# Task Proposal

## Meeting Date for the Proposal

14/12/24

## Task Code

WP2 T1 ST1

## Task Version

Version 1

## Task Members

### Task Lead:

N/A

### Supporting Members:

N/A

### Members:

Ismail Hendryx

## Task Description

### Initial Task Goal(s):

Source nuts and bolts, up to 10 cm by 10 cm as they exemplify the types of small, dense, and potentially dangerous objects left in low Earth orbit (LEO) after launch operations and satellite deployments. Explosive bolts, for example, are routinely used in satellite deployment processes, such as the pyrotechnic separation bolts in the Iridium satellite constellation launch. These bolts, typically around 1–2 cm in diameter and 3–5 cm in length, are often expelled at high speeds, rendering them un-trackable and hazardous as they drift into orbit [1,2]. Additionally, these nuts and bolts can come from lost astronaut tool bags [3].

*Several metal parts with wires

Description automatically generated*

*Figure (1):[2] Examples of explosive bolts (diameters ranging .25-5.75 inches)*

### How this Task links overall to the WP:

This task links to the overall Work Package as it is related to sourcing one of the 3 categories of debris type we defined for our scope.

## Task Results

### What was delivered:

For this task, although actual explosive bolts would be most realistic, they could be dangerous, as they could explode. Therefore, a realistic replica would be a 3D printed metallic version of the post-exploded bolts [4]. In terms of nuts [5] and lost astronaut tools (e.g rachet wrench with a socket) [6,7], these can be easily sourced online.

### Why we think this approach will work:

A close-up of a tool

Description automatically generatedA close-up of a set of nuts

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*Figure (2): Example of a Rachet that may be used in Space Figure (3): Example of a Bolts we may purchase*

## Supporting Task Research and Supervisor Notes

### Why have you completed the task this way:

Because it seems like the most feasible approach.

### What previous research or methodology did you use to complete this task and why:

I looked at our project proposal’s reference links and research as well as considering the available purchase options online.

### References:

*[1] NSE, “Explosive Bolts: The Unsung Heroes of Space Launch Vehicles - New Space Economy,” New Space Economy, Jul. 15, 2024. https://newspaceeconomy.ca/2024/07/15/explosive-bolts-the-unsung-heroes-of-space-launch-vehicles/ (accessed Nov. 10, 2024).*

*[2]* *“Explosive Bolts | PacSci EMC,” psemc.com, 2018. https://psemc.com/products/explosive-bolts-sep-bolts/*

*[3] S. J. Beard, “Where did I put that? Astronauts who lost a tool bag can’t get it back because it’s in orbit,” USA TODAY, Dec. 02, 2023. https://eu.usatoday.com/story/graphics/2023/12/02/astronaut-lost-tool-bag/71719486007/ (accessed Nov. 10, 2024).*

*[4] “ABS like pro resin,” Weerg.com, 2024, doi: https://www.weerg.com/en/global/quotation-tool/upload?\_gl=1\*1ynw2li\*\_up\*MQ..&gclid=EAIaIQobChMIxqLPrPeligMVCJCDBx3s4hGeEAAYASAAEgKEkvD\_BwE*

*[5] Amazon. https://www.amazon.co.uk/FandWay-M1-2-M1-4-M1-6-M2-5/dp/B0C399HDXP/ref=sr\_1\_16?crid=3M7PWDIBU74BW&dib=eyJ2IjoiMSJ9.fBYon0WK3pywLTvTElxZ5eRBGoLtuCmXowE3l7QXILDma5gMU1r9qcuph72TiBcUJe6a\_DEnwhuAI-3SaK4bWue1F\_EKVHrMs8YnWCgoV6WeMlmroxYOwiveUAAwKFe88smbHMtbQbmL2HVPJBVnSlUb5QWrEI4-0l-SquWTab\_n0cdwns-4nBPjF9CAhWHv-vK7sUVJu657ECtu-Zuunk9nb94H9PKqw9lrp9v6RPyCG8IUGNu\_bJqwHjgh\_RF4IeK-IFZm5r8z0mzTWlVwPg0yXvt734V1-M\_RZiW8SQZAAqqYQWHlQX63iELhxDTE\_C3ZK\_Jat1TzdCgH7ep9Db1yHZRmeldiH4tq4dRoZIATP1w3ETEj0eb14iGpGSCAJCcVPDV0jg4QpQaP8hQ0Sfxh047J6lvuyiiysry6b3RFIKG1rkzEsWWp3bgXDAzY.5Uisj447zF2iWavLobSk2p4ycgspDup6zi2BI8L5gk4&dib\_tag=se&keywords=big+nuts&nsdOptOutParam=true&qid=1734135554&sprefix=big+nuts+%2Caps%2C225&sr=8-16*

*‌* *[6] S. J. Beard, “Where did I put that? Astronauts who lost a tool bag can’t get it back because it’s in orbit,” USA TODAY, Dec. 02, 2023. https://eu.usatoday.com/story/graphics/2023/12/02/astronaut-lost-tool-bag/71719486007/*

*‌* *[7] Amazon. https://www.amazon.co.uk/s?k=ratchet+wrench&crid=36D39YQ0O4P7X&sprefix=ratchet+wrench%2Caps%2C95&ref=nb\_sb\_noss\_1*

### What points were mentioned by the supervisor related to this task (if any):

N/A

## Agreement

### Which team members agree/disagree with the results/approach for this Task:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Member | Stephanie  Buchanan | Ismail Hendryx | Kautilya  Chappidi | Jonathon Wong | Daniel Pawlak | Mohammed Islam | Gallad Isse |
| Agree( ) or Disagree( ) | () | () | () | () | () | () | () |

### Who Disagrees and why:

Most of the team disagreed as obtaining a metal 3D printed bolt seemed unfeasible, due to the timeframe and being accepted by the makerspace. Therefore, our plan of action was to use similar shaped metallic bolts and plastic 3d printed hollow bolts filled with sand for imitated weight.