

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

AVIA 5006 – Airport Planning

Semester 2, 2016

Course Outline

Course Staff

The course author and facilitator is Mr Rod Sullivan, a Senior Visiting Fellow with the School of Aviation. Mr Sullivan can be contacted via e-mail at r.sullivan@unsw.edu.au. Mr Sullivan does not visit campus during University semester and is available for student consultation only by special arrangement.

Mr Sullivan has a Bachelor of Civil Engineering Degree and a Bachelor of Economics Degree, both from the University of Queensland, and a Postgraduate Diploma in Public Administration from the University of Canberra. He is an airport operations specialist with extensive experience in airport engineering, planning and management, airport standards interpretation, the functional design of airport and helipad facilities, aircraft noise modelling and airspace protection.

Mr Sullivan joined the Australian Department of Civil Aviation as a graduate civil engineer in 1968 and spent the bulk of his career with that organisation and its successors till he left the Civil Aviation Authority in 1992. He then set up and directed what became one of the largest dedicated airport consultancy businesses in Australia until its sale in late 2004. He is now an independent consultant who:

- provides airport operators, aviation regulatory authorities and other consultants with operational, technical and standards advice;
- prepares and regularly presents operational training courses for a variety of airports; and
- prepares aircraft noise exposure forecasts and airport master plans.

In particular, Mr Sullivan has prepared master plans/development plans for Canberra, Hobart, Darwin, Bankstown, Camden, Hoxton Park, Ballina, Flinders Island, Narromine, Wagga Wagga, Latrobe, Gladstone, Moree, Burnie and Griffith Airports. He provided operational and technical advice on the development of an airport at Mt Hotham and the planning for the third runway at Brisbane Airport. He prepared suites of technical papers to underpin the Master Plans for Brisbane and Archerfield Airports.

He was the director of a major airport reconstruction project where he was responsible for the planning and involved in its design. The project involved reconstruction of airside, terminal and landside facilities.

In addition to this course, Mr Sullivan prepared and facilitates the unit on Airport Operations Management, AVIA 5007, in Master of Science and Technology (Aviation) and for 9 years lectured to undergraduates in Airport Management.

Course Information

Aims

This 6 UoC course aims to assist students develop a broad understanding of the key elements of Airport Planning so that regardless of the student's specific personal involvement in aviation, be it with an airport, an airline, air traffic service provider, aviation regulatory body, aviation consultant or interested financial institution, they can take a realistic view, when faced with an airport planning situation, of what the process can achieve and what constraints have to be taken into account.

Students will gain an insight into the complexities and wide ranging nature of the issues confronting an airport planner and of the long lead times and costs involved in providing airport infrastructure. They will also develop an appreciation of the need for effective and flexible planning if an airport is to be developed to its maximum potential – providing for future aviation needs while satisfying development imperatives which will ensure its long term commercial viability.

Learning Outcomes

On completion of this course students should be able to:

1. demonstrate, by completion of two written assignments and exercises contained in the course notes, an understanding of:
 - the need for airport planning, how it is approached and what the planning is designed to achieve;
 - the basic planning constraints that have to be managed eg regulatory requirements and site limitations;
 - the most common forecasting methods and their limitations;
 - the concept of capacity and delay and the part it plays in the inter-relationship of airport subsystems;
 - the purpose of the airport's physical facilities and factors that influence their location and size;
2. conduct independent research and inquiry and apply analytical skills in finding solutions to complex and difficult issues having prepared two written research assignments relating to airport planning;
3. apply good written communication skills by presenting solutions to such complex and difficult issues in a clear and concise manner;
4. apply knowledge gained in other disciplines or life experience to resolving airport planning issues/problems;
5. demonstrate, by way of successfully completing assignments and unit exercises. a capacity for self motivated learning, intellectual development, resourcefulness and successful time management.

Location

This course runs for twelve weeks in Semester Two and is part of the Master of Science and Technology (Aviation) offered through distance education.

Learning and Teaching Philosophy

The course aims to be interesting, challenging and enjoyable. The assignments are linked to the real world to allow students to apply their own life experiences to a practical airport planning situation. Student diversity in terms of experiences and learning styles is valued. 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 relates to several other courses offered as part of the Master of Science and Technology (Aviation) eg Law and Regulations in Aviation, Aviation and Security and Airport Operations Management. This course focuses on the physical environment that has to be planned to allow for the safe and efficient conduct of current and future aircraft operations.

Teaching Strategies

Students have been provided with a comprehensive set of notes supported by readings, a reading list and a list of useful internet sites. The course notes include exercises for the student to complete to focus and consolidate their understanding of the concepts and requirements involved in airport planning. These are not compulsory and answers are either present in the material or involve the student in making decisions, which as in life, may prove to be right or wrong by circumstance.

The materials reflect the course facilitator's long involvement in the aviation industry, specifically his experiences in airport planning, operations and the development of airport standards. The role of the course facilitator is to support and encourage students, to provide them with additional information and answer queries as required. There is however an expectation that students will take responsibility for their own learning and time management as required for the completion of the course and timely submission of assignments.

Internet

A Moodle Module has been created to accompany this course. This will be the primary vehicle for student and facilitator interaction. Additional readings or supplementary course materials may be posted throughout the semester as necessary.

Use of this facility allows the student, learning at a distance to:

- establish a link to UNSW and create a sense of belonging;
- communicate and share relevant information and/or experiences with other students and the facilitator;
- access material as required;
- source information in the notes quickly; and
- evaluate materials before downloading and printing.

Students are encouraged to utilise the internet to establish current regulatory requirements and consider airport master plans that have been made available via the Internet.

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 groups of students taking the course.

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 jamie.lim@unsw.edu.au for any administrative enquiries.

Course Schedule and Subject Matter

Schedule

This course is composed of 12 units to match the course duration of 12 weeks. However students are expected to manage their workloads so that relevant units are completed in conjunction with assignment and examination requirements. The approach to each topic involves self paced learning utilising the course notes and readings supplied and supplemented by student research.

Unit	Topic	Unit	Topic
1	Introduction to Airport Planning	7	Runways and Taxiways
2	Regulatory Requirements	8	Aprons
3	Airport Site Selection	9	Terminal Area – Passenger Building
4	Planning to Safeguard Future Airport Development	10	Terminal Area – Landside Facilities
5	Forecasting	11	Ancillary Airside Facilities
6	Airport Capacity	12	Landside Planning

Subject Matter Overview

An airport is primarily a transport interchange which provides the interface necessary to allow passengers, their baggage and airfreight to be transferred between land and air transport modes. This means that the airport is an extensive system of inter-related and finely balanced sub-systems. If any of the sub-systems are out of balance, airport users – airlines and their passengers as well as other aircraft operators - experience delays and inconvenience. An airport is also a very costly facility and so must provide for more than just present needs. To achieve these ends, the airport system and its sub-systems need to be planned for an appropriate future time horizon.

The reasons for planning airports and the actual planning process involved are little different to any other project that requires forward planning – a future need is recognised, a planning team has to be assembled, clear goals set, the existing situation reviewed and evaluated, constraints and options identified, and a plan of action recommended. In the airport environment this planning process usually results in the production of a Master Plan which identifies future aviation infrastructure requirements. This plan is essentially a concept plan not a detailed plan or design. It identifies areas of appropriate size and location so that there is sufficient flexibility to cater logically for a variety of future development scenarios. Flexibility is the key to a successful Master Plan.

In Australia, except in the case of privatised Commonwealth airports, no legislative requirements apply to the master planning process. In the case of these privatised airports the *Airports Act 1996* sets out the requirements that have to be met in terms of content, consultation and approval. The standards set by ICAO and given effect by national legislation have to be taken into account in planning for individual facilities. Account also has to be taken of local planning requirements which flow from State environmental legislation, policies and directions.

The legislative requirements are only one element of the framework in which planning takes place – site selection is another. Airports occupy large areas of land and finding the right site, in the case of a new airport, or coming to terms with the limitations of an existing site, has to occur before facilities can be planned. Compromise will, or will have been, a factor that has to be taken into account. Ideally the site, its size and location should reflect the role the airport is expected to play in the community. Consultation with relevant authorities and stakeholders, and evaluation of environmental impacts and alternative sites should aim to minimise adverse reactions to the selected site.

This requires a balance to be achieved. While the airport planner aims to minimise the adverse impacts of future airport development on the community there is also a need to put safeguards in place to protect this development from constraints that might be imposed by conflicting off-airport land uses and development.

As mentioned above, the airport plan has to cater for future not just present needs. To do this the future demand for facilities has to be predicted or forecast. Since forecasting is based on what presently happens, the collection of appropriate statistical data is important. However, the accuracy of a forecast diminishes as the time frame over which it extends increases. Forecasts, and the plan itself should be regularly reviewed and updated.

Another vital element in the planning framework is establishing the capacities of the existing airport facilities. A capacity limitation in one airport sub-system can have adverse effects on other sub-systems causing delay and inconvenience through the whole airport system. Forecasting the demand for each facility and setting this against a capacity requirement so that a desired level of service can be maintained will establish the timing for the provision of new or expanded facilities.

The size and location of the major airside facilities are determined by the type of aircraft and the number of aircraft it is planned will ultimately use them. They have to be planned with due regard to the relevant national and international standards. The prevailing winds determine the direction and number of runways. The design aircraft determines the size and geometry of runways, taxiways and aprons, and the required pavement strength. The performance of the design aircraft dictates the runway length, and the type of operation for which the runway is used (instrument or non-instrument) determines how close other facilities can be located to it. The number and location of taxiways provided is determined by the speed necessary to move aircraft between the runway and apron.

Aprons have to be planned not only to provide for the forecast number and type of aircraft using them but also to serve their multiple functions of parking and servicing aircraft, and providing access for passengers and freight handling. Their fundamental importance as the interface between landside and airside makes their planning vital since they have the potential to affect the efficiency and effectiveness of the overall airport system.

The passenger terminal building is the interface where the air traveller changes transportation modes – from surface to air or air to surface transport and, like the aprons, it must function efficiently. The location, size and layout of the building must be planned to facilitate the transfer between transport modes. It must contain facilities for processing passengers and their baggage, as well as the facilities and services necessary to “store” them and their greeters or well wishers until they leave the terminal.

Related terminal landside facilities such as access roads and car parks must be planned to handle expected peak demands and minimise congestion and delay to both arriving and departing passengers. External road systems may need to be augmented, and an internal airport road system and car parking areas will have to be provided to allow passengers, their friends and relatives, airfreight delivery and other service vehicles to access the airport.

The major items of infrastructure need to be supported by a range of ancillary facilities some of which have an aeronautical function and others which do not. However because they all serve a special purpose they all have specific siting, size and operational requirements. These factors need to be considered in the overall airport plan.

One of the factors which drives present day airport planning is the need to identify airport land which is surplus to present and future aviation requirements. If such land exists, it is potentially subject to external planning and zoning requirements and a source of revenue for the airport operator. Increasingly the airport operator is looking at possible commercial uses for these areas. Examples of possible uses are provided.

The Units

The 12 units follow the above overview and the unit titles in the schedule give a reasonable indication of their contents.

Unit 1 deals with the concept of airport planning – focussing on “why” plan, “how” to plan and “what” the Airport Master Plan is designed to achieve. Unit 1 explains what is meant by the term “airport planning” and why it is undertaken. It outlines the planning process and deals with such matters as establishing the planning team, goal setting and the need for consultation. It also deals with the content and purpose of the Master Plan.

Units 2, 3, 4, 5, and 6 deal with elements that comprise the framework in which planning takes place. Unit 2 considers the regulatory requirements relevant to airport planning in Australia and the standards that apply to the design of airside facilities. Unit 3 describes the airport site selection and evaluation process and the factors that have to be taken into account. Unit 4 deals with the issues that need to be considered to protect the airport’s future development from external constraints. These might result from such things as restrictions imposed by community reaction to aircraft noise and off-airport development infringing the airport’s airspace. Unit 5 deals with forecasting which establishes the need for, and size of, airport facilities to cater for aviation activities during the period covered by the plan. Unit 6 considers the concept of capacity and its importance in the airport planning process. It discusses how the capacity of various airport systems are measured and the consequences of system capacities being out of balance.

Units 7 and 8 deal with the planning of runways, taxiways and aprons - the major airside facilities. Unit 7 outlines the standards that apply to runways and taxiways. It looks at the factors that influence the orientation, length and width of the runways, the width of runway shoulders and runway strips and the provision of stopways, clearways and runway end safety zones. It also considers what determines the size, location and number of taxiways. Unit 8 outlines the factors that have to be taken into account when planning aprons so that they contribute to the overall efficiency of airport operations.

Units 9 and 10 deal with the terminal area of the airport – the passenger building and those airport facilities that allow passengers to access the terminal. Unit 9 looks at the factors influencing terminal design, the planning principles involved and types of building plans most commonly adopted. Unit 10 focuses primarily on vehicle access, operation and parking since the car is by far the preferred mode of transport to an airport. However public transport, both bus and rail, is also considered since it is playing an increasing role in providing public access to the airport.

Units 11 and 12 deal with the variety of ancillary facilities needed to support the airport’s operation. Unit 11 deals with the facilities located on the airside or the airside/landside boundary and Unit 12 with those usually located on the landside. They all have their own special siting and/or operational requirements that must be catered for in the planning process. Unit 12 also considers utilising any landside areas which the planning process has identified as not being required for aviation purposes.

Unit Exercises

Some of the exercises contained in the units refer to Dalton Airport. Dalton Airport and its staff do not exist. They have been created to provide a realistic scenario on which to develop an understanding of the subject material. Details about the airport are packaged with the details of the assignment topics which are posted as a separate file on Moodle.

Where the exercises refer to Dalton Airport, carry out the exercise as though you are the recently appointed airport planning consultant. Draw on your own work experience and utilise the course notes,

readings and common sense to provide the answers. As you work your way through the notes you may want to go back and revise some of your answers as your knowledge of the subject increases.

You are encouraged to complete these exercises to enhance your understanding of the practical nature of, and issues involved in, airport planning. They will also assist you in your exam and in your approach to, and preparation of, the assignments.

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; and,
- claiming credit for a proportion of 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 Postgraduate Handbook, and are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

The Learning Centre website is the central University online resource for staff and student information on plagiarism and academic honesty. It can be located at:

www.lc.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 of sources in preparing all assessment items.

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.

Resources for Students

Recommended Texts

While some of the texts are not of recent vintage they are still some of the most definitive available.

Ashford, N., Stanton, H.P.M., Moore, C.A., 1997, *Airport Operations*, 2nd Ed, McGraw Hill, New York.

Ashford, N. & Wright, P.H. 1992, *Airport Engineering*, 3rd edn, John Wiley & Sons, New York.

Bradley, A.L.W., 2010, *The Independent Airport Planning Manual*, Woodhead Publishing Limited, Cambridge.

Caves, R.E., & Gosling, G.D., 1999, *Strategic Airport Planning*, Pergamon, Oxford.

Dempsey, P.S., 1999, *Airport Planning & Development Handbook*, McGraw Hill, New York.

De Neufville, R. & Odoni, A., 2003, *Airport Systems - Planning, Design and Management*, McGraw Hill, New York.

Hirst, M., 2008, *The Air Transport System*, Woodhead Publishing Limited, Cambridge.

Kazda, A. & Caves, R.E. 2008, *Airport Design and Operation*, 2nd Ed, Pergamon, Amsterdam.

Wells, A.T. & Young, S.B., 2004, *Airport Planning & Management*, 5th Ed, McGraw Hill, New York.

Horonjeff, R.M., McKelvey, F.X., Sproule, W.J., Young, S., 2010, *Planning and Design of Airports*, 5th Ed, McGraw Hill, New York.

A copy of the following publication has been posted on Moodle with the course notes:

Sullivan, R.E., 1993. *Town Planning for Airports*, Federal Airports Corporation, Sydney.

Aviation Internet Sites

There are not many sites dedicated specifically to airport planning. The ones listed below may prove useful for certain units and will provide links to other sites that are worth exploring.

An all-purpose website that you are probably already familiar with which allows you to search on almost any topic is <http://www.google.com.au>. Google Earth will allow you to view the facilities at numerous airports. Google searches on Airport Design and Airport Planning will provide sites of interest.

A number of airports around the world now post their master plans on their websites. These provide useful examples of what the airport planning process is designed to achieve.

http://virtualskies.arc.nasa.gov/airport_design/index.html provides a short segment on Airport Design which provides a useful introduction to factors that need to be taken into account in the planning process.

Airservices Australia
<http://www.airservicesaustralia.com>

Aviation Statistics
<http://www.bitre.gov.au/statistics/aviation/index.aspx>

Bureau of Infrastructure, Transport & Regional Economics (BITRE)
<http://www.bitre.gov.au>

Department of Infrastructure and Regional Development
<http://www.infrastructure.gov.au>

Civil Aviation Safety Authority
<http://www.casa.gov.au>

International Civil Aviation Organisation (ICAO)
<http://www.icao.int>

International Air Transport Association (IATA)
<http://www.iata.org>

Airport Council International (ACI)
<http://www.aci.aero/>

Federal Aviation Administration
<http://www.faa.gov>

Sydney Airport
<http://www.sydneyairport.com.au>

Brisbane Airport
<http://www.bne.com.au>

Essential Readings

Each study unit is accompanied by readings. While you will note that some are not recent publications, they have been included either because they provide useful/pertinent illustrations to support the study material or they are still the most definitive available.

A list of these essential readings for the course has been posted on Moodle. You will be able to access the majority of these via links provided on the list. The remainder will be posted on Moodle as PDFs.

Rod Sullivan
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