

TSA High School UAV Drone Challenge

Operation Lifeline – Humanitarian Aid & Rescue

Mission Brief

Purpose

This Mission Brief supplements the TSA High School UAV Drone Challenge rules. All rules, specifications, and procedures contained in the official TSA High School UAV Drone Challenge regulations remain in effect unless specifically modified within this Mission Brief.

Overview

The mission of your team is to design, build, assemble, document, and test-fly a UAV capable of completing a series of humanitarian aid and disaster response missions. Teams will demonstrate engineering design, strategic mission planning, precision flight, and efficient mission execution while completing multiple mission objectives within the allotted flight period.

The event includes a pre-inspection and check-in of team members, verification of the TRUST certificates, the UAV, and all flight equipment (e.g., controllers, flight goggles, video displays, etc.) prior to competition.

The UAV Drone Challenge requires competitors to engineer and build an open-source UAV capable of completing multiple humanitarian response operations. To successfully complete the competition, each UAV should be capable of:

- Navigating confined structures
- Using onboard cameras to inspect infrastructure
- Retrieving and transporting a Rescue Figure
- Delivering emergency medical supplies
- Relocating hazardous material containment pods
- Activating an emergency communications beacon
- Returning safely to Home Base
- Drones may use grippers or magnets as their payload release mechanisms.

Competition Layout

The competition consists of an approximately 10-foot by 20-foot flight area divided into designated operational zones containing mission environments.

Prior to the start of the competition, the Event Coordinator shall establish the Course Architecture by placing the mission environments within their designated operational zones. Once the competition begins, the Course Architecture and mission environment locations shall remain unchanged for all teams.

A Pilot Area shall be located along one narrow end of the flight area adjacent to Home Base and extend from corner to corner across the 10-foot width of the course.

Home Base serves as the designated launch, recovery, and Safe Zone for all missions requiring delivery or retrieval.

The Pilot and Mission Assistants shall remain within the Pilot Area throughout the flight period unless directed otherwise by an Event Official.

The Flight Mission

- Team/Driver Meeting: Thirty (30) minute maximum for all teams at the assigned time. At the conclusion of the assigned meeting, competition will begin.
- Mission Time: Ten (10) minutes (running clock).
- Teams may attempt the mission objectives in any order during the flight period unless otherwise specified.
- Teams are not required to complete every mission. Teams will develop a flight strategy that best matches the capabilities of their UAV.
- The Course Architecture shall consist of designated mission environments and operational zones. A general course layout may be provided.
- The UAV may transport only one mission object at a time unless otherwise specified within an individual mission.
- Pilots may fly using First-Person View (FPV) or Visual Line-of-Sight (VLOS). A secondary team member may assist with navigation, mission observation, and communication throughout the flight.

Mission Summary

Each flight begins from the designated Home Base (Pilot Area), which serves as the team's operational command center. Home Base is the designated launch and recovery location for the UAV and serves as the Safe Zone for designated missions.

Before beginning each mission attempt, the team shall verbally declare the mission to an Event Official.

If a team elects to discontinue a mission before completing it, the team shall declare the mission canceled before beginning another mission.

Canceled missions may be attempted again during the flight period by declaring the mission before beginning another attempt.

Completed missions may not be attempted again for additional points.

Mission Declarations

To assist judges in accurately monitoring mission progress, teams shall use the standardized verbal declarations listed below throughout the flight.

- "Mission One." or "Mission One - Inspection"
- "Mission Two." or "Mission Two - Recovery"
- "Mission Three." or "Mission Three - Delivery"
- "Mission Four." or "Mission Four - Mitigation"
- "Mission Five." or "Mission Five - Beacon"
- "Mission Canceled."
- "Flight Complete."

Mission & Flight Completion

A mission is considered complete when the drone has returned to Home Base and a new mission has been declared or the declaration of "Flight Complete" has been made.

Teams declaring "Flight Complete" before the ten(10) minute time expires will receive 10 points.

If the ten (10) minute Mission Time expires before a drone is safe at Home Base no "Flight Complete" declaration can be made.

Upon the declaration of "Flight Complete," the official mission time shall immediately stop and be recorded. No additional missions may be attempted.

Mission Summary Table

Mission	Points	Objective	Point Breakdown
Mission 1 Infrastructure Inspection Module	5-25	Inspect designated structural markers within the Infrastructure Inspection Module.	Points are awarded upon visual verification of each scoring element through the UAV's FPV camera by an Event Official.
Mission 2 Rescue Figure Recovery	10-20	Retrieve the Rescue Figure and transport it to the Safe Zone at Home Base.	The Rescue Figure has been successfully placed within the designated Safe Zone or dropped..
Mission 3 Emergency Medical Delivery	15-35	Deliver emergency medical supplies to the designated treatment locations.	Medical Supply Pods have been successfully delivered to their designated treatment locations.
Mission 4 Hazardous Material Mitigation	5-30	Relocate Chemical Containment Pods to the Chemical Containment Zone.	All required Chemical Containment Pods have been successfully relocated to the designated Chemical Containment Zone.
Mission 5 Communications Beacon Activation	10-20	Navigate the Communications Corridor and activate the Emergency Communications Beacon.	The Emergency Communications Beacon has been successfully activated.

Mission 1 – Infrastructure Inspection Module

Objective: Inspect designated structural markers within the Infrastructure Inspection Module.

Available Points: 5-25

Mission Tasks: Enter the Infrastructure Inspection Module through the designated ground-level entrance.

1. Locate and verify **TSA Marker A**.
2. Rotate within the structure to locate and verify **TSA Marker B**.
3. Ascend to the second level and locate and verify **TSA Marker C**.
4. Exit the Infrastructure Inspection Module through the Designated Exit Opening.

Point Breakdown: Points are awarded upon visual verification of each scoring element through the UAV's FPV camera by an Event Official. Each scoring element may be awarded only once per mission attempt.

1	Verify TSA Marker A	5 Points
2	Verify TSA Marker B	5 Points
3	Verify TSA Marker C	10 Points
4	Exit the Infrastructure Inspection Module through the upper-level opening	5 Points

Mission 2 – Rescue Figure Recovery

Objective: Retrieve the Rescue Figure and transport it to the Safe Zone at Home Base.

Available Points: 10-20

Mission Tasks:

1. Locating the Rescue Figure.
2. Lift the Rescue Figure from its designated location
3. Place the Rescue Figure within the designated Safe Zone at Home Base

Point Breakdown: Points are awarded upon visual verification of each scoring element by an Event Official. Each scoring element may be awarded only once per mission attempt.

If the Rescue Figure is not placed within the designated Safe Zone, no additional retrieval attempts may be made during that mission attempt.

1	Lift the Rescue Figure from its designated location	10 Points
2	Place the Rescue Figure within the designated Safe Zone at Home Base	10 Points

Mission 3 – Emergency Medical Delivery

Objective: Deliver emergency medical supplies to the designated treatment locations.

Available Points: 15-30 +5

Mission Tasks:

1. Deliver an Emergency Medical Supply Pod to the Infrastructure Module rooftop location.
2. Deliver an Emergency Medical Supply Pod to the remaining designated treatment location.
3. Recover and continue transporting a dropped or missed Emergency Medical Supply Pod, if necessary.

If Mission 1 has been completed, deliver an Emergency Medical Supply Pod to the Infrastructure Inspection Module roof to earn the Operational Bonus.

Teams may pick-up any missed or dropped supply pods to continue the mission until completion. Teams may choose just to complete one designated treatment location.

If a team has completed Mission 1 before delivering the medical pod to the infrastructure roof, teams will receive a 5 point operational bonus.

Teams may only use each designated treatment location once.

Point Breakdown: Points are awarded upon visual verification of each scoring element by an Event Official. Each scoring element may be awarded only once per mission attempt.

Teams may recover and continue transporting a dropped or missed Emergency Medical Supply Pods during the mission attempt. Each designated treatment location may receive credit only once.

1	Deliver an Emergency Medical Supply Pod to the rooftop treatment location	15 Points
2	Deliver an Emergency Medical Supply Pod to the remaining designated treatment location	15 Points
3	Operational Bonus – Deliver the Emergency Medical Supply Pod to the rooftop treatment location after completing Mission 1	5 Points

Mission 4 – Hazardous Material Mitigation

Objective: Relocate Chemical Containment Pods to the Chemical Containment Zone.

Available Points: 2-20

Mission Tasks:

1. Navigate one level of the Hazard Passage on the outbound flight to the Chemical Containment Zone.
2. Relocate Chemical Containment Pods to the designated Chemical Containment Zone.
3. Return the UAV to Home Base.

Point Breakdown: Points are awarded upon visual verification of each scoring element by an Event Official.

Only one Hazard Passage route may receive credit during a mission attempt. Teams must choose either the Low-Risk, Moderate-Risk, or High-Risk Hazard Passage.

The selected Hazard Passage is scored only on the outbound flight to the Chemical Containment Zone.

The return flight to Home Base is not required to pass through the Hazard Passage.

Once Mission 4 is completed, Chemical Containment Pods moved during subsequent missions will not affect the Mission 4 score.

1	Successfully navigate the Low-Risk Hazard Passage	2 Points
2	Successfully navigate the Moderate-Risk Hazard Passage	5 Points
3	Successfully navigate the High-Risk Hazard Passage	10 Points
4	Each Chemical Containment Pod successfully relocated to the Chemical Containment Zone (10 Maximum)	1 point each

Mission 5 – Communications Beacon Activation

Objective: Navigate the Communication Passage and activate the Communications Beacon.

Available Points: 5-20

Mission Tasks:

1. Navigate either the Upper Communication Passage or the Lower Communication Passage.
2. Activate the Communications Beacon.
3. Return the UAV to Home Base.

Point Breakdown: Points are awarded upon visual verification of each scoring element by an Event Official.

Only one Communication Passage route may receive credit during a mission attempt. Teams must choose either the Upper Communication Passage or the Lower Communication Passage.

If the UAV makes contact with the ground while navigating the Communication Passage, the team may restart the Communication Passage. Only the first successfully completed Communication Passage will receive points.

1	Successfully navigate the Upper Communication Passage	5 Points
2	Successfully navigate the Lower Communication Passage	10 Points
3	Activate the Communications Beacon	10 Points

Overview / Procedures

- When the UAV drone is outside the competition tent area, all batteries must be disconnected. No exceptions. Violations will result in automatic disqualification.
- The event coordinator will assign each team a designated pit area for preparation and repair of drones.
- Teams must return to the home base before beginning another mission.
- Once a Mission is declared complete, objects will not be penalized for movement for the remainder of the match.
- Drones must fly through the selected course before completing a mission or target identification for it to count.
- Points will be awarded for:
 - Competed mission tasks
 - Pathway selection and completion
- Course Pathway Points:
 - Can only be earned once per run
- Mission Run:
 - If the drone fails to complete a mission , pathway points still count
- Drones must return to the home base between each mission. Only one mission may be completed at a time.
- In the event of a tie, the team with the faster mission time will advance.

Regulations

1. Safety is the top priority. Violations of safety guidelines may result in a warning or disqualification, depending on severity.
2. All drone operators must wear:
 - Safety glasses
 - High-visibility safety vests
3. Propellers can be installed in the pit area with batteries disconnected.
4. Upon entering the competition tent field, teams may only connect their drone's battery and power on with permission from the event coordinator or other authorized personnel.
5. When a drone is outside the competition tent, all batteries must be disconnected from the drone stack (including the flight controller, receiver, and ESCs), unless permission is given by the event coordinator or other authorized personnel.
6. UAV drones must only fly within the designated competition or practice fields.
7. Propeller guards are required.
8. Violation of any rule above may result in disqualification.

Course Obstacles/Payloads/Targets:

Mission objects will be similar to the ones found here:

[Hazmat Pods](#)

[Beacon](#)

Medical Supply Pod - 3D Print

Rescue Figure - 3D Print

The safe zone for the rescue figure will be a 14" x 14" square.

Infrastructure Identification Markers with camera - five (5) to fifteen (15) pts. The marker identified must be easily visible to the judges on a screen provided by the competitor to receive full points. It may be the same screen used for flight.

HS Drone Challenge UAV - 2027

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SCORE SHEET

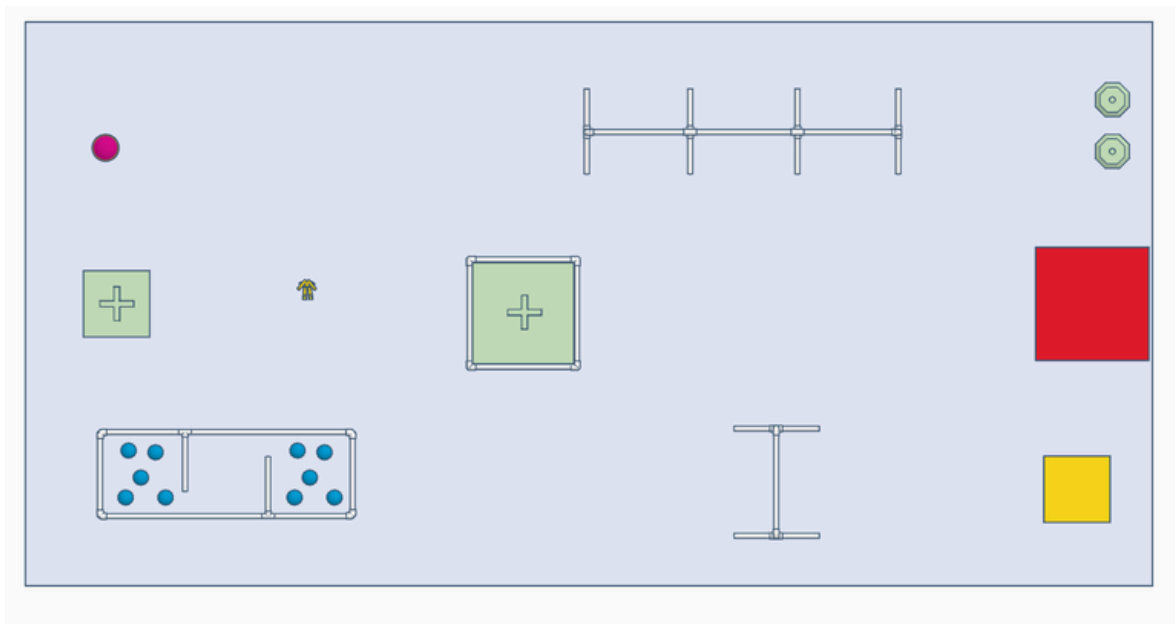
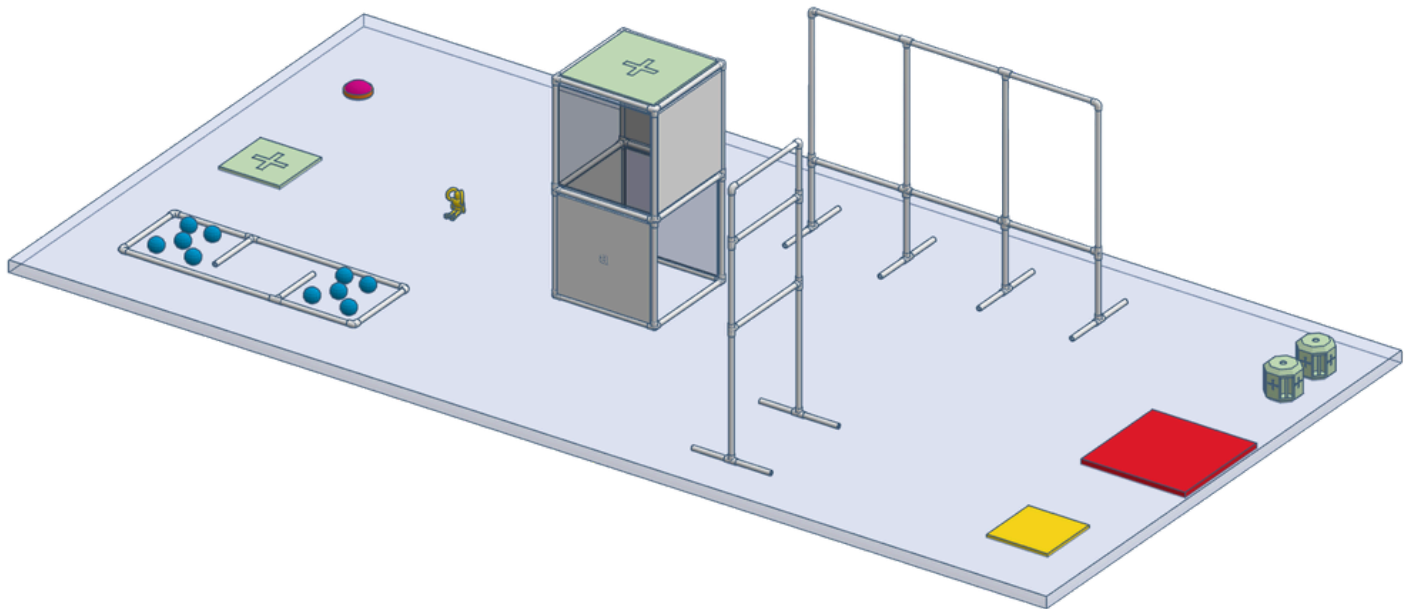
Team Number:		Time:		Total Points	Mission Points
M1- Inspection	☐ Marker A 5pts	☐ Marker B 5pts	☐ Marker C 10pts	☐ Exit 5pts	
M2- Recovery	☐ Lift Figure 10pts		☐ Deliver Figure 10pts		
M3- Delivery	☐ Pod A 15pts	☐ Pod B 15pts	MUST COMPLETE M1 FIRST TO RECEIVE		
			☐ Operational Bonus 5pts		
M4- Mitigation	ONLY ONE PASSAGE SCORED			Pods Contained 1pt each 	
	☐ Low Risk Passage 2pts	☐ Moderate Risk Passage 5pts	☐ High Risk Passage 10pts		
M5- Beacon	ONLY ONE PASSAGE SCORED		☐ Activate Communication Beacon 10pts		
	☐ Navigate Upper Passage 5pts	☐ Navigate Lower Passage 10pts			

Drone Challenge UAV

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Field Overview and Obstacle Drawings

drawings not to scale



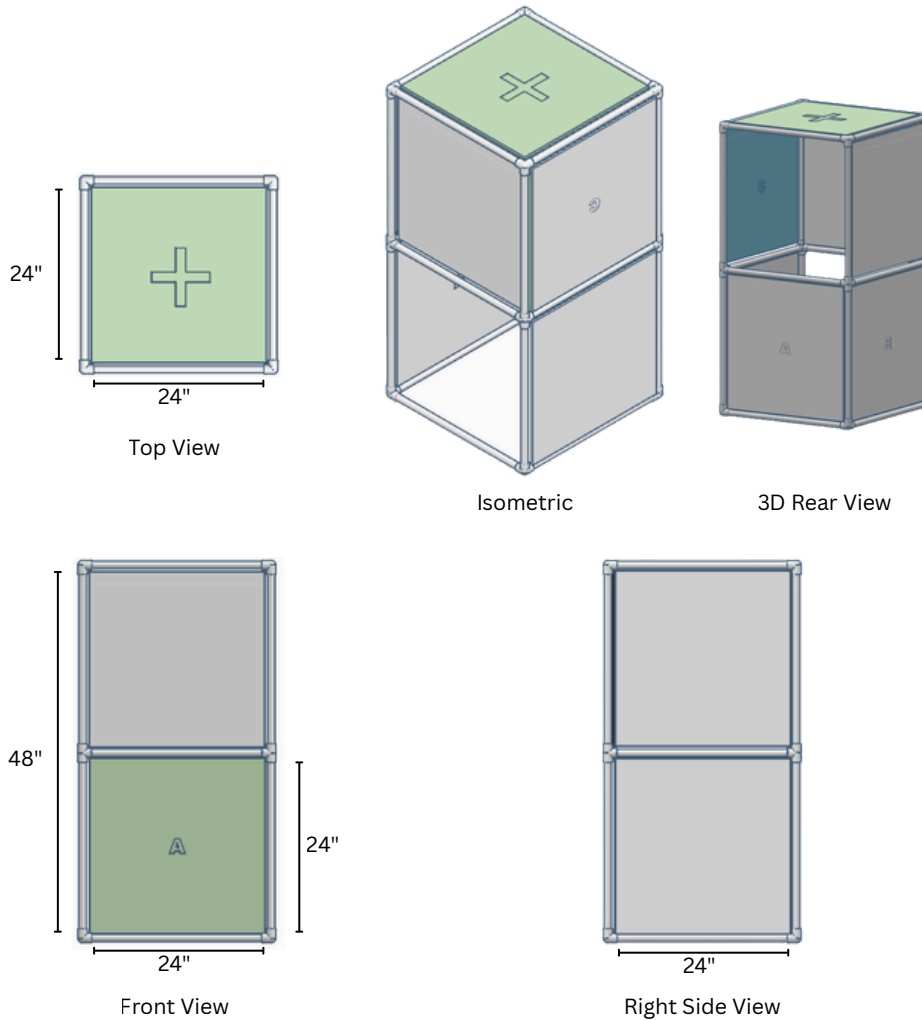
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Mission 1 - Infrastructure Inspection

Medical Tower

drawings not to scale



Material Cut List	
20	24" x ½" PVC pipe
8	½" PVC 3-Way 90 Degree Side Outlet Elbow
4	½" PVC 4-Way Side Outlet Tee
7	23 ½" x 23 ½" foam board or cardboard
40	Zipties



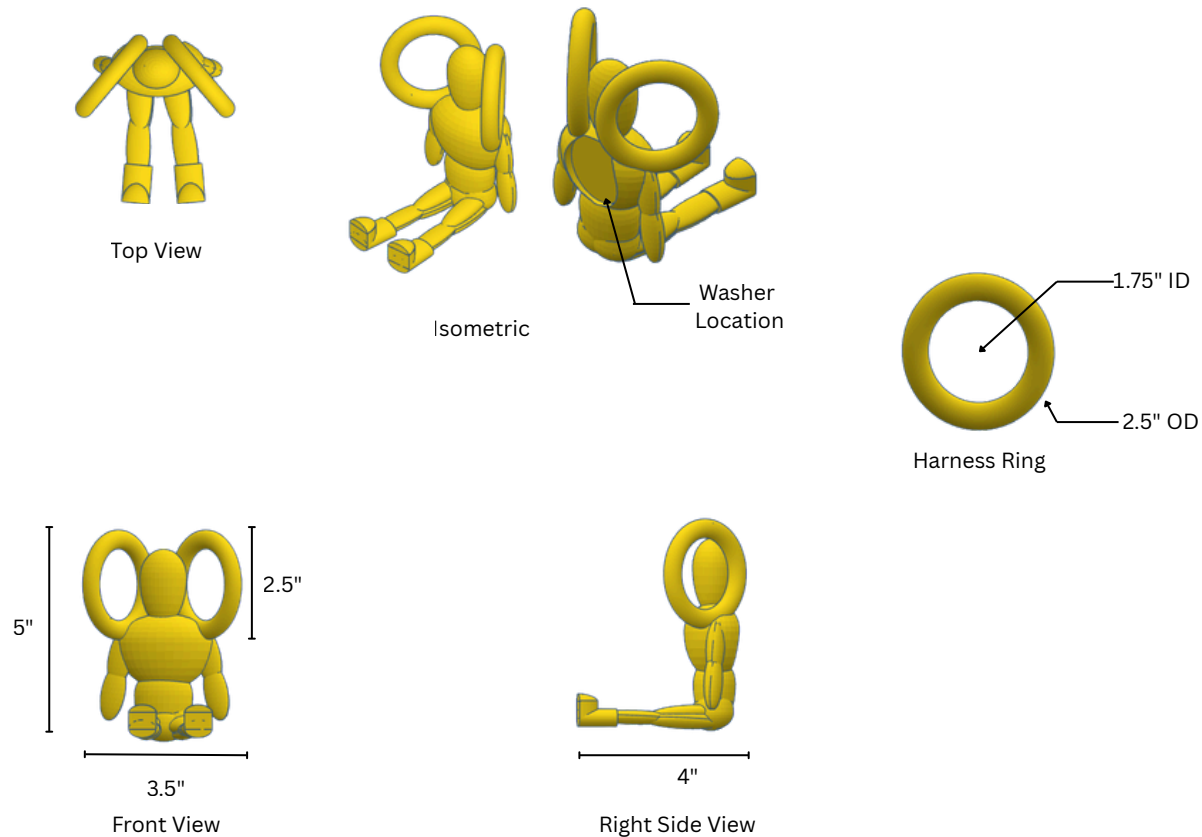
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Mission 2 - Rescue Recovery

Figure

drawings not to scale



3D Printed	May be substituted with object of same mass and harness ring sizes.
Weight	35 grams - 55 grams
Washer	3/8-in x 1-1/2-in Washer purchased at hardware store 1.5" diameter 5-7 grams 

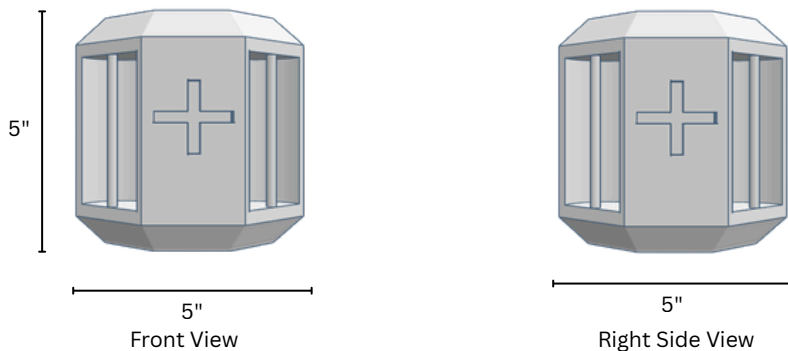
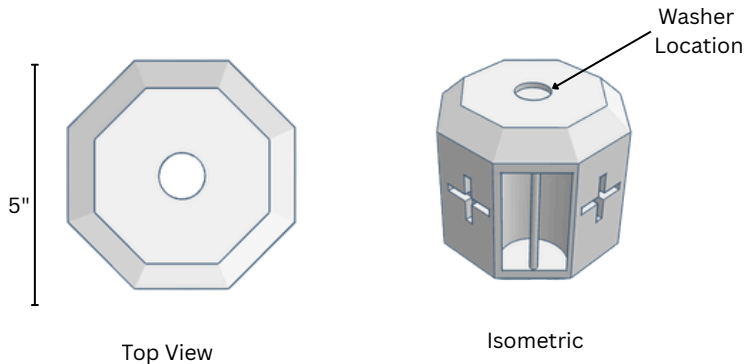
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Mission 3 - Emergency Delivery

Medical Pod

drawings not to scale



3D Printed	May be substituted with object of same size and mass.
Weight	200 grams - 250 grams
Washer	3/8-in x 1-1/2-in Washer purchased at hardware store 1.5" diameter 5-7 grams 

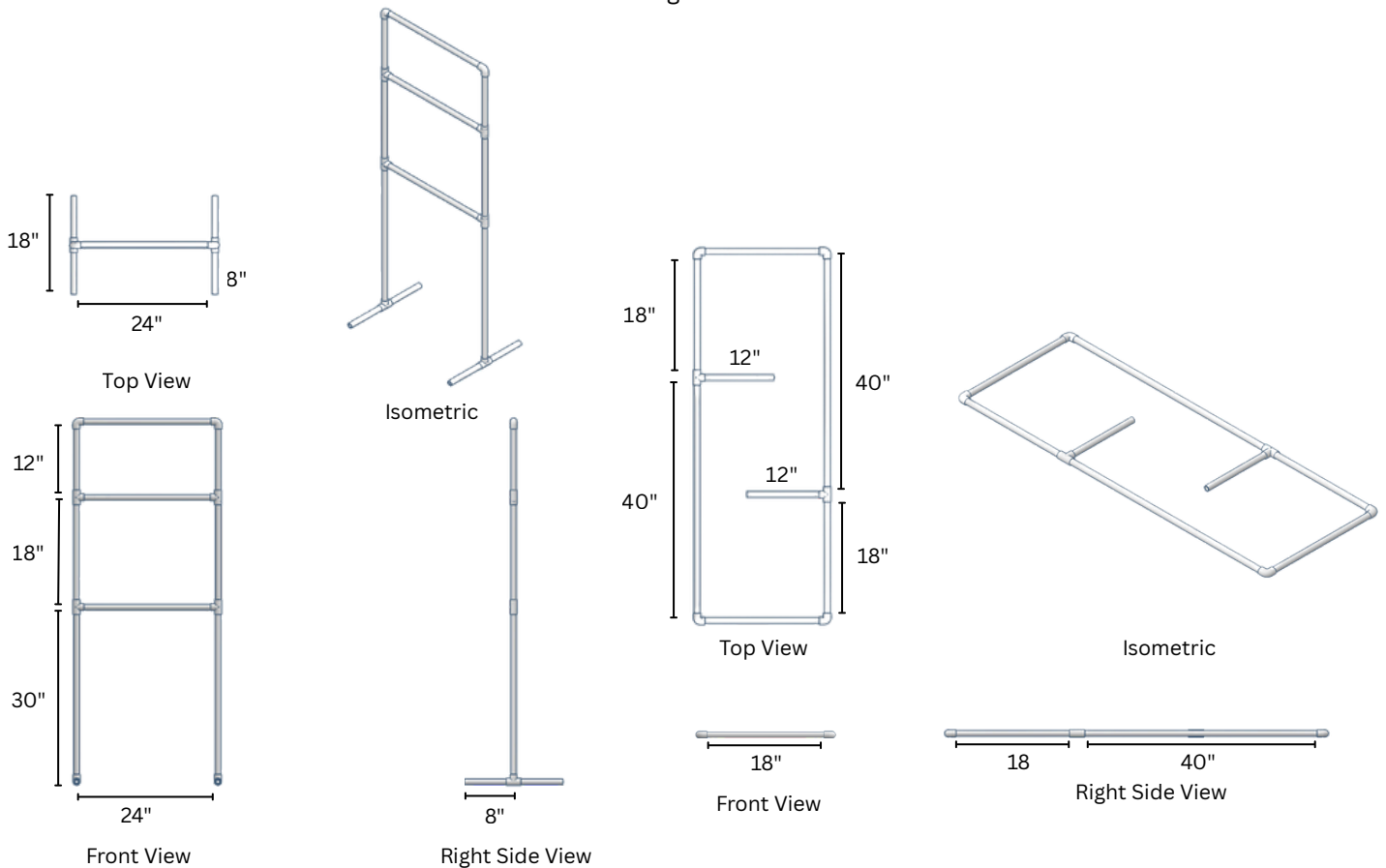
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Mission 4 - Hazardous Material Mitigation

Hazzard Passage

drawings not to scale



MATERIAL CUT LIST			
4	8" x ½" PVC pipe	6	½" PVC 90 Degree Side Elbow
4	12" x ½" PVC pipe	8	½" PVC Tee
6	18" x ½" PVC pipe	2	30" x ½" PVC pipe
3	24" x ½" PVC pipe	2	40" x ½" PVC pipe



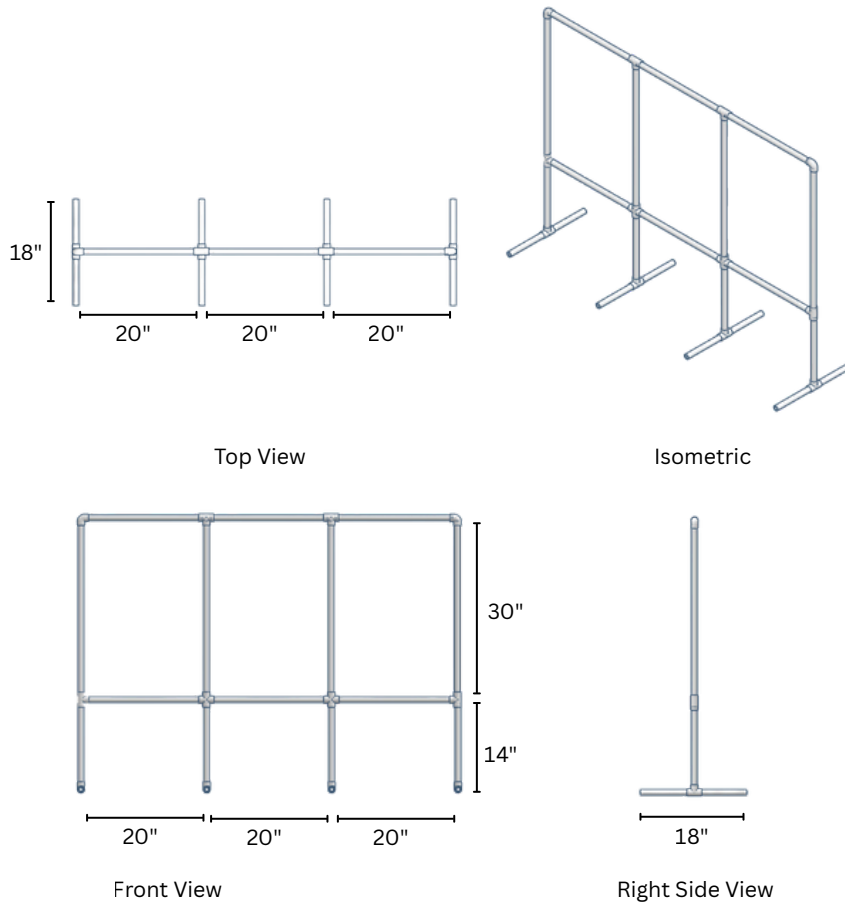
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Mission 5 - Communications Beacon Activation

Communication Corridor

drawings not to scale



MATERIAL CUT LIST			
8	8" x ½" PVC pipe	2	½" PVC 90 Degree Side Elbow
4	14" x ½" PVC pipe	8	½" PVC Tee
6	20" x ½" PVC pipe	2	½" PVC Cross Tee
4	30" x ½" PVC pipe		