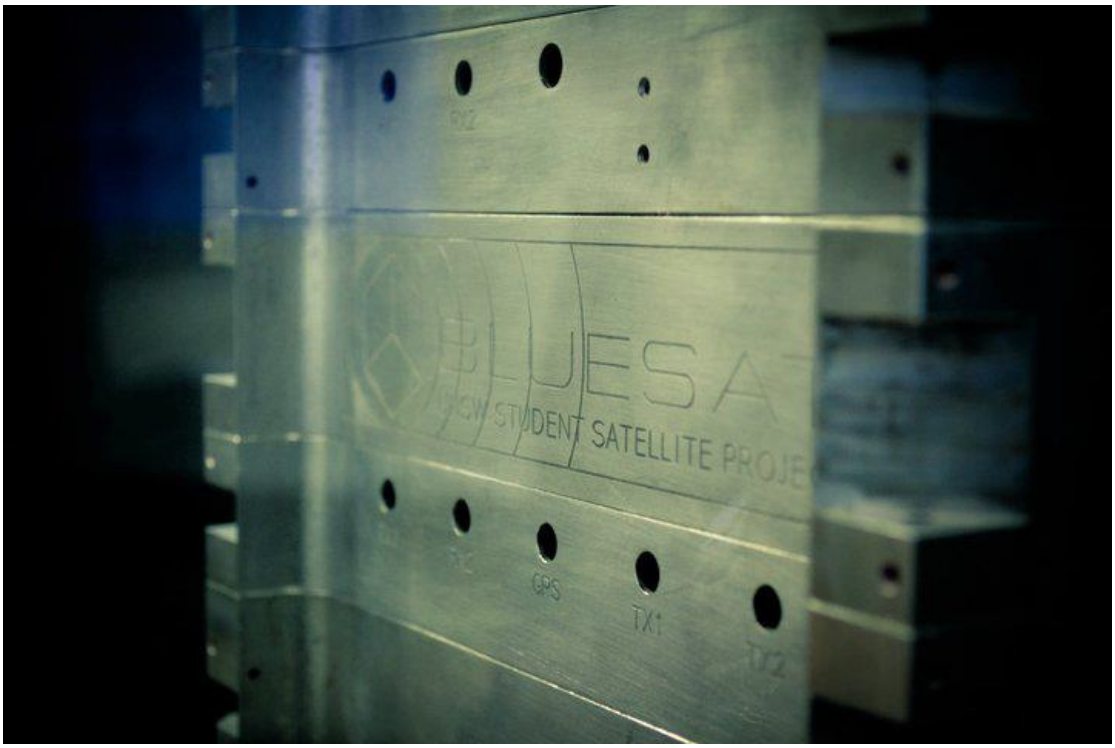
BLUESAT
UNSW STUDENT SPACE PROJECTS

Australia's Undergraduate Space Group

Proposal for Industry Partnership



Presented by

BLUEsat

University of New South Wales
Sydney, Australia

Contents

1 Executive Summary

This proposal introduces the BLUEsat group and outlines the progress that has been made in completing the BLUEsat satellite. It proposes an industry partnership between the BLUEsat Group and __company__ to help fund the launch of the satellite in April 2014. Incentives to sponsor the BLUEsat Group include widespread branding, networking events and student outreach opportunities.

2 Overview of the BLUEsat Project

The first BLUEsat satellite is an amateur radio satellite that has been entirely designed and built by undergraduate students at the University of New South Wales (UNSW). The satellite was completed in July of 2013.

The BLUEsat Group is rebuilding a flight model of our satellite to undergo a test launch in April 2014, and we are seeking funding to achieve this goal.

Today, the BLUEsat Group is made up of dedicated undergraduate engineering students at UNSW with an interest in space engineering. We are currently expanding into multiple student space engineering projects, each with a time frame of less than 2 years. Our team is primarily made up of talented Electrical, Mechanical and Software engineering students.

The aim of the BLUEsat Group is to:

- Provide UNSW Students with an opportunity to design, build and launch Space Hardware
- Teach students practical design and project management skills in the space-engineering field.
- Raise the profile of BLUEsat, UNSW and its sponsors by successfully competing in international Space Design Challenges.

Figure 1 - The BLUEsat Team

2.1 Background Information

BLUEsat's first major project was completed under the Warrawal Project. The Warrawal Project was a space educational program arising from the government-funded Australian Space Research Program (ASRP). The aim of the project was to create space-engineering educational opportunities within Australia.

As part of the project, the first BLUEsat microsatellite was to have a fully functional model by mid-2013. This deadline was successfully met, with the complete demonstration to the final Warrawal Consortium Conference taking place in July 2013.

BLUEsat is now re-building a flight model of the working satellite to undergo a test launch in April 2014. We are also preparing to compete in the Canadian Space Design Challenge (CSDC) and the NASA Lunabotics Competition.

Figure 2 - Finished BLUEsat satellite before the Warrawal Consortium demonstration.

2.2 BLUEsat Satellite Specifications

The BLUEsat microsatellite is an amateur radio satellite based on the original AMSAT design. It consists of an aluminium structure (pictured below) that is broken up into five trays. Four of the trays contain critical system components and the fifth tray carries the payload.

The payload will consist of the Namura Experimental GPS, a small array of sensors and two cameras. One camera will be positioned to photograph the curvature of the Earth and the second camera will face the satellite to document the flight.

Satellite Mass: 9kg

Dimensions: 23x23x23cm (Without Antennas)

23x23x90cm (With Antennas)

Frequencies: 145.95 MHz (Receiving)

436.54 MHz (Transmitting)

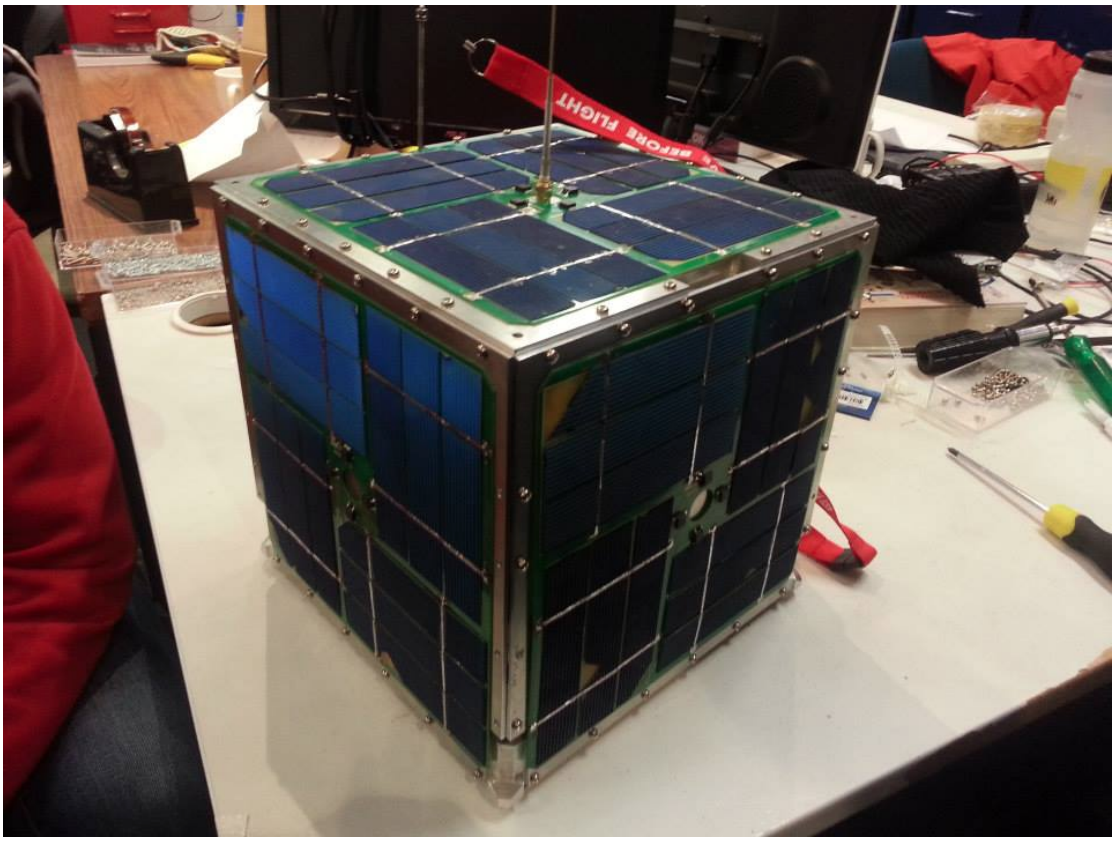


Figure 3 - Finished Satellite Structure

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3 BLUEsat's Future

With the first satellite project completed, the BLUEsat Group is heavily recruiting and expanding for the future. The Group will focus on undertaking three main projects – the Test Flight for the first Satellite, the Canadian Space Design Challenge (CSDC) and the NASA Lunabotics competition.

3.1 Test Flight

In April 2014, a stratospheric balloon launch will completely test the capabilities of the BLUEsat satellite under space conditions. This will allow for an effective telemetry sweep and comprehensive tests of the entire system. It will also provide us with important feedback on the satellite's performance in a radiation environment.

This will make BLUEsat the first satellite to reach space that is completely designed and built by undergraduate students.

There are several different flight durations available for the test launch, with longer flights providing a greater scientific and engineering return. Our goal is to test BLUEsat at a height of 40km for 24 hours, however this presents a significant financial investment for a student project.

BLUEsat would like to partner with ___(company)__ to work together and ensure this remarkable achievement can be accomplished together.

3.2 Canadian Space Design Challenge

The CSDC is a Canadian run CubeSat design competition. The competition calls for the design and delivery of a 3U CubeSat, with 21 months between registration and satellite delivery. The CSDC also requires that entrants participate in high-school outreach and science educational programs in order to increase space-technology awareness in the public community.

BLUEsat has contacted the CSDC administrators with support from the Australian Centre for Space Engineering Research (ACSER). The CSDC has given a positive response, encouraging UNSW to partner with a Canadian University in order to field an entrant into the next cycle of satellites, expected to be delivered in mid-2015.

3.3 NASA Lunabotics

The NASA Lunabotics Mining Competition requires university student groups to design and build an un-manned rover designed for operation on the moon. The challenge runs annually, with competitions held at the Kennedy Space Centre in Florida. International universities make up a significant number of entrants each year. Like the CSDC, the Lunabotics competition also requires student groups to perform high school outreach.

The BLUEsat Lunabotics team is currently working on an initial conceptual design, project plan and budget. The aim is to have a semi-functional model by end of Semester 1, 2014 and a rover ready for entrance to the May 2015 competition.

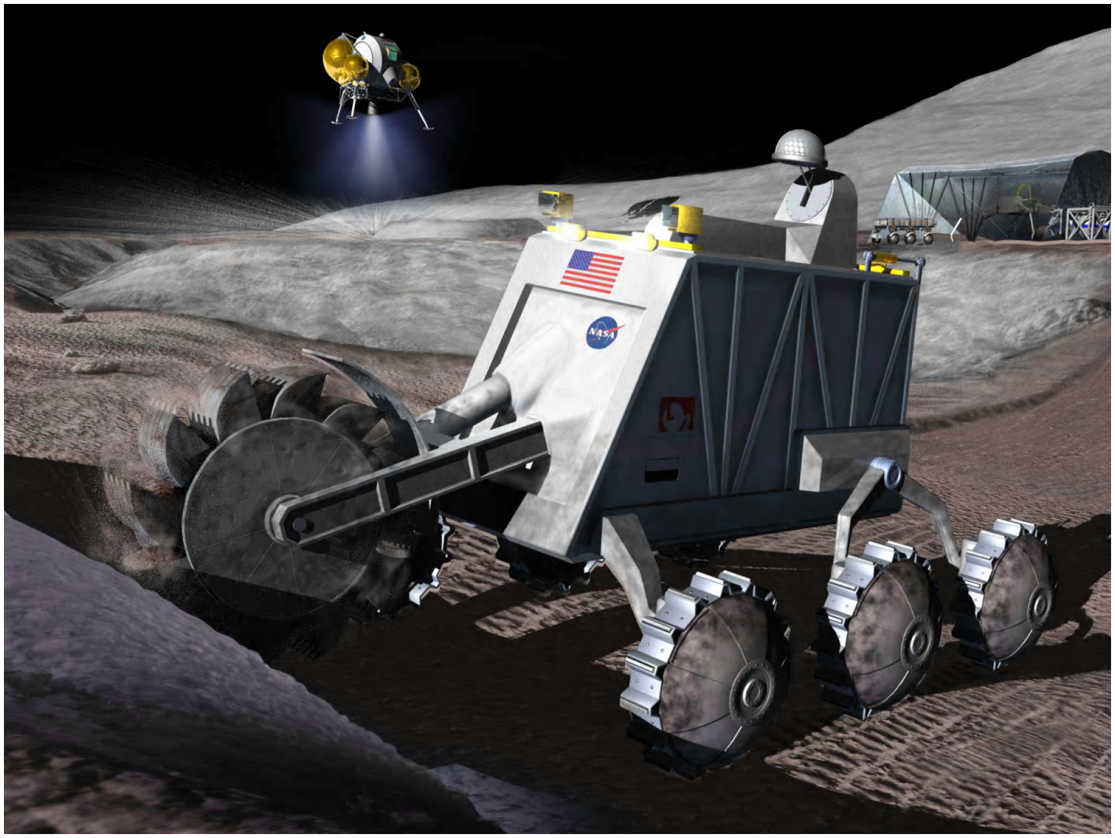

Figure 4 - Concept art for the NASA Lunabotics Competiton

4 Industry Partnership

BLUEsat would like to present gold and silver levels of sponsorship in return for industry partnership. We are interested in cash donations or sponsorship through discounted products.

Donations valued above $1000 towards the project will result in gold level of sponsorship. Smaller cash donations or reduced prices on services will result in a silver level of sponsorship.

The benefits of the gold and silver levels of sponsorship are outlined below:

Sponsorship Benefits	Silver sponsorship	Gold sponsorship
Sponsor name and logo on BLUEsat website	Included	Included
Sponsor name and logo on BLUEsat Facebook page	Included	Included
Branding on BLUEsat clothing and posters	Included	Included
Branding on all BLUEsat materials		Included
Presenting at public BLUEsat releases and networking evenings		Included
Recognised in all BLUEsat media releases		Included

BLUEsat sponsors will achieve significant publicity around UNSW, Sydney and internationally at space engineering design competitions through branding on our Facebook page, website, clothing, posters and publicity material. In the aftermath of our April 2014 balloon launch, we also anticipate significant media coverage (a recent example of this was the article “Satellite Project to Reach New Heights”, published in the Daily Advertiser on September 17, 2013).

We will be hosting several public releases and networking events in the lead-up to the launch of the BLUEsat satellite. Gold sponsors would be invited to make a presentation at the event and meet the team. Silver sponsors would be displayed at the event through the branding on all BLUEsat clothing and posters.

Further opportunities for publicity are available through the purchase of BLUEsat’s name (e.g. The __company__ BLUEsat Project). Please contact us for more information.

4.1 BLUEsat Financial Objectives

There are three areas that BLUEsat is seeking project funding for. These include the 2014 satellite launch, NASA Lunabotics Competition and Canadian Satellite Design Challenge. An overview of the expected costs are outlined below:

2014 Launch Costs

The 2014 launch currently presents the most significant investment for BLUEsat. This includes the cost of rebuilding the satellite, purchasing the stratospheric balloon, helium gas, parachute and the support hardware that is required. The total estimated cost is outlined below:

Item	Required Date	Projected Cost
Rebuilding flight model	March 2014	$4400
Launch cost	April 2014	$27000
Total		$31400

A detailed breakdown of these costs is included in Appendix A – BLUEsat Projected Budget.

NASA Lunabotics Competition

Designing and building a mining robot to compete in the NASA Lunabotics Competition requires purchasing the chassis, control system components and raw parts. The projected cost of the project is outlined below:

Item	Date Required	Projected Cost
Raw Parts and Robot chassis	April 2014	$7500
COTS control systems	April 2014	$7500
Total		$15000

Travel to Florida and accommodation will also be required to attend the competition, however this has been included as an optional cost in the Budget as BLUEsat members may be able to cover their own costs.

Canadian Satellite Design Challenge

Competing in the CSDC will involve purchasing the mechanical structure, subsystems and building the custom PCBs. This is predicted cost is outlined below:

Item	Date Required	Projected Cost
Mechanical structure	January 2015	$5000
Subsystems	January 2015	$10000
Custom PCBs	January 2015	$2500
Total		$17500

After the CSDC, there will be an opportunity to launch our designed satellite. This has been included in the budget as optional, as it represents a significant investment (projected cost of $50 000). The costs of travel to Canada and accommodation have also been included as optional, as BLUEsat members may be able to cover their own costs.

Ongoing Costs

Ongoing costs include the upkeep of room, hosting events, publicity, recruitment and purchasing equipment, parts and software. The yearly costs are outlined below:

Item	Time Period	Projected Cost
Misc equipment and Room Costs	January 2015	$6000
Events and recruitment	January 2015	$1400
Total		$7400

A full budget has been included in Appendix A.

We have estimated that operating costs for the next two years of the BLUEsat project will be $71,300. The School of Electrical Engineering at the UNSW has kindly agreed to match any financial sponsorships from industry partners.

5 Final Remarks and Contact Details

BLUEsat represents a promising opportunity to forge links between high achieving university students and sponsors from industry. Industry stands to benefit from having their brand associated with a unique and prestigious university research project. A partnership would also provide pathways between __company__ and promising students.

Please contact us to arrange a meeting and we can discuss the terms of the partnership.

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4. Appendices

4.1 Appendix A - BLUEsat Projected Budget

Balloon Launch By April 2014					
Item	**Need By**	**Unit Cost**	**Quantity**	**Total**	**Contingency (+20%)**
Raven Aerostar 3990m^3 Balloon	Mar-14	$5,000	2	$10,000	$12,000
Helium Gas	Mar-14	$1,500	1	$1,500	$1,800
Radio Uplink	Nov-13	$750	1	$750	$900
Radio Downlink	Nov-13	$750	1	$750	$900
Balloon Altimeter	Nov-13	$2,000	1	$2,000	$2,400
Balloon Termination Device	Nov-13	$1,000	1	$1,000	$1,200
Payload Recovery Parachute	Feb-14	$3,000	1	$3,000	$3,600
Parachute release device	Dec-13	$1,000	1	$1,000	$1,200
Secondary Power Supply - Lithium Non-Rechargable 28V 30Ah	Dec-13	$2,000	1	$2,000	$2,400
Recovery Costs	Apr-14			0	
Misc. Launch Hardware	Mar-14	$5,000	1	$5,000	$6,000
Personnel	Mar-14		5	0	
Transport Costs: Personnel + Hardware to Wagga Wagga (Optional)	Apr-14	$500	1	$500	$600
Accomodation (Optional)	Apr-14	200	5	$1,000	$1,200
			Total - Base	**$27,000**	**$32,400**
			Total - With Options	**$28,500**	**$34,200**

Satellite Flight Model By March 2014					
Item	**Need By**	**Unit Cost**	**Quantity**	**Total**	**Contingency (+20%)**
Batteries	Jan-14	$400	1	$400	$480
Passive Components (Resistors, Capactiors etc)	Nov-13	$500	1	$500	$600
Integrated Circuits	Nov-13	$700	1	$700	$840
Custom PCBs (Set)	Nov-13	$2,000	1	$2,000	$2,400
Transmitter Radio + Tuning	Dec-13	$400	1	$400	$480
Reciever Radio + Tuning	Dec-13	$400	1	$400	$480
Mechanical Structure Fasteners (Non-Optional)	Dec-13	$1,500	1	$1,500	$1,800
Mechanical Structure - Labour and tooling (Optional)	Jan-14	$8,500	1	$8,500	$10,200
			Total - Base	**$4,400**	**$5,280**
			Total - With Options	**$14,400**	**$17,280**

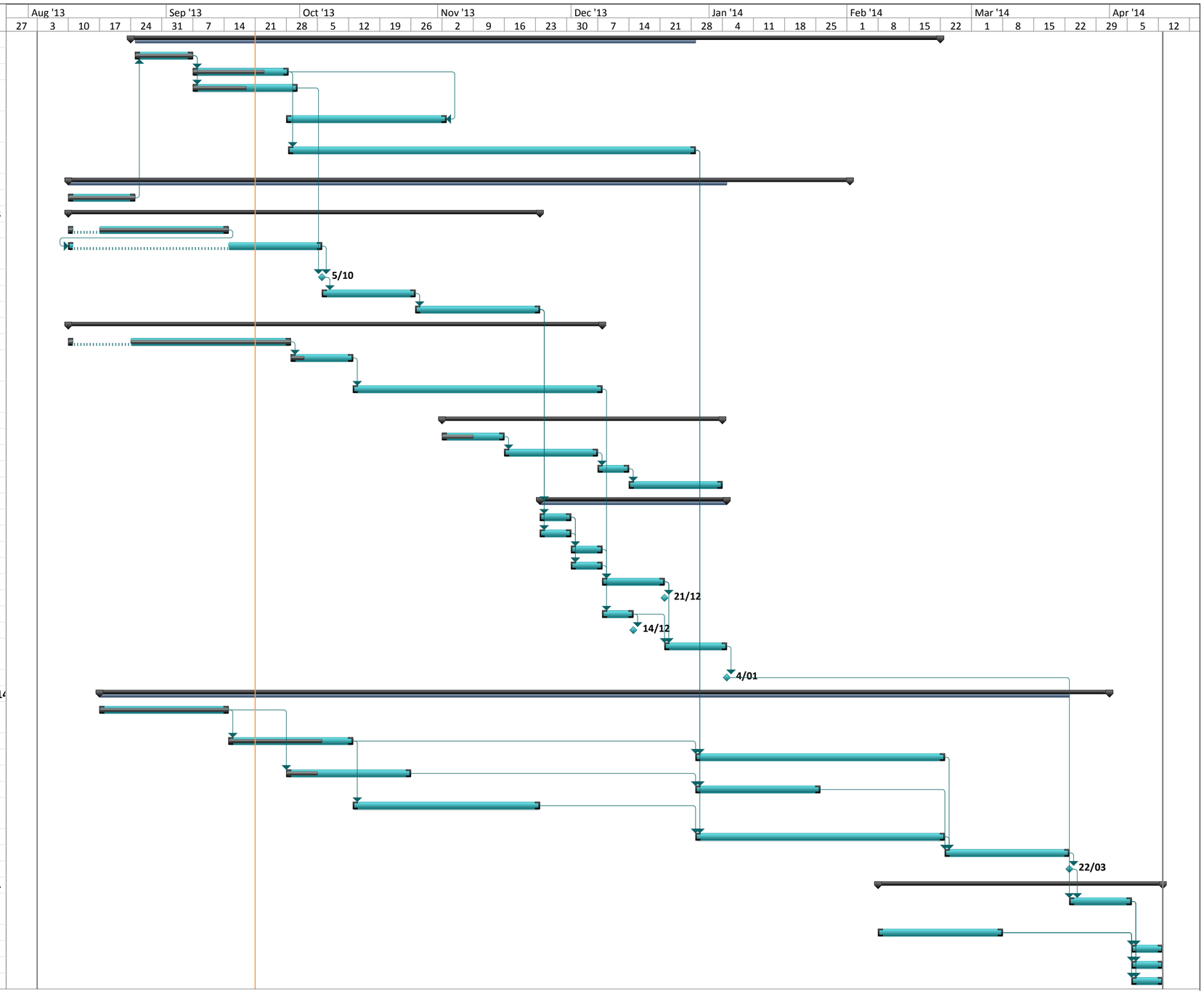
Lunabotics **By May 2015**					
Item	**Need By**	**Unit Cost**	**Quantity**	**Total**	**Contingency (+20%)**
Raw Parts and Robot Chassis	Apr-14	$7,500	1	$7,500	$9,000
COTS Control System and Components	Apr-14	$7,500	1	$7,500	$9,000
Travel + Accomodation to Florida (optional)	May-15	$2,000	4	$8,000	$9,600
			Total - Base	**$15,000**	**$18,000**
			Total - With Options	**$23,000**	**$27,600**

Canadian Space Design Challenge By September 2015					
Item	**Need By**	**Unit Cost**	**Quantity**	**Total**	**Contingency (+20%)**
Mechanical Structure	Jan-15	$5,000	1	$5,000	$6,000
COTS Subsystems	Jan-15	$2,000	5	$10,000	$12,000
Custom PCBs	Jan-15	$500	5	$2,500	$3,000
Travel and Accomodation (Optional)	Sep-15	$2,000	5	$10,000	$12,000
Launch (optional)	Jan-16	$50,000	1	$50,000	$50,000
			Total - Base	**$17,500**	**$21,000**
			Total - With Options	**$77,500**	**$71,000**

Ongoing Costs 2013-2015					
Item	**Need By**	**Unit Cost**	**Quantity**	**Total**	**Contingency (+20%)**
Upkeep of room	2013-2015	$1,000	1	$1,000	$1,200
Purchase of misc equipment	2013-2015	$5,000	1	$5,000	$6,000
Events at UNSW	2013-2015	$80	10	$800	$960
Recruitment costs (Promotional Material, etc)	2013-2015	$200	3	$600	$720
			Total	**$7,400**	**$8,880**

Total Costs		
Overall (Base Total)	**$71,300**	**$85,560**
Total (with Options)	**$150,800**	**$158,960**

ID		Outline Number	Task Mode	Task Name	Duration	Start	Finish
1		**1**		**Fund Raising**	**25.91 wks**	**Sat 24/08/13**	**Fri 21/02/14**
2	✓	1.1		Determine Total Project Budget	1.91 wks	Sat 24/08/13	Sat 7/09/13
3		1.2		Write Funding Proposal	3.05 wks	Sat 7/09/13	Sat 28/09/13
4		1.3		Raise Initial in-project budget ($5k AUD Approx)	3.34 wks	Sat 7/09/13	Mon 30/09/13
5		1.4		Raise Budget from Faculty (10k AUD Approx)	5.05 wks	Sat 28/09/13	Sat 2/11/13
6		1.5		Raise Budget from External Sponsors (20k Approx)	13.05 wks	Sat 28/09/13	Sat 28/12/13
7		**2**		**Satellite Flight Model Production**	**25.05 wks**	**Sat 10/08/13**	**Sat 1/02/14**
8	✓	2.1		Planning	2.05 wks	Sat 10/08/13	Sat 24/08/13
9		**2.2**		**Electronics Rebuild**	**15.05 wks**	**Sat 10/08/13**	**Sat 23/11/13**
10	✓	2.2.1		Existing Electrical Stock Inventory	4.2 wks	Sat 10/08/13	Sat 14/09/13
11		2.2.2		Electrical Parts Sourcing and Order Creation	3.14 wks	Sat 10/08/13	Sat 5/10/13
12		2.2.3		Order all Electrical Components and PCE	0 wks	Sat 5/10/13	Sat 5/10/13
13		2.2.4		Electrical components Delivery	3 wks	Sat 5/10/13	Sat 26/10/13
14		2.2.5		PCB assembly	4 wks	Sat 26/10/13	Sat 23/11/13
15		**2.3**		**Mechanical Structure Rebuild**	**17.05 wks**	**Sat 10/08/13**	**Sat 7/12/13**
16	✓	2.3.1		Mechanical Evaluation and Inventory	5.2 wks	Sat 10/08/13	Sat 28/09/13
17		2.3.2		Mechanical Parts Sourcing and Order Creation	2 wks	Sat 28/09/13	Sat 12/10/13
18		2.3.3		Mechanical Parts fabrication and assembly	8 wks	Sat 12/10/13	Sat 7/12/13
19		**2.4**		**Groundstation Interface Design and Build**	**9 wks**	**Sat 2/11/13**	**Sat 4/01/14**
20		2.4.1		Groundstation Interface PCB Design	2 wks	Sat 2/11/13	Sat 16/11/13
21		2.4.2		Parts + PCB Order and delivery	3 wks	Sat 16/11/13	Sat 7/12/13
22		2.4.3		PCB assembly	1 wk	Sat 7/12/13	Sat 14/12/13
23		2.4.4		Testing and Eval	3 wks	Sat 14/12/13	Sat 4/01/14
24		**2.5**		**Integration and Testing**	**6 wks**	**Sat 23/11/13**	**Sat 4/01/14**
25		2.5.1		CSC Functional Test	1 wk	Sat 23/11/13	Sat 30/11/13
26		2.5.2		Power System Test	1 wk	Sat 23/11/13	Sat 30/11/13
27		2.5.3		Communications Test	1 wk	Sat 30/11/13	Sat 7/12/13
28		2.5.4		Telemetry Test	1 wk	Sat 30/11/13	Sat 7/12/13
29		2.5.5		Electrical Integration Test	2 wks	Sat 7/12/13	Sat 21/12/13
30		2.5.6		Full Electrical Funtionality	0 wks	Sat 21/12/13	Sat 21/12/13
31		2.5.7		Mechanical Assembly Test	1 wk	Sat 7/12/13	Sat 14/12/13
32		2.5.8		Complete Flight Model Structure	0 wks	Sat 14/12/13	Sat 14/12/13
33		2.5.9		Full Assembly Functional and Performance Test	2 wks	Sat 21/12/13	Sat 4/01/14
34		2.5.10		Flight Model Complete	0 wks	Sat 4/01/14	Sat 4/01/14
35		**3**		**Launch Vehicle Preparation**	**32.34 wks**	**Sat 17/08/13**	**Mon 31/03/14**
36	✓	3.1		Research and Consultation with ADFA@UNSW	4.05 wks	Sat 17/08/13	Sat 14/09/13
37		3.2		Balloon Source & Quote	4 wks	Sat 14/09/13	Sat 12/10/13
38		3.3		Balloon order, manufacture and delivery	8 wks	Sat 28/12/13	Sat 22/02/14
39		3.4		Altimeter Source and Quote	4 wks	Sat 28/09/13	Sat 26/10/13
40		3.5		Altimeter Order + delivery	4 wks	Sat 28/12/13	Sat 25/01/14
41		3.6		'Other' Launch equipment source and quote	6 wks	Sat 12/10/13	Sat 23/11/13
42		3.7		'Other' Launch equipment order+delivery	8 wks	Sat 28/12/13	Sat 22/02/14
43		3.8		Launch Vehicle Assembly	4 wks	Sat 22/02/14	Sat 22/03/14
44		3.9		Launch Vehicle Delivery	0 wks	Sat 22/03/14	Sat 22/03/14
45		**4**		**Launch**	**9.07 wks**	**Sat 8/02/14**	**Sat 12/04/14**
46		4.1		Preparation of Satellite and Launch Vehicle	2 wks	Sat 22/03/14	Sat 5/04/14
47		4.2		Preparation of Accomodation and Travel	4 wks	Sat 8/02/14	Sat 8/03/14
48		4.3		Travel and Settling in at Wagga	1 wk	Sat 5/04/14	Sat 12/04/14
49		4.4		Set up	1 wk	Sat 5/04/14	Sat 12/04/14
50		4.5		Launch	1 wk	Sat 5/04/14	Sat 12/04/14



Project: launchSchedule
Date: Sat 21/09/13

Task	Summary	External Milestone	Inactive Summary	Manual Summary Rollup	Finish-only		
Split	Project Summary	Inactive Task	Manual Task	Manual Summary	Deadline		
Milestone	External Tasks	Inactive Milestone	Duration-only	Start-only	Progress		