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

AVIA5008 – Air Traffic Management

2018 Course Outline

Course Staff

The course facilitator is Mr Marek Bekier PhD, MSc of the School of Aviation. Mr Bekier can be contacted via e-mail at marek.bekier@unsw.edu.au.

Marek has over 20 years of operational and management experience in Air Traffic Management throughout Europe with hands-on experience in Aerodrome, Approach and Enroute ATC.

In 2010, after 15 years with Skyguide – the Swiss Air Navigation Provider – Marek moved to Scandinavia as part of an international consulting company that provides advice to airports, Air Navigation Service Providers, regulators and governmental bodies in the area of air traffic management in general and operational efficiency improvements in particular

Marek is currently running some larger projects introducing new ATM systems in the Middle East and Eastern Europe, supporting several European countries in the implementation of Single European Sky policies and providing a range of aviation consultancy services in SE Asia.

About the Co- Authors

Diana Dickens has a Bachelor of Education, Adult Vocational Education and a Diploma in Aviation. She has worked for over 24 years in the Aviation industry, beginning with Airservices Australia as a trainee Air Traffic Controller in 1977. She moved through the ranks of ATC in Sydney and held ratings in nearly all positions in Enroute, Tower and Approach/Departures.

After three years on Approach, in 1994, Diana moved into Curriculum Design and then onto the development of The Australian Advanced Air Traffic System (TAAATS). From 1995 to 1997 she undertook increasing responsibility for the implementation of TAAATS into Sydney moving into the Site Manager Position on a permanent basis in 1996.

By early 1998 Diana was the Operational Resources Manager for Sydney ATC and in November 1998 moved to the Air Traffic Manager role. In this role she was responsible for the day-to-day operations of Sydney, Bankstown and Camden air traffic control operations. In addition to the ongoing duties there were two major projects to be implemented. The first was the operational transition to TAAATS and

the second was the development and operation of Air Traffic Procedures for the Sydney Olympics in 2000.

Diana left Airservices in March 2001 after 23 years. She operated her own Business Consultancy specialising in organisational effectiveness and project management before taking up a position with Toyota Australia.

Walter Civitico started his career in ATC in 1972 as a controller in the RAAF. He joined civil ATC through a short course in 1975. Walter gained procedural sector ratings at Perth WA before taking a transfer to the Papua New Guinea Civil Aviation Agency. In his 4 years in PNG he worked at Nadzab and Lae airports as Senior Tower, Procedural Approach, Aerodrome Control and Sector controller all in one.

On his return to Australia, Walter worked as a Senior Sector controller (non-radar), then to open the new control tower in Karratha WA in 1983, and then working as Senior Tower controller at Jandakot and Perth. He moved to radar control in 1985 working arrivals and then radar Approach.

Walter is recognised as a skilled and effective trainer and whilst working as a shift based Approach/Flow controller he created, developed and delivered classroom and simulator training for approach control trainees at Perth. He was selected as a team leader with the advent of the 'Teams' structure in ATC and was the TMA Stream Specialist, Safety and Quality manager and TMA subject matter expert.

He moved onto the TAAATS project in 1997 as an instructor and Subject matter expert. He developed computer-based training, classroom lectures and simulation. As a TAAATS SME he developed procedures for use in the operational areas and participated in the exhaustive testing of the new system. He was seconded to the Operational Procedures Branch in Canberra. On commissioning of TAAATS he became an Operational System Supervisor, overseeing TAAATS operations in Melbourne. From 1999 to 2004 he was a Traffic Manager in Sydney TCU. In 2004 Walter moved back to Perth as a Tower controller and subsequently took up a position as Team Leader, then Operational Supervisor. Walter is now a Perth Tower ATC Line Manager holding the procedures portfolio.

Course Information

Air Traffic Management, as a concept, arose from the development of the Future Air Navigation Systems (FANS). It is described as consisting of a ground component and an air component, both of which are needed to ensure the safe and efficient movement of aircraft during all phases of operation.

Air Transport is defined as the full set of activities required to satisfy mobility needs by air (SESAR, 2006). The principal stakeholder groups in today's air transport industry are the end-users; customers in terms of passengers and freight, the airspace users (e.g., scheduled and non-scheduled airlines, military, business and general aviation), the aerodrome community (e.g. airport operators, ground handling agents), the Air Navigation Service Providers (ANSP) and the supply industry (e.g., aircraft manufacturers, suppliers of systems used for air traffic management and

airport operation purposes, suppliers of other supporting system. The term Air Traffic Management is relatively new and denotes the three primary, ground-based functions of the system:

✈ Air Traffic Control (ATC): Air Traffic Control (ATC), where the main objectives are to prevent collisions between aircraft and between aircraft and obstructions in the manoeuvring area, and to expedite and maintain an orderly flow of traffic. These objectives are achieved by applying separation between aircraft and by issuing clearances to individual flights having details as close as possible to their advised intentions.

✈ Air Traffic Flow Management (ATFM) Air Traffic Flow Management (ATFM) is established to support ATC in ensuring an optimum flow of air traffic to, from, through or within defined areas during times when demand or expected demand exceeds the capacity of the system

✈ Airspace Management (ASM). Airspace management has the objective, to maximize, within a given airspace structure, the available airspace in a way that shares it amongst users. It is an adjunct to ATC.

The objective of ATM is to enable aircraft operators to meet their planned times of departure and arrival and adhere to their preferred flight profiles with minimum constraints and without compromising agreed levels of safety (EUROCONTROL, 2006).

The provision of ATM is a highly responsible and expensive undertaking. Air Navigation Service Providers (ANSP) need to ensure their organisation, procedures, safety management and operational performance is the best that is possible within the reality of financing such a critical undertaking.

Increasingly the environment has become a significant feature of ATM. Flight paths are subjected to Environmental Impact Statements and the views of the community are taken into account for many of the operations at or near an airport.

Decisions on whether or not to sell government owned operations to the private sector are constantly under review. It is happening with Airlines, Airports, and has happened in varying degrees to ANSPs.

The commercial reality of the aviation industry today is that the end-user pays system costs. The customer has needs and expectations and the service provider must meet those needs and expectations or be able to explain why not. The highest operating cost for an airline is its fuel. Therefore, all possible reductions in the consumption of fuel that ATM can provide result in significant cost savings for the customers. This could be in a reduction in holding times, a more efficient route structure or an arrival STAR that is flown by the airborne computer to the runway.

It is a very collaborative environment. Much of the developments are done in conjunction with operators. This results in the best product or service fit and reduces the amount of time developing ideas or systems that aren't required.

The rate of development of new products and capabilities on both the ground and in the air is, particularly based on an increased application of automated technology, rapid. ANSPs, Airline operators and aircraft developers around the world now work together to develop the best ideas and test them. It is of course a dynamic process with some work becoming obsolete before it can be implemented.

The challenge is to remain at the forefront of this development and in that way be ready to implement, undertake or further develop the new concepts as they emerge.

Aims

This course aims to help students to develop a basic understanding of Air Traffic Management, its key underlying philosophies and of the roles and issues confronting Air Navigation Service Providers in the provision of Air Traffic Management services. Additionally, it is imperative to understand the many co-occurring challenges that are facing the industry today: to be more environmental friendly, less costly, safer and more efficient!

Learning Outcomes

On completion of this course students should be able to:

- demonstrate an understanding of how modern air traffic management developed;
- demonstrate an understanding of air traffic management;
- demonstrate an understanding of the role of an air traffic controller;
- demonstrate an understanding of how modern air traffic management services are delivered using the Australian TAAATS as an example;
- demonstrate an understanding of the differing types of airspace and the services provided within them;
- demonstrate an understanding of aeronautical publications and the processes used to develop air traffic management procedures;
- demonstrate a basic understanding of training and licensing requirements for providers of air traffic services;
- demonstrate an understanding how ANSPs can measure their efficiency.
- demonstrate a basic understanding of safety and risk assessment within the ATM environment
- demonstrate an understanding of the vital interaction between the ANSP and the customer in modern Air Traffic Management;
- demonstrate an understanding of the ANSPs role in environmental and community issues; and
- demonstrate a knowledge of the future directions expected in Air Traffic Management techniques, technology and facilitation.

Location

This course runs for the duration of Semester 1.

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 a variety of reference material to enable students with limited aviation experience to develop an understanding of Air Traffic Management practises and issues, while at the same remaining interesting and relevant for those students with greater experience. Because of the spread of student aviation experience, a great deal of background reading material is provided as the course aims to be interesting, challenging and equally enjoyable for all. Assessments are based on real world or simulated real world situations, and allow students to demonstrate their understanding of Air Traffic management issues. Student assessment is designed to reflect the learning outcomes, and meaningful and timely feedback will be provided on coursework. Application of the learned concepts in real-time scenarios and creativity in finding ways of solving problems will be awarded.

Integration into Overall Program

The course relates to several other courses offered as part of the MAvMgmt, that relate to human factors, risk and safety management, aviation security and aviation operations. This course focuses on the roles and issues of Air Traffic Managers / Air Navigation Service Providers.

Internet

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

Course Schedule

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

Unit 1	The History of Air Traffic Management
Unit 2	The ATM System
Unit 3	Air Traffic Control
Unit 4	Tasks of an ATCO (and what if things go wrong)
Unit 5	Automation in ATM
Unit 6	Human Factors in ATM
Unit 7	ATM Safety and Risk Assessment
Unit 8	ATM Training and Licensing
Unit 9	The Development of ATM Procedures
Unit 10	ATM and the Environment
Unit 11	ATM Efficiency and the Customer Relationship
Unit 12	The Future of ATM

Unit 1 provides information on the development of ATM in the world and in Australia. There are occurrences in history that still impact on today's developments. These units provide essential and interesting background reading.

Unit 2 introduces the Air Traffic Management system and provides an overview on its most important components and how they are normally organised. Air Navigation Service Providers are introduced their standard organisational structure is explained

Unit 3 provides the background to the most important element of the ATM system: Air Traffic Control. The main elements and the most important operational base concepts are explained and provide a good overview on the topic.

Unit 4 looks closer at the functions and tasks of the system operator: The Air Traffic Controller. How their work is impacted by external factors and what their challenges consist of is demonstrated in this unit.

Unit 5 then moves away from the operator and focuses on the new technology and support systems that are designed to support the ATCO in their execution of their daily tasks. Automation theory will help to provide the necessary academic fundament for this section.

Unit 6 is a natural follow-up chapter to automation and introduced the main concept Human Factors. The study of Human factors has transformed the view the aviation community looks at the teamwork within aviation and had helped to understand the breakdown in the human –machine and human – human interaction.

Unit 7 considers the importance of comprehensive safety and risk management processes that are demanded within such a highly responsible undertaking as ATM.

Unit 8 describes all the relevant requirements in connection with licensing and the importance of training to maintain high proficiency.

Unit 9 considers the importance ATM procedures and explains the factors that impact the procedure design in ATM

Unit 10 discusses the community and environment issues that are now day-to-day management issues for any ANSP.

Unit 11 deals with how the ANSP and the customers interact, what is expected and how expectations are dealt with. This includes the strategic planning forums and the stakeholders that are part of that process.

Unit 12 reviews what the future holds for ATM. Where do the ideas come from, how are they developed and what can be expected by the large investment programs such as NextGen and SESAR.

Assessment

Assessment components relate specifically to the learning outcomes for this course and key graduate attributes expected of UNSW students.

The MScTech (Aviation) 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 will provide you and us with feedback about your comprehension of the course content.

Criteria for Assessment

The criteria for assessment of all written work will be:

- Evidence of understanding of the concepts and problems being studied or reviewed.
- Ability to apply solutions in this aviation field from your own areas of experience.
- Ability to write in a concise and simple manner whilst solving complex and difficult issues.
- Being original and developing your own thoughts will be highly rewarded

Report Writing

Report writing standards and requirements are very varied in the University environment and within industry and Government. It is not expected that students will be perfect in this area. The standards in this course are similar to the author's experience in producing action-orientated papers for a Company Board's approval. The standards for referencing require noting publications which have been used, using quotes where appropriate and acknowledging others ideas. Students should endeavour to use the Harvard method of citation when required

The UNSW Harvard Referencing Guide can be found at:
https://student.unsw.edu.au/referencing

or download a free copy of Endnote (referencing software) from:
https://www.it.unsw.edu.au/students/software/endnote.html

Unit Exercises

Some units contain exercises. They are designed to enhance your understanding of the course. Any questions on these exercises can be communicated to the course facilitator.

Early Assessment

In this course, you will be provided with a set of 12 multiple choice questions at the beginning of each semester. These will cover the first 3 weeks of course materials. You should complete these questions with all serious intent one week prior to the Census Date (31 March and 31 August). The Course facilitator will provide the correct answers prior to census date, and explanations for each. Marking yourself honestly therefore will provide you with formative feedback as to whether you have covered the key issues prior to census date. The marks will not be used as a summative contribution to your final mark.

Assignment 1

Submission: End of Week 6 – note Sunday April 15, 2018
Weighting: 20%
Length: Ca. 1200 words (±10% is OK)

.

Assignment topics will be provided in due time. The student will need to demonstrate the ability to absorb the course documentation from the first units and set them into context. Originality, clarity and appropriate academic writing style will be rewarded.

Assignment 2

Submission: End of Week 12 – Sunday May 27th 2018
Weighting: 30%
Length: Ca. 1800 words (±10% is OK)

Assignment topics will be provided in due time. In this assignment, the student must provide evidence that the different course units have been understood and the can be connected. Real world scenarios are typically used to test the ability to transfer conceptual models and theories into the aviation arena. Originality of thought, correct application of examples and academic style will be rewarded.

Final Examination

Submission: Exam/Final Assessment Week, 08 -15th June 2018
Weight: 50%

This assessment task is a "Take Home" exam – you will be given a set of questions and submit the work through UNSW Moodle course by end of the Exam Week.

The examiner is looking for "interesting" and "innovative" answers and not a 'model answer' copied from the text. Answers should wherever possible show an understanding of the interconnection between course concepts.

Special Consideration

You can apply for special consideration when illness or unexpected circumstances beyond your control interfere with your assessment performance.

Assignment Extensions

If you need an assignment extension up to one week, you need to make a formal request with supporting documentation to the course facilitator by email **PRIOR** to the due date. Assignment extensions are not guaranteed and students should not assume that they will be given one.

Exams and Significant Long-Term Issues

A formal Special Consideration request must be lodged online with supporting documentation via https://student.unsw.edu.au/special-consideration

Academic Honesty and Plagiarism

Plagiarism is the presentation of the thoughts or work of another as one's own[1]. 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; and,
- 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

---

[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.

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

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:
1. correct referencing practices;
2. paraphrasing, summarising, essay writing, and time management;
3. appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

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 (Harvard style) of sources in preparing all assessment items.

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

Teaching comprises of self-directed course work, with Mr Marek Bekier being available by email marek.bekier@unsw.edu.au to address any questions.

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 Postgraduate Programs Coordinator at aviam@unsw.edu.au for any administrative enquiries.