ROBOT DRONE LEAGUE

2025 Official Challenge AMG

MOONBASE

2025 MOONBASE - Official Field

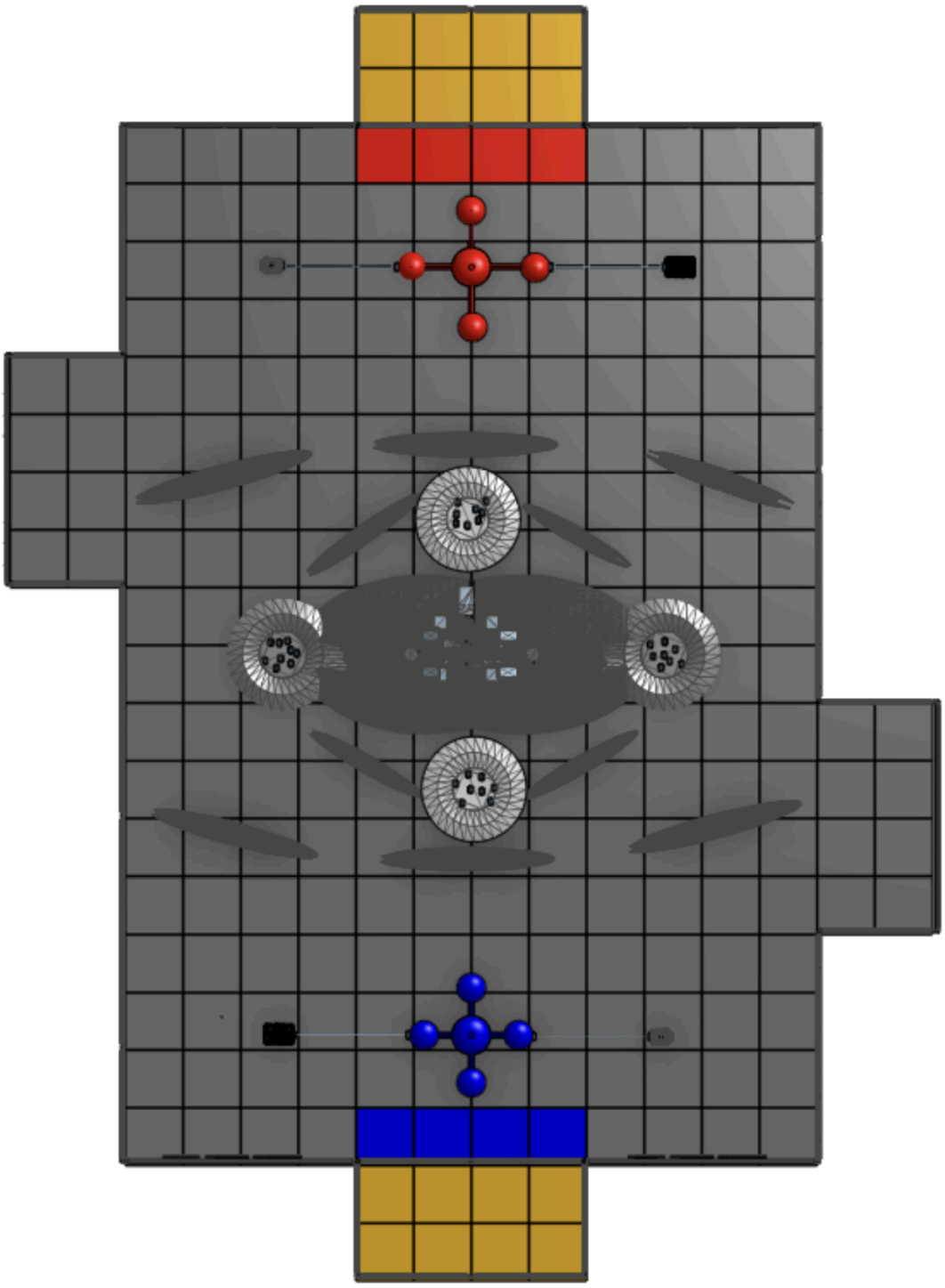

Fig. #1 RDL MOONBASE Field

Three Laws of Robotics

1. *A robot may not injure a human being or, through inaction, allow a human being to come to harm.*

2. *A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.*

3. *A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.*

~Isaac Asimov

And one more….

4. *A robot may not intentionally injure another robot unless the action or inaction conflicts with the First, Second, or Third Laws.*

~ Scooter Willis (Creator of RDL)

Sponsors

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Revisions Date	Page	Notes
10/30/2025	**25, 26**	**Deep / Shallow Craters, Small Dome, Communications Satellite**

Table of Contents

Introduction

Creativity and innovation are key elements to advancing the fields of science, technology, engineering, and mathematics (STEM) into the future. Robot Drone League (RDL) has been designed to provide students with open-ended challenges that allow for creation and innovation by engaging in hands-on design, engineering, and programming of interactive robots and drones. Students are presented with the opportunity to develop real-world connections to classroom learning. Working with robots in a collaborative game format can be a very powerful tool to engage students and enhance math and science skills through hands-on, student-centered learning. Through participation in RDL, students can develop the essential life skills of teamwork and collaboration, as well as critical thinking, project management, and communication required to become the next generation of innovators and problem-solvers in our global society. The 2025 RDL "MOONBASE" Challenge, presented by STREAMWORKS, is designed to inspire students to develop a lifelong passion for learning and pursuing educational and career opportunities in STEM fields by implementing real-world STEM-related problems that require innovative and critical thinking to find solutions.

For additional information, please contact:

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STREAMWORKS

Autonomous Measurements Guide

Overview

RDL 2025 Challenge: MOONBASE

RDL Autonomous Measurements Guide – 2025 MOONBASE Challenge

Autonomous Period

At the beginning of a 10-minute match, the first 60 seconds is considered the autonomous period. Human control of the robot or drone is not allowed. Teams are awarded points for autonomous movement of the robot or drone as depicted in the scoring table below. **NOTE: Drones and robots will not be reset during this time in the event of task failure.** Completing these tasks autonomously results in additional points during the autonomous period.

The RDL Autonomous Measurements Guide is designed to help teams prepare their robots and drones for the 2025 MOONBASE Challenge by providing an illustrative overview of the competition field layout. Using the official MOONBASE drawings, teams can plan and program autonomous mission functions that require precision in navigation, positioning, and task execution.

These illustrative drawings serve as a visual planning tool, showing approximate dimensions, placements of field elements, and key mission task locations such as the Lunar Gateway spacecraft, supply drop zones, and resource collection points. They allow teams to pre-program movement paths, sensor activation sequences, and payload delivery maneuvers before arriving at an event.

It is critical to note that all measurements provided in the guide are *approximate* and may vary slightly between regional and national events. Variations may occur due to venue-specific setups, material tolerances, and field assembly differences. Therefore, autonomous routines should be programmed with built-in flexibility and sensor-based adjustments rather than relying solely on fixed distances.

How to Use the MOONBASE AMG Illustrative Drawings

1. Review Field Layouts
   Study the drawings to understand the spatial relationships between key mission elements. Identify start positions, task areas, obstacles, and scoring zones.

2. Map Autonomous Paths
   Use the approximate dimensions to plan robot and drone travel routes. Integrate waypoints, turns, and positioning cues based on the illustrative diagrams.

3. Incorporate Sensor Feedback
   Program your systems to use onboard sensors (ultrasonic, photoelectric, GPS, vision, etc.) to refine positioning during missions and adjust for minor discrepancies between the drawings and the real field.

4. Build Adjustable Code
   Create routines with variables that can be fine-tuned once precise on-site measurements are taken.

5. Verify On-Site
   Extra consideration will be made at all events to ensure teams have adequate time to take precise measurements on the actual competition field before matches begin. This on-site calibration is essential to achieving consistent autonomous performance.

By combining the RDL Autonomous Measurements Guide with the 2025 MOONBASE illustrative drawings, teams can approach competition day with a strategic and adaptable plan—maximizing their mission success rate while staying prepared for real-world variances in the playing field.

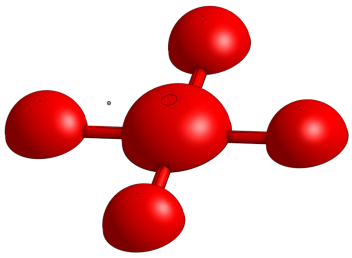
Need STL files for 3D printing game elements or need clarification or have additional questions regarding these drawings and dimensions?

Happy to Help!

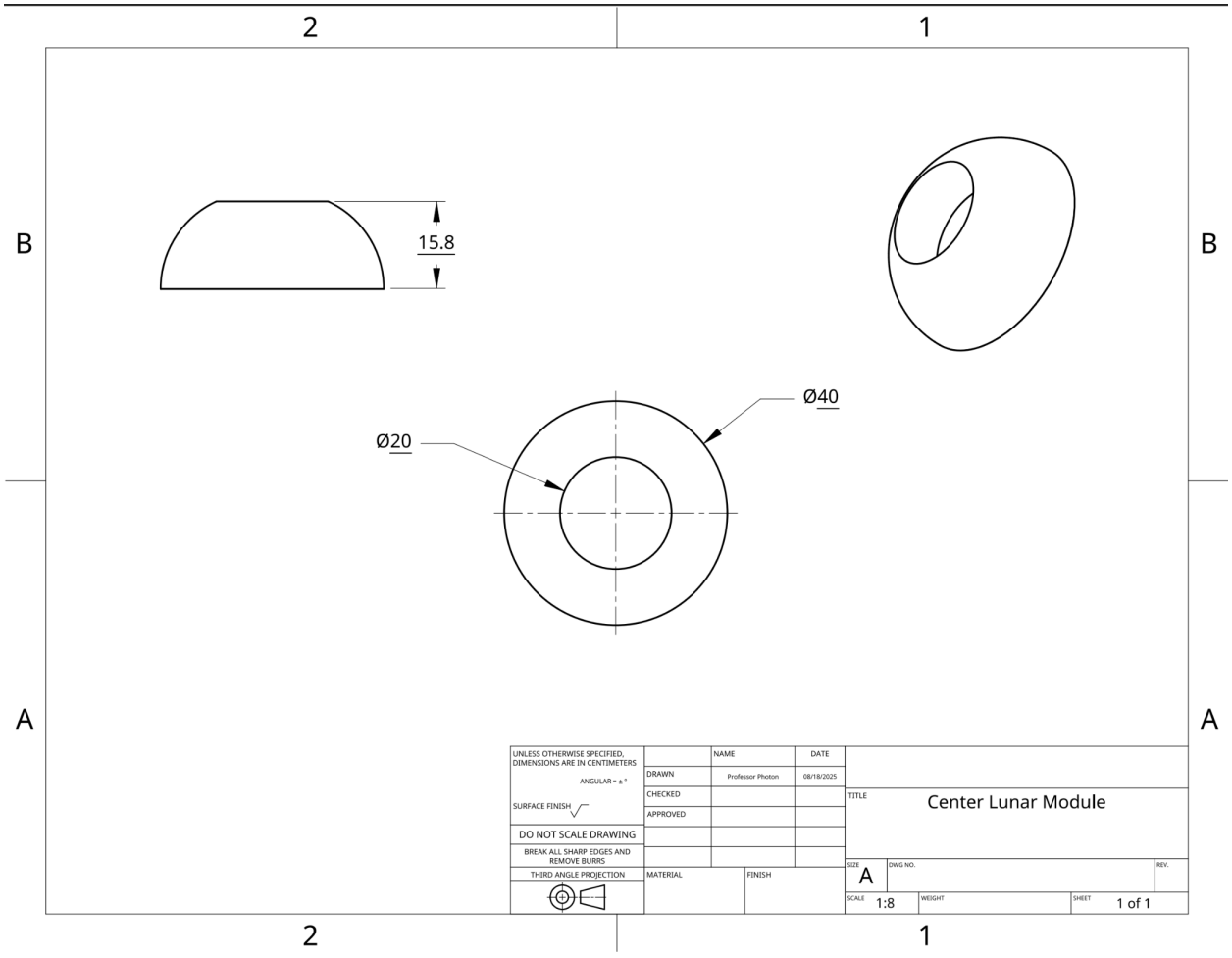
Please email **Ian Crews** at ian@streamworkseducation.org with your request.

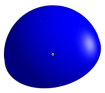
Habitat Modules

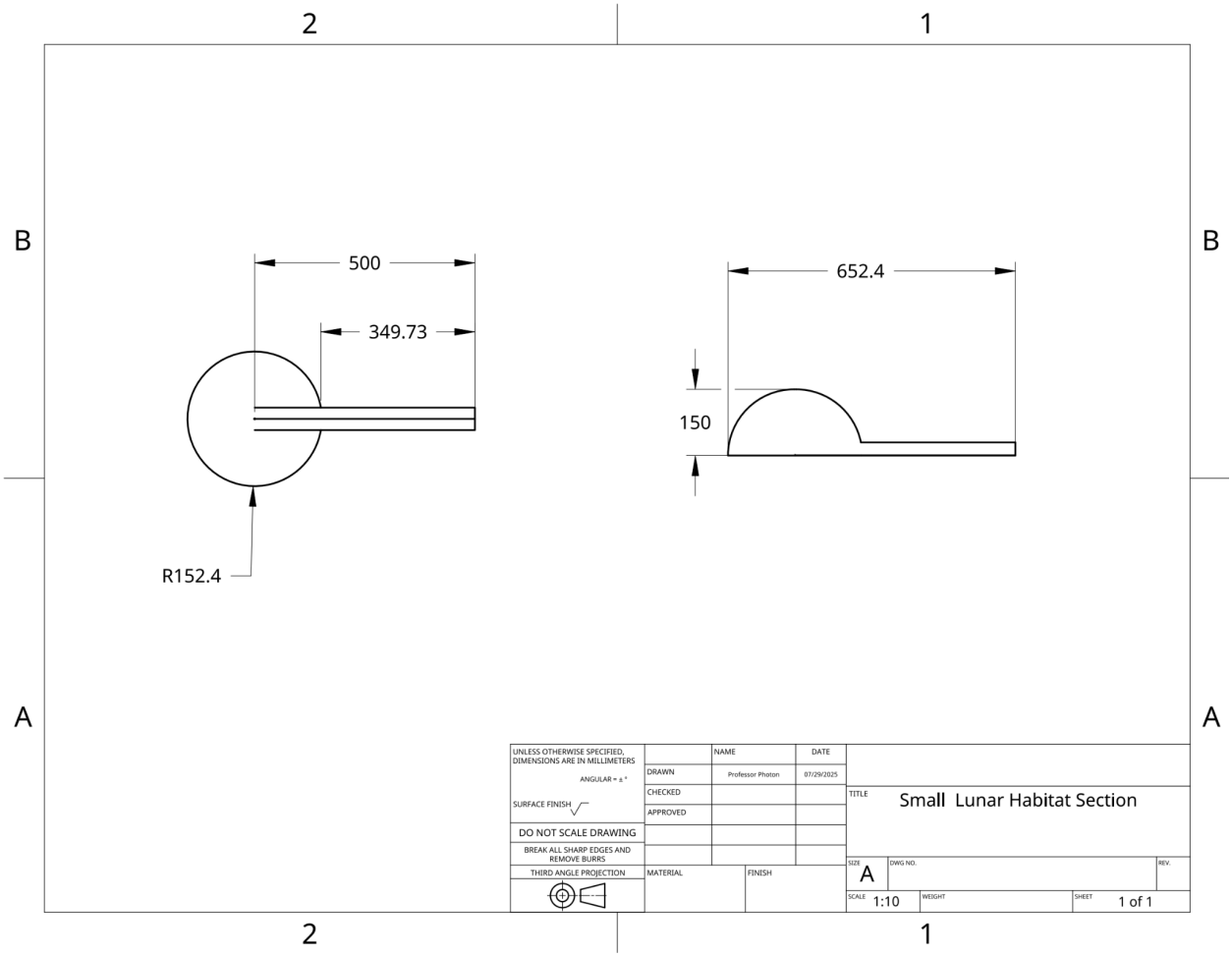
Mission Task #1 : "Assemble MOONBASE Habitat Modules"; Solar Panels, and Communications Satellite



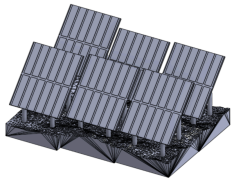
1. Biosphere Module (Large) -

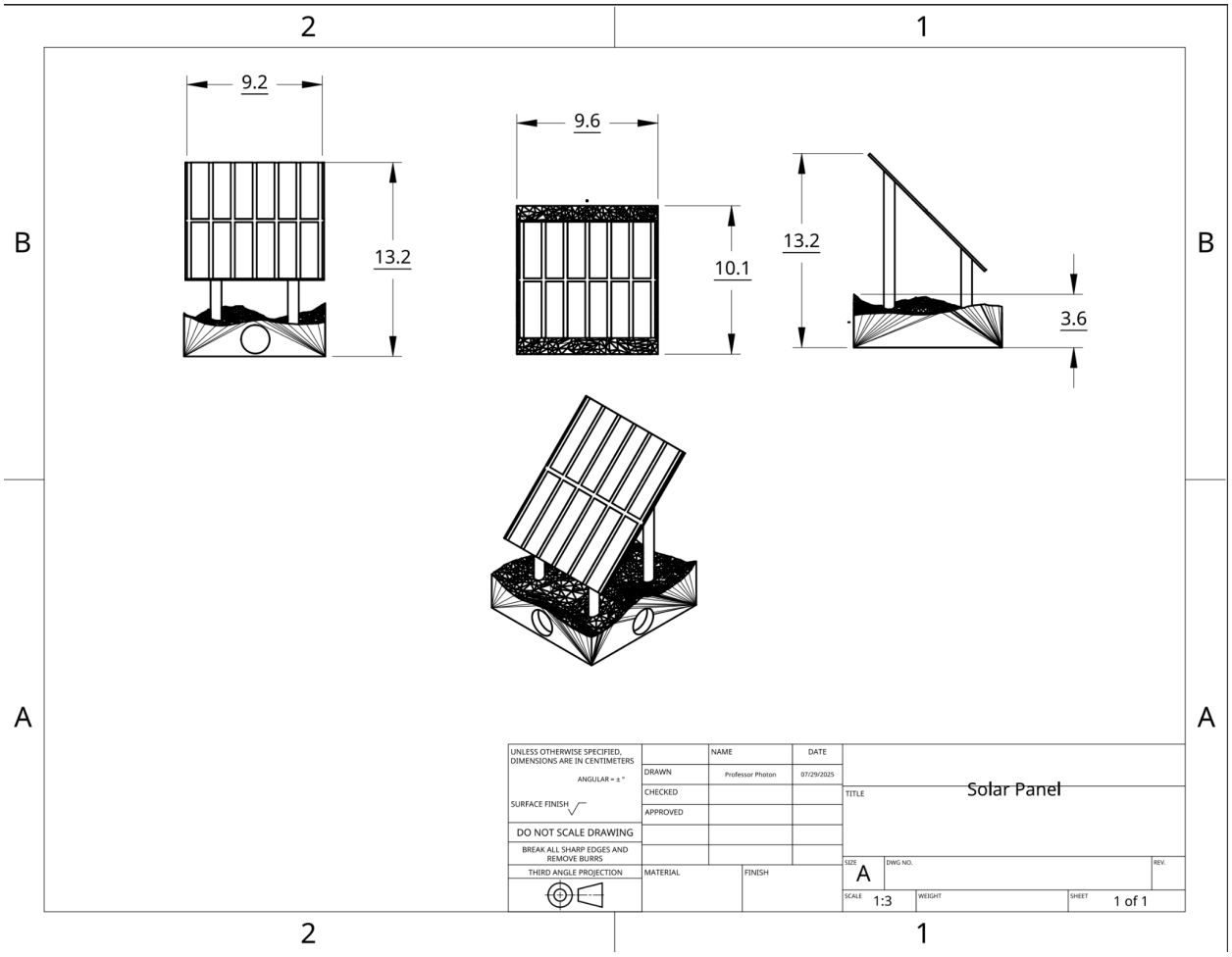


2. Exterior Biosphere Modules (Smalls) 

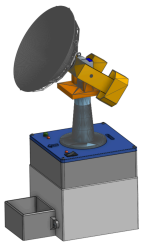


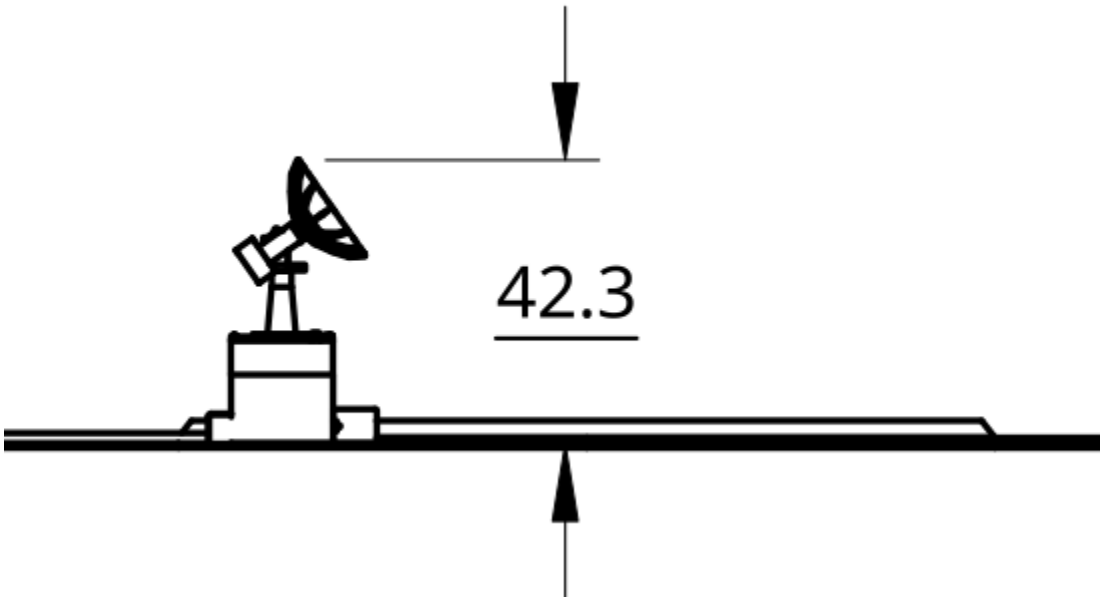
3. Solar panels array





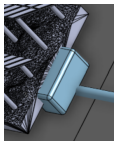
4. Communications Satellite



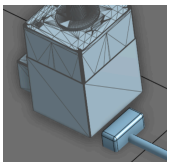


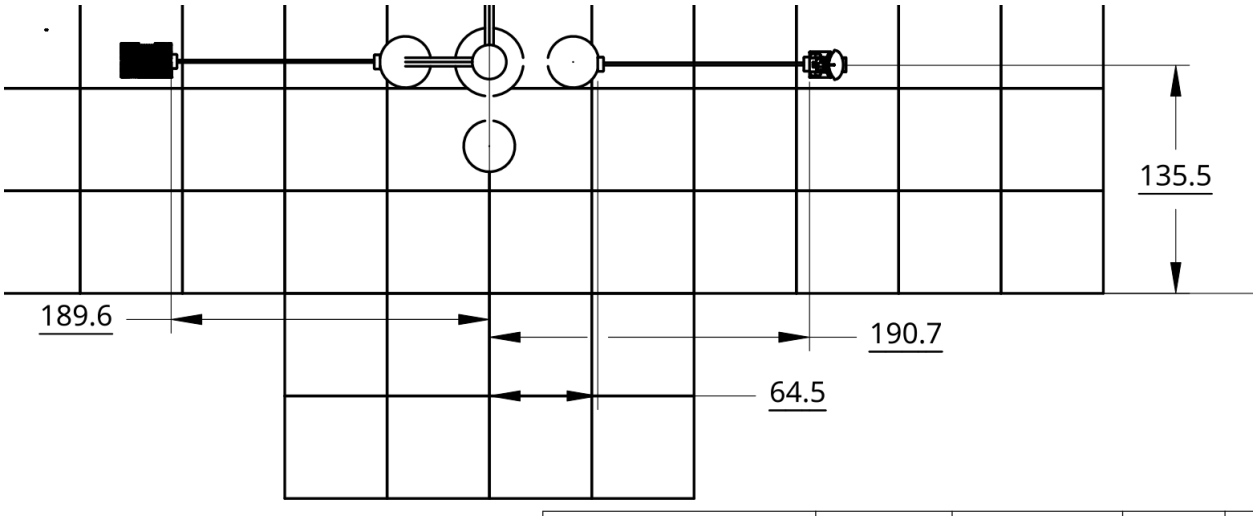
Mission Task #2 : "Establish Electrical Power and Secure Communications Link"

1. Solar Panels Array Connector



2. Communications Satellite Connector

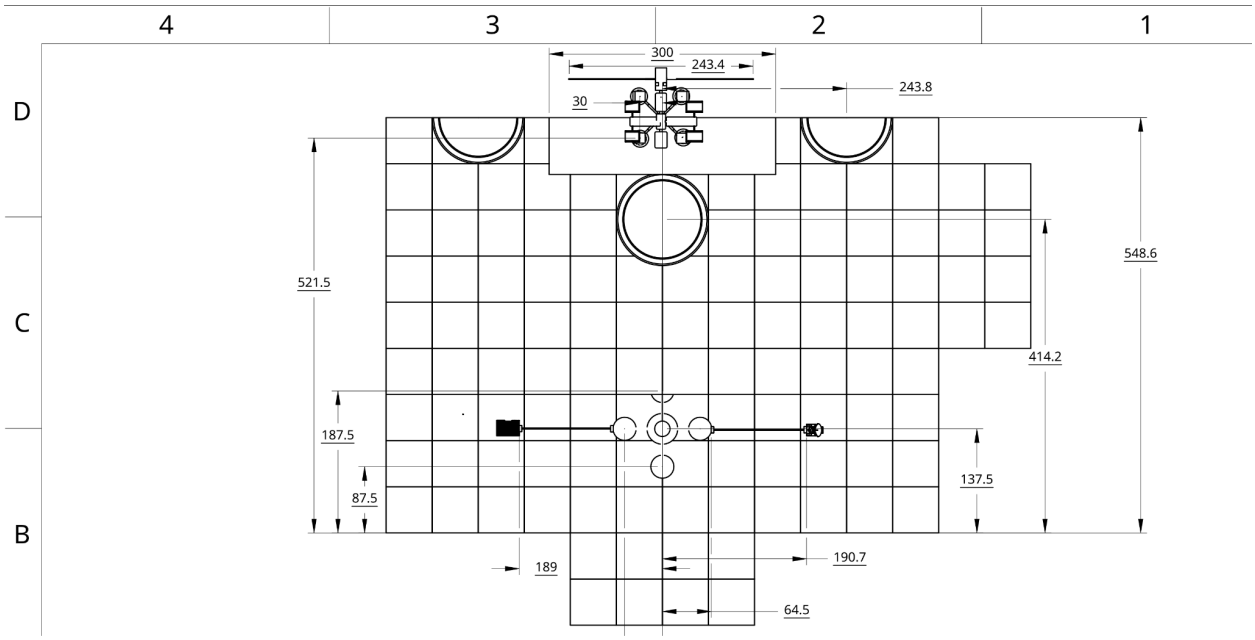




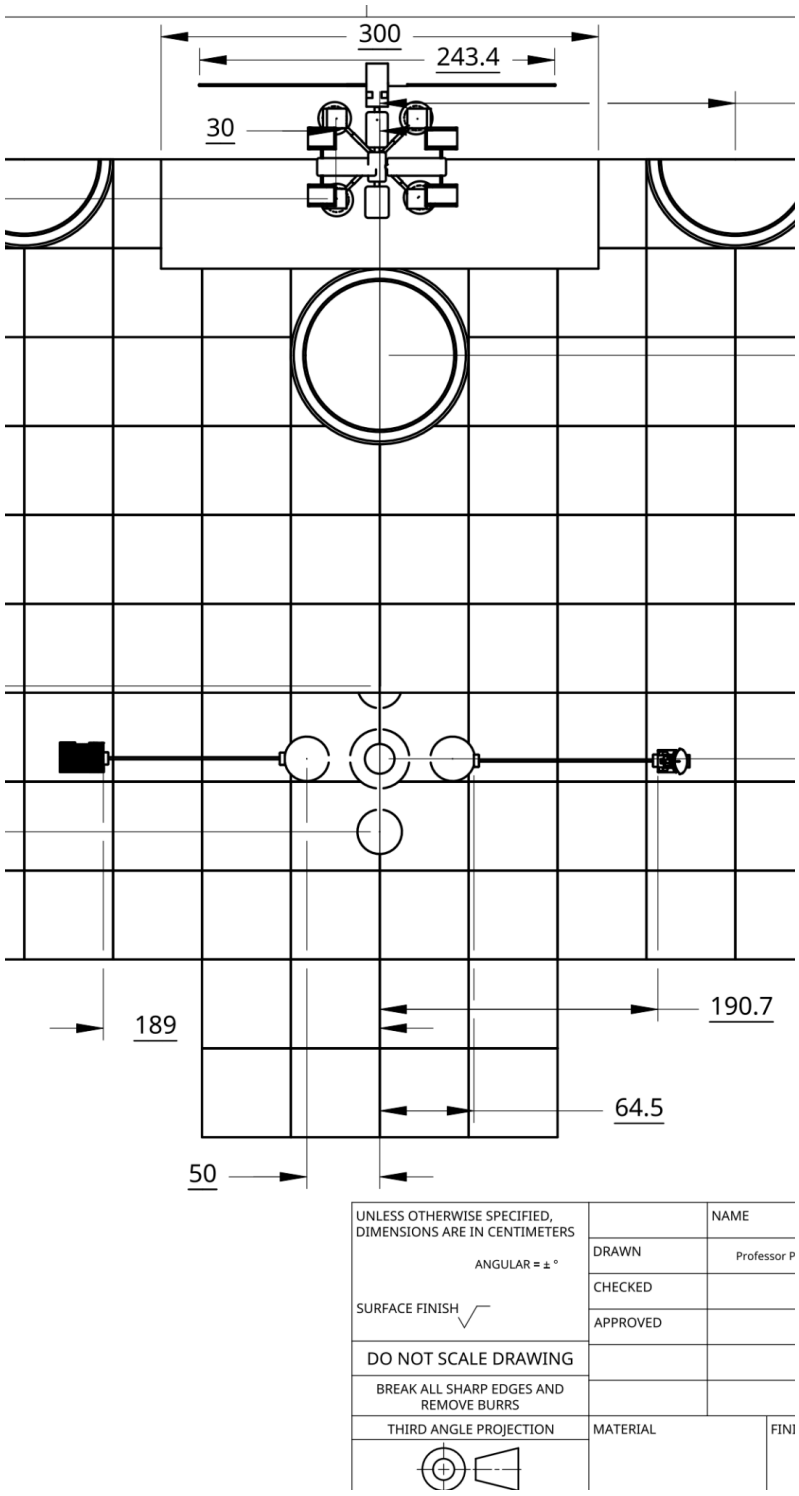
Mission Task #3 : "Aerial Survey and Exploration Site Marking"

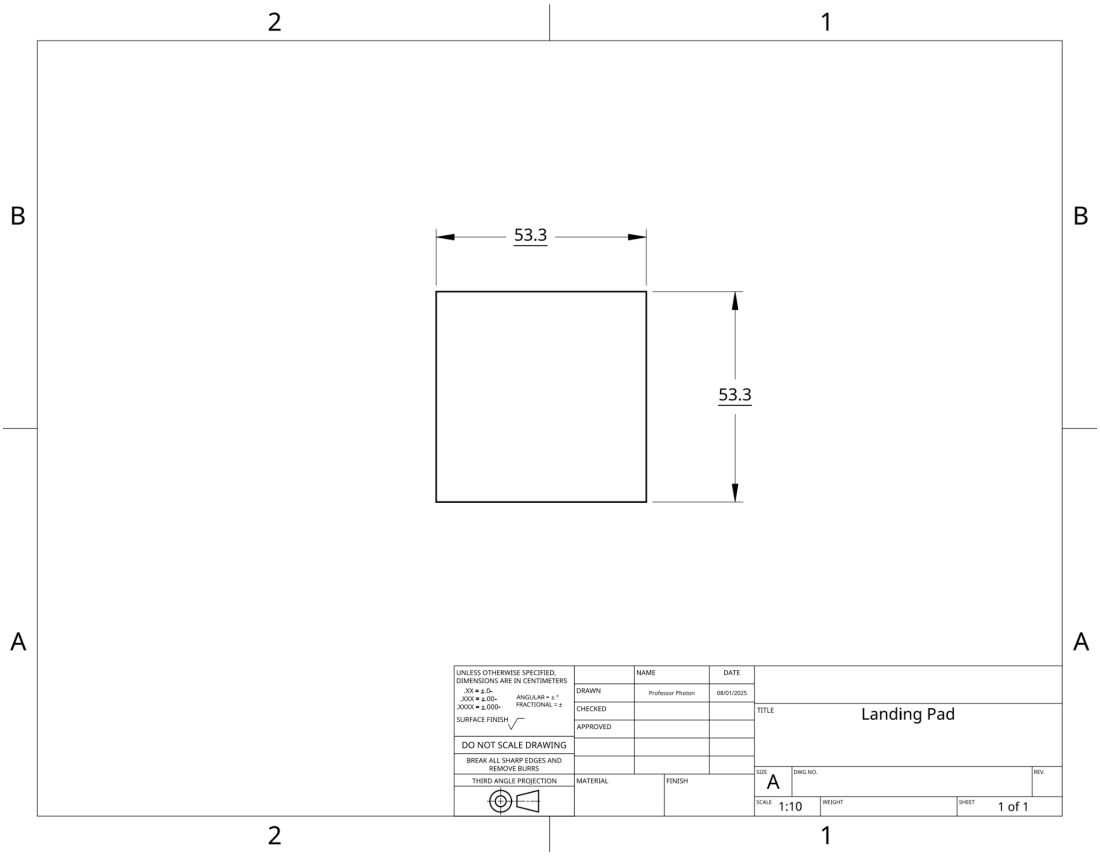
Mission Task #4 : "Sensor / Tool Deployment"

Mission Task #5 : "Crater Mining and Lunar Cavern Exploration"



Mission Task #6 : "Lunar Gateway Spacecraft"

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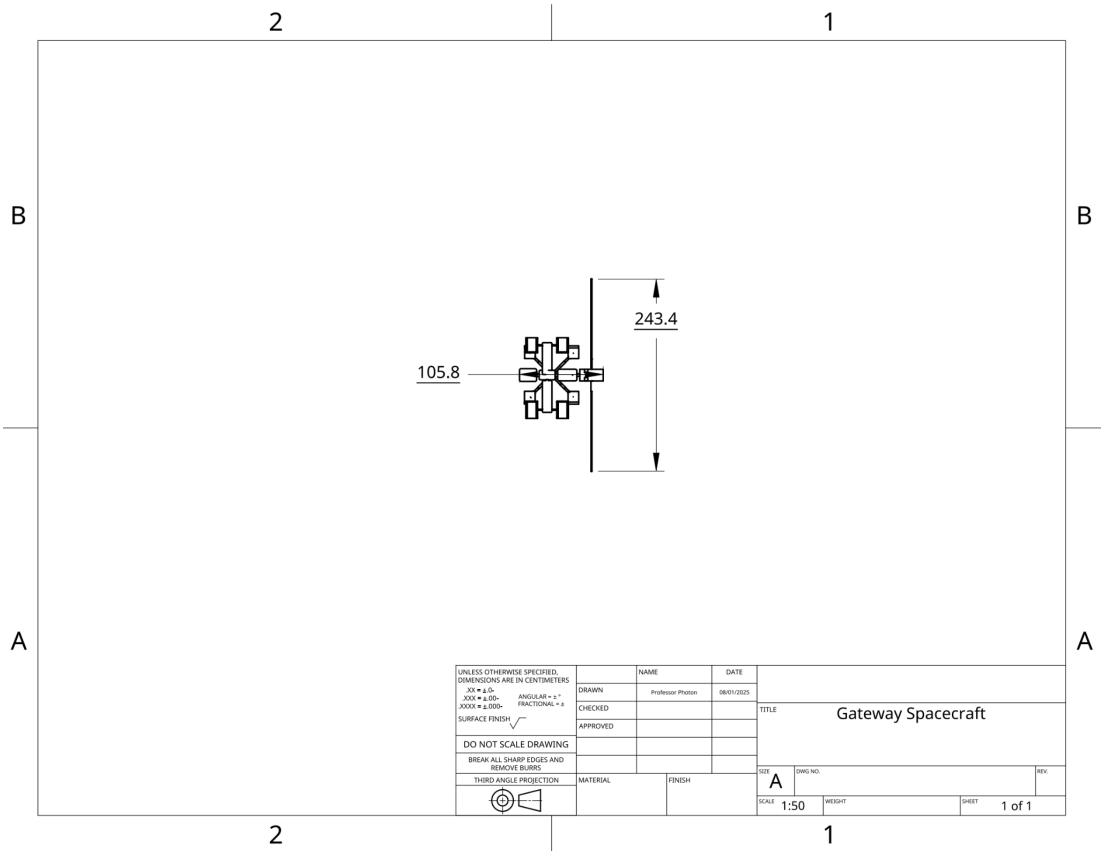
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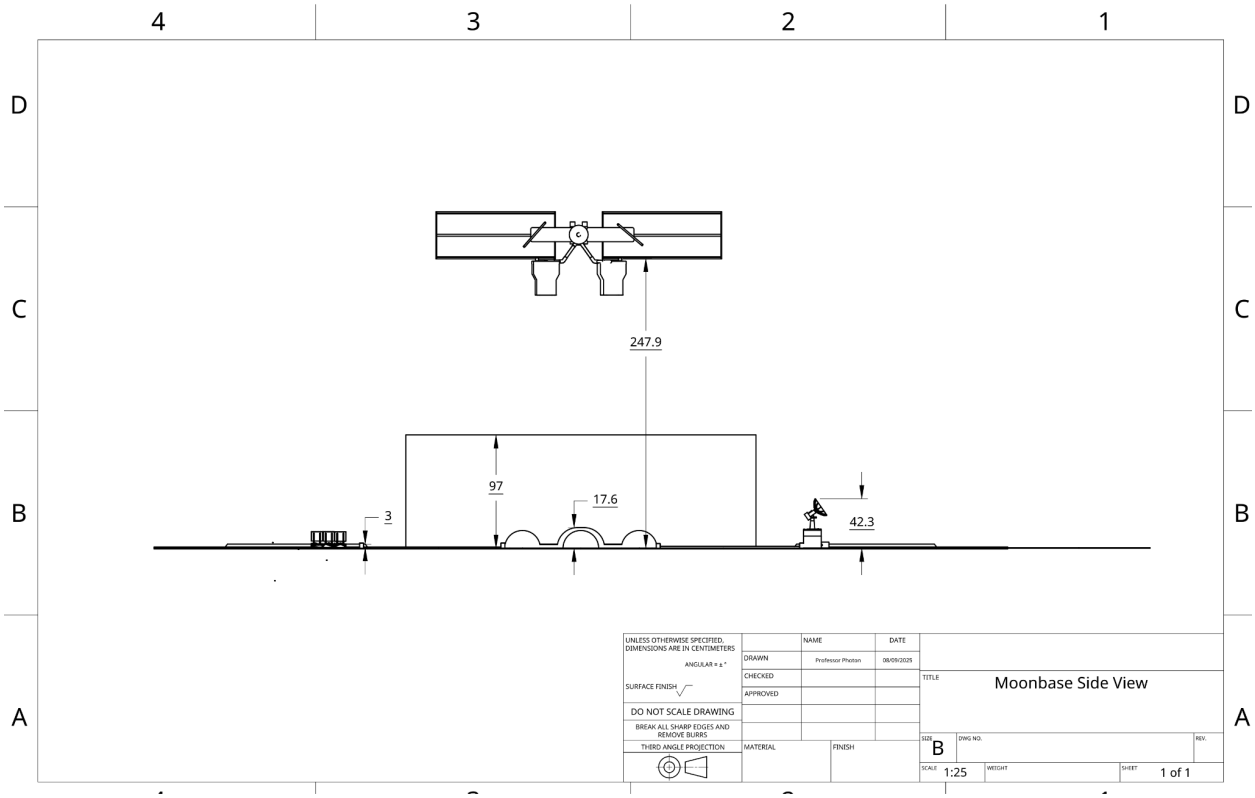
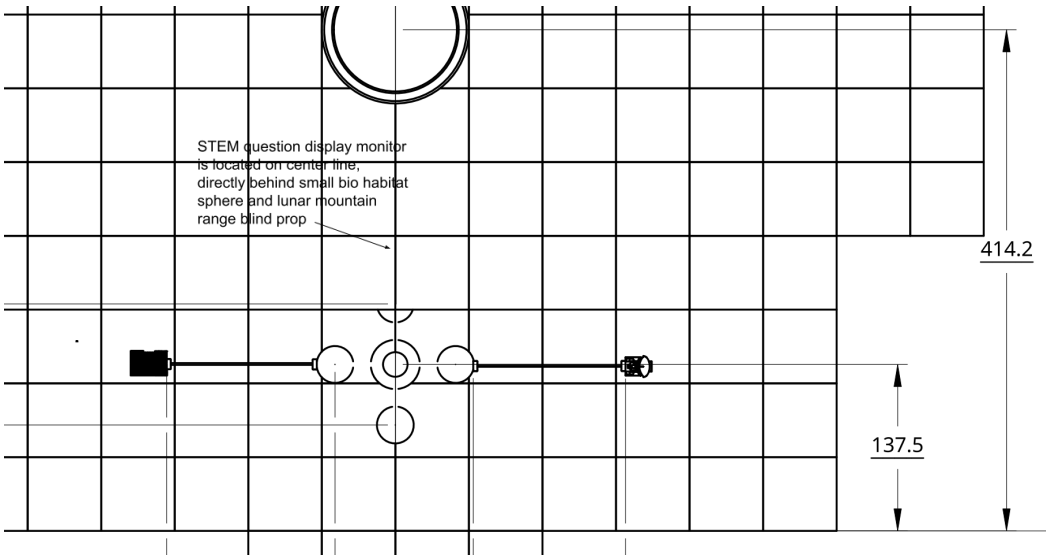
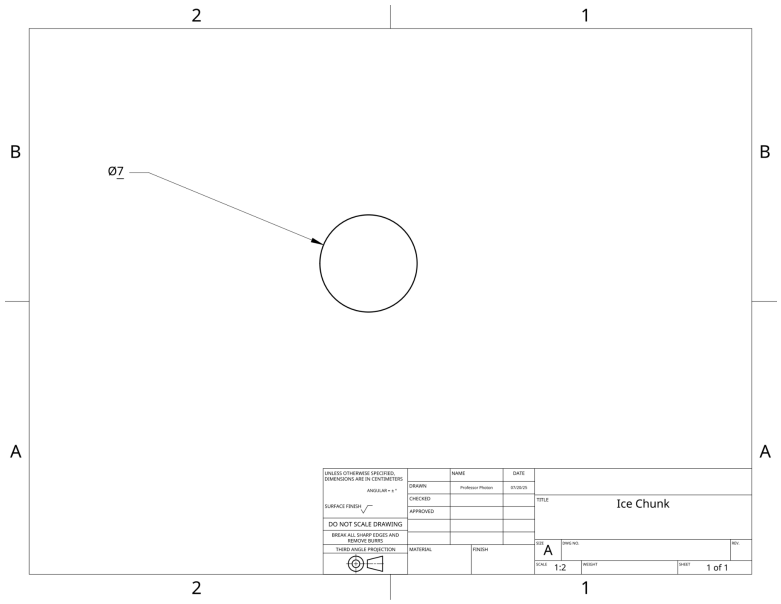


Mission Task #7 : "STEM Questions"

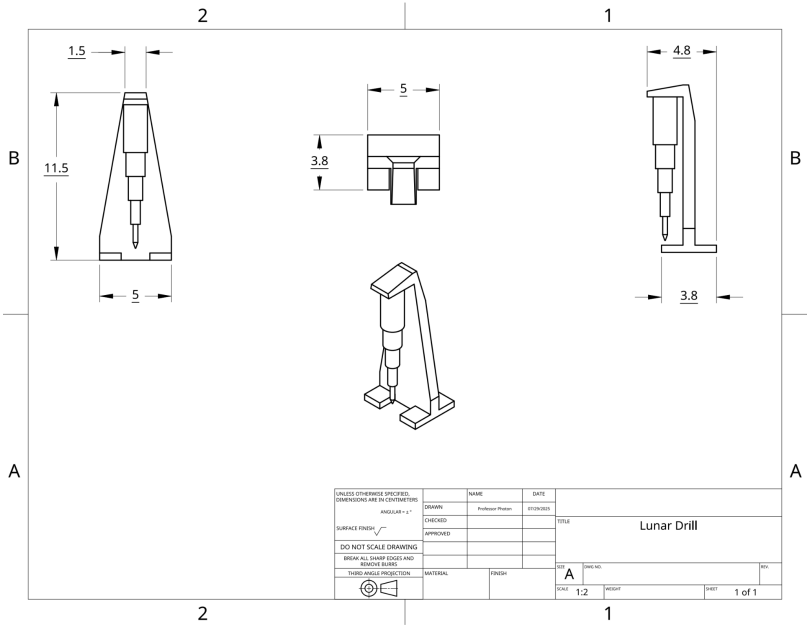


Game Elements

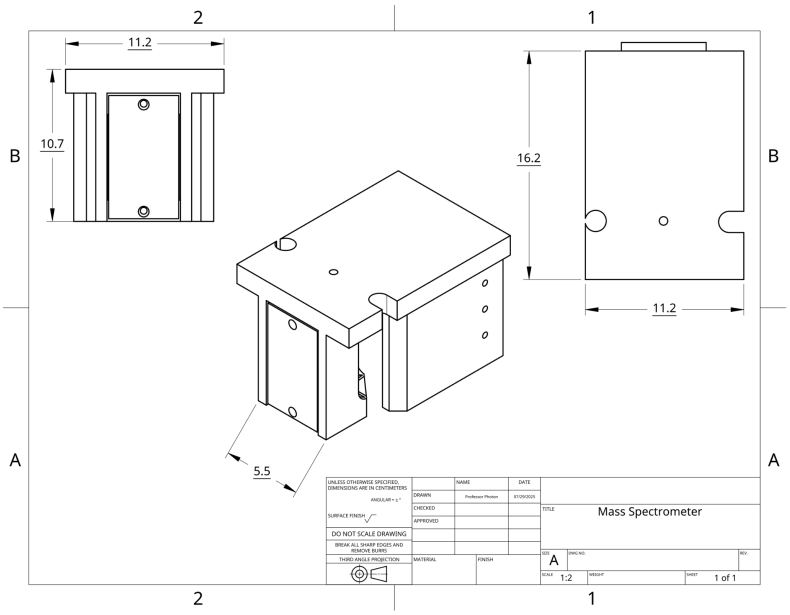
Ice (weight 21 grams)



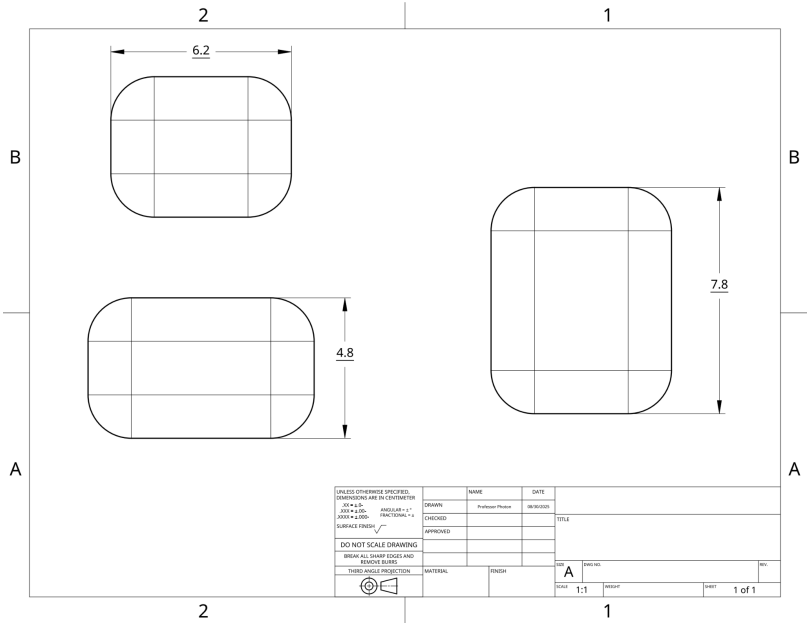
Space Drill
(weight 27 grams)



Mass Spectrometer
(weight 281 grams)

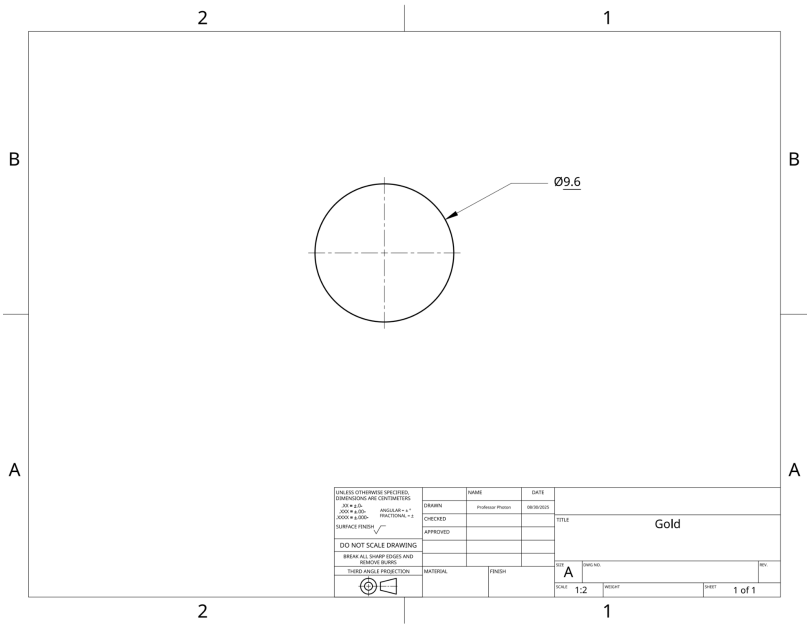


Moon Rock *
(weight 29 grams)



*Note: Actual moonrock game elements surface features are not smooth

Gold
(weight 181 grams)



Marker Beacon
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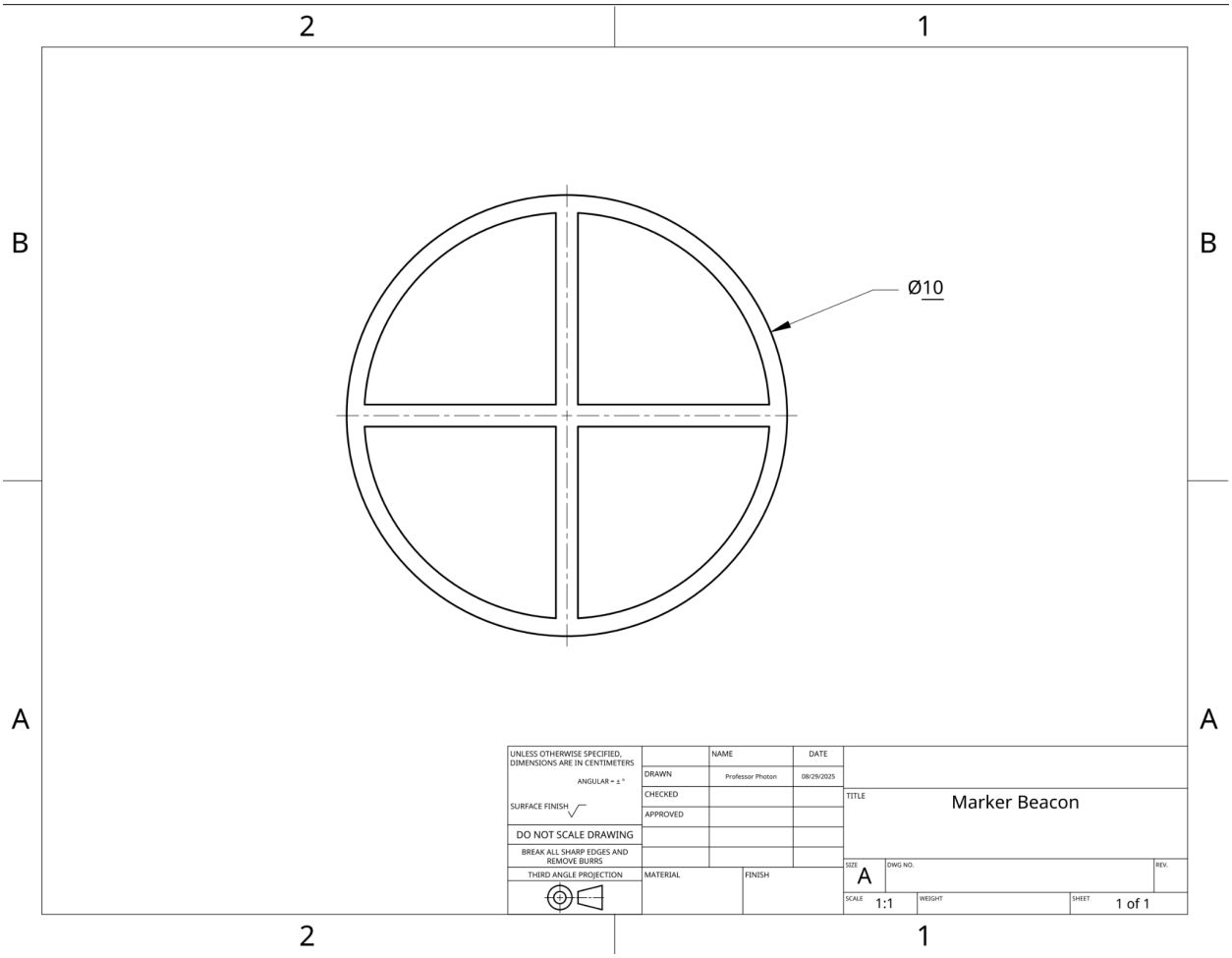
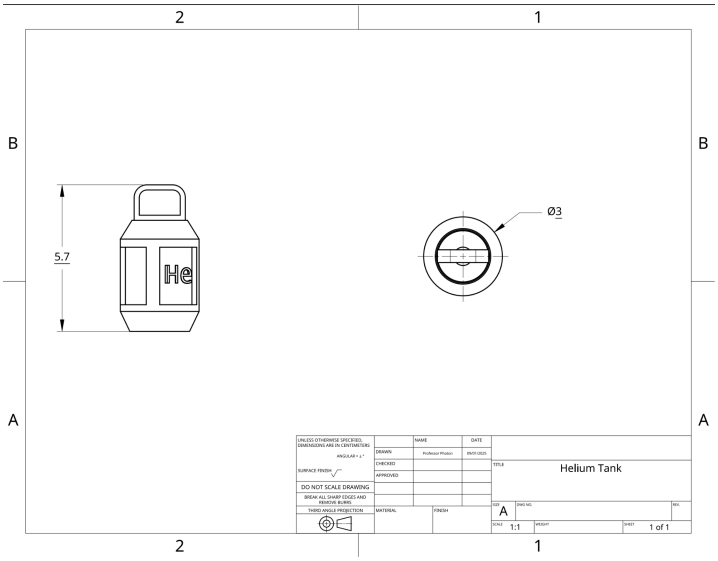


Helium Tank (5.5cm x 3cm diameter)
(weight 9 grams)



Micro Chip (2.5cm x 4.5cm)
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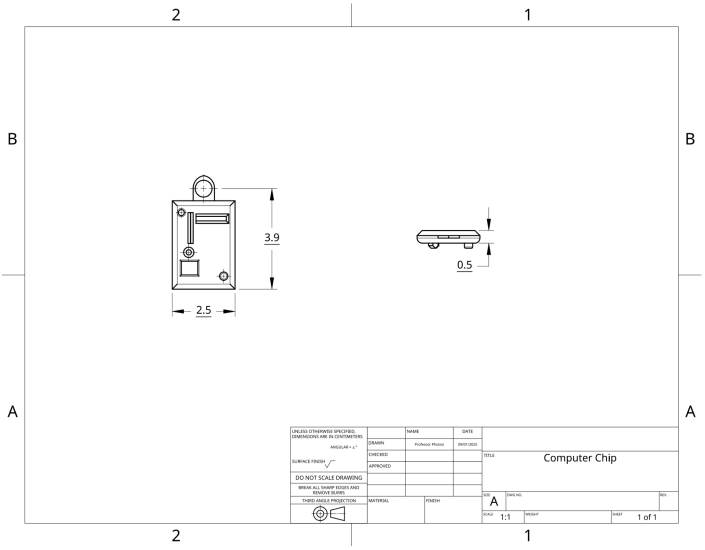

Emergency Supply Pod (4.0cm diameter)
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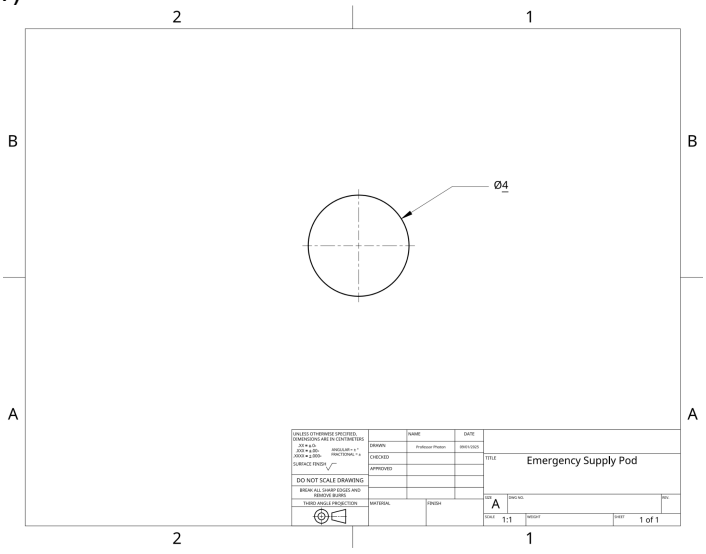

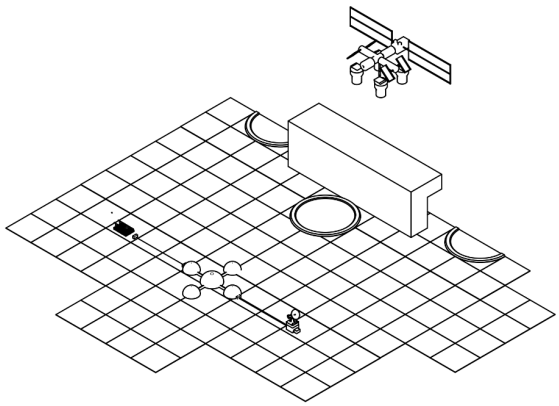

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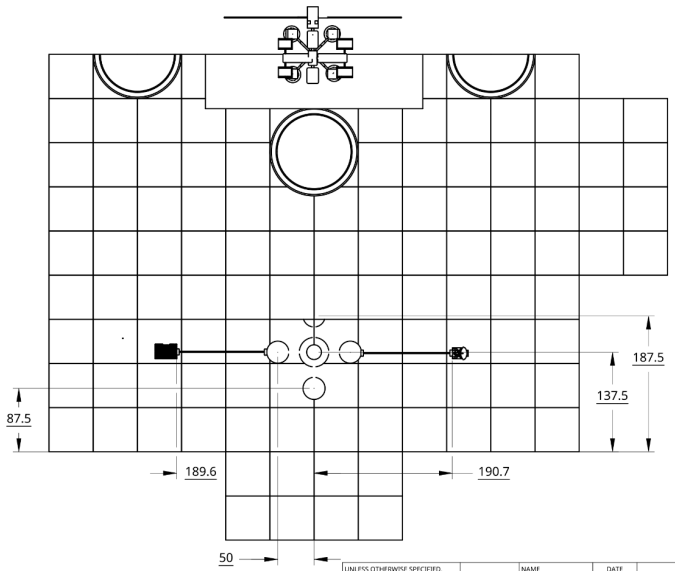

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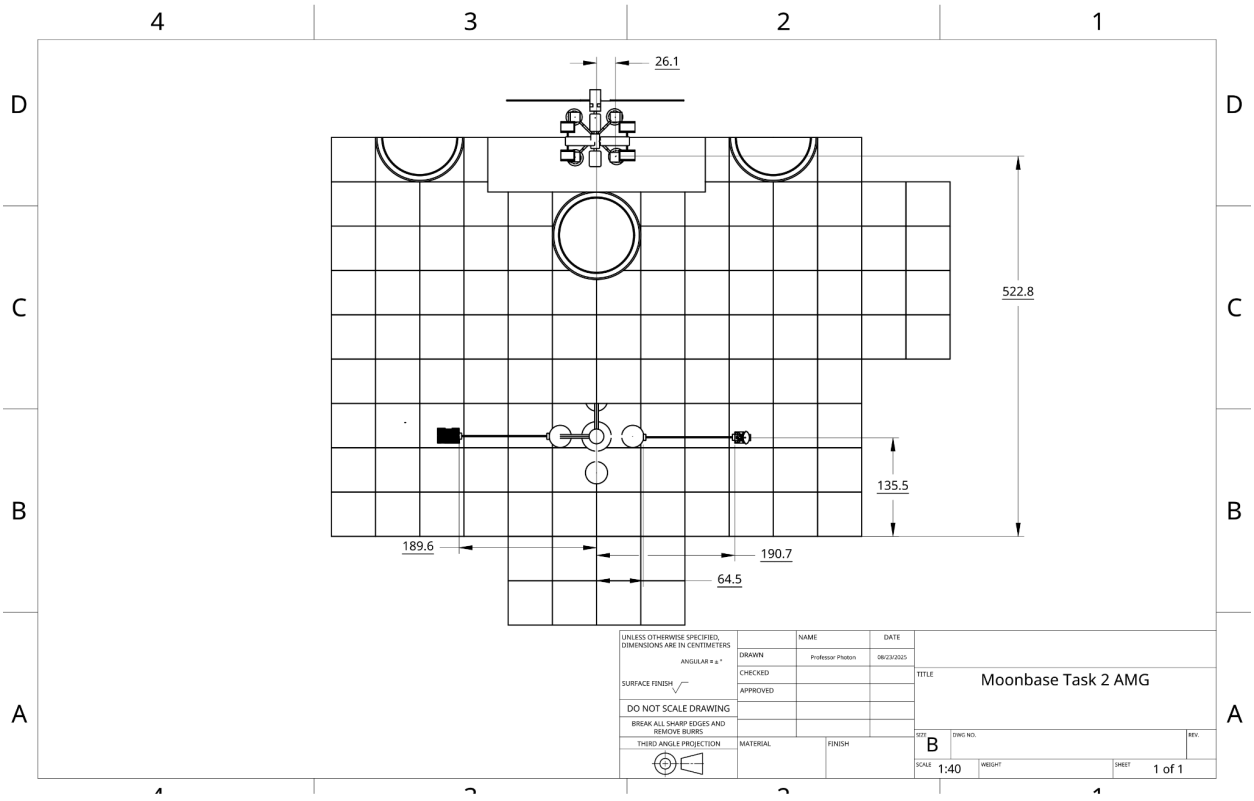
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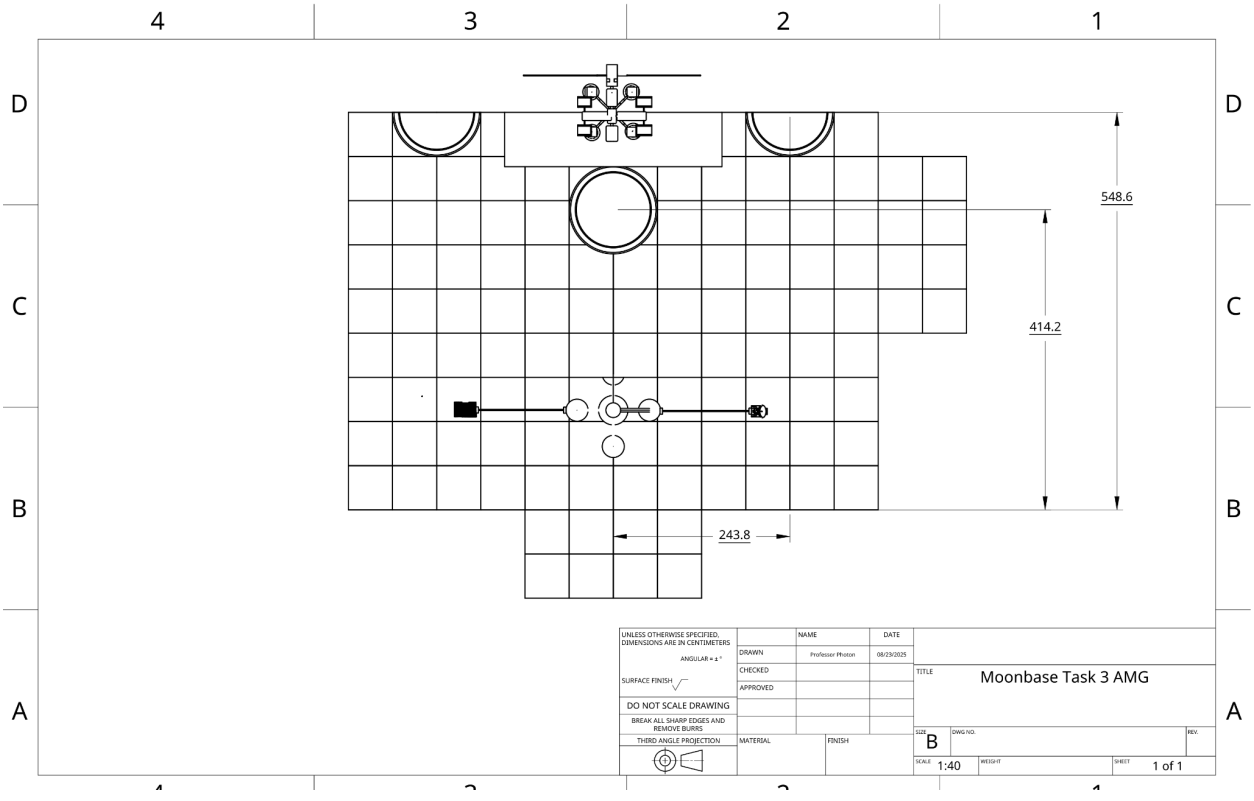
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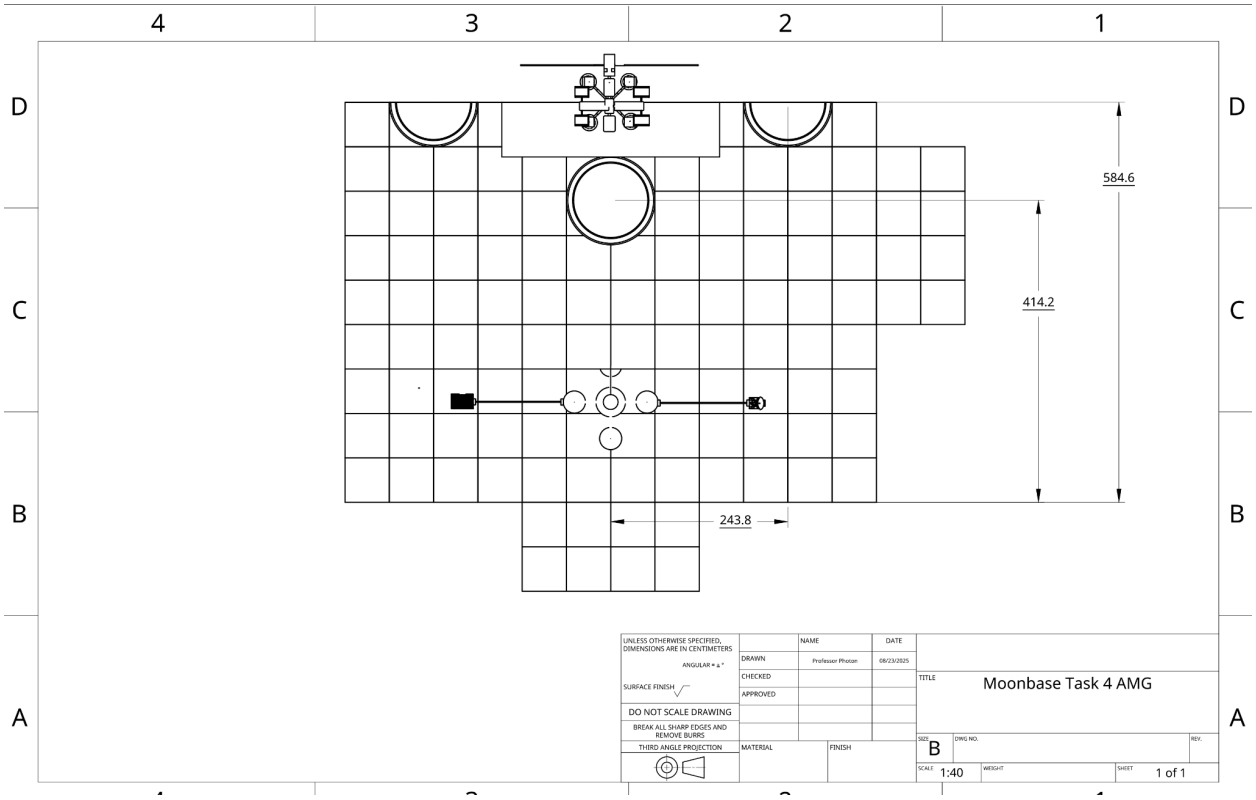

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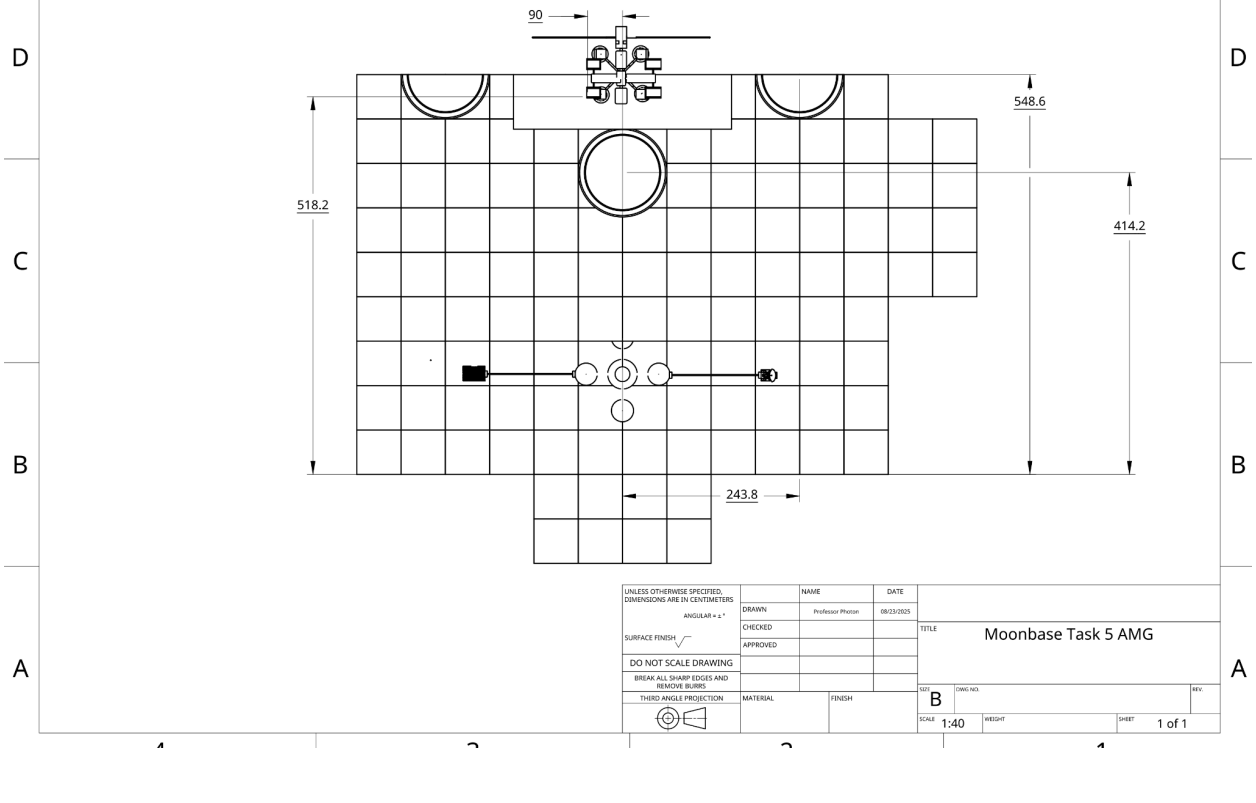

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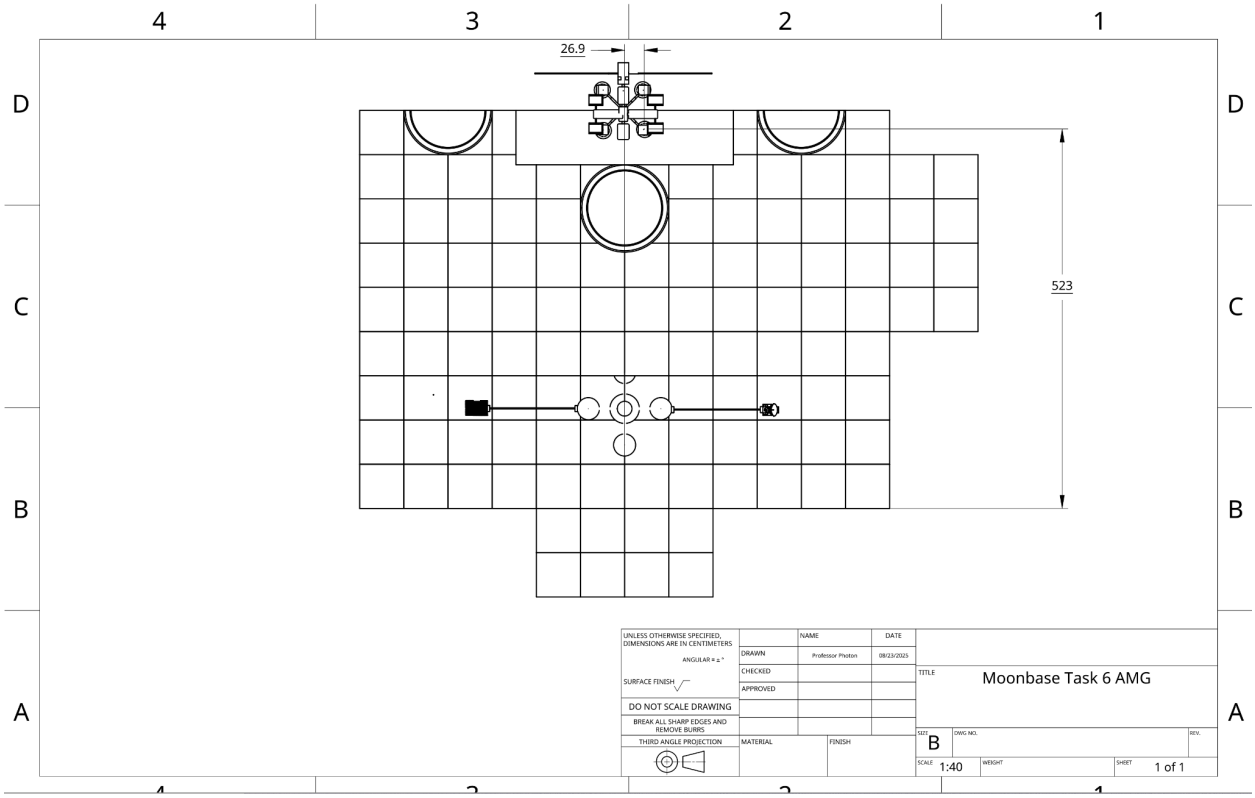
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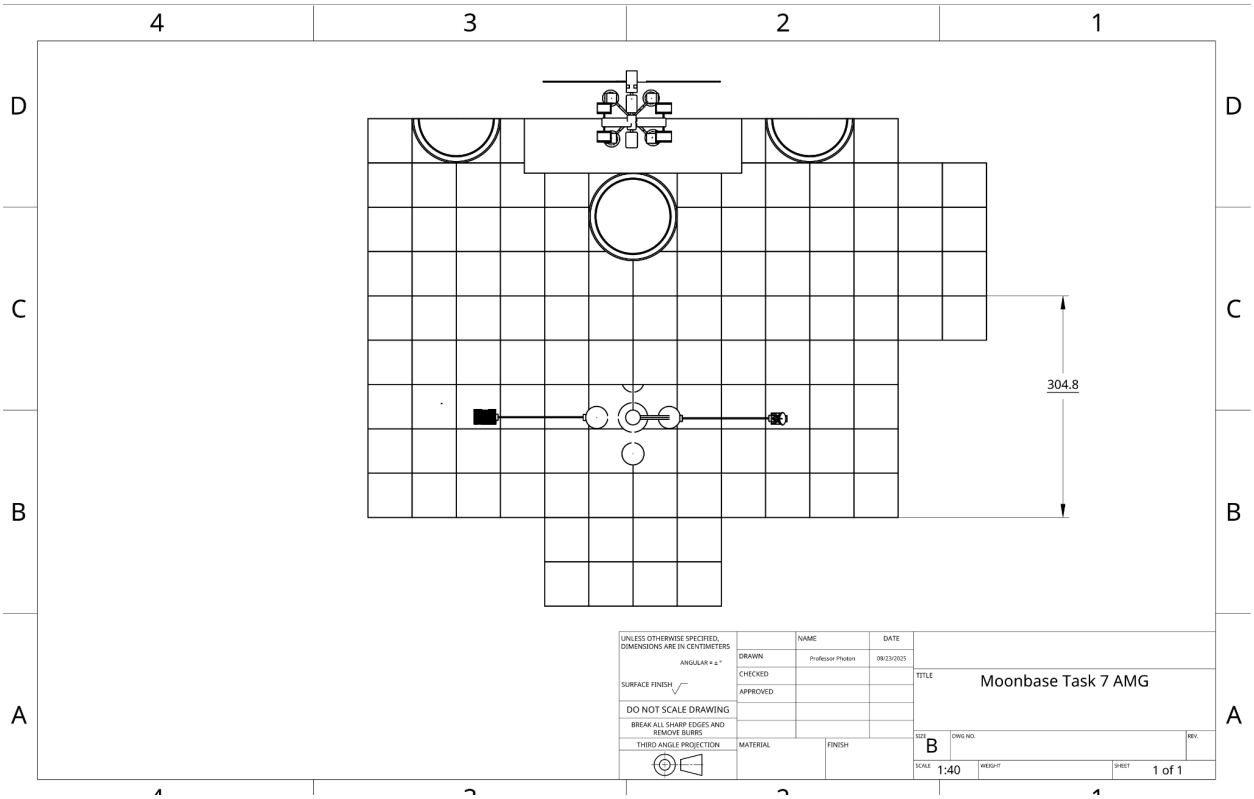
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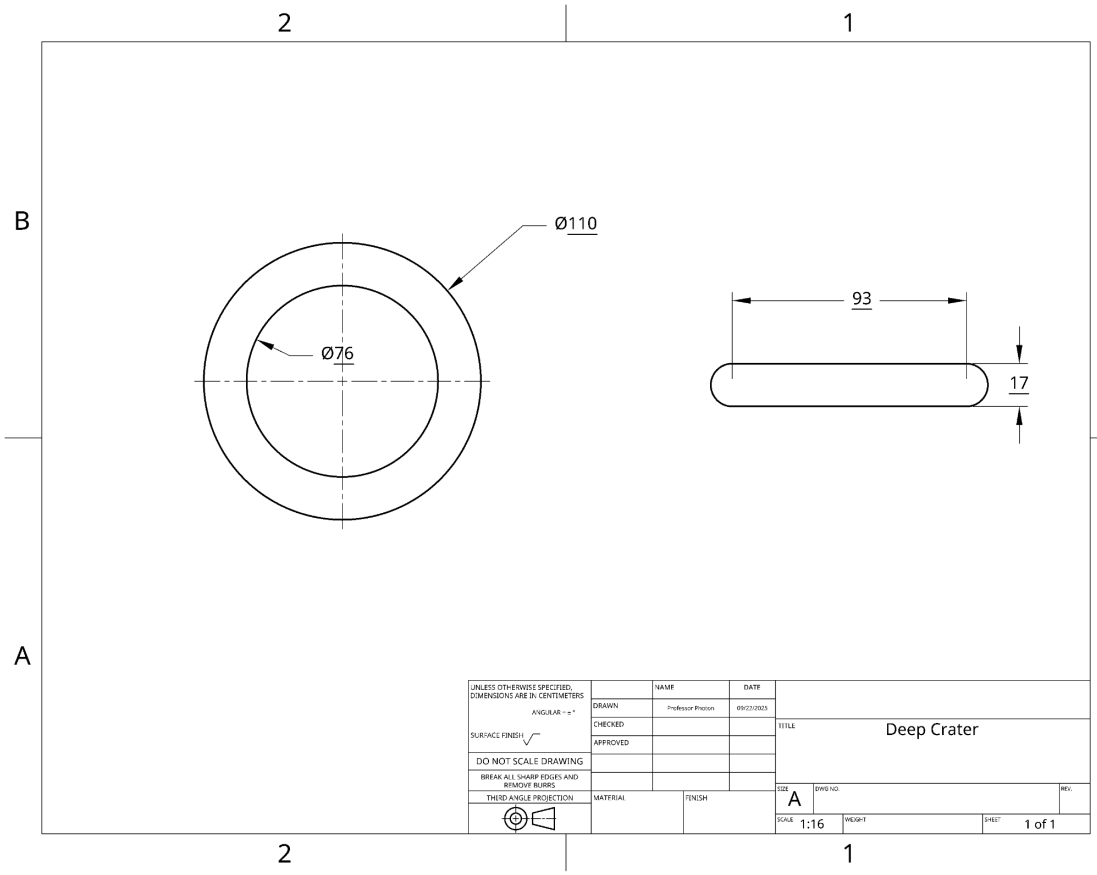

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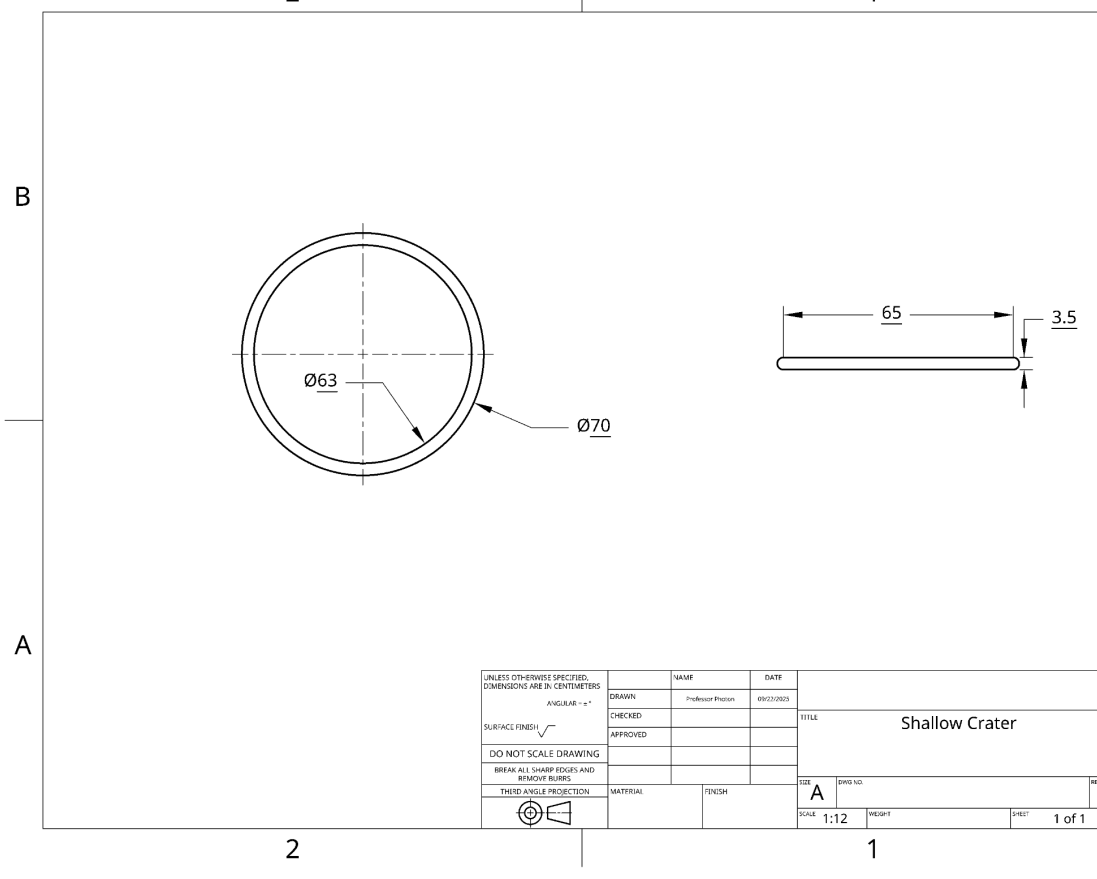
	APPROVED		
DO NOT SCALE DRAWING			
BREAK ALL SHARP EDGES AND REMOVE BURRS			
THIRD ANGLE PROJECTION	MATERIAL	FINISH	

TITLE: Deep Crater

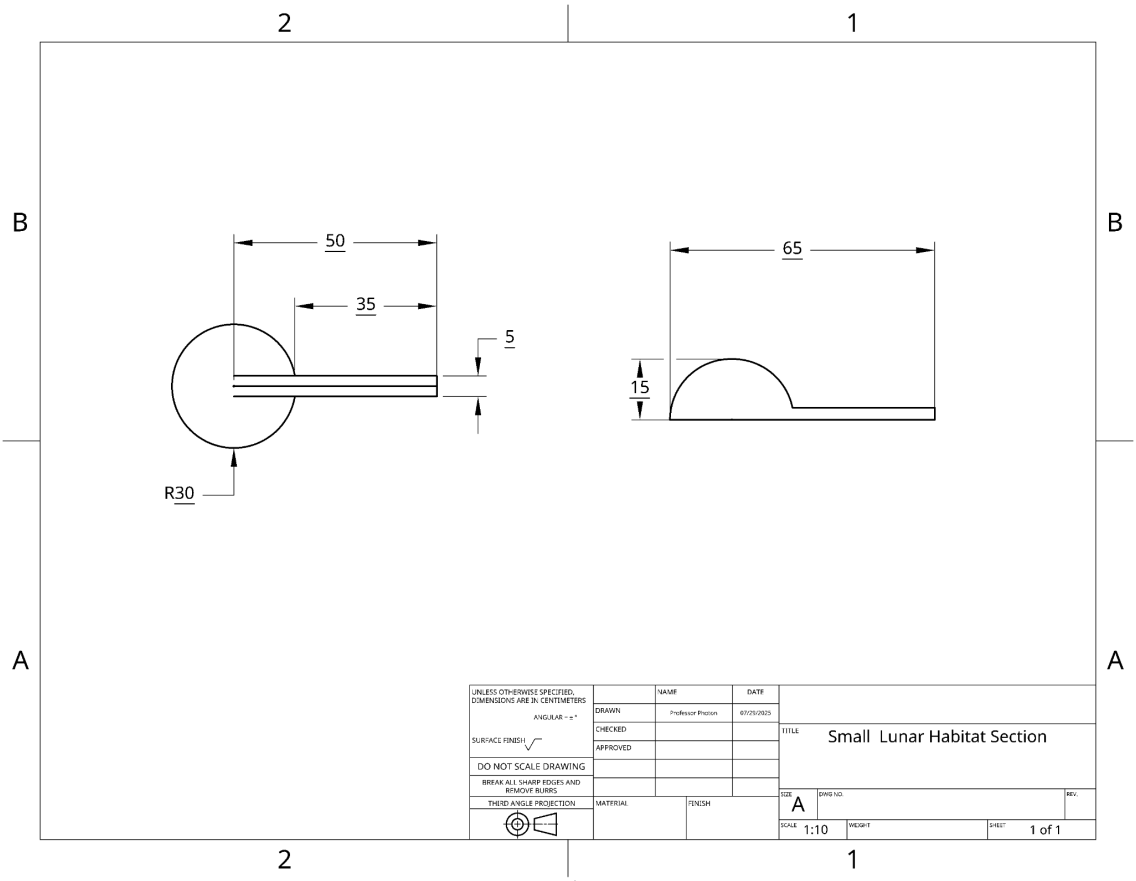
SIZE: A	DWG NO.		REV.
SCALE: 1:16	WEIGHT	SHEET: 1 of 1	



UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN CENTIMETERS		NAME	DATE
ANGULAR: ± °	DRAWN	Professor Pinzon	09/27/2025
SURFACE FINISH	CHECKED		
	APPROVED		
DO NOT SCALE DRAWING			
BREAK ALL SHARP EDGES AND REMOVE BURRS			
THIRD ANGLE PROJECTION	MATERIAL	FINISH	

TITLE: Shallow Crater

SIZE: A	DWG NO.		REV.
SCALE: 1:12	WEIGHT	SHEET: 1 of 1	

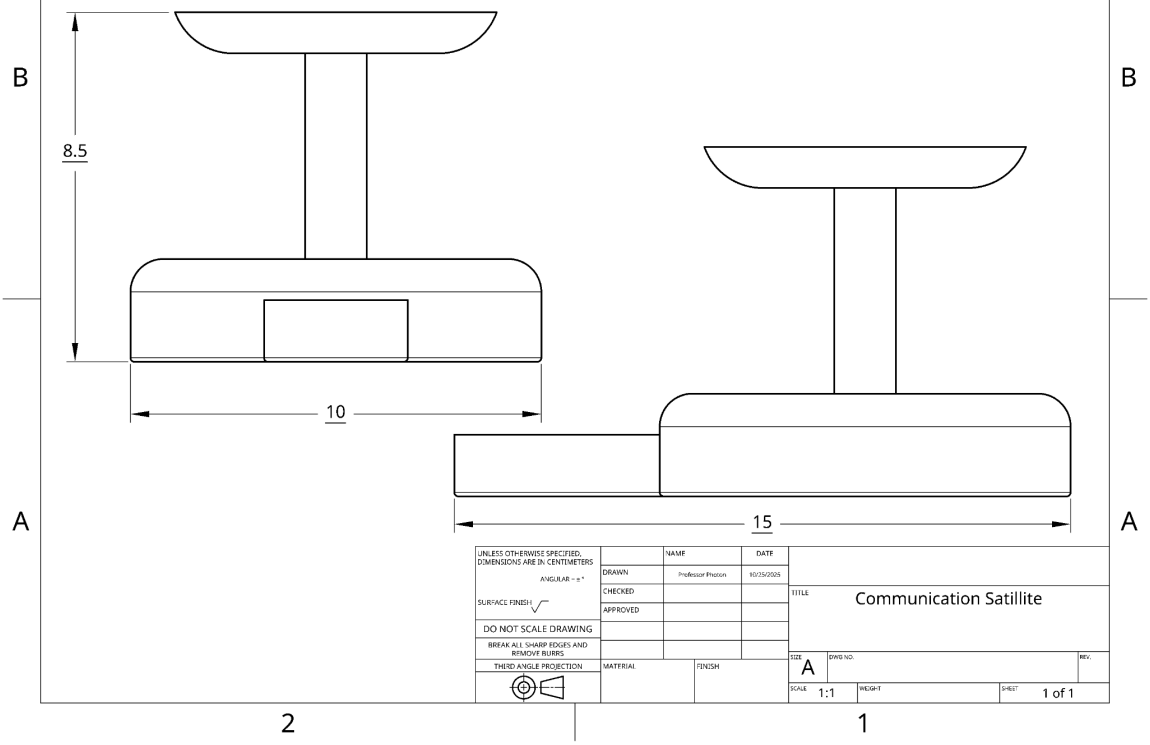


UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN CENTIMETERS ANGULAR: ± ° SURFACE FINISH DO NOT SCALE DRAWING BREAK ALL SHARP EDGES AND REMOVE BURRS THIRD ANGLE PROJECTION		NAME	DATE
	DRAWN	Professor Photon	07/25/2025
	CHECKED		
	APPROVED		
MATERIAL		FINISH	

TITLE: Small Lunar Habitat Section

SIZE: A | DWG NO. | REV.

SCALE: 1:10 | WEIGHT | SHEET: 1 of 1



UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN CENTIMETERS ANGULAR: ± ° SURFACE FINISH DO NOT SCALE DRAWING BREAK ALL SHARP EDGES AND REMOVE BURRS THIRD ANGLE PROJECTION		NAME	DATE
	DRAWN	Professor Photon	10/25/2025
	CHECKED		
	APPROVED		
MATERIAL		FINISH	

TITLE: Communication Satillite

SIZE: A | DWG NO. | REV.

SCALE: 1:1 | WEIGHT | SHEET: 1 of 1