



**THE UNIVERSITY OF ADELAIDE
STUDENT BRANCH OF
THE AMERICAN INSTITUTE OF
AERONAUTICS AND
ASTRONAUTICS**



ANNUAL REPORT 2004

**School of Mechanical Engineering
The University of Adelaide
Adelaide, South Australia
AUSTRALIA, 5005**



THE ADELAIDE UNIVERSITY STUDENT BRANCH OF THE AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS

MEMBERS 2004

Faculty Advisor

Dr Gerald Schneider
Dr Matthew Tetlow
Ms Kimberly Clayfield

AIAA Section Advisor

Mr Mark Bateup

Postgraduate Advisor/Returning Officer

Ms Sarah Crook

Executive Committee Members

Chairperson

Rogan Shimmin

Vice Chairperson

Martina Marinkovic

Secretary

Justin Hardi

Treasurer

Julie Barnes

UAV Team Leader

Stewart Jones

General Committee Members

Rebecca Baylis
Crystal Forrester
Artur Medon

AIAA Student Branch Members (41)

Babu	Vishrantha	Middleton	Elise
Bammann	Tom	Nguyen	Phuc
Borgas	Alexander	O'Connell	Michael
Boyd	Andrea	Odayappan	Segoron
Boyd	Marcus	Pearce	Susan
Butchart	Nick	Pham	Elizabeth
Buttery	Ruth	Randell	Sam
Carr	Joshua	Ravenscroft	Lachlan
Chartres	James	Richards	James
Coppola	Ryan	Robins	Rowena
Cranwell	Matthew	Rodger	Ben
Crouch	Keith	Shuard	Adrian
Eldridge	Mark	Sieburn	Jonathon

Fang
Gamboa
Garbowski
Jarrett
Jones
Kohlhagen
Liemar
Mason

Chung
Erwin
Liana
Mark
Richard
Emma
Simon
Shannon

Sysouphat
Teske
Turner
Vial
Williams
Zhou
Zoontjens

Andrew
Tim
Ben
Thomas
Tristan
Tong (Roger)
Luke

Membership Summary

Total Members 2004	50
Total Members 2003	39
Total Members 2002	44
Total Members 2001	90
Total Members 2000	31

CHAIRPERSON'S REPORT 2004

This year saw a huge increase in interest in Aeronautical activities, thanks to the commencement of a Aerospace Engineering degree at Adelaide University. Our annual careers night was proof of this, with club membership (previously fallen to around 30) almost double. Many thanks to Mark Ramsay from BAE Systems, Mark Bateup from DSTO, and Dr. Matt Tetlow (a postgraduate from Adelaide University) for their thought provoking presentations.

Our other big event for the year was a Design, Build and Fly competition for a remote control aircraft. A similar event was held in Sydney in 2003, but unfortunately could not be repeated. Therefore, our Unmanned Aerial Vehicle group organised a local competition to design a aircraft with limited motor size, to lift the most weight. The idea was to finalise a stable flight platform before adding automated control systems. The competition, held at Holdfast Model Aero Club, was a great success. The final result was a draw with the two entrants (Adelaide University and Holdfast) both lifting 3 kg. Although the craft in question was then forwarded to the Computer Science department to build their own control systems, the club now has a workable, stable design.

This year also saw many conferences held in Adelaide, such as the International Space University and the Australian Space Developers Conference. A series of fascinating talks was also provided by various bodies such as the AIAA local branch, the IEEE, and the IEAust, with many members taking advantage of free entrance. Topics included renewable energy, astrobiology, and aircraft tail-spin recovery. One free lecture provided by the International Space University featured a panel of astronauts, including Adelaide's own Andrew Thomas. These talks are not only fascinating, and give you a broader view of aeronautics and astronautics, but are also a great opportunity to network with local and international employers.

Other events included a movie night. While not drawing a huge crowd, this event shows promise to become a fun regular event. Our organised trip to the observatory fell through due to bad weather, and due to time constraints the field trip to the Edinburgh RAAF base has had to be postponed until next year. A couple of things to look forward to!

I encourage everyone to get involved next year. Although it may seem the club is not doing much for most of the year, the executive committee is busily trying to organise events. The more people and the more ideas we have, the better it will turn out for everyone! For a start, watch out for our new stall during O'Week!

Finally, I would like to extend my thanks to Dr. Matt Tetlow and Kimberley Clayfield for their support, and welcome to Sarah Crook who is taking over from Kimberley as Returning Officer. Last and most of all, many thanks to the Adelaide Chapter of the AIAA for their continued support.

Rogan Shimmin
Branch Chairperson

AEROSPACE CAREERS SEMINARS

The first event for the Student Branch in 2004 was annual Aerospace Careers Seminar which was held on the evening of Tuesday 4th May. The seminar featured three main speakers from the engineering industry and from The University of Adelaide. These were

Mr. Mark Bateup (Defence Research Scientist, DSTO)

Mr. Mark Ramsey (BAE Systems)

Dr. Matthew Tetlow (Aerospace Research Fellow, The University of Adelaide)

Each speaker spoke for around 20 minutes on their educational and career background, the history of their employer, and their current work. This year was the first time the seminar involved a speaker from within the university. Dr. Tetlow's presentation on Postgraduate Research was particularly interesting and gave the students another avenue to consider for their future.

Following the individual presentations, students stayed on to enjoy free pizza and soft drink, and to ask further questions of the presenters. The evening lasted about 2 hours and proved to be quite beneficial to the students. The Seminar was well attended and attracted around 30 new members to join the Student Branch for 2004.

OBSERVATORY VISIT

This year the Student Branch scheduled two Observatory visits to the private observatory in Kersbrook featuring an 8" reflector for May and August. Unfortunately, however, the visit had to be cancelled at the last minute due to bad weather making observing impossible, to the great disappointment of many members. Sadly this is the second year running in which the observatory visits has been cancelled due to bad weather.

AUSTRALIAN SPACE DEVELOPMENT CONFERENCE 2004, ADELAIDE

Early in the year the Student Branch was asked for interested students to volunteer to help with the organising of the 8th Australian Space Development Conference held at the Adelaide Hilton from July 28-30. These volunteers (Andrea Boyd, Artur Medon, Crystal Forrester, Susan Pearce and Sarah Crook) gained experience in event management and a behind the scenes look at conference proceedings as well as the opportunity to meet aerospace professionals.

MOVIE NIGHT

Tuesday the 10th of August marked the first free movie night held by the Student Branch. This was a social event planned to keep members active within the society and to promote the AIAA as a club. This was held in The University of Adelaide Union theatre which meant there was no cost of hiring facilities for the club. The night started with a short documentary on the Space Shuttle before the screening of Minority Report. Unfortunately due to late notice and lack of advertising the turn out was less than expected. However those who attended enjoyed the free popcorn and softdrink and socialising with other AIAA members

UNMANNED AERIAL VEHICLE PROJECT

In June 2002, the University of Adelaide AIAA Student Branch established an Unmanned Aerial Vehicle (UAV) Group. The aim of this special interest group was to provide members with hands-on experience in aircraft design and control, through the design, construction and flight of unmanned aircraft with control systems of varying degrees of complexity. The ultimate goal of this group is to build and fully autonomous UAV.

In 2004, the UAV group held and entered a competition to design, build and fly a remote control (RC) aircraft capable of carrying a maximum payload. This was a joint project between the University of Adelaide AIAA Student Branch and The University of Adelaide Computer Science Department. The 2003 and 2004 UAV competition teams consisted wholly of AIAA Student Branch members interested in extracurricular activities involving practical applications of their chosen courses.

Rule Specifications for 2004 UAV Competition

The main specifications of the 2004 UAV Design, Build and Fly competition were:

1. The aircraft must be designed to carry the maximum payload possible. The payload will be contained within a rectangular box to be carried by the aircraft (whose weight will be included in the total payload) with dimensions of 100mm x 100mm x 200mm. The container maybe orientated in any way.
2. The maximum engine size allowable is 0.25 cubic inches. Remove [Only this one engine maybe used to power the aircraft.]
3. The aircraft must take off using only the power of the engine.
4. A maximum of 5 channels can be used to control the aircraft.

The aircraft specifications placed two major constraints on the aircraft, engine size and physical payload size, but allowed space for creativity and originality.

Aircraft Design and Construction

The group aimed to build a light weight aircraft with a high aspect ratio to give the aircraft good low speed, high lift characteristics.

Length	1.2m
Wingspan	1.8 m
Chord length	0.225 m

Aspect ratio	8:1
Wing area	0.405 m ²
Weight (empty)	1.8kg
Take-off distance (empty)	~ 10 m
Take-off distance (loaded)	~ 60 m

The construction technique was similar to a conventional RC aeroplane. The size and weight of the payload box were the main consideration in the design.

Competition Day - Results

The first test flight was conducted the morning of the competition. The only modifications that had to be made were changing the positions of the battery pack and receiver. The test flight proved the aircraft was very stable and controllable.

The only other entry in the competition was by John Modistach, a member of Holdfast Model Aero Club and an experienced modeller. His aircraft was of similar design but had a wing span of roughly 2.2m and a shorter chord. Additionally, he included more dihedral in the wing to add stability for the lack of ailerons.

During the competition, the aircraft flew alternatively with the payload being increased in 500g intervals at the start of each round.

With no payload, both aircraft had a short take-off distance and good maneuverability. With 1.0kg of payload, the planes stabilised in the light breeze. The final payload both aircraft managed to lift was a recorded 3.05kg, exceeding all expectations.

Unfortunately, the University of Adelaide's aircraft crashed on the downwind leg of its 3.05kg payload flight due to an engine failure. However, minimal damage was experienced due to the experience of the pilot. Due to the success of both entries, the competition judges, Bill Finch and Ian Linke, declared the competition a draw. This was a fitting result as both planes performed extremely well.

Future Work

The ultimate aim of the group is to build an autonomous UAV. The group endeavour to enter future national aerospace competitions. This work will provide further experience in

the construction of light aircraft. Close ties will be maintained with University of Adelaide's Computer Science Department in the chance of future joint projects.

Team Members

Stewart Jones (Level 2)
James Dutschke (Level 1)
Tong Zhou (Level 1)
Brett Neale (Level 1)
James Richards (Level 1)
Rebecca Baylis (Level 1)
Crystal Forrester (Level 1)



UAV team for 2004

Project Advisors

Dr Matthew Tetlow - School of Mechanical Engineering, the University of Adelaide
Mr Bill Finch - Workshop staff, School of Mechanical Engineering, the University of Adelaide
Mr Ian Linke - Workshop staff, School of Electrical & Electronic Engineering, the University of Adelaide

Conclusions

This joint project between the University of Adelaide AIAA Student Branch and the University of Adelaide's Computer Science Department provided both parties with tools for the development of autonomous aircraft. The design emphasised the importance of practical knowledge when designing small scale aircraft. Model aircraft construction is a craft within itself, and although it can be based on the dynamics of actual aircraft, practical knowledge is invaluable.

Stewart Jones

Team Leader and Organiser 2004