Appendix A: Project Proposal Form

Team letter:	T	Name of person elected as team leader:	Matt Hunter

Responsibilities

List the responsibilities of each team member.

Lab pair no.	Name	Design responsibility
D12	Trong Luong Vo Xuan	Power distribution PPM-to-digital conversion
B6	Matt Hunter	Drive-testing etc. Bluetooth serial, UART serial
G21	Harry Beadle	Central control Bluetooth host
H22	Callum Marshall	Chassis design and production UART telemetry
B5	Tim Bills	Chassis design and production PPM-to-digital conversion
D11	Petros Karydogiannis	Sensors - understanding and interface RC - understanding and interface

Overall Design Summary

Give a summary of your design. Please make explicit exactly what you intend to build. Remember, a working design with more features would always obtain better marks. Be aware that you will be marked against what you declare in this document. YOU are setting the standard, YOU choose your goals and what you want to achieve.

Include a SPECIFICATION for the system you are designing. Be ***specific***, it's a ***specific***ation – e.g. the specification of the audio amplifier is: a gain of *x*, a bandwidth of *y*, capable of amplifying two independent audio channels, etc.

X-Frame remote controlled quadcoptor.
Estimated weight - 600g
Estimated thrust - 1600g
Flight time - 3 min
Battery type - LiPo

Absolute
Maximum payload - 1Kg

Recommended
Maximum payload - 500g

On-the-fly control tuning via bluetooth

Module Design Proposals

Please give details of each module of your overall design. In particular, give interfacing details between your module and other parts of the system. Complete one of these pages for each module of the design (continue on an additional sheet if necessary).

Names of people involved:	
Title of Module:	

- PPM-to-Digital conversion
- Taking the output of the receiver and converting it to a digital format for the controller and serial telemetry
- Trong / Tim

- UART Serial Telemetry
- Taking the processed data from the receiver, and data from the sensors to provide live data for the user and controller.
- Matt / Callum

- Bluetooth host/serial
- Sending data to a host computer, which can adjust PID constants via bluetooth to change the control scheme
- Harry / Matt

- Sensors
- Taking the altitude, pitch, roll and yaw and relaying them to the controller/ bluetooth serial
- Petros

- Drive
- Connecting together ESCs, motors and propellers to get the quadcopter off the ground
- Matt

- Power distribution
- Connecting the power distribution board to the system and monitoring temperatures
- Trong

- Chassis
- Designing and assembling the chassis for the electronics to be attached to.
- Tim / Callum

- Controller
- Converting the input from the receiver to an output for the ESCs whilst stabilising the quadcopter.
- Harry

- Assembly
- Bring everything together
- Everyone

- RC rx/tx
- Understanding output of receiver
- Petros

Cost Estimates

Please give detailed calculations and estimates of the overall cost of your proposed design below. Take care to include person-hour estimates for your software, board production and debugging, as well as your components and consumables. You should also estimate the production cost of your final unit (you may assume a large quantity are to be produced), the market price and determine how many need to be sold to be profitable.

Description	cost (£)	Quantity	Total (£)
person-hours	75	100	7,500
Components	99.91	1	99.91
conformance	2000	1	2,000
Overheads	100,000	1	100,000

Total 109599.91 → £110,000

Estimated cost of each unit → £85.43

If (with practice) each unit takes 1 hour at £20 per hour, Each unit costs £105.43

At £150 market value
2459 units need to be sold for profit

At £200 market value
1164 units need to be sold for profit

This doesn't factor in marketing discounts to get awareness of the product

Prototyping and Construction Method

Briefly describe your proposed method(s) of prototyping and construction, including whether you will use any surface mount packages.

No intention to use Surface mount

Pro:

Build each module and test separately where possible
Software can be tested, ~~but~~ with and without real data.

Initially test with il Matto boards, then for prototype, put atMega644p chips onto breakout board to save weight.

Construction - Acquire chassis, screw on motors, electronics etc. Make LiPo protection case and shelving for components

Planned Project Activities

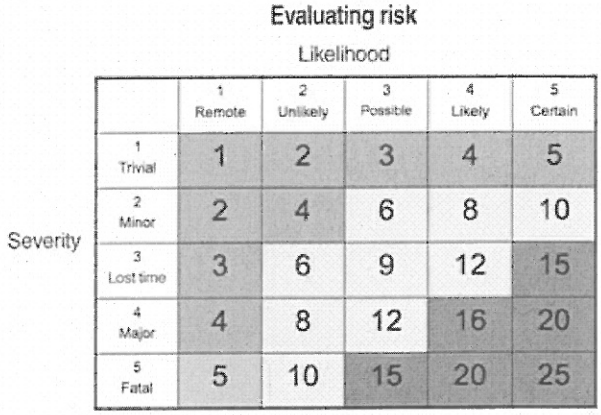
Please list the activities that you intend taking place during your laboratory time, and indicate when they should occur, and who will do them. The 'Initials' column must specify only one person. If two people are working on the same subsystem or task, you should list this as two separate activities, and be clear about what each individual is contributing to it.

Activity	Initials	Fri am	Fri pm	Mon am	Mon pm	Tue	Wed	Thu	Fri am	Fri pm	Mon am	Mon pm
Finish PPM Decoder, Test	TL TB	✓	✓									
Integrate PPM Decoder and telemetry	TL TB			✓	✓							
Finish serial telemetry and test	MH CM	✓	✓									
Bluetooth telemetry testing	MH HB		✓									
Test telemetry with real sensor data	CM			✓								
Investigate sensor systems	PK	✓	✓	✓								
Test telemetry with bluetooth and host	PK, CM, MH				✓							
Finish hosted application	HB	✓	✓									
Code refactoring	HB			✓								
Test in-house systems	HB				✓	✓						
Investigate RC system	PK					✓	✓					
Assemble whole system	TB, CM, TL					✓	✓	✓				
Test the drive	MH					✓						
Hardware test	MH (lead)							✓	✓	✓	✓	✓
PID tuning	HB (lead)								✓	✓	✓	✓

Risk Management

The D4 exercise is intensive, having demanding requirements yet running over a very short period of time. Successful project management requires management (i.e. planning) of risks. On the right hand side of this form, you should identify the predominant risks to your project, and the controls that you are going to put in place to minimise/mitigate them. Some things you may want to consider are illness of a team member(s), disruption to lab access, broken/faulty components, etc.

All members of your team should sign below to indicate that you have read the Risk Assessment form, taking particular note of items 20 and 21. If you can identify any additional risks to your health and safety that are specific to your design, then you should add corresponding entries to the Risk Assessment form and attach a copy to this project proposal form. If they are satisfied with your additions, a member of academic staff will sign this form during your first laboratory session on 3rd March 2017. In any case, You should also be aware of the regulations that govern the flight of UAVs in the UK – you can see summaries of these here and here.



International Register of Certified Auditors (IRCA), "A History of Risk", http://www.irca.org/Global/Images/technical/inform/issue%2024/24-SAsbury-Figure1.jpg

Hazard	Severity	Likelihood	Risk	Control	Controlled Severity	Controlled Likelihood	Controlled Risk
Components are damaged/broken through misuse	3	4	12	Comply with ESD handling guidelines. Confirm correct wiring with datasheet before applying power. Turn off power before rewiring. Order a spare of key components, if budget permits.	2	2	4
Slips and trips	1	3	3	Keep workspace tidy	1	2	2
Getting hit by copter	4	3	12	Keep copter in safety net	2	2	4
LiPo fire	4	2	8	Charge in LiPo sack, protection	3	1	3
Electric shocks / high current	2	2	4	Caution, dry hands, no jewlery.	2	1	2

Team member	I have read the Risk Assessment form and I agree to the described operating proceedure
<Name> Matt Hunter	<Signature>
<Name> Petros Karydogiannis	<Signature>
<Name> Callum Marshall	<Signature>
<Name> Timothy Bills	<Signature>
<Name> Henry Beadle	<Signature>
<Name> LUONG VO XUAN TRONG	<Signature>