Plan Overview

A Data Management Plan created using DMPonline

Title: Inert Simulants for Use in the Characterisation of Electro Explosive Devices

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Template: DCC Template

Project abstract:

The use of Electro Explosive Devices (EEDs) in initiation systems continues to increase with the prevalence of complex munitions in the battle space. EEDs share one key characteristic, that being the reliance on electric current as their source of initiation energy. The reliance of EEDs on electric current as a source of initiation energy, and their incorporation into often large and complex electrical circuits leaves them susceptible to stray currents induced by strong coherent electromagnetic fields. It is therefore essential to characterise the vulnerability off EEDs to EM fields, thus establishing safe limits of exposure.

Typically service EEDs consist of a bridgewire, an electical element that heats up on exposure to an electric current. This is coated or otherwise placed in contact with an energetic composition that provides the output energy. Characterisation, however, is conducted using EEDs that have had the energetic composition removed. Previous work has shown that the energetic material used in an EED affects its initiation energy. therefore, bare bridgewire characterisation is assumed not to be representative of service conditions.

This study will investigate material characteristics that affect energy transfer between bridgewires and energetic compositions. The overall aim of the study is to understand how manipulation of these characteristics can be used to synthesize inert materials that exhibit the same energy transfer properties as typical energetic materials used in EED manufacture. These can then be compared to live EEDs to determine whether they can be used to better simulate live EEDs.

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Inert Simulants for Use in the Characterisation of Electro Explosive Devices

Data Collection

What data will you collect or create?

The data collected for this study will primarily consist of energy flow characteristics such as conductivity, specific heat capacity, temperature increase, and applied current. The volume will largely be dictated by the number of compositions investigated. each composition will be subjected to several test runs to determine the information above. Whilst the data will be processed using proprietary software such as Excel, the raw data itself will be collected and stored as .txt files.

How will the data be collected or created?

The majority of the data will be will be collected using Differential scanning calorimetry equipment, and Op Sens temperature measurement equipment.

All experiments will be run in triplicate where possible to ensure the quality and accuracy of the data gathered. Where outliers are identified and excluded, this will be recorded along with a short justification.

Raw data from DSC will be outputted initially into a communal database for later filing. in order to correctly identify this data, it will be titled as follows. Researcher initials, date, type of test, composition, test parameters, run number. For example: VC,09-05-22, Cp, AlO-Sugar,25-150 @10, run 1. This may be modified to suit the communal database but will be stored as shown above in the dedicated database for this study. The run number will function as an effective version number with any additional data being gathered recorded as a separete run. Folders will be organized by Test type> Composition.

For processed data, secondary data and reports, the file naming format will take the form: Date code (YYYYMMDD), Title, Version (Vn.n), Author. For Example 20220523, *Change in Conductivity With Particle Size,* V1.0, Vincent Coombs. Major versions of the document will be defined as documents incorporating significant changes in technical content or conclusion. In these cases, the change in version number will result in an integer increase e.g V1.0 to V2.0. Minor changes will be clerical changes to the document, in which the original intent/conclusion of the preceding major version remains unchanged. These will result in decimal changes e.g V1.0 to V1.1.

Documentation and Metadata

What documentation and metadata will accompany the data?

A .txt file readme document will accompany the data, in this will explain the methodology used to gather the data, and, for the DSC derived data, the processing methods required to utilise the raw data. The file will also explain the file naming strategy as this is essential to understanding the metadata contained in the file name.

For Opsens Data, the serial number and calibration data for the probe, along with the adhesive used. This will be included in a test summary as it is specific to certain data sets.

Where proprietary or classified (Official Sensitive and Above) data is used, this will be excluded from publicly available data but will be recorded separately.

Ethics and Legal Compliance

How will you manage any ethical issues?

As the data gathered in this study will not include human or animal participants, tissue thereof, or any data derived from these categories, there are no ethical considerations to be made. Should any ethical considerations arise during the data gathering process, they will be managed in line with Cranefield University research ethics policies.

How will you manage copyright and Intellectual Property Rights (IPR) issues?

Any secondary data used will be attributed to the originator/ originating organisation. Any intellectual property developed as part of

this study will be managed in line with any IPR agreements between Cranfield university and Defence Equipment and Support.

Storage and Backup

How will the data be stored and backed up during the research?

Raw data from the DSC equipment will initially be stored on the CDC communal database. this will also be transferred to a Cranefield university MS teams sharesite along with any processed data. This will automatically be backed up on a daily as part of the Cranefield university IT policy.

Data from the Opsens equipment will initially be stored on the DE&S network but will be duplicated on the Cranfield MS teams share site as described above, for utility.

Any OS or above data will be retained on the DE&S network unless specific permission is granted by the owner of that data to store it on the canfield network in which case it will be transmitted using an appropriate r.mil email account. Any OS Data stored on the DE& S network that contributes to project outputs will be referenced and credited accordingly but will not be directly incorporated into the final output.

Data Stored on the DE&S network is backed up on a daily basis in line with DE&S Data management policy. This Data can be recovered if required with the support of the DE&S Knowledge and Information Management team.

How will you manage access and security?

Access t the MS Teams Sharesite is restricted, and the file location is accessible only team those on that team. access to the DE&S sharesite is password protected and only available to devices on the MoDNET network. Data transferred on the r.mil network is end to end encrypted to prevent intercept.

Secondary data Classified OS or above will where possible, be stored on the DE& S network, with only non product specific raw data and standards transferred via r.mil.

Selection and Preservation

Which data are of long-term value and should be retained, shared, and/or preserved?

All data generated can be considered to be valuable in the long term. As none of the data is subject to UK GDPR provisions or other ethical or legal requirements, there is no restriction to the length of time it can be stored.

Raw data is particularly valuable as it enables independent verification. processed data is also valuable as it will for the basis of a useable output for the funding organisation.

Data on the heat transfer mechanics of energetic materials would also hold value for the university as it adds to the data set supporting explosive safety research. Data on the Efficacy of RAM and Speed mixers can be reused to inform work within the formulations group on the achievable quality using those methods.

What is the long-term preservation plan for the dataset?

Data will be retained securely in Cranfield’s institutional data repository, CORD, which uses the figshare platform and preserves data for at least 10 years after project end, with datasets assigned a DOI for long-term accessibility, in accordance with Cranfield’s Management of Research Data Policy.

Data Sharing

How will you share the data?

Data pertinent to the study will be published as appropriate in a series of papers throughout the study, and incorporated into the final PHD thesis. This will be made available via the Barrington Library. Data will also be deposited on the Cranfield Online Research Data Repository (CORD)

Are any restrictions on data sharing required?

All data either generated or provided by other sources that is deemed to have a classification of Official-Sensitive or higher, or be commercially sensitive will be restricted to Cranfield university and DE&S.

Responsibilities and Resources

Who will be responsible for data management?

The principal researcher will hold the responsibility for management of the data in line with this plan. The named Research administrators, may at times contribute to both the generation and management of the data.

The Data management plan will be reviewed at critical stages of the project to ensure that it remains suitable for the data being gathered by the project. this will be discussed with the funding organisation and

What resources will you require to deliver your plan?

in order to deliver this plan, access to the Cranfield IT network, and the MoDNET Network will be required. this includes access to devices capable of accessing this network. Access to the CORD research database will also be required to facilitate long term storage and data sharing. If transfer of classified data is required, a canfield r.mil account may be required.