Air Lift
Game Manual
2023-2024

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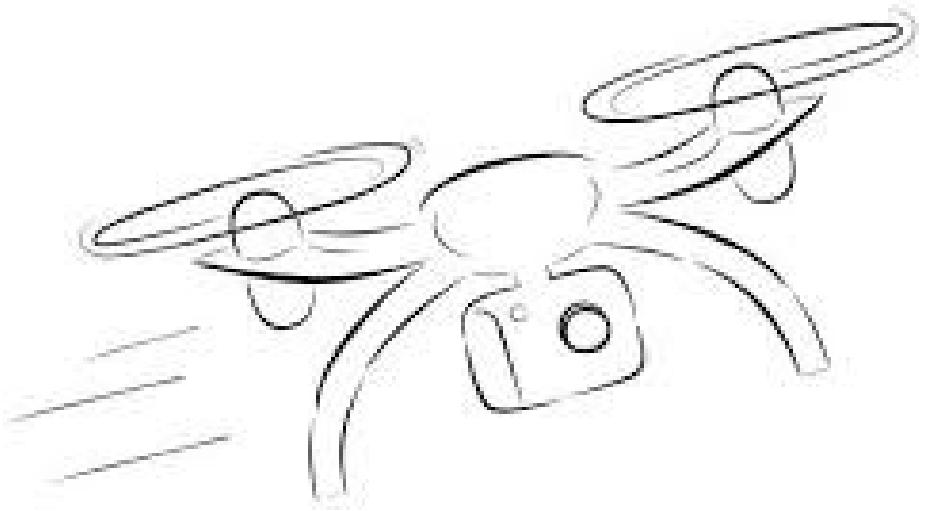


Air Lift

Section 1: Introduction

1.1 - Overview

This section provides background for the 2023-2024 CREATE Drones Challenge game called ***Air Lift***.
This competition is for students primarily in the 9th through 12th grades. Younger students are allowed to participate as well, based upon their ability and readiness for this level of engineering challenge. Blended age group teams, elementary, middle school, and high school are encouraged and welcomed to join as well.
This document lays out the challenge as conceived at the beginning of the season. CREATE reserves the right to make changes to these rules as the season progresses.

1.2 - Introduction

Join the CREATE Foundation this year to out-design, out-build, and out-fly the competition. Be the first to complete the course earn the most bonus points to be crowned champion, all while learning about engineering, the engineering process, how to communicate, collaborate and lead. Air Lift is a robust engineering challenge that will help students hone important life and technical skills while having a great time!
The Air Lift challenge has multiple key components:

- ***Design/Engineering:*** Teams will work together to design, build, and test drone add-on equipment, team-built game mechanisms and a land drone. The engineering process will be chronicled in a mandatory engineering notebook.
- ***Competition/Collaboration:*** Events ranging from a few hours to multiple days allow the teams to test their engineering, flying, collaboration, and communication skills.
- ***Judging:*** From registration to the finals, the teams will have the opportunity to show the referees/judges (rudges) and other tournament officials their skills across both technical and interpersonal areas. Judging will encompass each team's mandatory engineering notebook, on-field performance, technical knowledge, and social interactions throughout the event. Sportsmanship as well as engineering excellence will count heavily in the judged awards. See the appendix of this document for a full list of awards.

1.3 - Event Summary

Registration and Inspections: The day starts with registration and inspections. During inspections not only will the drones, land drones (optional) and team-built game mechanisms (optional) be inspected for safety and compliance to rules, the teams will also be quizzed on their technical knowledge and their engineering journey. The engineering notebook will be reviewed with the teams at this time. Submission of an engineering notebook is mandatory. Teams will not be able to register or pass inspection without submitting an engineering notebook and will therefore not be allowed to participate. NOTE: Engineering notebooks must be bound and the team number must be clearly written on the outside front cover of the notebook. Notebook is to be written in pen, not pencil. No erasing, simply strike through any discarded ideas or diagrams with a single line.

Pilot's Meeting and Opening Ceremony: Once the scheduled time for registration and inspections is over there will be a pilot's meeting where the rudges will go over important rules and answer any questions teams might have. The rudges will also take this time to remind teams of sportsmanship and the CREATE tournament code of conduct to be followed by all teams, team members, and their fans. The pilot's meeting will be followed immediately by the

opening ceremony.

Solo Flights: Each team will be given opportunities (the number of opportunities is up to the Event Partner) to fly solo and complete this year's solo task of winding up a 48" rope using the Team Built Mechanism (TBM) which must be activated by the Aerial Drone. A team's score is the number of seconds remaining on the clock, once the TBM has been activated and at least one other bonus task has been completed. The total score will be a combination of time bonus points and task bonus points. These flights are optional, however, they will be considered for many other judged awards. A team's ability to do well in the solo flights may become a very important consideration during alliance selection. Solo flight awards are given for the top finisher(s). The exact number of awards depends upon each event. Solo flights are 60 seconds long. Land Drones and TBM are optional for Solo Flights, but will potentially greatly enhance a teams score.

Qualification Matches: Teams are randomly paired to compete. There are two alliances, one blue alliance and one red alliance. At the end of qualification rounds all teams are ranked based upon the per match average of points they have earned.

Alliance Selection: After all qualification matches are over the top teams invite other teams to join them in a permanent alliance of **four** teams to compete in finals matches. A team may decline, and if they do they will be taken off the board and no other teams may select them. They may still act as an alliance captain and invite other teams to join them if they are ranked high enough. Teams should consider carefully before they decline because if they are not able to act as alliance captains they will be eliminated from further play.

Finals: Once all the permanent alliances have been determined the finals portion of the tournament begins shortly thereafter. Alliances are seeded based on their alliance captain team's ranking at the end qualification matches. The lowest seeded alliance goes first, scoring as many points as possible. Then the next lowest seed goes. This continues until the highest rank alliance competes. The alliance scoring the most points in the final rounds is crowned the on field tournament champion. Multiple finals rounds may be run at the discretion of the event partner. CREATE recommends at least two attempts are given. The finals score is the combination of the red side and blue side.

Awards and Closing Ceremony: The closing ceremony will end the competition and give event organizers an opportunity to thank sponsors and volunteers. Awards for both on-field and judged awards will be given out at this time. Remember, teams are being observed throughout the competition. From registration, inspections all the way to the final match, team technical knowledge, communication skills, sportsmanship, collaboration, and social skills are all being taken into consideration in determining awards.

1.4 - Example Event Schedule

Time	Description
8:00-10:00	Registration/Inspections
9:00-10:45	Solo Flights
10:45-11:00	Pilot's Meeting
11:00-11:15	Opening Ceremony
11:15-12:30	Qualification Matches
12:30-1:15	Lunch
1:20-2:15	Qualification Matches
2:20-2:40	Alliance Selection
2:45-3:40	Final Matches
3:45-4:00	Closing Ceremony / Awards

1.5 - Definitions

Aerial Drone - A quad-copter designated by CREATE. The drone may not be altered in any way. Adding mechanisms, both functional and decorative, are allowed per the rules detailed in Section 4 of this game manual. Changing any of the parts, motors, electronics, batteries, propellers, ANYTHING that comes with the standard drone, is prohibited. Replacing parts/motors/blades with identical parts is acceptable.

Add-on Equipment – Any mechanism, either functional or decorative, built by a team which is added onto an aerial drone without altering the standard aerial drone in any way. Examples of add-on equipment would be a hanging hook or protective propeller guards.

Alliance - Two randomly paired teams that work together during a Qualification Match, or four teams that work together during a Finals Match.

Coach - A student or adult designated as the team adviser during the tournament.

Course Completion – All tasks successfully accomplished and remotes returned to the floor.

Doubler - One aerial drone landed on the Landing Pad and one aerial drone landed on the land drone, DOUBLES the alliance score. Landing is successful on the landing pad or land drone as long as no part of the aerial drone touches the ground and the aerial drone has stopped moving. This determination is made at the END of a match. The Drone landing on the land drone must be in the air until 30 seconds or less on the clock. Landing early forfeits the doubler.

Driver- A team member responsible for operating and controlling the land drone.

False Start – Any remote picked up prior to the start of a match is considered a false start. Penalties are assessed upon each drone. Therefore it is possible for an alliance to be penalized three times if both pilots and land drone driver pick up their remotes early. False starts are determined by the Rudge. The alliance of the team that has false started with be assessed a penalty, for each team guilty of this infraction. Egregious or repeated infractions may result in the disqualification of the offending team or alliance.

Land Drone - A robotic device that operates on the ground. This drone is limited to 6 motors and must not be any larger than 18”x18”x18” as the start of a match. (The land drone is optional and is not required. However, many bonus points can only be earned via a land drone.) only one land drone is used per match. **NOTE on choosing which Land Drone to use in a match.** If teams on an alliance cannot decide on which Land Drone then the land drone of the higher ranked team will be used.

Landing Pad - The area a drone lands on. This is a mandatory task to complete the course for a Time Bonus and for the Doubler.

Launch Pad – The area on the floor from which a drone starts the match. The drone may be placed in any orientation.

Match - A timed period where drones attempt to finish the course and accumulate bonus points. These include solo flights, qualification matches, and final matches.

Pilot - A team member responsible for operating and controlling the aerial drone.

Pilot's Station - The designated region where the pilots and drivers stand during any match.

Pre-placement - Placement of the team-built game mechanisms created by teams. Each season there will be a specific set of rules governing the pre-placement of these student-designed and built game mechanisms.

Solo Flight - a sixty second flight where a single team uses their drone to activate the team-built mechanism to complete bonus task and then land on the landing pad. Land drones may optionally be used during the solo flight.

Team Built Mechanism – Any mechanism built by teams for the purpose of completing the team-built game mechanism task. See Section 4 of this game manual for more details.

Team Member – Any of the student participants that make up the team. Only two team members from each team are allowed in the Pilot's Station for each match.

1.6 - Let's Fly!

On the following pages are the rules of this fast-paced challenge. Your team will have the opportunity to design, build, and test your own drone add-on equipment, land drone and team-built game mechanism to soar past the competition.

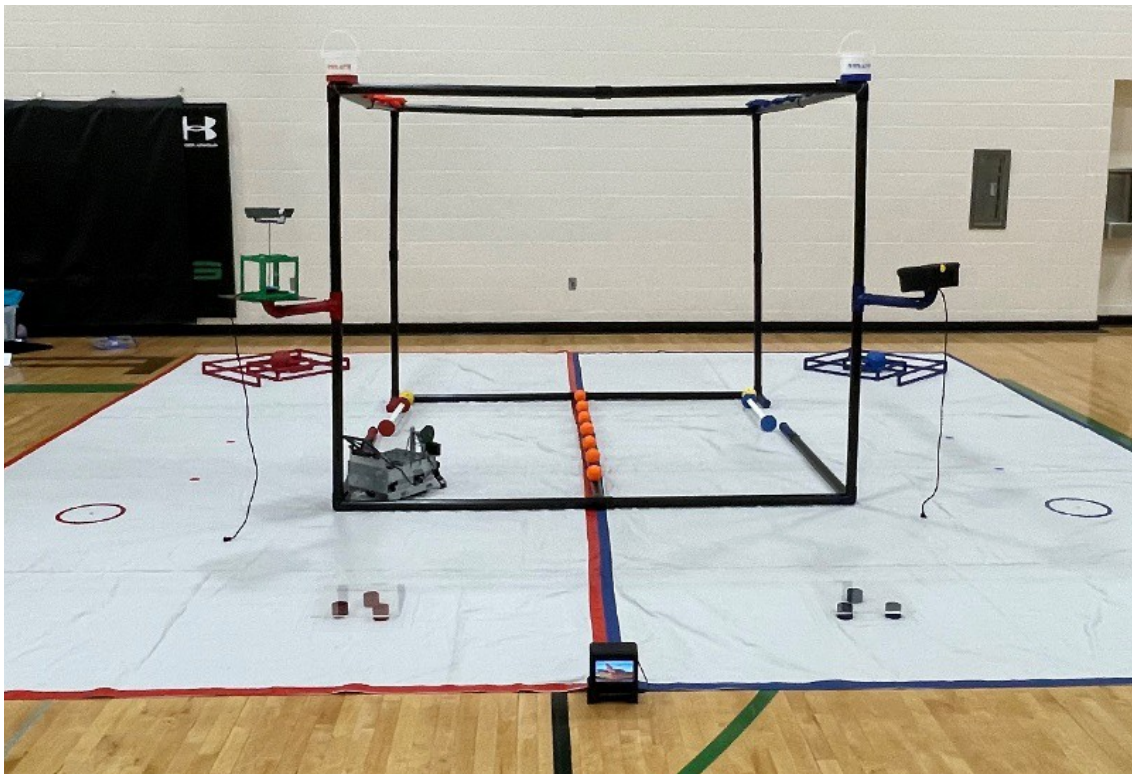
Section 2: The Game

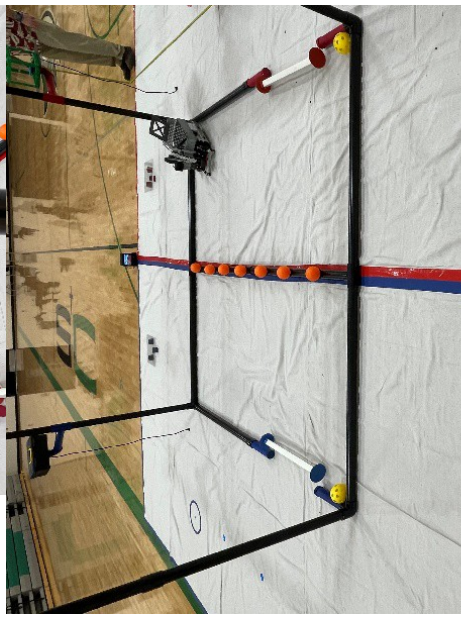
2.1 - Overview

This section describes the CREATE Drones Challenge game called ***Air Lift***. It also lists the game definitions and game rules.

2.2 - Game Description / Field Drawings

Matches are flown in an arena initially set-up similar to pictures below:



Four teams, two each on opposing alliances, compete to finish all the tasks on the course, to land on the landing pad and return their remotes to the floor. The on-field competition is broken into three parts: Solo Flights, Qualification Matches, and Finals Matches.

- ***Solo Flights:*** In the solo flight, a single team uses their aerial drone, TBM, and optional land drone. The aerial drone is used to activate their TBM to wind up a 48" long piece of rope. They may also opt to try to get additional points via the optional bonus tasks. (See Section 4 of this manual for all the details.) Once the team built mechanism successfully activated and the team lands on the landing pad, the team may return their remote to floor and stop the clock. The time remaining on the clock is added to any/all bonus points earned for a final Solo Flight score.
- ***Pre-Match Bonus:*** The first 20 seconds of each qualification and finals match is the pre-match period. During this 20 seconds an alliance is allowed to fly one aerial drone (no other remotes can be picked up) to activate their TBM. If the alliance is successful in completing the TBM task within the 20 seconds they earn the Pre-Match Bonus. NOTE: No other field elements may be disturbed during this flight. If any other objects are moved the team forfeits any pre-match bonus and if egregious may be disqualified at the discretion of the Rudge. The remote must be returned to the ground prior to 20 seconds. The pilot may opt to land the aerial drone or let the drone hover.
- ***Team Built Mechanism:*** The Team Built Mechanism, or TBM, is a non-electronic, non-motorized mechanism designed and built by students to wind up a rope that is 48" long. Success will be determined by the Rudge. If she/he cannot see any part of the rope from a standing position anywhere around the perimeter of the arena then it will be determined to be

successful. The TBM, no larger than 18”x18”x18” is attached to a 1.5” circular receiver approximately 3' off the ground. The TBM must be easy to quickly and securely mount on the receiver and must be easy to quickly remove. Once mounted, the TBM must not be larger than 18”x18”x18”. A 48” piece of rope will be given to each alliance. It will have a small knot on each end. It is up to each alliance to attach the rope (which also must be easy to install and remove) to their TBM. The rope must touch the floor once attached.

- ***Qualification Matches:*** Two randomly paired teams on an alliance, compete in a 20 second pre-match and 120 second match, to finish all mandatory tasks and any bonus tasks they opt for, as quickly as possible.

  TIME TASK BONUS:

  - 8 bean bags must be knocked off the perch on the upper core support pipe.
  - Large ball removed from MAZE
  - The Air Drone must activate the TBM.
  - Exit gate Success (by Air Drone)
  - One Air Drone of the alliance must land on the landing pad.

  ○ All remotes are returned to floor. Time stops once all remotes are on the floor. Any time remaining on the clock of a successfully completed course will be added to all bonus points for a final score. The maximum Time Task Bonus is 60 (sixty) points.

  ○ **TASKS for BONUS POINTS:**

  - Pre-Match Bonus. First 20 seconds of the match. ONE Drone takes off (second Drone and Land Drone cannot start yet) and attempts to complete the TBM task. Once complete, remote back on the ground (Drone can land or simply hover) If TBM is complete, Pre-Match Flight bonus points are awarded. - 20 points.
  - TBM Success – 25 points
  - Each bag in the Bucket – 5 points
  - Bucket moved to Circle – 25 points
  - Yellow Wiffle Ball moved out of the field – 15 Points
  - Fewer orange balls on your side – 25 points. NOTE: Only one orange ball can be controlled at a time by the land drone. Balls can be placed on an opposing alliance's side, not thrown or hurled. Energy cannot be imparted to the balls to ensure they don't leave the core. Large Ball from MAZE counts as 10 Orange Balls
  - Doubler (One air drone landed on landing pad, one air drone landed on land drone when land drone fully inside the core.) - All points doubled. NOTE: Air drone may not land on land drone until 30 seconds or less on the clock. Early landing on the land drone forfeits the doubler no matter how early in the match or for how briefly the landing takes place.

- ***Finals Matches:*** Alliances of four teams compete in a 20 second pre-match and 90 second match, to finish all mandatory tasks and any bonus tasks they opt for, as quickly as possible. In the finals ALL teams are on the same alliance and can help each other as the four team alliance sees fit. For example an air drone from one side could activate both TBMs if desired. Tasks are still assigned to each color/side, but can be completed by any air drone or land drone. All air and land drones may go anywhere in the arena.

  TIME TASK BONUS: Same as qualifying matches.

- All remotes are returned to floor. Time stops once all remotes FROM ONE SIDE are on the floor. Time stops for red and blue independently just like qualification matches. Any time remaining on the clock of a successfully completed course will be added to all bonus points for a final score. The maximum Time Task Bonus is 90 (ninety) points in finals matches.
- TASKS for BONUS POINTS: Same as qualifying matches.

Doubler works the same as in the qualification matches.

PENALTIES are the same as qualification matches but their value has been increased. See table below.

		Qualification	*Finals*
Object	***Scoring Task***	***Points***	***Points***
TBM Pre-Match	TBM Success in first 20 seconds of pre-match	20 points	20 points
TBM	TBM Success	25 points	25 points
Bucket Moved	Bucket moved from starting position.	10 points	10 points
Bucket on Perch	Bucket placed on perch.	30 points	30 points
Bean Bags in Bucket	Bean bags in bucket	5 points each	5 points each
Orange Balls	Have fewer orange balls on your side.	20 points	20 points
Yellow Wiffle Ball	Remove the Yellow Wiffle Ball from the Arena (out of the field)	15 points	15 points
Doubler	One air drone landed on landing pad, one air drone landed on land drone when land drone fully inside the core at 30 seconds or less.	Double all points	Double all points
Object	***Time Tasks***	***Points***	***Points***
Bean Bags	1. Eight bean bags must be knocked off their perch on the upper core support pipe.	Seconds left on the clock become points 60 Max	Seconds left on the clock become points 90 Max
MAZE	2. Large Bucky Ball removed from MAZE		
TBM	3. The Air Drone activates the TBM		
Landing Pad	4. Exit Gate Success by Air Drone 5. One Air Drone lands on the land-ing pad		

	In order to take the time bonus, both Drone remotes and the Land Drone remote (if LD is present) is on the ground and the Drones and LD are NOT moving.		
Object	***PENALTIES***	***Points***	***Points***
PENALTY	Start early	Minus 10 points each	Minus 20 points each
PENALTY	Skip one time task	Minus 15 points	Minus 30 points
PENALTY	Launching or hurling orange balls	Minus 10 points each	No penalty.
PENALTY	Fly/Drive Late	Minus 5 points each	Minus 15 points each

The competition field is an arena approximately 20' x 20' , divided into 10'x20' zones as shown by the red and blue lines in the diagram. The two Pilot Stations are outside of the competition field arena.

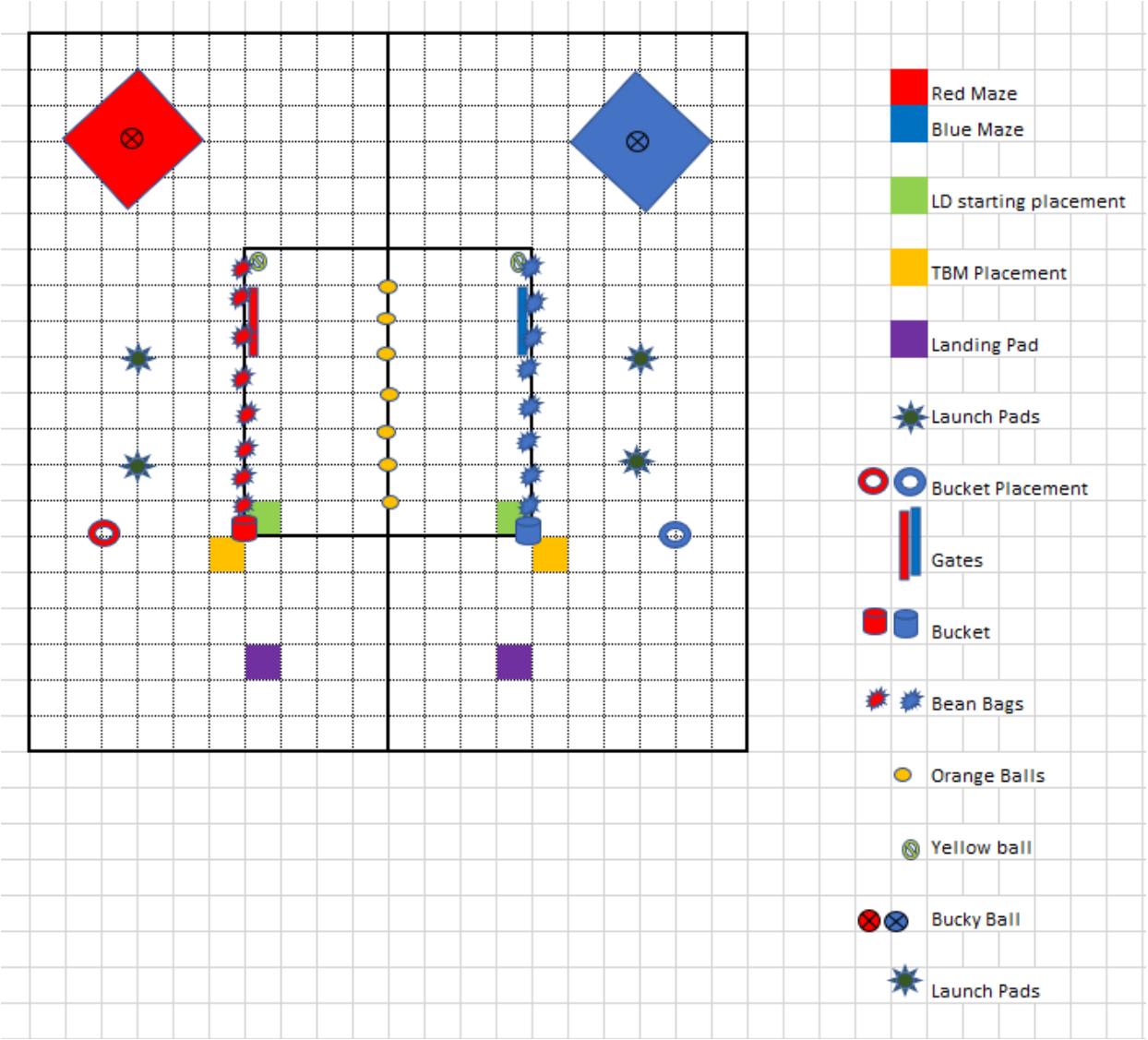
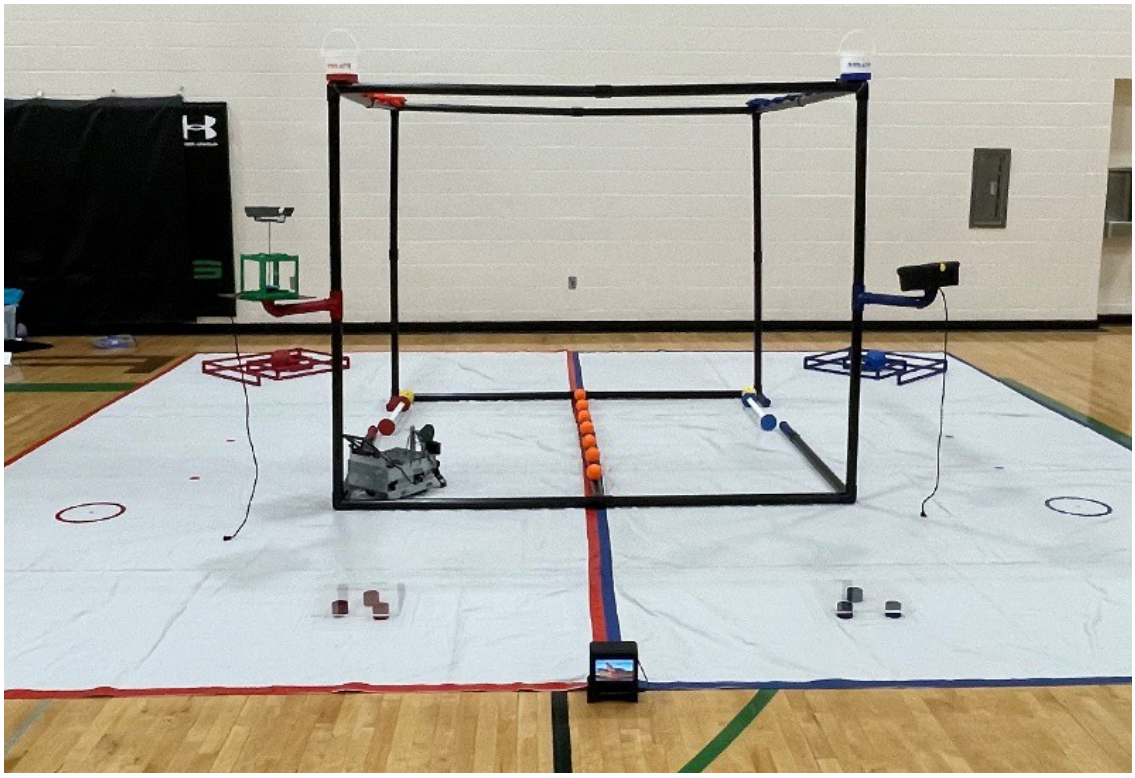


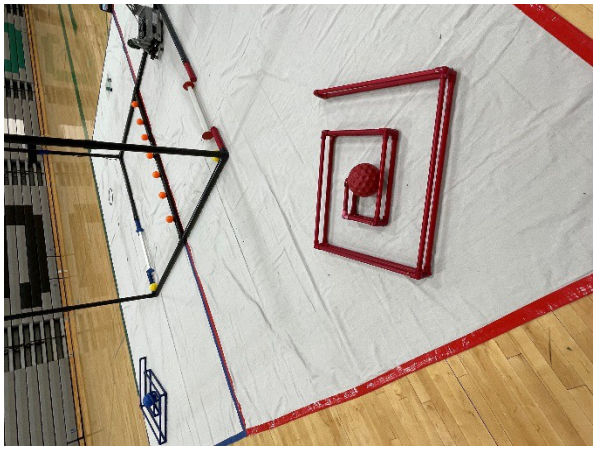
Photo Details of Game Objects and Placement:

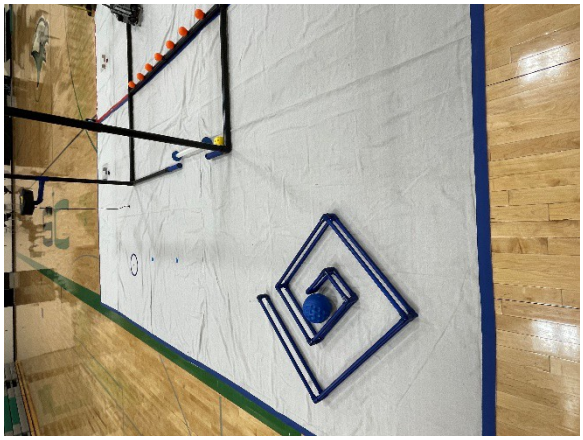
All descriptions will refer to distances from the edges of the playing surface as viewed from the audience. The RED is on the left and BLUE is on the right. Closest to the audience is the FRONT and furthest away from the audience is the BACK.



Maze

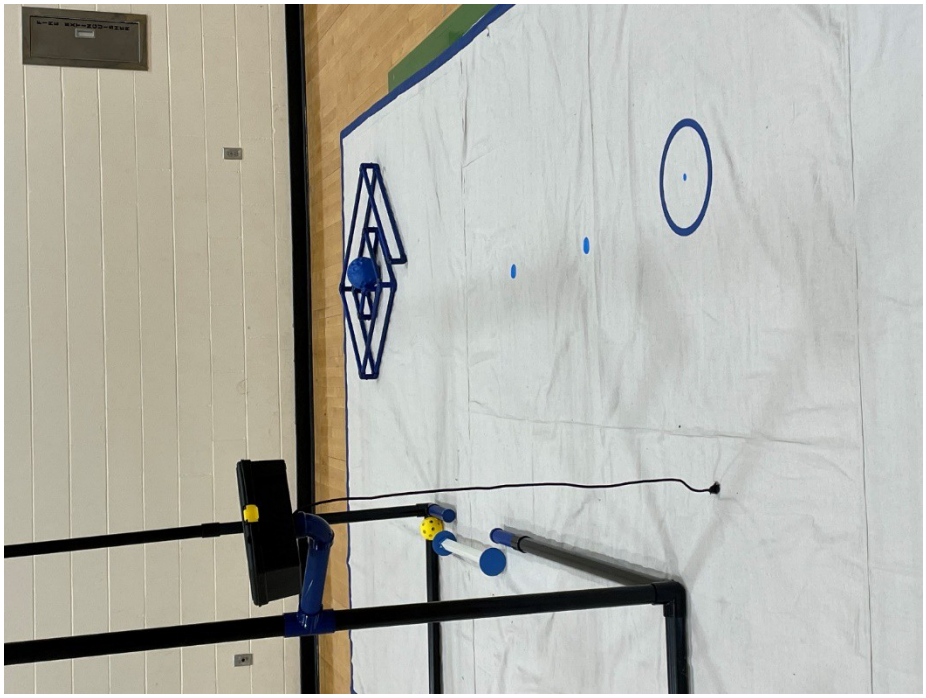
Each Maze is placed in the BACK corner (RED on the left and BLUE on the right) at an approximate 45 degree angle such that each corner is 12 inches from one side and 34 ½ inches from the other. The 'opening' of the maze points toward the GATE of the CORE.





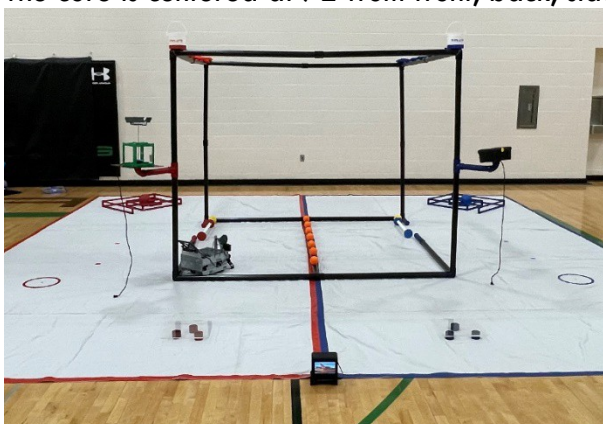
Launch Spots and Ring

The Launch Spots (2 RED and 2 BLUE) are placed on each corresponding side. The first is 42 inches from the side and 96 inches from front. The second is 42 inches from the side and 132 inches from the front. The center of Ring is 31 inches from the side and 72 inches from the front.



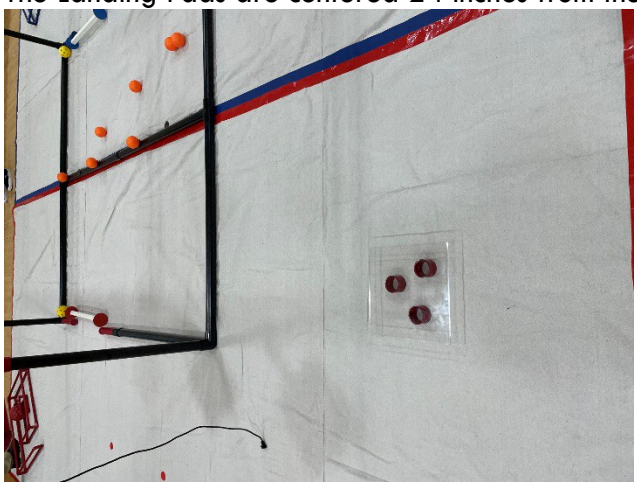
CORE

The core is centered at 72 from front, back, sides



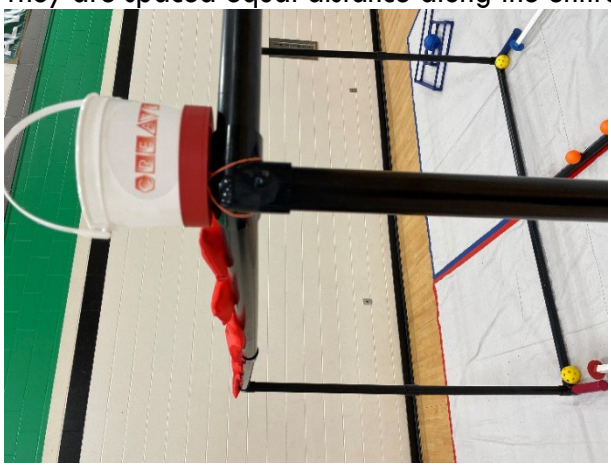
Landing Pads

The Landing Pads are centered 24 inches from the front and 36 inches from the center line.



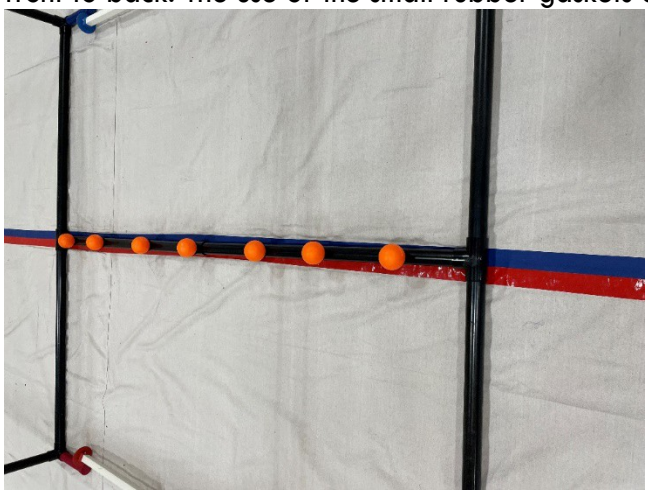
Bucket and Bags

The RED and BLUE Buckets start in a holder that is attached to the Front Corners of the Core at the top. The Bags are placed on the top of the Core on the side parallel to the RED and BLUE sides of the field. They are spaced equal distance along the entire length of the side.



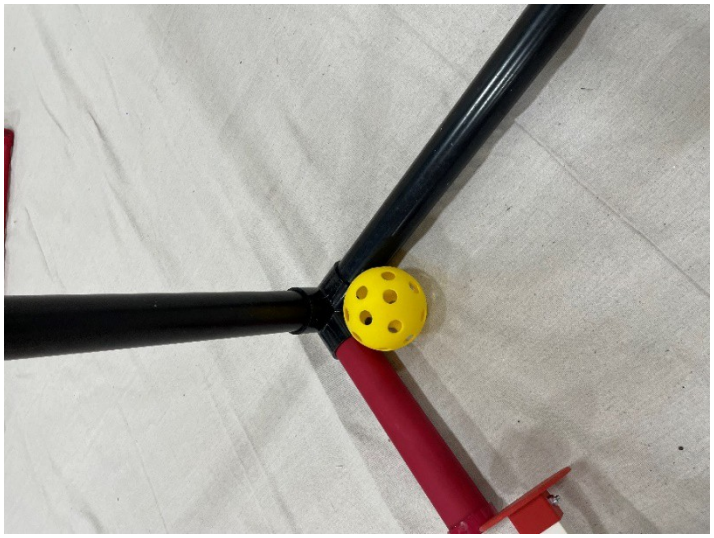
Orange Balls

The Orange Balls are placed on the pipe that divides the core on the floor. They are spaced equally front to back. The use of the small rubber gaskets ensure the balls stay in place.



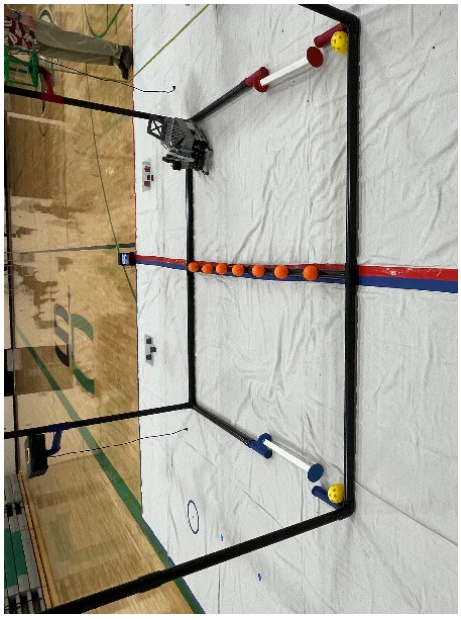
Yellow Ball

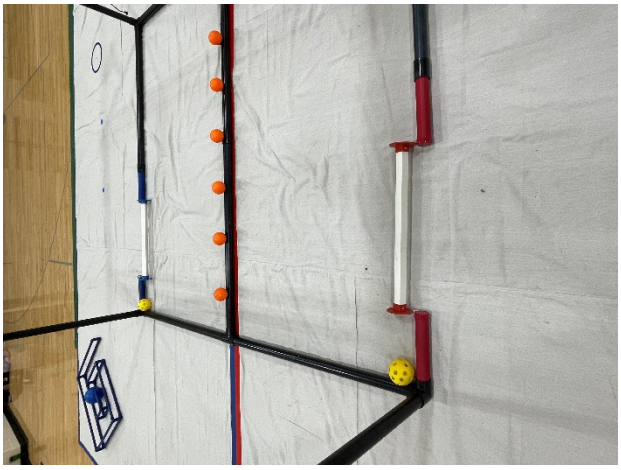
The two Yellow Balls are placed one in each back corner of the Core.



Gates

The gates are part of the perimeter of the Core which touches the floor. Gates are placed on the INSIDE of the Core, spanning the opening in the PVC of the Core.





TBM

The TBM is attached to the CORE on a PVC pipe that extends from the CORE approx. three feet from the ground.

2.3 - Game Rules

2.3.1 - Safety Rules

1. If at any time the drone's operation is deemed unsafe or has damaged the match arena, surface, core or game objects by the determination of the rudges, the offending team may be disqualified. The drone, add-on equipment and/or the team-built game mechanisms will require re-inspection before the team may match again.
2. No flying the aerial drone outside of your pit, practice arena, or competition arena. Flights in the pits should be limited to testing connection and stability.
3. If a drone becomes disabled in a match the pilot should shut down the drone immediately. Under no circumstances may a team member enter the arena while a match is in progress. The disabled drone can be retrieved after the match is over and the all-clear is given by a rudge.
4. Drones may not be flown at ANY TIME without all 4 blade guards appropriately attached. Any infraction of this rule may result in disqualification from a match(s) or disqualification for the entire event at the sole discretion of the head rudge.
5. Team-built game mechanisms and their operation must be deemed safe by rudges. Any such device deemed unsafe will require modification and re-inspection before being allowed to be used in the competition. Repeated or egregious infractions of this rule may result in disqualification at the discretion of the head rudge.

2.3.2 - General Game Rules

1. At the beginning of a match, each drone (land or aerial) may not

exceed a volume of 18 inches wide, by 18 inches long, by 18 inches tall. An offending drone will be removed from the match at the head rudge's discretion.
2. During a match only two pilots and one land drone driver are allowed in the pilot's station.
3. Only on-field team members are allowed in pre-placement of the drone or team-built game mechanism.
4. Only on-field team members are allowed in pre-placement of the land drone.
5. Team members are prohibited from making intentional contact with any game or field object. The first instance of intentional contact will result in a warning, with any following instances resulting in disqualification.
6. During a match, aerial drones may only be remotely operated by the pilots and land drones may only be operated by the Driver.
7. Drones must be designed to permit easy removal of game objects from any grasping mechanism without requiring the drone to have power after the match.
8. Field tolerances may vary by as much as +/-12". Teams must design their drones accordingly.
9. The CORE may have rules of engagement for land drones. Be sure to check out the game specific rules for land drones.
10. Pilots and drivers may not step out of the pilot's station.
11. No team members NOT in the pilot's box may assist in directing either land drone or aerial drone.
12. A maximum of three (3) people may be in the pilot's box and only if all three are driving or piloting.

2.3.3 - Air Lift Specific Game Rules

1. At the beginning of each match, the four aerial drones, two red and two blue, are placed on their respective launch pads.
2. One land drone per alliance may be used and if used must be positioned within the land drone starting area.
3. All remotes are placed on the floor prior to the start of a match. When the match begins the pilots may retrieve their remotes and start flying/driving their drones. Any pilot picking up their remote prior to the start of a match will be considered a false start and a false start penalty will be assessed. Repeated and/or egregious false starts may result in disqualification from the event at the discretion of the head rudge.
4. The Land Drone starts at the beginning of the Match. Remotes start on the Floor (like the Aerial Drone) and must be placed back on the ground (along with Aerial Drone Remotes) in order to stop the clock.
5. Air Lift's team-built mechanism will be a device that winds up a 48" length of rope, as detailed earlier in this document, so that no portion of the rope is visible from a rudge standing outside the arena. The device may be powered by compression, gravity or pneumatics only.

The entire mechanism may not exceed 18”x18”x18” when set in position. After the mechanism has been activated it can expand in an unlimited fashion, and must stay in one piece, keeping in mind safety rule 4.

6. Any land drone or aerial drone that strays far outside of it's designated area will be immediately disabled and will not be allowed to be used for the remainder of the match.
7. Anytime match affecting interference happens the impacted alliance will be offered the opportunity to rerun the match alone in the arena at the discretion of the rudges. This offer is optional and not required to be accepted by the impacted alliance.
8. Land Drone Restrictions:
    1. The land drone can roam any part of its alliance side, in the core or out. However, it CANNOT go outside of the tarped area. If even one wheel of the land drone goes off the tarp that land drone driver, when instructed by the rudge, will put down the remote and the land drone will be out for the remainder of the match. If the driver does not immediately comply the ALLIANCE will be disqualified. (The alliance agrees which land drone and driver to use, thus the entire alliance is disqualified.)
    2. Any incursion into the opposing alliances side may have similar consequences at the discretion of the rudge. If the incursion is slight and non match affecting it can be ignored, but that will be solely up to the rudge.
    3. The land drone may control only 1 orange ball at a time.
    4. The land drone may control only 1 bean bag at a time.
    5. The land drone may not move or control the bucket. (It is allowed to right (and adjust the handle) the bucket if knocked over, but it cannot control it to move the bucket.
    6. The land drone driver cannot pick up the land drone remote until an aerial drone has moved the “gate” separating the inside of the core from the outside.
9. Any orange ball that rolls off the tarp is out of play and is counted as on the side it rolled off of.

Section 3: The Tournament

3.1 - Overview

The ***CREATE Drones Challenge*** is played in a tournament format. Students as old as 12th grade are allowed to participate as well as younger students who are ready for this level of engineering challenge. Each tournament will include ***Solo Flights***, ***Qualification Matches*** and ***Finals Matches***. ***Practice Matches*** might be available at the tournament organizers discretion. The top ranked teams after qualification matches are over will invite other teams to join them in a permanent alliance in the finals portion of the tournament. The number of teams that advance to the finals matches will be determined by the event organizers. In addition to the competition portion of the event there are judged awards as well. These awards will range from technical knowledge, design, build quality, sportsmanship, and understanding of the engineering process.

3.2 - Tournament Definitions

Team Captain – A person chosen to represent their team.

Team Identification – A mandatory name tag or team shirt with the team number. This must be worn at all times so that Rudges, Queuing volunteers and other tournament officials can identify all members of the team, including coaches.

Solo Flight – Flight done by a single team. The flight will consist of take off from the launching pad, activation and hopefully successful task completion of the team built mechanism, and landing on the landing pad. This is a time-based flight. Teams will be ranked based upon time and bonus points earned. Flights are sixty seconds in length. If a team is unable to finish in sixty seconds or if their team-built game mechanisms fails to complete the assigned task, then the timed portion of their score will be zero. Any bonus points earned will make up their entire score.

Practice Match – An un-scored match used to provide time for teams to get acclimated to the official playing arena.

Qualification Match – A match used to determine the rankings for each team.

Finals Match – Matches used to determine the tournament champions.

3.3 - Registration and Inspection

The first thing a team must do is to register for the event at the registration table. Event specific information will be shared at this time. Teams must register prior to getting inspected. Once registered, teams should proceed to their pit table and get settled, then proceed to inspections. Inspections have multiple parts:

- ***Engineering Notebook:*** Each team will submit a bound engineering notebook when they register. Each notebook will have the team number clearly written on the outside front cover. All entries are to be done in pen. No erasing. Simply strike through, with a single line, any discarded ideas or diagrams. This notebook will be taken and reviewed, then returned to teams at the end of the interview. This engineering notebook may be used during optional/ad hoc, in-pit interviews with teams, at the discretion of tournament rudges. Not all teams are guaranteed these additional interviews, only those with superior notebooks or teams exhibiting superior technical ability/knowledge. Be sure to have your notebook available should a Rudge stop by your pit table.
- ***Drone Inspection:*** Each team is to have one Air Drone. It will be inspected to ensure compliance to all rules. All add-on parts/equipment that might be used in the competition must also be inspected and approved prior to teams being allowed to compete.
- ***Land Drone Inspection:*** Each team may have one and only one land drone. The land drone will be inspected to ensure compliance to all rules. All combinations and configurations of the land drone that might be used in the competition must be inspected and approved prior to teams being allowed to compete.
- ***Team-Built Mechanism Inspection:*** Each team may have at least one team-built mechanism designed to complete the team game task. They may have up to two TBMs if they so desire. It/they must be inspected to ensure compliance with all rules prior to a team competing.

  Any team that fails the Drone Inspection or the Team-built Mechanism Inspection will be required to fix any issues and be re-inspected prior to being allowed to compete.

  Any team that fails the Land Drone Inspection may choose to fix any issues and be re-inspected prior to being allowed to compete, or they may choose to compete without the land drone.

- ***Interviews:*** Once Drone, Land Drone and Team-Built Mechanism inspections have been passed, the process will move to the interview phase. Teams will use this opportunity to tell the story of their engineering journey to the inspector/judges. This presentation can focus on the drone, the land drone, the team-built mechanism, and their engineering notebook/engineering journey. Teams that are able to incorporate all of these elements into a 3 minute presentation will score higher than teams that focus on a subset of these areas.
- ***Judging:*** Information about teams will be collected throughout the inspection process as well as throughout the competition. All this information will be used in determining the winners of judged awards across a number of areas. See the Appendix of this game manual for a full list of awards.

3.4 - Practice Matches

At the event, practice matches may be played during the team registration time until the Pilots' Meeting begins. Practice matches are optional for teams. They will be run in qualification match format. If practice matches are offered at an event a practice match schedule might be provided, or be run on an ad hoc as requested, basis.

3.5 - Solo Flights

Solo Flights will be offered to teams on a first come, first served basis, after they have successfully passed inspection. The exact schedule will vary from event to event, so be sure to check the event schedule.

Please note that it is the ***responsibility of each team*** to come prepared and ready for Solo Flights. A certain amount of time, adequate for all teams to get the event partner specified number of attempts will be planned for in the event schedule. However if teams are not ready to participate and dead time occurs during that allotted time, some teams may find out that Solo Flight time has expired before they can get both of the attempts in. In this case it is NOT the responsibility of the event organizer to provide more time for Solo Flights. Get to registration early. Be ready to pass inspections. Get to Solo Flights as soon as they open. Ultimately it is up to each team to ensure they get their Solo Flights done.

Solo Flights consist of ONE Air Drone (Required), ONE Land Drone (Optional), and ONE TBM or substitute TBM.

Scoring for solo Flights is as follows:

Object	*Scoring Task*	*Points*
TBM	TBM Success	25 points
Bucket Moved	Bucket moved from starting position.	10 points
Bucket on Perch	Bucket placed on perch.	30 points
Bean Bags in Bucket	Bean bags in bucket	5 points each
Yellow Wiffle Ball	Remove the Yellow Wiffle Ball from the Arena (out of the field)	15 points
Doubler	Air drone landed on land drone when land drone fully inside the core.	Double all points
Object	*Time Tasks*	*Points*
Bean Bags	1. Eight bean bags must be knocked off their perch on the upper core support pipe.	Complete these two Tasks. Seconds left on the clock become points 60 Max
TBM	2. The Air Drone activates the TBM or a substitute TBM provided by the Event Partner	

	In order to take the time bonus, Air Drone remote and the Land Drone remote (if LD is present) is on the ground and the Air Drone and Land Drone are NOT moving.	
Object	***PENALTIES***	***Points***
PENALTY	Start Early	DQ
PENALTY	Fly/Drive Late	DQ

3.6 - Pilots' Meeting / Opening Ceremony

Just prior to the opening ceremony a mandatory pilots' meeting will be held. ***All pilots are to attend.*** All coaches and team members are encouraged to attend. At this meeting the Air Lift Challenge rules will be reviewed. There will be a time for Q&A from team members during this meeting. Event specific instructions will be reviewed at this time as well. Immediately following the pilots' meeting, the opening ceremony will be held. At this time all members of all teams, fans, spectators and officials are to be in attendance. Although the opening ceremony will be unique to each event, and event partner, CREATE encourages every opening ceremony to recognize any/all sponsors, identify and thank key volunteers, and remind teams that "Honor by Design" is an ideal worthy of all teams. Please build sportsmanship into each and everything you do. The opening ceremony will mark the beginning of the arena competition.

3.7 - Qualification Matches

A schedule of qualification matches should be available on-line at least 10 minutes prior to the first qualification match. Printed match schedules will be provided only on a needs basis. Randomly paired teams, joined in an alliance, will face off against another randomly paired set of teams in a match. Each team will receive the score of their alliance, unless disqualified, which will be made up of any time remaining on the clock and all bonus points earned. Teams will be ranked via their average match scores. All ties will be broken by using a team's highest individual qualification score. If still tied, then the second highest qualification score will be used, and so on.

Qualification Matches are a maximum of two minutes and twenty seconds in length. The clock will be set to 20 seconds if a pre-match phase is used and then 120 seconds. Time will count down from the beginning of the match. Once a match is over an alliance may optionally issue a challenge. (Challenges can range from their perceived malfunction of the course/game object, to interference by the other alliance. All challenges must be made prior to scores being finalized.) The rudges will then calculate the score for each alliance, asking each alliance to verify the score before making it final.

Challenges: If there is no challenge and the scores are agreed to by both alliances then the match is final. If there is a challenge, the challenging alliance must clearly specify the nature of their objection. The rudge will take into account their petition, confer with the other rudge if appropriate, and render a final decision. If the petition is upheld the challenging alliance will be given an opportunity to rerun their match. If the challenge involves interference by the opposing alliance, and that petition is upheld, then the interfering alliance will receive a score of zero for both teams. In this rare case the match will be pending until it is rerun. ***Please note that the ONLY members that may petition the rudges are the team members of the alliances that competed in that match.*** Rudges will be happy to answer questions, when time allows, from other team members or coaches, but under no circumstances will match results be overturned once teams have left the pilots' station.

Teams that do not have a functioning drone should attend matches even though they do not have a drone at the match. This is not only a courtesy to your alliance partner, but teams that attend matches will be awarded ranking points. Teams that do not attend matches will be disqualified from that match and will receive zero points for that match.

3.8 - Alliance Selection

Once qualification matches are over, all teams will be ranked based upon their average score per match. Top teams will be brought to the arena floor and in order will ask another team to join them in a permanent alliance. This will be repeated two more times until all alliances have 4 teams to compete in the Final Matches. When teams are considering who to ask to join them in their permanent alliance, not only should they consider a team's performance/ranking in the Qualification Matches, but also the Solo

Flight rankings. The number of alliance captains will be up to each event partner, but the following is recommended by CREATE:

16 team events – 4 alliance captains – All teams moving onto the Finals
24 team events – 4 to 6 alliance captains
36 team events – 5 to 7 alliance captains

A more detailed description of alliance selection can be found in section 1 of this manual. Once alliance selection has been completed there will be a brief 5-10 minute pause before Final Matches are started. Depending upon the schedule this pause may be longer at the discretion of the event partner.

3.9 - Final Matches

Final matches start with the lowest ranked alliance and proceed until the top ranked alliance has played a match. The second round of finals starts with lowest ranked alliance based on first round scores and proceeds to highest scoring/ranked alliance. Additional finals rounds may be held at the discretion of the Event Partner. The team with the highest match score of all Finals matches is the Tournament Champion. In the case of a tie, the higher seeded alliance is the Tournament Champion. Finals matches run 90 seconds with a 20 second pre-match phase for a total of 110 seconds.

3.10 - Awards / Closing Ceremony

Immediately after the finals match the Closing Ceremony will begin. All head-to-head competition awards, solo flight awards, and judged awards will be presented at this time. This will conclude the event, which we hope is a springboard for further education. See the appendix of this document for a full list of awards.

3.11 - Tournament Rules

1. Rudges have ultimate authority during the competition. ***Their rulings are final.***
   A. The rudges will not review any recorded replays.
   B. Any petitions for the rudges must be brought forward by a team member prior to leaving the pilots station.
2. The only people permitted by the arena are the two pilots and land drone driver.
3. Each team will be allotted ONE time-out of no more than three minutes. The time-out can only be called directly preceding a team's qualification or finals match and **cannot** be taken during a match.
4. The *qualification match* schedule will be available on-line no later than immediately after the pilot's meeting, or at least 10 minutes before the first match.
5. The qualification match schedule MAY NOT BE STRICTLY ADHERED TO. It should be viewed as a rough guide and no more. The schedule will be based upon a full two minute and 20 second match time. However, it is very likely that many matches may end sooner than 2 minutes and 20 seconds and the next match will start very shortly after a match ends. It is the intent to get teams as many qualification matches a possible in the allotted time. Moving ahead, sometimes well ahead, of the original schedule will assist with this. THEREFORE IT IS SOLEY UP TO EACH TEAM TO KEEP TRACK OF MATCHES AND TO GET TO THEIR MATCHES ON TIME.
6. All teams will be **scored** on ALL qualification matches they participate in.
7. When a team comes to the arena for a Solo Flight, Qualification Match or a Final Match they are allowed to bring one drone, one drone remote, one set of drone add-on equipment and one team-built game mechanism (if applicable) one land drone and one land drone remote. No additional batteries for either the drone or land drone or remotes are allowed and swapping batteries at the arena is strictly prohibited. Come prepared. Be sure your batteries are charged and your drone is ready for competition.

Section 4: The Drones and Team-Built Game Mechanism

4.1 - Overview

This section provides rules and requirements for the design and construction of any add-on components to your aerial drone, land drone, and to the team-built mechanism. Refer to Section 3.3 of this game manual for more information regarding inspection guidelines. The "CREATE Drone Inspection Checklist" can be found on the CREATE Drone Challenge game page of the CREATE website: www.CREATE-Programs.org.

4.2 – Aerial Drone Rules

Only unmodified DJI MINI SE or DJI MINI SE 2 drones are legal. Each team should have one working Drone, which has to pass inspection. Should a drone be damaged, disabled during a tournament a secondary drone may be used. Under no circumstances are two drones from the same team to be used on the same alliance. Teams violating this rule will be disqualified from that match. Repeated infractions may result in a team be disqualified from the entire tournament.

1. Any significant change to add-on equipment during the course of the tournament will require re-inspection.
2. Any other additional parts may be made for the drone as long as they are deemed safe by inspectors and the drone with all combinations of add-ons fits within an 18"x18"x18" box without exerting any pressure on the sides or top of the sizing box or sizing tool. Add-on equipment attached to the drone cannot be electronic, battery operated, or remotely controlled.
3. Drones may expand beyond their starting size constraints after the start of a match/flight.
4. Any restraints used to maintain starting size (i.e. zip ties, rubber bands, string, etc.) MUST remain attached to the drone for the duration of the match/flight.

4.3 - Team-Built Game Mechanism

The 2023-2024 game mechanism task will be to build a mechanism that is activated by an air drone and completely winds up a 48" length of 1/2" rope.

Game Mechanism Positioning:

- The TBM must be placed in/on the receiver approximately 3' above the ground. It is legal for the TBM to touch/rest on the vertical pole of the core the receiver is attached to. No part of the TBM may hang below the receiver, except the portion of the TBM that fits into the receiver. It is also legal for the TBM to attach the vertical pole of the core that the receiver is attached to.

Game Mechanism Set Up Time Limit:

- Teams should make every effort to build TBMs that can be set up quickly, in just a matter of seconds.
- Once all drones are ready for flight if there are any TBMs not set up the Rudge will begin a 30 second timer. Any TBM not set up within this 30 second limit will have to be

abandoned and thus may not be able to used in the match.

Team Built Game Mechanism:

- The game mechanism may be a maximum of 18”x18”x18”
- It may not have any battery power.
- It may not have any electronics or motors.
- All power must be stored kinetic energy such as compression (springs, rubber bands, etc), pneumatics (air only) or gravity.
- Mechanism must be activated directly by aerial drone only.
- Once activated the mechanism can expand beyond the initial 18”x18”x18” starting size.
- All safety rules apply to this mechanism.

Task:

- A 48” piece of 1/4” rope must be wound up inside the TBM such that the Rudge cannot see any portion of the rope from a standing position anywhere outside the arena.
- The rope will have a small knot on each end. The team must attach the rope to their TBM in such a fashion that at least some part of the rope touches the ground.
- The success of the TBM will be judged at the end of the match, not during the match.

Awards:

- The design and consistent successful functioning of this mechanism will be heavily considered in many of the judged awards. Clever design, consistent successful performance, and quality of build will all be factors that rudges will be looking for. (See the Appendix of this document for a full list of awards.)

4.4 – Land Drone Rules

1. Land drones must start no larger than 18'x18'x 18” at the start of a match.
2. A maximum of 6 motors may be used.
3. The land drone can be built our of any materials a team desires. So long as the build/materials pass all safety rules. Land drone must be built, not purchased. (I.E. No RC cars/trucks/etc.)
4. Pnuematics are allowed, but only unmodified VEX Pnuematics. No more than 2 air tanks.
5. One and only one control unit may be used.
6. One and only 1 battery, up to 12V may be used. Only batteries from VEX, VEX IQ, FTC or HOI approved batteries may be used.

4.5 - Additional Rules

7. Teams may be requested to submit to random inspections of their drones, add-on equipment, team-built game mechanisms, and/or land drone, at any time during the event at the discretion of the rudges. Failure to comply will result in disqualification.
8. Rudges or inspectors may decide that a drone, add-on equipment, or team-built game mechanism is in violation of the rules. In this event, the team in violation will be disqualified and will be barred from the arena until the equipment passes re-inspection. For more information on the inspection process please refer to section 3.3 of this game manual. The “CREATE Drone Inspection Checklist” can be found on the CREATE Drone Challenge game page of the CREATE website: www.CREATE-Found.org.
9. The following types of mechanisms and components are NOT allowed:
    A. Those that could potentially damage playing field components.
    B. Those that pose an unnecessary risk of entanglement.

10. All drone add-on equipment, land drones, and team built mechanisms are to be built by the students. Adults, coaches, parents, mentors are to be facilitators, offer suggestions, teach and guide. We understand that each student is unique and their learning facilitated by different styles which may benefit from varying levels of assistance. For instance, if a child cannot remove a stripped bolt it is perfectly acceptable for an adult to do that for the student. If a student has never seen a particular mechanism it is a great learning experience for the student to build it with an adult. However any mechanism that is in ANY significant way built by an adult should be dis-assembled and re-assembled by the student(s). It is very important that the students understand their equipment and are able to fix it during the tournament as adults are not to assist in any capacity, except to help remove stripped bolts or where safety is involved. Teams with adults acting in discord with this rule will be removed from consideration for judged awards. Repeated and/or egregious infractions may result in a team being disqualified from the tournament.

Appendix: Awards

A.1 - Overview

This section describes the awards for the CREATE Drone Challenge. It also describes the format of judging and offers helpful hints for teams to be used in preparation.

A.2 - Types of Awards

There are three types of awards given to teams competing in the CREATE Drone Challenge:

On-Field Awards - Based solely on the scores obtained on the field.

Judged Award - Based solely upon the scores received in the judged portion of the competition.

Hybrid Award - Based on the combination of on-field performance, the judged portion of the competition, and social interaction throughout the tournament. Teams must do well in both the On- Field and Judged Award categories.

A.3 - Judging

Judging is done throughout the day. It is done formally and informally by rudges and event officials as they watch your team's interaction with event officials, rudges, other teams and fans, and how you relate to members within your team.

Team judging is offered to every team attending a CREATE Drone tournament. It has a formal structure as follows:

- ***Team Presentation –*** During the first three minutes time your team will have an opportunity to present to the judges. Your focus can be your team-built mechanisms, how they work, and/or your engineering journey. You will be judged on presentation skills and technical knowledge.
- ***Questions –*** During the next 3 minutes scripted questions as well as specific inspector/rudge questions will be asked.

A.4 - Helpful Hints

Awards are based upon each team's performance throughout the entire day. Please keep in mind that everything you do says something about you and your team. Judges and event officials will be with you in the pit area, playing field and all the common areas. The following are characteristics of winning teams:

- Respectful - Respectful of each other, other teams, officials and everyone at the tournament.
- Enthusiastic - Enthusiasm is contagious. Great teams have plenty of it and spread it around!
- Focused – Everyone on your team should have a role to play and should take their role seriously.
- Knowledgeable – Each member of your team should have a good understanding of your drone, drone add-on equipment and team built game mechanism. They should know how team built components were constructed and what decisions were made in the final design of these mechanisms.
- Each team member contributes to the presentation and to answering questions. It is perfectly

acceptable to have one team member (student) lead the presentation. However the best teams are careful to make sure that every member of their team has a part in the presentation.

- Engineering notebooks are VERY helpful for the judges in team judging. Teams are strongly encouraged to spend the time to write a first-class engineering notebook. A well-written engineering notebook, which details not only your designs, both rejected and accepted, but also your journey as a team, will be looked on very favorably by the judges. A log of practice flight time will be viewed positively by the Rudges. (These logs usually include start/stop time of the practice session, the skill being practiced, and the initials of the pilot. Often these logs are kept in the back of the engineering notebook.) The notebook is also an excellent way to prepare for your interview as it helps you remember things that happened throughout the year and organizes your thoughts. Please keep in mind that all elements of the notebook are to be done by the students.
- Well run teams have coaches and mentors that understand that their role is to be a facilitator. During the interview all questions should be answered by the students only, unless specifically directed to a coach/mentor.

A.5 – Awards List / Description

NOTE: Not every award is offered at every competition. Awards are up to the Event Partner.

Honor Award - This is the highest award presented in a CREATE Drone tournament. The recipient of this award is a team that excels in all aspects of competitive drones. On field performance, technical knowledge, interviews and interaction with all teams, fans and tournament officials will be taken into consideration in determining the winner of this award. The Honor Award is heavily weighted toward technical innovation, fair play and collaboration.

Build Award - The "Build" award will be given to a team that has built an impressive machine, with attention to features and safety. Judges will look for beautifully crafted and constructed Air drones/Land drones/TBMs that also show a clear dedication to safety and attention to detail. These Air drones/Land drones/TBMs will have a professional feel and quality look to them, with clear attention to quality in construction.

Design Award - The "Design" award is presented to a team that demonstrates an organized and professional approach to the design process, project management, time management and team organization. The winning team will be able to describe how they created and implemented an efficient and productive design process to effectively manage their time and resources to accomplish their project goals.

Key Criteria:

1) Engineering Notebook is a clear, complete document of the team's design and build process.

2) Team is able to explain their design and strategy throughout the season.

3) Team demonstrates personnel, time and resource management throughout the season.

4) Teamwork and interview quality.

Energy Award - The "Energy" award will be decided based on team enthusiasm at the event. The winning team will demonstrate enthusiasm throughout the competition – in the pit area, on the field, in the audience, when their drone/robot is playing and when it's not. This award will be judged and decided by the volunteers and staff at the event.

Innovate Award - This award is given to the team with the most innovative solution to the current year's challenge. Innovation is judged at multiple levels: 1) Highest level - Building non-kit or predominantly non-kit based Land drones which address the challenge in an effective and innovative way, 2) Intermediate level - Introducing additional components, (structural parts, motors, controllers, sensors) to predominantly kit based Air drones/Land drones/TBMs in an effective and innovative way, and 3) Base level - Using kit based parts/equipment in an effective and innovative way. Custom built parts, effective performance and innovative design are key attributes assessed for this award.

ACE Champion - Presented to the # 1 ranked team in the Drone Solo Flight Competition.

ACE Finalist - Presented to the #2 ranked team in the Drone Solo Flight Competition.

Sportsmanship Award - The "Sportsmanship" award will be presented to a team that has earned the respect and admiration of the volunteers and other teams at the event. This team is a model for all to follow and interacts with everyone in a positive, respectful and polite manner. This award is judged during the event by teams, referees and volunteers.

Tournament Champion - Presented to the winning alliance of the Open Robotics Competition tournament.

Tournament Finalists - Presented to the runner-up alliance of the Open Robotics Competition tournament.

A.6 - "Honor by Design"

Honest – Follow the spirit of the rules of the competition. Do "what's right" when no one is

looking.

Competitive – Always give your best. Be humble in victory and gracious in defeat. Be respectful of your teammates, coaches and mentors, competitors, judges and spectators.

Collaborative – Act in the best interest of the team's goals and be supportive of your fellow teammates. Share knowledge, tools, and parts with other teams.

Leader – Encourage, praise, involve and constructively challenge your teammates.

Professional – Works hard and is determined. Overcomes obstacles. Is well trained and acts in a professional manner.