

OPERATION LIFELINE

Humanitarian Aid Response

THE SITUATION

A major disaster has isolated communities, damaged infrastructure, disrupted communications, and created hazardous conditions. Humanitarian-aid teams need fast, accurate information and safe access to affected areas.

UAV teams have been deployed as part of Operation Lifeline to assess priority zones, reposition a relief-point marker, clear lightweight debris, and navigate vertical and horizontal damaged access routes.

Mission Overview

#	MISSION	HUMANITARIAN-AID TASK
M1	Emergency Zone Landing	Precision landings on designated areas.
M2	Relief Point Relocation	Use a simple probe or a controlled pushing action to move a lightweight marker off one pedestal and onto another pedestal.
M3	Debris Containment	Use propeller wash or a controlled pushing action to move ping-pong balls into a holding area.
M4	Emergency Access Corridor	Navigate a horizontal corridor using controlled altitude changes.
M5	Debris Field Navigation	Vertical reverse hurdles. The drone must ascend and descend through a vertical corridor.

Regulations / Procedures

Safety Regulations

- Safety is the top priority. Violations of safety guidelines may result in a warning or disqualification, depending on the severity of the violation.
- All drone operators must wear: safety glasses and high-visibility safety vests.
- Power cannot be applied to the propellers unless the drone is within the airspace.
- 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 they are instructed to do so at the Hot Table.
- Participants may not fly in an intentionally dangerous manner.
- UAVs may be flown only within the designated competition or practice fields.
- Participants will be asked to emergency stop or crash their drone if its flight course poses a threat to any individuals.

Preparation and Course Procedures

- Participants may only fly their drone when instructed to do so by a judge.
- The mission course location and layout will be determined at the conference. Teams will receive the course layout during check-in/sign-up for flight-path planning. An example layout is given below.
- Each UAV must begin every flight attempt within the designated start zone.

Mission Points

- The two highest(divided by two) attempt scores will be added together to determine the team's total score. The lowest attempt score will be dropped.
- Mission points are awarded according to the completion requirements for each mission.
- Mission points may be earned only once per flight attempt unless otherwise stated.

The Flight Mission

Attempts and Time

- Each team is permitted three (3) flight attempts.
- Each attempt must start from the designated start zone.
- Pilots create their own obstacle paths, each containing a combination of any of the available missions.
- Each member of the team must serve as the pilot on at least one (1) of the attempts.
- Each attempt has a maximum time limit of one (1) minute, measured with a running clock.

Team Communication

- The spotter is encouraged to communicate with the pilot regarding the UAV's position, alignment, clearance, and nearby course obstacles during the attempt.
- The pilot must remain in the designated pilot area. The spotter may move around the outside of the tent area.

Judging and Recording

- The judging team records all mission points earned during the attempt.
- If the drone unintentionally stops during the attempt and no power is applied to the drone propellers, the spotter may enter the airspace, pick up the drone, and move it to the launch pad to continue the attempt.
- If a part of the drone becomes detached during the attempt, it may be retrieved after the attempt is scored and there is no penalty. If the spotter retrieves the detached part during the attempt, a 20% rules violation will be applied in Tier 1.
- If the participants agree with the score sheet, the participants initial the score sheet and the score is final.

Mission Details & Scoring

01	Emergency Zone Landing - mission may be scored only once per round.	15 points
Humanitarian response priorities can change quickly. The UAV must land at three marked emergency assessment zones labeled A, B, and C. • The propellers must come to a complete stop at each landing. • Multiple landing attempts are permitted within the flight-attempt time limit. • Each Landing Zone is only scored once. Each landing zone is worth five(5) points COMPLETION REQUIREMENT: Landing zones may be done in any order. Partial Completion allowed.		
02	Relief Point Relocation - mission may be scored only once per round.	25 points maximum
A lightweight marker represents a humanitarian-aid relief-point that must be repositioned as community needs change. The UAV uses an attached probe/stick, propwash, or the drone body to remove the marker from one pedestal, then places the marker onto another pedestal. No gripper, magnet, or complex retrieval system is required. • Marker successfully removed from the starting pedestal: 5 points • Marker properly placed on the short designated receiving pedestal: 10 points • Marker properly placed on the tall designated receiving pedestal: 20 points COMPLETION REQUIREMENT: Award each listed point value when its stated action is completed. Partial completion allowed.		
03	Debris Containment - mission may be scored only once per round.	30 points maximum
Ten lightweight ping-pong balls represent storm debris near a response route. The UAV uses propeller wash or a controlled pushing action to maneuver the balls through an opening in a raised platform, then directs them into a designated holding area or container. • Each ball successfully moved through or off of the platform opening: 1 point • Each ball successfully directed into the designated safe containment area: 2 additional points • Partial completion is permitted. Each ball may earn a maximum of 3 points. COMPLETION REQUIREMENT: Award points separately for each ball that meets a listed scoring condition.		
04	Debris Field Navigation - mission may be scored only once per round.	25 points maximum
The UAV navigates a collapsed structure by descending from an above opening then exiting out through a side opening. Landing for Mission 01 may occur during this process. • Entering the structure from above: 10 points • Exiting the structure through side opening: 15 points • Multiple attempts are permitted within the flight-attempt time limit. COMPLETION REQUIREMENT: The UAV must pass completely into the structure and must exit completely to earn assigned points. Partial mission completion is permitted.		
05	Emergency Access Corridor - mission may be scored only once per round.	25 points maximum
The UAV navigates the openings of a vertical wall obstacle representing a restricted route through damaged infrastructure. UAV may ascend or descend through the opening to receive points • Low opening ascended/descended: 10 points • High opening ascended/descended: 10 points • Travel through pedestal gate over obstacle wall: 5 points • Travel under the wall through opening: 5 points • Multiple attempts are permitted within the flight-attempt time limit. • Each opening may be scored only once. COMPLETION REQUIREMENT: The UAV must pass completely through an opening to earn its assigned points. Partial mission completion is permitted.		

MS Drone Challenge - 2027

Operation Lifeline – Humanitarian Aid Response

Team Number:		Time:		Attempt Number	Total Points/2	Mission Points
		Pilot 1	Pilot 2			
M01- Landing	☐ Landing A 5pts	☐ Landing B 5pts		☐ Landing C 10pts		
M02- Relocation	☐ Remove Marker From Pedestal 5pts	ONLY ONE PLACEMENT SCORED				
		☐ Place Marker on low Pedestal 10pts		☐ Place Marker on highPedestal 20pts		
M03- Containment	Ping-Pong Balls Removed from platform 1pt each			Ping-Pong Balls Contained in Safe Area 2pts each		
M04- Access	☐ Enter Structure From Above 10pts			☐ Exit Structure through Side opening 15pts		
M05- Navigation	☐ Low Opening 10pts	☐ Upper Opening 10pts		☐ Upper Pedestal Gate 5pts	☐ Low wall opening 5pts	

Team Number:		Time:		Attempt Number	Total Points/2	Mission Points
		Pilot 1	Pilot 2			
M01- Landing	☐ Landing A 5pts	☐ Landing B 5pts		☐ Landing C 10pts		
M02- Relocation	☐ Remove Marker From Pedestal 5pts	ONLY ONE PLACEMENT SCORED				
		☐ Place Marker on low Pedestal 10pts		☐ Place Marker on highPedestal 20pts		
M03- Containment	Ping-Pong Balls Removed from platform 1pt each			Ping-Pong Balls Contained in Safe Area 2pts each		
M04- Access	☐ Enter Structure From Above 10pts			☐ Exit Structure through Side opening 15pts		
M05- Navigation	☐ Low Opening 10pts	☐ Upper Opening 10pts		☐ Upper Pedestal Gate 5pts	☐ Low wall opening 5pts	

MS Drone Challenge - 2027

Operation Lifeline – Humanitarian Aid Response

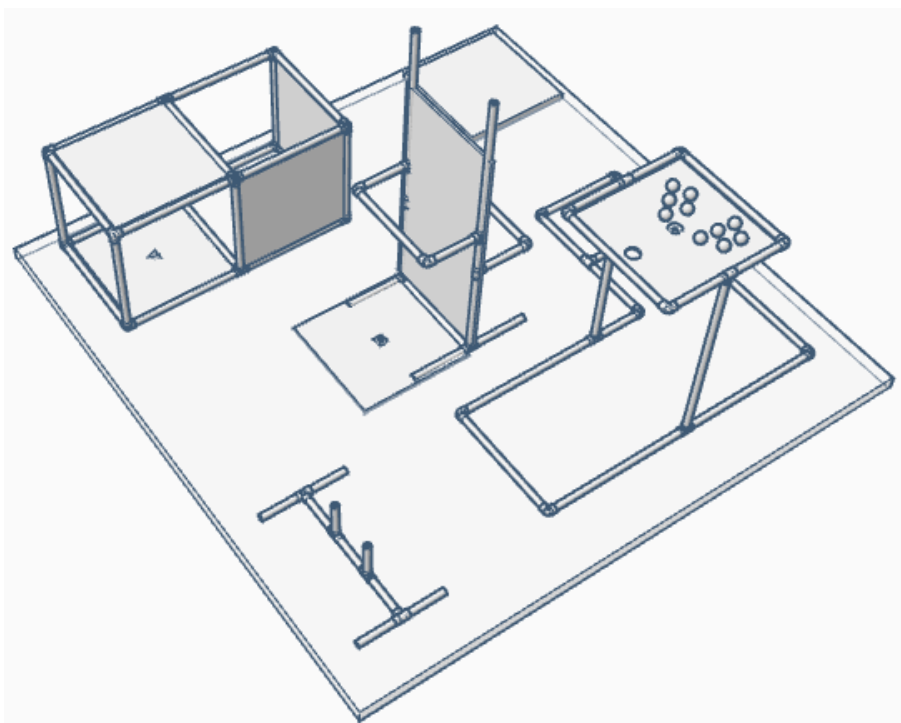
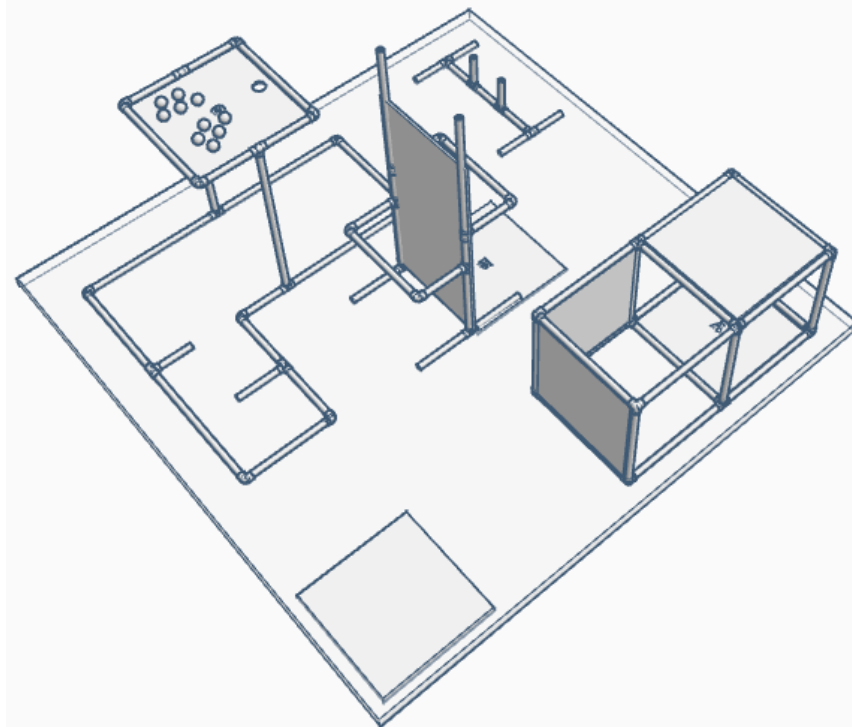
Team Number:		Time:		Attempt Number	Total Points/2	Mission Points
		Pilot 1	Pilot 2			
M01- Landing	☐ Landing A 5pts	☐ Landing B 5pts		☐ Landing C 10pts		
M02- Relocation	☐ Remove Marker From Pedestal 5pts	ONLY ONE PLACEMENT SCORED				
		☐ Place Marker on low Pedestal 10pts		☐ Place Marker on highPedestal 20pts		
M03- Containment	Ping-Pong Balls Removed from platform 1pt each			Ping-Pong Balls Contained in Safe Area 2pts each		
M04- Access	☐ Enter Structure From Above 10pts			☐ Exit Structure through Side opening 15pts		
M05- Navigation	☐ Low Opening 10pts	☐ Upper Opening 10pts		☐ Upper Pedestal Gate 5pts	☐ Low wall opening 5pts	

Team Number:		Time:		Attempt Number	Total Points/2	Mission Points
		Pilot 1	Pilot 2			
M01- Landing	☐ Landing A 5pts	☐ Landing B 5pts		☐ Landing C 10pts		
M02- Relocation	☐ Remove Marker From Pedestal 5pts	ONLY ONE PLACEMENT SCORED				
		☐ Place Marker on low Pedestal 10pts		☐ Place Marker on highPedestal 20pts		
M03- Containment	Ping-Pong Balls Removed from platform 1pt each			Ping-Pong Balls Contained in Safe Area 2pts each		
M04- Access	☐ Enter Structure From Above 10pts			☐ Exit Structure through Side opening 15pts		
M05- Navigation	☐ Low Opening 10pts	☐ Upper Opening 10pts		☐ Upper Pedestal Gate 5pts	☐ Low wall opening 5pts	

Course Obstacles & Mission Setup - Missions 01-05

Obstacle locations will be determined at the conference. PVC obstacles are constructed from $\frac{1}{2}$ " PVC pipe and connectors. Listed measurements indicate opening sizes and are $\pm \frac{1}{2}$ " tolerance. Drawings are not to scale. A cut list is provided for each Obstacle.

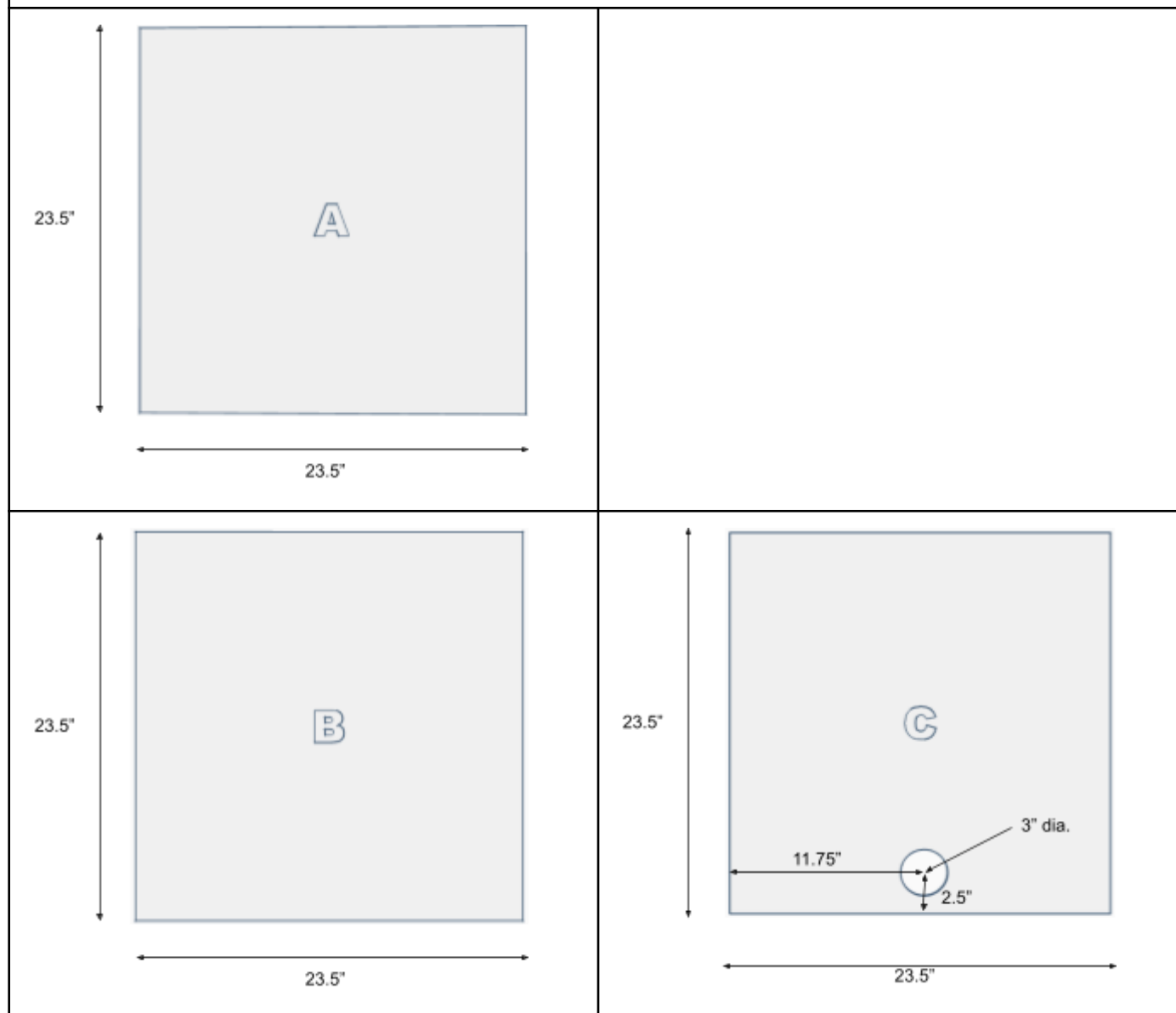
An example course layout is provided below. The course may be set up inside a 10'x10' area or a 10'x20' area.



2027 MIDDLE SCHOOL UAV DRONE CHALLENGE

Mission 1 - Emergency Zone Landing - drawings are not to scale

Marked landing area



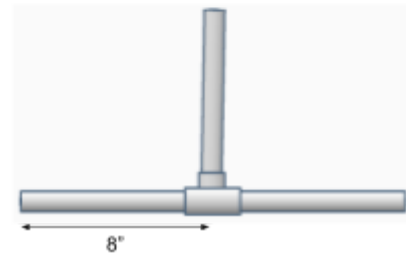
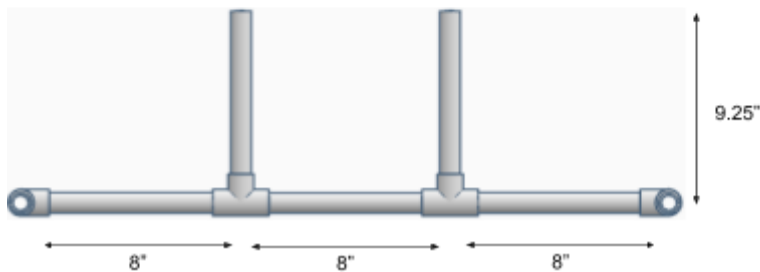
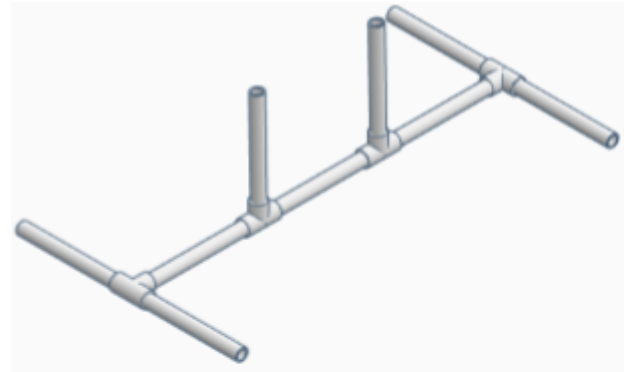
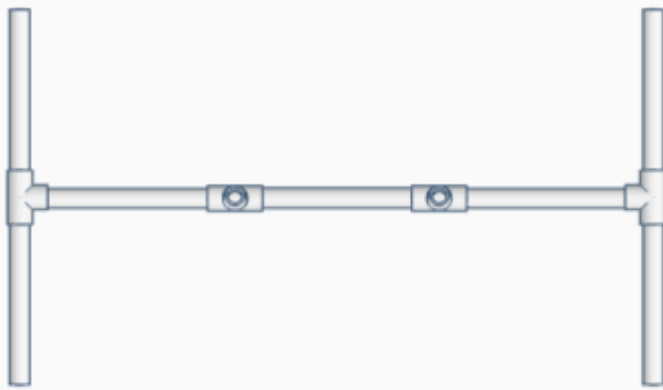
Material Cut List

3	3/16" or 1/8" foam board or cardboard - zone A & B may be taped onto floor area
As needed	Zip ties to attach - Recommended 2 per side

2027 MIDDLE SCHOOL UAV DRONE CHALLENGE

Mission 2 - Relief Point Relocation - drawings are not to scale

Pedestal Obstacle



Material Cut List

7	1/2" PVC	8" long
2	1/2" PVC	9 1/4" long
4	1/2" PVC Tee	
1	3oz Bath Cup	Turned upside down with a 4"x1/2" handle attached with tape

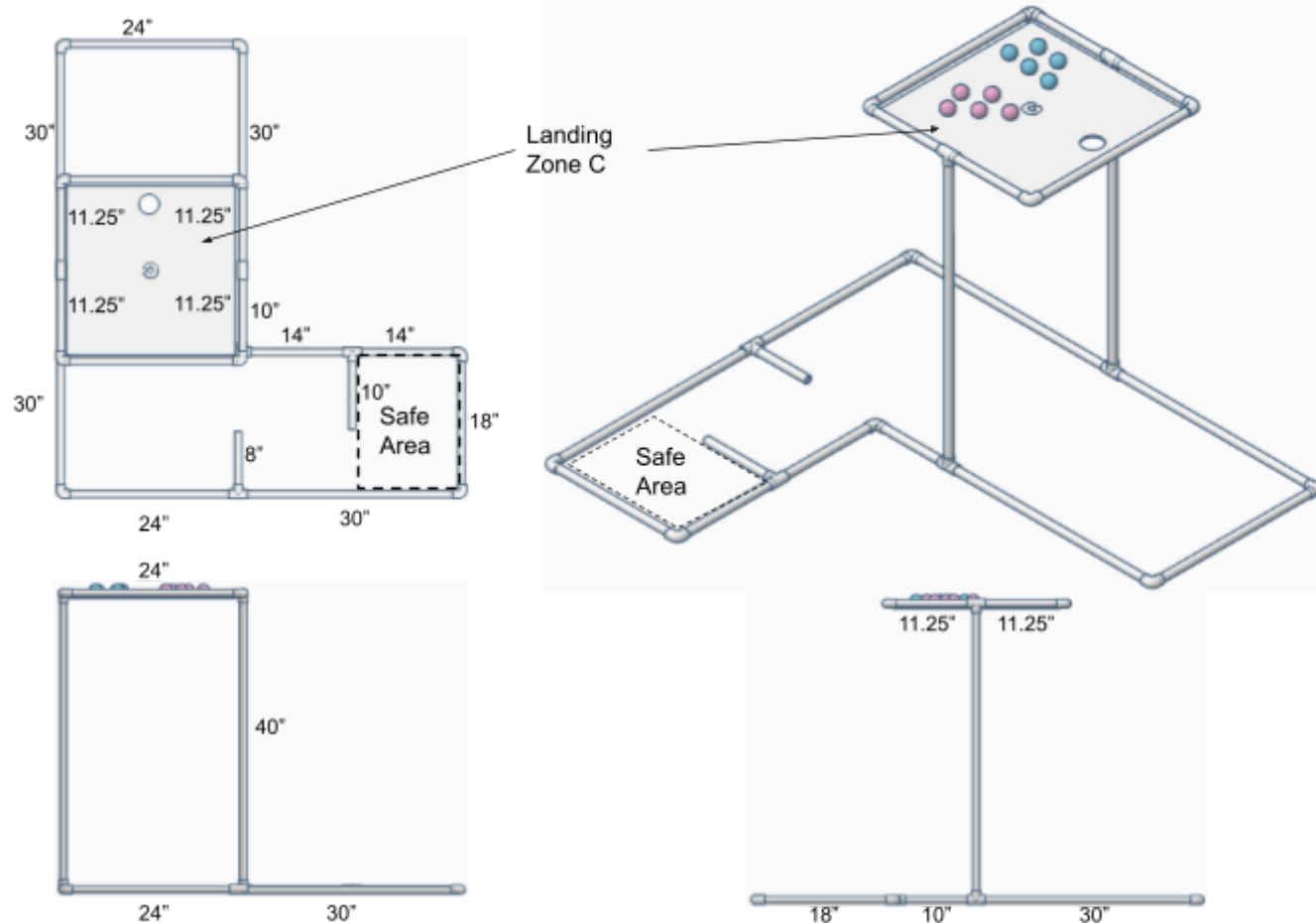


Marker

2027 MIDDLE SCHOOL UAV DRONE CHALLENGE

Mission 3 - Debris Containment - drawings are not to scale

Ping-Pong Ball Obstacle



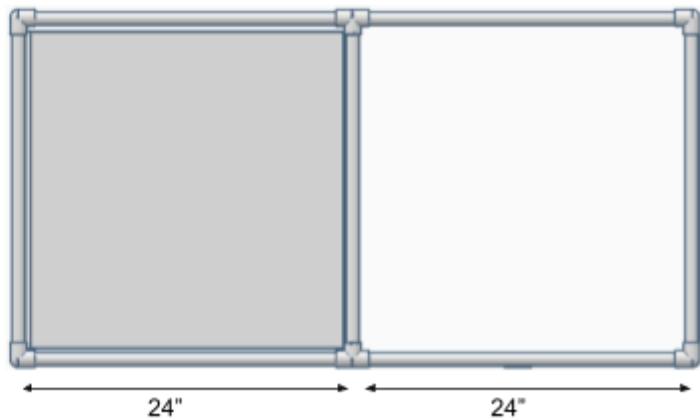
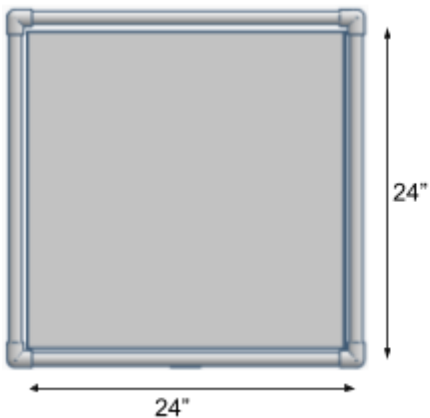
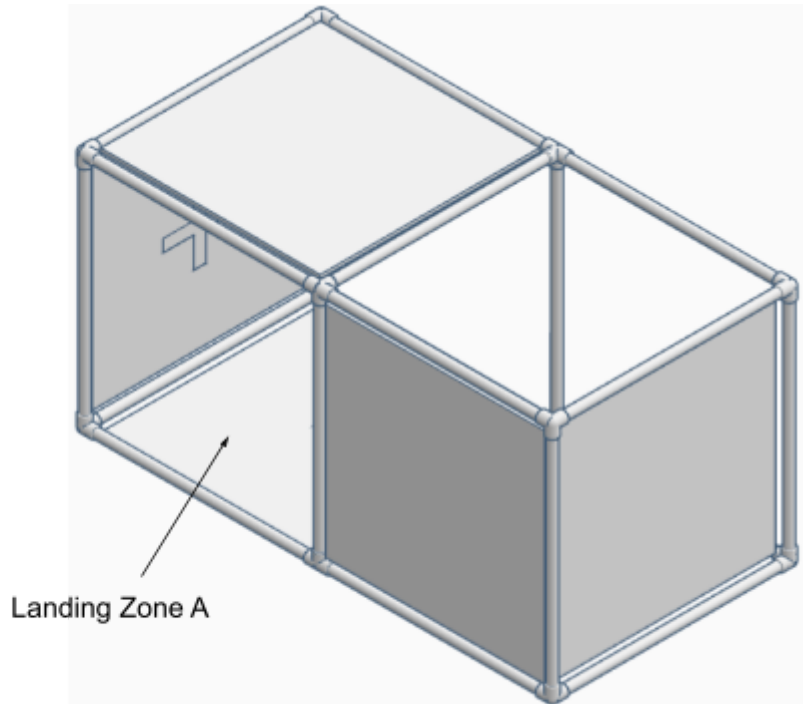
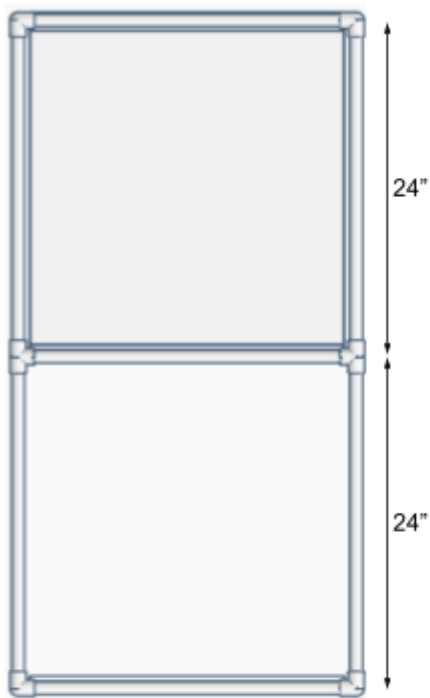
Material Cut List

1	$\frac{1}{2}$ " PVC	8" long		4	$\frac{1}{2}$ " PVC	24" long
2	$\frac{1}{2}$ " PVC	10" long		4	$\frac{1}{2}$ " PVC	30" long
4	$\frac{1}{2}$ " PVC	11 $\frac{1}{4}$ " long		2	$\frac{1}{2}$ " PVC	40" long
2	$\frac{1}{2}$ " PVC	14" long		10	$\frac{1}{2}$ " PVC Elbow	
1	$\frac{1}{2}$ " PVC	18" long		6	$\frac{1}{2}$ " PVC Tee	

2027 MIDDLE SCHOOL UAV DRONE CHALLENGE

Mission 4 - Debris Field Navigation - drawings are not to scale

Tunnel Obstacle



Material Cut List

20	1/2" PVC	24" long
8	1/2" PVC	3-Way 90 Degree Side Outlet Elbow
4	1/2" PVC	4-Way Side Outlet Tee
4	3/16" or 1/8" foam board or cardboard - 23 1/2" x 23 1/2"	

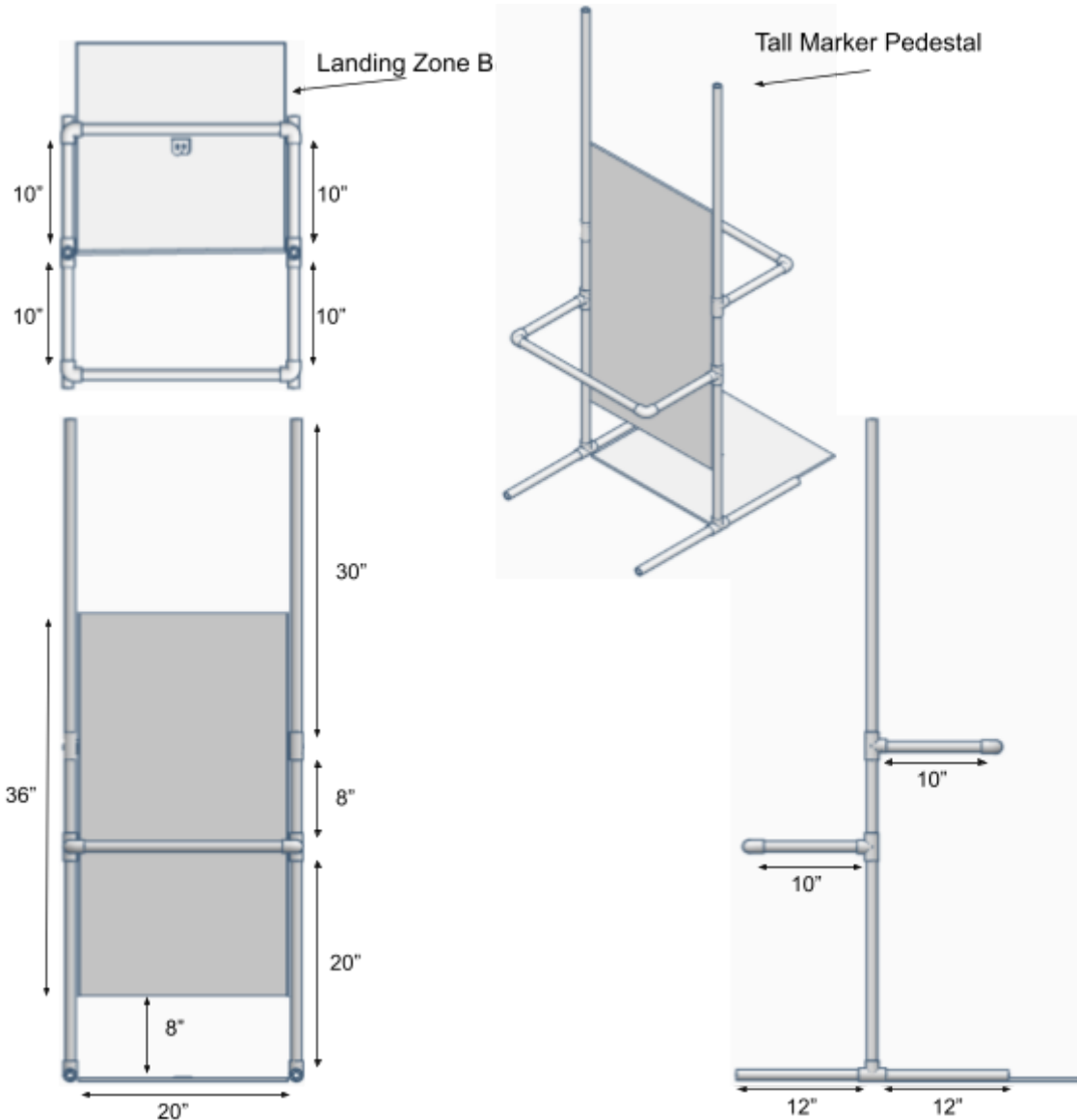
32+

Zip ties to attach - Recommended 2 per edge

2027 MIDDLE SCHOOL UAV DRONE CHALLENGE

Mission 5 - Emergency Access Corridor - drawings are not to scale

Vertical Wall



Material Cut List

2	½" PVC	8" long		4	½" PVC	12" long
4	½" PVC	10" long		4	½" PVC	20" long
2	½" PVC	30" long		12+	Zip ties to attach - 6 per edge	
1	3/16" or ⅛" foam board or cardboard - 19½" x 36"					