

BUILD-FLY-CODE

COMPETE

WHERE COMPETITION MEETS THE CLASSROOM.



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FOR THE WIN
ROBOTICS

BUILD-FLY-CODE "COMPETE"



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WHAT IS

BUILD FLY CODE COMPETE

BUILD FLY CODE
COMPETE



- Build Fly Code Compete is a cutting-edge STEM and workforce readiness program that transforms the classroom into a 5-week drone education and competition pathway.
- Students engage in career-focused challenges to Build, Fly, Code, and Compete against peers nationwide, preparing them for the next generation of opportunities.
- Teams will have the chance to showcase their skills in five unique challenges, each designed to test different aspects of drone mastery. Scores for each challenge will be recorded and displayed on a centralized leaderboard. Teams are recommended to consist of 3-5 students, fostering collaboration and teamwork.
- This dynamic format ensures an engaging and competitive experience that integrates STEM learning with practical, real-world applications.
- Each challenge is structured to accommodate four teams per station, allowing up to 20 teams to participate in total. These challenges encompass manual and autonomous drone piloting as well as leveraging Hopper's onboard camera for mission objectives.

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REQUIRED MATERIALS

HOPPER

Through secure, proprietary and cutting-edge US technology, Hopper makes STEM and computer science learning accessible and engaging at a whole new level. With an impressive sensor array and computer vision technology, Hopper is designed to be robust, reusable and scalable for years, and to help students learn how to solve simulated real-world problems in the classroom. Hopper was named after Grace Murray Hopper, an icon FTW holds in high regard.

BUILD FLY CODE ACTIVITY SET

The Build Fly Code activity set contains 4 multi-use towers and 9 custom landing pads. This combination provides all assets required to bring the Build Fly Code activities to life in your classroom.

BUILD FLY CODE PLATFORM ACCESS CODE

Build Fly Code (BFC) is a learning platform comprised of drone hardware and software, computer applications, evergreen content, competition, community and connection, providing experiential hands-on STEM and computer science education for all students, powered by Hopper®.

MEET HOPPER



SPECIFICATIONS

Dimensions - 7in x 7in

Weight - 65g with battery, 50g without

Max Range - 150ft

Max Height - 15ft

FAA - Category 1 Drone (weight < 250g)

Compliance - SECTION 889 of the John S. McCain National Defense Authorization Act (NDAA)

Connectivity - WiFi, Bluetooth

Product Usage - Indoor Only (Outdoor use not recommended)

HARDWARE

Inertial Measurement Unit (3 Axis Accelerometer and 3 Axis Gyro)
3 Axis Magnetometer
24 Bit Color Sensor
2MPixel Articulated Camera (Forward-Facing Or Downward-Facing)
Infrared (IR) Sensor Array For Remote Temperature Sensing
Pressure Sensing Altimeter Sensor
Temperature Sensor
Flow Sensor
Time Of Flight Range Finder For High Accuracy Height Above Terrain Measurements
WiFi Radio
Bluetooth Radio

SOFTWARE

Flight – Flight Control
Telemetry - Measurement Readings Delivered Via WiFi (Examples: Flow Sensor, Speed, Acceleration, Altitude, Camera, IR Sensor)

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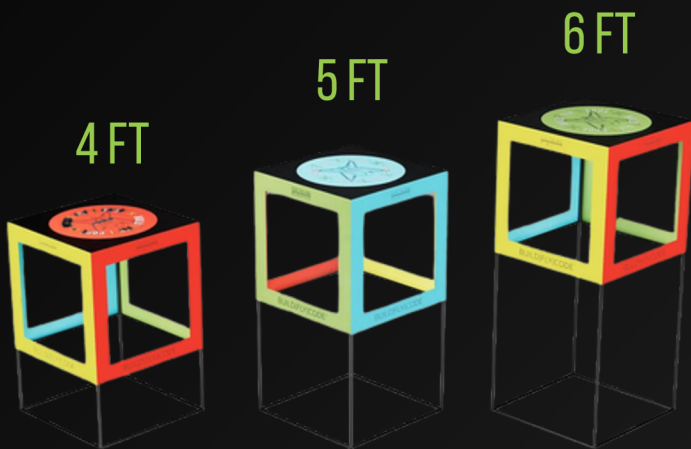


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BUILD FLY CODE ACTIVITY SET

The Build Fly Code activity set contains 4 multi-use towers and 9 custom landing pads. This combination provides all assets required to bring the Build Fly Code activities to life in your classroom.

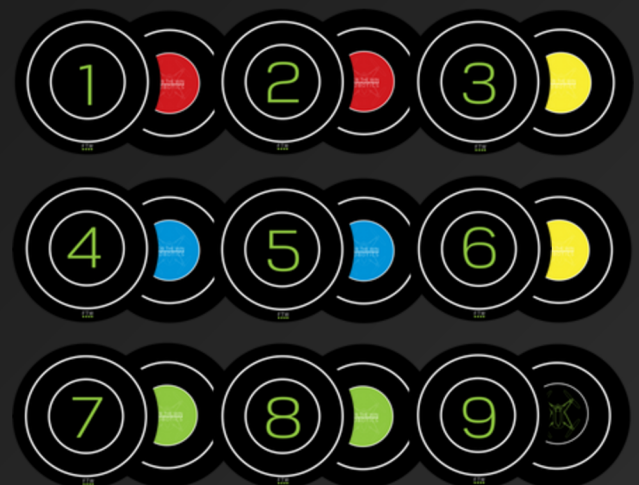


TOWERS

- Adjustable heights of 4, 5, 6 feet
- Each tower is adorned by color-coded sides in Red, Green, Blue, and Yellow
- A closed-off top ensures smooth landing and takeoffs
- The tower base measures 32" x 32", with openings of 24" x 24"

LANDING PADS

- Dual-sided functionality for maximum utility
- Numbered 1-9 on the front side for clear identification
- The back side features color coding with 2 pads each in Red, Green, Blue, and Yellow, and 1 Black pad for multi-use
- Foldable design enables hassle-free storage in the included cases
- Diameter of each pad is 31" for ample landing space



BUILD FLY CODE

PLATFORM ACCESS

Build Fly Code (BFC) is a learning platform comprised of drone hardware and software, computer applications, evergreen content, competition, community and connection, providing experiential hands-on STEM and computer science education for all students, powered by Hopper®.

With content inspired by STEM and Career Technical Education (CTE) pathways showcasing real-world applications in fields such as search and rescue, aerial surveillance, precision delivery, first response and entertainment, the BFC curricula enhances the skills necessary to support the vast and growing number of industries impacted by drones.

Within the platform, you'll find the Compete Manual, a detailed guide that breaks down each challenge step-by-step. This manual covers everything from game objectives and rules to scoring mechanics and strategy tips, ensuring you're fully prepared for every aspect of competition. In addition to the manual, you'll gain exclusive access to STL files for all challenge components.

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BUILD-FLY-CODE
"COMPETE"

EMERGENCY
RESPONSE
LESSON 1

BUILD-FLY-CODE
"COMPETE"

EMERGENCY
RESPONSE
LESSON 2

BUILD-FLY-CODE
"COMPETE"

EMERGENCY
RESPONSE
LESSON 3

BUILD FLY CODE

CHALLENGE COMPONENTS

Inside the Build Fly Code Platform, you will find the STL files for the challenge components required for Build Fly Code Compete.

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BUILD-FLY-CODE
"COMPETE"

CHALLENGE
COMPONENTS



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BUILD FLY CODE COMPETE

FLY CHALLENGES



EMERGENCY RESPONSE

This flying challenge simulates real-life drone-assisted firefighting missions, where drones are deployed to hazardous areas to help extinguish fires. Using the hand controller or FTW Fly, teams will pilot their Hopper drones to "collect water" and extinguish simulated fires in burning towers. This scenario mirrors how emergency services use drones to access otherwise unreachable areas and provide critical support in firefighting efforts.



CROP CARE

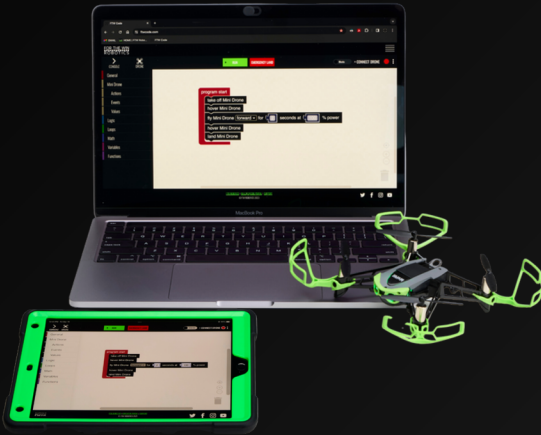
This challenge simulates real-world agricultural practices where drones are used to monitor and treat crops efficiently. In this head-to-head competition, teams will pilot their Hopper drones to identify and treat crop areas, working collaboratively to ensure precise navigation and effective decision-making. This challenge incorporates both the hand controller and the video stream through FTW Fly.



BUILD FLY CODE COMPETE

CODE CHALLENGES

BUILD FLY CODE
COMPETE



PACKAGE DELIVERY

As drones become increasingly relevant in logistics, this challenge reflects real-world drone delivery applications. Teams will demonstrate how Hopper drones can address delivery challenges using custom code written on the FTW Code platform. The goal is to simulate small package deliveries, showcasing how drones can optimize delivery routes.



SITE INSPECTION

This coding challenge replicates the real-world use of drones for infrastructure inspections, such as monitoring bridges, buildings, and power lines. Using Hopper's camera and FTW CODE, teams will program their drone to autonomously fly over four towers and inspect them for hidden logos. This scenario reflects real-world safety and structural inspections where drones collect visual data from hard-to-reach areas.



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BUILD FLY CODE COMPETE

FLY & CODE CHALLENGES



SEARCH AND RESCUE

This challenge combines both flying and coding to simulate real-world scenarios where drones locate and rescue objects in hazardous environments, such as after natural disasters. Teams will use a single drone to first identify hidden objects with the camera and then program it to autonomously fly to the corresponding tower, hover for 5 seconds to simulate a rescue, and return to their launch pad.





GLOSSARY

LANDING PAD

- A designated area where Hopper may takeoff from or land on.

ACTIVITY SET TOWER

- A designated structure in the challenge that Hopper may fly through or land on.

FTW CODE

- The custom programming platform used to fly Hopper during autonomous flight.

REMOTE PILOT IN COMMAND (RPIC)

- The team member responsible for manually flying Hopper with either the hand controller or the FTW Fly app.

VISUAL OBSERVER (VO)

- Team member who maintains visual line of sight with Hopper at all times while instructing the pilot.



GLOSSARY

AUTONOMOUS FLIGHT

- Hopper is flown without live team support using FTW Code website or IOS iPad app.

MANUAL FLIGHT

- Hopper is flown with live team support using the hand controller or the FTW Fly app.

SUCCESSFUL LANDING

- A landing where all four of Hopper's feet are inside the correct land pad.





OFFICIAL RULES

PROHIBITED ACTIONS

MANIPULATING ASSETS IN THE FLIGHT ZONE

- Teams are strictly prohibited from altering, interfering with, or relocating any assets, obstacles, or objects within the designated flight zone during the competition.
- Under no circumstances may teams interfere with or manipulate another team's drone, equipment, or programmed flight paths. Any such action will result in immediate penalties or disqualification.

DAMAGING ASSETS IN THE FLIGHT ZONE

- Intentional or reckless actions that result in damage to any assets, including but not limited to towers, landing pads, or competition equipment, are strictly prohibited.
- Accidental damage due to improper drone operation may also incur penalties based on severity and context as determined by the referees. Any team found to be intentionally damaging assets will face immediate disqualification from the event.

UNAUTHORIZED ENTRY INTO THE FLIGHT ZONE

- Team members must receive explicit approval from a referee before entering the flight zone, whether for drone retrieval or any other reason.
- Unauthorized entry into the flight zone will result in a warning for the first infraction. Subsequent violations may lead to penalties or team disqualification.

OFFICIAL RULES

PROHIBITED ACTIONS

BUILD-FLY-CODE
COMPETE



TAMPERING WITH EQUIPMENT

- Teams are prohibited from tampering with competition-provided equipment, including drones, controllers, or software platforms (e.g., FTW CODE or FTW Fly).
- Teams caught tampering with their own or another team's equipment will face immediate disqualification.

UNSPORTSMANLIKE CONDUCT

- All participants must demonstrate respect and good sportsmanship toward other teams, referees, and event staff.
- Unsportsmanlike conduct may result in warnings, penalties, or disqualification.

VIOLATING COMPETITION RULES

- Teams must adhere to all competition rules and specific challenge guidelines. Refusal to comply with referee instructions or deliberate rule violations will result in penalties or disqualification.

SAFETY VIOLATIONS

- Teams are responsible for ensuring the safe operation of their drones. Reckless flying that endangers other participants, referees, or spectators is prohibited.
- Any incident deemed a safety risk by referees may result in an immediate stop to gameplay and potential penalties or disqualification.

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"COMPETE"



OFFICIAL RULES

SAFETY GUIDELINES

IN THE EVENT OF A MALFUNCTION OR CRASH, TEAMS MAY PERFORM NECESSARY REPAIRS UNDER THE FOLLOWING CONDITIONS:

SAFETY FIRST

- Teams may only approach their drone if the flight zone is deemed safe, and there is no risk to other participants or drones.
- The referee or competition staff must confirm that it is safe to enter the flight zone.
- All Safety measures must be strictly adhered to at all times to avoid risks to participants or equipment.

PERMITTED REPAIRS

- Teams are permitted to perform the following troubleshooting steps on their drone during the competition while time continues:
 - **Battery:** Replace or reconnect the battery if it has come loose or is malfunctioning.
 - **Connection:** Reestablish connection with the drone via FTW Fly, FTW Code, or the hand controller.
 - **Components:** Inspect and secure any loose motors, propellers, or propeller guards to ensure the drone is operational.
- It is important that all repairs are completed within a reasonable time frame to avoid delays in the competition.

OFFICIAL RULES

SAFETY GUIDELINES

BUILD·FLY·CODE
·COMPETE·



DRONE FLIGHT ZONES

- Drones may only be flown within the designated flight zones
 - Repeated violations of this rule may result in penalties or disqualification.

REMAIN IN DESIGNATED STATIONS

- Pilots and visual observers are required to stay outside of the flight zone at all times unless instructed otherwise by a referee.

MAINTAIN DRONE CONTROL

- If a referee identifies a safety concern such as a loss of control, or a drone flying too far outside of the flight zone, the referee will issue an immediate command to ground the drone.

PREFLIGHT DRONE INSPECTION

- All drones must undergo a preflight inspection before each match to ensure structural integrity and operational safety.

PERSONAL SAFETY

- Safety Glasses
 - All team members must wear safety glasses while in or around the flight zone.
- Situational Awareness
 - Students must maintain situational awareness at all times.



BUILD FLY CODE COMPETE

PRE-FLIGHT CHECKLIST

BEFORE FLYING, STUDENTS MUST CONDUCT THE FOLLOWING CHECKS TO ENSURE THE DRONE IS IN PROPER CONDITION:

PROPELLERS

- Securely attached to the correct motor
- Not damaged (replace if necessary)

PROPELLER GUARDS

- Securely attached to the airframe
- Not damaged (replace if necessary)

AIRFRAME

- Not damaged
- All four feet installed

MOTORS

- Fully seated in the airframe
- Wires properly tucked away

BATTERIES

- Fully charged

FLIGHT ZONE

- Clear of obstacles and safe for flying

SAFETY GLASSES

- Worn by all participants at all times



BUILD-FLY-CODE

 EMERGENCY RESPONSE 

EMERGENCY RESPONSE



OVERVIEW

This flying challenge simulates real-life drone-assisted firefighting missions, where drones are deployed to hazardous areas to help extinguish fires. Using the hand controller or FTW Fly, teams will pilot their Hopper drones to "collect water" and extinguish simulated fires in burning towers. This scenario mirrors how emergency services use drones to access otherwise unreachable areas and provide critical support in firefighting efforts.

MATERIALS

- 4 Activity Set Towers
- 4 Landing Pads
- 4 Hoppers
- 4 Controllers/FTW Fly Devices
- 12 Challenge Components per Team



EMERGENCY RESPONSE



SETUP

FLIGHT ZONE

- Tape out a 20ft x 20ft flight zone to set up the challenge.
- Mark visual observer zones by placing a 2ft piece of tape perpendicular at each midpoint (10ft) of the flight zone.
- The pilot box shall be a 2ft x 2ft box directly behind the landing pad.

TOWERS

- Position four towers within the zone, each at a height of 6ft.
 - *Ensure the color and orientation of each tower aligns with the illustration on the next page.*
- Place each tower so that it is centered along each 10ft edge, ensuring a 30-inch clearance between the tower's outer edges and the boundaries of the flight zone.

CHALLENGE COMPONENTS

- Attach 3 challenge components (representing the 3 fires) evenly spaced along the vertical pole on each side of the tower (12 total per tower), ensuring they match the color of the corresponding side.

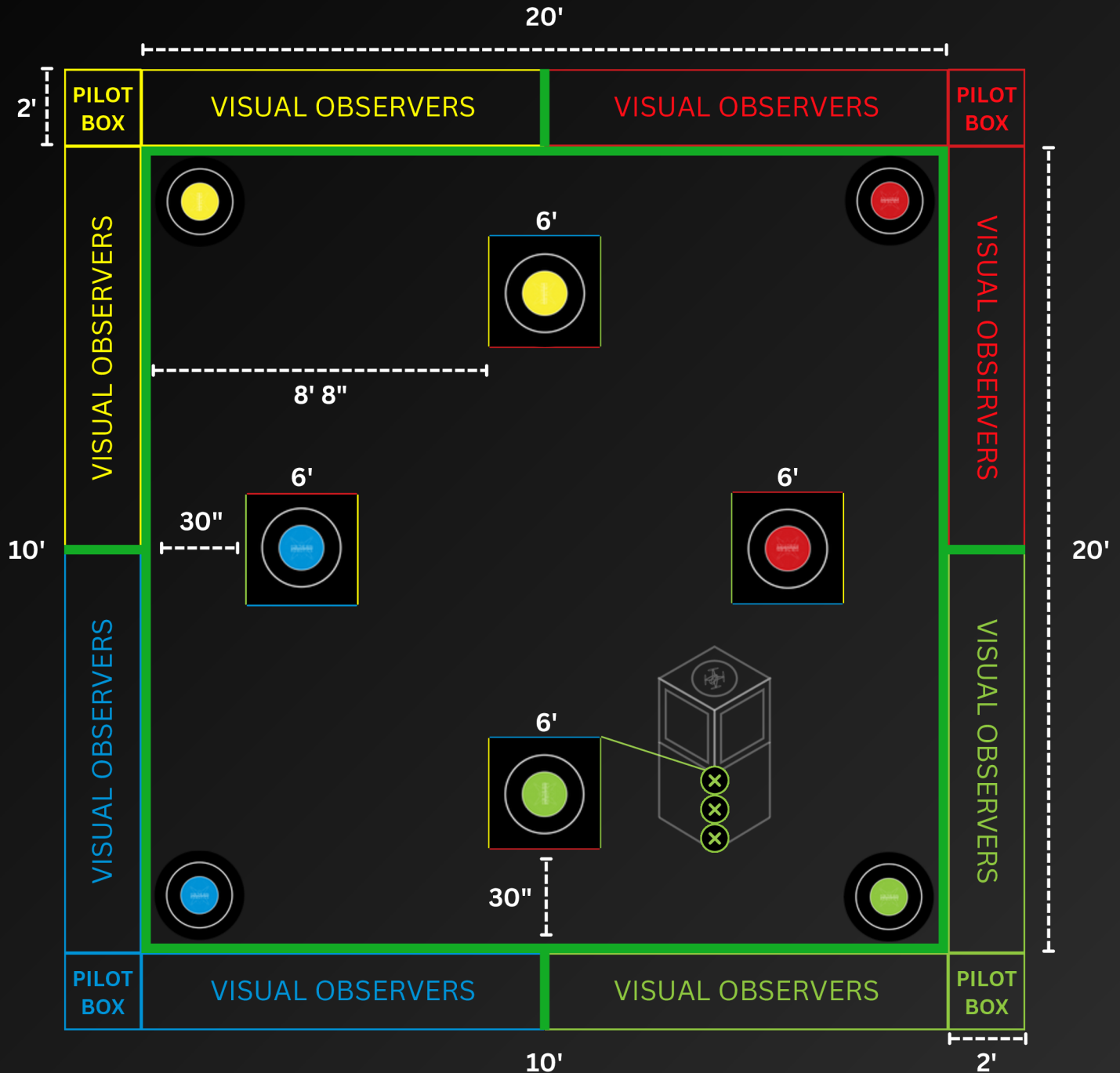
LANDING PADS

- After the towers are positioned, place each landing pad flush with the flight zone boundaries in its designated corner.
 - *Ensure landing pad colors align with the illustration on the next page.*

EMERGENCY RESPONSE



SETUP



EMERGENCY RESPONSE



GAMEPLAY

OBJECTIVE

- Teams will use Hopper to extinguish three fires per tower by flying through the tower and returning to their landing pad in a single continuous sequence.

STARTING POSITIONS

- Hopper shall begin on the team's designated landing pad.
- Visual observers shall be positioned in their designated boxes (10ft along each side).
- The RPIC shall be positioned in the pilot box.

EXTINGUISHING A FIRE

- Begin by taking off from the landing pad.
- Navigate Hopper to a tower and enter through the team's color.
- Once inside the tower, descend and exit through the bottom.
- Return Hopper back to the landing pad and land successfully.

CHALLENGE COMPONENT REMOVAL

- If Hopper successfully lands back on the landing pad, a referee will remove one component from the tower to indicate the fire has been successfully extinguished.

REPEAT THE PROCESS

- Continue this sequence until all flames have been extinguished, or time runs out.

EMERGENCY RESPONSE



RULES

EXTINGUISHING A FIRE

- A fire is not considered extinguished if:
 - The drone crashes.
 - The drone enters the tower through the wrong color entrance.
 - The drone does not successfully return to the landing pad.
- Teams must start again if the fire is not considered extinguished.

PILOT REQUIREMENTS

- Three different team members shall be a pilot for one round.
 - This ensures all team members participate actively in the challenge and perform different roles.

DESIGNATED ZONES

- Pilot's must remain in the pilot box at all times.
- Visual observers must remain within their designated areas at all times.

DRONE RETRIEVAL

- One visual observer will act as the designated runner.
- The runner is responsible for retrieving the drone in the event of a crash, or if the drone does not return to the landing pad.
- The runner must first get approval from a referee before entering the flight zone.

EMERGENCY RESPONSE



SCORING

ROUND LENGTH

- There shall be 3 rounds that last 10 minutes each.
- Teams must extinguish all 12 fires as quickly as possible.

TIME RECORDING

- If a team extinguishes all 12 fires within 10 minutes, their time will be recorded and used for scoring.
- If a team does not extinguish all fires within the time limit, their time will default to 10 minutes.

FINAL TIME CALCULATION

- The average time of all team members' rounds shall be used as the team's final score for ranking purposes.

POINT ALLOCATION

- Points are awarded based on the team's performance compared to others.
- For example, if there are 12 teams:
 - The team with the fastest time earns 12 points.
 - The second-fastest team earns 11 points, and so on.
 - The slowest team earns 1 point.

EMERGENCY RESPONSE



SCORING

SCORING SHEET

- **Teams**
 - Begin by filling out the first column with each team name.
- **Transfer Times**
 - At the end of each round, transfer the recorded times for each team from the scorecard to the scoring sheet.
- **Calculate Average Times**
 - After the third round, calculate the average time for each team.
- **Assign Points**
 - Rank the teams from fastest to slowest based on average times.
 - Distribute points accordingly, with the fastest team earning the maximum points.

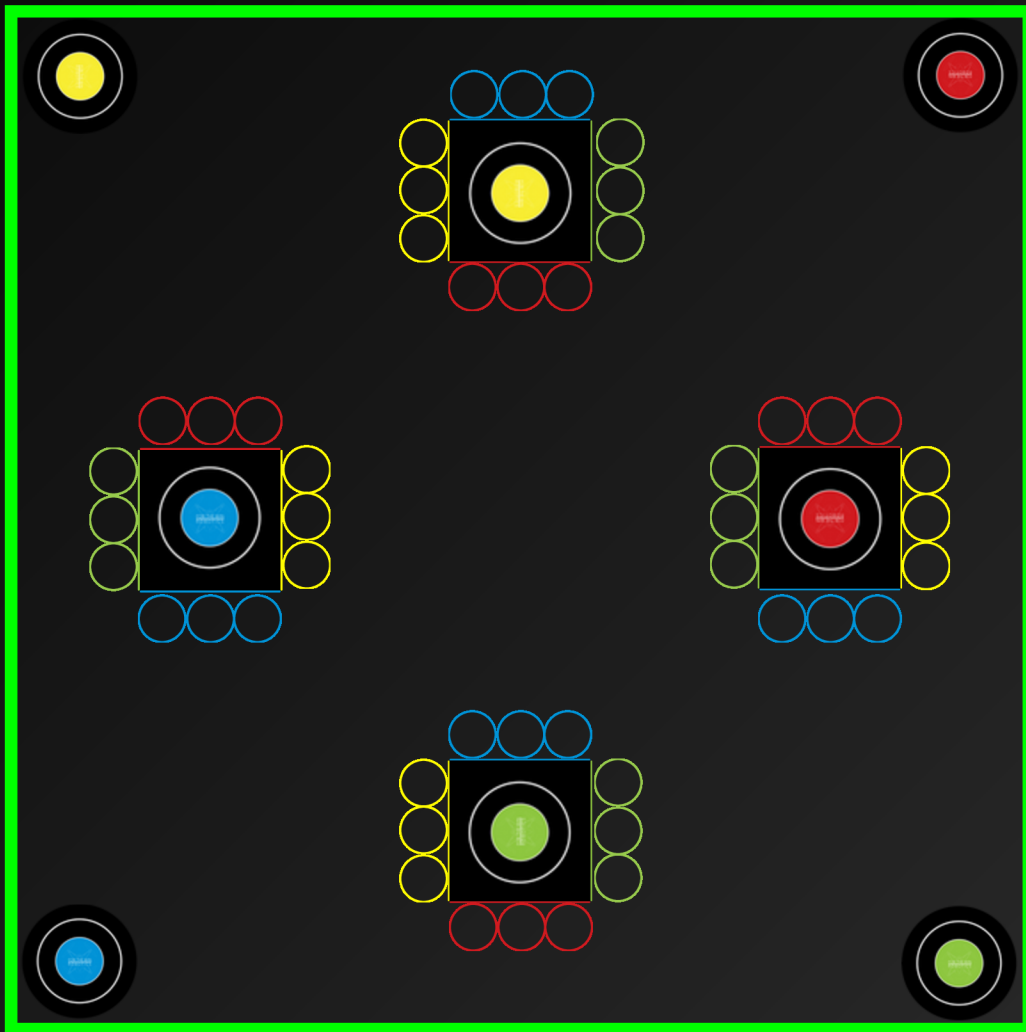
SCORECARD

- **Marking Fires Extinguished**
 - Each tower has three circles per team (12 total per tower).
 - For every fire extinguished, mark one circle for the corresponding team near the tower where the fire was extinguished.
- **Recording Total Time**
 - After completing the challenge, annotate the team's time next to their designated landing pad on the scorecard.
- **Repeat for Each Round**
 - Use a new scorecard for each subsequent round.

EMERGENCY RESPONSE



SCORECARD





BUILD-FLY-CODE



CROP CARE



FOR THE WIN
ROBOTICS

CROP CARE



OVERVIEW

This challenge simulates real-world agricultural practices where drones are used to monitor and treat crops efficiently. In this head-to-head competition, teams will pilot Hopper to identify and treat crop zones, working collaboratively to ensure precise navigation and effective decision-making. This challenge incorporates both the hand controller and the live camera feed through FTW Fly.

MATERIALS

- 3 Activity Set Towers
- 14 Landing Pads
- 2 Hoppers
- 2 Controllers
- 2 FTW Fly Devices



CROP CARE



SETUP

FLIGHT ZONE

- Tape out a 10ft x 20ft flight zone to set up the challenge.
- The pilot and navigator box will be to the left of the starting landing pad.
- The visual observer boxes will be along the 20ft edges of the flight zone.

TOWERS

- Position three towers within the zone, each at a height of 4ft.
 - *The color and orientation is not relevant in this challenge.*
- Align the three towers across the center of the flight zone to create two crop fields (one for each team).

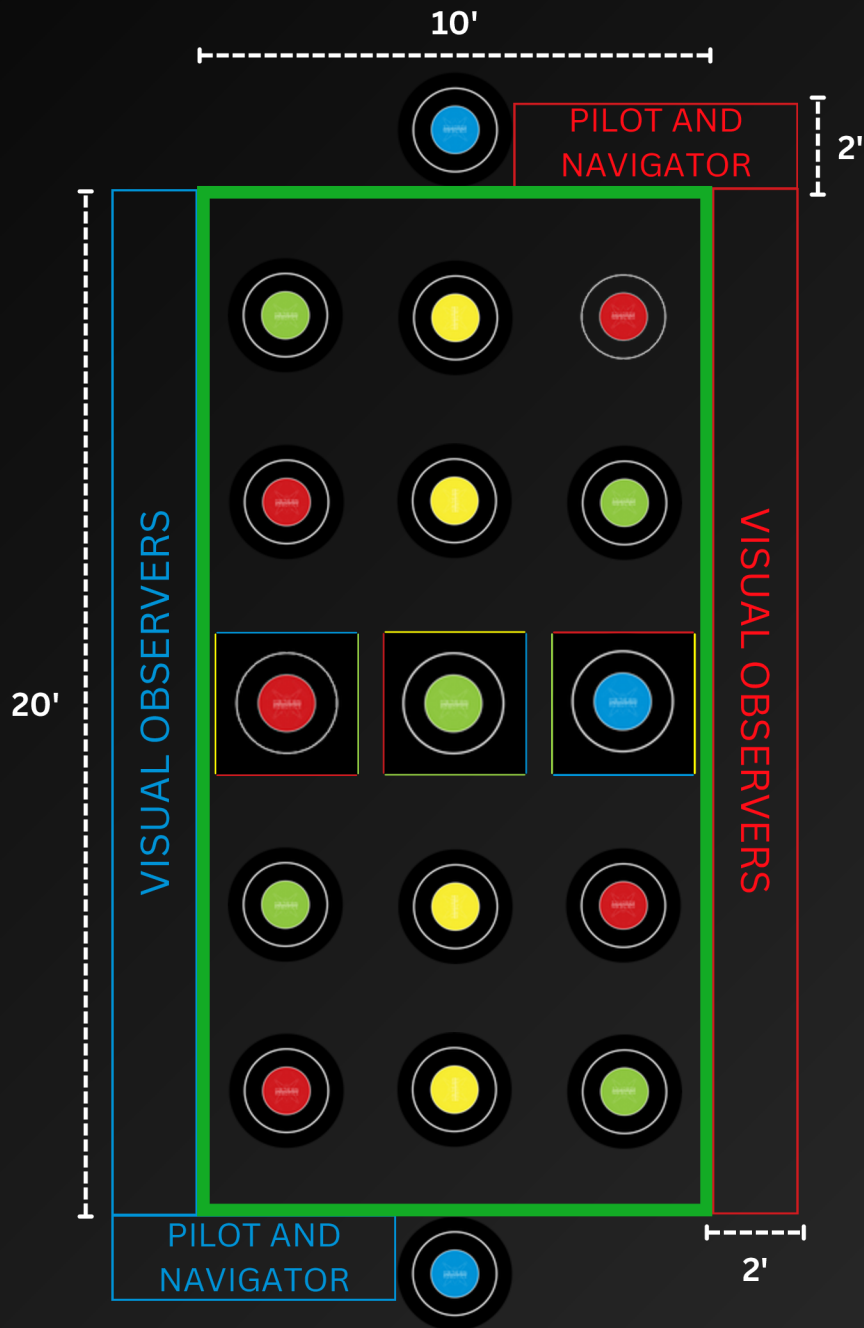
LANDING PADS

- After the towers are positioned, place one blue landing pad at the center of each 10ft edge of the flight zone.
- Each team will position their 6 remaining landing pads (2 red, 2 yellow, and 2 green) in their crop field before the start of the challenge.

CROP CARE



SETUP



This setup is designed for head-to-head competition but can also be run with a single team at a time. In that case, only one side of the flight zone is needed, and seven landing pads will be required.

CROP CARE



GAMEPLAY

OBJECTIVE

- Teams will use Hopper and its live camera feed to monitor and treat crop zones. The navigator views the live feed, relaying instructions to the pilot, who controls the drone. The goal is to land on the correct landing pads in the proper sequence to successfully treat all crop zones while competing head-to-head.

STARTING POSITIONS

- Each team's Hopper starts on their designated blue landing pad.
- Pilots and navigators stand in their designated boxes, with their backs turned to the flight zone.
- The remaining teammates will act as visual observers. They will stand along the sides of the flight zone and will ensure Hopper stays within the flight zone at all times. They may also give instructions to the pilot and navigator.

CROP TREATMENT

- Takeoff from the blue landing pad and navigate over the towers to the opposing team's crop field.
- The pilot must rely on the navigator's instructions to land on one of the opposing team's landing pads.
- A crop area is only considered treated if:
 - Hopper successfully lands on the pad.
 - The crop zones are treated in the correct sequence.

CROP CARE



RULES

LANDING SEQUENCE

- Crop zones must be treated in the following order:
 - Red Landing Pads - High insect or disease pressure.
 - Yellow Landing Pads - Medium insect or disease pressure.
 - Green Landing Pads - Low insect or disease pressure.

DRONE RETRIEVAL

- One visual observer will act as the designated runner.
- The runner retrieves the drone after a successful landing or in the event of a crash. They are also responsible for flipping the landing pad after a successful treatment.
- The runner must get approval from a referee before entering the flight zone and also get confirmation from a referee for a successful landing.

DESIGNATED ZONES

- Pilots and navigators must remain in their assigned boxes with their backs turned toward the flight zone.
- Visual observers must remain within their designated areas throughout the challenge.

CROP CARE



SCORING

ROUND LENGTH

- There will be 3 rounds that last 10 minutes each.
- Teams must treat all crop zones as quickly as possible.

TIME RECORDING

- If a team treats all 6 crop zones within 10 minutes, their time will be recorded and used for scoring.
- If a team does not treat all zones within the time limit, their time will default to 10 minutes.

FINAL TIME CALCULATION

- The average time of all team members' rounds will be used as the team's final score for ranking purposes.

POINT ALLOCATION

- Points are awarded based on the team's performance compared to others.
- For example, if there are 12 teams:
 - The team with the fastest time earns 12 points.
 - The second-fastest team earns 11 points, and so on.
 - The slowest team earns 1 point.

CROP CARE



SCORING

SCORING SHEET

- **Teams**
 - Begin by filling out the first column with each team name.
- **Transfer Times**
 - At the end of each round, transfer the recorded times for each team from the scorecard to the scoring sheet (see below).
- **Calculate Average Times**
 - After the third round, calculate the average time for each team.
- **Assign Points**
 - Rank the teams from fastest to slowest based on average times.
 - Distribute points accordingly, with the fastest team earning the maximum points.

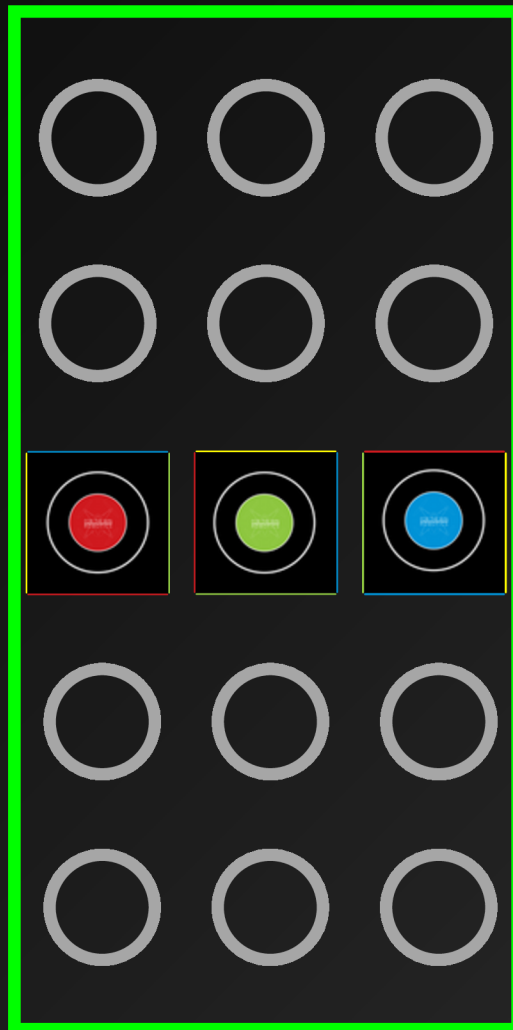
SCORECARD

- **Marking Crops Treated**
 - For every crop area treated, mark that landing pad as complete by either shading in the landing pad, or adding a checkmark.
- **Recording Total Time**
 - After completing the challenge, annotate the team's time on the scorecard.
- **Repeat for Each Round**
 - Use a new scorecard for each subsequent round.

CROP CARE



SCORECARD





BUILD-FLY-CODE

 PACKAGE DELIVERY 

PACKAGE DELIVERY



OVERVIEW

As drones become increasingly relevant in logistics, this challenge reflects real-world drone delivery applications. Teams will demonstrate how Hopper drones can address delivery challenges using custom code written on the FTW CODE platform. The goal is to simulate small package deliveries, showcasing how drones can optimize delivery routes.

MATERIALS

- 4 Activity Set Towers
- 9 Landing Pads
- 4 Hoppers
- 4 FTW Code Devices



PACKAGE DELIVERY



SETUP

FLIGHT ZONE

- Tape out a 20ft x 20ft flight zone to set up the challenge.

TOWERS

- Position four towers within the zone.
 - Adjust the height of the first tower to 4ft, the middle two to 6ft, and the rear tower to 5ft.
 - *The color and orientation is not relevant for this challenge.*
- Each tower should have 44 inches (3 ft 8 in) of clearance from the nearest boundary.
- The towers are placed 8 ft 8 in away from the opposite boundary to ensure even spacing within the zone.

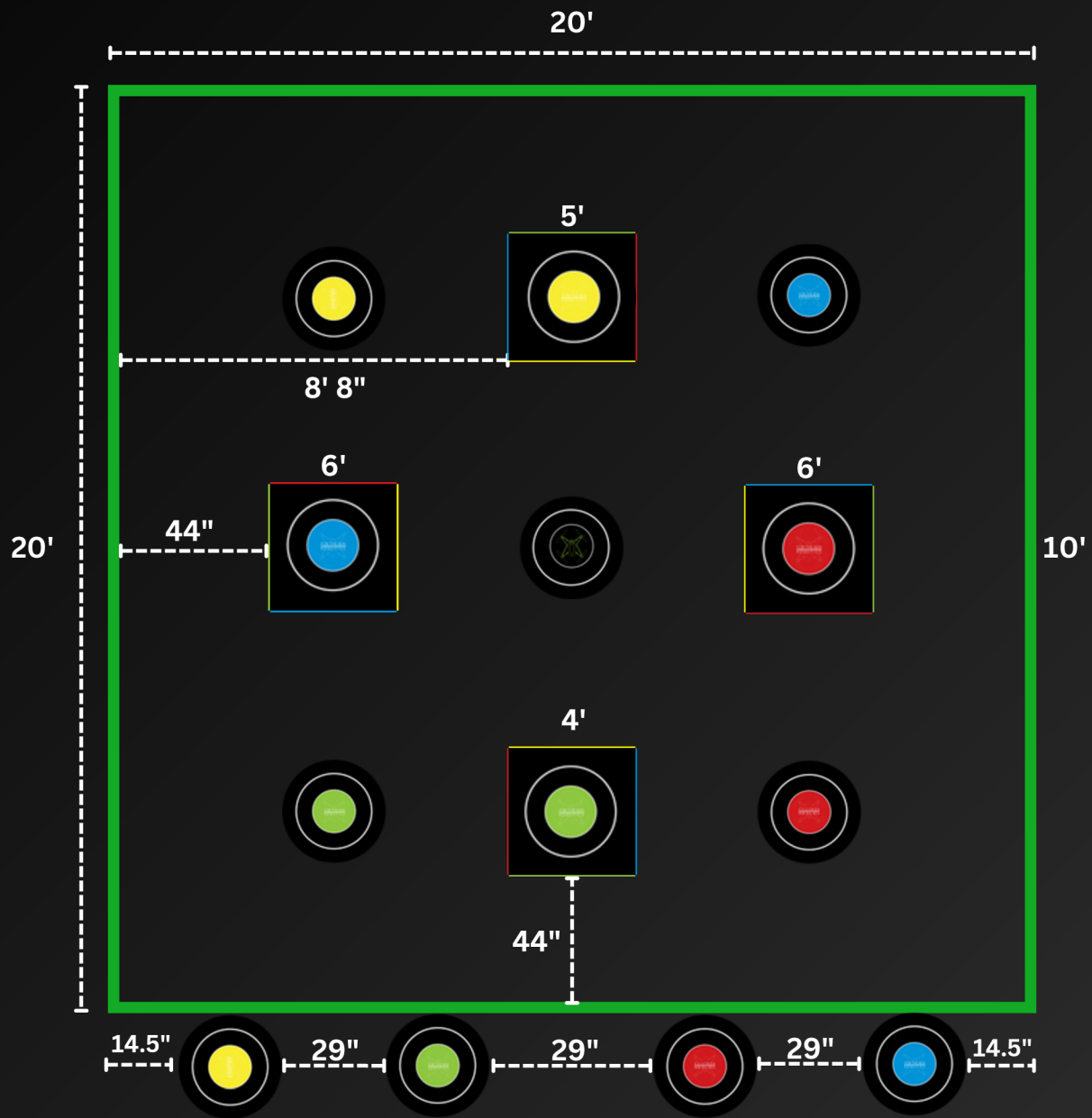
LANDING PADS

- After the towers are positioned, place five landing pads in the flight zone. Align each landing pad where the towers intersect.
 - *The colors are not relevant for the landing pads inside the flight zone.*
- Then, align four landing pads along the outer edge.

PACKAGE DELIVERY



SETUP



PACKAGE DELIVERY



GAMEPLAY

OBJECTIVE

- Teams will program Hopper to autonomously fly and land at designated zones, which include landing pads and elevated towers.
- Each successful landing represents a successfully delivered package.

STARTING POSITIONS

- Hopper starts on each team's designated landing pad.
- All team members, except for the designated runner, must remain outside the flight zone at all times.

DELIVERING PACKAGES

- From the starting landing pad, teams will program Hopper to fly to one of the nine landing zones.
- A package is considered successfully delivered when Hopper lands completely on the designated zone.

REPEATING THE PROCESS

- Teams will continue delivering packages, aiming to land on all nine zones before time expires.

PACKAGE DELIVERY



RULES

SUCCESSFUL LANDING

- For a landing to be considered successful, Hopper must touch down with all four feet fully on the designated landing pad or tower. If the drone does not land completely on the target, the team must reattempt the landing.

DRONE RETRIEVAL

- Each team must assign one member as the designated runner. This person is responsible for retrieving Hopper and returning it to the starting landing pad in the event of a crash or landing.
 - Before entering the flight zone, the runner must receive approval from a referee.
 - The runner must also confirm with a referee that the landing was successful before retrieving the drone.

DELIVERING PACKAGES

- When a package is successfully delivered, a team member must mark the corresponding zone as complete on their scorecard.

PACKAGE DELIVERY



SCORING

ROUND LENGTH

- There shall be 2 rounds that lasts 20 minutes each.
- Teams must deliver all 9 packages as quickly as possible.

TIME RECORDING

- Record the time it takes for a team to deliver all 9 packages.
- If a team does not deliver all 9 packages within the time limit, their time will default to 20 minutes.

FINAL TIME CALCULATION

- The average time of all team members' rounds shall be used as the team's final score for ranking purposes.

POINT ALLOCATION

- Points are awarded based on the team's performance compared to others.
- For example, if there are 12 teams:
 - The team with the fastest time earns 12 points.
 - The second-fastest team earns 11 points, and so on.
 - The slowest team earns 1 point.

PACKAGE DELIVERY



SCORING

SCORING SHEET

- **Teams**
 - Begin by filling out the first column with each team name.
- **Transfer Times**
 - At the end of each round, transfer the recorded times for each team from the scorecard to the scoring sheet.
- **Calculate Average Times**
 - After the second round, calculate the average time for each team.
- **Assign Points**
 - Rank the teams from fastest to slowest based on average times.
 - Distribute points accordingly, with the fastest team earning the maximum points.

SCORECARD

- **Marking Packages Delivered**
 - For every package delivered, mark the landing pad or tower on the scorecard.
- **Repeat for Each Round**
 - Use a new scorecard for each subsequent round.

PACKAGE DELIVERY



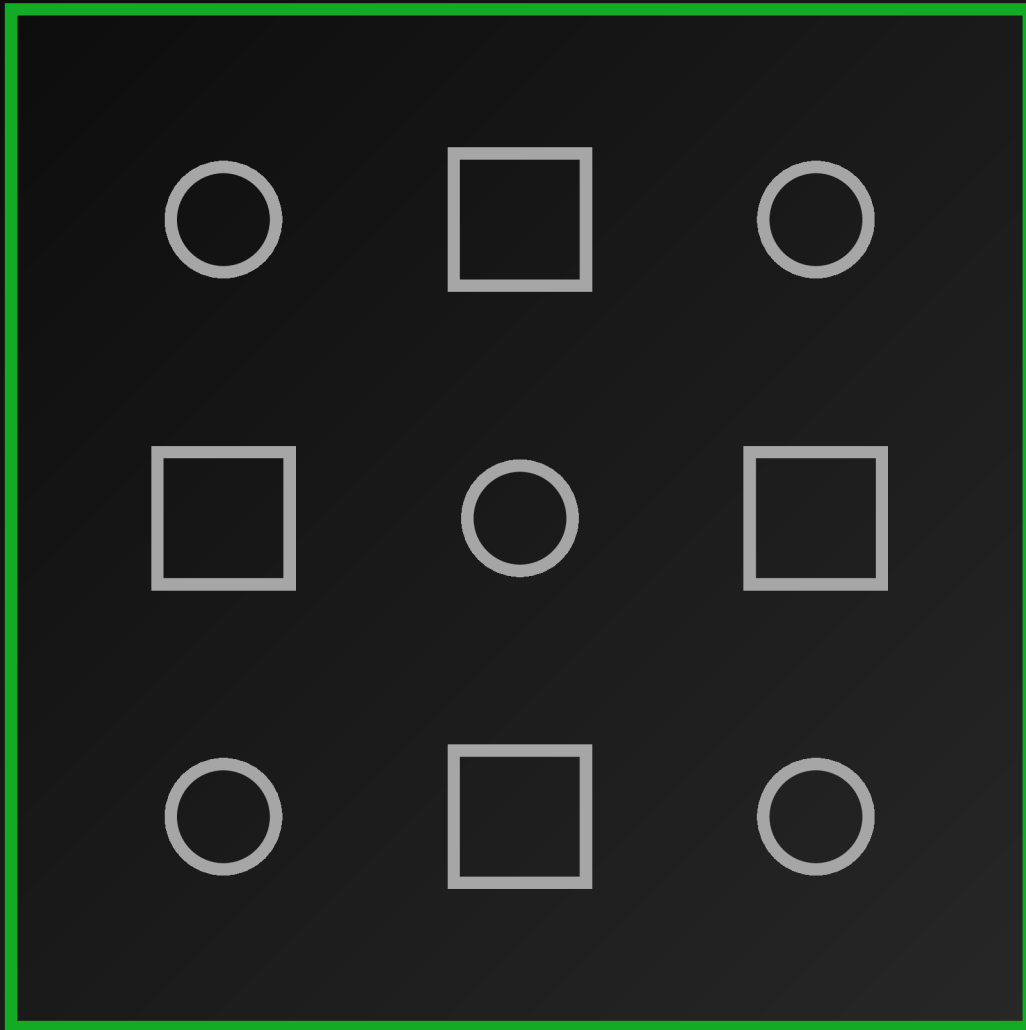
SCORING SHEET

TEAM	ROUND 1	ROUND 2	TOTAL	POINTS

PACKAGE DELIVERY



SCORECARD





BUILD-FLY-CODE

 SITE INSPECTION 

SITE INSPECTION



OVERVIEW

This coding challenge replicates the real-world use of drones for infrastructure inspections, such as monitoring bridges, buildings, and power lines. Using Hopper's camera and FTW CODE, teams will program their drone to autonomously fly over four towers and inspect them for hidden logos. This scenario reflects real-world safety and structural inspections where drones collect visual data from hard-to-reach areas.

MATERIALS

- 4 Activity Set Towers
- 5 Landing Pads
- 2 Hoppers
- 2 FTW Fly Devices
- 2 FTW Code Devices
- 4 Challenge Components



SITE INSPECTION



SETUP

FLIGHT ZONE

- Tape out a 20ft x 20ft flight zone to set up the challenge.

TOWERS

- Position four towers within the zone.
 - Adjust the height of the front towers to 5ft, and the rear towers to 6ft.
 - *The color and orientation is not relevant for this challenge.*
- Each tower should have 44 inches (3 ft 8 in) of clearance from the nearest boundaries.

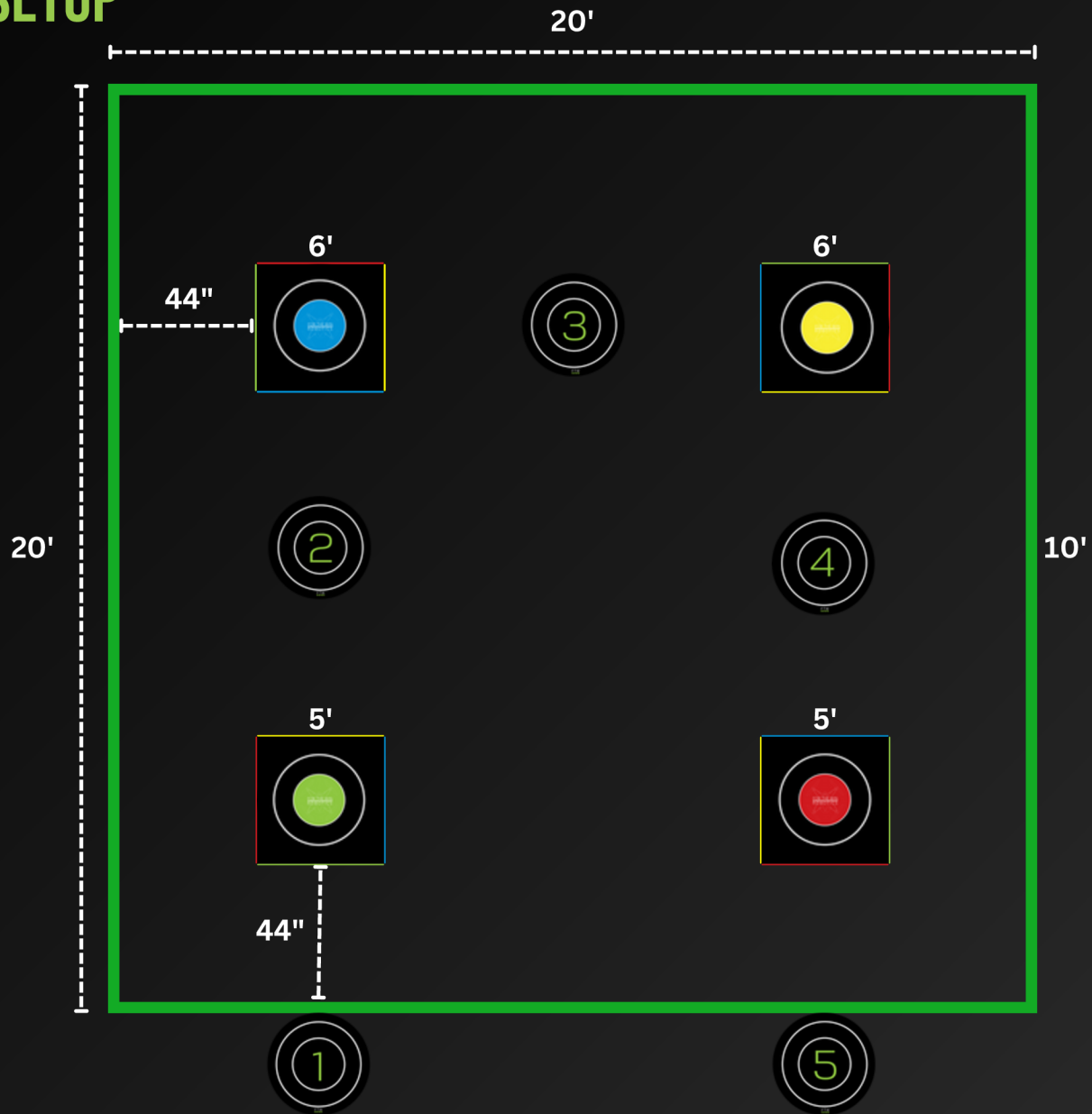
LANDING PADS

- After the towers are positioned, place three landing pads in the flight zone. Align the landing pads centered between each column of towers, and one centered between the top row of towers.
 - *The colors are not relevant for the landing pads inside the flight zone.*
- Then place two landing pads along the outer edge of the flight zone aligned with the towers.

SITE INSPECTION



SETUP



This setup is designed for head-to-head competition but can also be run with a single team at a time. To accommodate four teams, add two landing pads along the opposite edge and one additional landing pad between the two other towers.

SITE INSPECTION



GAMEPLAY

OBJECTIVE

- Teams will program Hopper to autonomously fly over the towers while using the live camera feed in FTW Fly to inspect the hidden logos on top. As the drone hovers over each tower, teams will analyze the feed to identify and document the logos.

STARTING POSITIONS

- One team will begin with Hopper on the #1 landing pad, and the other team will begin on the #5 landing pad.
- All team members, except for the designated runner, must remain outside the flight zone at all times.

INSPECTING A TOWER

- Teams will begin by taking off from the landing pad and navigating Hopper over the first tower while also using the live camera feed to inspect the logo on top of the tower.
- They will then land on the next designated landing pad, serving as a checkpoint.
 - A team member will annotate the logo on the scorecard.

REPEAT THE PROCESS

- Continue this sequence until the drone reaches the opposing team's starting pad or time runs out.

SITE INSPECTION



RULES

SUCCESSFUL LANDING

- For a landing to be considered successful, Hopper must touch down with all four feet fully on the designated landing pad. If Hopper does not land completely on the target, the team must reattempt the landing.

DRONE RETRIEVAL

- Each team must assign one member as the designated runner. This person is responsible for retrieving Hopper and returning it to the landing pad in the event of a crash.
 - Before entering the flight zone, the runner must receive approval from a referee.

INSPECTING A TOWER

- If a team successfully lands on the next landing pad but fails to identify the logo on top of the tower, they must return and inspect the tower again.

SITE INSPECTION



SCORING

ROUND LENGTH

- There shall be 2 rounds that lasts 20 minutes each.
- Teams must inspect all 4 towers as quickly as possible.

TIME RECORDING

- Record the time it takes for a team to inspect all 4 towers.
- If a team does not inspect all 4 towers within the time limit, their time will default to 20 minutes.

FINAL TIME CALCULATION

- The average time of all team members' rounds shall be used as the team's final score for ranking purposes.

POINT ALLOCATION

- Points are awarded based on the team's performance compared to others.
- For example, if there are 12 teams:
 - The team with the fastest time earns 12 points.
 - The second-fastest team earns 11 points, and so on.
 - The slowest team earns 1 point.

SITE INSPECTION



SCORING

SCORING SHEET

- **Teams**
 - Begin by filling out the first column with each team name.
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 - At the end of each round, transfer the recorded times for each team from the scorecard to the scoring sheet.
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 - After the second round, calculate the average time for each team.
- **Assign Points**
 - Rank the teams from fastest to slowest based on average times.
 - Distribute points accordingly, with the fastest team earning the maximum points.

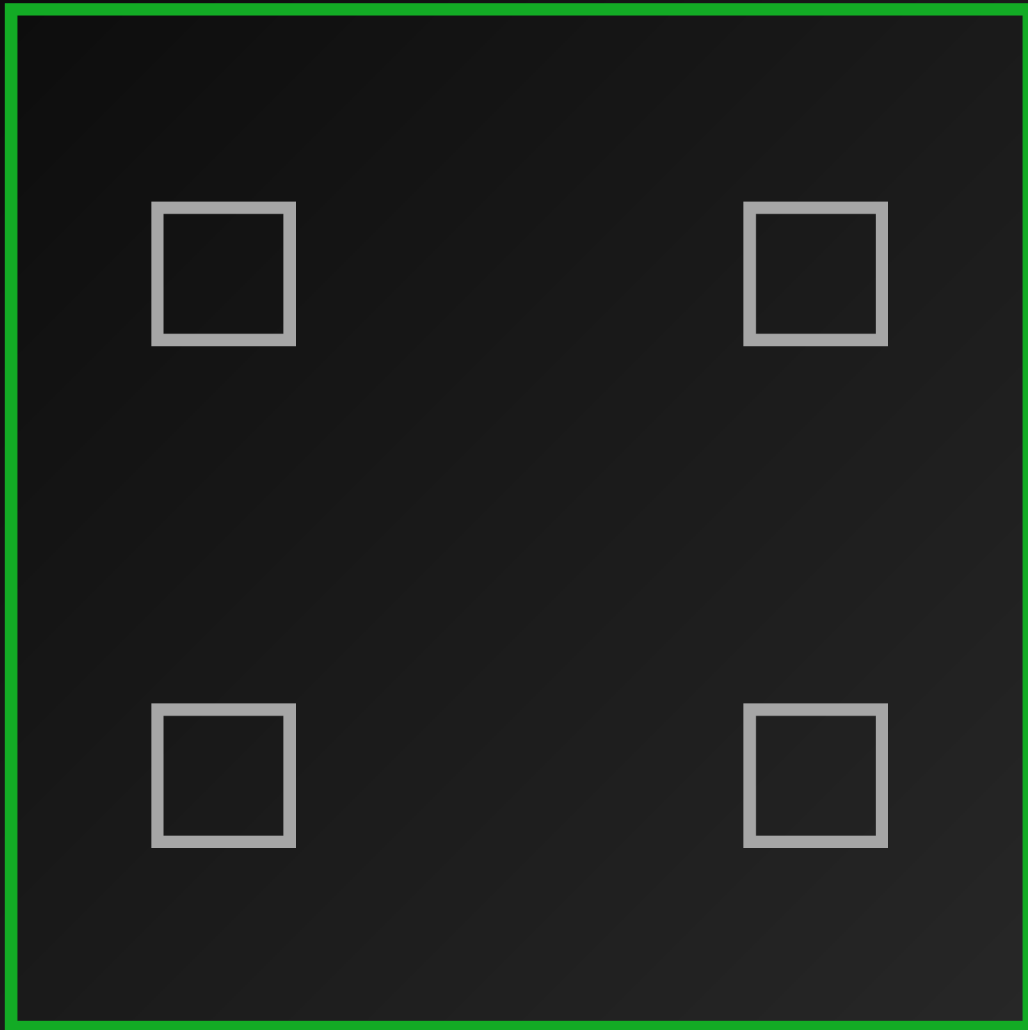
SCORECARD

- **Marking Tower Logos**
 - For every tower inspected, a team member will mark the logo found on the scorecard.
- **Repeat for Each Round**
 - Use a new scorecard for each subsequent round.

SITE INSPECTION



SCORECARD





BUILD-FLY-CODE



SEARCH AND RESCUE



SEARCH AND RESCUE



OVERVIEW

This challenge combines flying and coding to simulate real-world scenarios where drones locate and rescue objects in hazardous environments, such as after natural disasters. Teams will use Hopper to first identify hidden objects using the live camera feed, then code it to autonomously fly to the corresponding tower, hover for five seconds to simulate a rescue operation, and return to their landing pad.

MATERIALS

- 4 Activity Set Towers
- 4 Landing Pads
- 4 Hoppers
- 4 FTW Fly/Code Devices
- 4 Challenge Components per Team



SEARCH AND RESCUE



SETUP

FLIGHT ZONE

- Tape out a 20ft x 20ft flight zone to set up the challenge.

TOWERS

- Position four towers within the zone.
 - Adjust the height of the front and rear towers to 5ft, and the middle towers to 6ft.
 - *The color and orientation is not relevant for this challenge.*
- Each tower should have 44 inches (3 ft 8 in) of clearance from the nearest boundary.
- The towers are placed 8 ft 8 in away from the opposite boundary to ensure even spacing within the zone.

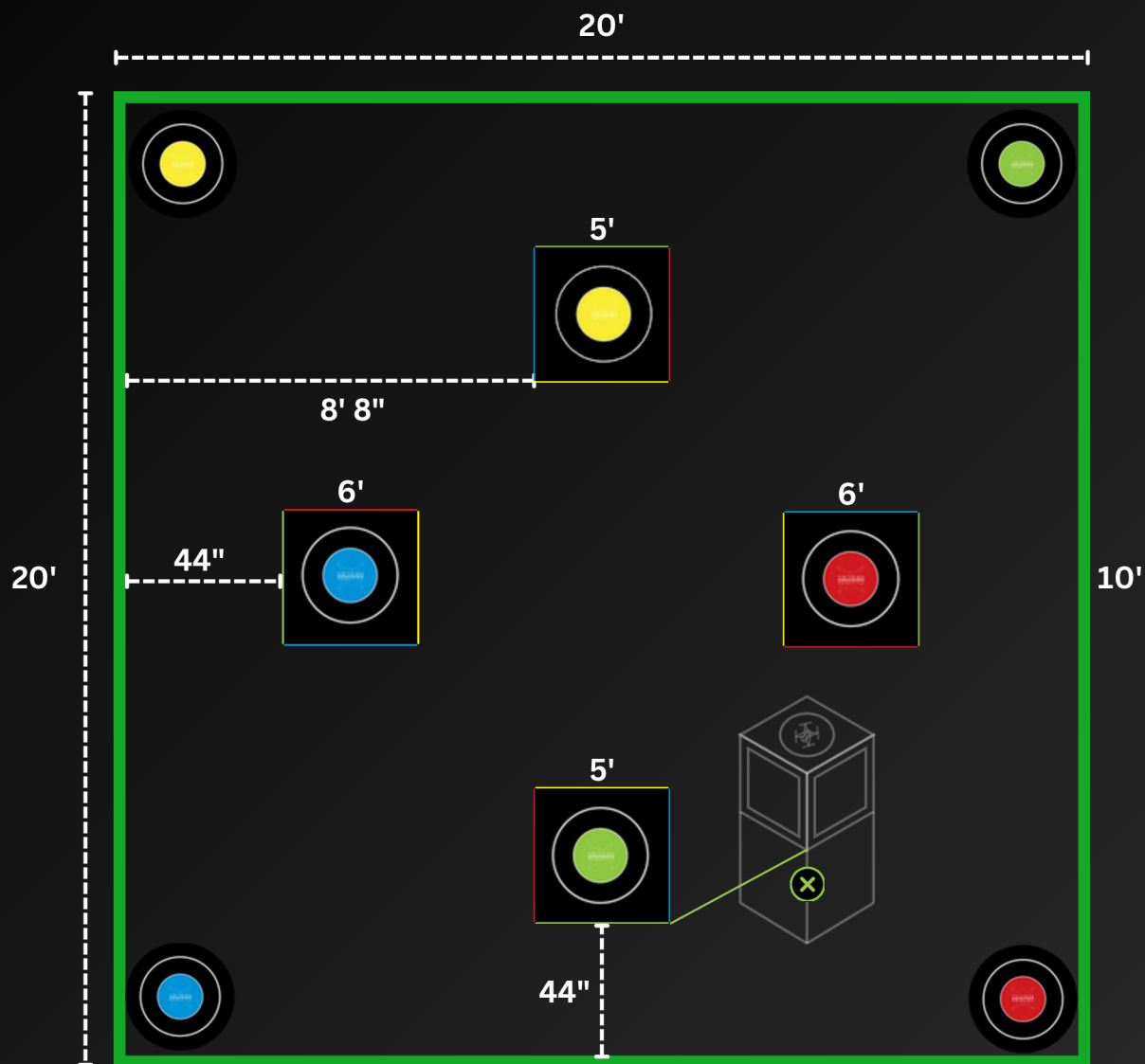
LANDING PADS

- After the towers are positioned, place each landing pad flush with the flight zone boundaries in its designated corner.
 - *Ensure landing pad colors align with the illustration on the next page.*

SEARCH AND RESCUE



SETUP



SEARCH AND RESCUE



GAMEPLAY

OBJECTIVE

- Teams will use Hopper to locate and rescue objects in hazardous environments, simulating real-world disaster response scenarios. The challenge consists of two phases: manual search and autonomous rescue.

STARTING POSITIONS

- Referees will hide four team-specific logos (Square, Triangle, Circle, X) on different towers so that they are not visible from the team's corner.
- Each team will begin with Hopper on their landing pad for Phase 1.
- The RPIC shall be positioned in the pilot box, and visual observers shall be in their designated areas.

PHASE 1: MANUAL SEARCH

- Teams will use FTW Fly to manually pilot Hopper and inspect each tower using the live camera feed.
- The objective is to identify and record the location of all four logos.
- Once confident they have correctly identified each logo's location, teams will return Hopper to their landing pad.

SEARCH AND RESCUE



GAMEPLAY

PHASE 2: AUTONOMOUS RESCUE

- Teams will switch to FTW Code for the rescue phase.
- Using FTW Code, they will program Hopper to perform a sequence of rescue missions.
 - Hopper will take off from the landing pad, fly to the identified tower, and then land on top.
- After completing each rescue, the drone will be retrieved, returned to the landing pad, and reprogrammed for the next tower.

RESCUE ORDER:    

CHALLENGE COMPONENT REMOVAL

- After each successful rescue, a referee will confirm the completion and mark the tower as cleared by removing the challenge component.

REPEAT THE PROCESS

- Teams will continue this process until all four logos have been successfully "rescued" or time runs out.

SEARCH AND RESCUE



RULES

SUCCESSFUL LANDING

- For a landing to be considered successful, Hopper must touch down with all four feet fully on the designated tower. If the drone does not land completely on the target or lands out of sequence, the team must reattempt the landing on the correct tower in the proper order.

DRONE RETRIEVAL

- Each team must assign one member as the designated runner. This person is responsible for retrieving Hopper and returning it to the starting landing pad in the event of a crash or landing.
 - Before entering the flight zone, the runner must receive approval from a referee.
 - The runner must also confirm with a referee that the landing was successful before retrieving the drone.

SUCCESSFUL RESCUE

- When an object is successfully rescued, a team member will mark the corresponding zone as complete on their scorecard.

SEARCH AND RESCUE



SCORING

ROUND LENGTH

- There shall be 2 rounds that lasts 20 minutes each.
- Teams must rescue all 4 objects as quickly as possible.

TIME RECORDING

- Record the time it takes for a team to rescue all 4 objects.
- If a team does not rescue all 4 objects within the time limit, their time will default to 20 minutes.

FINAL TIME CALCULATION

- The average time of all team members' rounds shall be used as the team's final score for ranking purposes.

POINT ALLOCATION

- Points are awarded based on the team's performance compared to others.
- For example, if there are 12 teams:
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SEARCH AND RESCUE



SCORING

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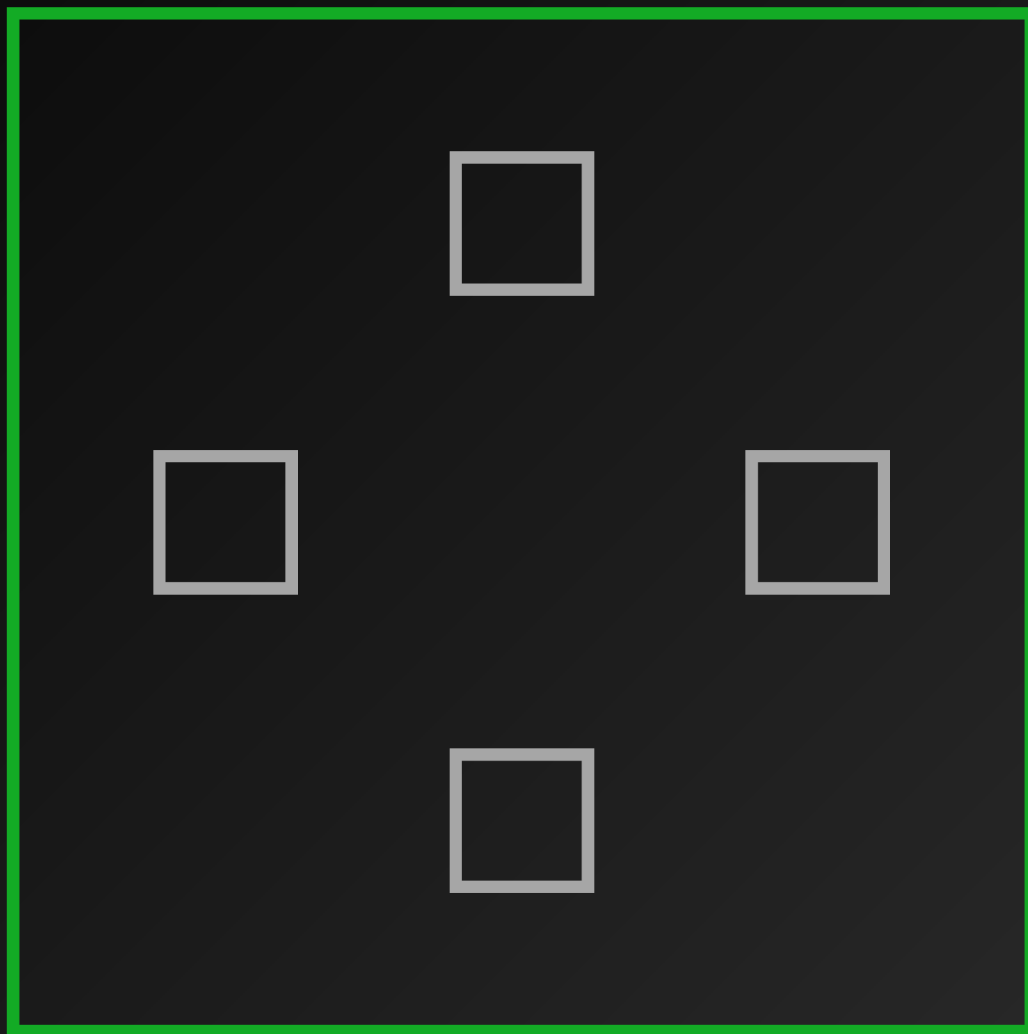
SCORECARD

- **Marking Successful Rescues**
 - For every successful rescue, mark the tower on the scorecard.
- **Repeat for Each Round**
 - Use a new scorecard for each subsequent round.

SEARCH AND RESCUE



SCORECARD



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BUILD • FLY • CODE
• COMPETE •



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FOR THE WIN
ROBOTICS

BUILD-FLY-CODE

COMPETE

WHERE COMPETITION MEETS THE CLASSROOM.



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FOR THE WIN
ROBOTICS