



Ministry
of Defence



National Armaments Director Group

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Our Reference: OMEIP_01

INDEPENDENT PROJECT PROPOSAL FOR AN ASSESSMENT OF ALTERNATE CASE MATERIALS IN SMALL ARMS AMMUNITION

1. Abstract

This project proposes an evaluation of alternative materials for use in small arms ammunition case production.

Motivated by supply-chain constraints, processing costs, and the increasing availability of recycled commercial brass grades, the research will compare historic specifications with potential alternatives from suppliers and published sources. The study will establish baseline material requirements, review relevant standards and previous research, and assess the implications of substitution for procurement resilience, production efficiency, and sustainability.

Computational modelling of tensile behaviour will be used to examine properties linked to drawability, including ultimate tensile strength, yield strength, and modulus of elasticity, with results compared against published data where possible.

The intended outcome is an evidence-based recommendation on material down-selection, together with a structured framework for assessing future substitutions in tightly controlled, safety-critical manufacturing environments.

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4. List of Abbreviations

Abbreviation	Meaning
E	Young's modulus / modulus of elasticity.
MOD	Ministry Of Defence
OME	Ordnance Munitions and Explosives
SAA	Small Arms Ammunition
SAA	Small Arms Ammunition
UTS	Ultimate Tensile Strength
YS	Yield Strength

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Table 1 - Table of Contents

6. Introduction And Background

Small Arms Ammunition (SAA) is generally consists of 4 primary components, Bullet/ Projectile, Case, Propellant and Primer, see Figure 1.

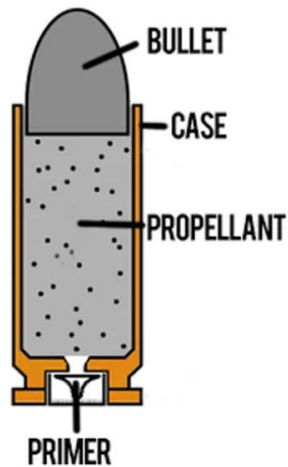


Figure 1 - SAA Components [1]

Historically the material chosen for the case of the ammunition was Brass due to its mechanical properties for drawing and high resistance to corrosion. Brass is available in a wide variety of specifications, but all contain Copper and Zinc as the primary constituents with additional chemicals to alter performing qualities.

SAA in the UK has historically used 'Cartridge Brass' defined in Defstan 095-009 [2]. The chemical constituents of which are detailed in Table 2.

Element	Min %	Max %
Copper	68.5	72.00
Lead ^a		0.02
Iron ^b		0.05
Bismuth		0.002
Nickel		0.10
Tin		0.03
Aluminium		0.005
Arsenic		0.01
Antimony		0.005
Manganese		0.005
Silicon		0.005
Phosphorus		0.001
Cadmium		0.005
Other (Total except silver)		0.05
Zinc		Remainder

Table 2 - Cartridge Brass Chemical Composition [2]

Due to the limiting constraints of this, standard suppliers must undertake additional processing of the brass to reduce 'contaminants' to comply with the standard. This additional work and cost are then passed on to the customer as increased price.

It has been reported that around 95% of brass is recycled worldwide, consequently many commercial grades available often contain recycled proportions which slightly increases the level of impurities as shown in Table 3. [3] [4] The primary contaminant of lead can be removed but this process is complex and costly. [5]

Supplier	Holme Dodsworth Metals [6]	S&D Non-Ferrous [7]	Smiths [8]
Brass Grade	CZ106/CW505L	C26000	CZ106/CW505L
Chemical Composition %			
Copper	68.5 – 71.5	68.5 – 71.5	69-71
Lead	0.05	0.05	0.05
Iron	0.05	0.05	
Zinc	Rem	Rem	Rem
Others	0.30	0.30	0.1
Nickel			0.3
Aluminium			0.02
Tin			0.1

Table 3 - Commercial Brass Chemical Breakdowns

Due to the inherently military nature of Small Arms Ammunition casing, minimal public research papers are available for review. Despite this some research has been done into similar questions. For example, in 1972 the US military investigated using aluminium casing material to reduce weight and the reliance on Brass [9]. This paper provides a detailed breakdown of the case requirements that will be used.

As the primary difference between the current brass standard and the commercially available standards is lead content. The inclusion of lead influences the machinability of brass; this is well understood and documented and will be a primary area of the project. [10] [11] [12].

7. Aims and Objectives

The aim of this project is to explore and evaluate alternative materials for use in SAA Cartridge Case production. This will be done through identification of alternative materials and evaluation of these materials against a determined standard. The timeline for this project is planned to be 6-8 months to allow for sufficient research, planning and testing to be performed.

The secondary objectives can be broken down to 8 key stages with associated subtasks for planning. These are detailed in Table 4 with further breakdown of the currently known activities. As the project progresses these activities will be tracked and reported to the project supervisor monthly to ensure sufficient progression.

Item	Start Date	Duration (Days)
Project Conception		
Initial Brief	26/03/2026	1
Idea Generation and discussion	01/04/2026	70
Team Impact discussion	10/06/2026	1
Question decision	10/06/2026	1
Draft Project Proposal	10/06/2026	9
Internal Review	20/06/2026	1
Project Proposal Submission	19/06/2026	1
Differentiated Deadline Extension	26/06/2026	1
Research		
Background Research	01/07/2026	18
Define Baseline Material Requirements	27/07/2026	14
Identify Alternative Brass Grades	06/07/2026	7
Review Previous Research	06/07/2026	21
Draft Literature Review and Standards Comparison	27/07/2026	7
Supply Chain Assessment		
Map Sourcing from Raw material to Final Product and back	03/08/2026	14
Compare Current and Potential Options	17/08/2026	7
Identify Supply Chain Constraints	03/08/2026	14
Draft Supply Chain Risk & Resilience Assessment	17/08/2026	7
Manufacturing Assessment		
Define Machinability Requirements	24/08/2026	28
Impact of change on Machinability	24/08/2026	28
Down-select for Modelling or Testing	21/09/2026	12
Assessment of Modelling Results to Deep drawing, Annealing and Tool wear	10/11/2026	14
Experiment/ Trial		
Modelling Plan (Dogbone)	21/09/2026	12
Modelling Trial	02/11/2026	12
Modelling Results Evaluation	16/11/2026	14
Comparison of Modelling to Real Tests	30/11/2026	14
Cost and Contract Implication?		
Compare material costs, changes to process and tooling	11/01/2027	30
Final Report Review and Submission		
Supervisor Review	05/03/2027	7
Internal Review	12/03/2027	7
Final Report Submission	19/03/2027	1
Poster		
Draft	19/03/2027	24
Supervisor Review	12/04/2027	2
Internal Review	14/04/2027	2
Poster Submission	16/04/2027	1

Table 4 - Task Breakdown Structure

7.1.Gantt Chart

Though the full scope of this project is not fully defined and is likely to change the below Gantt Chart has been created to assist in the key milestone identification and time planning. Figure 2 shows an extract of this live document and details plans, resources required and planned blocking/ restricting activities outside of the project. This chart documents the past and forecasted activities from March 2026 – April 2027.

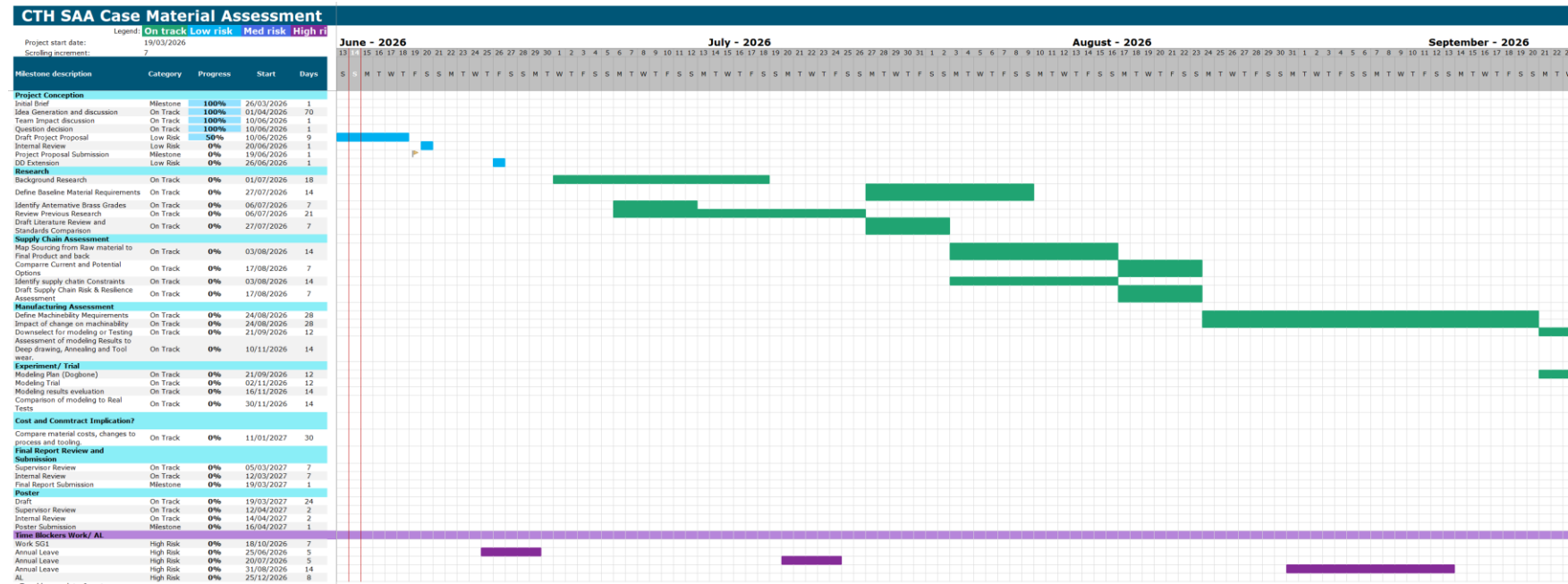


Figure 2 - Gantt Chart Extract [13]

8. Resources & Planning

8.1. Resources Required

As material properties of brass and other available materials are well known, it is unlikely that physical resources will be required for this project. To complete apprenticeship standard requirements computational modelling may be required to validate reported physical testing.

8.1.1. Physical Resources

Physical resources are not required for this project and have therefore not been allocated.

8.1.2. Human Resources

Input from subject matter experts, advisers and colleagues is required for this project. Due to the nature of the project this resource is not planned or costed and is forecasted to be minimal.

8.1.3. Other Resources

This project may require visiting manufacturing sites such as BAE Radway Green and material suppliers. All costing associated with this are forecasted to be in line with the primary researcher's job role and therefore covered under normal travel and subsistence policies and funding.

9. Experimental Design

One of the basic material properties to determine a metals suitability of drawing is its tensile strength. The tensile strength test takes a sample of material with known proportions and pulls it apart with measured force and displacement. This test is often referred to as a 'Dog Bone' test due to the shape of the sample. From this test, Ultimate tensile strength (UTS), yield strength (YS) and the modulus of elasticity (E) can be determined. This will then allow the assessment of ductility and in turn understanding of drawability.

Due to the likely unavailability of physical test apparatus, a computer modelling approach will be utilised to demonstrate this test with comparison to manufacturer results.

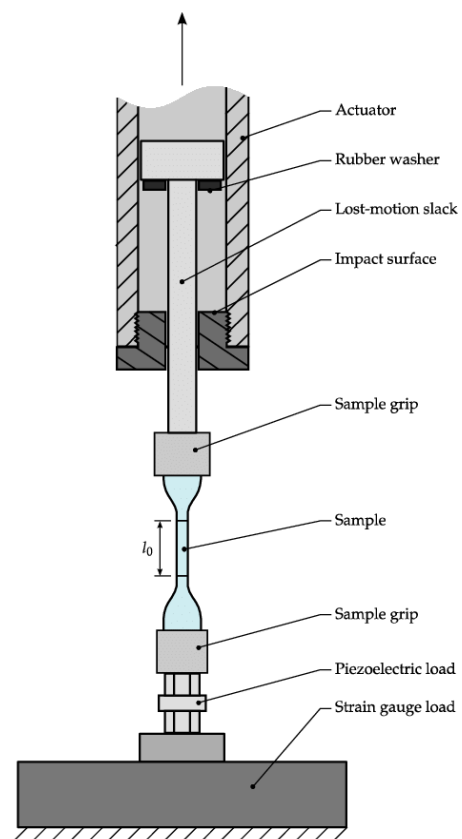


Figure 3 - Tensile Strength Test [14]

9.1.Outline of Experimental Procedure

The broad test procedure for a physical test and a digital test is very similar and are detailed below.

Table 5 - Tensile Test Process

Physical Test	Modelling Test
Prepare Sample	Design Sample
	Define Material Properties
Control Environmental Conditions	Control Environmental Conditions
Machine Calibration	Model Calibration
Define Test Parameters	Define Test Parameters
Run Test	Run Test
Data Collection	Data Collection

9.2.Data Collection

Data collection for both tests is done through the software and can be processed digitally to determine UTS, YS and E for the sample material.

9.3.Data Evaluation

The data will be evaluated through comparisons to published values, other experimental data and benchmark testing.

9.4.Risks & Limitations

With physical testing the risks are minimised through the design of the test setup. The operator is displaced from the equipment, often behind a protective shield to prevent projection of fragmentation. There are no credible risks associated with computer modelling beyond normal office hazards.

9.5.Ethical Issues

Though the development of Small Arms Ammunition is inherently linked to ethical questions the simple metallurgical evaluation intended in this proposal significantly reduces the ethical issues. As the overall intent of this research is to understand supply chain limitations, reduce procurement costs and understand changes in manufacturing the ethical considerations are limited. An argument could be made that the reduction in cost and emphasis on use of recycled material is ethically beneficial as reducing waste, impact on the environment and cost is beneficial to the public.

10.Conclusion

This proposed project will explore the impact of using alternative materials in SAA case production with the intent to achieve increased value for money. This project could have additional benefits of reducing environmental impact and furthering sustainable development of mass produced and procured items in line with the UN guidance for sustainable development [15] .

11. References

- [1] P. D. World, "Ammunition Anatomy – Nomenclature & Construction a Bullet," 12 06 2026. [Online]. Available: <https://athlonoutdoors.com/article/anatomy-of-a-bullet/>.
- [2] Ministry of Defence, "Cartridge Brass for Ammunition Issue 4," Ministry of Defence, Bristol, 2008.
- [3] Copper Development Association Inc, "Brass Rod: A Poster Child for Sustainability," 14 06 2026. [Online]. Available: <https://www.copper.org/choosebrass/pdf/brass-rod-a-poster-child-for-sustainability.php#:~:text=Brass%20is%20one%20of%20the,keeps%20waste%20out%20of%20landfills..>
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- [6] Holme Dodsworth Metals, "CZ106 / CW505L / Cartridge Brass," HD Metals, [Online]. Available: <https://www.holmedodsworth.com/materials/datasheets/brass-datasheets/cz106-cw505l-cartridge-brass>. [Accessed 12 06 2026].
- [7] <https://www.sdnonferrous.co.uk/product/70-30-cartridge-brass>, "70/30 CARTRIDGE BRASS," <https://www.sdnonferrous.co.uk/product/70-30-cartridge-brass>, [Online]. Available: <https://www.sdnonferrous.co.uk/product/70-30-cartridge-brass>. [Accessed 12 06 2026].
- [8] Smiths Metal Centres 2023, "CZ106 (CW505L) Technical Datasheet," 2023. [Online]. Available: <https://www.smithmetal.com/cz106.htm>. [Accessed 12 06 2026].
- [9] R. Donnard and T. Hennesy, "ALUMINUM CARTRIDGE CASE FEASIBILITY STUDY using the M16A1 Rifle with 5.56mm Ball ammunition as the test Vehicle," Department for the Army, Philadelphia, 1972.
- [10] L. Amaral and E. al, "Effect of lead on the machinability of," *Journal of Strain Analysis*, vol. 1, no. 1, pp. 1-14, 2018.
- [11] J. Johansson and E. al, "On the function of lead (Pb) in machining brass alloys," *Journal of Advanced Manufacturing Technology*, vol. 120, no. 11-12, pp. 7263-7275, 2022.
- [12] N. Greenberg, R. Meyer and E. Derazne, "Comparative study on the machinability of lead-free brass," *Journal of Cleaner Production*, vol. 149, no. 4, pp. 366-377, 2015.
- [13] Microsoft, "Gantt charts," 14 06 2026. [Online]. Available: <https://excel.cloud.microsoft/create/en/gantt-charts/>.
- [14] A. Sancho, M. Cox, G. Aldrich-Smith, T. Cartwright, C. Davies, P. Hooper and J. Dear, "Experimental methodology for the measurement of plasticity on metals at high strain-rates," in *The European Physical Journal Conferences*, London, 2018.
- [15] UN Brundtland Commission, "Report of the World Commission on Environment and Development: Our Common Future," Oxford University Press, Oxford, 1987.

12. Annex 1 – 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:	Charles Thomas Hadley
2	Student Number:	2207149
3	Email address:	2207149@student.uwtad.ac.uk Charles.Hadley104@mod.gov.uk
4	Programme of Study:	OME Engineering
5	Director of Studies/Supervisor:	Ewa Kazimierska

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

SECTION C: Details of Research Activity

1	Indicative title:	AN ASSESSMENT OF ALTERNATE CASE MATERIALS IN SMALL ARMS AMMUNITION		
2	Proposed start date:	26/03/2026	Proposed end date:	16/04/2027
	Introduction to the Research (maximum 300 words in each section) Ensure that you write for a <u>Non-Specialist Audience</u> when outlining your response to the three points below: <i>Purpose of Research Activity</i> <i>Proposed Research Question</i> <i>Aims of Research Activity</i> <i>Objectives of Research Activity</i> Demonstrate, briefly, how <u>Existing Research</u> has informed the proposed activity and explain <i>What the research activity will add to the body of knowledge</i> <i>How it addresses an area of importance.</i>			
2	Purpose of Research Activity			

	This project proposes an evaluation of alternative materials for use in small arms ammunition case production. Motivated by supply-chain constraints, processing costs, and the increasing availability of recycled commercial brass grades, the research will compare historic specifications with potential alternatives from suppliers and published sources. The study will establish baseline material requirements, review relevant standards and previous research, and assess the implications of substitution for procurement resilience, production efficiency, and sustainability. Computational modelling of tensile behaviour will be used to examine properties linked to drawability, including ultimate tensile strength, yield strength, and modulus of elasticity, with results compared against published data where possible. The intended outcome is an evidence-based recommendation on material down-selection, together with a structured framework for assessing future substitutions in tightly controlled, safety-critical manufacturing environments.																																																																																										
3	Research Question An Assessment of Alternate Case Materials in Small Arms Ammunition																																																																																										
4	Aims of Research Activity 13.Aims and Objectives The aim of this project is to explore and evaluate alternative materials for use in SAA Cartridge Case production. This will be done through identification of alternative materials and evaluation of these materials against a determined standard. The timeline for this project is planned to be 6-8 months to allow for sufficient research, planning and testing to be performed. The secondary objectives can be broken down to eight key stages with associated subtasks for planning. These are detailed in Table 4 with further breakdown of the currently know activities. As the project progresses these activities will be tracked and reported monthly to ensure sufficient progression. <table><tr><th>Item</th><th>Start Date</th><th>Duration</th></tr><tr><td colspan="3">Project Conception</td></tr><tr><td>Initial Brief</td><td>26/03/2026</td><td>1</td></tr><tr><td>Idea Generation and discussion</td><td>01/04/2026</td><td>70</td></tr><tr><td>Team Impact discussion</td><td>10/06/2026</td><td>1</td></tr><tr><td>Question decision</td><td>10/06/2026</td><td>1</td></tr><tr><td>Draft Project Proposal</td><td>10/06/2026</td><td>9</td></tr><tr><td>Internal Review</td><td>20/06/2026</td><td>1</td></tr><tr><td>Project Proposal Submission</td><td>19/06/2026</td><td>1</td></tr><tr><td>DD Extension</td><td>26/06/2026</td><td>1</td></tr><tr><td colspan="3">Research</td></tr><tr><td>Background Research</td><td>01/07/2026</td><td>18</td></tr><tr><td>Define Baseline Material Requirements</td><td>27/07/2026</td><td>14</td></tr><tr><td>Identify Alternative Brass Grades</td><td>06/07/2026</td><td>7</td></tr><tr><td>Review Previous Research</td><td>06/07/2026</td><td>21</td></tr><tr><td>Draft Literature Review and Standards Comparison</td><td>27/07/2026</td><td>7</td></tr><tr><td colspan="3">Supply Chain Assessment</td></tr><tr><td>Map Sourcing from Raw material to Final Product and back</td><td>03/08/2026</td><td>14</td></tr><tr><td>Compare Current and Potential Options</td><td>17/08/2026</td><td>7</td></tr><tr><td>Identify supply chain Constraints</td><td>03/08/2026</td><td>14</td></tr><tr><td>Draft Supply Chain Risk & Resilience Assessment</td><td>17/08/2026</td><td>7</td></tr><tr><td colspan="3">Manufacturing Assessment</td></tr><tr><td>Define Machinability Requirements</td><td>24/08/2026</td><td>28</td></tr><tr><td>Impact of change on machinability</td><td>24/08/2026</td><td>28</td></tr><tr><td>Down select for modelling or Testing</td><td>21/09/2026</td><td>12</td></tr><tr><td>Assessment of modelling Results to Deep drawing, Annealing and Tool wear.</td><td>10/11/2026</td><td>14</td></tr><tr><td colspan="3">Experiment/ Trial</td></tr><tr><td>Modelling Plan (Dogbone)</td><td>21/09/2026</td><td>12</td></tr><tr><td>Modelling Trial</td><td>02/11/2026</td><td>12</td></tr><tr><td>Modelling results evaluation</td><td>16/11/2026</td><td>14</td></tr></table>	Item	Start Date	Duration	Project Conception			Initial Brief	26/03/2026	1	Idea Generation and discussion	01/04/2026	70	Team Impact discussion	10/06/2026	1	Question decision	10/06/2026	1	Draft Project Proposal	10/06/2026	9	Internal Review	20/06/2026	1	Project Proposal Submission	19/06/2026	1	DD Extension	26/06/2026	1	Research			Background Research	01/07/2026	18	Define Baseline Material Requirements	27/07/2026	14	Identify Alternative Brass Grades	06/07/2026	7	Review Previous Research	06/07/2026	21	Draft Literature Review and Standards Comparison	27/07/2026	7	Supply Chain Assessment			Map Sourcing from Raw material to Final Product and back	03/08/2026	14	Compare Current and Potential Options	17/08/2026	7	Identify supply chain Constraints	03/08/2026	14	Draft Supply Chain Risk & Resilience Assessment	17/08/2026	7	Manufacturing Assessment			Define Machinability Requirements	24/08/2026	28	Impact of change on machinability	24/08/2026	28	Down select for modelling or Testing	21/09/2026	12	Assessment of modelling Results to Deep drawing, Annealing and Tool wear.	10/11/2026	14	Experiment/ Trial			Modelling Plan (Dogbone)	21/09/2026	12	Modelling Trial	02/11/2026	12	Modelling results evaluation	16/11/2026	14
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5	Objectives of Research Activity See above																																				
	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.																																				
6	Any data collected will be from modelling results or physical engineering performance tests. This will be manually collected and recorded digitally for processing. No people outside of the researcher will be required.																																				

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: (this box should expand as you type)		

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: NA		

	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?	0
11	Who will the participants be?	NA
12	How will you identify the participants?	NA

	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			
	NA			

	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			
	NA			

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: MA
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	
	N/A	
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: Computational Modelling and general research activities.	How you will mitigate the risk to the investigator: These activities fall inside the scopes and boundaries of general office work and are therefore considered ALARP on the assumption that current risk assessments, OSHE and employer required training is extant.

	Physical testing	Physical testing is an unlikely activity due to funding constraints but if conducted will fall under a dedicated risk assessment and mitigation activity prior to commencement.
4	University/institutional risks For example: adverse publicity, financial loss, data protection	
	Risk to the University: Reputational risk from Development of Small Arms Ammunition	<i>How you will mitigate the risk to the University:</i> The course is Ordnance Munitions and Explosives. The assessment and development of munitions is a part of this industry. This proposal is driven primarily by value for money for the taxpayer, a benefit to the public.
5	Environmental risks For example: accidental spillage of pollutants, damage to local ecosystems	
	Risk to the environment: N/A	<i>How you will mitigate the risk to environment:</i> N/A

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?
	NA
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.
	NA
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.
	NA

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>	☐	X
	If YES, provide a description of the data and explain why this data needs to be collected:		
2	NA		

	Does it involve special category data (as defined by the GDPR)?	YES	NO
3	“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),	☐	X
	If YES, provide a description of the special category data and explain why this data needs to be collected:		
4	NA		

	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, anonymisation and pseudonymisation:		
	All Data Will be stored on the Ministry of Defence Network, secured up to ‘OFFICIAL-SENSITIVE’. This system is compliant with GDPR and the Official Secrets Act. Prior to release to the university, it’s security classification will be confirmed and release as ‘OFFICIAL’.		

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):		

	<i>No Personal Data will be collected as part of this research, GDPR and DPA do not apply.</i>	
20	List all who will have access to the data generated by the research activity:	
	<i>Primary researcher - Charles Hadley</i> <i>MOD Sponsor – TBC</i> <i>UWTSD Marker – TBC</i> <i>UWTSD Examiner – TBC</i> <i>UWTSD Supervisor – TBC</i>	
21	List who will have control of, and act as custodian(s) for, data generated by the research activity:	
	<i>Primary researcher</i>	
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.	
	All Data Will be stored on the Ministry of Defence Network, secured up to 'OFFICIAL-SENSITIVE'. This system is compliant with GDPR and the Official Secrets Act. Prior to release to the university, it's security classification will be confirmed and release as 'OFFICIAL'. It will be stored for a minimum of 14 years in line with the MOD information policy.	
22	Confirm that you have read the UWTSD guidance on data management (see https://www.uwtssd.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.uwtssd.ac.uk/research/research-ethics/		
1	Signature of applicant:	Charles Hadley	Date: 17/06/26
2	Director of Studies/Supervisor:	Not Yet Assigned	Date: TBC
3	Signature:	TBC	

FOR INTERNAL USE ONLY:

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