



Process Review 2015

Into the conduct of the investigation into
the Fox Glacier accident
in September 2010

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Executive summary

The Transport Accident Investigation Commission (Commission) inquired into the circumstances and causes of the Walter Fletcher FU24, ZK-EUF, loss of control on take-off and impact with terrain at Fox Glacier Aerodrome, South Westland on 4 September 2010. The Commission published its findings and recommendations on 9 May 2012, making several recommendations to improve the safety of future parachuting operations. A year later the Coroner published findings and recommendations on the same event, but with a focus on the circumstances and cause of the deaths.

The Commission and the Coroner differed in their explanations of the primary cause of the accident. The differences were sufficient to prompt media interest, which largely focused on the Commission's investigation processes in this case. Criticisms were made about the control of wreckage at the site and the release of parts of wreckage following the initial site visit.

The Commission directed its staff to review the evidence relating to its findings, including the consideration of further evidence that had been brought to the attention of the Coroner at his hearing.

At the same time the Chief Executive commissioned an independent review of the investigative procedures and processes (the review) applied to the Fox Glacier inquiry. This document reports on the findings and recommendations of the independent reviewer, and subsequent actions taken in light of the review. This document does not relate in any way to the Commission's evidential review, which forms part of a separate formal inquiry.

The review identified three key areas where the investigation process could have, with the benefit of hindsight, been better. These related to the resourcing of the investigation, the management of evidence at the accident site and the analysis of the evidence.

The reviewer found that resourcing at the accident site was not adequate, that procedures for the control and handling of evidence, and file noting, on site could be improved and that while the analysis undertaken was generally good, further testing and analysis could have been undertaken.

Submissions received on the review from Commission staff provided some points of clarification and addressed some of the specific issues and examples raised by the reviewer, but overall they accepted the broader issues raised by the review.

The issues surrounding the resourcing of the investigation on the day of the accident, and the consequent additional workloads and pressures this created, had flow-on effects for the management of the evidence on site and the depth of analysis undertaken. The reviewer's findings highlighted gaps and weaknesses in the Commission's investigative resourcing and procedures.

It is to be remembered that this investigation was undertaken under difficult circumstances. The investigator in charge was the only available Commission air investigator on that day. He attended the accident from Christchurch while continuing to deal with the aftermath of a major earthquake (on the same day as the accident flight) that had affected his home and family.

The substantive benefit of this process review is the opportunity to remedy the gaps and strengthen the Commission's operating procedures so that organisational and individual performance can be improved.

Action either has been taken or is underway to address the issues identified by the review. Key actions include:

- the securing of additional government funding to better resource investigations, including employing additional investigators and contracting experts to undertake detailed testing where required
- the deployment of at least two accident investigators to every site and ensuring a mix of technical and operational investigative skills

- the tightening of evidence processes, including a default position of removing all evidence when able from an accident site and securing it for the duration of the investigation, and tighter controls on access to and the release of evidence
- a greater use of external experts, including the holding of expert conferences where this would assist in analysing the circumstances and causes of an accident
- continuing the Commission's substantial investment in safety investigation training for all investigators through the internationally recognised Cranfield University programme
- ensuring that accident reports provide comprehensive detail on the conduct of the investigation process.

1. Introduction

1.1. Background

On Wednesday 9 May 2012 the Transport Accident Investigation Commission (Commission) published its aviation occurrence report on the Walter Fletcher FU24, ZK-EUF, loss of control on take-off and impact with terrain at Fox Glacier Aerodrome, South Westland, 4 September 2010. This report was followed by the Coroner's own report into the deaths caused by the aircraft accident, in May 2013. The two related reports differed in a number of aspects.

Key differences went to the **prime** cause of the accident and the role of the control stick in the accident. The Commission identified 'weight and balance' as the prime cause of the accident and a key safety issue to be addressed going forwards (among other things). The Coroner found that some other (unidentified) factor, coupled with weight and balance, caused the crash. The Coroner also found that a fracture of the plane's control stick, while unlikely, could not be ruled out as a cause of the crash. The Commission had made no specific finding in respect of the control stick. The control stick was released along with other pieces of wreckage. The released portion of wreckage was buried four days after the site examination.

In early 2014 several parties expressed concerns through the media about the investigative process followed in the inquiry. Concerns were expressed about:

- the burial of part of the aircraft wreckage
- the time it took for investigators to get to the scene of the accident, and the time spent at the scene
- the differences between the Coroner's findings and the Commission's findings
- the protocols the Commission follows during an investigation and whether they were followed in the Fox Glacier inquiry.

In light of these concerns the Commission directed its staff to review the evidence relating to its findings. At the same time the Chief Executive commissioned an independent review of the investigation procedures and processes applied in the Fox Glacier inquiry.

The independent review was undertaken by Bruce Robertson:

- Licensed aircraft maintenance engineer with 40 years in general aviation
- Private Pilot Licence Fixed Wing
- Cranfield University-trained air safety investigator
- Member International Society of Air Safety Investigators
- National diplomas in aeronautical maintenance, strands aeroplanes, rotorcraft, powerplant piston and powerplant turbine engine
- Owner and operator aircraft maintenance business for previous 28 years.

This document reports on the findings and recommendations arising from the independent review.

1.2. Terms of reference

The independent reviewer was asked to review the Commission's procedures relating to the Fox Glacier investigation against international 'best practice' standards, including techniques taught at the multimodal and air accident investigation courses at Cranfield University, applicable Commission operating policies and International Civil Aviation Organization (ICAO) investigation guidelines. The reviewer was asked to report his findings and any recommendations for process improvements to the Chief Executive.

1.3. Conduct of the review

The reviewer undertook the following tasks in order to complete his review:

- (a) A review of the case files, photographs and on-site examination process
- (b) A review and assessment of the evidence, and the analysis of that evidence, that led to the findings in the final report
- (c) The identification of process gaps and shortcomings
- (d) Making recommendations to remedy gaps and shortcomings. The reviewer then briefed senior management on his findings and recommendations. These were captured and written up by the Commission's General Counsel and confirmed with the reviewer.

Submissions were then sought from key personnel in relation to the reviewer's findings and recommendations, and these were also considered.

2. Independent reviewer's findings and recommendations

This section outlines the findings and recommendations of the independent reviewer.

2.1. Areas of concern

The independent reviewer identified three key areas where the investigation process followed in the Fox Glacier inquiry could have been better. These areas were:

- the resourcing of the investigation
- the evidence management at the site
- the analysis of the evidence.

The independent reviewer qualified his assessment of the investigative practice by noting that hindsight tends to bring failures and shortcomings into stark relief.

2.2. The reviewer's findings

The reviewer made 15 findings grouped as follows:

2.2.1 *The resourcing of the investigation was not adequate in that:*

1. (Through no fault of the Commission), only one Commission investigator was available for deployment on the day
2. While two RNZAF [Royal New Zealand Air Force] Officers were appropriately seconded as additional resources to assist with the investigation, one was a trainee, requiring supervision
3. The investigation team would have benefited from having expertise in the field of aeronautical engineering available to it on site to complement the operational expertise of the two experienced investigators
4. Even with the seconded RNZAF Officer, the investigation team was short staffed given the scale of the investigative effort required
5. The seconded RNZAF Officer's contribution to the inquiry appears to have ended after the site examination, depriving the Investigator in Charge of opportunities to brainstorm and debate potential causes and safety issues with other investigators familiar with the accident site at later points in the inquiry.

2.2.2 *The securing, control and handling of evidence at the accident site was not as disciplined as it could have been, in particular:*

1. The arrival of Commission investigators to the accident site 27 hours after notification, while understandable in the circumstances, was not ideal given the serious nature of the accident, along with the desirability of interviewing witnesses as early as possible and deterioration of the site due to bad weather
2. The site examination appears to have been unduly short given the nature of the accident and site notes on file were not as comprehensive as might have been expected
3. There is evidence to suggest that the control stick was moved at some point in the site examination (though we don't know when, why or by whom or whether this was an 'appropriate' disruption or not)
4. The control pin from the lock was identifiable in a photograph of the scene but was not located by the investigators on site, which fueled speculation about its role in the accident
5. The timing of the release of parts of the wreckage was, on balance and with the benefit of hindsight, premature. This meant that competing theories about the cause of the accident that were subsequently raised were unable to be tested. However, once released, the burial of the wreckage at a recorded location was in accordance with accepted practices for wreckage disposal

6. It's difficult to ascertain from the files whether clear expectations were set to ensure a secure chain of custody of the wreckage during its removal and transportation from the accident site to Commission premises by a contractor.

2.2.3 The analysis of the evidence was generally good, but could have been improved by:

1. Questioning and investigating some issues more deeply, for example the flight profile of the aeroplane on the accident flight, job sheets for modifications to the aeroplane for the parachuting role
2. Undertaking further analysis, testing and discussion of different or competing theories to guard against actual or perceived 'confirmation bias' e.g. testing of the control stick or fuel control unit, greater discussion of reasons for and against particular hypotheses
3. Corroborating critical findings, e.g. operational testing (e.g. flight tests) as well as theoretical modelling to analyse weight and balance issues
4. Capturing adequately in the investigation files and/or final report the thinking that was unfolding through the course of the investigation, including all lines of inquiry pursued (or raised but dismissed) and the conduct of the inquiry.

2.3. The recommendations

In order to address the findings the independent reviewer made nine recommendations. These are listed below.

1. Match investigator resource to the scale and type of occurrence under investigation, with a minimum of two experienced investigators on site.
2. Strengthen site management practices to ensure the Commission has control of an accident site and the evidence on that site.
3. Ensure adequate forensic photography capability is available on site, and that appropriate forensic methods are used to present photographic and other evidence.
4. Review site note taking procedures and protocols to ensure proper guidance is provided on expected standards and scope.
5. Strengthen protocols and decision making around the release of evidence, including specific provisions relating to the handling and disposal of wreckage.
6. Develop a pool of specialist contractors available for selected phases of the investigation process to support technical or operational components of an investigation.
7. Consider, as a matter of course as part of the analysis process, conducting expert conferencing to develop and test hypotheses relating to complex technical matters or where multiple theories of accident cause and circumstances are present.
8. Ensure witness interview processes support an accident investigator-centric perspective rather than adopting or acting in reliance on police witness statements.
9. Ensure findings of fact and lines of inquiry, including evidence of theories and scenarios considered then dismissed, along with supporting reasons, are well documented in investigation files and, where appropriate, in the final report.

3. Feedback on findings and recommendations

The write-up of the reviewer's findings and recommendations was provided to the investigators involved in the initial investigation, the Chief Investigator of Accidents and the Deputy Chief Investigator of Accidents for comment.

Their feedback was supportive of the independent review and its recommendations. Submissions received did provide some points of clarification and addressed some of the specific issues and examples raised by the reviewer, but demonstrated an overall acceptance of the broader issues and a commitment to continual learning and improvement. Specific points raised in submissions relating to each of the key areas raised by the reviewer are outlined below.

Resourcing at the accident site

Internal feedback also highlighted the challenges of resourcing this particular inquiry on the day, due to a confluence of unusual circumstances. Submissions rightly pointed out that the standard has always been more than one investigator at an accident site, but this was not achievable on this day as only one of the usual complement of three aviation investigators was available¹. Submitters agreed that deployment to these sorts of accident should include a mix of operational and technical investigative staff, and this has now been put into effect, including through contracting external expertise to advise investigators on site (or afterwards) where needed. The use of seconded investigators from other agencies is an appropriate mechanism to upscale investigation teams in the event of a large-scale accident, but submitters accepted that seconded investigators should be involved in relevant analysis sessions as well as initial site examinations.

Securing, control and handling of evidence

Submitters accepted that the duration and standard of the site work, as shown by file notes, were not adequate. Submitters agreed that getting to this site earlier would have been better, but noted that it is no longer considered best practice to "drop everything and make haste" to all accident sites. Each accident site is different and issues such as health and safety assessments, investigation resource planning and proper handovers from rescue personnel are important to get right. All these interests need to be balanced 'on the day'. The Commission has a Memorandum of Understanding (MoU) in place with New Zealand Police to ensure that accident sites are appropriately secured pending investigators' arrival. This arrangement did occur on the day of the accident.

Submitters noted that the control stick was picked up for closer examination at the site but had been photographed in situ prior to any disruption. So submitters disagreed there was any 'inappropriate' disruption of the evidence.

Submitters accepted, in hindsight, that the release of parts of the wreckage four days after the accident was premature and that the control and security of wreckage, including in transit, are important and appropriate arrangements should be made and properly recorded.

Analysis of evidence

Submitters generally accepted that the analysis of the evidence did not go deep enough in this case. Expert conferencing was viewed as a good investigative tool for certain investigations, and used more often than in the past. Submitters suggested that a greater formalisation of post-site and intermediate analysis sessions would assist in addressing some of the process issues raised. This process is now in place.

¹ One was overseas and the third position was vacant at the time.

4. Chief Executive's decision

All the information provided by the independent reviewer along with the submissions from key personnel have been considered. It is accepted that all individuals involved were committed to the task at hand and doing their best within the context in which they were operating on that particular day. While some particular examples and details raised by the reviewer can be explained and dismissed, the reviewer and internal submitters, operating with the benefit of hindsight, all acknowledged that the investigative processes applied in the Fox Glacier inquiry could have been better.

The issues surrounding the resourcing of the investigation on the day of the accident, and the consequent additional workloads and pressures this created, had flow-on effects for the management of the evidence on site and the depth of analysis undertaken. This highlights gaps and weaknesses in the Commission's investigative resourcing and procedures, rather than in the actions of any particular individuals. Of key concern, notwithstanding the clarifications provided by submitters, is that the control of evidence at the site was not as structured and disciplined as it should have been. Additional resourcing and clearer on-site procedures would almost certainly have made a difference.

The substantive benefit of this process review is the opportunity to remedy the gaps and strengthen the Commission's operating procedures so that organisational and individual performance can be improved. The review has benefited greatly from the openness of all staff involved to reflect on what happened and why. All submitters were supportive of the findings and recommendations of the reviewer, and of making further improvements to organisational practice.

The Commission's investigators are committed to independent, impartial, safety-focused inquiries that lead to overall improvements in the safety of the wider transport system. The results of the initial investigation into this case, notwithstanding the issues outlined here, did enable the Commission to identify and make recommendations to resolve key broader transport safety issues evidenced by this accident. Nevertheless, the Commission accepts the key lessons from the process review and will use them to strengthen its investigative processes further.

The next section outlines the actions taken, or underway, to do this.

5. Actions

This section identifies actions and improvements that have already been taken and made since the initial investigation into the Fox Glacier accident in 2010, and the work that is underway or planned to address further the issues raised by the independent reviewer.

Resourcing at the accident site

At the time of this review the Commission had already submitted a business case to the Government for additional funding to better support its investigations. Since the review the Commission has received funding to hire six additional investigators and supporting technical, research and legal staff over the next three years to ensure that investigations are better resourced. This will enable a greater 'team approach' to investigations from the site through to analysis and the identification of safety issues.

The Commission has already changed procedures to deploy (at least) an operational and a technical investigator to accident sites of this nature and is reviewing MoUs with other agencies, including processes for seconding additional investigators, if required, throughout the investigation lifecycle. We have also clarified the rules and permissions required to second or contract additional investigation resources if required for a particular accident.

Securing, control and handling of evidence

The Commission's default position at accident sites is now to seize, secure and retain all evidence that can reasonably be found for the duration of its inquiries.

Procedures and controls relating to handling, tracking, transporting, testing and access to and release of wreckage and other evidence have also been tightened, with greater involvement of Commissioners and senior management in decisions. A former police forensic expert was contracted to review and formalise our evidence-handling procedures.

All investigators receive training in interviewing witnesses and an ongoing check process is in place to ensure that interviews retain a safety investigation focus. More money is being spent on contracting external experts to test evidence and provide additional technical or expert advice to the Commission. The Commission is also looking at establishing a panel of experts in line with government best procurement practice, to enable quick access to required expertise as needed.

Analysis of evidence

The Commission already makes a significant investment in training all our accident investigators through the internationally recognised transport investigation programme offered by Cranfield University, England. This benchmarks the Commission's investigators with their international peers. To ensure that this best-practice training is put into effect, we are developing and implementing a quality assurance framework that draws together all the rules, policies and procedures that apply to accident investigations. We are looking at technology to enable better access to appropriate procedures and checklists in the field, even remote accident locations.

We are also reviewing how an accident investigation is managed, including appropriate management oversight and reviews at critical points in the process, and a greater involvement of Commissioners at critical process points.

We are increasingly using expert conferencing as an investigation tool and have developed standing terms of reference for the conduct of these, based on expert conferencing conducted in relation to court proceedings.

We have moved to ensure that accident reports are more fulsome in describing the conduct of inquiries, including highlighting significant avenues investigated but ultimately found not to be relevant.

The following table summarises actions undertaken against the reviewer's recommendations.

Recommendation	Action to address recommendation	Status
Match investigator resource to scale and type of occurrences	<ul style="list-style-type: none"> • At least two investigators sent to every site, more where required. Mix of technical and operational skills involved • Additional resourcing secured through the Government and six more investigators to be hired • MoUs with agencies, contractor panels and delegation processes all reviewed to ensure the Commission can scale up investigative resources quickly if required 	<p>In place</p> <p>Underway</p> <p>Underway</p>
Strengthen site management practices	<ul style="list-style-type: none"> • Review and improve evidence handling procedures at site 	Completed
Ensure forensic photography capability available on site	<ul style="list-style-type: none"> • Commission investigators are trained in photography as part of Cranfield training investment • MoU with New Zealand Police – forensic photography is undertaken prior to any site disturbance 	<p>In place</p> <p>In place</p>
Review site note-taking procedures and protocols to ensure proper guidance is provided	<ul style="list-style-type: none"> • Appropriate documentation and file noting requirements have been reinforced to investigative staff • Assess technology options for remote access to requisite procedures and checklists 	<p>In place</p> <p>Underway</p>
Strengthen protocols and decision-making around release of wreckage	<ul style="list-style-type: none"> • Strengthened delegations and controls on evidence taken from site, including transportation, third-party access, testing and release • Default policy of securing and retaining all wreckage/evidence at site for duration of inquiry 	<p>In place</p> <p>In place</p>
Develop a pool of specialist contractors to support investigations	<ul style="list-style-type: none"> • Greater use of external experts to test evidence and review investigator findings • Look to establish panel of experts in line with government best procurement practice 	<p>In place</p> <p>Underway</p>
Consider expert conferencing as a matter of course	<ul style="list-style-type: none"> • Expert conferencing standard terms of reference developed • Expert conferencing considered, depending on nature of investigation • Move to a more team-based approach to all parts of the inquiry process 	<p>In place</p> <p>In place</p> <p>Underway</p>
Ensure witness interviews support safety focus	<ul style="list-style-type: none"> • Investigators trained in safety interview techniques • Quality assurance process in place to check this is occurring 	<p>In place</p> <p>In place</p>
Ensure findings of fact and lines of inquiry are well documented	<ul style="list-style-type: none"> • Investment in internationally recognised Cranfield University investigation programme for investigators 	In place

	<ul style="list-style-type: none"> • Adoption of Australian Transport Safety Bureau Analysis Framework • Analysis training/refresher training provide to all investigators • Conduct of inquiry sections of Commission reports broadened to ensure all significant process matters covered 	<p>In place</p> <p>Underway</p> <p>In place</p>
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6. Conclusion

This process review was commissioned following criticisms made about the standard of investigation undertaken in the Commission's inquiry into the Walter Fletcher FU24, ZK-EUF loss of control on take-off and impact with terrain at Fox Glacier Aerodrome in September 2010.

The aim of the review was to examine the investigative procedures undertaken in the Fox Glacier inquiry in light of international practice and guidance, including practices taught at Cranfield University, ICAO's investigation guidelines and the Commission's own operating procedures and policies. The reviewer was asked to make recommendations for process improvements as appropriate.

The review did reveal procedural weaknesses that manifested on the day of this accident when the Commission's resources were stretched. The lack of sufficient resources and technical capability compounded the difficulties found by investigation staff on what proved to be a difficult day for New Zealand. As a result decisions were made in respect of site and wreckage management that had flow-on effects for the rest of the investigation.

Key recommendations with regards to matching resources to the scale and type of investigation, strengthening evidence and site management, and ensuring that appropriate technical expertise is available have been accepted and are being implemented.



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