Report of the

Controller and Auditor-General

Tumuaki o te Mana Arotake

Civil Aviation Authority Safety Audits – Follow-up Audit

December 2000

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Foreword

This report sets out the results of our follow-up audit of the Civil Aviation Authority's conduct of safety audits of participants in the civil aviation industry.

We first looked at the subject in 1997 in the context of risk management by the three transport safety authorities – the Civil Aviation Authority, the Land Transport Safety Authority, and the Maritime Safety Authority. We reported the results of that audit to the House of Representatives in our *Fourth Report for 1997*. Because of the nature of our 1997 findings in relation to the Civil Aviation Authority we decided to carry out a follow-up audit.

We have discussed fully the results of our follow-up audit with the Authority, and have reflected many of the Authority's comments in this report. Nevertheless, the Authority does not agree with everything that we say in this report.

D J D Macdonald
Controller and Auditor-General

15 December 2000

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Summary

The Civil Aviation Authority of New Zealand (CAA) was established on 10 August 1992 by amendment to the Civil Aviation Act 1990. Its principal function is to undertake activities which promote safety in civil aviation at reasonable cost. [1]

The CAA carries out safety audits as a means of establishing the extent to which those operating within the aviation system are complying with aviation rules. Where safety auditors identify non-compliance and unsafe practices, the CAA seeks to have them corrected before they cause an accident or incident.[2]

In 1997 we undertook an audit of risk management in the CAA, as a result of which we made several findings and a number of recommendations. Because of the nature of those findings and recommendations, we decided to carry out a follow-up audit.

Key Findings and Conclusions

Our 2000 follow-up audit identified areas in the CAA's operations that need to be addressed if the CAA is to play a full part in improving New Zealand's air safety performance. Our key findings and conclusions are as follows:

1. There has been a downward trend in the overall New Zealand aviation accident rate over the past 10 years. However, New Zealand's accident rate over the past 10 years is higher than the rates of the United Kingdom, the USA, and Australia.

2. There was a decreasing trend in accidents for eight of the nine Safety Target Groups (which group different types of aircraft by size and type of operation – see Figure 3 on page 17) between 1995 and 2000. However, seven out of nine did not meet the safety targets set for the group. The CAA rates these seven groups – which comprise smaller, low-volume operators – as *high-risk*. The two groups that met their targets comprise the larger operators, are rated as *low-risk*, and provide 96 per cent of the aviation industry's capacity.

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1 Section 72B(1), Civil Aviation Act 1990. The CAA is also required to be consistent with the standards and recommended practices established internationally by the International Civil Aviation Organisation (ICAO), the Montreal-based body that sets standards for civil aviation world-wide.

2 Appendix 1 on page 37 gives the Civil Aviation Act definitions of aviation "accident" and "incident".

3. The CAA has:

   - established priority areas and developed broad strategies to address these areas; and

   - developed a system for establishing a level of confidence for individual operators called the Quality Index and trained its safety auditors to use the index.

   The auditors consider the Quality Index to be a practical assessment tool. However, we found some inconsistencies in the use of the index, and some confusion among operators about the assessment process. These difficulties need to be addressed before the Quality Index scores can be judged to be fully reliable.

4. Hours spent on routine safety audits – which are the main activity of the CAA's safety auditors – have increased since our 1997 report. Within the total time spent on routine audits, the CAA increased audit hours for large operators.

5. Routine safety audits are generally undertaken annually, irrespective of each operator's risk profile. This practice, together with the increased resources applied to routine audits of large operators, means that the CAA has not systematically targeted its routine audits in respect of the smaller operator groups it has identified as high-risk. However, audit hours on spot checks increased substantially in 1999 compared with 1997. These checks focus quite properly on high-risk aviation groups and operators, and concentrate on inspection of an operator's actual practice.

6. The routine safety audits are based on the audit of operators' systems, whether the operator is large or small, or high-risk or low-risk. Often, this approach may not be the most appropriate for smaller operators – who do not generally have sophisticated quality management processes, and where greater use of physical inspections of actual operations would be likely to be more effective.

7. In conducting routine audits there is evidence that safety auditors are undertaking more inspections and sampling than in 1997. However, it is unclear how many of these involve physical inspection, as opposed to sampling of documentation.

8. We found some dissatisfaction among operators regarding the value for money that they believed they received from routine audits. Larger operators felt that the CAA could do more to add value to their quality assurance processes. Smaller operators felt that the routine audits of their operations should focus less on checking documentation and more on physical inspections.

9. Since our 1997 report the CAA has taken a number of steps to improve the standard of safety audits and the capability of its audit group – for example through staff training and induction, and documenting audit policy and procedures. This has led to a general improvement in the quality of audit reports and documentation, and the audit process appears to be well understood by the CAA's safety auditors.

10. We found that there were still issues of consistency of audit approach between individual safety auditors, some of which the CAA had attempted to address. To date, there has been limited management review of audit plans.

11. The CAA has a well-established system for requiring operators to take corrective action to fix instances of non-compliance with aviation rules, and for following up operators' responses.

Recommendations

We recommend that the CAA should:

- ensure that its new organisational structure does not result in reduction of the effectiveness of its safety audit resources;
- consider what resources are required to gain assurance on the safety of low-risk operators;
- more appropriately target audit resources at high-risk operators;
- improve the consistency of the use of the Quality Index – for example, by group managers selectively reviewing audit plans and how auditors arrive at their scores;
- increase the proportion of audit time spent on physical inspections for operators which have limited quality management processes; and
- seek to strengthen staff capability by arranging secondments of skilled staff from large operators (recognising relevant constraints).

1 – Background to the Audit

1997 Audit Office Report

101 In 1997 we undertook an audit of risk management by the three transport safety authorities – Civil Aviation Authority, Land Transport Safety Authority, and Maritime Safety Authority.[3]

102 We approached that audit in the expectation that, in order to ensure effective risk management, the safety authorities would:

- Identify sources of risk. This meant collecting and analysing accident and other data (including, where necessary, obtaining expert opinion), to provide a basis for estimating risk levels.
- Identify and implement safety activities which were likely to reduce risk levels at reasonable cost.
- Assess the extent to which risk levels had been reduced.

103 We made findings and recommendations for all three safety authorities, but the more serious of these concerned the Civil Aviation Authority (CAA). In particular, we concluded that the CAA **did not** systematically assess the potential consequences of aviation accidents and incidents in order to identify accurately:

- the areas of highest risk; and
- the aviation safety initiatives that offered the best safety benefits to New Zealand.[4]

104 We also found that the CAA's safety audits were focused on checking an operator's documentation rather than seeking to confirm that the procedures specified in the operator's manuals were being carried out in practice.

105 The standard of the safety audits also did not meet our expectations. Individual auditors applied their own standards and, as a result, could reach different conclusions. The reasons for that situation were that audit plans were not prepared, senior staff did not review audit findings, and there was little follow-up of previous audit recommendations.

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3 *Fourth Report for 1997*, parliamentary paper B.29[97d], pages 77-121.

4 Ibid., page 86, paragraph 4.031.

106 The recommendations that we made included that the CAA should:

- develop a system of cost benefit analysis which would accurately identify aviation safety initiatives that offered the best safety benefits, and therefore adequately manage risk;
- continue a broad-based approach to safety audits with a focus on more rigorous audits of high-risk operators or types of aircraft;
- conduct more inspections to confirm that operators applied their quality management systems in practice; and
- develop the proposed confidence rating system to allow targeting of audit resources at high-risk operations and operators.

Our 2000 Follow-up Audit

107 Our 2000 follow-up audit focused on how the CAA has addressed the concerns raised in our 1997 report. Specifically, we wanted to ascertain whether, since 1997, the CAA:

- had improved its assessments of risk to accurately identify the areas of highest risk;
- was targeting its limited resources at the areas of highest risk; and
- had improved its conduct of safety audits.

108 In conducting the follow-up audit we:

- interviewed senior CAA managers, including the chief executive – the Director of Civil Aviation;
- interviewed 13 CAA safety auditors and CAA safety analysis staff;
- extensively reviewed CAA files;
- visited 12 operators with varying sizes of operation;
- observed CAA safety audits in practice; and
- reviewed CAA documentation – including the *Draft Safety Plan 2000-2001* and the most recent *Aviation Safety Report*.

109 We did not examine a large part of the CAA's operations, and this report should be read with the scope of our audit in mind. However, we note that the CAA has taken a number of steps in other areas to improve its operational performance, including:

- restructuring into groups that are aligned to industry sectors;
- rewriting aviation rules that aim to raise the safety standards for smaller commercial operations;
- establishing education programmes; and
- formulating a segmented risk-related strategy (published in its business plan).

Further Review of the CAA

110 Before we finalised this report of our follow-up audit, the Ministry of Transport began its triennial performance review of the CAA. The Minister of Transport announced that, as part of the review, the Ministry would also examine some concerns that industry representatives had expressed about the CAA. The Ministry is expected to advise the Minister of changes in the CAA's systems, policies and practices which could enhance the CAA's performance and improve its relationship with the aviation industry – while at the same time recognising the CAA's fundamental obligation to protect the public interest in aviation safety.

111 We spoke to the Ministry's review team about our follow-up audit. The review team intends to consider our findings, conclusions and recommendations as part of its own examination.

2 – The Civil Aviation Authority

Approach to Regulating Civil Aviation

201 The CAA was established in its present form in 1992 to promote aviation safety at reasonable cost.

202 The CAA uses a "life-cycle" approach to regulating civil aviation. Participants – whether individuals or firms, although we use the general term "operator" in this report – may enter the aviation system when they have met minimum CAA standards. While in the system, they must continue to comply with the standards. The CAA issues aviation document(s) containing conditions that must also be complied with.

203 At, usually annual, intervals the CAA checks operators' compliance and identifies any corrective actions necessary to ensure that the required standards and conditions continue to be met. The CAA's approach to these checks is that advocated in the 1988 Swedavia-McGregor Report,[5] which emphasises examining the operator's documented systems or manuals that detail the authorities and processes within the operation.

204 The CAA checks operators' manuals. Any deviation in practice from the manuals is an indication that the operator does not have sufficient control over its procedures. The checking is termed "surveillance" and covers all forms of inspection, audit and monitoring.

Organisation Structure

205 Figure 1 on the next page illustrates the CAA's organisation structure up to 1 May 2000. The Safety Audit Unit, which was the primary focus of our audit, was part of Safety Certification and was responsible for surveillance. Another part of Safety Certification, the Operator Certification Unit, was responsible for assessing whether operators met the standards for entering the aviation system. We did not examine the Operator Certification Unit.

206 We have used the term "safety audits" to describe the activities of the Safety Audit Unit.

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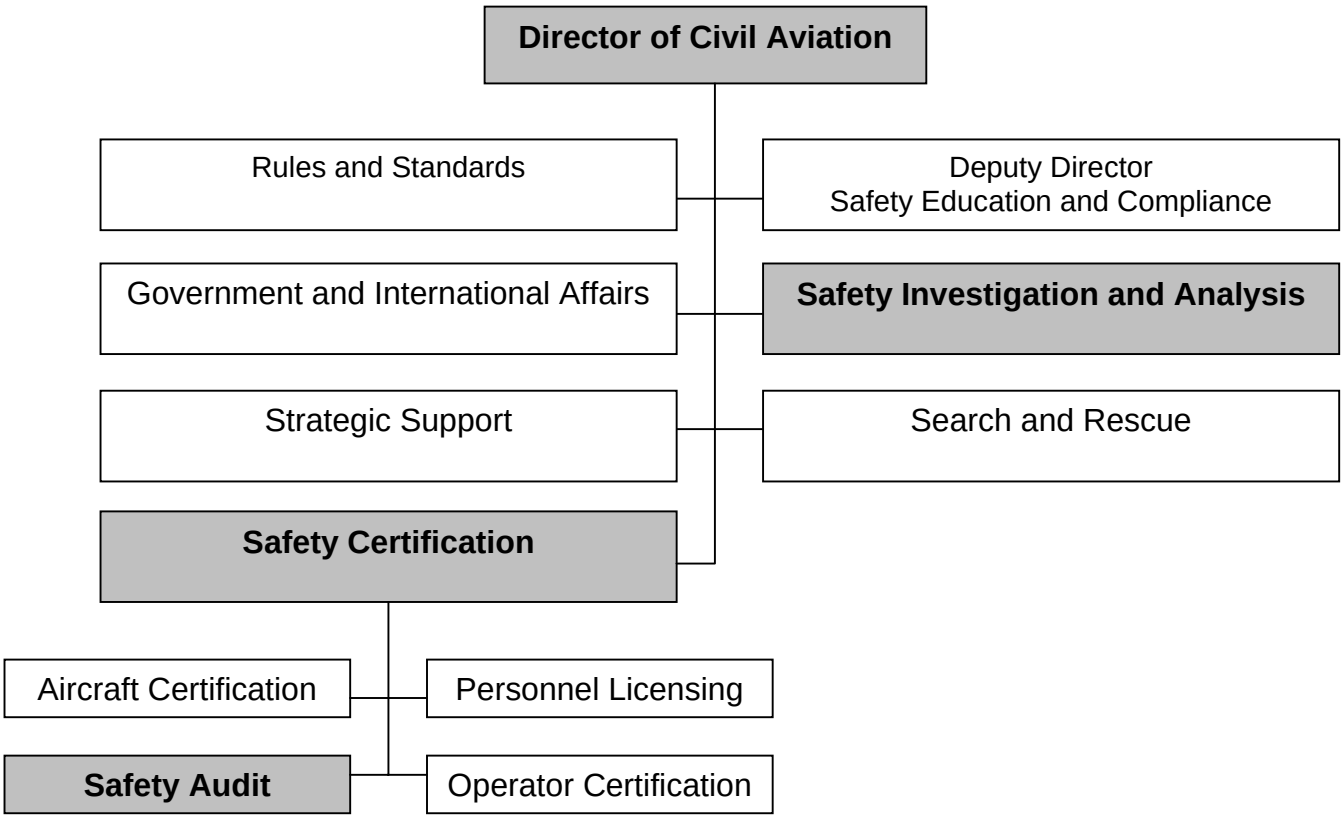
5 Swedavia AB and McGregor & Co., *Review of Civil Aviation Safety Regulations and the Resources, Structure and Functions of the New Zealand Ministry of Transport Civil Aviation Division*: a special report commissioned by the Government, April 1988.

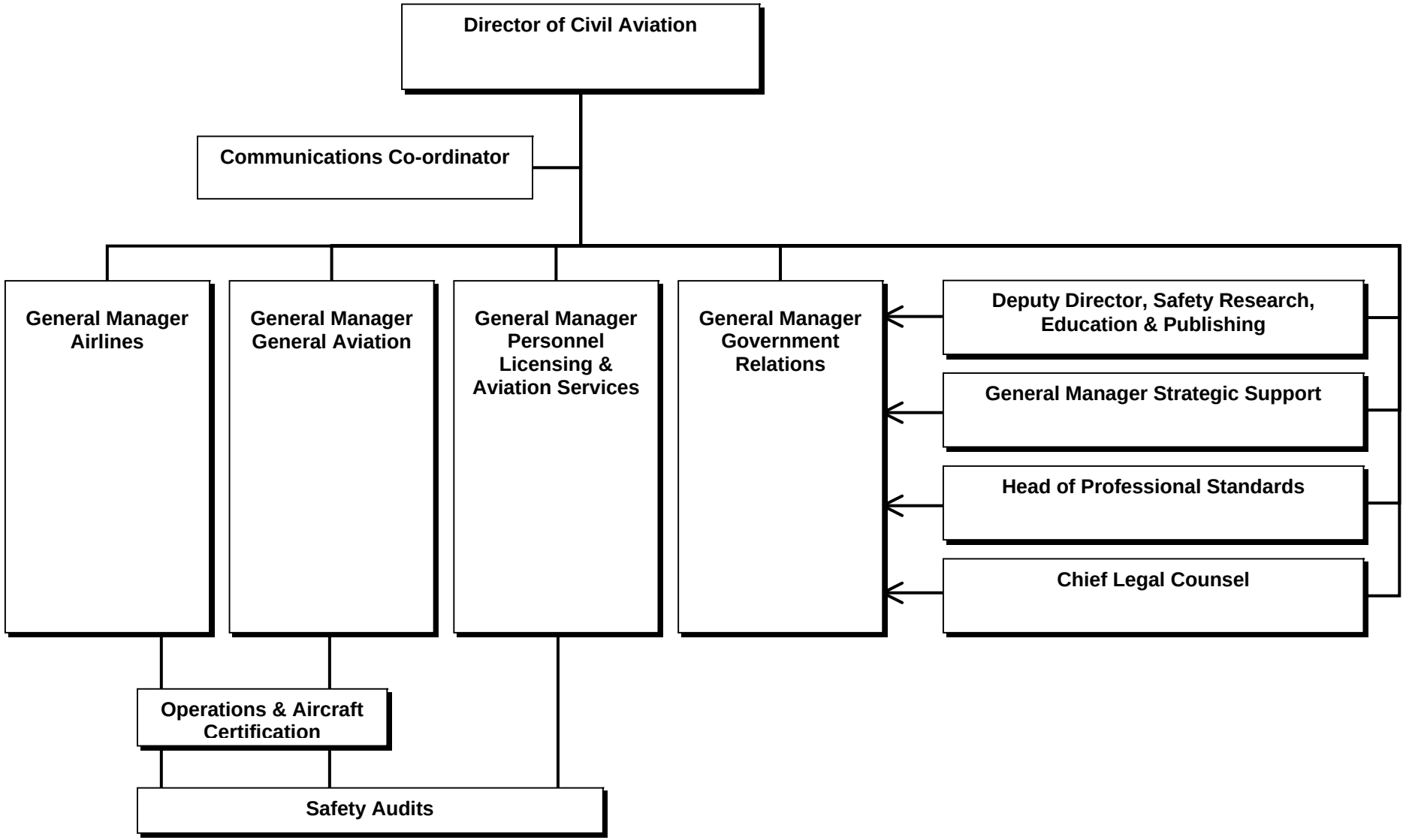
Figure 1
CAA Organisation Structure
before 1 May 2000



207 From 1 May 2000 the CAA implemented a new organisation structure. The new structure – which is shown in Figure 2 on the next page – has three groups aligned with sectors in the aviation industry – Airlines; General Aviation; and Personnel Licensing and Aviation Services. The Safety Audit Unit was disbanded and its auditors were placed into these three groups.

208 The CAA should ensure that the new structure does not result in reduction of the effectiveness of its safety audit resources – for example, by reducing the flexibility of staff deployment between different areas, or the extent to which auditors can easily share expertise and exchange good practice.

Figure 2
CAA Organisation Structure since 1 May 2000



3 – Safety Targets and Aviation Accident Rates

301 In 1995, the CAA set safety targets for the first time, over the five years 1995-2000.[6] In accordance with international practice, the targets were based on aircraft weight categories and the number of accidents per 100,000 flying hours. There are nine Safety Target Groups (STGs), determined by aircraft weight and the type of operation flown (see Figure 3 on the next page).

302 The CAA's 1999 Annual Report suggested that the targets are a means of identifying:

- the safety performance of the aviation industry;
- areas where the CAA needs to take action; and
- the consequences of those actions.

303 However, the safety targets can only provide a crude indication of safety performance and improvements – especially over the short to medium term.

304 The CAA explained that improvements are unlikely to have an immediate discernible effect on aircraft accident rates, as technical enhancements might in road vehicles. The CAA saw itself as sharing joint responsibility with the aviation industry for achieving the safety targets by:

- concentrating its efforts where it can best influence the industry to continuously improve and meet the targets; and
- devising a range of activities and initiatives aimed at its core role of improving safety performance.

305 Aviation accident targets and rates over the five years 1995-2000 for each STG, and for the aviation sector as a whole, are detailed in Appendix 2 on pages 38-40. Most notably:

- There was a decreasing trend in accidents for eight of the nine STGs – including the 2,721-5,670 kg group, which is accorded the highest risk. The increasing trend was for non-revenue (private) helicopters.

[6] The CAA has set new safety targets for the five years 1 July 2000 to 30 June 2005.

Figure 3: Safety Target Groups

Aircraft Type	***Summary***
	***Group 1:*** ***aircraft weight 13,608 kg and above*** Number of aircraft – 71
	***Group 2:*** ***aircraft weight 5,670 kg to 13,608 kg*** Number of aircraft – 68
	***Group 3:*** ***aircraft weight 2,721 kg to 5,670 kg*** Number of aircraft – 103
	***Groups 4-6, aircraft weight below 2,721 kg:*** **4 – revenue-earning passenger and freight** **5 – other revenue-earning, e.g. agriculture** **6 – non-revenue-earning, i.e. private** Number of aircraft – 1,528
	***Groups 7-9, helicopters:*** **7 – revenue-earning passenger and freight** **8 – other revenue-earning, e.g. agriculture** **9 – non-revenue-earning, i.e. private** Number of aircraft – 417

Source: CAA.
Note: The aircraft weight figures are the metric equivalent of the imperial weight figures used by the ICAO.

- The targets for the two largest STGs were met. These two groups make up about 96 per cent of the capacity of the New Zealand aviation industry.
- Seven of the nine STGs did not meet their five-year targets, despite the decreasing trend in accidents for eight of the nine STGs.
- Recent trends show an increase in the rate of accidents for aircraft under 2,721 kg and helicopters.

306 The CAA emphasised that this had been its first experience of setting targets of this kind, and that it was difficult to use the results to draw firm conclusions about the industry's or the CAA's performance.

307 We agree that such broad-based targets are unlikely to illustrate gradual improvements or deterioration, except over the long term. However, we endorse the continued use of targets as:

- an important long-term indicator of safety performance of the nine STGs; and
- a means of communicating with the industry about the expected rate of safety improvements.

1999 CAA International Comparison of Accident Rates

308 In 1999, the CAA compared New Zealand air safety performance with that of the United States, the United Kingdom and Australia. The analysis found that these three countries, described by the CAA as "foreign equivalents", have much lower rates of aviation accidents and fatalities than New Zealand.

309 For example, the USA's National Transportation Safety Board excludes accident and fatality data from Alaska in its aviation accident statistics. This is because Alaska has a commercial aviation accident rate three to four times greater than that of the other 49 States and is regarded as a "special case". However, the Alaska accident rate is still lower than that of New Zealand.

4 – Assessment of Risk in Aviation Groups and Operators

Main Findings and Conclusions

401 Our main findings and conclusions are that:

- The CAA can make a reliable assessment of risk by group by using historical data of air accidents and the cost of those accidents. The analysis shows that low-volume aircraft operators are the highest risk. Larger operators, which carry 96 per cent of the industry's capacity, are assessed as low-risk.

- The CAA has established priority areas and has developed broad strategies to address these areas.

- The CAA has three complementary tools (which are at different stages of development) for assessing the risk associated with individual operators. The most developed tool is the Quality Index that the CAA's safety auditors use to make separate assessments of an individual operator's flight operations and maintenance.

- The CAA's auditors have received training in the use of the Quality Index, and they consider the index to be a practical assessment tool. However, we found some inconsistencies in the use of the index that need to be addressed before the index scores can be judged to be fully reliable.

- We found some confusion among operators about how the Quality Index process should work, and a need for fuller communication to operators on the procedures and the outcome of the Quality Index relating to their operations.

Assessment of Risk by Aviation Group

402 The CAA's Draft Safety Plan 2000-2001 (the 2000-2001 Plan) identifies strategies that should direct the CAA's activities, and aggregates the nine STGs into two higher-level groups:

- high-volume low-risk – comprising STGs 1 and 2; and

- low-volume high-risk – comprising STGs 3 to 9.

403 The 2000-2001 Plan notes that these two higher-level groups "almost certainly require different responses from the CAA".

- For the high-volume low-risk group, the focus is on the operators' internal systems – which should identify, notify, report, and remove the causes of aviation failure. (The CAA aims to ensure that these functions are being carried out effectively.)

- For the low-volume high-risk group, the emphasis is on the use of inspections – to check actual practice.

404 Large aircraft in STGs 1 and 2 (over 5,670kg) account for some 96.2 per cent of aviation capacity in terms of passenger hours. However, these aircraft incur only about 5 per cent of the social cost (or "cost to the country") of aviation accidents – estimated at an average $55 million a year over the last 10 years.

405 The remaining 3.8 per cent of aviation capacity is provided by aircraft in STGs 3 to 9, which are responsible for 95 per cent of the social cost of aviation accidents.

406 The incidence of the social cost of aviation accidents among STGs over the 10 years 1989 to 1999 is illustrated in Appendix 3 on page 41.

407 The CAA further determines priorities by considering:

- whether each STG would meet its five-year accident target;

- the average social cost of accidents per year;

- the accident cost per person/flight; and

- the potential consequences of an accident reflected by the average number of aircraft seats.

408 Using these criteria, the CAA's priority STGs in descending order are:

- 3: aircraft weight 2,721-5,670 kg

- 4: aircraft weight under 2,721 kg – passenger and freight

- 7: helicopter – passenger and freight

- 1: aircraft weight 13,608kg and above which, though low-risk, attracts priority because of the large number of passengers carried.

409 The CAA also produces an Aviation Safety Report every six months. The report brings together information from CAA surveillance, aviation accident reports, and other sources (such as reports of problems with particular aircraft types).

410 The Aviation Safety Report details the causal factors involved in accidents and incidents, accident reduction targets and the cost of accidents.[7] This information and analysis helps to identify areas that require attention through such means as audit, education, advisory circulars or rule changes.

Assessment of Risk by Operator

Risk Assessment Tools

411 The CAA uses three formal tools to assess the risk associated with individual operators:

- risk assessment;
- the Non-compliance Index; and
- the Quality Index.

412 For ***risk assessment***, the CAA set up a project in October 1998 to establish all known risk factors and methods. The risk assessment considers eight key items, including the operator's last Quality Index and Non-compliance Index scores. Other factors include the operator's management, operational stability, and financial status. The purpose in bringing these factors together is to examine areas of risk that collectively may erode safety levels.

413 The Non-compliance Index is still under development. It weights instances of non-compliance identified either by the operators themselves or the CAA over a 12-month period. Each instance of non-compliance is scored for relative severity as minor, major, or critical. The score is then divided by the CAA audit hours completed for the operation. The CAA uses the index to rank an operator in relation to other operators in the same group.

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[7] The CAA has identified other risk factors outside those of operators or type of aircraft. Major risk areas include controlled flight into terrain, runway incursions, and aircraft icing.

414 The CAA considers that the Quality Index has the potential to be a key tool for establishing a level of confidence and targeting audit effort. The Quality Index is also more advanced than the other two measures of risk. We therefore focused on the Quality Index.

The Quality Index

415 The Safety Audit Unit developed the Quality Index in 1998 in response to the Ministerial Inquiry's recommendation that the CAA record a "level of confidence" in an operator's adherence to rules and documented procedures.

416 To derive an index score for each operator, the safety auditors assess the following 10 aspects of an operation:

- management and staff attitude towards safety;
- clarity of the management system;
- documentation;
- facility stability and upkeep;
- material (aircraft/tools/equipment);
- adherence to standards and specifications;
- personnel skill, knowledge and numbers;
- control/management system effectiveness;
- corrective and preventative action; and
- auditor's confidence score.

417 Each of those aspects is rated on a scale of 1-10. The assessment is entirely based on the results of the auditor's sample testing or observations during the audit. It is therefore important that the Quality Index score is supported by information contained in the audit report and is consistent with the report's content.

418 Safety auditors regard the Quality Index as a practical tool, offering a snapshot of the operator's safety. The CAA has made some use of the results of the index and the wider risk assessment in directing surveillance action – for example, by ordering spot checks where problems are identified. We also noted one case where routine audit effort was reduced for an operator judged to be low-risk.

419 The CAA has conducted training for audit staff on applying the Quality Index. However, documentary and interview evidence that we collected showed confusion and some inconsistencies in application of the index, which were also reflected in comments we received from some operators.

420 Three examples from our discussions and documentary review are given below.

- An operator was using two different trading names for marketing purposes, but was running essentially the same operation with the same chief pilot, management and aircraft. However, within the same year, the "different" companies were given Quality Index scores of 56 in one case and 73 in the other, which confused the operator.

- The audit report on an operator stated "Thank you for actioning the audit findings promptly", but gave no credit in the Quality Index assessment section for "taking corrective actions". The index score was therefore not consistent with the audit report.

- A Quality Index score for one operator did not evaluate three areas of the operation: facility stability; tools, equipment and materials; and taking corrective action. The operator told us that the company had recently opened a new hanger with all new equipment, but the CAA safety auditors had not inspected this facility.

421 The CAA's policy on the Quality Index states that in the event that no score is entered for any area of operation the final score is scaled to a base of 100. This confused the operator in the third example given above because the effect was to "score" areas of operation that were not in fact observed.

422 There is scope for improving communication about the Quality Index. For example, the safety auditors for flight operations and maintenance produce separate Quality Index scores, but the operator receives only the lower of the two scores. This means that operators are denied information that would assist them in assessing the relative strengths and weaknesses of their operation. The CAA told us that it was intending to give both scores to operators.

423 We also identified a misunderstanding – both internally in CAA and between the CAA and the industry – about the policy for changing the frequency of audits where an operator gains a good Quality Index score. Some operators told us that they understood that good Quality Index scores would lead to a reduction in frequency of audits.

424 The CAA's web site states that it will consider reducing the frequency of audits if an operator is given a Quality Index score of over 75. However, the Director of Civil Aviation told us that the CAA does not have a policy of reducing the frequency of audits.

5 – Targeting Resources at Areas of Risk

Main Findings and Conclusions

501 Our main findings and conclusions are that:

- Audit hours spent on routine safety audits – which are the main activity of the CAA's safety auditors – have increased over the past three years. Within the total time spent on routine audits, the CAA has increased audit hours for large operators (that are relatively low-risk).

- Routine safety audits are generally undertaken annually, irrespective of each operator's risk profile. This practice, together with the increase in resources applied to routine audits of larger operators, means that the CAA has not systematically targeted its routine audits in respect of the STGs it has identified as high-risk.

- More than three times as many hours were spent on spot checks in 1999 compared with 1997. Spot checks focus quite properly on high-risk STGs and operators – concentrating on inspection of an operator's actual practice – and are generally well regarded in the aviation industry.

- The depth of an individual audit may be altered according to the particular risk assessment of an operator, but auditors often have a number of audits to undertake each week. We believe there is a risk that, because of the workload, auditors will not have time to undertake a rigorous audit where they find particular problems with an operator.

- The CAA has recently established a team to help link risk analysis and safety audit planning, which is intended to improve targeting of the STGs identified as high-risk.

- We found some dissatisfaction among operators regarding the value for money that they believed they received from routine audits. Larger operators felt that the CAA could do more to add value to their own quality assurance processes. Smaller operators felt that the routine audits of their operations should focus less on checking documentation and more on physical checks.

Safety Audit Tools

502 The CAA's published *Surveillance Policy* of 30 June 1999 notes a number of safety audit tools. The tools we observed or examined were:

- spot checks; and
- routine (programmed) audits.

503 The CAA has other safety audit tools, including:

- **special purpose audits**, which are used –
  - after an accident;
  - as a result of serious audit findings[8];
  - as a result of information received; or
  - consequent on a CAA risk assessment; and
- **inspections**, which are used for operators that are not required to have documented quality management systems. These operators include agricultural aircraft operators and air traffic service personnel.

Audit Hours

504 The CAA told us that all operators were previously under-audited.

505 There has been an increase in resources invested in safety audits:

- safety auditor positions rose by 5 to 17 between 1997-98 and March 2000; and
- routine audit hours were about 22% higher in 1998-99 than the previous year, but fell back slightly in 1999-2000.

506 Over the three years 1997-98 to 1999-2000 there was a marked increase in spot check hours (see Figure 4 on the next page).

[8] The term "finding" has a special meaning in this context, as explained in paragraph 610 on page 34.

Figure 4
Safety Audit Hours 1997-98 to 1999-2000

Year	Routine Audits (hours)	Spot Checks (hours)	Total (hours)
1997-98	9,211	901	**10,112**
1998-99	11,287	1,918	**13,205**
1999-2000	10,440	3,702	**14,142**

Source : CAA.

Spot Checks

507 Spot checks can be planned as part of a programme, targeted at an individual operator, or conducted at random. The CAA has used spot checks partly to focus on high-risk operators and types of operation. The objective is to sample actual practice unannounced, and to establish or verify the on-going level of compliance in specific areas.

508 There have been two spot check programmes where the whole Safety Audit Unit undertook spot checks of a particular area of aviation. At the time of our field work, two staff were employed to undertake spot checks on a day-to-day basis. They target their effort using the results of risk assessments and the findings from routine audits.

509 Generally, spot checks are well received by operators and accepted by the industry, because they are seen as testing real aviation practice.

510 One operator noted that there had been a decline in spot checks about three years ago. That operator felt that some operators had become complacent, and that the perceptible increase in spot check activity over the past year or so had "kept operators on their toes".

511 Some operators told us that spot checks can be a good relationship builder, since spot check staff pass on practical advice and best practice.

Routine Audits

Targeting of Routine Audits

512 Routine audits are an important safety audit tool, using by far the largest proportion of audit resources (see Figure 4). We expected that the audits would be targeted on the basis of the risk assessments by STG. However, we found instead that routine audit hours were increasing for the larger operators. For example, Air New Zealand's audit hours have increased from 750 to 1,200 over the past four years.

513 The CAA explained that the larger airlines in New Zealand had only recently completed the process of certification to higher flight operations standards, and the CAA considered that the new quality assurance systems required attention because they were relatively untested.

514 There is also a pragmatic aspect to the CAA's approach to the larger airlines, in that the public expects very high standards of the operators in STG 1. A single accident involving a large aircraft could result in a large number of fatalities, and the CAA takes this factor into account in its assessment of risk.

515 It is self-evident that the CAA must devote adequate audit resources to surveillance of the larger airlines. However, the basis of New Zealand's approach to aviation safety is that the operator takes responsibility for safety. Large operators' reputations depend on their safety record and they invest in their own quality assurance processes.

516 We felt that the CAA's audits needed to add value to the operator's relatively sophisticated quality assurance systems in order to justify the high number of audit hours spent on large operators. Operators we spoke to considered that the audits did not do so. We did not test these assertions, which would have entailed "second-guessing" the safety auditors' technical expertise. However, we felt that the CAA should be concerned at the views of these operators.

517 We expected to find some targeting of routine audits on high-risk operators. However, the increase in audit hours for large operators had not been matched by an increase in audit hours for smaller high-risk operators (though the latter might have received proportionately more attention from spot checks).

518 Since we completed our field work, the CAA's new General Aviation Group (see Figure 2 on page 15) – which is responsible for smaller operators and helicopters – has established a Safety and Risk Analysis Team. The team works with the CAA's Safety Analysis Unit to gather and assess information about the aviation sector that is intended to assist particular audits or to help spot check programmes.

519 If the General Aviation Group operates as intended, its work should help to ensure that risk assessments have a direct effect on audit operations, so that resources are targeted at aviation groups and operators identified as high-risk.

Frequency of Routine Audits

520 Section 15 of the Civil Aviation Act 1990 gives the Director of Civil Aviation the power to *carry out such inspections and monitoring as the Director considers necessary in the interests of civil aviation safety and security*.

521 The objective of a routine audit is to establish the level of compliance with the legislation and with the operator's own documented processes. Each operator is liable to be audited annually. The International Civil Aviation Organisation standard states that – *all significant aspects of* [an] *operator's or organisation's procedures and practices should be evaluated and appropriate inspections conducted at least once in every twelve-month period.*[9]

522 The CAA may specially increase the frequency of audits where an operator is judged to be a particular risk. For example, in one case we examined an operator was being audited six-monthly because of serious safety audit findings in previous audits. These more frequent audits would continue until the operator had reached an acceptable standard.

523 The CAA told us that it would not hesitate to undertake a special purpose (unscheduled) audit of an operator, should the risk associated with the operator justify such audit activity. However, in the cases we examined, these audits were a reactive measure following an accident or serious audit findings rather than a pre-emptive step due to a risk assessment.

[9] ICAO document 9734–AN/959, *Safety Oversight Manual* (Part A).

Depth of Routine Audits

524 Safety auditors are divided into two main areas of expertise – flight operations and maintenance. Within these two areas there are further areas of focus, such as helicopters or large jet aircraft. Safety auditors undertake a number of functions, including:

- planning audits by reading previous audit reports, and establishing a profile of the operator – including recent changes to management, new equipment or aircraft, and previous accidents;
- conducting audits on-site and identifying any safety audit findings and causal factors;
- establishing and agreeing with the operator the due date for corrective actions that need to be taken in order to achieve compliance;
- following up on the corrective action that the operator has taken;
- writing an audit report for the Director of Civil Aviation on the work performed, any breaches of the rules identified, and action to be taken to remove any safety hazards; and
- entering and maintaining safety audit findings and other information from audit activities on the CAA database.

525 Some auditors may undertake four or five audits in a week. There is a risk that auditors will not have time to undertake a rigorous audit where they find particular problems with an operator, if they are scheduled to perform an audit the next day in another location. The CAA told us that auditors have the support of management to extend audits where appropriate. The CAA's letter to an operator indicating the likely extent of the next safety audit also states that, should the auditors require to do so, they will audit in greater depth.

526 Before undertaking an audit, the safety auditor responsible for the audit determines the extent and depth to which an operator should be audited. Different approaches are adopted, depending on the size of an operator:

- Large audits need to be broken down into manageable modules, and for larger operators the audit programme may be customised by mutual agreement.
- For smaller operators, the CAA writes to the operator setting out an estimate of how long the audit should take.

527 Individual safety auditors develop audit plans. The plans were not routinely reviewed to ensure that a consistent approach was taken or that all risk factors had been addressed.

528 The CAA told us that the depth of audits for higher-risk aircraft under 5,760kg and helicopters (STGs 3-9) had increased between 1995 and 2000, with increased auditor time spent on-site. However, a number of operators that we spoke to perceived little increase in the time taken for physical inspections (see paragraph 705 on pages 35-36).

Audit Fees

529 Operators pay a fee to the CAA for routine audits. The hourly charge is $133 including GST. The fee includes preparation, audit visits, report preparation, report and correspondence writing, and corrective action follow-up.

530 Spot checks are funded from levies charged on airline tickets.

531 The Director of Civil Aviation considers that the cost of audits is a major relationship difficulty between the CAA and the industry. However, a number of operators (large and small) were more concerned with value for money from routine audits than the baseline cost:

- Larger operators felt that the CAA could do more to add value to their own quality assurance processes.

- Smaller operators felt that the routine audits focused unduly on checking documentation rather than actual practice (such as in-flight checks or procedures actually followed by a pilot). They considered that more physical checking would better reflect the reality of their operation.

6 – Standard of Safety Audits

Main Findings and Conclusions

601 Our main findings and conclusions are that:

- Since our 1997 report the CAA has taken a number of steps to improve the capability of its audit function. These steps have resulted in a general improvement in the quality of audit reports and documentation. We consider that the audit process is well understood by the CAA's safety auditors.

- Operators identified that consistency of audit approach between safety individual auditors was still an issue.

- The CAA has a well-established system for requiring operators to take corrective action to fix instances of non-compliance with aviation rules, and for following up operators' responses. A backlog of outstanding responses developed in 1999, and the CAA ran a special exercise to bring outstanding responses down to a more acceptable level.

Measures Taken to Improve CAA Safety Audit Capability

602 Since our 1997 report, the CAA has undertaken a number of initiatives to improve the standard and consistency of audits and the operational aspects of safety auditing, including:

- undertaking extensive training and induction;

- developing (but not yet finalising) an *Audit Procedures Manual* – although the CAA has published a *Surveillance Policy*;

- developing a confidence rating system in the form of the Quality Index (paragraphs 415-424);

- establishing the position of Standards and Monitoring Officer in August 1999;

- developing templates for audit reports, introductory meetings with operators, checklists, and audit reports;

- establishing a complaints register;

- developing customised audit programmes for larger operators;

- improving planning and resourcing to enable two auditors to visit an operator to undertake the flight operations and maintenance aspects of a routine audit simultaneously;

- providing operators with an indication of the likely extent of their next audit (in terms of hours), by analysing previous audit hours and the operator's last quality index score; and

- publishing frequently asked questions, the CAA *Surveillance Policy*, and other information on the CAA web site.

603 We observed a general improvement in the quality of audit reports and documentation since 1997. The use of checklists and the identification of what areas had and had not been audited gave an indication of the required depth of the audit. We observed a greater consistency in format and tone of audit reports.

604 We interviewed 13 of the CAA's 17 safety auditors and believe that the audit process is well understood by audit staff.

605 However, some operators said that there were continuing problems with consistency between auditors and consistency of approach to audits. The evidence for these problems derived from our own review of audits, and from comments made by safety auditors and operators.

606 Consistency of audit approach and practice is important because it:

- is fairer to the operator;

- allows for comparable results;

- reduces the risk of personal standards and subjectivity; and

- ensures that rules are reliably applied.

607 The CAA is concerned to improve consistency and (as part of its restructuring) has created a new senior management position – Head of Professional Standards – to promote consistency across the organisation.

608 The CAA lost a number of experienced and skilled safety audit staff during 1999 and early 2000. Some were recruited by large airlines. While this suggests that the CAA employs high-quality staff, there is a

concern in the industry that further losses will erode the CAA's audit capability (especially in the large aircraft area).

609 A possibility being explored by the CAA is secondment of skilled staff from large operators to the CAA. However, such an arrangement would be subject to coping with certain constraints – such as conflict of interest and the timing of availability of identified skilled staff.

Rectifying Non-compliance with Aviation Rules

610 Where an audit reveals non-compliance with aviation rules or the operator's own documented procedures, the safety auditor issues a "finding" notice. The notice indicates whether the finding is critical, major, or minor. It describes the non-compliance, establishes the cause, and prescribes corrective action that the operator must take. The operator must respond to the notice stating what action has been taken, and return the notice with any supporting documents.

611 The CAA has a system for tracking finding notices and which auditor is responsible for them. At the end of 1999 finding notices for which a response was still outstanding grew to 250 compared to 108 in June 1997. The CAA undertook a special exercise at the start of 2000, which reduced the number of outstanding responses to 117. Of these, 91 were less than two months old.

612 There is a risk, particularly with a high outstanding workload, that operators' responses to finding notices might be accepted without adequate substantiation or evidence. We examined a sample of findings notices and responses as an indication of how thoroughly the special exercise had been carried out. In a small number of cases there was no evidence on file to support closure of the finding notice, but on further enquiry the evidence was located on a different file. None of the finding notices we examined were closed without evidence.

7 – Undertaking More Physical Inspections

Main Findings and Conclusions

701 Our main findings and conclusions are that:

- The CAA uses a systems-based approach for its routine audits that is suitable for large operators but not for smaller ones, which are not likely to have such well-developed quality management systems. Physical inspections of aircraft and maintenance work, and sampling of pilots' actual procedures with in-flight checks, provide a more suitable approach to audits of smaller operators.

- There is evidence that safety auditors are spending more time on physical inspections and sampling of documentation than in 1997. However, it is unclear what relative proportions of time are now being spent on those two activities compared with 1997. We share the views of the Transport Accident Investigation Commission that the CAA should examine actual practice as part of its routine audits, particularly of smaller operators.

Approach to Safety Audits

702 The CAA safety audit approach is based on the requirement for operators to develop and implement documented quality management systems that will ensure continued compliance with aviation rules. The safety auditors sample the operator's systems to test compliance.

703 The quality management systems, documents and manuals subject to testing are generally those that the operator was required to submit for approval to obtain an operator's certificate, and thereby gain entry into the civil aviation system. This audit method is known as a systems-based approach, and is well established in a range of types of auditing.

704 However, it is unrealistic to expect small operators to have the same quality management systems as those of large airlines. For this reason, our 1997 report recommended that the CAA conduct more physical inspections of smaller operators to test compliance with aviation rules.

705 Physical inspections focus on the safety practices actually undertaken by the operator and may involve:

- asking an operator to re-perform a task;

- sampling the actual work of the operator through a route check (i.e. flying with the operator); or

- physically examining the aircraft.

706 The 2000-2001 *Plan*'s strategies to address high-risk STGs include focusing safety audits on "monitoring the ongoing safety performance of the operators and emphasising the use of inspections". The Director of Civil Aviation told us that in 1999 he had instructed safety audit staff to increase the proportion of physical inspections. Safety auditors confirmed that they are undertaking more physical inspections and sampling[10] of documentation compared to 1997.

707 Most operators we consulted confirmed that, during routine audits, more sampling of documentation is being undertaken rather than physical inspection of their actual practice. They perceived that this was particularly true for flight operations, which can be more difficult to audit than maintenance (because inspection tools such as in-flight checks of pilots' procedures require advanced skills and are often costly and time-consuming to test directly).

708 In contrast, spot checks focus more on inspection and checking of an operator's actual practice. Spot check staff told us that 80% of their work is inspection of practice and the remaining 20% is spent checking key documents.

Transport Accident Investigation Commission

709 The Transport Accident Investigation Commission noted in its report of an April 1999 fatal air accident that CAA safety audits did not ask operators to demonstrate how they complied in practice. The Commission noted that the CAA should require operators to *show how the management system is followed in practice*. The Commission concluded that, by using such an approach, it was probable that the CAA could have identified shortcomings and ensured the operator corrected them.

10 *Sampling* is a standard audit tool which recognises that (in this case) a safety auditor cannot examine all the functions and documentation of an operator, and may undertake a selective examination.

Appendix 1

Statutory Definitions of Aviation "Accident" and "Incident"[11]

"Accident" means an occurrence that is associated with the operation of an aircraft and takes place between the time any person boards the aircraft with the intention of flight and such time as all such persons have disembarked and the engine or any propellers or rotors come to rest, being an occurrence in which –

(a) A person is fatally or seriously injured as a result of –
(i) Being in the aircraft; or
(ii) Direct contact with any part of the aircraft, including any part that has become detached from the aircraft; or
(iii) Direct exposure to jet blast –
except when the injuries are self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to passengers and crew; or

(b) The aircraft sustains damage or structural failure that –
(i) Adversely affects the structural strength, performance, or flight characteristics of the aircraft; and
(ii) Would normally require major repair or replacement of the affected component –
except engine failure or damage that is limited to the engine, its cowlings, or accessories, or damage limited to propellers, wing tips, rotors, antennas, tyres, brakes, fairings, small dents, or puncture holes in the aircraft skin; or

(c) The aircraft is missing or is completely inaccessible.

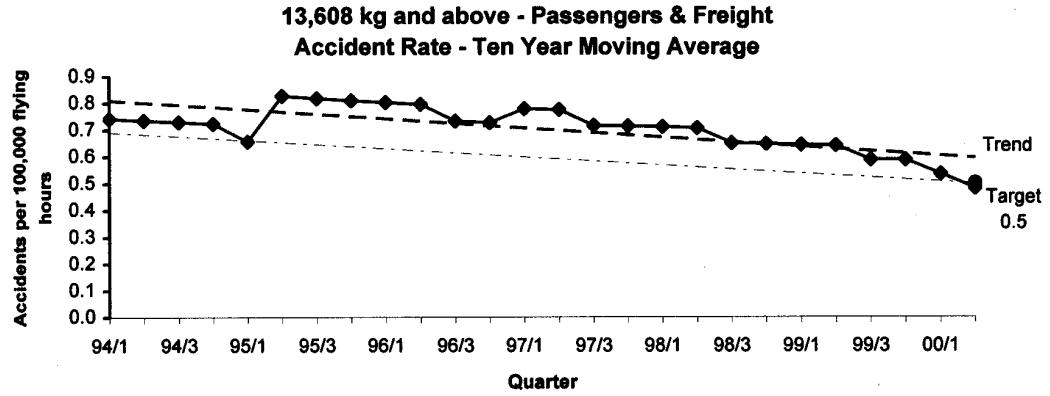
"Incident" means any occurrence, other than an accident, that is associated with the operation of an aircraft and affects or could affect the safety of operation.

[11] Section 2, Civil Aviation Act 1990.

Appendix 2

Aviation Accident Targets and Rates by Safety Target Group

1



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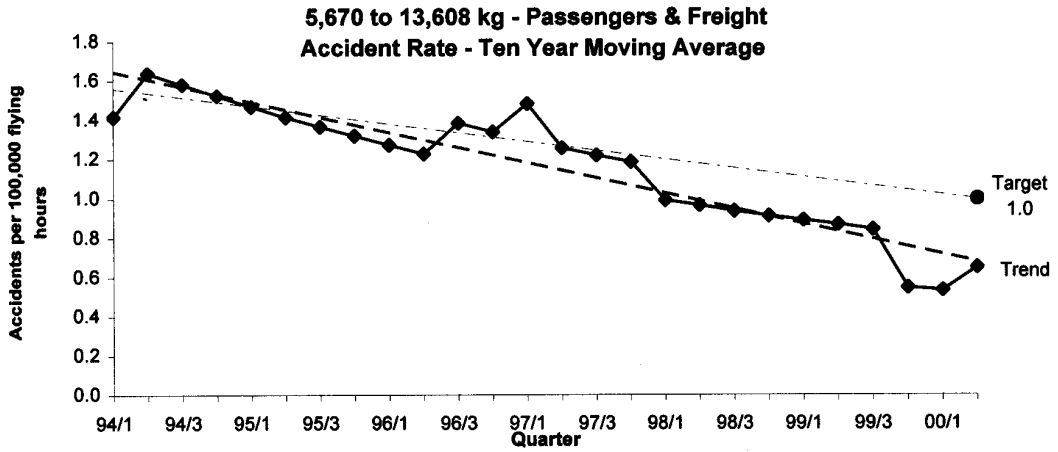

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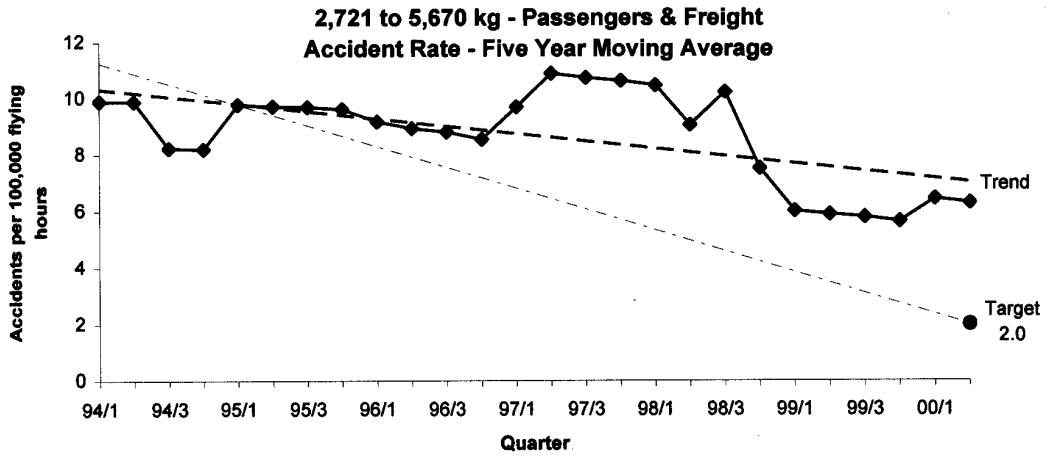

Appendix 2 (continued)

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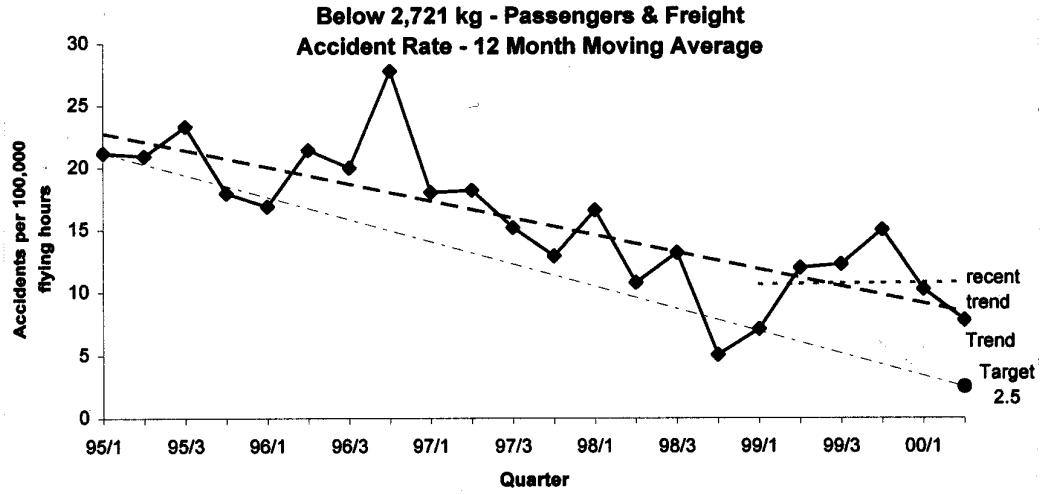

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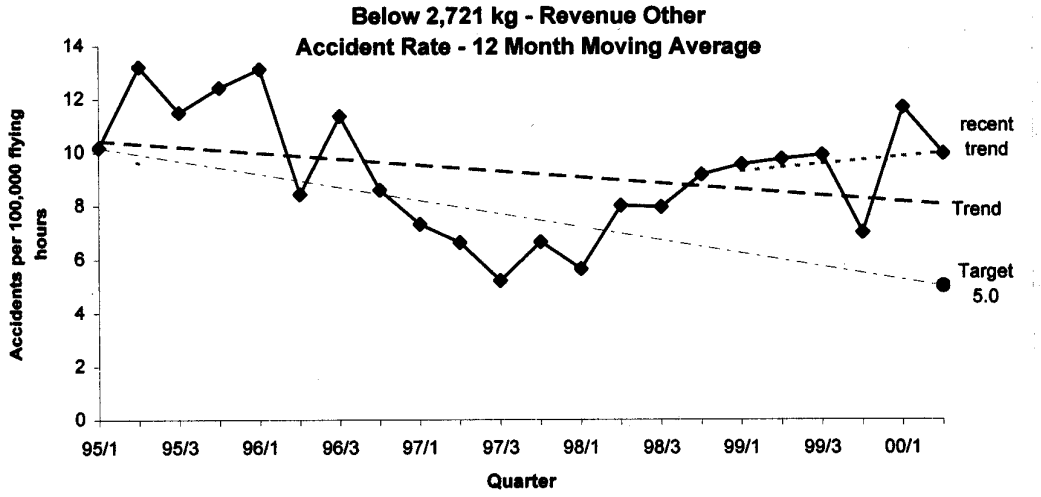

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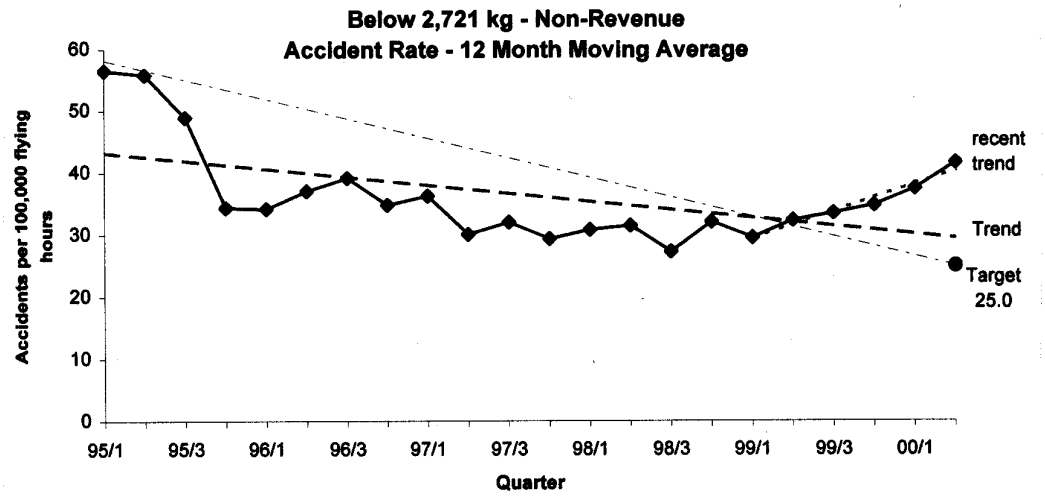

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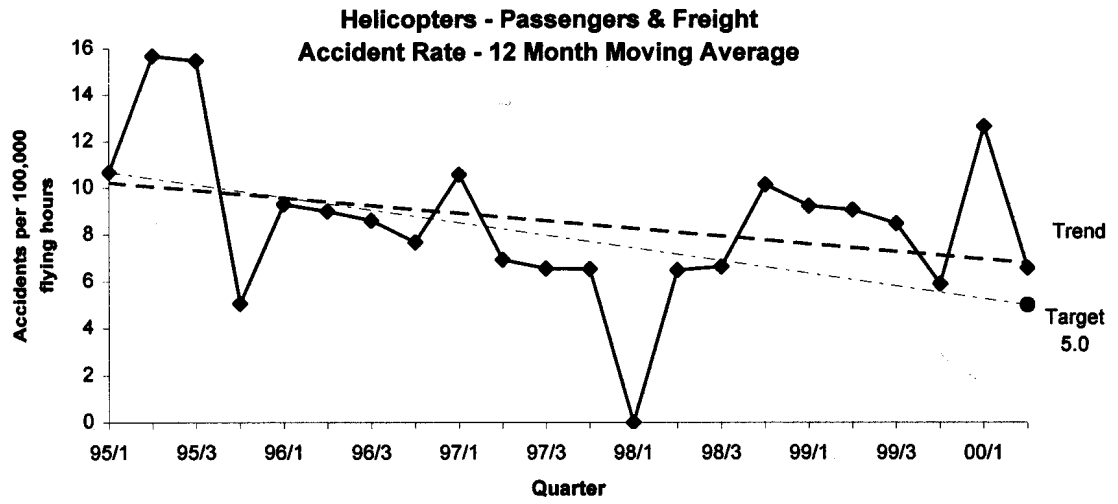

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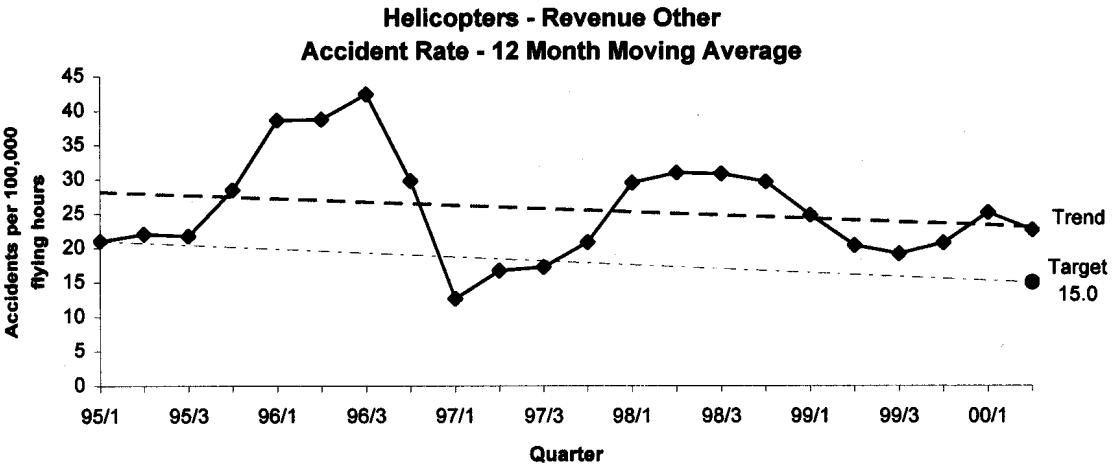

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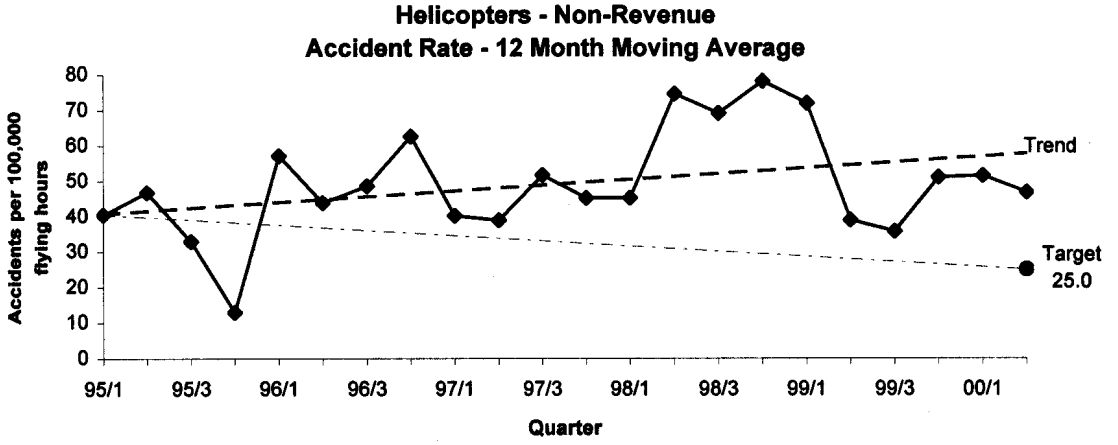
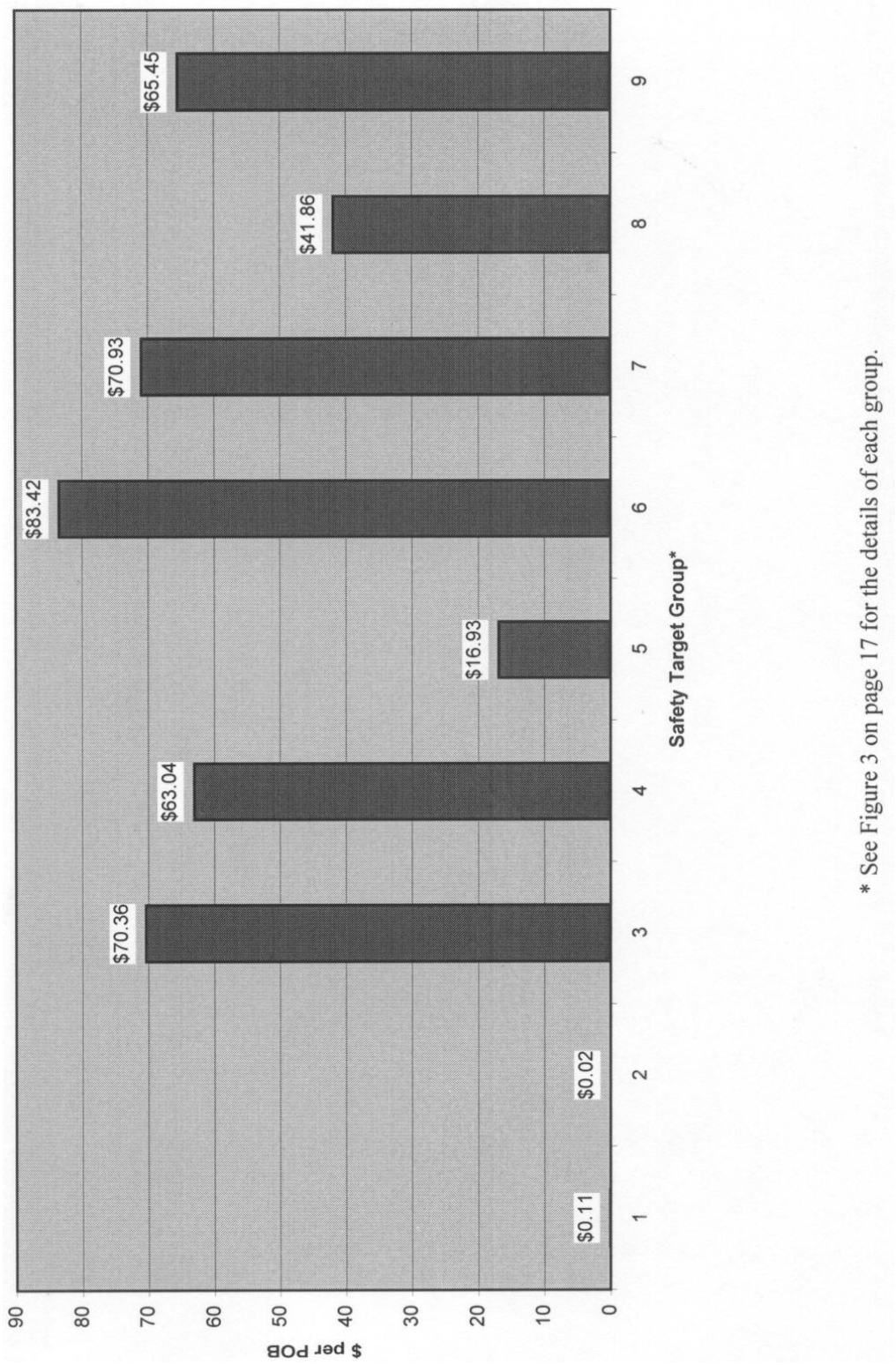


Appendix 3

Social Cost of Aviation Accidents 1989-1999

Cost per person on board (POB) $



* See Figure 3 on page 17 for the details of each group.