TEXAS SPACE GRANT CONSORTIUM
DESIGN CHALLENGE

TOPIC # - TDC - 109

LUNAR SURFACE RECYCLING-SCAVENGING AND REUSE OF DISCARDED MISSION HARDWARE

BACKGROUND

Current lunar missions commonly leave behind sizable components such as structural frames, tanks, and electronics that become inert debris despite their value as potential resources for future lunar operations. No standardized process exists for identifying, recovering, or reusing these materials, representing a missed opportunity for supporting sustainability, maintainability, and independence from Earth. This project aims to develop a feasible, low-resource system for scavenging and reusing discarded lunar mission hardware to support long-duration missions. Students will design a conceptual system that includes tools, robotic attachments, and methods for processing and repurposing materials.

DELIVERABLES

The project will:

- Catalog and evaluate discarded lunar equipment to focus on recoverable metals and components in accessible locations.
- Prioritize parts suitable for retrieval and reuse by near-term terrestrial or robotic systems.
- Develop a conceptual design for lunar-based scavenging/recycling, including specialized tools and methods for detachment, transport, and refurbishment.
- Analyze resource requirements (energy, time, crew/robotics) to ensure feasibility under mission constraints.
- Demonstrate the solution with a digital twin or prototype, consistent with TSGC guidelines.

DESIGN TEAM PROFILE

NASA MENTOR:	Eugene Schwanbeck (eugene.r.schwanbeck@nasa.gov)
LEVEL:	Undergraduate students of any level
MAJOR/DISCIPLINE:	Computer Engineering, Electrical Engineering, Civil Engineering, Aeronautical Engineering, Computer Science, Mechanical Engineering
TEAMS:	1
DURATION:	One or Two-Semester Project

NASA