

2026-27

ARC Competition Rulebook

Aerospace Robotics Competition

Season Theme: Mines & Skyscrapers

Table of Contents

Table of Contents	1
1. Introduction	1
1.1 What is the Aerospace Robotics Competition?.....	2
1.2 What are the Benefits of ARC?.....	2
1.2.1 For Students	2
1.2.2 For Volunteers.....	2
1.2.3 For Sponsors.....	2
1.3 Season Overview	3
1.3.1 Mission Background	3
Engineering	3
Drones	3
Communication.....	3
Ethics	3
1.3.2 Rulebook Overview.....	4
2. Competition Overview.....	4
2.1 Competition Venue	4
2.2 Team Roles.....	4
2.3 Season Schedule.....	5
2.4 Eligibility Requirements	6
2.4.1 Season Participation Eligibility	6
2.4.2 Advanced and Beginner Divisions	6
2.4.3 National Competition Eligibility.....	6
3. 2026-27 Season Challenges: Mines & Skyscrapers	7
3.1 Component Descriptions	7
3.1.1 Tool Assignments.....	8
3.1.2 Construction Component Specifications (K'NEX-Based Kit).....	8
3.2 Round 1: The Mines (Qualifying Flight)	10
3.2.1 Tasks	10
3.2.2 Round Schedule.....	11
3.2.3 Seeding.....	11
3.2.4 Example Field Layout	11
3.3 Round 2: Mine & Build (Head-to-Head).....	12
3.3.1 Field Layout	12

3.3.2 Phase 1 — Brick Mining (7-Minute Window).....	12
3.3.3 Phase 2 — Skyscraper Build (5-Minute Window).....	13
3.3.4 Interference & Safety	13
3.3.5 Example Field Layout	13
3.3.6 Round 1 → Round 2 Coupling	14
3.4 Virtual Tasks	14
3.5 Flight & Build Procedure	15
3.6 Technical Presentation	16
3.6.1 Team Logistics	16
3.6.2 Engineering Process	16
3.6.3 Final Product	16
3.6.4 Presentation Style	17
3.6.5 Procedure.....	17
3.7 Ethical Presentation.....	17
3.7.1 Grading.....	17
3.7.2 Process	17
3.8 Scoring Equations	18
3.8.1 Round 1: The Mines.....	18
3.8.2 Round 2, Phase 1: Brick Mining.....	18
3.8.3 Round 2, Phase 2: Skyscraper Build.....	18
3.8.4 Virtual Tasks Scoring.....	19
3.8.5 Technical Presentation Scoring	19
3.8.6 Ethical Presentation Scoring	20
3.8.7 Round Penalties.....	20
3.8.8 Final Scoring & Comparison to 2025-26	20
4. Drone Requirements	21
4.1 Mechanical Requirements	21
4.1.1 Structure	21
4.1.2 Mechanism Design	21
4.1.3 Controls.....	21
4.1.4 Batteries.....	22
4.1.5 Budget Requirements	22
4.1.6 Supplies and Sources	22
4.2 Safety and Legal Requirements.....	23
5. Competition Rules	23
5.1 Logistics.....	23

5.2 Conduct Requirements	23
5.3 Competition Day Supplies	24
6. Awards	24
Appendix A: Scoring Sheets	24
Appendix B: Technical Inspection Rubric.....	27
Appendix C: Example Budget.....	29
Appendix D: Resources.....	31
Appendix E: Recommended Supplies.....	32
Appendix F: Field & Mission Diagrams	33
Revision History	36

1. Introduction

1.1 What is the Aerospace Robotics Competition?

The Aerospace Robotics Competition (ARC) is a high school and middle school drone competition offered by the non-profit organization STEM-ED INC. STEM-ED INC has the mission of providing hands-on, accessible, and relevant opportunities for students to encourage them to join STEM.

ARC is currently offered in 3 regions:

- Antelope Valley, CA: AntelopeValley@stemed.org
- New England (NH): NewEngland@stemed.org
- San Diego, CA: SanDiego@stemed.org

Each region consists of up to 30 teams, with volunteers providing local support and events. Regions with up to 18 teams will host a Saturday-only competition. Regions with 19-30 teams will host a 2-day competition from Friday through Saturday. Event schedules will be finalized and published after registration is closed and at least 7 days prior to the event.

The top 3 champions from the advanced division and the top 2 champions from the beginner division of each region will be invited to the ARC National Championship. The National Competition rulebook is released approximately 30 days before the event, with further details distributed throughout the season.

1.2 What are the Benefits of ARC?

1.2.1 For Students

ARC seeks to ignite a passion for aerospace-related STEM work in high schools and middle schools around the nation. The competition is built upon four pillars:

- Hands-on flying of unmanned aerial vehicles (UAVs)
- Developing knowledge of unmanned and autonomous systems
- Learning basic aerospace engineering principles
- Understand ethical considerations when developing technology

High school students (and middle school students/teams) gain valuable experience with hands-on designing, building, testing, and flying of quadcopter drones. They are encouraged to use the engineering process, complete independent research, and practice communication and teamwork skills.

1.2.2 For Volunteers

STEM-ED INC is 100% volunteer-operated, which supports the mission of an affordable competition. All volunteers are passionate about promoting accessible STEM opportunities to students of all backgrounds. ARC needs a wide variety of skill sets for these events to be possible, and volunteers are encouraged to learn and grow in any topics of interest. Please contact your local region or Support@stemed.org if you are interested in receiving more information about supporting STEM-ED INC as a volunteer.

1.2.3 For Sponsors

Robotics events require an extensive list of supplies, which must be purchased through team fundraising or sponsorship. As STEM-ED INC aims to provide an affordable event to all students, sponsorships are critical for reducing team participation costs and creating a fantastic competition experience. Donors can support STEM education in their community and nationwide by providing financial assistance through the registered 501(c)(3) non-profit organization STEM-ED INC. Please contact your local region or Support@stemed.org if you are interested in receiving more information about supporting STEM-ED INC as a donor.

1.3 Season Overview

1.3.1 Mission Background

While drones are exciting and fun, there is a greater purpose to the skills learned through ARC. As the season progresses, challenges are focused on developing several areas of students' lives.

Engineering

- The engineering process develops vital critical thinking skills useful in all aspects of engineering and life.
- Hands-on skill development improves coordination, experience, and confidence in hands-on projects.
- Completing ARC challenges promotes creativity in designs, develops an understanding of successful structures, and boosts problem-solving abilities.
- Troubleshooting skills are important for all aspects of life, promoting a logical process of patiently working through issues to find a solution.

Drones

- Since drones are a growing technology with a wide variety of functions, students develop an understanding of real-world problems and solutions through getting hands-on experience with cutting edge technology.
- ARC challenges are related to positive applications of drones, giving students the opportunity to ponder the humanitarian and industrial benefits of their skills — this season, through the lens of infrastructure and construction.

Communication

- Teamwork is required for all engineering roles, so ARC provides challenges which encourage teamwork for success.
- No matter how impressive a design is, if the engineer cannot communicate properly, the design cannot be used. ARC requires both verbal and written communication, so students build these critical skills through practice.

Ethics

- Ethics is central to the competition, guided by STEM-ED's core values of Integrity, Excellence, and Respect. Volunteers and students are expected to uphold these principles throughout the event.

- STEM-ED has partnered with the Saint Anselm College Center for Ethics in Society to illuminate the need for students to consider the ethical implementation of technology development.
- Through real-world challenges, students learn to apply their skills to improving the world.
- ARC prioritizes safety, urging teams to consider the well-being of others, including opponents and spectators, rather than solely focusing on winning.
- Humility and admitting mistakes are vital for engineers to prevent dangerous, costly errors. ARC fosters a supportive environment in which students feel safe asking questions and seeking help.

1.3.2 Rulebook Overview

This rulebook is large, but it is full of important information for teams to reference throughout the season. Teams are recommended to read the entire rulebook once and print a copy for meetings.

Smaller companion documents to be released:

- 2026-27 Field Setup Guide
- 2026-27 Safety and FAA Compliance Guide
- Scoring calculation sheet
- Scoring rubrics

Available at <https://www.stemed.org/arc>. Feedback via Rulebook Feedback Form; questions to Support@stemed.org.

2. Competition Overview

2.1 Competition Venue

Each ARC competition venue will use standardized specifications for safety and field setup. The flying field boundaries are marked with soccer cones (or similar), keeping personnel outside drone tether range.

- Red Zone: for the pilot(s)/copilot(s) of the current round only.
- Team support zone: teammates, coaches, mentors, parents/guardians may spectate.
- Students/spectators from other teams not currently participating must stay outside both zones, watching from bleachers or team pits (see Section 5.2).

Team technical and ethical presentations are completed indoors. A projector will be provided; the judging panel displays the teams' virtually-submitted presentation slides.

2.2 Team Roles

Role	#	Requirements	Recommendations
Team Captain	1 (Req'd)	Must be a student; must respond to emails and share info with teammates; must submit virtual tasks	Be a responsible student chosen by teammates; be committed to leading and teaching
Teammate	1-4 (Rec'd)	Must be students	—

Role	#	Requirements	Recommendations
Pilot	1 (Req'd)	Must be a student; may be team captain; may rotate role amongst multiple students (only one at field during each match)	Identify pilot(s) early and practice throughout season
Copilot	1 (Req'd)	Must be a student; may be team captain; may rotate role amongst multiple students (only one at field during each match)	Identify copilot(s) early and practice throughout season
Coach	1 (Req'd)	Must be adult legally responsible for students; must submit registration paperwork and fees; must commit to attending the competition; must respond to emails and share info with students; must allow students to do all work at the event	Be prepared to guide students in matters such as teamwork, but do not worry about having technical skills; begin planning logistics (funding, recruitment, meeting spaces, etc.) before the season begins

Note: "Student" = a high school or middle school student during the 2026-27 school year. "Rec'd" = Recommended, "Req'd" = Required.

2.3 Season Schedule

Date	Event	Location	Notes
Friday, December 11, 2026	Registration Closes	https://www.stemed.org/registration	Registration form + \$1200 fee due.
Friday, December 18, 2026	Virtual Task #1	https://www.stemed.org/arc-submissions	See Section 3.4 for more details. Due the day of before 11:59PM PST and with penalty until 4/17/2027 11:59PM PST
Friday, January 29, 2027	Virtual Task #2	https://www.stemed.org/arc-submissions	See Section 3.4 for more details. Due the day of before 11:59PM PST and with penalty until 4/17/2027 11:59PM PST
March 19, 2027	Virtual Task #3	https://www.stemed.org/arc-submissions	See Section 3.4 for more details. Due the day of before 11:59PM PST and with penalty until 4/17/2027 11:59PM PST
Saturday, April 17, 2027	Virtual Task #4-10	https://www.stemed.org/arc-submissions	See Section 3.4 for more details. Due the day of before 11:59PM PST
Saturday, April 17, 2027	Regional Waivers DUE	https://www.stemed.org/arc-submissions	Required for all students to access the flying field.
Saturday, April 24, 2027	Regional Competitions	Per-region venues	Saturday-only (≤ 18 teams) or Fri-Sat (19-30 teams).

Date	Event	Location	Notes
Friday, May 14, 2027	National Competition Tech. Pres. Slides DUE	—	See Section 3.6 (Technical Presentation).
Friday, May 21 & Saturday, May 22, 2027	National Competition	Flint Hill Academy — Washington, DC	Invitational event — top 3 per region in the advanced division. Top 2 per region in the beginner division.

2.4 Eligibility Requirements

2.4.1 Season Participation Eligibility

To participate in the ARC season (Virtual Tasks, virtual office hours, Regional Competition), teams must complete all registration tasks by the published registration deadline. Registration (completed by team coach):

- Submit registration form: <https://www.stemed.org/registration>
- Pay registration fee: <https://www.stemed.org/registration>

Additional tasks to compete in Regional Competition:

- All students must have a waiver completed by parent/guardian, submitted through WaiverSign by the published deadline, to participate at the flying field or in photographs.
- Teams must submit Pre-Competition Surveys and attend their Regional Pre-Competition Briefing.
- All teams must pass Technical Inspection (Appendix B), including FAA drone registration and bringing a physical copy of the pilot's TRUST Exam Certificate, to compete in flying portions.
- Teams must provide a budget spreadsheet to compete (Section 4.1.5).
- Ineligible-for-flying teams are still encouraged to complete Technical Presentation; teams ineligible for any portion are encouraged to attend as spectators.

2.4.2 Advanced and Beginner Divisions

The 2026-2027 competition year is introducing divisions: advanced and beginner. Teams must elect their division one month before the regional competition. The beginner division is meant for new and/or younger teams. Teams decide which division they want to compete in. However, any team that has a member who is in high school and has participated in previous ARC competitions is not eligible for the beginner division.

2.4.3 National Competition Eligibility

All Regional eligibility requirements apply. Teams must receive a National Competition Invitation from their Regional Event and RSVP within 7 days of receiving it. Non-RSVP or decline forfeits the roster spot, offered to next eligible team from that region. There are no additional registration fees for National; teams cover their own travel.

3. 2026-27 Season Challenges: Mines & Skyscrapers

The 2026-27 season introduces a new construction-themed game: teams pilot drones into a series of mine shafts to identify assigned tools, then compete head-to-head to mine building materials and construct a free-standing skyscraper. The season includes a solo Qualifying Flight round, a Head-to-Head Mine & Build round, a technical presentation, and an ethical presentation. During head-to-head rounds, teams are assigned a color (random, used for queueing and field-side assignment).

The unique portion of this year's flying challenge is that the Mine and Build rounds build off each other. The figure below describes the relationship between the two rounds. Doing well in the Mine portion will give teams an advantage in the Build portion, both in seeding and in build materials.

3.1 Component Descriptions

Name	Acronym	Description	Representative Item on Field
Tool Assignment	TA	Shape/color combination assigned to a team immediately before their flight window (see Section 3.1.1 for the four combinations)	Assignment card/placard
Mine Shaft	MS	Cardboard box, 18"x18"x28", bearing one of the four shape/color combinations for Tool ID (Section 3.1.1)	Cardboard box (www.uline.com/Product/Detail/S-4758/Corrugated-Boxes-200-Test/18-x-18-x-28-Corrugated-Boxes)
Base Camp	BC	Drone launch and landing pad	Landing pad
Brick	BR	Field-mined K'NEX rod-and-hub building blocks; combines with other Bricks at the Foundation to build the Skyscraper frame (Section 3.1.2)	Rod + connector-hub piece
Supply Depot	SD	Landing pad that awards Depot Material on landing	Marked landing pad
Depot Material	DM	Stabilizing component that unlocks higher Skyscraper tiers	Connector/support piece
Stockpile	SP	Each team's Brick collection zone	Marked zone
Foundation	FD	Standardized base plate all teams build on	Kit-provided base plate
Reinforced Foundation	RFD	Earned upgraded Foundation	Upgraded base plate
Ground Station	GS	Pilot's control/telemetry setup location	Table
Queueing Location	QL	Pre-match staging area	Table
Camera	CAM	Drone-mounted inspection camera	Camera

3.1.1 Tool Assignments

Four Tool Assignments are used this season, one per Mine Shaft. Each Tool is a distinct shape/color chosen for high visual contrast, supporting both onboard computer-vision confirmation and semi-autonomous visual confirmation via camera feed (Task 1B, Section 3.2.1).

Shape Options	Color Options
Circle (1 ft diameter)	Red
Square (1 ft side)	Blue
Triangle (1 ft x 1 ft square cut in half along the diagonal)	Green

Each of the 4 Mine Shafts (Section 3.3.1) is marked with one of the 9 total possible combinations of shape and color above. Immediately before a team's Round 1 flight window, one of the four combinations is randomly assigned as that team's Tool Assignment (TA) — not known in advance.

3.1.2 Construction Component Specifications (K'NEX-Based Kit)

All Bricks, Depot Material, and Foundation/Reinforced Foundation pieces this season are built from a single standardized K'NEX-based kit, specified in the Field Kit Assembly Guide. The kit is chosen specifically so that every field-mined piece stays light and simple enough for a small, student-built drone mechanism (Section 4.1.2) to reliably pick up, carry, and release — while the Foundation itself, which never leaves the ground, is built for rigidity instead.

Foundation (FD):

- The foundation kit will consist of the following parts:

Part	Qty	Link
Any Color Rod – 128mm	24	https://knexreplacementparts.com/product/metallic-green-rod-128mm/
Any Color 2-way Connector	4	https://knexreplacementparts.com/product/granite-2-way-connector/
Any Color 3-way Connector	8	https://knexreplacementparts.com/product/red-3-way-connector/
Any Color 4-way Connector	4	https://knexreplacementparts.com/product/gray-4-way-connector/
Total	40 parts	

Reinforced Foundation (RF):

- The reinforced foundation kit will include the foundation kit as well as the following parts:

Part	Qty	Link
Any Color Rod – 128mm	12	https://knexreplacementparts.com/product/metallic-green-rod-128mm/
Any Color 3-way Connector	4	https://knexreplacementparts.com/product/red-3-way-connector/

Any Color 5-way Connector	4	https://knexreplacementparts.com/product/gray-5-way-connector/
Total	20 additional parts including the foundation kit	

Bricks (BR):

- The brick (BR) will be a cube part that teams will have to pick up from the ground. It can be made of the following parts:

Part	Qty	Link
Any color 128 mm Rod	12	https://knexreplacementparts.com/product/metallic-green-rod-128mm/
Any color 3-way Connector	8	https://knexreplacementparts.com/product/red-3-way-connector/
Total	20 parts	

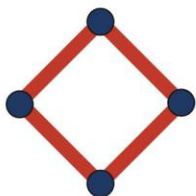
Depot Material (DM):

- The depot material is gained by landing on the supply depot. The following parts are gained:

Part	Qty	Link
Any color 5-way Connector	1	https://knexreplacementparts.com/product/gray-5-way-connector/
Any color Rod – 128mm	3	https://knexreplacementparts.com/product/metallic-green-rod-128mm/
Total	4 parts	

(a) Brick (BR)

one 128 mm rod per side



(b) Depot Material (DM)

5-way connector hub, fully rodded
(one standardized rod in each socket)

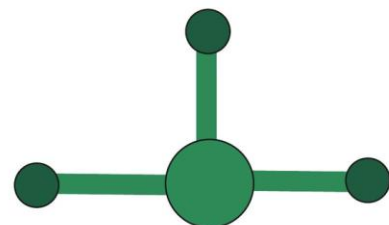


Figure 3.3 — K'NEX-Based Construction Component Specifications: (a) Brick (BR) Top View and (b) Depot Material (DM).

3.2 Round 1: The Mines (Qualifying Flight)

Theme: Every mining operation starts with the right tools. Before teams can mine for Bricks, they must prove they can navigate the shafts and identify their assigned tool. This round is flown solo — no opponent on the field — and produces the seeding used to bracket Round 2, the same way qualifying sets grid position in motorsport.

3.2.1 Tasks

Task 1A — Base Camp Landing :

- Takeoff from Base Camp (BC) and land at BC at the end to earn points

Task 1B — Tool ID (mine shaft identification & inspection):

- Each team is assigned a Tool Assignment (TA) (shape/color combination — see Section 3.1.1 for the four combinations) immediately before their flight window — not known in advance.
- Sub-task: Fly to and inspect each mine shaft (MS)
- A successful mine shaft inspection is defined as the drone hovering over a mineshaft for approximately 5 secs and getting a judge's approval (ex. Receiving a thumbs up from a judge)
- A mineshaft will be a cardboard box containing the Tool shape that teams can lower a camera to observe
- Sub-task: lower the onboard camera to inspect the shaft at close range and confirm the shape/color match — autonomous computer-vision confirmation (most points) or human visual confirmation via camera feed (fewer points).
 - Autonomous Identification of Color gives points
 - Autonomous Identification of Shape gives points
 - Autonomous Identification of both Color and Shape gives the most points
 - Non-autonomous (i.e. human) identification of Both will result in points
 - Autonomous Identification of any/all attribute will result in team receiving a Reinforced Foundation
- These two sub-tasks are scored independently, which produces three effective autonomy outcomes: both autonomous (highest score), one autonomous/one semi-autonomous (middle score), or both semi-autonomous (lowest score, still fully scorable).

Pilot/copilot should communicate with the Flight Judge to announce/demonstrate autonomous task performance. In poor weather, rounds may move indoors; indoor flights **MUST** have semi-autonomous takeoff/landing (remaining tasks may still be auto or semi-auto).

3.2.2 Round Schedule

Each Round 1 flight window = 5 minutes. Field Manager counts down from three to begin; countdown starts once tether attached, battery connected, drone armed, team stepped back into Red Zone. Setup tasks (connecting computers/monitors, starting autonomous programs) count within the 5 minutes.

Once the timer begins, pilot/copilot may re-enter the field as needed for problem-solving until the drone leaves Base Camp; after that, no one may enter the field. Leaving Base Camp means that no

part of the drone remains on the launch pad. If a takeoff was attempted and the drone becomes airborne for less than a second and drops back to the ground, if any part is still on the launch pad where it rests, the drone is still at Base Camp. The round continues until time is called, all points scored, or the team forfeits remaining time.

3.2.3 Seeding

Combined score from Task 1A + Task 1B ranks all teams. The seeding will be done by pairing the best scoring teams with the lowest scoring teams. For further rounds, the score from the previous rounds will be used to seed teams similarly.

3.2.4 Example Field Layout

The diagram below illustrates one possible arrangement of Round 1 components — a single team's Base Camp and the 4 Mine Shafts (one per Tool Assignment, Section 3.1.1) spread around the circular field. Only one team flies at a time in Round 1.

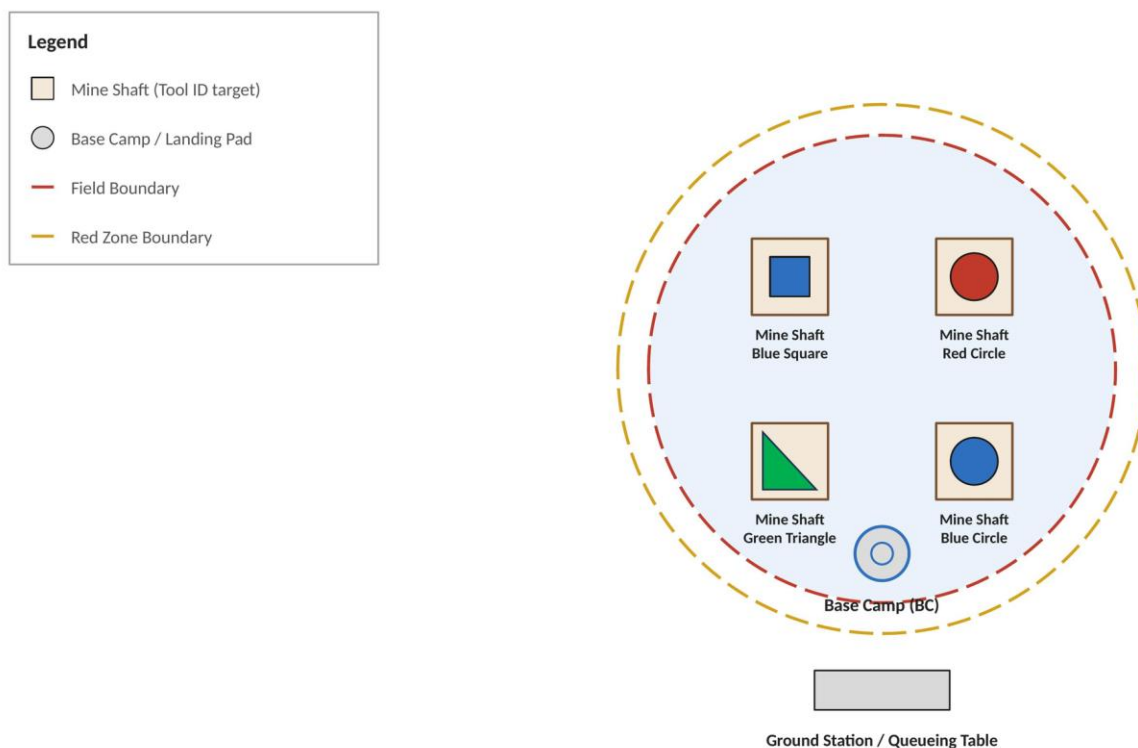


Figure 3.1 — Example Round 1 ("The Mines") field layout. Illustrative only, not to scale; see Appendix F for the formal diagram.

3.3 Round 2: Mine & Build (Head-to-Head)

Theme: Now that tools are identified, it's time to mine. Two teams share the field simultaneously, competing for the same limited Bricks, then race the clock to build the tallest stable Skyscraper they can. Depending on the size of the regional competition, teams may be afforded two attempts at round 2. The highest score of the two attempts will be used as the official score for this round. If the second attempt is higher, a one-time 100-point deduction will be applied to encourage teams to succeed on their first attempt.

3.3.1 Field Layout

- Circular field, 40-ft radius (80-ft diameter).
- 4 Supply Depots (landing pads), spread across the field, positioned so teams pass by them while moving between shafts and their Stockpile.
- Approximately 20 Bricks distributed on the field for mining.

3.3.2 Phase 1 — Brick Mining (7-Minute Window)

- Teams pilot drones to pick up Bricks from the field and carry them to their own Stockpile.
- Contested resource: both teams may go for the same Brick — whichever team secures it denies it to the opponent as long as they are able to get it to their own Stockpile (SP). No rule restricts which Bricks a team may pursue.
- An undamaged brick is defined as one that has all its parts connected when it settles in the stockpile. If Bricks break during any portion of the round, teams can bring portions of the broken Brick to their stockpile; however, they will only receive points for undamaged bricks that they bring back. The broken Brick parts will be available for teams to use in Phase 2.
- Supply Depots: landing at a Depot awards points and one Depot Material for a maximum of 4 Depot material that can be earned by a team. Teams cannot re-land on a Depot Pad and have it count as multiple depot landings; i.e., each separate Depot must be landed on to receive points. This gives teams without gripper capability a real scoring path independent of Brick collection, and gives every team a reason to route through each Depots during mining.
- Teams must then return to the starting landing pad and will earn points if they are able to within the time limit.

3.3.3 Phase 2 — Skyscraper Build (5-Minute Window)

- Immediately following Phase 1, though in a different section of the competition area (i.e., not on the flight playing field), each team has 5 minutes to build a free-standing Skyscraper from the Bricks and Depot Materials they collected.
- Standardized Foundation (FD): every team starts from the same kit-provided Foundation piece — no material advantage from what a team builds on.
- Reinforced Foundation (RFD): teams that succeed in any portion of the Autonomous ID will receive a reinforced foundation-enhanced kit
- Height Tiers: 1 ft / 2 ft / 4 ft / 6 ft. A Skyscraper must maintain its qualifying tier height for 10 seconds post-build to score that tier. If the tower collapses during the 10-second window, the height of the collapsed tower will be used.
- Free-standing definition: no team contact, no external support except with team-built k'nex structures, built entirely off the common Foundation/ground area during the entire 10 second window.

3.3.4 Interference & Safety

- No drone may impede another team's drone during head-to-head flight.
- Accidental interference: point penalty (see Section 3.8.7, Penalties).
- Intentional interference: elimination from that round (Field Manager judgment).

3.3.5 Example Field Layout

The diagram below illustrates one possible arrangement of Round 2 components on the shared circular field: the 4 Supply Depots contested by both teams, roughly 10 Bricks distributed for mining, each team's Stockpile and Ground Station/Queueing area on its assigned side, and the off-field Skyscraper Build Areas used in Phase 2.

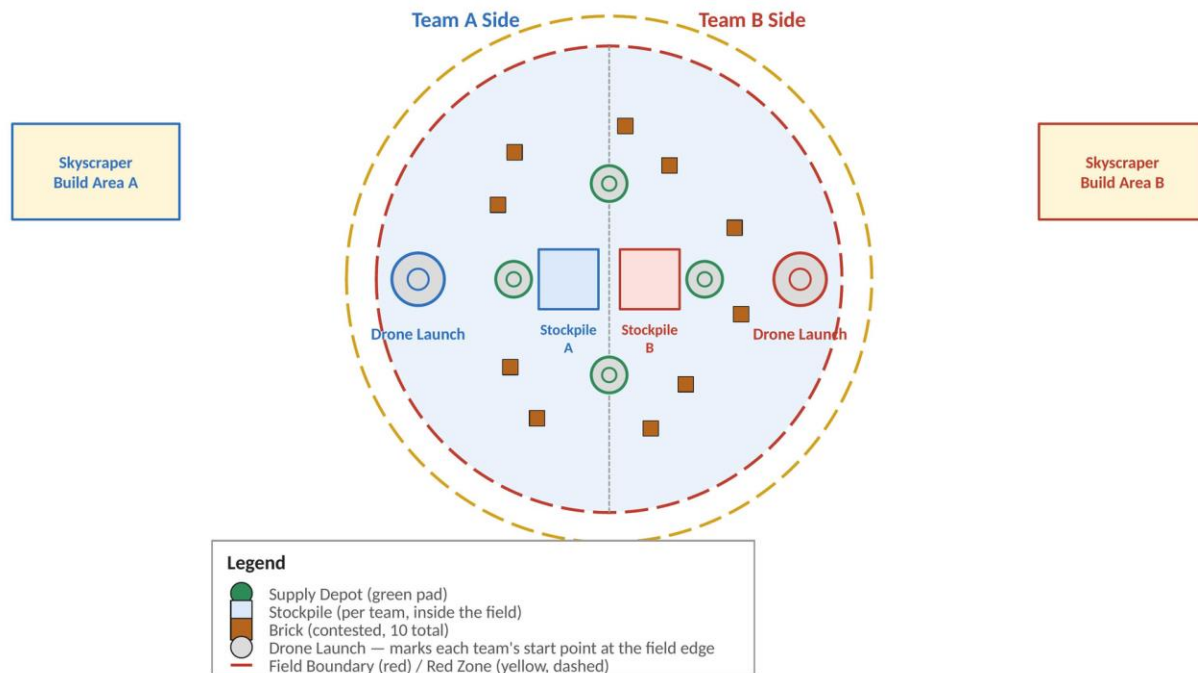


Figure 3.2 — Example Round 2 ("Mine & Build") head-to-head field layout. Illustrative only, not to scale; see Appendix F for the formal diagram.

3.3.6 Round 1 → Round 2 Coupling

Round 1 performance shapes Round 2 in two separate ways: Combined Task 1A/1B score sets the Seeding → Bracket Pairing (Section 3.2.3), and Tool ID (Task 1B) success sets Foundation Selection carried into Round 2 (Section 3.3). The diagram below traces both paths from Round 1 scoring through Round 2's two build phases to the Final Score.

Figure 3.4 — Round 1 → Round 2 Coupling: Score & Resource Flow

Round 1 performance shapes Round 2 two separate ways: it sets the head-to-head bracket, and Tool ID success sets foundation selection. Illustrative process flow, not to scale.

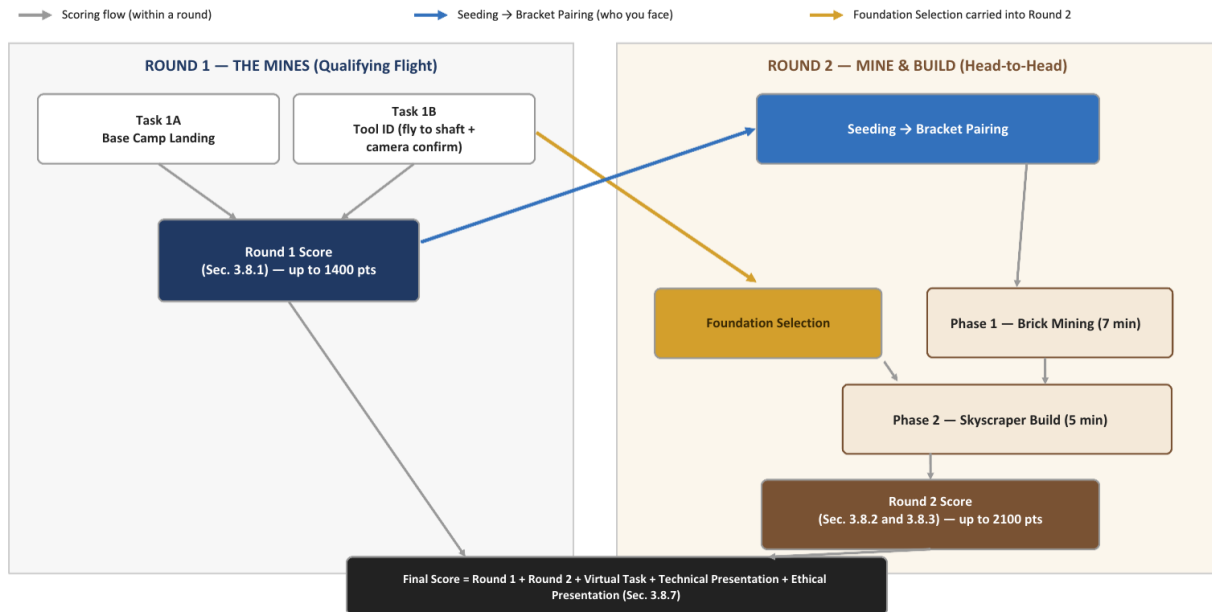


Figure 3.4 — Round 1 → Round 2 Coupling: Score & Resource Flow. Illustrative process flow

3.4 Virtual Tasks

The following tasks are to be completed virtually. These missions must be submitted through the STEM-ED INC website: <https://www.stemed.org/arc-submissions>.

- 1. TRUST Exam:** Submit TRUST Exam certificates. Pilots **MUST** have a TRUST Exam certificate to legally fly at the competition (see Section 4.2).
- 2. Power On:** Submit video of the team powering on the drone.
- 3. Takeoff and Land:** Submit video of the drone taking off and landing. May be completed autonomously or semi-autonomously.
- 4. Mechanism Prototype:** Submit video demonstrating a mechanism prototype. Does not need to be attached to the drone; may be moved by hand.
- 5. Drop Object from Air:** Submit video of the drone dropping an item from the air. Drone must be in flight; any payload; item may be preloaded.
- 6. Camera Operation:** Submit video of a student reading a number off the camera feed monitor from data transmitted via camera. Provide video of the drone as well as of the camera feed monitor during flight. This does not need to be completed with the official camera dictated in Section 4.1.6 — teams may use any camera and monitor to complete this Mission.
- 7. Autonomous Waypoints:** Create a flight path of 3 waypoints and submit video of the drone autonomously flying the path. Provide video of the drone as well as of the ground station during flight.
- 8. Color Recognition:** Submit video of a computer vision program successfully identifying a red object, along with a text file of the code. May use Python or C++.
- 9. Register Drone through FAA:** Submit a screenshot of completed drone registration. Drones **MUST** be registered with the FAA to legally fly at the competition (see Section 4.2).

10. Budget: Submit budget spreadsheet. Must comply with the limits listed in Section 4.1.5. Note that this is a REQUIRED task to compete.

Tasks are due in 4 stages (see Section 2.3 for the season schedule):

- **Virtual Task 1: Due 12/18/2026**
- **Virtual Task 2: Due 1/29/2027**
- **Virtual Task 3: Due 3/19/2027**
- **Virtual Task 4-10: Due 4/17/2027**

Virtual Tasks 1 through 3 may be submitted late for a 50% point reduction. Submissions will be accepted through the Virtual Task 4 due date.

3.5 Flight & Build Procedure

Governed by the Field Manager, who directs all major steps and rules on safety/final calls; teams must obey directions, including immediate Kill Switch activation when commanded. Teams must arrive at the Queueing Table at least 5 minutes before their scheduled round or forfeit the match (no makeup opportunity).

Step	Action	Location	Note
1	Queue for match; attach camera if desired	Queueing Table	5 min before match time
2	Pilot and copilot enter Red Zone	Red Zone	Wait for Field Manager
3	Pilot prepares ground station; copilot attaches tether and propellers; add camera/telemetry radio/preloaded component as desired	Ground Station Table & Base Camp	—
4	Pilot and copilot plug in battery, arm drone, prepare for flight	Base Camp, Ground Station Table	Wait for Field Manager
5	(Round 2) Wait for both teams to be ready	Ground Station Table	—
6	Field Manager countdown: 3/2/1/Go	Ground Station Table	Wait for Field Manager
7	Clock begins; team(s) may take off	Ground Station Table	—
8	Field Manager calls 1-minute-remaining warning	—	—
9	Field Manager countdown: 5/4/3/2/1/Time's Up	—	Must land immediately
10	Team(s) disarm drone, turn off controller	Ground Station Table	—
11	Team(s) enter field, unplug battery	Field	Wait for Field Manager
12	Team(s) unhook tether, exit field	Field	Must unplug battery first
13	(Round 2 only) Teams proceed to Skyscraper Build area with collected Bricks/Depot Materials	Build Area	5-minute build clock begins on Field Manager's call

3.6 Technical Presentation

Presentations given entirely by students, no coach/mentor/parent assistance.

3.6.1 Team Logistics

- Team organization and dynamics: member list/roles, team photo(s), meeting style details.
- Team schedule for project completion: task breakdown, responsible member(s), planned vs. actual completion times.

3.6.2 Engineering Process

- Software methodology: software chosen and why, ground station chosen and why, waypoint navigation strategy, camera feed setup.
- Mission overview and strategy: method of choosing tasks, strategy for completing the Mines & Skyscrapers challenges.
- Mechanism design: design process, early designs/prototypes vs. final result.

3.6.3 Final Product

- Vehicle overview: labelled images of drone/mechanism; front/top/side/isometric views with primary dimensions labelled.
- Electronics diagram: layout of major electronics systems (flight controller, speed controllers, motors, etc.).
- Product success: flight test results, projected competition score.

3.6.4 Presentation Style

- Slides legible and clear: readable text/color choices, no crowding/overlap.
- Presenters professional and well-prepared: minimal filler words, ready to speak on assigned subjects.
- All team members speak: each student actively involved.
- Q&A responses: professional answers to all judge questions.

Judges account for presenter limitations due to disabilities; judged on individual preparedness/effort.

3.6.5 Procedure

- Submit slides virtually by midnight 7 days before Regional Competition (<https://www.stemed.org/arc-submissions>); most recent submission before deadline is used.
- Setup: judges project submitted slides; team sets up display materials.
- Presentation: up to 10 minutes; judges raise hand at 1 minute remaining.
- Q&A: judges ask questions for up to 5 minutes.
- Cleanup: team exits, next team sets up.

3.7 Ethical Presentation

Focus: ethical use of drone technology, engineering ethics, responsibility.

3.7.1 Grading

- Academic Validity: explanation of theory/doctrine behind proposed solution to ethical dilemma; describe programming to achieve the proposed solution.
- Comprehension and Elocution: clear understanding of the problem and why engineering ethics is critical; professional, comprehensible delivery.
- Discussion: all speak and demonstrate inclusion; respect during disagreements; value one another's ideas (graded on collaborative effort, not content/correctness).
- Q&A Responses: professional answers to all judge questions.

3.7.2 Process

Similar setting to Technical Presentation; teams respond to an ethical dilemma posed by judges. All-student presentation, no adult assistance.

- Setup: team enters, stands in designated area; recommended to bring paper/writing utensils (whiteboard availability varies by venue).
- Question: judges provide the ethical dilemma.
- Discussion: up to 5 minutes, in front of judges (affects discussion-portion grading only).
- Presentation: up to 5 minutes, answering the dilemma per grading requirements (some open-ended for creativity).
- Q&A: up to 5 minutes.
- Cleanup: team exits, next team sets up.

Students may not discuss the ethical question with other teams until all teams have completed their Ethical Presentation.

3.8 Scoring Equations

3.8.1 Round 1: The Mines

#	Task	Score	# Possible	Total Score
1a	Semi-autonomously fly to and land on Base Camp	200	1	200
2a	Autonomous Tool ID of both Shape and Color	1000	1	1000
2a1	Autonomous Tool ID of Shape	500	1	500
2a2	Autonomous Tool ID of Color	500	1	500
2b	Semi-autonomous Tool ID confirmation (camera feed)	200	1	200
3a	Fly to a mineshaft	50	4	200
—	Best-case total (full autonomy, 1a+2a+3a)			1400

NOTE: Only one of each a/b pair scores per task, based on which mode was flown.

3.8.2 Round 2, Phase 1: Brick Mining

#	Task	Score	# Possible	Total Score
1	Deliver an undamaged Brick to team Stockpile	100	10	1,000
2	Land at a Supply Depot (earns 1 Depot Material)	50	4	200
3	End Mining Phase on the starting landing pad	100	1	100
—	Total possible			1,300

3.8.3 Round 2, Phase 2: Skyscraper Build

#	Task	Score	# Possible	Total Score
1	Reach & hold Tier 1 (1 ft, 10 sec)	150	1	200
2	Reach & hold Tier 2 (2 ft, 10 sec)	300	1	300
3	Reach & hold Tier 3 (4 ft, 10 sec)	500	1	500
4	Reach & hold Tier 4 (6 ft, 10 sec)	800	1	800
—	Best-case total (Tier 4 only — not cumulative)			800

3.8.4 Virtual Tasks Scoring

Unchanged from the 2025-26 rubric.

#	Mission	Notes	Score
1	TRUST Exam	TRUST Exam Certificate submitted for each student on roster. Legally required for pilot to carry TRUST Exam Certificate while flying.	25
2	Power On	Power on drone.	50
3	Takeoff and Land	Takeoff and land. May be completed autonomously or semi-autonomously.	100
4	Mechanism Prototype	Demonstrate mechanism prototype. Does not need to be attached to drone. May be moved by hand.	100
5	Drop Object from Air	Drop any item from air. Drone must be in flight. May use any payload. Payload may be preloaded.	100
6	Camera Operation	Read a number off camera feed monitor from data transmitted via camera.	100
7	Autonomous Waypoints	Create a flight path of 3 waypoints and autonomously fly path.	150
8	Color Recognition	Successfully identify a red object using computer vision program. May use Python or C++. Must provide text file of code.	300

9	Register Drone	Register drone through FAA. This number MUST be displayed on drone during flight.	25
10	Budget	Budget spreadsheet. Must comply with limits in Section 4.1.5.	50
			Total: 1,000

3.8.5 Technical Presentation Scoring

#	Task	Score
1	Team organization and dynamics	50
2	Team schedule	50
3	Software methodology	100
4	Mission overview and strategy	100
5	Mechanism design	100
6	Vehicle overview	100
7	Electronics diagram	100
8	Product success	100
9	Legible/clear slides	100
10	Professional and well-prepared	50
11	All team members speak	50
12	Q&A responses	100
P1	Team continues presenting after time is called	-100
—	Total	1,000

3.8.6 Ethical Presentation Scoring

#	Task	Score
1	Explanation of theory/doctrine	100
2	Programming the drone	50
3	Comprehension	50
4	Elocution	50
5	All speak and demonstrate inclusion	50
6	Students demonstrate respect during disagreements	50
7	Students value one another's ideas	50
8	Q&A responses	100
P1	Team continues presenting after time is called	-50

#	Task	Score
—	Total	500

3.8.7 Round Penalties

Round	Action*	Value
Round 1, Round 2	Accidental drone-to-drone interference	-100
Round 1, Round 2	Intentional drone-to-drone interference	Elimination from that round
Technical Presentation	Presentation continues after time is called	-50

3.8.8 Final Scoring & Comparison to 2025-26

Component	2025-26 (last year)	2026-27 (proposed)
Virtual Tasks	1,000	1,000 (unchanged)
Flight/Game	Mission 1: 1,000 + Mission 2: 1,500 = 2,500	Round 1: 1,400+ Round 2: 2,100 = 3,500
Technical Presentation	1,000	1,000 (unchanged)
Ethical Presentation	500	500 (unchanged)
Total	5,000	6,000

4. Drone Requirements

UAV must meet all requirements to be flight-eligible; inspected pre-flight (Appendix B). All components within budget allowances (Table 4.1); teams present component/price list at technical inspection. STEM-ED-suggested components/kits meet all financial requirements (Section 4.1.6). All design/build/code/test work must be completed by students only (adult coaches/mentors may guide, not do hands-on work or make major decisions). Drones MUST have a kill switch to immediately cut motors in emergencies.

4.1 Mechanical Requirements

4.1.1 Structure

- Overall UAV dimensions $\leq 36" \times 36" \times 36"$ on the ground, no propellers attached (fits in a 36-inch cube).
- 4 motors, 1 propeller each; propellers $\leq 14"$ diameter; no lifting surfaces other than these propellers.
- Carabiner clip securely fastened within the tether zone, connected to field tether carabiner before power-on.
- Structure must be sturdy (Technical Inspector judged); no loose components.
- Drone must stand on legs extending $\geq 4"$ below the electronics/structure closest to the ground, and $\leq 10"$ below the drone base plate.

4.1.2 Mechanism Design

- Must design/build a unique mechanism to complete flight tasks — including Brick pickup/carry and, if used, camera-lowering for Tool ID — no Commercial Off The Shelf (COTS) mechanisms (e.g., pre-made claw).
- Mechanism may use multiple servos, but all powered by one single NiMH battery (Section 4.1.4).
- Must begin within the mechanism allowable zone; may not extend above the drone base plate at any time.
- May not detach from drone during flight.
- May not extend beyond the mechanism allowable zone.
- Different mechanisms allowed for different events, but each must pass technical inspection (Appendix B).

4.1.3 Controls

- GPS sensor securely mounted on UAV.
- Flight controller must be one of: Cube Orange+, or Pixhawk (any version).
- Sensors: may use accelerometer, gyroscope, magnetometer, barometer within the flight controller; no additional purchased/used sensors. May add an approved camera (Section 4.1.6) for live footage to ground station.
- Computer vision teams may use a Raspberry Pi companion computer (any version).

4.1.4 Batteries

- Main UAV Battery: LiPo, ≤ 6 cells, commercially available (no homemade batteries), proper usage/storage (Section 4.2), no damaged batteries (dents, cracks, swelling, smoking).
- Servo Battery: NiMH, powers mechanism servo/actuator.
- Safety: battery wires MUST be securely restrained away from propellers, servos, and the ground.

4.1.5 Budget Requirements

Item	Max \$	Notes
Drone	\$3,000	Flight controller, motor controllers, motors, propellers, LiPo batteries, all spare components brought to competition
Mechanism	\$300	Structural components/hardware, servo and gears, NiMH battery
Transmitter/Receiver	\$300	See recommended list
Sensors	\$0	No additional sensors may be purchased
Tether Supplies	—	Required carabiner
Camera	—	Any for practice; only required models at competition
Camera Feed Monitor	—	Same as above

Item	Max \$	Notes
Total	\$3,600	<i>Does not include required carabiner, camera, camera feed monitor</i>

4.1.6 Supplies and Sources

Recommended, not required suppliers (STEM-ED INC is not sponsored by/does not endorse these).

Required Components:

- Carabiner: any strong carabiner with a functioning latch.
- Camera Mount: if using ARC-provided RunCam camera, must have quick attachment not damaging camera/antenna (practice-only — cannot be brought to competition, signal interference risk). RunCam Spotter V2 FPV Camera/5.8GHz Transmitter; RunCam 5.8GHz 4.3" FPV Display Screen. Alternatively, Arducam Camera for Raspberry Pi does not require quick attachment and is brought by the team (not supplied by ARC).

Recommended Drone Kits:

- Option 1: ARC-Recommended AirXRP Drone Kit (spreadsheet at stem-ed.org/recommendedsupplies)
- Option 2: DEXI PX4 Development Kit (requires team-designed legs)
- Option 3: Prior-season ARC Kit Drone (returning teams may reuse; upgrade components linked)
- Option 4: Student-designed drone (any drone meeting rulebook requirements)

Necessary Tools: Soldering Iron, Allen Wrenches, Safety Glasses, Zip Ties, Computer (research, budget spreadsheet, presentation slides, virtual tasks), Paper and Writing Utensils.

Banned Components (signal interference — safety/sportsmanship, strictly enforced, Section 5.2):

- RunCam Camera and Monitor set may not be brought to the competition venue.
- No device that may interfere with opponents' telemetry signal.

4.2 Safety and Legal Requirements

STEM-ED INC releases official safety/FAA compliance guidelines as an addendum to the rulebook. Pilots must be able to safely operate the drone; if unable (e.g., medical emergency), asked to land and let a teammate pilot future rounds. Teams **MUST** follow Field Manager commands (positioning, Kill Switch activation). Safety/legal questions: <https://www.faa.gov/> or Support@stem-ed.org.

5. Competition Rules

5.1 Logistics

Check-in table on arrival (wristbands, schedules, maps) → team pits (home base, charge batteries nearby). Teams must be at the queueing table on their field side before their assigned time slot; queueing volunteers guide teams to the ground station table. Teams not competing in the current match may not enter field zones. Only pilot/copilot may enter the red zone — not other students, coaches, mentors, or parents/guardians.

5.2 Conduct Requirements

Ruling challenges: student team members only (not parents/coaches/mentors/spectators), kept cordial, discussed with the Field Manager.

Safety rules include: obeying field boundaries, powering off electronics off-field, reinspection after drone damage, using tether at all times on field. Continued willful non-compliance → discretionary penalty (value/distribution set by Field Manager/Regional Coordinator).

Penalty	Potential Value
Safety Violations	
Enter field without approval	-50
Attach battery without first attaching tether	-50
Refusal to use Kill Switch when instructed	Elimination from all Rounds of Current Round Type (No Warnings)
Accidental drone-to-drone interference	-100 points (see Section 3.8.7)
Intentional drone-to-drone interference	Elimination from that round (see Section 3.3.4 and 3.8.7)
Sportsmanship Violations	
Continued disobedience of explicit instructions	-200
Disrespectful treatment of an opponent or volunteer	-300
Interference with opponent telemetry/radio communications	-100 (Up to DQ if Egregious)

5.3 Competition Day Supplies

Required: Drone, safety glasses (pilot/copilot), battery charger, TRUST Exam Certificates (all pilots), camera mount (if using camera).

Recommended: Sunscreen, water, snacks, spare batteries, spare propellers, common tools/adhesives, weather-appropriate attire, comfortable shoes, hair ties, first aid kits, medications as needed. (Outdoor competition — prepare for weather and a long day standing.)

6. Awards

Prizes per region to top three advanced teams overall and top two beginner teams overall (aggregate score across all competition parts). Teams must successfully fly (take off, sustain flight >30 seconds) to be prize-eligible. National Championship award amounts will be defined in the National Championship rulebook.

Advanced Division

Achievement	Award
1st Place, Overall	\$2,500
2nd Place, Overall	\$1,500

Achievement	Award
3rd Place, Overall	\$750

Beginner Division

Achievement	Award
1st Place, Overall	\$750
2nd Place, Overall	\$500

Appendix A: Scoring Sheets

Judge-facing fill-in scoring sheets for Virtual Tasks, Round 1 (The Mines), Round 2 Phase 1 (Brick Mining), Round 2 Phase 2 (Skyscraper Build), Technical Presentation, and Ethical Presentation, built directly from the scoring tables in Section 3.8. Carried over in format from the 2025-26 Appendix A (Team Number box, fill-in Score column, Final Score/Judge Initials footer); point values and tasks below are updated for the 2026-27 Mines & Skyscrapers season. Recommend producing these as a standalone one-page-per-round PDF/laminated card set for judges.

Virtual Tasks Scoring Sheet

Team Number: _____

#	Tasks	Points	Score
1	TRUST Exam	25	
2	Power On	50	
3	Takeoff and Land	100	
4	Mechanism Prototype	100	
5	Drop Object from Air	100	
6	Camera Operation	100	
7	Autonomous Waypoints	150	
8	Color Recognition	300	
9	Register Drone (FAA)	25	
10	Budget (REQUIRED)	50	
		Total	1,000

Virtual Tasks 1–3 may be submitted late for a 50% point reduction; see Section 2.3 and Section 3.4.

Final Score: _____ / 1,000 **Judge Initials:** _____

Round 1 — The Mines Scoring Sheet

Team Number: _____

#	Task	Points	Score
1a	Semi-autonomously fly to and land on Base Camp	200	
2a	Autonomous Tool ID of both Shape and Color	1000	
2a1	— Autonomous Tool ID of Shape only	500	
2a2	— Autonomous Tool ID of Color only	500	
2b	Semi-autonomous Tool ID confirmation (camera feed)	200	
3a	Fly to a mineshaft (4 shafts × 50 pts each)	200	
		Total	1,400

Best-case total shown is full autonomy (1a + 2a + 3a). Only one of each a/b pair scores per task, based on which mode was flown.

Final Score: _____ / 1,400 **Judge Initials:** _____

Round 2, Phase 1 — Brick Mining Scoring Sheet

Team Number: _____

#	Task	Points	Score
1	Deliver an undamaged Brick to team Stockpile (× up to 10, 100 pts each)	1,000	
2	Land at a Supply Depot — earns 1 Depot Material (× up to 4, 50 pts each)	200	
3	End Mining Phase on a landing pad	100	
		Total	1,300

Final Score: _____ / 1,300 Judge Initials: _____

Round 2, Phase 2 — Skyscraper Build Scoring Sheet

Team Number: _____

#	Task	Points	Score
1	Reach & hold Tier 1 (1 ft, 10 sec)	150	
2	Reach & hold Tier 2 (2 ft, 10 sec)	300	
3	Reach & hold Tier 3 (4 ft, 10 sec)	500	
4	Reach & hold Tier 4 (6 ft, 10 sec)	800	
	Second round?	-100	
		Total	800

Score is the highest tier successfully held — not cumulative across tiers.

Final Score: _____ / 800 Judge Initials: _____

Round 1 / Round 2 Penalties (Section 3.8.7)

Action	Value
Accidental drone-to-drone interference	–100
Intentional drone-to-drone interference	Elimination from that round

Technical Presentation Scoring Sheet

Team Number: _____

#	Task Description	Max	Score
1	Team organization and dynamics	50	
2	Team schedule	50	
3	Software methodology	100	
4	Mission overview and strategy	100	
5	Mechanism design	100	
6	Vehicle overview	100	
7	Electronics diagram	100	

8	Product success	100	
9	Slides are legible & clear	100	
10	Professional & well-prepared	50	
11	All team members speak	50	
12	Q&A responses	100	
P1	Penalty: team continues presenting after time is called	-100	
		Total	1,000
Suggestions:		Praise:	

Final Score: _____ / 1,000 **Judge Initials:** _____

Ethical Presentation Scoring Sheet

Team Number: _____

#	Task	Score	Earned
1	Explanation of theory/doctrine	100	
2	Programming the drone	50	
3	Comprehension	50	
4	Elocution	50	
5	All speak and demonstrate inclusion	50	
6	Students demonstrate respect during disagreements	50	
7	Students value one another's ideas	50	
8	Q&A responses	100	
P1	Penalty: team continues presenting after time is called	-50	
		Total	500

Final Score: _____ / 500 **Judge Initials:** _____

Appendix B: Technical Inspection Rubric

Carries over from the 2025-26 Technical Inspection Rubric (Side A/Side B) — the drone hardware requirements in Section 4 are unchanged this season apart from the Mechanism Design line, which is reworded below for Brick pickup/carry and (if used) camera-lowering for Tool ID rather than last year's payload-specific mechanisms.

Inspection, Side A

Caution: Vehicle is to be presented with battery and propellers removed.

Category	Task	Pass
Inspection	Battery & propellers removed	☐
	Drone connected to inspection tether	☐
Safety	Team demonstrates working kill switch	☐
	Team has carabiner clip firmly fastened to underside of drone for tether attachment	☐
Budget	All components remain within budget allowances (Section 4.1.5)	☐
Camera	Mount (if applicable) enables quick attachment/detachment of camera without damaging camera	☐
Structure	UAV does not exceed 36" cube	☐
	UAV has 4 motors with 1 propeller each	☐
	Propellers do not exceed 14" diameter	☐
	Structure must be sturdy with no loose components	☐
	UAV must stand on legs extending at least 4" and no more than 10"	☐
Mechanism Design	Mechanism is student-designed, not COTS (Brick pickup/carry; camera-lowering for Tool ID if used)	☐
	Mechanism is controlled using a single servo	☐
	Mechanism remains within allowable zones	☐
	Mechanism will not detach during flight	☐
Controls	UAV has GPS sensor and it is securely mounted	☐
	UAV uses Pixhawk or Cube Orange+ flight controller	☐
	Teams do not use any other sensors beyond those included in flight controller/drone kit	☐
Ready		☐

Inspection, Side B

Caution: Vehicle is to be presented with battery and propellers removed.

Category	Task	Pass
Batteries (inspect all spares)	Team uses lithium polymer (LiPo) battery to power flight controller	☐

	LiPo does not contain more than 6 cells	☐
	LiPo must be commercially available (no homemade batteries allowed)	☐
	Team uses proper battery usage & storage techniques	☐
	LiPo does not display signs of damage (swelling, dents, cracks, etc.)	☐
	Team uses nickel-metal hydride (NiMH) battery to power servo (if applicable)	☐
Pilot/Copilot	Pilot(s) and copilot(s) have safety glasses	☐
	Pilot(s) have TRUST Exam certificate (physical copy in pocket during competition)	☐
Sportsmanship	Team confirms drone was designed, built, and programmed by students only	☐
	Team confirms they have not brought any telemetry radios on site	☐
	Team agrees to all safety and conduct requirements	☐
FAA	FAA registration number displayed on drone	☐
Ready		☐

Team Captain Initials: _____ **Inspector Initials:** _____

Appendix C: Example Budget

Carries over the 2025-26 Example Budget spreadsheet structure (Competition Budget, Extra Items, Funds Raised / Remaining Funds), created in Microsoft Excel. One change from last year: the Transmitter/Receiver cap rose from \$200 to \$300 and the overall competition-budget total rose from \$3,500 to \$3,600 (Section 4.1.5); the Drone (\$3,000), Mechanism (\$300), and Sensors (\$0) caps are unchanged. The example below (totaling \$687.32) fits comfortably within both this year's and last year's caps, so the line items themselves carry over unchanged.

Example Budget — Competition Budget

Item	Qty	Cost	Source	Purchaser	Reimbursed?	Notes
Holybro S500 V2 Kit	1	\$429.99	Holybro.com	School	NA	
Readytosky Brushless Motors (4-pack)	1	\$39.99	Amazon.com	Anna	Not yet	Submitted reimbursement paperwork
GemFan 1045 CW/CCW Propeller Props	4	\$71.92	Amazon.com	Joe	Yes	
Deegoo [4-Pack] Servo Motor	1	\$17.99	Amazon.com	Anna	Yes	
CNHL LiPo Battery (2-pack)	1	\$28.99	Amazon.com	School	NA	
Tenergy NiMH Battery	2	\$11.99	Amazon.com	Joe	Not yet	Bought 2 to have spare
Flysky FS-i6X RC Transmitter w/ FS-iA6B Receiver	1	\$54.99	Amazon.com	School	NA	
Bass Wood (for mechanism)	1 pack	\$14.99	Home Depot	Juan	Yes	
Glue (for mechanism)	1 bottle	\$8.99	Home Depot	Juan	Yes	
Screws (for mechanism)	1 box	\$4.49	Home Depot	Juan	Yes	
Carabiner	1	\$2.99	Amazon.com	Maria	NA	No reimbursement requested
Total (Included in Competition Budget Limits)		\$687.32				

Example Budget — Extra Items

Item	Qty	Cost	Source	Purchaser	Reimbursed	Notes
RunCam Spotter V2 FPV Camera and 5.8GHz Transmitter	1	\$49.99	Amazon.com	School	NA	
RunCam 5.8GHz 4.3" FPV Display Screen	1	\$59.99	Amazon.com	School	NA	
Total (Not Included in Competition Budget Limits)		\$109.98				

Example Budget — Funds Raised & Remaining Funds

Source	Amount	How to write in Excel:
School Assistance	\$623.95	
Parents/Guardians	\$150.00	
Bake Sale	\$75.50	
Social Media Venmo Fundraiser	\$125.00	
Total Funds Available	\$974.45	=SUM(C26:C29)
Amount Spent	\$797.30	=C15+C21
Remaining Funds	\$177.15	=C30-C31

Appendix D: Resources

2026-27 Season Documents

- 2026-27 Field Kit Assembly Guide: <https://www.stemed.org/arc> (updated for the K'NEX Brick/Foundation build — pending release; last season's is the 2025-26 Field Kit Assembly Guide Rev B)
- FAA guide: <https://www.stemed.org/arc>
- Safety guide: <https://www.stemed.org/arc>

STEM-ED INC Technical Resources

- ARC Video Series: <https://www.stemed.org/resources>
- ARC Tutorials: <https://www.stemed.org/resources>
- Office Hours: <https://www.stemed.org/events>
- Coach Training: <https://www.stemed.org/events>
- STEM-ED INC Forum: Coming Soon!

Additional Resources*

- Mission Planner Instructions: <https://ardupilot.org/planner/>
- Holybro Product Documentation: <https://docs.holybro.com/>

**STEM-ED INC is not affiliated with the creators of these resources and cannot guarantee the quality or accuracy of these websites.*

Appendix E: Recommended Supplies

Drone

See <https://www.stemed.org/recommendedsupplies> for an itemized list of recommended components.

Teams may also choose to create a mechanism to manipulate objects on the field — this season, primarily picking up and carrying Bricks and Depot Material, and (if used) lowering a camera for Tool ID. Materials, such as wood, 3D-printed plastic, carbon fiber, and aluminum, should be selected by function and cost.

Tools

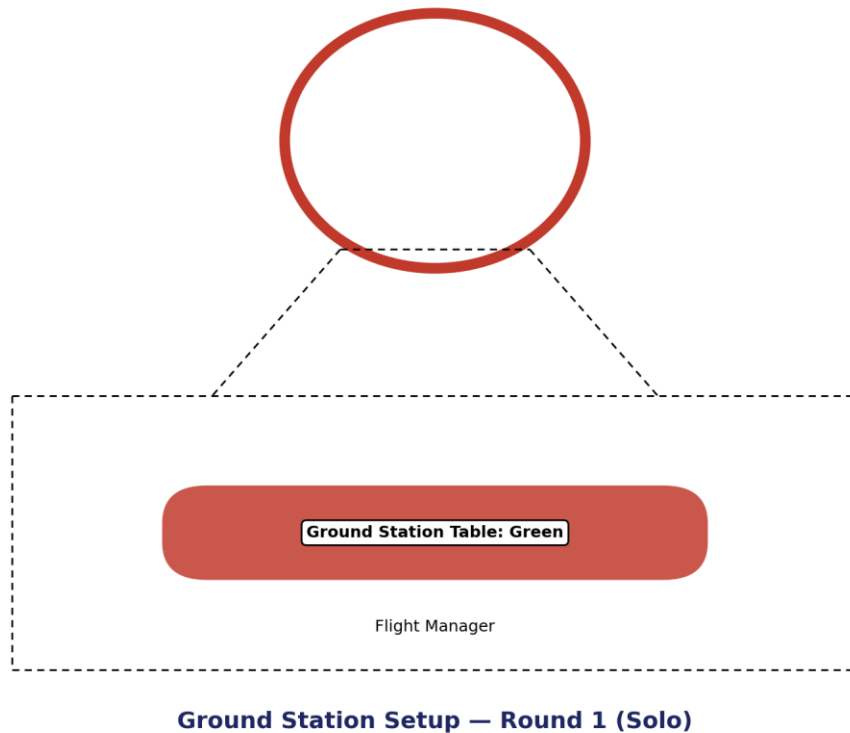
Tool	Example	Notes
Soldering Iron	See recommended supplies	Use with caution
Electrical Tape	See recommended supplies	Use to cover any wire connections. Do not leave any bare wires.
Zip Ties	See recommended supplies	Use to organize wires. Do not leave wires loose enough to tangle in propellers.
Allen Wrenches	See recommended supplies	Use to assemble drone kit.
Safety Glasses	See recommended supplies (regular & over-glasses options)	Wear when: using soldering iron; cutting materials; piloting/copiloting drone
Computer	—	Research and access resources; create budget spreadsheet; create Technical Presentation slides; complete virtual tasks
Paper / Writing Utensils	—	Record notes during meetings; draw mechanism prototype ideas

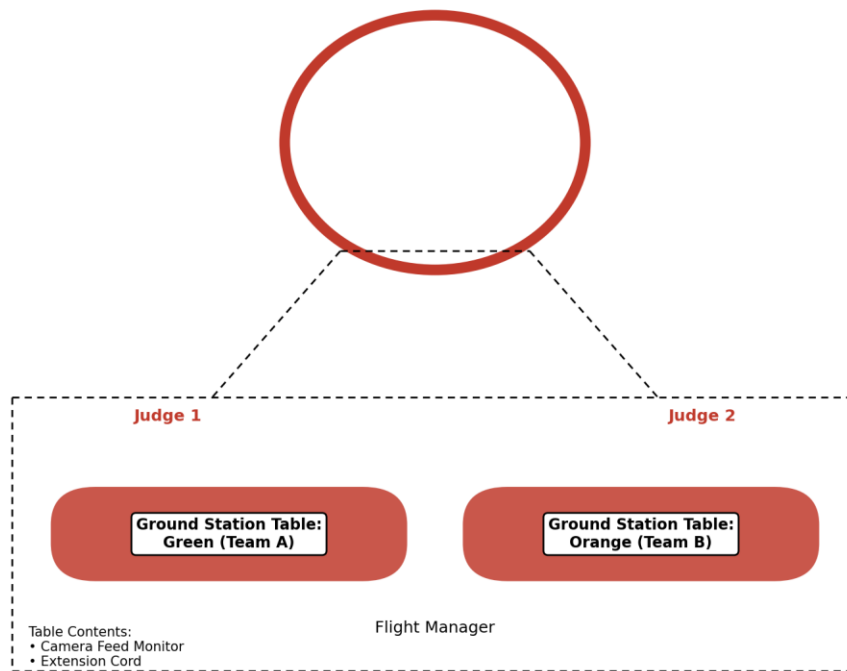
Appendix F: Field & Mission Diagrams

See the figures below for diagrams of Round and mission components and setup. Figures are approximate and not to scale unless noted.

Round 1 & Round 2 — Ground Station Setup

Round 1 is flown solo, one team at a time, with a single ground station table and Flight Manager (mirrors the 2025-26 Mission 1 Ground Station Setup). Round 2 is head-to-head, with two ground station tables (Green for Team A, Orange for Team B), one judge per team, and a shared Flight Manager (mirrors the 2025-26 Mission 2 Ground Station Setup).

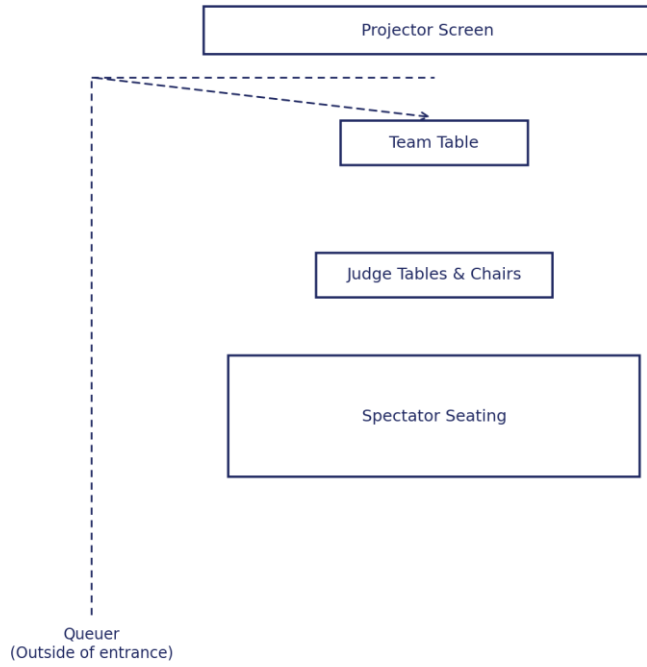




Ground Station Setup — Round 2 (Head-to-Head)

Presentation Diagrams

Shared room layout for both Technical and Ethical Presentations — projector screen, team table, judge tables/chairs, spectator seating, and a queuing area outside the entrance.



Example Technical/Ethical Presentation Room Setup

Revision History

Revision	Date	Notes
A	October 3, 2026	Kickoff Release