are counter rotating, which makes it that much easier for the pilot to take control. I may well go to the significance of it veering to the right at the time. I think I have some questions later about that particular aspect. But to me that is not the point.

My big concern with this is: do we have an organisation that we are funding to protect the safety of travellers? It goes beyond aircraft now to air safety: are we being properly serviced and are we doing enough to satisfy the public that ATSB is a suitable organisation? I am just concerned. As Senator Ferris said, we seem to fly an awful lot without seeing the driver, which can frighten you. So carrying on from where we were, do you know what the aircraft manufacturer's safe single engine operating speed for the Piper Chieftain is?

Mr Bills—The safe single engine operating speed?

Senator BUCKLAND—Or minimum, if you like, because they have a minimum. If it is not going fast enough, it is coming down fairly quickly.

Mr Bills—I might ask Mr Cavenagh, who is a pilot, to respond.

Mr Cavenagh—I am not sure if you are referring to one engine operating or no engine operating.

Senator BUCKLAND—No, in a single engine operation, what is the safe or the minimum operating speed for that engine? There is a point where you cannot control it if you get below it.

Mr Cavenagh—It is called the minimum control speed. I think for this aircraft, I cannot recall the figure precisely, but it is quite slow; it is probably around 60 to 70 knots or something like that, maybe a bit lower. I could find that out for you.

Mr Bills—We will take that on notice.

Senator BUCKLAND—That would be appreciated. Does that depend on which engine it is? I think that is what I was referring to when I said the propellers all went the one way round and there used to be what was known as the critical or the primary engine.

Mr Cavenagh—Yes.

Senator BUCKLAND—Does that still apply with counter rotating propellers? Again, if you need to take that on notice, I would be quite happy for that.

Mr Cavenagh—Again, I would like to confirm that detail from the pilots handbook, if I could.

Senator BUCKLAND—Yes, thank you. There was a point where, shortly after the mayday was given, the plane was still being tracked by radar and the speed of 167 knots was calculated as what that plane was doing. Is it likely that both engines, despite their condition, were still spinning around at the time to be able to maintain that speed? That is a fairly fast speed given that the minimum speed, as we have just heard, is around 60 or 70 knots.

Mr Bills—We believe that, by that stage, the left engine had ceased operating significantly before then and the aircraft was operating on the right engine only. At the time the mayday was given, we believe that the hole that had developed in the No. 6 piston had developed and therefore it was not getting full power from that engine. The 167 knots was actually prior to that time.

Senator BUCKLAND—Okay. I was amazed that they actually tracked that. I did not realise that. Were they able to detect how quickly it was slowing down?

Mr Bills—There were two different radar sensors, one of which was operating intermittently well but the other was pretty good, and that is where we got the speed data from. In terms of the speed possible on one engine, I think we briefly canvassed that last time and that is covered in attachment F to our report.

Senator BUCKLAND—That is right. I have actually read the whole lot of them, and it makes your head spin round. In the ATSB report, there was the claim that the pilot—and I am not saying this to try to look for blame again—pushed the remaining engine beyond its operating limits and overheated the remaining engine to the point where the piston blew a hole in it. That was the right engine. I was just curious as to the significance of that. I understand that the piston that blew the hole in it was directly below the take-off point for the engine temperature; is that the right term? It is where the temperature is taken.

Mr Bills—Let me backtrack a little: the temperature probe is on top of the No. 6 cylinder, and the No. 6 cylinder is the cylinder in which the No. 6 piston developed the hole. But there was also overheating on some other nearby cylinders. At some point that hole developed and the temperature gauge being on top of that cylinder would have shown an extended overtemperature condition before that hole developed. So the issue is: at what time in the flight did it develop? In our view, it is more likely to have developed after the left engine failed, and the pilot was experiencing the stress of that. We do not know the passenger reaction et cetera. The coroner's view is that it happened eight minutes into the cruise of the flight, which means that there was a no-stress situation for the pilot. He would have just ignored the overtemperature condition, and the hole developed in the right engine. We think that is far less likely than the scenario that we have but we cannot prove it, of course.

Senator BUCKLAND—And I am not about to test that too far either, with my ability. If the left engine had failed, there is not a great deal of time and the second engine has failed as well in that it has a hole, the engine would still operate, wouldn't it, on the other five cylinders?

Mr Bills—Yes.

Senator BUCKLAND—Although it would be pretty noisy and rough.

Mr Bills—Being a turbo-charged engine, that is right, there would be some roughness, power surging and so forth, we think.

Senator BUCKLAND—But with respect to a pilot that is at sea, trying to maintain no doubt height as best he could—Geoff Buckland's interpretation of this, of course—to get the best glide effect he could, should it come to that, still heading for Whyalla, I am not sure if it would not be the reaction to try to get the best you

could out of it and ignore any high temperature, if indeed it was showing a high temperature, which we would have to assume it was.

Mr Bills—There is certainly no evidence of any problem with the temperature gauge. So, yes, we believe that he was operating on one engine. He had come to the top of descent and initiated descent at a normal rate, which was 400 feet per minute. The hole developed and then the descent profile changed to 650 feet per minute, which was too fast or too steep to make Whyalla, hence he ditched in the ocean—Spencer Gulf.

Senator BUCKLAND—Known to many as a fine fishing place. Just going back a bit earlier to the recorded speed of 167 knots, was that prior to the mayday or at the time the mayday call was put through?

Mr Bills—There is a chart on page 13 of our supplementary report. At 1847:15 or slightly thereafter we see the drop down in speed. The erratic track is because we have summed the data from the two sensors, one of which was intermittent. So the actual speed was not tracking that green line as it shows there. That is really an artefact from that problem. But in terms of the time period, you can look from 1847 or 1848 forward. You see the mayday at 1901:10, which of course was after radar coverage ended, but prior to that we can see that the speed had dropped slightly.

Senator BUCKLAND—It was at 1855:54 that it started showing a very significant drop in its altitude as well.

Mr Bills—There was the normal descent profile initially and then at about 1858 or thereabouts, it became very steep as shown by the blue line.

Senator BUCKLAND—Yes. It just seems odd to me that we cannot get agreement between the parties—and I do not want to pursue that because it is an issue that is done with now—and there were conclusions drawn by the coroner, using the expertise that they were able to get, that conflicts with ATSB about which engine went first. As I say, I do not think very much for us rests with that, but it really does highlight to me that someone is not too sure what happened—probably no-one is entirely sure. But there is such a varying difference in opinions as to how it happened, I suppose that is really why I am asking for this to be going on now.

Mr Bills—It is extremely complex and there is limited data. We ourselves changed our view as we analysed further data, so there was a difference between our draft report and our final report. We did not have a mindset we were locked into; we changed our mind when we got additional data. But even with that additional data, there were still areas which will never be known. The key thing that directs us to, I think, is to be a bit humble in this process and not pretend to know all.

In terms of the committee, your role may be somewhat similar to ours, which is to make sure that any safety deficiency, irrespective of which scenario is right, is covered off so that future safety is best protected. That is really where we are at: we have endorsed the safety recommendations that the coroner has made. In fact, most of them we suggested he make or had made ourselves before. But there are some others that flow from our scenario that we believe also need to be addressed.

Senator BUCKLAND—It just seems that a few of the comments in that supplementary report invite the notion that, if you really push the comments in the report to their limits, the pilot may well have been errant in some of his actions. That does still concern me. As I say, I do not want to go into that but it keeps coming back to that: overreaction, why it went to the right and I think there were comments as to why he did not drop down. Again, not being a pilot, I think I would stay up as high as I could for as long as I could to glide. It probably glides like a brick. I am not sure what they are like when they do not have engine power.

Mr Bills—The key thing in transport investigation, aviation investigation and in other areas is that there is a huge amount of data that shows that humans make errors normally under stressful circumstances and make errors even in non-stressful circumstances. There are mistakes, lapses and omissions. None of these are deliberate with the intention of causing harm. They are not breaches of regulations; they are not frivolous actions. Humans under pressure make errors. That is the reason why defences are designed into systems so that, if an error is made, there is some sort of recovery process. So to say that this pilot may have made an error is not to blame the pilot, it is to say that he is human.

Senator BUCKLAND—And no-one has.

Mr Bills—I know you are not.

Senator BUCKLAND—But when you pick that up and read it, it does come to mind.

Mr Bills—There is a straw man argument that I think was advanced to suggest that we were indeed blaming the pilot because of the fact that the right engine developed this hole. But the scenario that was advanced by the coroner and his team, which has the hole being melted early in the flight before anything else went wrong, actually creates a worse scenario for the pilot because the stress of the situation of having lost an engine has not already occurred. Instead, somehow there is just a hole melted in that No. 6 piston in a non-stressful situation. So on either scenario there is an issue; on either scenario we do not know the full circumstances; and we are not blaming the pilot.

Senator BUCKLAND—It is probably best for Dr Romeyn to answer these questions. However, before I do that: Mr Cavenagh, before you came to the table, I raised the question of the effects of the counter-rotating propellers as opposed to same way rotating propellers.

Mr Cavenagh—Yes.

Senator BUCKLAND—Believe it or not this is schoolbook learning from many years ago, but my understanding is that, if you lose one engine, the other engine does not always fully compensate. That is, they may be the same power, but what is the effect when you lose an engine? Does it severely go one way or is it like when you had same way turning propellers where you had to push one foot down to get the yaw or whatever to adjust?

CHAIR—There was a Twin Comanche that just went down—

Senator BUCKLAND—I understand that and that is why I am asking the question because I do not understand. I do know from reading that, if you lost an engine, they used to say it was going down because the second engine was not a primary—

Mr Cavenagh—We did not focus closely on the minimum control single engine speed of the aircraft with respect to the radar record that we had, because we knew at that stage that the aircraft had quite sufficient flying speed to safely continue. And loss of controls due to severe asymmetric effects, which is what happens when you get to a minimum control speed, was not an issue at those sorts of speeds.

As to how far and how severe an aircraft might yaw when one engine does fail is a function very much of the aircraft and its design. Some aircraft can yaw fairly nastily; others are fairly benign; so it does vary from aircraft to aircraft. With this particular aircraft, it is not a sudden whip type manoeuvre, it is a more gradual manoeuvre. But it is something that would be quite evident to the pilot and probably the passengers and evident in the sense of they would feel it within their sort of seat-of-the-pants type feeling, if I can use that expression. It would be just like when you are driving a car and you get into a skid—you can feel yourself going sideways.

CHAIR—But this particular aircraft can or cannot maintain straight level flight with one engine and a full load?

Mr Cavenagh—With a full load it would depend on a number of things—temperature of the day and that sort of thing. But with the load it had on this night, it was capable of maintaining altitude on one engine.

Senator BUCKLAND—The graph that we referred to earlier pretty well indicates that that is what happened, too.

Mr Bills—It is probably worth mentioning that, in our original report, attachment C refers to a number of other ditching occurrences internationally. There are some where the aircraft could not maintain the altitude on the remaining engine, and they have been documented. So it does happen. The really difficult circumstance here was that this pilot had to ditch at night where there was no moon, it was poor weather and he was into Spencer Gulf.

Senator BUCKLAND—When the propeller is going down, that is the stroke, if you like, that has the effect on the control of the plane or the thrust? I mean, it is all thrusting but it is in fact the downward pressure that would actually have the effect on the control surface, wouldn't it? So if it was going counter clockwise it would have a different effect to if it was going clockwise, wouldn't it?

Mr Cavenagh—In general terms, yes, but this is a very complex area of thrust vectors and air flow behind the propeller, and that leads to the notion of which engine is critical. As I indicated earlier and as you said, Senator, the propellers on this aircraft rotate in different directions. I do not recall at this time whether the operating handbook does refer to one engine being the critical engine. That is something that I will need to check.

Senator BUCKLAND—I might need to get away from the boys' own annuals for a little while. I cannot even find the books I used to read that go to that; I just remember those features about them. Dr Romeyn, could you explain how the failure analysis of the left engine was carried out by ATSB?

Dr Romeyn—In general or in detail?

Senator BUCKLAND—In general terms, because in detail I think would go into the technical findings of that.

Dr Romeyn—In our report, for example, figure 14 on page 39 has the overview schematically as to what we are trying to achieve. With any of the failure analysis type of work, it is a matter of reviewing all of the available physical evidence, considering any other recorded evidence and any other reported evidence, and looking at it. Through the body of that section which deals with the analysis of the failure, there are other diagrams in there which break down each component.

Mr Bills—This is the original report.

Senator BUCKLAND—This is now the original report.

Dr Romeyn—Yes.

Senator BUCKLAND—I can remember going through that.

Dr Romeyn—From a basic point of view, it is a matter of looking at all the available evidence, seeing what key events have occurred and classifying them correctly. For example, if there is a fracture of one of the components in a subassembly or in the whole engine, working out what mechanism caused that to fracture. In a lot of engine components, because they are being subjected to loads which vary over time, they alternate and fatigue is one of the prime mechanisms for developing cracks. Those cracks will grow steadily until they reach a certain size, at which time the component can no longer handle the operating stresses and you have a fracture.

Once you work out your key events, it is a matter of looking at the linkages between various events and seeing what factors are potential initiating factors. For example, if you are looking at a fatigue failure, fatigue is a fairly complex mechanism which is affected by: first, material and basic material properties; second, the detailed design of the particular component. That is like the little geometrical features about how sharp radii are, whether there is any surface damage, whether it has been surface hardened, how smooth the surface is.

The third most important point is the nature of the loads that are applied to that component or subassembly. So the loads will be the steady loads plus the alternating loads. Then the issue is what stresses those loads create within the component. Additionally, you can get stresses from heating or cooling—in particular, differential heating and cooling. So it is looking at all those issues for each component, working down to the key one, coming back and looking at the big picture, looking at other associated subassemblies and components, seeing what is common and what is different.

Senator BUCKLAND—Who exactly did the analysis? Did you do it yourself?

Dr Romeyn—Yes.

Senator BUCKLAND—And over what period was that conducted?

Dr Romeyn—Initially after the accident I was off work with a fractured ankle.

Senator BUCKLAND—I think I have heard about this.

Dr Romeyn—When I came back to work that was my task after that, so that would have been in September 2000. Subsequently we have revisited parts of that work. In a lot of these things there are issues that develop. Occurring within that period there were other engines that had failed, had structural failures, so that same methodology was applied to what evidence was available.

Senator BUCKLAND—With respect to the left engine that failed with the crank case, it had not been in the plane for very long, so it was a reasonably new or young engine—

Dr Romeyn—In the report, I think it is something like 200—

Mr Bills—It is 262.1 hours.

Senator BUCKLAND—But it was from a batch that was recalled due to crankshaft concerns; is that right?

Dr Romeyn—That is correct.

Senator BUCKLAND—And had it been back for someone to have a look at, or was that batch found after the crash?

Dr Romeyn—The issue with the recall of the crankshafts occurred much, much later.

Senator BUCKLAND—Much later?

Dr Romeyn—Yes.

Mr Bills—There was an initial service bulletin in February 2002, but the first service bulletin that mentioned the left crankshaft by serial number was 16 September 2002, which is roughly nine months after our report.

CHAIR—What caused that to happen—just a history of these things failing?

Mr Bills—The service bulletin? Yes, there were a number of failures in the United States.

CHAIR—Were they associated with a bearing failure as well or did some of them just go ‘boom’?

Dr Romeyn—The common issue that was raised was the location of the fatigue fracture. Being at the No. 6 journal, initiating in the forward fillet, I guess it becomes a little muddy because there are a number like that. But in some of the documentation that we got from the FAA, the diagrams that were shown there show fatigue cracks propagating through the crank web between No. 5 and No. 6 connecting rod. With MZK and the Sharp Aviation one, the fatigue crack initiated in the radius and propagated into the web but then through the journal itself. So there are subtle differences. But I think the FAA response was directed to a more general issue of fatigue failures.

CHAIR—So they did not think it was caused by a mechanical fault; it was just a structural fault in the steel? It was not just a bit of slack or a little bit of movement in the con rod. Did they think it was a poorly constructed crankshaft?

Dr Romeyn—When you go through the FAA service bulletins and the introductory remarks, they have basically attributed the initiation of the cracks to what has been termed sometimes as a random metallurgical flaw, but that flaw has not been clearly characterised.

CHAIR—Are you in disagreement with that?

Mr Bills—We are not in disagreement with that. It is more a matter that, of the crankshafts in the suspect batch of this material that was tested based on the service bulletin, 30 per cent of them were found to have steel that was suspect and 70 per cent of them were allowed to go back into service where the steel work was fine. So the issue is: was the MZK left crankshaft one of the 30 per cent or one of the 70 per cent? That is where it gets complicated and confusing. The simplest explanation would be that it is one of the dodgy batch. But all the testing that we have done—indeed, that others have done; and Dr Romeyn has done the testing—indicates that it was not part of the dodgy batch. It failed for a different reason.

Dr Romeyn—Just to add to that—

Senator BUCKLAND—Just before you do: are you saying that, whilst the engine number said it was within that batch, it was not found to be one of the dodgy ones?

Mr Bills—That is right, exactly, and crankshafts fail for a number of reasons, not only material defect.

Senator BUCKLAND—Of course.

Mr Bills—And this one was not, in our view, a material defect under normal engine operating conditions.

Senator BUCKLAND—Go ahead, Dr Romeyn.

Dr Romeyn—That is all I was going to add—that there is not just one sole reason for fatigue cracks initiating in crankshafts. There are quite a few different reasons.

Senator BUCKLAND—So at the end of the day you come up with a scientific theory as to how this all developed. Has that scientific theory that ATSB holds been subjected to rigorous peer review? I understand that it was tested through the coroner’s court, but in itself would it be normal for you to come up with a conclusion and then send it off for someone else to test your theory?

Mr Bills—This investigation was a bit different from normal in many ways.

Senator BUCKLAND—This was all prior to the coronial inquiry?

Mr Bills—Yes, but our draft report, which was sent to interested parties for comment for the specific reason that we wanted to clear up any factual disagreements and also as a matter of natural justice, was leaked to the

media, you will recall. In particular, that caused distress not only for the operator but also for the families because this happened without any notice.

Our final report of December 2001, as I said earlier, changed some of the analysis based on some further work that we had done and also some of the inputs that we got as a result of the draft report being out for consultation. Because it was such a significant change, my preference would have been to circulate it further, again including to a number of experts, to get their peer views, as you are suggesting. The problem was that the media told us that, if we circulated another draft, it would be leaked to them within 24 hours. So we were in a difficult position. That is probably the most important reason why our new act imposes a very substantial penalty for people who make public our draft reports. That is essentially the issue. But subsequently there has been a lot of dialogue with the FAA, with CASA and with others as well as through the coronial process that you referred to.

Senator BUCKLAND—It raises other ethical questions, and I do not intend to pursue those. But surely the threat of further leaks would not stop you getting a scientific theory tested. It certainly would worry you, and I guess I would be looking around behind doors to see who was doing it, but surely it would not stop a scientific verification process.

Mr Bills—Dr Romeyn is a very experienced metallurgist and failure analyst and he believed that the mechanism for this crack was properly characterised by his work. So it was not so much a theory as a matter of expert judgment. Indeed, based on all the other work that has occurred subsequently, it appears that his expert judgment was absolutely right first time.

There have been plenty of other theories as to why this crankshaft broke related to material defects. Each one of them that has been tested, looking at the other side of the equation, has been found to be wanting, whether it be high temperature oxide inclusions, a stray large inclusion at the site of the fracture or a honeycomb feature.

Senator BUCKLAND—I was going to come to findings in the oil and things like that later. Has ATSB been asked by anyone to test and verify the findings that they found into failures of the crankshafts on other engines, particularly those that were in that batch or the nine that were referred to earlier?

Mr Bills—In terms of the multi-engine study that Dr Romeyn is still engaged in, when he has written that up in the new year, it will go out to experts both in Australia and overseas before we finalise the report. We have not been asked to do that, but that is our normal procedure.

Senator BUCKLAND—Does anyone come to you and say, ‘We have found this happen, can you run your eye over it and see if you agree or disagree’?

Mr Bills—I am sure that happens from time to time.

Dr Romeyn—Is this in failures that have occurred?

Senator BUCKLAND—Yes, particularly on these crankshafts.

Mr Bills—Say like Sharp, for example.

Dr Romeyn—Not all our work comes as the result of an accident. Some of the other work comes from what we call incidents, such as engine failures that have not caused any drama in-flight. They have been successfully shut down, and the flight has proceeded with a safe landing. We are interested in looking at those when we can get a look at them. A lot of information is available, and that forms part of what we call our proactive investigation work.

Senator BUCKLAND—How can you actually withdraw a defective component as being the cause of the failure? We know there was a fatigue crack, yet it seems you are saying that it is not necessarily a defective component. How can you come to that conclusion?

Dr Romeyn—Like I said before, with issues relating to fatigue cracking in components it is a function of material, a function of detailed design and a function of the applied loads. To put it more simply, if you want to break a paper clip you bend it back and forwards. If you bend it back and forwards very slightly, it will take you a lot longer to break it; if you bend it back and forwards more vigorously you will break it more quickly. That issue is a function of the applied loads, not a function of the material of the paper clip. When you look at these things, the danger is in oversimplifying and not looking at all of those features that come together.

Senator BUCKLAND—The failure of the left engine, can that be replicated at all on a test bed? Has there been an effort to try to replicate what might have happened?

Dr Romeyn—From memory, Lycoming, the engine manufacturer, has run an engine on a test bed and has broken it. If you operate the engine under conditions of higher than normal loads, then the outcome is you will break some components in the power train and you could break the crankshaft by a fatigue mechanism.

Mr Bills—It is also worth mentioning that the Sharp Aviation incident that Dr Romeyn referred to earlier was the case where almost an identical break in the crankshaft occurred. The failure mechanism involved, we believe, a fatigue crack thermally initiated; the crankshaft remain dogged; and in almost every circumstance, it was very similar to the MZK left failure. While that is not done in test circumstances, it is another example.

Senator BUCKLAND—With respect to testing of your theory, how does ATSB react to that being put under scrutiny? Do you believe that your testing is sufficiently accurate to not warrant other people testing it? That seems to be what happened with the coroner's report. You get a divergence of view. It seems to me that there is a bit of 'I'm good enough' that does appear in some of the writing. It is a matter of 'I got it right the first time, why should I be tested? It is putting my reputation and my ability on the line.' There seems to be a little bit of self-preservation.

Mr Bills—That is not really a problem for us. We do not mind being tested provided that it is done in an objective and non-adversarial way. It is where we find ourselves in a process that is adversarial and linked to other legal issues, including damages issues, that we can have some difficulty—as occurred in this case.

Our normal methodology is to work in a team with internal criticism and scrutiny. Then when we have a draft report it is circulated widely in Australia and internationally and always given to the regulator, CASA. If it is a US-manufactured aircraft, it is generally circulated overseas. Everyone has an opportunity to critique the draft report and to make suggestions as to how it can be improved. That is not the process that you would apply if you were not interested in other comments.

In terms of after we have developed a report, of course we are willing to listen to other views but hopefully we have captured them in that earlier process. In this case, we had these service bulletins issued after our report was released, so it was a different circumstance from most—there was this potentially new information. As I said before, superficially it sounded as if that could solve the reason why the left crankshaft broke in a neater manner than our investigation had found. But it turned out not to be the case; it was indeed as Dr Romeyn had initially found.

Senator BUCKLAND—The testing that Dr Romeyn did, that was not destructive testing, was it?

Mr Bills—No, initially it was not destructive testing, but subsequently in March this year it was after we got the crankshaft back from the United States.

Senator BUCKLAND—Why wasn't it done originally?

Mr Bills—I will let Dr Romeyn speak for himself but, in general, if you can test a component and establish a failure mechanism based on the tests that are done, including in this case chemistry tests with an external laboratory, as well as the internal work that was done, then you do not test something to destruction because it may be needed in evidence in other inquiries, including coronial inquiries.

Senator BUCKLAND—So if I draw from that that the crankshaft had not destructed at the time of the crash—again, using my words, and I would like to be corrected if I am wrong here—it was the bearing failure that led to the engine stopping?

Mr Bills—No, it is more complex than that. I will let Dr Romeyn take you through it.

Dr Romeyn—The crankshaft had fractured. There was a separation of the No. 6 connecting rod journal, so the crankshaft was in two pieces. Because of the angle of the fracture, and it is being held in a crank case with bearings, it can rotate for a short period of time until you get enough working between those two parts where it starts to slip, and you can see that clearly. The process that led to the development of fatigue crack at that location is likely to have involved the bearing insert that was installed in the No. 6 connecting rod.

The difficulty in all of this is the use of terminology. There are a number of issues with bearing inserts. With the bearing material, which is like a lead tin material that overlays an aluminium tin which is bonded onto a steel backing, there are a number of ways that can break down. There are quite a lot of complex issues there. The adequate location of that insert within the housing is also an important issue.

When we are looking at a potential chain of events, it is in how that bearing insert was retained, how it was damaged in service. Unfortunately, as it all goes through, the primary evidence that we had was that, with regard to the sections of bearing that were recovered, basically all that remained were very thin bits of the steel backing that had been extruded out. That is what we have got.

I would just like to explain something, Senator, about testing. The work that is done typically with failure analysis does not just work on testing in the sense that you apply a procedure and you look at some result. It is a matter of observing the available evidence, and that evidence can be microscopic. So there is a lot of observational work. It is not directly applying a test and getting a numerical answer. I hope that clarifies some issues.

Mr Bills—And in terms of the bearing problem here, I go back to figure 57 in the supplementary report where Dr Romeyn has illustrated how we believe the edge of the bearing back just touched the crank initiating this fatigue crack through the surface heating effect, rather than anything beneath the crankshaft as a result of a material problem.

Senator BUCKLAND—I have to say that it did strike me as curious that there was no destructive testing until after it came back from testing in the United States. I accept what you have said in answer but I do find that a little bit unusual.

Mr Bills—In hindsight we would have destructively tested, and certainly if we had known the service bulletins were there prior to concluding our initial investigation, there would have been destructive testing.

But just to give you an example of how it is easy to be wise in hindsight, the coroner had control of this crankshaft between March and August 2002. He was happy to allow it to go to the United States without any destructive testing having occurred at that time. That was prior to the September bulletin that listed the MZK left crank by number. So if it was so obvious that destructive testing should have occurred, then it could have occurred in Adelaide or it could have occurred jointly between Adelaide and us at that point. But it was not that obvious.

It did become obvious after that third service bulletin that we needed to have another look and do the destructive testing. The hope was that that would have been done in the United States in October prior to Dr Romeyn, the coroner and the whole team going over there to see the results. But it did not happen because of, I guess, various wranglings in the legal area over there. It required us to put a bit of pressure on for the testing to ultimately occur in January. There were problems with that, as the committee knows. Ultimately that testing led to a fairly small report, but it did rule out a number of things that the coroner's experts had opined. Then we got the crankshaft back and were able to do some further work, which again showed no further problems with the steel. It is easy now to say that we should have done destructive testing back in 2001 or 2000, but it was not obvious to us at the time.

Dr Romeyn—Just to add to that on the issue of destructive testing, we are very much aware that we are the first player in the line on any of these issues and basically to do the destructive examination would have destroyed a significant volume of the crankshaft material at the critical location of the fatigue initiation site. When other players in the aviation safety industry needed to look at it, we would have just had what photographs we would have had of that area. There is a judgment that you have to make as to whether you have gained enough evidence out of it to keep it intact so that it is there. Any of the material issues that subsequently surfaced occurred much, much later.

Senator BUCKLAND—Throughout the ATSB report there is the reference to the 50 cycles of the crankshaft before it broke and, of course, you relate 50 flights to 50 cycles which even I can understand. What science was used to come up with the fact that there had been a problem for 50 cycles? I have read the report but I still have difficulty—why couldn't it have been 20, 30 or 60?

Dr Romeyn—The estimate that was on there is approximately 50. It is a feature of fatigue crack growth that occurs when the loads are not all uniform or constant, the alternating side of it. Where you do have the spectrum load situation, it means that you have high peak loads alternating as well as other ones. If you look at the figures in those reports that show the fatigue fracture surface, you can discern on those a pattern of sequential markings that people loosely refer to as beech marks where they are growth rings on trees. Those fracture surface features do not occur at random. They relate to the loading cycles that are imposed on that component.

In the case of a crankshaft in an engine, you do have a spectrum loading situation in that there are no alternating loads when the engine is off. When you turn the engine on and you spin it up under rpm, there will be a load on that. And then imposed on the top of that load there are other inertial loads and combustion pressure loads. It is a combination of that whole flight spectrum which gives you the actual features on the fracture surface.

The basis for that is well established in literature on fatigue. In fact, when people do full-scale fatigue testing—say down here in Australia at the defence science labs—you apply particular spectrum loads in which you put in marker loads. So when you actually get the fracture, you can look for the marker loads because they will come up as a distinct fracture surface feature. That allows you to plot out the time over which that crack has grown. When I am talking about time, it is loading cycles. Fatigue cracking is not just time based; it is alternating loading cycle based.

Mr Bills—The reference in the original ATSB report, which Dr Romeyn wrote, is on pages 56 to 60, if you need to refer to that.

Senator BUCKLAND—This idea of the crack propagating one striation, is that just from a normal theory of metallurgy that you come to that? Just as you can dig through the sand and find out how old the earth is, is it through scorching, burning or staining to be able to—

Dr Romeyn—Are you referring to those more distinct markings that you can see?

Senator BUCKLAND—Yes.

Dr Romeyn—They represent periods of significant load change. Within each of those bands there will be further progression from other engine alternating load cycles. What happens is that where the crack is small, only major loads will cause the crack to advance. Once the crack gets bigger, the stresses at the crack tip are such that the lesser loads in the loading cycle cause the crack to advance. That is why you see close to the origin that those markings are close together and, as you get further away, they become wider.

Senator BUCKLAND—And the higher load periods would be on take-off and the climb?

Dr Romeyn—Yes, that is right.

Senator BUCKLAND—I suppose the initial part of the climb and then on landing; is that right?

Dr Romeyn—No, it would relate to in this case just the dynamics of the crankshaft. Obviously when it is rotating at maximum rpm and subjected to maximum gas pressure loads from combustion would be the highest load situation.

Mr Bills—It is probably worth noting that virtually everyone at the inquest, and certainly the coroner, concluded that roughly 50 cycles was the period over which the fatigue crack developed in this left crankshaft. That is not an area where there has been any major disagreement.

Senator BUCKLAND—I am just curious as to how you can come up with that figure.

Mr Bills—Sure.

Senator BUCKLAND—And Dr Romeyn has been helpful there.

CHAIR—We will have a short break.

Proceedings suspended from 6.14 p.m. to 6.21 p.m.

CHAIR—We will reconvene. We will have some questions on notice towards the end of proceedings, and I am trying to encourage Senator Buckland to finish at 7 p.m.

Senator BUCKLAND—I propose to carry on, but there is a point where I can conveniently stop because the rest really goes to mechanical engineering material that can be confirmed quite easily in writing. With respect to the testing that has been carried out to date by ATSB into the engine—in fact, the two engines in this case—has that drawn any complementary conclusions; that is, other bodies who agree with your findings?

Mr Bills—In terms of the right engine, there is no dispute that the hole occurred as a result of excessive engine temperature conditions. The only issue is whether it was the right engine after the left or before the left.

Senator BUCKLAND—Yes, and the duration that it had been operating with the hole.

Mr Bills—That is certainly an issue. We think that one of the reasons it is far less likely to have occurred early on is not only that it was a low stress part of the flight and the pilot did not notice it but also that if there was a hole then, there would be a venting of oil that would have occurred which would have made it difficult for that engine to still be turning over at the point of impact. And unlike the left engine where the propeller blades were feathered, the right engine blades were in the operating range. There was some power on that engine fairly close to the point of impact, and the propellers were rotating at impact, as the report explains.

Senator BUCKLAND—Yes.

Mr Bills—So there is not really a dispute with the right engine in terms of any of the metallurgical evidence; it is more a matter of the sequencing.

Senator BUCKLAND—With respect to the left engine, the crank case, have you drawn any supportive scientific organisations to say, ‘Yes, your testing procedures have come up with the correct analysis of what went wrong’?

Mr Bills—We have not sought to do that in any explicit way. The evidence is in the report. To put it in a different way, the alternatives that have been proposed throughout the inquest, which related to the material flaw in the crankshaft, have been analysed in great detail and each of those, as they have been analysed, has fallen away as an explanation.

Senator BUCKLAND—Fallen away by whom? Has it fallen away from your judgment or a collective judgment?

Mr Bills—It is in our judgment but it is based on the hard evidence, and the hard evidence is there for anyone to see. For example, the initial theory of the South Australian experts assisting the coroner was that there were massive high temperature oxide inclusions in this crankshaft that had been baked in there or certainly part of the steel making process. When they initially looked at the pieces that had been sectioned out of the crankshaft and encased in bakelite, they did not notice these high temperature oxide inclusions. Later on, they did notice them on two occasions. But having removed 55 microns, which is roughly 0.05 millimetres from the surface, these massive high temperature oxide inclusions disappeared. And we believe that what was being seen was basically surface corrosion.

McSwain in the United States, the company that was doing the work for the families, initially agreed with the South Australian experts that these things occurred, based on whatever observation they made of this sample. But when they did their further testing, including the destructive testing, their report said there was no evidence of massive high temperature oxide inclusions. Given that they had an incentive to find them and they did not find them, that is good confirmation that these things did not exist.

The second theory in terms of a problem in the steel was that there was a large inclusion just at the site where the fatigue crack was initiated. That also was subject to the destructive testing regime in the United States, and when they got down to the initiation point there was no inclusion there. The speculation then changed to the fact that it might have dropped out, but there was no evidence. Dr Romeyn can talk about how likely such an inclusion dropping out without any evidence on either side of the fatigue crack would be, but we do not believe it was very high.

The third possibility was that there was some sort of a honeycomb feature in the steel, which is the type of effect Dr Romeyn was talking about earlier, that is linked to the service bulletins. But there has been no testing that has shown that. We have had testing done by an external laboratory, as well as internally, and found no such thing related to the crack in MZK. On the other hand, CASA has indicated that the physical evidence is consistent with a thermal crack, as Dr Romeyn has suggested all along. The alternatives have been progressively ruled out, as far as I am concerned. That did not stop McSwain in the US saying that it was probably a material defect in their opinion but they may change their opinion, and all the rest of it. And that led to a settlement of an amount that we talked about last time.

CHAIR—When this plane crashed, did you say that the propellers were still rotating?

Mr Bills—The right propellers were still in the operating range.

CHAIR—They were not feathered—

Mr Bills—Correct. The left propeller was feathered. So the right one was in operating range rotating and hence it has some bending. We can show you in the report a picture of that which makes it clear—

CHAIR—So they do not auto-rotate?

Mr Bills—Auto-feather—certainly the left engine would have auto-feathered after the crankshaft broke, but the right engine would not have, based on the hole in the No. 6 piston alone.

Senator BUCKLAND—I know the legal arguments that went on in America before the tests were carried out about who was going to be there, how it was to be done, the rules, how much each one was going to get paid to watch the tests—that is the American system, sadly, and hopefully not ours. So I understand all of that and know all that went on. But how different from your theory is that of the engine manufacturer in their conclusions or their views?

Mr Bills—We have not had a lot of information from the engine manufacturer as to what their views are. They wrote us some comments in February—2002 or 2001?

Senator BUCKLAND—2002, I think.

Mr Bills—I do not think I brought that with me, but certainly they initially made some comments along the lines of their view was that there were excessive engine pressures in both engines and it was not the engines that were at fault. But they would say that, wouldn't they?

Senator BUCKLAND—That is why I am asking the question because, apart from the manufacturer's position, all the evidence tends to say that there was a problem with this particular engine range and hence the batch that were defective and the comments about the nine engines that we referred to earlier in CASA's evidence. I can understand they are protective of their position because they make an awful lot of engines and there are an awful lot of airplanes flying around with them. So they certainly have a vested interest. With respect to the technical and scientific evidence that Dr Romeyn came up with, do they hold the same view as you as far as the metallurgical analysis or the engineering analysis is concerned? I am just interested.

Mr Bills—The key thing is that, once this all got embroiled in litigation, the engine manufacturer was not forthcoming with any information. Just going back a step to some of your introductory words there, of course it was the engine manufacturer who issued the service bulletins—Textron Lycoming, the engine manufacturer. So they were the ones that identified problems with the batch of crankshafts and were quite open about that. But they have never actually said what they think, other than that early comment that I referred to, occurred in this case; so we just do not know.

Senator BUCKLAND—Did Textron Lycoming do any independent testing of the crankshaft of MZK?

Mr Bills—No.

Dr Romeyn—No.

Senator BUCKLAND—Did Textron Lycoming have people present when testing was carried out in America?

Mr Bills—Yes.

Senator BUCKLAND—At all times?

Mr Bills—As far as we are aware but we are somewhat hampered by the fact that the testing in late January this year occurred without our knowledge.

Senator BUCKLAND—I am coming to that later.

Mr Bills—But our understanding was that Textron Lycoming were represented there.

Senator BUCKLAND—But you were not always present—you were there for most of the testing, as I recall?

Mr Bills—That is correct. We were there until the testing was halted around lunchtime on 16 January.

Senator BUCKLAND—Can you just explain the circumstances of that to us? Who was there? Was it Dr Romeyn?

Mr Bills—No, Mr Blyth was there, who is with us this evening. So if we get into detail, then he can certainly assist. But essentially he was there as an observer; he had no influence on the decision making or on what did or did not happen. As I understand it from Mr Blyth, and it is in a number of written reports that have been given to the coroner and others, there were some discussions about finishing at that time. Despite the fact that the work was not completed, they did finish the testing at around one o'clock on the 16th. The objective of the testing had not been met. They had not got to the point at which the fatigue crack was initiated. The crankshaft was boxed up and sent back to R.J. Lee in Pennsylvania; that is my memory. We complained very quickly to the coroner's counsel assisting and solicitor that this had halted and the testing had not been completed. There is a long story associated with that—

Senator BUCKLAND—Yes.

Mr Bills—I do not want to go there if you do not—

Senator BUCKLAND—It does not help us very much. What was the reason that Mr Blyth was not there, though? Was it a toilet break or a break like we have just had?

Mr Bills—In the second part of January?

Senator BUCKLAND—Yes.

Mr Bills—Because the testing was completed, the crankshaft was sent to another city in the United States and there was no agreement to recommence testing.

Senator BUCKLAND—But the testing did recommence?

Mr Bills—The testing did recommence.

Senator BUCKLAND—Who was there as observers? We know Mr Blyth was not. Who was there?

Mr Bills—There was no independent observer, and that is part of our problem. The coroner had made an order on 3 January this year that, whenever the crankshaft was unboxed and destructive testing was performed upon it, any party could be present, including the ATSB. We had clearly indicated that we wanted to be present because we thought it was important that there be an honest broker there to see what happened. Based on the days that Mr Blyth was there in the middle of January, we believe it was essential that that honest broker observer was there.

I discussed with counsel assisting, Mr Eriksen, the need for this testing to be completed. I wanted it to be done back in Australia because I thought there had been enough sort of games played. I suggested to him that, if the coroner needed a legal instrument for us to get the crankshaft back, I could issue a section 19CC notice. Mr Eriksen said, 'No, that won't be necessary. It will even slow the process down,' and was keen to get the crank back as quickly as possible. He was going to get back to me. Well, he did not.

I called him again, and he said that Mr Greenwell for the families and McSwain in the United States were still suggesting that the testing had been completed. We said, of course, that it had not, and I said then that we wanted it back and would a section 19CC notice be the appropriate mechanism. He seemed to be amenable to that and asked some questions about whether our laboratory was capable of doing the additional testing required, the destructive testing. I said that it was and I thought that the coroner would agree to return the crankshaft to us to finish the testing. But suddenly it appears that the coroner authorised Mr Kernahan to have the testing recommenced at the end of January without anyone being there as an independent observer, certainly without us being there. That is essentially the story.

CHAIR—What do you think that was all about?

Mr Bills—Look, I do not want to speculate on motives. There was probably some time pressure.

CHAIR—Was there some sort of ulterior motive?

Mr Bills—I would not suggest an ulterior motive. I am just saying that the coroner's order allowed us to be there; this happened without us being there; and it happened in circumstances where I thought I had an agreement that the crankshaft was coming back to us to finish the testing.

CHAIR—Was it a matter of costs?

Mr Bills—Subsequently we offered to pay for it to come back. So it would not have been that or it should not have been.

CHAIR—How long were you there observing all this when you were there?

Mr Bills—There were two occasions. There was the first occasion where Dr Romeyn, Mr Cavenagh and our SC were over there in October with the coroner.

CHAIR—For how long—a month?

Mr Bills—For a week or so—10 days?

Dr Romeyn—Two weeks.

Mr Bills—Two weeks at great cost.

CHAIR—It was not a cheap exercise.

Mr Bills—It was not a cheap exercise. And then in January Mr Blyth would have been there for the best part of a week?

Mr Blyth—Yes, that is right.

Mr Bills—And still it was not complete. So by that time we were getting a bit annoyed that this was being delayed.

CHAIR—Someone standing on the railway station or on the tram or standing at the back of court or a casual observer might have thought they were just playing games.

Mr Bills—Well, there was a lot of legal toing and froing—exactly right.

CHAIR—And that is never about the truth; it is always about the law.

Mr Bills—We believe that our process is more likely to uncover the truth because we do not have an axe to grind. That is really the theme of what we have been saying.

Senator BUCKLAND—Some of my questions on notice will actually go back to where we are now, but there is another area of questions. I was going to finish on this but, because of time constraints, unless I change now, I will not get to it and I would rather ask these questions directly of you. The rest I can put on notice. During the coroner's inquiry the ATSB engaged Russell McIlwaine SC to attend the coroner's inquiry and act upon your instructions. Who was actually instructing Mr McIlwaine? Did you, Mr Bills, instruct him yourself or was there an officer assigned to instruct counsel?

Mr Bills—The way legal matters work in the department is that there is a department legal area that controls expenditure and is involved in the selection of counsel; so it is not a decision that we make unilaterally. Mr McIlwaine had previously acted for the ATSB and BASI—or maybe just BASI; no, it would have been the ATSB as well because he was involved in VHS case C in Perth. The instructing solicitor was Mr Greg Kathner, who is a senior executive lawyer with the Australian Government Solicitor. He is also based in Sydney and has had significant past experience with air safety investigation matters.

Senator BUCKLAND—So the selection of counsel is made. At some point in time someone from ATSB would have to tell the story so that McIlwaine SC knew what he was talking about come the coroner's inquiry. Who was the individual person from ATSB that was assigned to do that or were there group sessions? It would have been with junior counsel, I imagine.

Mr Bills—No.

Senator BUCKLAND—It was directly with McIlwaine?

Mr Bills—It was either directly with McIlwaine or through Mr Kathner, and it occurred as part of the team. So the four gentlemen you see at the table today were all involved in that.

Senator BUCKLAND—The four of you were. How often did you have contact with McIlwaine before the inquiry began?

Mr Bills—Not that often. There was a meeting with counsel assisting the coroner and his team early in the piece, on 1 March 2002. They came to ATSB and had detailed briefings on our report. An offer was made for them to come back at any time with questions to Dr Romeyn or others. But there were no significant comebacks, if you like, from that process.

We were operating on the basis, as we had been advised by the coroner's counsel assisting/solicitor, that there were not any significant issues until late in the piece when there was an issue raised about lead oxybromide deposits. But the key advice we had, and this is covered in the document I tabled at the start of this hearing, was that there was that one issue; the others were minor; the first six weeks of the inquest would be basically search and rescue; and there was no real need for us to be represented.

Yet when the inquest commenced, it turned out that there were half a dozen significant issues raised on 22 July last year. We had not been given any warning of any other than the lead oxybromide issue. Mr McIlwaine was not available to represent us at that time because of the advice that had been given and he had other matters to deal with. So that really set the tone of feeling as if we had been ambushed and were in an adversarial contest when we did not wish to be.

Senator BUCKLAND—So once it got started and it was known that you ought to be there pretty early in the process—not, as you expected, later—what was the arrangement? I have never briefed counsel in anything like this, only in industrial matters, but there is generally a report back to take further instructions or ATSB seeing proceedings and deciding that you need to give further instructions. How often did that occur once the trial started?

Mr Bills—Well, after the inquest started and we had had this surprising opening, for a period the solicitor assisting the coroner suggested that they were only minor issues, other than this lead oxybromide question, and that there was no sort of desire to get the ATSB or anything like that. So for a while we took them at their word and organised a meeting on 9 August mutually, and that is discussed in the document I tabled today.

It was after that meeting that it became obvious that we were really in a situation which was extremely adversarial. At that point, we were still only a couple of weeks into the inquest. Remember we had been told

that the first six weeks would be search and rescue, so we did not need to have Mr McIlwaine available and there was difficulty getting him throughout that period. Once he did become available and there were some periods where he was not available subsequently, we interacted with him on a daily basis. We would have at least one person from the ATSB, whether it be Mr Walsh, Mr Cavenagh, Dr Romeyn or a combination, at the inquest working with Mr McIlwaine all the time. And instructions would be either given on the spot or by reference to Mr Kathner in Sydney and/or me in Canberra.

Senator BUCKLAND—At any time did Mr McIlwaine give advice that caused ATSB to alter their instructions significantly; that is, change their position in any way?

Mr Bills—No, I do not think there would be any major issue of that kind. I am sure that he would have given some good advice from time to time but not on the big issues.

Senator BUCKLAND—Did you instruct Mr McIlwaine not to cross-examine the mechanical engineer Fred Zockel?

Mr Bills—No, and this matter is also covered in the document I tabled today. Basically, Mr McIlwaine was not available for the week in which Dr Zockel and Professor King were giving evidence. We were told, I think late on the Thursday before the Monday that the inquest was to resume, that this was the case. On Friday, we had to scabble around and find another counsel to represent us in that following week, but there was not time to apprise her of the detail of this very complex matter in order that she could cross-examine.

Senator BUCKLAND—You have just said he was not there during King's cross-examination either?

Mr Bills—That is correct, for the same reason that he had another matter on.

Senator BUCKLAND—And there was no junior counsel available to be there?

Mr Bills—Well, we got an Adelaide based counsel to represent us. But given the one day's notice, it was not possible to bring her up to speed on the complexities of mechanical engineering and fuel kinetics to ask questions.

Senator BUCKLAND—I see, although the expert advice was there. Was Dr Romeyn present at the time?

Dr Romeyn—For that week?

Mr Bills—No, I do not think so. We can check our records but at this stage, no.

Senator BUCKLAND—Was Mr Walsh or Mr Cavenagh present?

Mr Bills—Mr Walsh was present.

Senator BUCKLAND—Mr Walsh, can you just remind us of your field of expertise?

Mr Walsh—I am a transport safety investigator. My specialist trade is air traffic services and air traffic control.

Senator BUCKLAND—Did you say Mr Cavenagh was present?

Mr Cavenagh—I was not present that week, no.

Senator BUCKLAND—Who was junior counsel?

Mr Bills—There was no junior counsel throughout.

Senator BUCKLAND—I am sorry, the appointed counsel was how I think you referred to her.

Mr Walsh—Ms Gaby Brown.

Senator BUCKLAND—No instructions were given to Ms Brown to ask any questions?

Mr Walsh—That would be correct. As Mr Bills has said, they were extremely complex issues. There really was not the opportunity to provide a full and comprehensive briefing or instructions for Ms Brown. To try to develop questions or cross-examination issues on the go, which is basically what it would have had to have been while these people were on the stand or were giving evidence, was really an impossible task. It really was too complex at that time to be able to instruct on any specific line of questions. So we were at that stage in that week very much in monitoring mode, noting what had been said and ensuring that we noted the issues so we could address them at a later time.

Senator BUCKLAND—Did Ms Brown protest at all to the coroner her difficulties in lack of notice and lack of briefing? Did she make that known to the coroner?

Mr Walsh—You would have to ask Ms Brown. I do not know—nothing that I was specifically aware of.

Senator BUCKLAND—We can check the transcript, I guess.

Mr Bills—But it was really an issue at our end. The fact that Mr McIlwaine was unavailable at short notice was not anything to do with the coroner or his scheduling.

Senator BUCKLAND—No, I am not suggesting that but I would have thought that the difficulties would have been made known to the coroner.

Mr Bills—I understand.

Senator BUCKLAND—And a request for the right to recall witnesses may well have been made. I have to say that I have not read the transcript and am hoping I do not have to.

Mr Bills—I would not suggest it as a light read, Senator. There are thousands of pages. I think we can assume, subject to us checking, that she did not raise anything on the transcript. Whether she said something privately, as counsel do, we are not aware. But the key issue is, as Mr Walsh said, that we followed the evidence. We dealt with the evidence of the experts based on their written reports and what they gave in evidence through our submissions and supplementary submissions.

Senator BUCKLAND—Despite that, though, I understand there was an insistence by Mr McIlwaine for Mr Eriksen, counsel assisting, to provide written reports on the evidence of the two expert witnesses, Zockel and King; is that correct?

Mr Bills—We were keen to get final written reports from the experts because, going back to my comments 10 minutes or so ago, we felt that we had been ambushed with this list of disagreements that were raised in the counsel assisting's opening in the inquest which related to matters that these experts dealt with. They had virtually locked themselves in to a position that was adversarial to our report from the opening statement by counsel assisting, and that had been exacerbated by this meeting in Mr Eriksen's chambers on 9 August. So having experienced those two fairly traumatic events, we were keen to see what lay behind these experts' criticisms of our report, which is why Mr McIlwaine—I think correctly—wanted to see final written reports from these gentlemen.

Senator BUCKLAND—Seeing the reports and having an opportunity to examine the witnesses are really two very different things. Did ATSB instruct Mr McIlwaine to make arrangements to subsequently cross-examine these witnesses?

Mr Bills—In terms of Professor King's evidence, the cross-examination that occurred really confirmed all we needed to confirm. Namely, he agreed that the ANU and the University of Canberra chemists who had done the testing on the deposits that identified lead oxybromide was done in an appropriate scientific manner and that the test quality that was used was of a higher standard in terms of characterisation than the work that had been done at the University of Adelaide by Professor King. So he conceded that.

Professor King also conceded that, for our scenario, the real issue was the quantity of lead oxybromide deposits about 50 flights before the accident, which is when we believe the fatigue crack was initiated, not the amount that was in the left engine at the time of the accident itself. So there was no dispute there. And also Professor King agreed that there was a need for further research in this area because of its great complexity. And we agreed with that. So there was really no reason for us to cross-examine Professor King at a later stage.

Senator BUCKLAND—But at the time, prior to the examination-in-chief and cross-examination by others, you would not have known that?

Mr Bills—No, but your question was along the lines of why didn't Mr McIlwaine insist on recalling him—

Senator BUCKLAND—Exactly, that was my question. Did you instruct Mr McIlwaine, because he could not be there, to have these witnesses held for subsequent cross-examination?

Mr Bills—We did not instruct him to recall the witnesses or not recall the witnesses. In large measure, we relied on his judgment as to how best to proceed. But as I was saying, with Professor King, there was really nothing in his evidence that was out of sync with our own thinking. So there was no need to recall him.

Senator BUCKLAND—That might be a convenient place to stop.

CHAIR—You are very punctual.

Senator BUCKLAND—I am very punctual.

CHAIR—Thank you very much, gentlemen, for coming along and for your time and patience. The *Hansard* transcript of the hearing will be available in a day or two. We are putting some questions on notice from Senator Buckland. I declare the hearing closed.

Committee adjourned at 7.00 p.m.