

Producing aviation professionals: a review of two different educational methods

Steven J. Thatcher & Sofia Michaelides-Mateou

Abu Dhabi University
Abu Dhabi, United Arab Emirates

ABSTRACT: This article reviews two different educational methods used by two different universities to produce aviation professionals, and in particular, airline flight crew. In this article, the authors outline the history behind the design and development of two aviation programmes, one at the University of South Australia (UniSA) in South Australia, Australia, and one at Abu Dhabi University (ADU) in Abu Dhabi, United Arab Emirates. The most obvious difference between the two programmes is the difference in length, the ADU programme is four years long and the UniSA programme is three years long. But, the difference between the two institutions, in terms of how each institution packages their aviation offerings, is more substantial than this, and reflects the difference in philosophy between the two institutions. The programme offering at UniSA is offered jointly with a Graduate Diploma in Aviation. The ADU programme provides foundation or general broadening education courses in the first or freshman year of the programme before a student progresses to the aviation courses. Flight training is undertaken after graduation from the degree.

Keywords: Aviation programme, aviation studies, aviation offerings, airline flight crew, flight training

INTRODUCTION

In this article, the authors review two different educational methods used by two different universities to produce aviation professionals, and in particular, airline flight crew. They outline the history behind the design and development of two aviation programmes, one at the University of South Australia (UniSA) in Adelaide, South Australia, Australia, and one at Abu Dhabi University (ADU) in Abu Dhabi, United Arab Emirates.

One of the authors has previously described the development of aviation programmes at the University of South Australia and its antecedent institution South Australian Institute of Technology (SAIT) [1][2]. The development of aviation programmes at the UniSA began in the early 1980's, when senior airline transport pilot practitioners from Ansett, Trans Australian Airlines and QANTAS met in Adelaide, the capital city of South Australia, at the Levels Campus of SAIT with academic staff from SAIT. The Levels Campus of SAIT later became the Mawson Lakes Campus of University of South Australia (UniSA). This group of experts met to discuss the professional status of flight crew and the necessary educational qualifications required for airline transport pilots to gain professional recognition. This was the result of an emerging consensus in the Australian aviation industry that air transport pilots should belong to a profession, similar to other professionals in professions, such as medicine and law.

Similarly, the development of aviation programmes began at ADU in the early 2010's, when senior aviation practitioners from Etihad Airlines met with faculty from ADU in Abu Dhabi, the capital city of the United Arab Emirates to discuss developing a Bachelor's degree programme in aviation for Etihad cadet pilots. This group of experts developed a Bachelor's degree programme in aviation for Emirati Etihad cadet pilots as part of the UAE's Emiratisation Policy.

Although the development of the aviation programme at ADU was some 30 years after the development of aviation programmes at UniSA the prime motivation for programme development was the same, to elevate the status of commercial and airline pilots to that of a professional by awarding flight crew internationally recognised university degree qualifications. Further, it appeared to be the view of both the UniSA and ADU development teams that flight crews needed to be not only trained to fly an aircraft, but to be educated in all areas of piloting, including management, aviation psychology and human factors, educational processes and high technology aircraft control systems. Both groups commenced development of a tertiary award programme, at their respective institutions, which would move pilot education into the tertiary sector. This had the advantage of delivering a university level programme that would

allow pilots to be educated, as well as trained in civil aviation and, thereby, achieve professional status. The programmes in each institution have evolved over time such that, the UniSA now offers a Bachelor of Aviation (BAv) and ADU now offers a Bachelor of Science in Aviation (BScA).

Although both programmes have similar aims, focussed around the professionalisation and education of flight crew, and other roles in the aviation industry, they have different education strategies by which they achieve these aims.

AVIATION AT UNIVERSITY OF SOUTH AUSTRALIA

In 1991, SAIT and the College of Advanced Education merged to form the University of South Australia (UniSA) and in the same year opened its own flight training school at Parafield Aerodrome. The University of South Australia Flying School (later renamed the UniSA Aviation Academy) purchased a fleet of five Piper Warrior aircraft to cater for current and future student demand. The UniSA became the first university in Australia to own and operate a flight training school.

Also in 1991, a Stage 1 Submission for the Bachelor of Applied Science in Civil Aviation was submitted. The Stage 2 Submission was finalised in October 1992 with the first students commencing in 1993 [1]. This was in response to high student demand for a degree qualification in civil aviation. In 1995, after another programme review, the flight training component was removed as a requirement for admission to the award. From 1995, a student was no longer required to have obtained an Australian Commercial Pilot Licence with a Command Instrument Rating in order to graduate. This allowed many students to study the degree without doing the integrated flight training programme or, indeed, any flight training. However, the majority of students still undertook the degree flight training programme at the Aviation Academy in conjunction with the Bachelor of Applied Science (Civil Aviation).

Since 1993, the Bachelor of Applied Science (Civil Aviation) has been revised a number of times [3]. In 2013, the title was changed to Bachelor of Aviation as it was seen as being more indicative of the content and focus of the programme. As a result of the various amendments, courses have been removed and courses have been added. The result is a well-rounded professional degree in pilot education. The current courses in the degree are included in Table 1.

If a student successfully completes the Bachelor in Aviation degree, they will have studied in excess of the requirements for the Australian Airline Transport Pilot Licence theory subjects and will have developed the attitude to succeed in an international aviation industry. They will also have developed the skills necessary for life-long learning. An attribute essential for success as a professional pilot in the airline transport industry. Further, the academic studies and flight training are closely integrated to provide a professional pilot education programme. The way in which lectures and tutorials are delivered encourages students to become a very close knit group. The friendships formed during this time period form a valuable network, which seems to last well into their future careers.

AVIATION AT ABU DHABI UNIVERSITY

The Bachelor of Science in Aviation (BScA) programme at ADU was designed to provide students with the opportunity to study most areas in the aviation industry. The BScA includes courses that are required in order to become a professional pilot, as well as courses that are required for careers, such as airline management, airport operations, flight operations, human factors specialists, and safety and security. The BScA degree includes courses, which combine theory and practical elements of study. This encourages students to apply their knowledge in both a theoretical and practical manner as professional pilots and aviation personnel. Students are also given the opportunity to learn how to diagnose real world problems and develop a variety of solutions, improve their communication skills, increase their critical thinking and decision-making skills, and work in a multi-cultural environment.

The BScA was developed some five years ago, when faculty members from ADU and consultants in the field of aviation education and training came together to develop the degree programme. The BScA programme was developed from elements of the Australian, USA and UAE undergraduate curricula. Since the BScA programme's inception ADU has graduated two cohorts of students, most of these students have progressed to the Etihad Airways flight training programme offered at Etihad's Flight Training Centre in Al Ain, Abu Dhabi, UAE. After 18 months of flight training at Etihad's Flight Training Centre, the pilot cadets will transition to the right hand seat of an A320 as a first officer. Other, non-Etihad, students have obtained positions with UAE airlines in non-pilot roles, have pursued further studies in trainee manager courses in airline companies, have begun working in flight operations with local and international companies or have pursued further academic qualifications in aviation. Currently, the Aviation Department at ADU offers the BScA as a four year undergraduate programme, and an aviation specialisation in the MBA programme. MSc programmes in airport and airline management, airport and airline operations, safety and security, and human factors are being developed, so as to provide a pathway to further studies for non-Etihad graduates.

One feature of the ADU programme is the internship course in the final year of the programme. This is a five to 13 week full-time internship with an aviation related company, such as Abu Dhabi International Airport, Dubai International Airport, Al Jaber Aviation. The students can gain valuable experience in a wide range of positions in the aviation industry. These positions include flight operations, airline management and airport management. The majority of these positions allow students to become familiar with airside operations at major international airports, such as Abu Dhabi

and Dubai. Student exposure to the internship programme has enabled non-Etihad cadets to gain employment in the aviation industry and is a very exciting component of the programme.

Table 1: Comparison of courses offered in the aviation degree programmes at the UniSA and ADU.

UniSA	ADU
	Freshman year
	Fall semester
	Communication Skills in Arabic I
	English I
	Islamic Culture
	Introduction to IT Applications
	General Statistics
	University Study Skills
	Winter term
	Communication Skills in Arabic II
	English II
	Spring semester
	Mathematics for Science and Technology
	Natural Sciences
	General Psychology
	UAE and GCC Society
	Critical Thinking
	Summer term
	Technical Communication for Engineering and Science
	Principles of Management
First year	Sophomore year
Semester 1	Fall semester
Aviation Physics 1N	Aerodynamics
Aviation Practice	Aircraft Engines
Aerodynamics 1	Aviation Law
Aircraft Engines and Systems 1	Crew Resource Management
	Professional Ethics
	Winter term
	Airline Management
	Open Elective 1
Semester 2	Spring semester
Meteorology 1	Private Pilot Operations
Aviation Law and Flight Rules	Introduction to Meteorology
Navigation 1	Systems and Components
Human Performance and Limitations	Flight Physiology
	Aircraft Performance
	Summer term
	Instrument Pilot Operations
	Open Elective 2
Second year	Junior year
Semester 1	Fall semester
Navigation 2	Airport Operations
Meteorology 2	Flight Safety
Human Factors	Aviation Weather
Aircraft Operations 1	Flight Navigation
	Air Traffic Management
Semester 2	Spring semester
Aerodynamics 2	Electronic Flight Management System
Aircraft Engines and Systems 2	Aviation Science of Multi-Crew Flight Operations
Threat and Error Management	Jet Transport Systems
Aircraft Operations 2	Pilot Career Planning and Interviewing Techniques
	Commercial Pilot Operations
Third year	Senior year
Semester 1	Fall semester
Communication and Research Methods	Internship
Aviation Operations and Management	
Crew Resource Management	

Heavy Aircraft Systems	
Semester 2	Spring semester
Risk and Safety Management	Open Elective III
Aviation Project	Open Elective IV
Large Aircraft Performance and Planning	
Elective	

COMPARISON OF PROGRAMMES OFFERED AT UNISA AND ADU

The programme schedule for the Bachelor of Aviation offered by the UniSA and the Bachelor of Science in Aviation offered by ADU is presented in Table 1 above. Perhaps the most obvious difference between the two programmes is the difference in length of the programmes; the ADU programme being four years long and the UniSA programme being three years long. But, the difference between the two institutions, in terms of how each institution packages their aviation offerings, is more substantial than this, and reflects the difference in philosophy between the two institutions.

The programme at the UniSA is a three year programme offered jointly with a Graduate Diploma in Aviation. The BAv is a highly focused programme, which focusses on the flight operations or academic studies relevant to a professional pilot or flight crew member. The Graduate Diploma includes the flying and theoretical components for a Commercial Licence and Command Instrument Rating in addition to studies in multi crew operation. If a student elects to take the Graduate Diploma concurrently with the BAv, they will graduate in three years with both a BAv and a Grad Dip Av. This enables a student to commence work as a commercial pilot after graduation.

The programme offered at ADU follows a different philosophy. The BScA programme is a four year programme and provides foundation or general broadening education courses in the first or freshman year of the programme. After completion of the freshman year the students enter the second year of the programme, sophomore year and commence aviation related courses. The aviation courses are a mixture of technical and non-technical courses. For example, the programme includes Private Pilot Operations, Instrument Pilot Operations and Commercial Pilot Operations on the technical side and Crew Resources Management, Aviation Science of Multi Crew Operations and Flight Physiology on the non-technical side. The programme is designed to give a student a balanced, general introduction to many aviation discipline areas. The degree is a broad-based programme, which allows students to decide which particular area of aviation interests them and pursue it through further study.

Upon completion of the BScA, a student will be able to undertake an MSc in Flight Operations, Flight Safety and Security, Airline/Airport Management, Airline/Airport Operations or enrol in a flight training programme to complete a Commercial Pilot Licence with a frozen ATPL. This pathway allows students to gain a general broad-based education in aviation before specialising in a particular field of interest. For example, a student from the Etihad Cadet Pilot Programme would graduate in four years (or three years if they elect to study during the winter and summer terms) with a BSc in Aviation. They will, then, enter a Multi-crew Pilot Licence Training Programme at Al Ain for 18 months. After which, they will graduate with a frozen ATPL and a Multi-crew Pilot Licence (MPL), which will allow them to act as a first officer on an Airbus A320 aircraft operating on local routes in the region.

The differences can be summarised as follows, the UniSA Bachelor's degree is highly specialised to flight operations, which combined with a concurrent graduate diploma would enable a student to be ready to enter the industry as a commercial pilot upon graduation after three years. The ADU degree is broad-based with half the degree focused on the technical, flight crew operations area and half focused on the non-technical operations area. The ADU degree combined with MPL training would enable a student to be ready to enter the industry as a commercial pilot after five and half years. A student with either a degree from UniSA or ADU would be eligible to enter a Master's degree programme after graduation. With the UniSA philosophy a student could gain a Master's degree as part of a nested programme arrangement with six months to one year by adding the thesis component on to the Graduate Diploma. The possible timelines for educational pathway progression to PhD following the philosophy of each institution can be seen in Table 2.

Table 2: Cumulative timelines for education progression at each institution.

Award/Qualification	Abu Dhabi University (cumulative years)	University of South Australia (cumulative years)
Bachelor's degree	4	3
Graduate Diploma	Not applicable	3
Commercial Pilot Licence Instrument Rating	5.5	3
Master's degree	7.5 (or 6 if flight training not undertaken)	3.5
PhD	10.5 (or 9 if flight training not taken)	6.5
Total time to PhD	10.5 (or 9 if flight training not taken)	6.5

To become specialised in either one of the non-technical or technical areas a graduate from the ADU Bachelor's degree would need to undertake a Master's programme or the flight training programme. In order to become specialised in one of the non-technical areas, a graduate from the UniSA Bachelor's degree would need to undertake a Master's degree programme in the non-technical area. However, if a student has undertaken the concurrent graduate diploma degree, the student would already be specialised in the technical area upon graduation.

CONCLUSIONS

In conclusion, the two institutions deliver their aviation programmes in two very different ways. The most obvious difference is the length of their respective programmes in terms of the time taken to obtain a commercial pilot qualification and the time taken for the pathway to Master's and PhD qualifications. The other difference between the two institutions is the educational philosophy behind the development of each programme. The UniSA's philosophy was to offer the BAv and Grad Dip Av as concurrent programmes, such that the students have flight crew qualifications at the end of three years and upon graduation from the Bachelor's degree. The ADU philosophy was to offer the BScA and flight training sequentially, such that the students have flight crew qualifications at the end of four and a half, to five and a half years depending on whether the students take extra courses in the winter and summer terms. Both institutions have a philosophy to deliver broadening undergraduate education courses, but ADU allocates both a full first year dedicated to broadening and foundation studies, as well as electives within the major years of the programme. The UniSA only offers the broadening electives.

The suite of programmes offered by both institutions fulfils the requirements for students to graduate with a Bachelor's degree and a commercial pilot qualification. In the ADU Bachelor's programme, the academic courses are not taken concurrently with the flight training. However, once flight students enter pilot training, they will do the ground and flight training in an integrated fashion. They will also repeat many of the technical courses studied in the Bachelor's degree in their ground training. By comparison, in the UniSA's Bachelor's degree, students take the academic courses together with the flight training and do not undertake ground training at the flight academy. The question, perhaps, is which is the better philosophy? Should students undertake the flight training in parallel or in series with the academic theory? Undertaking the aeronautical knowledge or theoretical material, in parallel with the practical flight training using an integrated flight training approach, has been recognised as the better method in terms of student pilot learning outcomes [4-7].

An integrated approach to the education and training of pilots is recognised as the most efficient, because elements learned in the academic (or in ground training, the aeronautical knowledge) courses are applied within a short period of time in the practical flight exercises. This leads to better learning outcomes in the learning of flight skills. Conversely, reinforcement of academic elements in the practical flight training leads to better understanding and learning of the academic elements. This understanding allows the students to progress to the next element in the academic course having more fully understood the preceding element of the course. Thus, the learning of flight skills is assisted by the learning of academic theory and, in turn, the learning of academic theory is assisted by the learning of flight skills.

In the UniSA philosophy, this cycle is complete and closed. But, in the ADU philosophy the academic theory is learned in isolation from the learning of flight skills. As a consequence, the learning of academic elements is probably not as efficient, and the understanding not as fully realised as would have been the case if practical flight training was used as a reinforcement of learning outcomes. However, once a student progresses to the flight training after graduation from the degree, the learning of flight skills is assisted and linked with the learning of ground aeronautical knowledge courses.

But, perhaps the benefit of integrated education training or experiential learning, is a cultural issue as the research has only been conducted within a western context, rather than a middle-eastern context [4-6]. Perhaps, in other cultures, a focus on general or foundation studies prior to undertaking the aviation major courses is more beneficial in achieving learning outcomes. Also, perhaps, it is better to undertake flight training after graduation. In this way, a student can revise and repeat elements of the technical academic theory courses through the delivery of aeronautical knowledge courses in a ground training environment as they undertake their flight training.

But, *time is money* and the longer it takes to achieve pilot qualifications the more expensive it becomes for an airline or an individual. Most airlines would prefer a programme, which will graduate pilots within two years or within three years if studying for a degree. Only a few airlines have the economic luxury to allow longer than three years for a pilot's flight education and training.

REFERENCES

1. Thatcher, S., The development of a new discipline in aviation education and training at the University of South Australia. *Proc. 5th Global Cong. on Engng. Educ.*, New York, USA, 17-21 July, 85-88 (2006).
2. Thatcher, S., The internationalisation of the aviation education, research and operations laboratory (AERO Lab) at the University of South Australia. *Proc. 10th UICEE Annual Conf. on Engng. Educ.*, Bangkok, Thailand, 19-23 March, 45-48 (2007).
3. Thatcher, S.J., Mapping the aviation curriculum. *Inter. J. of Technol. and Engng. Educ.*, 6, 1, 5-10 (2009).

4. Lintern, G., Flight instruction: the challenge from situated cognition. *The Inter. J. of Aviation Psychology*, 5, 4, 327-350 (1995).
5. Lave, J. and Wenger, E., *Situated Learning: Legitimate Peripheral Participation*. New York: Cambridge University Press (1991).
6. Thatcher, S., Experiential learning and the classification of team skills in pilot education. *World Trans. on Engng. and Technol. Educ.*, 6, 2, 271-274 (2007).
7. Thatcher, S., Scenario-based learning and assessment for second year aviation students. *Global J. of Engng. Educ.*, 11, 2, 123-133 (2007).

BIOGRAPHIES



Steve Thatcher is the Inaugural Chair of Aviation at Abu Dhabi University (ADU) in Abu Dhabi, UAE. He is also the Inaugural Professor of Aviation at ADU and an Adjunct Professor at Central Queensland University. Steve works in partnership with Etihad Airlines to provide Etihad cadet pilots the opportunity to study a Bachelor of Science in Aviation. Previously, Steve was a founding member of the team that introduced Australasia's first tertiary award course in Aviation in 1985 at the University of South Australia's (UniSA) antecedent institution the South Australian Institute of Technology. This established the aviation discipline in the Australasian region. Steve was also a founding member of the team that established the University's Aviation Academy in 1990 becoming the first university in Australasia to own and operated a flight training school. Steve was also a founding member of the Australasian University Aviation Association. Serving as Secretary for a number of

years. In 2005, Steve successfully negotiated the SA Government Fixed Wing Shark Patrol Service for UniSA Aviation. UniSA Shark Patrol provides a valuable community service and has provided graduate pilots with valuable flight time experience at a stage in their careers when it is relatively difficult to get flight experience. Steve recently won the Chancellor's Award for Community Engagement for the UniSA Shark Patrol. Steve has qualifications in Physics, Psychology, Education, Computer Systems Engineering and Aviation. He has been a Jackaroo in South West Queensland, a Mechanical Engineer for British Aerospace (UK) and has lectured in Physics, Electronics and Aviation. He holds a Commercial Pilot Licence and a Grade One Instructor Rating. Steve is on the Editorial and Review Boards of several journals and international conferences. Steve has won the UICEE's Silver Badge of Honour for distinguished contributions to engineering education, outstanding achievements in the globalization of engineering education through the activities of the Centre, and, in particular, for remarkable service to the UICEE.



Dr Sofia Michaelides-Mateou holds a Doctorate from the University of Middlesex, UK, a Bachelor of Laws (LLB) and a BA from the University of Witwatersrand, South Africa and has been a full-time lecturer of law and air law for over twenty years. Sofia is currently an Associate Professor of Aviation at the College of Engineering at Abu Dhabi University in the UAE. She is also an Adjunct Professor at Emirates Aviation University and has lectured at Cranfield University, UK. Sofia is co-author of the book *Flying in the Face of Criminalisation: The Safety Implications for Prosecuting Aviation Professionals for Accidents* (Ashgate, UK, 2010) and the author of the book *Air Law: A Practical Perspective* (Sakkoulas, Greece, 2010). She has presented many papers at international aviation conferences and published articles on numerous aviation areas including UAS, unruly

passengers, the liability of aviation professionals, subsequent to a serious aviation accident or incident, protection of aviation safety data and just culture. Finally, she is an aviation-legal consultant who has participated in a number of aviation litigation cases, an Associate Member of the International Society of Air Safety Investigators (ISASI), a member of the Flight Safety Foundation and of the Eurocontrol Just Culture Task Force.