

**The University of New South Wales
School of Aviation**

AVIA5022 – Aircraft Accident Investigation Techniques

2016 Course Outline

Course Staff

The course co-ordinator is Peter Wogens of the School of Aviation. Peter can be contacted via e-mail at peter.wogens@unsw.edu.au.

Peter is experienced in aircraft accident and incident investigation, airline safety management systems, quality assurance and aviation security. He has held several positions as Director of Safety, Quality and Security in various aviation operations in Asia.

Peter holds an Air Transport Pilot Licence with over 10,000 hours in domestic and international flight operations. He has held an Instructor rating, a Command Instrument Rating and is a full member of the International Society of Air Safety Investigators (ISASI). He was awarded an MBA from the University of New England (Australia) in 2002, a Bachelor of Laws (Hon. London) in 2012, a Bachelor of Laws (UNE) in 2016 and holds qualifications in Aviation Systems Safety from the University of Southern California and Advanced Management from Cranfield University (UK).

Peter joined the then Bureau of Air Safety Investigation in 1995 where he was trained as an air safety investigator, following which he conducted a two-year research project into the safety issues surrounding advanced technology aircraft.

He joined a major Asia Pacific international airline in 1997 as the Manager of Air Safety Investigation and went on to become Head of Corporate Safety. His challenge was to transform a traditional flight safety department into a corporate safety department in a multi-cultural environment, including the adoption of ICAO style accident and incident investigation protocols, which were applied to the investigation of serious incidents.

Peter's experience allows him to view aviation accident investigation from the perspective of a safety system user and the safety system provider/government agency.

About the Author

Barry Sargeant retired in mid 2001 from the Australian Transport Safety Bureau (ATSB), where he held the position of Deputy Director, Air Safety Investigation. He holds an Air Transport Pilot Licence, with a total flying experience in excess of 9,000 hours. Barry gained 18 years experience as a government air safety investigator, initially with the Bureau of Air Safety Investigation (BASI), which subsequently joined with other government transport safety agencies to form the Australian Transport

Safety Bureau on 1 July 1999. He served as an Examiner of Airmen with the Department of Transport before moving to BASI in 1983.

During his service as an investigator he completed Basic, Advanced, and Major Accident Investigation Courses conducted by BASI. Also, he completed the National Transportation Safety Board (NTSB) Boeing 767/757 Investigators Course (*Boeing Commercial Airplane Group, Seattle 1992*), as well as a Crash Survival Investigators Course (*International Centre for Safety Education, Phoenix 1995*). While in BASI/ATSB he was also an accredited Rail Safety Investigator (*Inter-Government Agreement*) and is currently a Member of the International Society of Air Safety Investigators (ISASI).

Barry was the investigator in charge of the Monarch Airlines accident investigation in 1993 (*BASI Occurrence No.199301743*). That investigation was the first time the Bureau had employed an accident causation model proposed by Professor James Reason as an analytical tool for a major (by Australian standards) aviation accident investigation. Professor Reason later used the investigation of the Monarch Airlines accident as a case study in his book *'Managing the Risks of Organizational Accidents'* (Reason 1997).

In October 1997, following a major collision between two coal trains at Beresfield NSW, Barry was asked to conduct an investigation into the accident, at the request of the NSW government, although having no prior knowledge of the rail industry. The investigation was unique as it was the first time in Australia that air safety investigators had been involved in the investigation of a rail occurrence. Because previous investigations by the rail industry had focused on blaming individuals, rather than addressing systemic issues, he was specifically chosen to lead the investigation due to his system safety knowledge.

The investigation subsequently identified a number of safety deficiencies that were directly linked to organisational issues, including the management of human error, vigilance control systems, safety defences, communications, standard operating practices, occurrence reporting systems and fatigue management. All of those deficiencies had existed within the rail system for a considerable time, but had gone unrecognised because previous investigations had failed to look at the system as a whole.

Course Information

'The real question, of course, is not what safety costs us, but what it saves.'
(James Reason 1997)

This 6 UoC course is intended to provide you with a general understanding of the processes of aircraft incident and accident investigation, in order that you might better understand the role of air safety investigation in the wider aviation context.

The investigation of aircraft incidents and accidents is now recognized as an essential component of any effective safety management system. By its very nature, an aircraft accident represents some form of failure of the aviation safety system. In many cases, valuable insights into the safety health of a safety system can be gained

by the effective use of proven incident / accident investigation techniques. Such investigations are necessarily 'reactive' but do provide a valuable 'snapshot' of how flight operations, maintenance practices and general company management was actually being conducted at the time of the event. When combined with a 'proactive' incident reporting and investigation program (now components of a Safety Management System) the often hidden factors that adversely influence the actions of operational personnel can be revealed.

The investigation techniques examined in this course are directed solely to the objective of accident prevention. The apportioning of blame or the determination of liability is not part of this process.

In many cases, aircraft accident investigations are commenced in chaotic, stressful, and sometimes physically challenging situations. Such circumstances can place significant demands on investigators. It is at those very times that a thorough understanding of the process of investigation is essential to ensure that all elements are properly addressed during that initial phase. Once the dust has settled the investigation enters a more ordered phase, where the likely course of the investigation becomes clearer, leading in time to the identification of significant factors and deficiencies, ultimately resulting in safety actions or recommendations designed to prevent a recurrence of the same type of event.

The following 12 units will provide the basic building blocks for a system of investigation based on the International Standards and Recommended Practices, as described in Annex 13 to the Convention on International Civil Aviation, the ICAO Manual of Aircraft Accident Investigation, and the ICAO Human Factors Training Manual.

Objectives

The objective of this course is to address the following areas:

- **Why investigate?** Understanding the reasons for undertaking an accident investigation, and how to determine the type and level of investigation required.
- **The investigator.** Developing an appreciation of the personal qualities required of an accident investigator.
- **How to investigate.** Recognising the advantages of adopting a system of investigation, and understanding how to utilise such a system within the legislative framework.
- **Managing the investigation.** Gaining an understanding of the management of complex investigations, together with an appreciation of the role of specialist investigators.
- **Identifying safety deficiencies.** Learning how to utilise analytical, systems based processes, to look beyond the actions of individuals in order to examine

the less obvious task and organisational factors that could adversely affect safety.

- **The safety message.** Providing an overview of the types and formats of accident investigation reports, designed to gain the greatest safety benefit.

It is important to state at the very beginning that it is **not** the objective of this course to equip you to be a fully qualified air safety investigator. However, the skills you will learn here are essential for the proper understanding of how the investigative process might affect you or your organization. It will equip you to be able to interface effectively with government investigation agencies by eliminating any element of surprise that often exists through ignorance of the investigative process. It will also assist management in planning adequate training for their company's safety investigators and to understand the importance of human factors in the wider scheme of system safety.

This course, if taken with **AVIA5015 Safety Management System (previously AVIA5314)**, will give you the full picture of internal and external aviation safety management and incident/accident investigation.

It is also important to note that although this course makes reference to the Australian Transport Safety Board (ATSB), the objective is not simply to provide an exposition of the structure and work practices of that organization alone. The ATSB is typical of good government transport investigation agencies around the world. **If you are not based in Australia, you are encouraged to research the practices of the transport investigation agency in your country in parallel with the course material.**

Units

The twelve units have been developed to address the preceding course objectives and to provide the student with a well-developed, general understanding of the subject. The course should be of interest to all participants and does not require specialist expertise in any particular sector of aviation. The knowledge gained from successful completion of the course is readily transferable to other areas of safety management, well beyond the aviation industry.

Unit 1 - examines the **reasons** for conducting an investigation, the level required, and the likely **safety benefit** to be gained from undertaking such an inquiry.

Unit 2 - examines the basic **investigation process**, together with advanced **accident causation models** that enhance the investigative process.

Unit 3 - addresses the **role of the investigator**, and discusses those human **qualities** likely to be found in a successful investigator, why those qualities are important, and how such qualities can be developed.

Unit 4 - looks at the prevailing **legislation**, both nationally and internationally, and the international **standards and recommended practices** adopted by most countries for the investigation of aircraft accidents and incidents.

Unit 5 - focuses upon accident **notification and response** process. In particular, the depth and likely scope of the investigation following notification of an accident, the composition of the **investigation team**, **resource requirements**, and other associated issues.

Unit 6 - examines the **on-site phase** of the investigation, including **control of accident site**, **preservation of evidence**, **occupational health and safety**, and **site security** issues.

Unit 7 - directs the student to sources of **material evidence**, and how that evidence is collected and used in the investigation. Related issues include the obtaining and use of **witness evidence**, the **role of the interviewer**, **interviewing strategies and techniques**, and the **reliability and testing of witness evidence**.

Unit 8 - concentrates on determining the **history of the flight**, drawing upon a variety of data, and how that data can be used in establishing the likely flight path and performance of the aircraft.

Units 9 and 10 - provide the reader with an overview of the evaluation of **human factors** in relation to accident causation, and the involvement of organisational and task related factors in the promotion of human error.

Unit 11 - provides an understanding of the **role of the specialist investigator**, and how their technical expertise can be utilised, not just for the collection of factual evidence, but just as importantly, how that data is analysed and ranked with other information.

Unit 12 - concentrates on the forms of **accident investigation reports** in common usage. The standard of a report has a direct impact on the effectiveness of its 'safety message'. This unit also addresses the formulation of safety recommendations or other safety actions.

Learning Outcomes – How to succeed in AVIA5022?

Learning outcomes or objective – have a particular role in distance learning. Traditional syllabi talked only of the content to be covered; lectures/tutors talked of the dates on which topics would be covered, in the hope that students would thereby acquire knowledge. The role of **learning outcomes** is to make clear what learners are expected to **do** – and what they are expected to **achieve**.

Throughout this material you will be told the intended objectives in a set of outcomes at the beginning of each unit.

You will meet these outcomes again on the '**reflect and review**' pages at the end of each unit. There you will consider whether you have attained the outcomes, and

whether you should revise the unit, or proceed to the next one.

Reflection – we live in an age of reflection – which simply means thinking about – or contemplating what we are doing in order to help ourselves do better.

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Location

This course runs for 12 weeks (Week 2 to Week 13 – see UNSW Semester Calendar) plus a period for revision and a final exam/assignment.

Please contact the School of Aviation for the start date of each semester.

The course is delivered electronically via UNSW Moodle, on a distance-learning basis. The core component of delivery is the course manual. Course manuals are written by experts from various backgrounds within the aviation industry and a cross section of disciplines at UNSW. Each manual has been designed to guide the learner in the most effective and efficient way. As new concepts are introduced, practical exercises are provided so you can develop skills, which can be applied immediately in your workplace. Students are able to study at their own pace, in accordance with their particular work schedules and locations. Academic review and feedback is delivered via e-mail or Moodle.

Learning and Teaching Philosophy

This course aims to provide an academic environment in which students are actively engaged in the learning process. The course aims to be interesting, challenging and enjoyable. Activities are linked to both research and scholarship, and the real world, and allow students to reflect on how accident investigation issues affect them and others in the aviation industry. Student diversity in terms of experiences and learning styles is valued. A supportive environment is provided but there is an expectation that

students will take responsibility for their own learning and also learn co-operatively with their peers. Student assessment is designed to reflect the learning outcomes, and meaningful and timely feedback will be provided on coursework.

Integration into Overall Program

The course links with several other courses offered as part of the MScTech/MAvMgmt in Aviation, that relate to human factors, organisational behaviour, risk and safety management, and aviation operations. This course focuses on human performance within a socio-technical environment.

Internet

Online content and study materials can be accessed via UNSW Moodle:
<http://moodle.telt.unsw.edu.au>

Course Schedule

The course comprises of 12 units to match the course duration of 12 weeks.

Unit 1	The Purpose of Investigation
Unit 2	The Process of Investigation
Unit 3	The Accident Investigator
Unit 4	Legislation and Standards
Unit 5	Accident Notification and Response
Unit 6	The Accident Site
Unit 7	Sources of Material Evidence
Unit 8	History of the Flight
Unit 9	Human Factors 1
Unit 10	Human Factors 2
Unit 11	Specialist Examinations
Unit 12	Investigation Reports

Essential Readings & Reference Material

Essential Readings - are provided with each unit. As the title implies, they are **essential** for your understanding of the course material and must be read. Sometimes these readings are referred to within the text and should be read before

proceeding. In some units the readings should be read after completing the unit reading. This will be made clear to you in the text of each unit.

Reference Material - refers to material that is **secondary** to the Essential Readings. This material could be provided solely for your further reading, or it may be referred to in the text or Reflect and Review section. Examples include legislation, and ATSB accident reports and articles. As the title suggests, you should refer to this material as necessary, however unlike the Essential Readings it may not be necessary to read the entire document, e.g. Air Navigation Act 1920.

Dated Material – like the study of the Law, air safety investigation has its roots in processes and procedures that go back many years. Although every attempt has been made to provide recent examples of the principles being discussed, sometimes older/original examples are preferred.

Assessment

The MScTech (Aviation)/MAvMgmt Program's approach to assessment closely follows that of the Australian Open Learning Program of the Australian Graduate School of Management. At all times assessment is intended to form a component of the learning process and assignments are designed to encourage you to apply what you learn to your own organization. Assignments will be assessed on the basis of how you apply course material to gaining new insight into your organization. Written comments will accompany your return assignments and exercises and should provide useful feedback. The examination/final assignment will provide you and us with feedback about your comprehension of the course content.

Students must submit both assessments in order to be awarded a pass in this course. A “fail” result in Assignment 1 does not mean that you will fail the course.

Criteria for Assessment

Unless otherwise specified, the following criteria will be applied in assessing your written work:

- evidence of understanding of the concepts, theories and ideas developed in the course;
- ability to apply those concepts to situations from your own experience;
- capability to structure an assignment logically and limit it to the length required;
- the degree to which the material submitted for assessment addresses the specified or negotiated assignment requirements.
- the proper use of grammar, spelling, style, and academic referencing, together with an appropriate mix of research and original thought.

Students are referred to the University's rules on academic conduct, which are contained within the Student Handbook. Specifically, plagiarism is absolutely unacceptable and may lead to failure of the course, or in extreme cases exclusion from the University. Students are referred to the University's *Student Handbook* for full details on academic regulations.

Final Course Results

All final course marks are scaled by the School and reviewed by the Faculty. The final approved course result will be officially released on myUNSW in accordance with the UNSW calendar. Students should not assume their final official marks directly from each assessment task even after all the marks for each every assessment are received.

Academic Honesty and Plagiarism

Plagiarism is the presentation of the thoughts or work of another as one's own¹. Examples include:

- direct duplication of the thoughts or work of another, including by copying work, or knowingly permitting it to be copied. This includes copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor;
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.²

Submitting an assessment item that has already been submitted for academic credit elsewhere may also be considered plagiarism.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism.

Students are reminded of their Rights and Responsibilities in respect of plagiarism, as set out in the University Undergraduate and Postgraduate Handbooks, and are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

UNSW Academic Skills and Support website provides information on plagiarism and academic honesty. It can be located at:

<https://student.unsw.edu.au/plagiarism>

Also the Learning Centre <http://lc.unsw.edu.au/> provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

¹ Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle.

² Adapted with kind permission from the University of Melbourne.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

Resources for students

All required texts are provided in the Course Manual via UNSW Moodle.

Reference Texts

There are no mandatory textbooks for this course as all readings have been included with each unit. This permits distance education to take place anywhere in the world at a reasonable cost, and with equitable access to resources. However, many students may wish to use additional texts to further their personal interest in this subject area.

A few suggestions are listed below:

ICAO 1970, *Manual of Aircraft Accident Investigation*, 4th edn, Doc 6920-AN/855/4

ICAO Circular 1993, *Human Factors Digest No. 10 Human Factors, Management and Organization*, Circular 247-AN/148.

ICAO 1998, *Human Factors Training Manual*, Doc 9683-AN/950.

Reason, James. (1990) *Human Error*. Cambridge University Press.

Reason, James. (1997) *Managing the Risks of Organisational Accidents*. Ashgate Publishing Limited.

Internet

Significant resources are available through the Internet.

The Australian Transport Safety Bureau has a well developed website that provides access to a wide range of current ATSB and (older) BASI investigation reports, current legislation, and aviation safety statistics.

<http://www.atsb.gov.au>

International investigation agencies also provide a rich source of information on accident investigation reports and legislative requirements:

UK

<https://www.gov.uk/government/organisations/air-accidents-investigation-branch>

Canada

<http://www.tsb.gc.ca/eng/index.asp>

New Zealand

<http://www.taic.org.nz/>

France

<http://www.bea.aero/en/index.php>

USA

<http://www.nts.gov/aviation/aviation.htm>

Informal Feedback

In addition to the formal assessment feedback, it is anticipated that informal feedback will be available to students throughout the session. This may take place in a number of ways including direct e-mail to the course coordinator. The aim is to encourage a level of interaction between student and facilitator that one might expect in a classroom environment.

Students are also encouraged to highlight any inaccuracies or errors within the manual so future revision may be made. Whilst every effort is made to ensure accuracy, human error occasionally prevails and your comments are welcomed.

Course Guidance

Students are encouraged to communicate with their course coordinator if they have any questions about the material or their progress through the course.

This is best achieved via direct e-mail with the course coordinator.

When emailing, please include the course identifier and unit or subject relating to your question.

Details of the Course Facilitator's email and other contact details can be found in the welcome letter from the course facilitator or the School Administration Officer.

Errata

Students are encouraged to highlight any inaccuracies within this manual so future revisions may be made. Whilst every effort is made to ensure accuracy, human error occasionally prevails and your comments are welcomed.

Continual Course Improvement

Periodically, student evaluative feedback on the course is gathered, using among other means, UNSW's Course and Teaching Evaluation and Improvement (CATEI) Process. Student feedback is taken seriously, and continual improvements are made to the course based in part on such feedback. Significant changes to the course will be communicated to subsequent cohorts of students taking the course

Teaching Strategies

The MScTech (Aviation)/MAvMgmt and its associated programs, the Graduate Certificate in Aviation Management and the Graduate Diploma in Aviation Management, are offered through distance education and have been specifically designed for students who are unable to attend weekly sessions at the university. The MScTech (Aviation)/MAvMgmt is targeted towards professionals and managers who work in aviation related environments.

Administrative Matters

Students should be familiar with the information contained in <https://my.unsw.edu.au> regarding expectation of students, enrolment, fees and other policies that affect you. Also students must be familiar with the information provided in the Postgraduate Aviation Student Guide. This essential document can be obtained from the School of Aviation and is available on UNSW Moodle. Please contact Jamie Lim at aviam@unsw.edu.au for any administrative enquiries.