

Project Proposal for Investigation into a land recovery method for uncrewed aerial targets

by Owain Plant

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Investigation into a land recovery method for uncrewed aerial targets

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Major project proposal: Ordnance,
Munitions & Explosives- Safety

Name: Owain Stuart Plant
Student Number: 1910280
Date: 24/03/2023

Owain Stuart Plant (1910280)
UNIVERSITY OF WALES TRINITY SAINT DAVID

Abstract

This assignment will be discussing a project proposal put forward to firstly find and then implement a way to allow aerial targets to be recovered to land. It must also allow for the recovery area to be contained within MOD (Ministry of Defence) Aberporth range boundary, it must be conducted safely without any advertent effects from the carried OME (Ordnance, Munitions & Explosives) and avoid the magazines area. The proposal will firstly look at the background information followed by the problem at hand, aims and objectives. It will then look at the project design looking at the intended method for carrying out the work, the resource required, what the deliverables are and when they need to be completed by. It will also consider any ethical issues with an ethics form attached in the appendix.

Table of Contents

1. Introduction	2
2. Background	2
2.1. Problems at hand	2
2.1.1. OME issues	2
2.1.2. Topography of the range	3
2.2. Aims.....	3
2.3. Objectives.....	3
3. Project Design	5
3.1. Data Collection.....	5
3.2. Data Evaluation	5
3.3. Risks & Limitations	5
3.4. Ethical Issues	5
3.5. Resources Required	5
3.6. Planning.....	5
3.7. Costs.....	5
4. References	6
5. Bibliography	6
6. Appendix	7
6.1. Aerial target information	7
6.2. Resource required.....	7
6.3. Ethics form	8
6.4. Gantt chart.....	0

Table of figures

Figure 2- Image of range boundry containment	3
Figure 5- Ethics form	14
Figure 6- Final project planning Gantt chart	15

1. Introduction

This project proposal is to ensure that both the company and the university fully understand and accept the scope of the work that is going to be carried out for the major project. When deciding on the chosen project it required different factors be considered, firstly whether it could be completed in the required timescale. Another requirement is that the project was approved by the authors employer and within there are of expertise. The project must also be of a technical nature with the resources that are required being feasible and accessible. These factors meant that the chosen project as seen on the title page was decided to be an investigation into land recovery method for uncrewed aerial targets.

2. Background

The proposed project is to look at the land recovery method for three different uncrewed aerial target systems at MOD (Ministry of Defence) Aberporth. It is required that the availability of the land recovery option for these systems at Aberporth be made possible, whilst ensuring it is contained within its boundary and the residual risk level does not change. These uncrewed aerial targets are used for a variety of different reasons for example surface to air or air to air weapons release training, further information on aerial targets is in the appendix later in the assignment.

A literature review was carried out for previous work carried out in this area, the first area where research was carried out was into the manufacturer information. The information from the manufacturer for the three systems is for sea recovery from set altitudes which is not suitable for use, these sources of information have not been referenced due to their sensitivity.

Two Methodologies were found for land recovery one being the Manorbier methodology and the other being Hebrides methodology. [1] [2] These cannot be used due to them being unsuitable, unverified, unscrutinised and not having any providence behind them. There is similar work carried out in the space sector however this work was found to not be applicable, one example paper is the Mars Precision Landing Using Guided Parachutes by John McKinney and Charles Lowry. [3] Other information cannot be found due to this being new emerging technology with little research currently carried out in this area, the application is also unique meaning it requires a new methodology be created and tested.

2.1. Problems at hand

The reason for this investigation is when the system is recovered at sea it is a costly process which has a long turnaround time, requires many hours work, requires replacement of components due to contamination, and requires a vessel with personnel aboard be used to recover it. There are two main areas of investigation for this project these are the ordinance, munitions and explosives (OME) issues and the topography of the range.

2.1.1. OME issues

The other area requiring investigation and further knowledge with an assessment conducted is into the types of fuel that are used on these systems, the payloads it can carry, the method and system that is used to initiate the cut down process, effect of impact from free fall on the carried OME, effect of impact from fall from shoot on the carried OME, effect of a fuel fire on the carried OME if the fuel was to initiate. An investigation will also be carried out to look at the effect of what would happen to the stored OME if the system was to hit the magazine compound.

2.1.2. Topography of the range

The image shown below in figure 1 shows the range boundary for Aberporth range, this area is where the uncrewed aerial target must be contained within. As well as containment to the range boundary shown below highlighted in yellow is the magazine store which also requires avoidance.



Figure 1- Image of range boundry containment

2.2. Aims

The first and most important aim is that the chosen method must be intrinsically safe and have the desired outcome every time with no room for error. The next aim is to prove the feasibility of land recovery for the three systems. Then the calculations will need to be refined with the drift distances plotted and have the method approved. It is then required that an investigation be carried out into the hazards associated with the fuel and OME carried when conducting land recovery. The final Aim once all of the work above is complete is to test the methodology with trials and the data gained reported on.

2.3. Objectives

The aims of the project above have objectives attached to them to ensure that they can be successfully delivered, these objectives are shown below in table 1.

Feasibility of land recovery for the three systems	
1.	Research and gain understanding of the current drift distances calculations for sea recovery and its methodology for calculation.
2.	Carry out checks on the current methodologies validity and see if there is any way to expand upon it.
4.	Using various computer software systems, mathematical calculations and carrying out modelling for potential options.
5.	Assess if the parachute drift distance and the free fall distance for the different systems fit within the range boundaries.
6.	Compile the work to create a presentation showing the methodology used and the findings gained.

Refine calculations and plot drift distance area	
7.	Presenting the information gained to the Group Lead Trials assurance ranges and the range safety officer for review.
8.	Carry out required changes as requested from the review.
9.	Propose the solution to the range safety comity as an option to be taken forward and to look whether the proposal is tolerable.
10.	Take into account feedback from range safety committee and carry out necessary changes as is required.
11.	Refine the methodology then plot the findings using the trials controlled system.
12.	Get the methodology approved for trial.
Investigate hazards associated with the OME carried when conducting land recovery	
13.	Read the insensitive munitions reports and any supporting documentation about the fitted OME.
14.	Assess what the effect of the different systems would be if they were to have a slow cook off or fast cook off by researching the fuel that is used and its burn temperature.
15.	Look at what effect impact has on the fitted OME whether a hard landing would be enough force to cause it to initiate.
16.	These checks must be carried out to ensure that the system used has a worst case scenario no more than deflagration.
17.	Compile an argument for the use of the OME on the system during land recovery.
18.	Look at if it would be tolerable to land in magazine compound.
19.	Create a safety case and look at safe procedure for dealing with fitted OME and if the drift distance area changes due to what is being carried.
20.	Have first and second line assurance carried out on completed work.
Test of the methodology	
21.	Prior to test flight recovery trials the OME report and the land drift distance reports will need to be reviewed, scrutinised and approved for use.
22.	Trial the methodology completing five recoveries per system in varying conditions to gain the required results and prove the methodologies validity.
23.	Input methodology as a standard method ensuring that certain stipulations and restraints are in place and clear.
24.	Apply the method and the knowledge that has been gained on other sites and carry out knowledge share activity.

Table 1- Project objectives

3. Project Design

The first solution is to do nothing, the problem with this is that the current method being very time consuming and costly with a better more efficient method required.

3.1. Data Collection

The data that will be collected is survey information, technical aircraft information, met data and IM certificates which will give the relevant outputs required described above. This output data will be peer reviewed and scrutinized at both first and second line assurance.

3.2. Data Evaluation

The methodology must work in accordance with the system requirements set out previously. The data gained will be peer reviewed and approved by first and second line assurance prior to the test flights being carried out.

3.3. Risks & Limitations

There are different risks and constraints associated with this project including commercial and safety related risk. These will be controlled by the using several technics including hazard identification, risk assessments, work instructions and fault tree analysis for justifying an ALARP argument. These will be created to ensure that all hazards and risks are understood, considered, managed and controlled as best as is possible. All personnel involved in the project work will have a good understanding of the risk assessment as well as be suitably qualified, current and competent in their role.

3.4. Ethical Issues

The ethics form for this project is in the appendix later in the assignment.

3.5. Resources Required

Initially the task requires work be carried out autonomously for the feasibility, after completion additional resource will then be required. A list of this required resource as well as equipment and software required is shown in section 6.2. in the appendix.

3.6. Planning

The planning for the project was done by using a Gantt chart showing the proposed timescales for the work to be carried out, this can be seen in section 6.4. in the appendix.

3.7. Costs

The costs associated with this project includes peoples time, software required and all equipment which will be covered by an overarching QinetiQ project known as the ARM (Air Range Modernization) program.

4. References

- [1] J. Sutherland, "Hebrides methodology- Construction of recovery trace in support of CATS operations," QinetiQ, 2017.
- [2] E. Muirhead, "Manorbier Methodology- Launch, Recovery and general flying trip wires," QinetiQ, 2020.
- [3] J. McKinney and C. Lowry, "Mars Precision Landing Using Guided Parachutes," American institute of aeronautics and astronautics, 2012.
- [4] Alexander street, *Achieving SMART Goals*, Melbourne: Seven Dimensions, 2013.

5. Bibliography

- 1) Leveson, Nancy G, *Engineering a Safer World*, Cambridge: The MIT Press, 2016.
- 2) Checkland, Peter, Gough. T, Scholes. J, "Soft Systems Methodology in Action," *The Journal of the Operational Research Society*, vol. 42, no. 9, p. 818, 1991, doi: 10.2307/2583669
- 3) Marder, M. (2011) *Research Methods for Science*, Cambridge University Press: Cambridge.
- 4) Weaver, P. (2004) *Success in Your Project: A Guide to Student System Development Projects*, Prentice Hall: Harlow
- 5) D. K. Hitchins, *Systems engineering; a 21st century systems methodology.*, Portland: John Wiley & Sons, 2007.

6. Appendix

6.1. Aerial target information

Aerial target systems offer an opportunity to test many different types of weapon systems utilizing one affordable and reusable system. They can also fly a wide variety of speeds and have excellent manoeuvrability profiles, which offers a high degree of versatility. They can be used to meet a wide variety of both training requirements as well as specific weapon system requirements. They do this by utilizing different payloads and augmentation techniques. They can carry both internal and external payloads some examples of these are chaff, flares, electronic countermeasures, infrared augmentation, passive and active radio frequency augmentation, vector and scalar proximity scoring.

6.2. Resource required.

The people required are pilots, in flight safety officer, ground safety officer, range control, trials conducting officer, trials planner, project manager, technical lead, technical assurer, air traffic control, aerial targets, engineering, head of site, operations manager, trials assurance lead, range safety officer and aerial target technicians.

As well as the human resource required there is other resource required to carry out this project these are a computer system, google earth, survey data and Microsoft software package to begin with. Once the first investigation is completed it will require the things used above as well as the trials control system, launch platform, three different aerial target systems, sea tracking marine radar, air tracking radar, range vessels, meteorological data, telemetry, radios communications, tracking radar boresight CCTV, non-tracking CCTV, display screens, hybrid tracking manager (HTP) and flight termination system (FTS).

6.3. Ethics form

Shown below in figure 2 is the OME ethics form.

APPLICATION FOR ETHICAL APPROVAL

In order for research to result in benefit and minimise risk of harm, it must be conducted ethically.

The University follows the OECD Frascati manual definition of research activity: "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications". As such this covers activities undertaken by members of staff, postgraduate research students, and both taught postgraduate and undergraduate students working on dissertations/projects.

The individual undertaking the research activity is known as the "principal researcher".

This form must be completed and approved prior to undertaking any research activity.

SECTION A: About You (Principal Researcher)

1	Full Name:	Owain Plant
2	Student Number:	1910280
3	Email address:	1910280@student.uwtsd.ac.uk
4	Programme of Study:	OME (Ordnance Munitions and Explosives)
5	Director of Studies/Supervisor:	Gareth Collett

SECTION B: Internal and External Ethical Guidance Materials

Please list the core ethical guidance documents that have been referred to during the completion of this form (including any discipline-specific codes of research ethics, location-specific codes of research ethics, and also any specific ethical guidance relating to the proposed methodology). Please tick to confirm that your research proposal adheres to these codes and guidelines. You may add rows to this table if needed.

1	UWTSO Research Ethics & Integrity Code of Practice	☒
2	UWTSO Research Data Management Policy	☒

SECTION C: Details of Research Activity

1	Indicative title:	Investigation into a land recovery method for uncrewed aerial targets		
2	Proposed start date:	02/04/2023	Proposed end date:	22/03/2024
Introduction to the Research (maximum 300 words in each section) Ensure that you write for a Non-Specialist Audience when outlining your response to the three points below: - Purpose of Research Activity - Proposed Research Question - Aims of Research Activity - Objectives of Research Activity Demonstrate, briefly, how Existing Research has informed the proposed activity and explain - What the research activity will add to the body of knowledge - How it addresses an area of importance.				
3	Purpose of Research Activity	To enhance the current capability that the range can offer.		
4	Research Question	To investigate the option for land recovery method for uncrewed aerial targets?		
5	Aims of Research Activity	The first solution is not to do anything, the problem with this solution is the current system is very time consuming and costly with a better more efficient method required. This means that something must be done and the chosen method must be intrinsically safe and have the desired outcome every time with no room for error. It is First step is to look at the feasibility of land recovery for the three systems, this will be done by doing theoretical rough calculations. These will determine if the parachute drift distance and the free fall		

distance fit within the range boundaries. This will need to be presented to the range safety committee for approval and review.

The next step is to refine the calculations to determine maximum tolerable wind levels with more accuracy, as well as plot the drift distance area onto a map. Once this is complete and has been approved an assessment and report of the hazards associated with the fuel and OME carried when conducting land recovery will be carried out. This must show that the systems used comply with the insensitive munitions standards for these potential hazards, with the worst case scenario being deflagration.

Once the OME report and the land drift distance reports are reviewed, scrutinised and approved a test of the methodology will be conducted and results reported back. If the recovery method can prove to be successful on five recoveries in differing wind speeds and directions then it will be put into the standard range processes. This method and the knowledge that has been gained can then be shared and used on other sites.

Objectives of Research Activity

1. Research and gain understanding of the current danger area, drift distances and its methodology for calculation.
 2. Check the current methodologies validity and see if there is any way to expand upon it.
 3. Reading, understanding and using surveyed information supplied by TSDA
 4. Using various computer software systems, mathematical calculations and carrying out modelling for potential options while always working ethically with high integrity.
 5. Concluding the best option is to explore the tolerable levels of wind for land recovery from different directions.
 6. Expanding on the Manorbier methodology by taking into account different land height for the range and applying limiting wind features for wind in a certain bearing while following the ALARP principal.
 7. Read and create an argument for the use of OME on the system by looking at IM report for stuff used and assess what would happen if system was to have slow cook off or fast cook off by researching the fuel that is used and its burn temperature.
 8. Look at what effect impact has on the fitted OME whether a hard landing would be enough force to cause it to initiate.
 9. Will look at if it would be tolerable to land in magazine compound or near occupied buildings.
 10. Compiling the work to create a presentation showing the methodology used and the findings gained to the highest quality.
 11. Presenting the information gained to the highest quality possible to the Group Lead Trials assurance ranges and range safety officer for review and working with them for any changes required.
 12. Proposing the solution to the range safety comity as an option to be taken forward and to look whether the proposal is tolerable.
- Refine calculations and plot drift distance area
13. Take into account feedback from range safety committee and carrying out necessary changes as is required.
 14. Refine the methodology then plot the findings using survey data and the trials controlled system.
 15. Get the methodology approved for area considering drift distance only with stipulation that it's only used when no OME is fitted.

	Investigate hazards associated with the fuel and OME carried when conducting land recovery 16. Checks must be carried out to ensure that the system used comply with the insensitive munitions standards for the potential hazards it could encounter, with the worst case scenario being deflagration 17. Create a safety case and look at safe procedure for dealing with fitted OME and if the drift distance changes due to what is being carried. Test of the methodology 18. Prior to test flight recovery the OME report and the land drift distance reports will need to be reviewed, scrutinised and approved for use. 19. Trial the methodology and gain the required results from the test to prove validity. 20. Input methodology as a standard method ensuring that certain stipulations and restraints are in place.
	Proposed data collection methods (maximum 600 words) Provide a brief summary of all the methods that may be used in the research activity to collect data, making it clear what specific techniques may be used. If methods other than those listed in this section are deemed appropriate later, additional ethical approval for those methods will be needed. You do not need to justify the methods here, but should instead describe how you intend to collect the data necessary for you to complete your project.
7	The data that will be collected is survey information, technical aircraft information, met data and IM certificates which will give the relevant outputs required described further in the project proposal. This output data will be peer reviewed and scrutinized at both first and second line assurance.

SECTION D: Scope of Research Activity

	Will the research activity include:	YES	NO
1	Use of a questionnaire or similar research instrument?	☐	☒
2	Use of interviews?	☐	☒
3	Use of focus groups?	☐	☒
4	Use of participant diaries?	☐	☒
5	Use of video or audio recording?	☐	☒
6	Use of computer-generated log files?	☐	☒
7	Participant observation with their knowledge?	☐	☒
8	Participant observation without their knowledge?	☐	☒
9	Access to personal or confidential information without the participants' specific consent?	☐	☒
10	Administration of any questions, test stimuli, presentation that may be experienced as physically, mentally or emotionally harmful / offensive?	☐	☒
11	Performance of any acts which may cause embarrassment or affect self-esteem?	☐	☒
12	Investigation of participants involved in illegal activities?	☐	☒
13	Use of procedures that involve deception?	☐	☒
14	Administration of any substance, agent or placebo?	☐	☒
15	Working with live vertebrate animals?	☐	☒
16	Procedures that may have a negative impact on the environment?	☐	☒
17	Other primary data collection methods. Please indicate the type of data collection method(s) below.	☐	☒
	Details of any other primary data collection method:		

If you have ticked NO to every question then the research activity is (ethically) low risk and you may skip section E and continue to section F.

If YES to any question, then no research activity should be undertaken until full ethical approval has been obtained.

SECTION E: Intended Participants

	Who are the intended participants:	YES	NO
1	Students or staff at the University?	☐	☐
2	Adults (over the age of 18 and competent to give consent)?	☐	☐
3	Vulnerable adults?	☐	☐
4	Children and Young People under the age of 18? (Consent from Parent, Carer or Guardian will be required)	☐	☐
5	Prisoners?	☐	☐
6	Young offenders?	☐	☐
7	Those who could be considered to have a particularly dependent relationship with the investigator or a gatekeeper?	☐	☐
8	People engaged in illegal activities?	☐	☐
9	Others. Please indicate the participants below, and specifically any group who may be unable to give consent.	☐	☐
	Details of any other participant groups:		

	Participant numbers and source
	Provide an estimate of the expected number of participants. How will you identify participants and how will they be recruited?
10	How many participants are expected?
11	Who will the participants be?
12	How will you identify the participants?

	Information for participants:	YES	NO	N/A
13	Will you describe the main research procedures to participants in advance, so that they are informed about what to expect?	☐	☐	☐
14	Will you tell participants that their participation is voluntary?	☐	☐	☐
15	Will you obtain written consent for participation?	☐	☐	☐
16	Will you explain to participants that refusal to participate in the research will not affect their treatment or education (if relevant)?	☐	☐	☐
17	If the research is observational, will you ask participants for their consent to being observed?	☐	☐	☐
18	Will you tell participants that they may withdraw from the research at any time and for any reason?	☐	☐	☐
19	With questionnaires, will you give participants the option of omitting questions they do not want to answer?	☐	☐	☐
20	Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	☐	☐	☐
21	Will you debrief participants at the end of their participation, in a way appropriate to the type of research undertaken?	☐	☐	☐
22	If NO to any of above questions, please give an explanation			

	Information for participants:	YES	NO	N/A
24	Will participants be paid?	☐	☐	☐
25	Is specialist electrical or other equipment to be used with participants?	☐	☐	☐
26	Are there any financial or other interests to the investigator or University arising from this study?	☐	☐	☐
27	Will the research activity involve deliberately misleading participants in any way, or the partial or full concealment of the specific study aims?	☐	☐	☐
28	If YES to any question, please provide full details			

SECTION F: Anticipated Risks

	Outline any anticipated risks that may adversely affect any of the participants, the researchers and/or the University, and the steps that will be taken to address them.	
1	Risks to participants For example: sector-specific health & safety, emotional distress, financial disclosure, physical harm, transfer of personal data, sensitive organisational information. If you have identified in section D that there are no participants then enter N/A and go skip to question 3.	
	Risk to participants: N/A	How you will mitigate the risk to participants:
2	If research activity may include sensitive, embarrassing or upsetting topics (e.g. sexual activity, drug use) or issues likely to disclose information requiring further action (e.g. criminal activity), give details of the procedures to deal with these issues, including any support/advice (e.g. helpline numbers) to be offered to participants. Note that where applicable, consent procedures should make it clear that if something potentially or actually illegal is discovered in the course of a project, it may need to be disclosed to the proper authorities	
3	Risks to the investigator For example: personal health & safety, physical harm, emotional distress, risk of accusation of harm/impropriety, conflict of interest	
	Risk to the investigator: N/A	How you will mitigate the risk to the investigator:
4	University/institutional risks For example: adverse publicity, financial loss, data protection	
	Risk to the University: N/A	How you will mitigate the risk to the University:
5	Environmental risks For example: accidental spillage of pollutants, damage to local ecosystems	
	Risk to the environment: N/A	How you will mitigate the risk to environment:

SECTION G: Feedback, Consent and Confidentiality

If you have identified in section D that there are no participants then enter skip this section and continue to section H.

1	Feedback What de-briefing and feedback will be provided to participants, how will this be done and when?
2	Informed consent Describe the arrangements to inform potential participants, before providing consent, of what is involved in participating. Describe the arrangements for participants to provide full consent before data collection begins. If gaining consent in this way is inappropriate, explain how consent will be obtained and recorded in accordance with prevailing data protection legislation.
3	Confidentiality / Anonymity Set out how anonymity of participants and confidentiality will be ensured in any outputs. If anonymity is not being offered, explain why this is the case.

SECTION H: Data Protection and Storage

	Does the research activity involve personal data (as defined by the General Data Protection Regulation 2016 "GDPR" and the Data Protection Act 2018 "DPA")?	YES	NO
1	<i>"Personal data" means any information relating to an identified or identifiable natural person ('data subject'). An identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person. Any video or audio recordings of participants is considered to be personal data.</i>	☐	☒
If YES, provide a description of the data and explain why this data needs to be collected:			
2			
	Does it involve special category data (as defined by the GDPR)?	YES	NO
3	<i>"Special category data" means sensitive personal data consisting of information as to the data subjects' – (a) racial or ethnic origin, (b) political opinions, (c) religious beliefs or other beliefs of a similar nature, (d) membership of a trade union (within the meaning of the Trade Union and Labour Relations (Consolidation) Act 1992), (e) physical or mental health or condition, (f) sexual life, (g) genetics, (h) biometric data (as used for ID purposes).</i>	☐	☒
If YES, provide a description of the special category data and explain why this data needs to be collected:			
4			

	Will data from the research activity (collected data, drafts of the thesis, or materials for publication) be stored in any of the following ways?	YES	NO
5	Manual files (i.e. in paper form)?	☐	☒
6	University computers?	☐	☒
7	Private company computers?	☒	☐
8	Home or other personal computers?	☒	☐
9	Laptop computers/ CDs/ Portable disk-drives/ memory sticks?	☒	☐
10	"Cloud" storage or websites?	☒	☐
11	Other – specify:	☐	☒
12	For all stored data, explain the measures in place to ensure the security of the data collected, data confidentiality, including details of backup procedures, password protection, encryption, <u>anonymisation</u> and <u>pseudonymisation</u> .		
	The data that will be collected will be kept on password protected systems and any external hardware will be password protected and encrypted. All data will have a three-step backup procedure to prevent data being lost.		

Data Protection			
	Will the research activity involve any of the following activities:	YES	NO
13	Electronic transfer of data in any form?	☐	☒

14	Sharing of data with others at the University outside of the immediate research team?	☐	☒
15	Sharing of data with other organisations?	☐	☒
16	Export of data outside the UK or importing of data from outside the UK?	☐	☒
17	Use of personal addresses, postcodes, faxes, emails or telephone numbers?	☐	☒
18	Publication of data that might allow identification of individuals?	☐	☒
19	If YES to any question, please provide full details, explaining how this will be conducted in accordance with the GDPR and Data Protection Act (2018) (and/or any international equivalent):		
	N/A		
20	List all who will have access to the data generated by the research activity:		
	The principal researcher, project team, industrial partner, external examiner & second marker		
21	List who will have control of, and act as custodian(s) for, data generated by the research activity:		
	Principal researcher.		
22	Give details of data storage arrangements, including security measures in place to protect the data, where data will be stored, how long for, and in what form.		
	Data stored will be kept password protected and encrypted. Once the project is completed all data stored will be deleted.		
22	Confirm that you have read the UWTSD guidance on data management (see https://www.uwt.ac.uk/library/research-data-management/)	☒	
23	Confirm that you are aware that you need to keep all data until after your research has completed or the end of your funding	☒	

SECTION I: Declaration

The information which I have provided is correct and complete to the best of my knowledge. I have attempted to identify any risks and issues related to the research activity and acknowledge my obligations and the rights of the participants. In submitting this application I hereby confirm that I undertake to ensure that the above named research activity will meet the University's Research Ethics and Integrity Code of Practice which is published on the website: https://www.uwt.ac.uk/research/research-ethics/			
1	Signature of applicant:	Owain Plant	Date: 14/03/2023
2	Director of Studies/Supervisor:	Gareth Collett	Date:
3	Signature:		

FOR INTERNAL USE ONLY:

Ethical approval given			
1	Signature of assessor:		Date:
2	Name:		
3	Role:		

Figure 2- Ethics form

6.4. Gantt chart

The Gantt chart below in figure 3 shows an estimated breakdown of the time planned to be spent on each activity. These objectives were planned by using the SMART acronym method meaning they are specific, measurable achievable, relevant and time bound. [4]

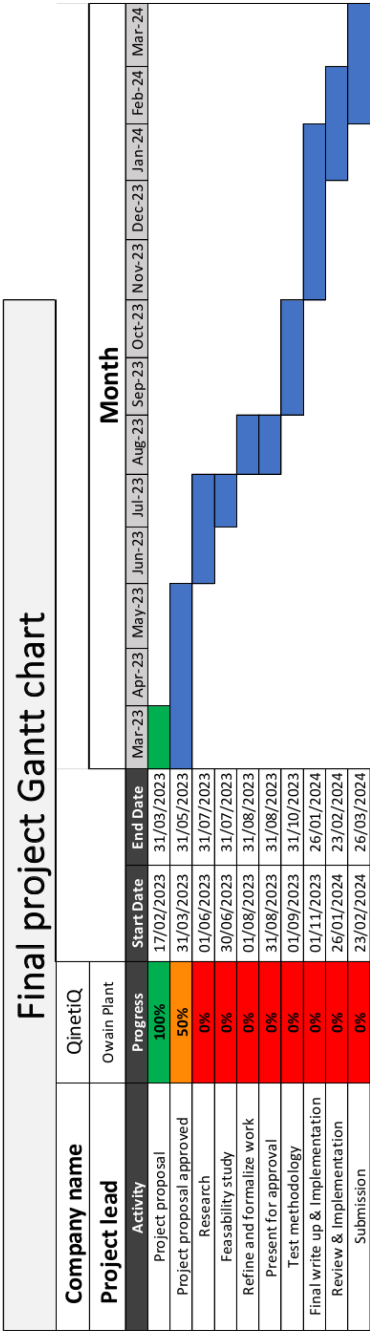


Figure 3- Final project planning Gantt chart

Project Proposal for Investigation into a land recovery method for uncrewed aerial targets

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

40/100

Intro / Aim & Objectives (150 words)		
Project title. Identification of a specific problem to be investigated. Well-defined aims and SMART objectives. Explaining why this project is worth doing. Discussion of what the project needs to do in order to be a success. Description any deliverables that will be produced at the end of the project No information as to why this topic was selected. The only mention of the topic is in the last sentence of the introduction where the title is stated with no additional detail. This section should have been an introduction to the project topic with justification as to why it was being performed. Too much focus on information that is not relevant at this point. Aims and objectives have been included but they need to be considerably more concise. Four aims and twenty-three objectives have been included, generally one clear aim and no more than five objectives are included. The objectives should not be step by step instructions as to how the project will be completed as this is not required at this level. Good attempts at SMART demonstrated with clear reference to success criteria and end of project deliverables.	20	5

Background to the Project / Literature Review (450 words)		
Description of how the work to be done in the project relates to the work identified in the literature review. Discussion of any ethical issues raised by the project Identifying what has already been done within the field. Topic familiarity. Brief literature review using appropriate sources – 6-8 journal papers and book chapters rather than just websites. Selection of relevant models & concepts. Discussing that a literature review was performed is not necessary, more focus should be put on the content described in the literature that was reviewed. Published works have been referenced but with no real detail, only a surface level explanation as to why they are unsuitable methods. This section would have benefitted from going into more detail on the topic. Information provided on topic issues demonstrating some familiarity, however this is limited due to the surface level information provided. Four references have been included, a good attempt however 6-8 would be expected at this level. Some of the sources are dated, try and stick to sources published within the last five years where possible. Additional sources included in the bibliography but again, some of these are quite dated.	20	8
Project Design (200 words)		
Clear statement of which development methods are to be used and why they are appropriate. Clear statement of which tools are to be used and why they are appropriate.	30	13

Clear description of how data collected will be analysed Some attempts made to describe data collection and analysis. Much of the more detailed information from the objectives section may have been more appropriate to include in this section instead. Good consideration of how the potential risks will be mitigated for this project.		
Resources / Planning (200 words)		
List of any deliverables. Clear diagram showing both timing and resource use. Completed ethics form. Limited and relevant appendices Some mention of deliverables throughout. Gantt chart has been included but there is very little room for error, is there a contingency plan in place in case any of the tasks take longer than anticipated? Resources listed in 6.2 should be included in the resources and planning section rather than in the appendices. Appendix 6.1 contains information that would have been better suited to the main body of the text rather than the appendices. Completed ethics form included. Each appendix should be included as a separate item (e.g. Appendix 1 – Gantt Chart, Appendix 2 – Ethics Form, etc) rather than as subsections of one larger section.	15	9
Document Presentation		
Correct spelling. Grammar and punctuation. Flow of narrative/fluency. Coherence.	15	5

Word processed.		
Correct use of referencing with bibliography.		
Strict word limit for main text – 1000 words.		
Document was prefaced with an abstract which is not necessary for a proposal. Some minor spelling and grammar mistakes. Attempts made at IEEE referencing throughout but with errors. Citations should be used to credit information stated, not be used at the start of a sentence and described. Reference [4] has not been cited in the text and would be more appropriately included in the bibliography than the reference list. Did not adhere to the wordcount of 1000 +/- 10%. While information contained in tables are not usually included in the word count in this case they were as an excessive amount of information was included (438 words worth) and makes up an entire section of your proposal. As such, the proposal was 50% over the word limit and thus has been penalised.		
TOTAL	100	40

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

PAGE 14

PAGE 15

PAGE 16
