The University of New South Wales

School of Aviation

AVIA5024 – Flight Deck Operations for Advanced Transport Aircraft

2016 Course Outline

Course Facilitator

The course facilitator is Dr Simon Henderson of the School of Aviation. Simon can be contacted via e-mail at simon.henderson@unsw.edu.au.

Simon Henderson is the A330 Fleet Standards Manager with Virgin Australia. Before taking up this position in January 2011, Simon was a Type Rating Examiner and Training Proficiency Captain with Emirates Airline. Before joining Emirates in 2002, Simon was the flight training development manager for Ansett Australia. In that role he was the 2002 recipient of the Flight Safety Foundation Award for Achievement in Human Factors and Flight Safety. Much earlier in his career, he graduated from the Royal Australian Airforce Academy in 1982 and flew Dakota, Hercules and Boeing 707 aircraft. When Simon left the airforce as a squadron leader he was the flying safety staff officer for Air Lift Group based at Richmond in NSW. Simon has worked with the LOSA collaborative, is a member of the UKCAA CRM advisory panel, and is also a member of the IATA Training and Qualification Initiative.

Simon was a member of a FAA's Civil Aviation Safety Team examining flight deck automation and has also sat on several CASA and other international panels. Simon received his Doctorate in 2009 and is a Senior Visiting Fellow at the University.

Original Authors

Principal Author

Mark Walmsley is a qualified experimental test pilot with the Royal Australian Air Force. Mark has a Bachelor of Aerospace Engineering (Honours) from RMIT, and a Master of Science in Aerospace Design, Management and Manufacture from Bristol University, UK. He has worked with the RAAF as a transport pilot flying C-130H/J aircraft, as a test pilot at the RAAF's Aircraft Research and Development Unit, and as the commanding officer of the Airmovements Training and Development Unit. Mark has been involved in aviation capability enhancement projects as a project manager and test and evaluation/certification subject matter expert, notably the C130J electronic warfare installation project. Mark is currently employed as the resident project test pilot for the RAAF's Airborne Early Warning & Control project, a multi-billion dollar project acquiring six Boeing B737-700 AEW C aircraft.

Flight experience (aircraft and simulator) includes the numerous large aircraft types (Boeing 747-200/300/400, B777, B737NG, B707, Airbus A320/A321/A340, Lockheed C-130H/J, Bombardier CRJ50, Embraer 135, Alenia G222/C27J) as well as military combat aircraft (SAAF Cheetah D, F-111, F/A-18B, Mig-29UB).

Assistant Authors

Robert Denney is a qualified experimental test pilot with the Royal Australian Air Force and has a Bachelor of Aeronautical Engineering (Honours) from Sydney University. Rob completed RAAF pilots course prior to flying the MB-326H and F-111C/G aircraft at Number 1 and 6 Squadrons holding the position of Electronic Warfare Officer. Rob completed Empire Test Pilots School (UK) prior to serving at the Aircraft Research and Development Unit (ARDU) as a test pilot and supervisor on numerous F-111, BAE Systems Hawk, and Boeing F/A-18 flight test programs. Test programs included cockpit evaluations, systems assessments, handling qualities evaluations and performance calculations. Rob is currently employed at ARDU as the flight commander in charge of experimental flight test activities for all fixed wing Australian Defence Force aircraft.

Greg Choma joined the RAAF in 1986 and completed Bachelor of Aerospace Engineering through the Australian Defence Force Academy and Royal Melbourne Institute of Technology. He then completed RAAF pilot training and subsequently flew Caribou Transport and then F-111 strike aircraft in operational, supervisory and maintenance test pilot roles. He flew all Australian variants of the F-111, flew operationally in East Timor and participated in the first successful firing of an AIM-9M missile from this platform. He has a particular interest in the practical application of Human Factors aspects of aviation and has worked as a liaison officer providing human factors advice to operational, investigative and engineering organisations. He is currently employed as a pilot with QANTAS where he has flown internationally on the B747 (classic), and is currently a First Officer flying B737-300, 400 and 800(NG) variants.

Course Information

Advanced transport aircraft are those modern aircraft containing such features as integrated electronic displays, advanced automation modes and flight management systems. Some aircraft also feature fly-by-wire and head up displays system technology. These aircraft almost exclusively require only two pilots, though often additional pilots are added for crew duty reasons on long range flights. The combination of reduced crewing, advanced features, and a difficult flying task makes this a very complex environment for flightcrews to operate in.

In this module we first overview the nature of accidents and incidents for the last four decades noting the change from predominantly mechanical failures to predominantly flightcrew related failures. We then consider human performance theory and introduce a model for how flightcrews process information during the conduct of their flight duties. Of particular note is the importance of situational awareness, cognition and mental models to accurate information processing on the flight deck.

We next review the major advanced technology features present on modern aircraft. Here we explain fly-by-wire technology and contrast this with conventionally controlled aircraft. Flight deck controls such as the wheel, throttles and basic autopilots are described and discussed as a precursor to an in-depth analysis of advanced automation. Here we look in detail at advanced autopilots and the different modes and feedback mechanisms, before describing flight management systems. In reviewing flight deck electronic displays we examine the history, limitations and advantages of these integral displays. We further discuss flight deck display technology by considering Head Up Displays which provide flightcrews with a unique control interface offering many commercial and operational advantages.

Having laid a technological foundation we return to flightcrew information processing to discuss decision making and decision implementation. Safe and efficient flight operations can only be achieved with consistent high performance by flightcrews in this area. Their performance in this regard is discussed by considering flight deck management with particular emphasis on quantifying the types and frequencies of flight deck errors. This error review in particular is of enormous benefit to all aviation professionals. We also discuss the emerging field of flight deck management and introduce a conceptual framework for this based on extant project management principles. We develop the "aviate-navigate-communicate" lexicon into a five-level, primary and secondary task, mental model for flight deck task hierarchy based on different flight phases.

We conclude the module by discussing the characteristics of the top aviation professionals as well as reviewing the attributes of, and programs employed by the premier aviation organisations.

Aims

The course aim is to equip students with a wide ranging understanding of these diverse issues resulting in an improved overall performance in aviation related tasks. A significant outcome is the ability of students to be able to discern the advantages and disadvantages of different types of advanced technology, and then apply those lessons in their own working environment.

Location

This course runs for the duration of Semester 2.

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 system safety 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.

Internet

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

Additional Reading and reference material

Each unit has a list of additional reading or reference material. Some of these are now outdated and the tutor will supply a set of suggested reading materials to use instead.

Course Schedule

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

Unit 1	The Human Factor
Unit 2	Situational Awareness
Unit 3	Cognition, Mental Models and Schema
Unit 4	Aircraft Control Theory
Unit 5	Flight Deck Controls
Unit 6	Advanced Automation
Unit 7	Flight Deck Electronic Displays
Unit 8	Head Up Displays
Unit 9	Decision Making and Implementation
Unit 10	Flight Deck Management
Unit 11	Aviation Professionals
Unit 12	Professional Aviation Organisations

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 subject 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 subject content.

Criteria for Assessment

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

•   Evidence of understanding of the legal concepts, theories and ideas developed in the subject;

•   Ability to apply these concepts to situations from your own experience;

•   Capacity to structure an exercise or assignment logically and limit it to the length required;

•   Degree to which the material submitted for assessment addresses the specified or negotiated assignment requirements.

Assignment Format

The following guidance is offered for assignment submission:

• Use an appropriate paragraph numbering system that matches the assignment question.

• Use at least font size 12.

• Provide a left and right margin of at least 3 cm.

• Use 1.5 line spacing.

• Logical assignment layout.

• Use of a paragraph numbering system related to the question is recommended.

• Use of tables, bullets or other methods to summarize and present concise information is recommended.

Assignment Submission

Assignments are to be submitted through the UNSW Moodle's Turnitin Submission Box unless advised by the facilitators.

Grading and Assessment Rubrics

A grading rubric will be provided prior to each assignment and the exam. This should be referred to by the student when the critically review their own work before submission.

Final Course Results

All final course results are reviewed and scaled by the School and the Faculty. The final approved course results will be officially released via Mail and myUNSW in July (S1) and December (S2). 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 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 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:

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.

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[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.

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.

Informal feedback

As well as the formal assessment procedure, every attempt will be made to give informal feedback during the instruction sessions. This might consist of students swapping exercises to comment on each others work, or it might consist of group discussion. It is essential that all the set exercises be attempted in order to achieve a satisfactory level of understanding of the basic concept of the subject.

Resources for students

Required Texts/Sources

There are no formal texts for this course. The course material supplied covers the essential aspects.

The use of the internet as a source of recent information is encouraged. Several useful sites are listed below. This course will usually direct students to appropriate sites but it is up to students to research the existing and new sites as part of your discovery. In many Units the website is used as the source of an essential reading. If you are unable to get access then please contact the course administrator for a copy.

The UNSW library allows students to access various electronic magazines and journals. The UNSW Aviation administration staff will provide information as how to achieve this access.

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.

Acknowledgments

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