Question no.: 128

Program: n/a
Division/Agency: (ATSB) Australian Transport Safety Bureau
Topic: Reduced Revenue in 2011-12
Proof Hansard Page/s: 80 (12/02/13)

Senator FAWCETT asked:

Senator FAWCETT: I do. Mr Dolan, welcome. I am just going to your portfolio budget statements. I notice that the forecast appropriations and running through your total cash received estimated in the 2010 budget for the 2011-12 was around $22 million and then actual is about $100,000 less, so that is not a huge difference in the scheme of things, but given that there are cost growth pressures and indexations to take into account, you have obviously made savings within ATSB. Can you take on notice for the committee and come back to us to highlight the key areas where those savings have been made within ATSB because I cannot track, at the level of discernment within the papers, where those savings have actually been made?
Mr Dolan: I am happy to take it on notice. It is difficult to discern because there was some transitional funding to establish our new arrangements as the national rail investigative organisation in dealing with the sorts of budget pressures that all agencies are subject to. Given that we are largely a staff driven organisation we have had to carefully manage our future staffing arrangements, and that is our main mechanism of dealing with budgetary pressures.

Answer:

In its 2011 Portfolio Budget Statement, the ATSB estimated its *appropriation* for 2011-12 would be $22,208,000. In the 2012 Portfolio Budget Statement, the ATSB projected the actual appropriation outcome for 2011-12 would be the same: $22,208,000.

In its 2011 Portfolio Budget Statement, the ATSB estimated its total *expenses* for 2011-12 would be $23,503,000. In the 2012 Portfolio Budget Statement, the ATSB projected the actual expenses outcome for 2011-12 would be $23,383,000, a reduction of $120,000. This reduction was attributed to lower-than-estimated depreciation and amortisation expenses.

In its 2011 Portfolio Budget Statement, the ATSB estimated its total *cash receipts* for 2011-12 would be $22,837,000. In the 2012 Portfolio Budget Statement, the ATSB projected the actual cash received outcome for 2011-12 would be $21,842,000, a reduction of $995,000. This reduction was principally attributed to a lower-than-estimated requirement to draw down cash from appropriations, as a result of changes to the timing of cash payments.

Question no.: 129

Program: n/a
Division/Agency: (ATSB) Australian Transport Safety Bureau
Topic: ATSB Investigator Training
Proof Hansard Page/s: 80-81 (12/02/13)

Senator FAWCETT asked:

Senator FAWCETT: I would like to go to the issue of training. Has training changed since the budgetary pressures or since the transition that has combined a number of modes of transport in terms of the competency levels you expect of your investigators by virtue of the type of training and their experience?
Mr Dolan: It has changed slightly. We reviewed our work level standards for our investigators and for senior transport safety investigators. It slightly increased our expectations of them and we have been providing training to support that but, generally speaking, we have continued with what has been a very successful program focused on diploma level qualifications for our people with an agreed curriculum. We are a registered training organisation for those purposes and we intend to continue with that. We think it is fundamental to our job and it would not be subject to this; we will do it even with cost pressures.
Senator FAWCETT: Organisations such as the Defence Force send their safety investigators to the United States generally or sometimes other places for training. Do you send people to peer organisations in world-leading countries—UK, US—for training in accident investigation?
Mr Dolan: Generally not. We will occasionally, in discussing the development plans of individual staff, give them an opportunity for a range of study opportunities, generally not overseas, but occasionally there. Horses for courses, but the core of it is the training we have developed and continue to deliver ourselves.
Senator FAWCETT: Is that training benchmarked on a regular basis against the training delivered by comparable organisations in, for example, the United States?
Mr Dolan: Yes, through the International Transport Safety Association, which is the heads of a range of counterpart agencies. We have benchmarking on both what is covered and the level to which it is delivered, and we remain well positioned against the NTSB, the TSB in Canada, their accident investigation branch in the UK and so on.
Senator FAWCETT: Is that a self-assessment or do you share investigators? So, for example, you might send someone to look at their training and they send someone here.
Mr Dolan: It was coordinated and assessed by TSB, by the Canadians, and they drew on the material supplied by a range of other bodies to do that.
Senator FAWCETT: Did that generate a report back to ATSB as to where you stood against the benchmark.
Mr Dolan: It generated a report to the various heads of agency, yes. **Senator FAWCETT:** Could you make a copy of that report available to the committee?
Mr Dolan: I would have to check with my colleagues in other agencies who might have sensitivities about what it says about their training, so could I take it on notice?

Senator FAWCETT: You can take that on notice. I think the committee would be happy to receive that in confidence and not publish it, but I would be interested to see a copy of what was commented about your comparison for the benchmark.
You talk about differences with your workforce now and training—and again, I am probably talking specifically of the aviation side here—compared to when VASI was operating. Are there differences to the level, location and scope of training that is provided to accident investigators?
Mr Dolan: I have only been in the organisations 3½ years, so I am relying on what I have been told about history. However, my understanding is that compared to the VASI days there has been a much more explicit and enhanced range of training products made available, both for our entry level investigations and the ongoing training of them. As I said, we are now a registered training organisation, so it was done within a much more structured and rigorous framework. My assessment would be that there have been substantial improvements in what we have been doing over the past 10 or 15 years.
Senator FAWCETT: Could you take on notice to do a comparison of the scope of training in terms of who conducted it, where it was, how long it was and scope content of the training for an investigator under the VASI regime at various levels, whether it be entry or supervisory type levels, with what is currently conducted by ATSB?
Mr Dolan: To the extent that we have that material; I am happy to do that.

Answer:

In response to Senator Fawcett's final question, the Australian Transport Safety Bureau (ATSB) has drawn a comparison of the investigation training regimes conducted under the Bureau of Air Safety Investigation (BASI) and that currently being conducted by the ATSB through Attachments A and B respectively. Attachment A covers the BASI era and incorporates the first five years of the ATSB, post its establishment in 1999. Attachment B then covers the ATSB's training commitments post 2003, after its formal establishment as a nationally accredited, Registered Training Organisation (RTO). This comparison has primarily focused on aviation investigation training.

As summarised through Attachment A, prior to 2003, aviation investigation training was conducted on an ad hoc basis, consisting of a range of short courses facilitated by international providers and those conducted internally. While at the time this approach to training was considered adequate, there were certain limitations in terms of the inherent costs associated with international providers combined with a lack of internal workplace trainer and assessor qualifications and experience. To address these limitations, over 2003-04, the ATSB positioned itself as a RTO and was subsequently scoped to deliver the accredited Diploma of Transport Safety Investigation (TSI Diploma). This status has and continues to serve as the means to enable formalisation of the minimum operational training requirements for all transport safety investigators. Tertiary accreditation also enhances the ATSB's external credibility through the recognition of a formal qualification. The TSI Diploma is based on the Vocational Education and Training model and is designed to produce 'an investigator in charge of a less complex transport safety investigation' (multi-modal). Trainees can expect to dedicate approximately 700 hours towards gaining the Diploma, equating to approximately 12-18 months of on-the-job training, depending on a number of variables.

These variables are best described through the following terminologies:

- Recognised Current Competencies (RCC)/Recognised Prior Learning (RPL) - The ATSB recruits experienced industry personnel (i.e. aircraft maintenance, flight/marine/rail operations, air traffic controllers, engineers and human factor specialists) and these individuals bring a multitude of formal qualifications and skills. Therefore, it is necessary to establish which of these are relevant in context of the Diploma, as this determines the workload in terms of the following categories.

- Core Training - This training is managed internally and is geared towards the liabilities/shortfalls identified through the RCC/RPL process and to specifically target those skills and knowledge required by our investigators. All core training courses are designed to support the twelve TSI Diploma Units of Competency and are facilitated by appropriately qualified personnel (subject matter experts). The complete list of core courses is provided through Attachment B.

- On-the-Job Training and Experience (OJT/OJE) – To facilitate a safe working environment, investigators-in-training initially attend job sites in the capacity as an understudy. There they are supported through a senior coach/mentor program, with all formalised training conducted by either experienced diploma-qualified personnel and/or trainers qualified in Certificate IV Training and Assessment. This training and experience represents a major element in finally determining the applicant's ability to satisfy all TSI Diploma requirements.

In acknowledging that the TSI Diploma, as a base-level tertiary qualification, is limited by design, it is therefore necessary that an ongoing professional development regime be established. Given the parameters of any learning continuum are boundless, the ATSB has controlled its advanced curriculum through strict alliance to well defined senior work level standards. These standards articulate the work outputs required by senior staff and are geared towards the developing capacity to undertake the role of 'an investigator-in-charge of major transport safety investigation'. Therefore, in preparation (given actual exposures will be limited), all senior investigators are encouraged to participate in any or all of the following professional development options:

- Advanced core training courses – these are designed to build on the TSI Diploma platform including; coronial representation, media, representational duties, technical report writing, project management, mentoring, cross disciplinary awareness and the workings of government. While it is still in the development stage, it is worth noting that the ATSB is working towards establishing an Advanced Diploma in Transport Safety Investigation, with the aforementioned advanced courses serving as its core curriculum.

- Industry awareness – designed to maintain specialist skills through ongoing professional applications (licence renewals, revalidations, professional memberships etc). Concurrently this participation ensures that professional and open channels of communication with related industry bodies are maintained. Also it is through this development option that investigators, on occasion, are presented the opportunity to attend overseas training courses. Recent examples include Airbus 380 familiarisation

(France), Jet Engine Mishap Investigation and Aircraft Fire and Explosion (United States).

- Advanced tertiary qualifications – (Advanced Diploma - Doctorate) through targeted subject areas including; aviation, science, engineering, business and general management. Presently the ATSB is supporting a number of aviation safety investigators across a wide array of subjects from a Masters of Investigation Management to Post Doctorate studies in Psychology (Human Factors).

The ATSB's concerted efforts in establishing a professional development regime for its investigators have been widely recognised throughout the world. This is evident by the number of inquiries we receive to either attend our training and/or requests to assist in developing similar TSI Diploma frameworks. Further, our full compliance with ICAO training standards for Aircraft Accident Investigators (Attachment C) has been confirmed through external audits conducted in 2004 and 2007, respectively.

Finally in terms of Senators Fawcett's request to receive, in confidence, a copy of the benchmarking exercise conducted by the Transportation Safety Board of Canada in 2008, the relevant training data is provided through Attachment D. In relation to the rail and marine comparative data, the ATSB has increased its focus/commitment in both modes over the past 24 months, in readiness for the National Safety Investigation Reforms.

129 – Attachments

Attachment A – Training conducted over BASI era
Attachment B – ATSB core investigator training courses post 2003
Attachment C – ICAO Accident investigation training guidelines
Attachment D – International benchmarking final report November 2008

Attachment A – Training conducted over the BASI era, incorporating the first five years of the ATSB, post its establishment in 1999.

Provider	Subject and Focus	Date and Location	Duration	Comments
Bureau of Air Safety Investigation	Human Factors (all investigators)	Established in 1985 - ongoing (internal)	1 week	Was the first of its kind (here and internationally), delivered annually.
Bureau of Air Safety Investigation	OH&S course (all investigators)	1990 - ongoing (internal)	1 day	Basic training for on-site deployments, provided through internal means.
Southern California Safety Institute	Accident Fundamentals (entry level investigators)	1990 - 1995 (United States)	2-3 weeks	Attended periodically by a small number of investigators only. Represented a poor return on investment as it was focused on US legislative requirements, practices etc.
Bureau of Air Safety Investigation	Operational Induction (entry level investigators)	1995 - 2003 (internal)	1 week	An overview/induction course, provided through internal means for each new intake.
Southern California Safety Institute	Accident Fundamentals (entry level investigators)	1995, 1997 and 1999 (Australia)	1-2 weeks	Attended by most of the investigators at the time and was brought to Australia to reduce the cost and allow for some customisation. Feedback suggests it was a reasonable product overall.
Bureau of Air safety Investigation	OASIS database (all investigators)	1997-2007 (internal)	2-3 days	Basic training on the internal accident investigation database, provided through internal means.
Australian Transport Safety Bureau	Coronial Witness (all investigators)	2000-ongoing (internal)	1 day	Provided by an external subject matter expert, delivered annually.
Southern California Safety Institute	Investigation Management (senior investigators)	2001 (Australia)	1 week	Attended by most of the senior investigators at the time. Again a reasonable product.
Australian Transport Safety Bureau	Advanced Investigation (senior investigators)	2002 and 2003 (Australia)	1 week	An adaptation of the Investigation Management course provided by the Southern California Safety Institute, provided through internal means.
Australian Transport Safety Bureau	Interviewing (all investigators)	2002 - ongoing (internal)	2 days	Provided by an external subject matter expert
Australian Transport Safety Bureau	Critical Incident Stress (all investigators)	2002 - ongoing (internal)	1 day	Provided by an external subject matter expert

Attachment B – ATSB core investigator training courses post 2003

Provider	Subject and Focus	Date and Location	Duration	Comments
Australian Transport Safety Bureau	Induction (entry level investigators)	2003 – ongoing (internal)	2 days	Provides an overview of the organisations business priorities, workforce structure, capabilities, including a tour of our laboratories etc.
Australian Transport Safety Bureau	Transport Safety Investigation Act (all investigators)	2003 – ongoing (internal) Refresher every 2 years	1 day	Designed to ensure investigators understand their delegations under the Act and includes an overview of other legislative requirements.
Australian Transport Safety Bureau	Work Health and Safety (all investigators)	2003 – ongoing (internal) Refresher every 2 years	1 day	Covers the Commonwealths WHS legislation and associated responsibilities and the ATSB's extensive WHS management framework.
Australian Transport Safety Bureau	Bloodborne Pathogens and On-site Safety (all investigators)	2003 – ongoing (internal) Refresher every 2 years	1 day	Prepares investigators for the unique hazards associated with accident sites, including the proper use of personal protective equipment etc.
Australian Transport Safety Bureau	Critical Incident Stress (all investigators)	2003 – ongoing (internal) Refresher every 3 years	1 day	Covers 'best practices' in response to critical incident or potentially traumatic events, early recognition of signs of stress, mobilising organisational support and strategies to enhance resilience.
Australian Transport Safety Bureau	Aviation Accident Investigation Fundamentals (all aviation investigators)	2003 – ongoing (internal)	5 days	Intensive course designed to provide aviation investigators the basic skills and knowledge to be applied during the conduct of an on-site investigation, including the role and responsibilities of the Investigator in Charge.
Australian Transport Safety Bureau	Investigation Analysis (all investigators)	2003 – ongoing (internal) Refresher every 3 years	5 days	In depth course designed to cover the ATSB's analytical methodologies and supporting systems, including models of accident development, critical reasoning, statistical reasoning and processes for facilitating safety action.
Australian Transport Safety Bureau	Cognitive Interviewing (all investigators)	2003 – ongoing (internal) Refresher every 2 years	2 days	Provides investigators with the knowledge of factors which influence the ability of witnesses to provide accurate information, an understanding of good investigative interviewing techniques etc.
Australian Transport Safety Bureau	Human Factors (all investigators)	2003 – ongoing (internal)	5 days	Intensive course designed to consider the effects of physical, psychological, and environmental factors on human performance in different task environments, including the role of human operators in complex systems. Incorporates external subject matter experts.

Australian Transport Safety Bureau	Cultural Intelligence (all investigators)	2003 – ongoing (internal)	1 day	Provides the fundamentals skills and knowledge to apply communication strategies, appropriate to culture/gender and age. Provided through an external subject matter expert.
Australian Transport Safety Bureau	Media Awareness (all investigators)	2003 – ongoing (internal)	1 day	Basic workshop designed to prepare investigators to communicate with the media at a local level. Provided through an external subject matter expert.
Australian Transport Safety Bureau	Digital Photography (all investigators)	2003 – ongoing (internal)	2 days	An advanced course taking base level skills to a professional level (forensic focus). Provided through an external subject matter expert.
Australian Transport Safety Bureau	Coronial Witness (all investigators)	2003 – ongoing (internal)	1 day	Conducted in a Moot Court, designed to prepare investigators to act/serve as an expert witness in a judicial inquiry. Provide through an external subject matter expert.
Australian Transport Safety Bureau	Helicopter Underwater Escape Training (marine investigators)	2003 – ongoing (internal) Refresher every 3 years	1 day	Introduced to address the ATSB's WHS obligations in terms of our investigators using helicopters for ship to shore purposes. Provided through external subject matter experts.
Australian Transport Safety Bureau	Safety Investigation Information System (all investigators)	2007 – ongoing (internal)	2 days	Designed to ensure our investigators have a comprehensive understanding of our internal data management system.
Australian Transport Safety Bureau	4WD Familiarisation (all investigators)	2009 – ongoing (internal) Refresher every 3 years	1 day	Introduced to address the ATSB's WHS obligations in terms of our investigators using these vehicles safely when travelling to remote accident sites. Provided through external subject matter experts.
Australian Transport Safety Bureau	Safety Investigation Quality System (all investigators)	2012 – ongoing (internal)	1 day	Designed to ensure our investigators have a solid understanding of the ATSB's extensive investigation related policies, procedures etc.
Australian Transport Safety Bureau	Surface Safety Investigation Fundamentals (all rail and marine investigators)	2012 – ongoing (internal)	3 days	Intensive course designed to provide marine and rail investigators the basic skills and knowledge to be applied during the conduct of an on-site investigation, including the role and responsibilities of the Investigator in Charge.
Australian Transport Safety Bureau	Report Production (all investigators)	2012 – ongoing (internal)	2 days	Designed to enable investigators involved in the report production process to produce a final investigation report in a single format for all transport modes that can be understood by a diverse readership.

Australian Transport Safety Bureau	Helicopter Winching (selected investigators)	2013 – ongoing (internal) Refresher every 2 years	1 day	Introduced to address the ATSB's WHS obligations in terms of our investigators having to be winched into remote accident sites. Provided through external subject matter experts.

Cir 298
AN/172

Training Guidelines for Aircraft Accident Investigators

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and published under his authority

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TABLE OF CONTENTS

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INTRODUCTION

1. The investigation of an aircraft accident is a task that can be almost unlimited in scope. Therefore, some investigations will be curtailed by the resources available, unless proper management of the investigations is exercised. The investigator-in-charge is responsible for ensuring that the expenditure of the resources available results in an investigation that extracts the maximum benefit to the safety of aviation. The investigator-in-charge must have the experience to direct the investigation in a manner that ensures resources are used to the maximum effect and not squandered on irrelevant lines of inquiry. At the same time, the investigator-in-charge must also ensure, as much as is practicable, that relevant lines of inquiry are terminated as soon as they have achieved the level beyond which further expenditure of resources will be uneconomical in terms of enhancing safety.

2. As an investigator gains experience, he will realize that the need to increase his knowledge and upgrade his skills is a continuing process. While training is essential, the optimization of an investigator's capabilities generally depends upon a personal commitment to excellence.

3. During the Accident Investigation and Prevention (AIG) Divisional Meeting in September 1999, several States expressed the view that there was a need to develop common standards for the training of investigators. The training standards were to be compiled in such a way that they would be adaptable to a variety of cultures and operational requirements. Based on the discussion, the meeting in its Recommendation 7/2, agreed that ICAO would develop guidelines for the training of investigators.

4. In response to the Recommendation, ICAO developed the training guidelines contained in this circular. The circular discusses the experience and employment background required for training as an aircraft accident investigator. It also outlines the progressive training that is considered necessary to qualify a person for the various investigation roles, including appointment as the investigator-in-charge of an investigation into a major accident involving a large transport category aircraft. ICAO acknowledges that training guidelines are evolutionary in nature and may need to be updated periodically.

5. Throughout this circular, with the exception of the definitions in Chapter 1, the use of the male gender should be understood to include male and female persons and the term "accident" should be understood to include "incident".

6. ICAO is grateful for the considerable assistance provided by the International Society of Air Safety Investigators in the preparation of this circular.

Chapter 1
TERMINOLOGY

The definition of the terminology is hereby given to ensure that the readers understand the intended meaning of the terms in the context of this circular.

Accident investigation authority. The State organization responsible for conducting aircraft accident investigations.

Accident investigator. A person engaged in the investigation of aircraft accidents, incidents and other aviation safety hazards.

Accredited representative. A person designated by a State, on the basis of his or her qualifications, for the purpose of participating in an investigation conducted by another State.

Adviser. A person appointed by a State, on the basis of his or her qualifications, for the purpose of assisting its accredited representative in an investigation.

Expert/Specialist. A person invited to participate in an investigation, on the basis of his or her specialized knowledge, skills or experience.

Investigation. A process conducted for the purpose of accident prevention. It includes the gathering and analysis of information, the drawing of conclusions, the determination of causes and the making of safety recommendations.

Investigator-in-charge. A person charged, on the basis of his or her qualifications, with the responsibility for the organization, conduct and control of an investigation.

Observer. A person permitted to be present in an investigation for the purpose of observing the investigation process.

Chapter 2
BACKGROUND EXPERIENCE FOR INVESTIGATORS

2.1 Aircraft accident investigation is a specialized task which should only be undertaken by qualified investigators. Many States establish an accident investigation authority manned by qualified and experienced investigators. Some States have both an independent accident investigation authority and an accident investigation unit within the regulatory authority; others rely on investigation by the regulatory authority alone. Some States do not have any personnel employed solely for aircraft accident investigation. Such States should train appropriately qualified personnel in the accident investigation techniques required to participate in or to conduct an aircraft accident investigation. When assigned to an accident investigation, such personnel should be relieved of their regular duties for the duration of the investigation.

2.2 Potential accident investigators must have considerable practical experience in aviation as a foundation on which to build their investigation skills. This experience can be acquired from civil or military qualification as a pilot, aeronautical engineer or aircraft maintenance engineer. Personnel qualified in flight operations, airworthiness, air traffic management, or aviation related management might also be suitable for accident investigator training. Since accident investigations will often involve specialized areas, it is important that those selected for training as investigators understand the aviation infrastructure and are able to relate to the many different areas of aviation.

2.3 Normally, a small team or even a single investigator conducts the investigation of an accident involving a general aviation or small commuter aircraft. In these investigations, it is desirable for an operations investigator to have some technical experience and for an engineering investigator to have some experience as a pilot. In addition, the investigators should have a comprehensive understanding of the interrelationship of each of the supporting services that are necessary to operate an aircraft in the aviation environment.

2.4 Since the outcome of an accident investigation is largely dependent upon the aviation knowledge, skills and experience of the assigned aircraft accident investigators, they should have:

— an understanding of the depth of investigation that is necessary in order for the investigation to conform with the legislation, regulations and other requirements of the State for which they are conducting the investigation;

— a knowledge of aircraft accident investigation techniques;

— an understanding of aircraft operations and the relevant technical areas of aviation;

— the ability to obtain and manage the relevant technical assistance and resources required to support the investigation;

— the ability to collect, document and preserve evidence;

— the ability to identify and analyse pertinent evidence in order to determine the causes and, if appropriate, make safety recommendations; and

— the ability to write a final report that meets the requirements of the accident investigation authority of the State conducting the investigation.

2.5 In addition to technical skills and experience, an accident investigator requires certain personal attributes. These attributes include integrity and impartiality in the recording of facts; ability to analyse facts in a logical manner; perseverance in pursuing inquiries, often under difficult or trying conditions; and tact in dealing with a wide range of people who have been involved in the traumatic experience of an aircraft accident.

Chapter 3
TRAINING GUIDELINES

3.1 GENERAL

3.1.1 Aircraft accident investigators require different levels of experience, knowledge and training according to the particular role to which they are assigned. Aircraft accident investigators should receive training commensurate with their responsibilities as an accident investigator, group leader, investigator-in-charge, accredited representative, adviser or expert/specialist. The training guidelines and course syllabi should be planned in such a way that the investigators receive appropriate levels of training that will enable them to perform efficiently in any of the roles assigned to them by the employer.

3.1.2 Training a person for aircraft accident investigation involves several phases. These phases include initial training, on-the-job training, a basic accident investigation course and an advanced accident investigation course supplemented by specialized courses. While on-the-job training is an ongoing process that continues for many years, there should be sufficient time intervals between each formal course to allow the investigator to consolidate the information and the techniques learned.

3.1.3 Formal courses are designed to complement on-the-job training by exposing trainee investigators to a cadre of experts who can pass on the details of their specialties to their students. The experts are usually recruited from those with experiences in a particular area of accident investigation. They include experienced investigators, aviation medicine physicians, psychologists, aeronautical engineers and manufacturers' representatives.

3.1.4 In many States, structured courses in aircraft accident investigation are conducted by universities, manufacturers, military establishments, accident investigation authorities and other educational institutions.

3.1.5 ICAO does not endorse specific courses or educational institutions that offer aircraft accident investigation training. However, the *Aviation Training Directory* and the ICAO web site (www.icao.int/td) list institutions that offer aircraft accident investigation courses.

3.2 PHASE 1 — INITIAL TRAINING

The aim of the initial training is to familiarize new investigators with the legislation in their State and with the procedures and requirements of the accident investigation authority. The following subjects should be included in the initial training or indoctrination:

a) Administrative arrangements

- — Applicable legislation;
- — International agreements (including Annex 13 — *Aircraft Accident and Incident Investigation*);
- — Memoranda of understanding with other organizations;
- — Liaison arrangements with local and national authorities;
- — Structure of the State's accident investigation authority;
- — Aircraft accident investigation manuals and procedures;

— Definitions and accident classification;
— Equipment and tools;
— Transport arrangements;
— Ethics and conduct; and
— Expenditure control.

b) Initial response procedures

— On-call procedures;
— Notification of other national authorities and organizations;
— Securing of records, recordings and samples;
— Accident site jurisdiction and security;
— Investigator safety including psychological stress;
— Recovery of human remains;
— Requests for autopsies; and
— Family assistance.

c) Investigation procedures

— Authority and responsibility;
— Size and scope of the investigation;
— Investigation management;
— Use of specialists;
— Parties to the investigation, accredited representatives, advisers and observers; and
— Release of information to the news media.

3.3 PHASE 2 — ON-THE-JOB TRAINING

Following the initial training, an accident investigation authority should provide on-the-job training for a new investigator. During this second phase, the new investigator will practice the procedures and tasks covered in the initial training, and gain familiarity with investigation techniques. This training will also familiarize him with the investigation tasks at the accident site, the collection of factual information, the analysis of the factual information and the development of the final report. The conduct of on-the-job training often involves more than one experienced investigator and is not limited to investigations within the State that employs the trainee/investigator.

3.4 PHASE 3 — BASIC ACCIDENT INVESTIGATION COURSES

After completing the initial familiarization training, the aircraft accident investigator who is under training should attend a basic accident investigation course as soon as is practicable, preferably within the first year of training. A basic course should have a syllabus that includes the subjects discussed in Chapter 4.

3.5 PHASE 4 — ADVANCED ACCIDENT INVESTIGATION COURSES AND ADDITIONAL TRAINING

3.5.1 ***Advanced accident investigation courses***. As a trained investigator gains experience, he should be enrolled for an advanced accident investigation course where he can update his knowledge of the basic techniques and increase his knowledge in special areas relevant to accident investigations.

3.5.2 ***Additional training***. Investigators may be called upon to investigate accidents involving a variety of aircraft types. It is impracticable to train an investigator on each of the aircraft types that he may encounter. Nevertheless, investigators should have a basic knowledge of most of the major air transport aircraft types that are operated in their State. It is therefore recommended that investigators attend aircraft type courses on the most common aircraft types used by the airlines in their State. Preferably, such aircraft type courses should include specialized technology transport category aircraft (i.e. aircraft equipped with a glass cockpit, fly-by-wire systems and aircraft which contain composite materials in their structure). There is no need for each investigator to attend type courses on all the large aircraft types used in their State. Training on the various aircraft types can be shared equitably among the investigators. For example, one investigator could be trained on one or two large aircraft types and another investigator on other aircraft types. Investigators with a technical or engineering background could attend the aircraft type courses for technical/maintenance personnel. Similarly, investigators with a pilot background could attend the aircraft type courses for pilots, which could include introductory flight training in a flight simulator.

3.5.3 In accordance with Annex 13, the State of Design and the State of Manufacture participate as accredited representatives in investigations involving the type of aircraft that are designed or manufactured in their State. Although the accredited representatives of the State of Design and the State of Manufacture are usually accompanied by expert advisers from the designer organization and the manufacturer, it is essential that the investigators, who are appointed as accredited representatives of the State of Design and the State of Manufacture, have a basic knowledge of the aircraft designed or manufactured in their State.

3.5.4 Other additional training can be obtained by attending conferences and seminars conducted by aircraft accident investigation organizations, such as the International Society of Air Safety Investigators (ISASI); by reading related material such as the *Aircraft Accident Digest* circulars and aircraft accident reports issued by other States; and by exposure to major investigations as observers at major investigations on site in other States.[1]

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1. The ICAO Assembly recommends in Appendix V of A33-14 that:

   "Contracting States cooperate in the investigation of major aircraft accidents or accidents in which the investigation requires highly specialized experts and facilities, and that to this end Contracting States, to the extent possible, *inter alia*:

   a) provide, on request by other Contracting States, expert assistance and facilities for the investigation of major aircraft accidents; and

   b) afford opportunity to Contracting States seeking investigation experience to attend investigations of major aircraft accidents, in the interest of developing and furthering investigation expertise."

Chapter 4
ACCIDENT INVESTIGATION COURSE GUIDELINES

4.1 BASIC COURSE

4.1.1 Recommended topics

Basic aircraft accident investigation courses should cover the following topics:

- the responsibilities of the States involved, as defined in Annex 13 — *Aircraft Accident and Incident Investigation*;
- the accident site considerations, such as security, hazards, safety precautions, wreckage diagramming, collection of evidence and control of access;
- the investigators' personal equipment and protective clothing;
- the examination and recording of the wreckage and witness marks;
- the range of apparatus available for recording evidence;
- witness interview techniques;
- the full range of in-flight recorders and ground-based recorders;
- the determination of the time and origin of any aircraft fires;
- crashworthiness and survival aspects;
- the properties and the modes of failure of materials used in the aircraft structure;
- the design of aircraft systems and likely modes of failure;
- aerodynamics and aircraft performance;
- the examination of power plants;
- human performance;
- aviation medicine and pathology; and
- the methodology of report writing.

4.1.2 Detailed breakdown of the topics that should be covered

4.1.2.1 ***General introduction.*** The first phase of a course should introduce the investigator to the history of aircraft accident investigation, the development of the international agreements on the conduct of

investigations, and the Standards and Recommended Practices (SARPs) adopted by ICAO and its Contracting States in the field of aircraft accident investigation. The applicable international agreements and SARPs are contained in Annex 13 — *Aircraft Accident and Incident Investigation* to the Convention on International Civil Aviation. Relevant guidance material is provided in the *Manual of Aircraft Accident Investigation* (Doc 6920) and *Manual of Aircraft Accident and Incident Investigation* (Doc 9756). A review of these documents and their salient points is required so that the investigator knows where to find the information on the relevant topics. General guidance should also be given on the investigation of accidents involving unlawful interference, both civil and military aircraft or facilities, and inaccessible or missing aircraft.

4.1.2.2 ***Accident notification procedures.*** The investigator should be introduced to the accident notification systems and the appropriate responses to be expected from each State and organization that are notified. This introduction should cover the ways on how the notification of the occurrence of an accident initiates the process of an investigation. It should also cover the support to be provided to the accident investigation authority in the State of Occurrence by the State of Registry, the State of the Operator, the State of Design, the State of Manufacture, and any other States that are involved by virtue of the number of their nationals involved in the accident or are involved by providing a permanent base for the investigation due to their proximity to an accident site. Accident investigators should be made aware of the requirements of Annex 13 in relation to this phase of an investigation. Preparation for overseas travel in the form of passports and visas and airport airside passes should be reviewed, as should the benefits of access provided by the international agreements inherent in Annex 9 — *Facilitation*.

4.1.2.3 ***Investigation management.*** The introduction should cover the role of the investigator, the skills he will need to acquire, and the accident investigation process. He should be made aware of the value of assessing the availability of resources (such as funding, personnel, equipment and buildings) as well as the planning for the investigation of a major accident beforehand. He should be given guidelines for determining the appropriate size and scope of an investigation, the differences between the management of large and small investigations, and the type of circumstances in which assistance from specialists will contribute to the success of the investigation. An appreciation of the realities of the limits imposed by the resources available and the optimum use of those resources should be discussed. The value of memoranda of understanding with departments and organizations that might be involved in an investigation should also be addressed.

4.1.2.4 ***Investigators' equipment.*** The equipment to be used during investigations will be determined not only by availability and cost but also by the means available to transport it to the site. Information on the use of contemporary aids such as global positioning systems (GPS), satellite telephones, and data links back to base, as well as on the use of basic items such as compasses and inclinometers should be made available. Means of recording in extreme wet or cold conditions should not be overlooked. Instruction on the proper method of taking samples of aircraft fluids and the appropriate containers should also be included.

4.1.2.5 ***Accident site safety.*** The safety of personnel at an aircraft accident site is of paramount importance and must be understood by participants of an investigation. An investigator is a valuable resource and it is important that he is protected and well equipped to do his work in the field with as little risk as is practicable and with the optimum efficiency. Aircraft accidents frequently occur in adverse weather conditions in areas of inhospitable terrain such as mountainsides, swamps and deserts, or in adverse climatological conditions involving snow and ice or fierce heat. The need to take appropriate measures to protect those on the site against exposure to the elements, to any hazardous cargo or dangerous materials released from the aircraft, and against injury or infection must be understood. There are medical risks and hazards from the aircraft wreckage itself and they must be explained to the investigators. Another subject that must be covered is how to deal with psychological stress of investigators and other personnel with exposure at an accident site. Disease is an ever-present risk and inoculations against such risks as hepatitis, malaria and tetanus are essential. The use of protective equipment against airborne and blood borne pathogens should be demonstrated. Utilities such as gas mains, electricity transmission lines and main transport routes require special consideration. Finally, a plan for aid and rescue in the event of an accident involving personnel at the site is required by many occupational health and safety organizations and is also dictated by common sense.

4.1.2.6 ***Protection of evidence.*** To establish a suitable environment for a competent examination of the area and the accident debris, measures should be taken to protect the wreckage from fires, meteorological hazards and souveniring. The need to give priority to recording transient evidence, securing light objects that may be lost in the wind, and recording ground scars and other site markings that may become obliterated should be addressed. The conduct of interviews with the rescue personnel should also be discussed in order to facilitate the determination of the movement of items of wreckage, which they may have caused inadvertently.

4.1.2.7 ***Initial action at the accident site.*** The investigator should be given a thorough understanding of the numerous considerations that should be taken into account at the accident site. With some exceptions such as accidents involving missing aircraft or resulting in wreckage that is inaccessible, the accident site is the primary area of investigation. The methods of apportioning time effectively, prioritizing the types of information to be gathered, plotting the position of surface marks, and identifying and plotting the position of items of wreckage, as well as the preparation for the removal of any exhibits to a secure site are important considerations that the investigator should become familiar with from the outset.

4.1.2.8 ***Information gathering techniques.*** The investigator under training should be introduced to the methods of gathering and reviewing relevant documentation and procedures; the interview techniques used for different types of witnesses; the transcription of air traffic services and other recordings; and the review of aerodrome facilities, emergency services responses and meteorological data.

4.1.2.9 ***Communication and recording media.*** The various media available for communicating to and from an accident site and for recording the evidence at the accident site and throughout the investigation are essential elements of an investigation course. Digital video cameras and digital cameras, standard film photography, laptops and hand-held computers with connections via satellite telephones to sources of information of immediate use at the accident site, and tape recorders are all useful for recording the available information as accurately and rapidly as is practicable. As each type of equipment is evolving rapidly, it is an essential subject in the training of an investigator.

4.1.2.10 ***Witness interviews*****.** The range of witnesses varies with physical condition, nature of involvement, and differences in ethnic backgrounds. They will also vary in their value based on their understanding of the required information and their proximity to the scene. They may be a visual witness who saw an event or an aural witness who heard a sound or relevant conversation. The preparation for interviews, information to be gleaned from body language, the relative positioning of the interviewer and interviewee, preparation of the questions to be asked, the use of open questions, the art of listening and general conduct of the interview, the use of recorders such as video cameras and tape recorders, the value of written statements and signed transcripts must be considered. The precautions to be taken when interviewing the injured or persons in ill health, the young, the aged, and hostile witnesses as well as the use of experts in the field of inquiry should be discussed.

4.1.2.11 ***Recorders.*** In addition to the flight recorders, there are many other forms of recorders used in the aviation industry, from the security cameras on the aerodrome perimeter fence to the maintenance recorders in the aircraft, each with potential use to an investigator. The value of each form of recorder, the methods of interpreting and downloading the information, and the sources of readout must be in the course syllabus. Equally, the value of manufacturer's expertise in recovering information from damaged recorders (such as global positioning receivers, solid-state flight recorders and inertial navigation unit components) should be explored. Another aspect of importance is the means of locating the flight recorders and recovering them from locations that are difficult to reach. Recorders at air traffic services facilities, particularly those that record radar returns, should be the subject of a separate study and guidance regarding their potential use to an investigation.

4.1.2.12 ***Examination of relevant maintenance documents.*** The maintenance history of the aircraft is established primarily from the records held by the operator. However, the investigator must learn to establish

whether the maintenance, inspection procedures and servicing that are recorded as having been completed have in fact been carried out, and he must also learn to determine the adequacy of the specified maintenance procedures.

4.1.2.13 ***Fires and explosions.*** The evidence available to distinguish an in-flight fire or explosion from post-accident fires forms a valuable lesson that must be passed on to the new investigator. The means of determining the ignition source and the fuel supply of a fire are important. It is necessary to teach about the effectiveness of fire fighting measures available on board the aircraft and the means for preventing post-accident fires during an investigation.

4.1.2.14 ***Survival aspects.*** The chances of occupants surviving an accident can be assessed and the means to do so should be given to the accident investigator. The investigator should know the formulae for impact force calculations and the various forms of attenuating impact forces. A discussion on the limits of human tolerance to heat and impact forces is worthwhile, as are the effects of toxic by-products of the accident environment. The efficiency of the rescue and fire fighting services, standard pre-flight passenger briefing spiels, restraint systems, seat anchorages and aids to egress from the aircraft are items that should be studied under this heading. It is also very important to review the factors that affect the occupants' chances of surviving the accident. The means of determining the after effects of a fire on the occupants and the fire's impediment to passenger evacuation must be discussed, as must the availability of such items as smoke hoods and smoke goggles. An understanding of the methods used to protect the aircraft occupants from the impact forces and post-impact effects (such as thermal stress and water immersion) is very important for the accident investigator. He must be able to assess the effectiveness of the methods and make recommendations which will provide better protection for the occupants in the future.

4.1.2.15 ***Structures.*** As the basis for the examination of the wreckage, the study of structures is an area of prime interest to the investigator. The study of structures should comprise metallurgy, fibre reinforced plastics and timber structures, stress analysis and the strength of these materials. It should also include the various modes of failure and the characteristics of such failures in the materials used in aircraft structures. The methods of failure analysis, reconstruction of areas of interest in the airframe, and the evidence of the various modes of failure are important considerations. The various types of flight controls and landing gear structures should also be studied under this heading. This section of the syllabus should cover the advanced equipment used in the study of failure mechanisms, the preparation of samples for examination by such equipment, and the methods for comparative testing of similar materials. The study of structures also provides a platform for introducing the means of wreckage trajectory analysis. Every effort should be made to provide examples of the various failure modes in materials used in aircraft construction.

4.1.2.16 ***Systems.*** Aircraft systems vary from mechanical controls that are still found in general aviation aircraft to the fly-by-wire systems already extant in wide-bodied transport aircraft. There are a wide variety of systems that the investigator should become familiar with in general terms. However, the focus should be on the resources available to assist the investigator in the event of an accident involving a complex system and on common causes of system failure that might be experienced. A lead to system health can often be found in past maintenance records or on-board recorders. It is necessary to discuss, in general terms, fuel, hydraulic, pneumatic, electrical, pressurization, flight control, instruments, navigation, autopilot and instrument systems. Other topics that should be considered include software failures in airborne computers and the adequacy of the protection against catastrophic events ensuing from such failures.

4.1.2.17 ***Aerodynamics.*** The common areas of aerodynamics that frequently assume importance in an investigation are those related to performance and in-flight structural failure caused by overload or flutter. A review of basic aerodynamics and the means of detecting failure from aerodynamic factors should be included in the investigator's basic training. The topics of engine failure recognition speed, V_1 and V_2, climb gradient, over-speed, engine-out performance, icing and stability also deserve special attention.

4.1.2.18 ***Power plants.*** The detailed analysis of power plants is normally the subject of a separate course and is usually carried out in conjunction with the engine manufacturer's representatives.

Nevertheless, the explanation of the basic principles of reciprocating and turbine engines has a place in basic and advanced investigation courses. The same is true with regards to the analysis of damage to propellers and helicopter rotors, and a general overview of methods of evaluating damage to determine if further investigation of the particular propeller or engine is warranted. For example, propellers and turbines can give a worthwhile indication of an absence of engine power at the time of impact. This is another subject in which examples of failures and accident damage form an essential part of the course.

4.1.2.19 ***Rotary wing aircraft.*** A general introduction to the principles of flight for helicopters and their control systems is relevant. However the subject of investigating helicopter and other rotary wing aircraft accidents is usually the subject of a separate specialty course.

4.1.2.20 ***Organizational information.*** Organizational and management information is a section of the final report format and it concerns the organizations and the management involved in influencing the operation of the aircraft. The organizations include, for example, the operator; the air traffic services, airway, aerodrome and weather service agencies; and the regulatory authority. Conducting a review of the organizational structure and functions as well as the management policies and practices of the agencies, authorities and aircraft operator involved is a subject that should be covered. For example, an investigator should have the competence to review an aircraft operator's management functions, policies and practices in their entirety. There are many aspects of the supervisory process which may have a direct bearing on the accident, such as acceptance of inadequate flight crew qualifications; deficient guidance material; maintenance shortcuts; improper crew rostering; failure to provide proper training in aircraft type; shortcomings in crew resource management; and unreasonable pressure to complete schedules on time. The methods of investigating management and organizational aspects of an organization to determine the presence of any risk factors or other shortcomings is a requirement of a well-rounded accident investigation course. An examination of the means of supervision is very important and will include a review of orders, regulations, manuals and independent audits as well as the performance of supervisors, instructors and company management.

4.1.2.21 ***Human performance.*** No accident investigation can be complete without a thorough consideration of Human Factors issues involved. The demands of the environment and the aircraft on the human often approach the physiological and psychological limits of the flight crew, maintenance and servicing crews, air traffic services personnel and other personnel required to support aircraft operations. The study of human limitations, communications, fatigue, decision-making processes, flight crew health and the information available from post-mortem examinations are vital components of this section of an investigation course. An examination of the handling of the aircraft will encompass the areas of operations and training.

a) The area of operations includes the man-machine relationship and the actions or lack of actions in the events leading to the accident. The investigation in this area covers specifically how the flight crew members reacted, analysed and attempted to cope with the complexities of the flight.

b) The area of training will cover the extent and adequacy of the training relevant to the accident flight. The *Manual of Civil Aviation Medicine* (Doc 8984), the *Human Factors Training Manual* (Doc 9683), the *Human Factors Guidelines for Air Traffic Management (ATM) Systems* (Doc 9758) and the *Human Factors Guidelines for Safety Audits Manual* (Doc 9806) are references which can be used in this section of the training.

4.1.2.22 ***Determination of the flight crew's suitability for the flight.*** The flight crew members are required to meet certain licensing, training and experience requirements before conducting any flight. In addition, they must be fit for their duty and the complement of the crew must be appropriate. Familiarity with the flight crew documentation and requirements is essential. Fitness of the flight crew for the flight can be considered as part of several Human Factor considerations and should be explained in detail.

4.1.2.23 ***Methods of analysing the factual information gathered.*** There are several structured procedures for analysing the evidence and facts determined during the investigation. Knowledge of these procedures will enable the investigator to establish whether further investigation is required in order to complete the investigation or to test any hypotheses that the investigation team is considering.

4.1.2.24 ***Report writing.*** Report writing is an integral responsibility of an accident investigator. ICAO has developed a format for writing reports that leads logically from the history of the flight to the safety recommendations. There is a minimum of duplication and a full consideration of aspects of the flight that are relevant to the improvement of safety. Knowledge of this format and process gives the investigator a sound basis for drafting the final report, including the formulation of appropriate safety recommendations.

4.1.2.25 ***The news media and public relations.*** Almost any aircraft accident is of interest to the news media and will to some extent involve the investigator-in-charge in public relations activities. There are two aspects to this subject: the information made available to the public, and the more specialized approach to the survivors and the families of those involved in an accident. The importance of keeping others informed on the progress of an investigation, while not speculating as to causes and protecting the privacy of those who assist with sensitive information, must be explained to investigators. The *Guidance on Assistance to Aircraft Accident Victims and their Families* (Cir 285) is a sound basis for addressing this subject.

4.2 ADVANCED COURSE

4.2.1 Recommended topics

4.2.1.1 Most topics covered in the basic course will also apply to advanced courses, but the instructors are expected to vary their treatment of these topics to suit the purpose of the course and the experience level of the students. In addition to the review of the topics in the basic course, an advanced course should cover the topics in 4.2.1.2 to 4.2.1.4.

4.2.1.2 In general, an advanced course is desirable for preparing an investigator for the responsibilities of group leader or investigator-in-charge of a major investigation. Such a course should aim to give the investigator an understanding of and some competence in the organization of a major accident investigation.

4.2.1.3 In addition to the review of the organization of a major investigation, topics that should be discussed include:

- the provision of family assistance to those involved in an accident;
- relations with the media;
- an introduction to methods for cataloguing a large number of fragments of wreckage;
- management of a large accident site for security, safety and protection of the personnel;
- preparation of briefings and answers to formal questions for members of government;
- the methods of undertaking investigations that involve both civil and military aircraft; and
- liaison with the law enforcement authorities in accidents involving unlawful interference.

4.2.1.4 Other specific subjects which should be included in advanced courses include:

- techniques used to investigate accident damaged systems that involve specialized technologies such as glass cockpit, fly-by-wire systems, GPS, and enhanced ground proximity warning systems (EGPWS);
- reconstruction of evidence recorded in damaged solid state recorders;
- the use of virtual video presentations in large structural reconstructions of wreckage; and
- the use of computer simulations and programmes for flight simulators to recreate aspects of the aircraft's flight path which are of interest to the investigation.

4.3 SPECIALTY COURSES

4.3.1 Specialty courses may be introduced to an investigator at any stage after a basic course. The courses would augment the skills and knowledge acquired by the inspector in order to meet the needs of a particular area of accident investigation that is relevant to his assigned duties.

4.3.2 For topics such as helicopter accident investigation, gas turbine engine accident investigation, accident survival aspects, fires and explosions, Human Factor investigation, family assistance and media relations, they are generally extensive enough to warrant a short course of their own with a specialized syllabus.

4.3.3 Description of the systems involving specialized technologies (such as glass cockpit, fly-by-wire systems, GPS, electronic flight instrument system (EFIS) and EGPWS) is usually provided during aircraft type courses. However, aircraft type courses do not include the investigation aspects nor the investigation techniques of such complex systems. Extensive information can be obtained from memory chips and other solid state electronic circuits used in new technology systems. Increasingly, the investigation techniques for solid state electronic circuits are covered in accident investigation courses. Nevertheless, aircraft accident investigation authorities should contact the manufacturers of such systems for specialty courses, since most manufacturers have accident investigators and support personnel that are familiar with the systems and the investigation techniques required to extract the information stored in the systems.

— END —

ICAO TECHNICAL PUBLICATIONS

The following summary gives the status, and also describes in general terms the contents of the various series of technical publications issued by the International Civil Aviation Organization. It does not include specialized publications that do not fall specifically within one of the series, such as the Aeronautical Chart Catalogue *or the* Meteorological Tables for International Air Navigation.

International Standards and Recommended Practices are adopted by the Council in accordance with Articles 54, 37 and 90 of the Convention on International Civil Aviation and are designated, for convenience, as Annexes to the Convention. The uniform application by Contracting States of the specifications contained in the International Standards is recognized as necessary for the safety or regularity of international air navigation while the uniform application of the specifications in the Recommended Practices is regarded as desirable in the interest of safety, regularity or efficiency of international air navigation. Knowledge of any differences between the national regulations or practices of a State and those established by an International Standard is essential to the safety or regularity of international air navigation. In the event of non-compliance with an International Standard, a State has, in fact, an obligation, under Article 38 of the Convention, to notify the Council of any differences. Knowledge of differences from Recommended Practices may also be important for the safety of air navigation and, although the Convention does not impose any obligation with regard thereto, the Council has invited Contracting States to notify such differences in addition to those relating to International Standards.

Procedures for Air Navigation Services (PANS) are approved by the Council for worldwide application. They contain, for the most part, operating procedures regarded as not yet having attained a sufficient degree of maturity for adoption as International Standards and Recommended Practices, as well as material of a more permanent character which is considered too detailed for incorporation in an Annex, or is susceptible to frequent amendment, for which the processes of the Convention would be too cumbersome.

Regional Supplementary Procedures (SUPPS) have a status similar to that of PANS in that they are approved by the Council, but only for application in the respective regions. They are prepared in consolidated form, since certain of the procedures apply to overlapping regions or are common to two or more regions.

The following publications are prepared by authority of the Secretary General in accordance with the principles and policies approved by the Council.

Technical Manuals provide guidance and information in amplification of the International Standards, Recommended Practices and PANS, the implementation of which they are designed to facilitate.

Air Navigation Plans detail requirements for facilities and services for international air navigation in the respective ICAO Air Navigation Regions. They are prepared on the authority of the Secretary General on the basis of recommendations of regional air navigation meetings and of the Council action thereon. The plans are amended periodically to reflect changes in requirements and in the status of implementation of the recommended facilities and services.

ICAO Circulars make available specialized information of interest to Contracting States. This includes studies on technical subjects.

6/03, E/P1/1400

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Printed in ICAO

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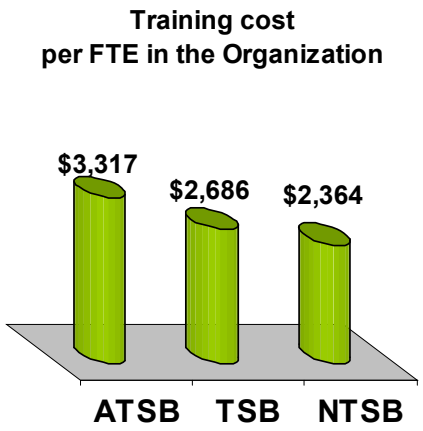
Training and Certification

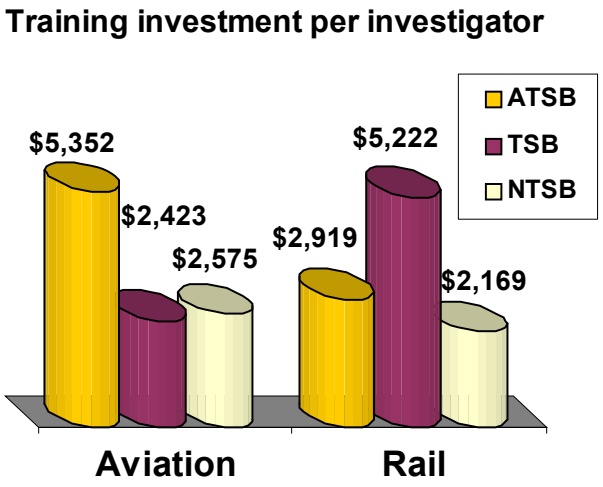
Measure	ATSB	TSB	NTSB
Training Expenditures ($000s)	$307	$607	$891
FTEs in the Organization	92,4	226	377
Training cost per FTE in the organization	$3,317	$2,686	$2,364

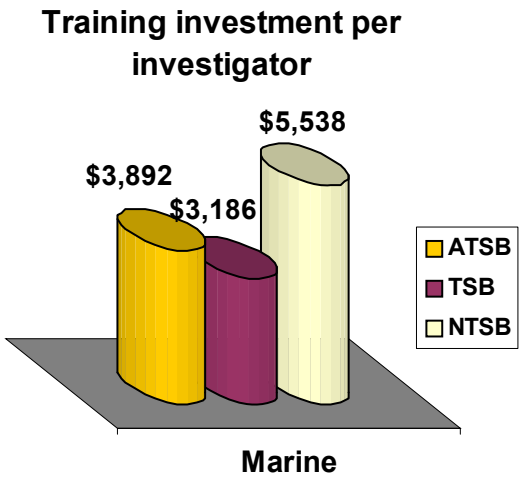


Observations

- All figures above are in CAD and have been converted using the following rates obtained July 8th, 2008 :
  - 1 USD = 1.0207CDN dollars
  - 1 AUD = 0.9731 CDN dollars
- ATSB has the highest training cost per FTE. This can be explained in part by ATSB`s 18-month long, 700 hour TSI Diploma that all investigators must follow once hired. Other training initiatives include tertiary education (e.g. Masters of Fire Investigation, Statistics, etc) and manufacturer's courses (e.g. Pratt and Whitney, Boeing, etc). Further, demographics have changed in Australia, some investigators are joining at a younger age, and so more training investment is required.
- ATSB considers flight training to be just one of several ways for pilots to stay qualified/ abreast of the industry. Since pilots can opt out of flight training, this allows ATSB to be more flexible in the budget amounts approved for pilots who do chose to do flight training.
- TSB has the second highest training expenditures per FTE, but it is in line with NTSB.
- Note that the above figure for TSB does not include some $622,117 expenditures for flight training and alternate flight training as well as related travel costs. These expenditures represent contractual obligations that TSB has for its Aviation investigators to maintain certification once hired. ATSB and NTSB do not have such contractual obligations.
- If we include these flight training expenditures for TSB, TSB has significantly higher costs, with $5,439 per FTE in comparison to $3317 for ATSB and $2364 for NTSB.

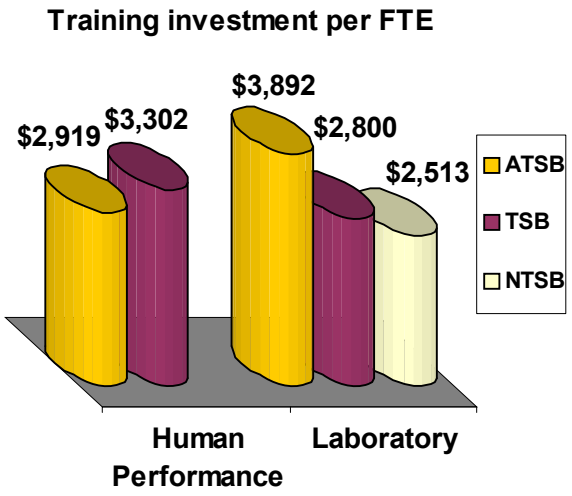
Training and Certification





Observations

- ATSB`s training investment in Aviation FTEs is significantly higher than TSB's and NTSB's. As per the previous slide, the expenditures above for TSB do not include flight training expenditures.
- In contrast, TSB invests nearly double the amount per FTE in Rail, as compared to the other organizations.
- ATSB and TSB invest similarly in the Marine mode and NTSB invests far more in the Marine mode as compared to the other partners.
- In Human Performance, TSB invests more than ATSB per FTE.
- In Laboratories, ATSB invests the most, followed by TSB, and NTSB invests the least.
- NTSB was unable to provide the training investment for Human Performance.



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