# UAS4STEM

# 2024 ADVANCED DIVISION

## RULEBOOK V-2

5161 E. Memorial Dr., Muncie IN 47302
modelaircraft.org

**UAS4STEM.ORG**

If you have questions about the UAS4STEM program,
please contact the Education Department at education@modelaircraft.org,
or 765-287-1256.

# UAS4STEM

## How to choose a competition division:

All new UAS4STEM teams are encouraged to choose the beginner division.
Returning teams are encouraged to choose the advanced division.
Any returning UAS4STEM team who has placed first, second, or third at finals within the past two years must select the advanced division. *If a team feels that there are extenuating circumstances in regard to preferred division, reach out to the UAS4STEM competition staff.*

**BEGINNER UAS4STEM DIVISION:**
Video component (simplified)
Basic search mission
No pickup or dropoff

**ALL DIVISIONS:**
Ground school
Flight Readiness Review
Virtual preliminaries
International competiton

**ADVANCED UAS4STEM DIVISION:**
Video component (training)
Multiple target search mission
Delivery mechanism engineering challenge
Includes pickup and dropoff portions

## BEGINNER AWARDS*

*(per team)*

**1st place: $1250**
**2nd place: $1000**
**3rd place: $750**

## ADVANCED AWARDS*

*(per team)*

**1st place: $2500**
**2nd place: $2000**
**3rd place: $1500**

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**Award amounts may be adjusted.*

# TEAM RULEBOOK

## 1. CONCEPT OF OPERATIONS (CONOPS)

A small group of people require assistance. Your team has been called upon to provide rapid response, using an Uncrewed Aircraft System (UAS).
In order to support this mission, the team must comply with Special Instructions (SPINS) for departure and arrival procedures while also remaining within assigned airspace. The team will also be tasked with identifying various Points of Interest (POI) to conduct payload pickup and delivery operations. The team will be required to engineer a mechanism for these tasks.

## 2. INTRODUCTION

### 2.1 THE GUIDING PRINCIPLE

The guiding principle of the UAS4STEM drone challenge is the safe application and execution of systems engineering principles to design, build, and operate a sUAS to successfully accomplish the mission tasks.

2.1.1 Teams who have competed in the previous two seasons of UAS4STEM and have placed in the top three are required to compete in the Advanced category. *If a team feels that there are extenuating circumstances in regard to your preferred class, reach out to the UAS4STEM competition staff who will confer and determine on a case-by-case basis.*

2.1.2. Off-the-shelf sUAS are not allowed to be flown for any scored UAS4STEM mission. As a training aid, pre-manufactured aircraft may be utilized.

### 2.2. OPPORTUNITIES AND RECOGNITION

Student teams will be judged based on their performance and that of their system. Awards and recognition will be given for top performances. Opportunities for interaction with aviation professionals and industry leadership will be provided.

### 2.3. RULES

The competition will be based upon the rules outlined within this document containing administrative and performance objectives. UAS4STEM staff reserves the right to make changes to these rules and issue clarifications, updates or addendums at any time.

## 3. SCHEDULE

See www.uas4stem.org or refer to UAS4STEM email and live stream communications for updated scheduling information.

## 4. MAJOR ELEMENTS OF THE COMPETITION

### 4.1. REGISTRATION PROCESS

4.1.1. Once the team manager sends all requested team information and pays the registration fee, memberships are distributed for one team manager, one assistant manager, and up to ten (10) student team members aged 11-19. Credentials for the virtual ground school will then be created.

4.1.1.1 Only registered UAS4STEM participants (not to exceed ten students per team) are allowed to compete or participate in scored competition activities.

4.1.2. It is required that all student members of the team successfully complete the virtual UAS4STEM Ground School course as a matter of safety. Failing to do so will result in disqualification.

4.1.2.1. All participants should comply with any national and local regulations regarding model aircraft and the national airspace.

4.1.3. By participating in the competition, the team, advisors, and all support members, as well as judges and volunteers, agree to have any pictures of persons, vehicles, or equipment photographed and released to the public.

4.1.4. Once a team has officially entered ten students on their roster, any changes to the roster that result in new members may be assessed an additional fee.

### 4.2. VIRTUAL PRELIMINARY COMPETITION

The virtual preliminary competition occurs in the spring. Each team will have the opportunity to schedule an appointment slot with the judges; UAS4STEM email and online live/recorded communications will contain information about this process. Appointments will be in Eastern Time, with flexibility offered across time zones. These will last approximately 50 minutes total.

4.2.1. Prior to the competition, a proof-of-flight video shall be submitted to verify that the team's aircraft can fly in a safe manner. This is a pre-requisite for possible advancement to nationals. The aircraft should be in full autonomous configuration and perform the following:

- Take off
- Fly to at least one waypoint a minimum distance

# UAS4STEM PRELIMINARY COMPETITION SCORING

Advanced Division (100 points* available)

**FRR Presentation** *(maximum 20 minutes)*

| PARAMETER | OBJECTIVE | PERCENTAGE |
|---|---|---|
| TEAM MEMBER INTRODUCTIONS | Introduction of all team members. Including flight mission roles and experience. All team members present are encouraged to participate. | 5% |
| VIDEO PRESENTATION | A student-created video is required to be shown during the FRR. The video shall creatively showcase the UAS4STEM competition and team, offering insight, tips, tricks, or similar support for new teams. Your team video should exhibit technical prowess, quality of content, and creativity. The video shall not exceed 5 minutes in length. A link to the team's video (YouTube is preferred) shall be submitted to UAS4STEM staff. | 10% |
| SYSTEM OVERVIEW | Identify flight tasks planned, expected performance, and any risk evaluation. | 10% |
| SYSTEM SAFETY | Identify design and operational strategies. | 10% |
| DEVELOPMENTAL TEST RESULTS | Include test plan schedule (through ground testing to flight testing to mission performance testing), results of testing, and any corrective action taken to improve the effectiveness of mission completion. | 15% * |
| EVIDENCE OF MISSION ACCOMPLISHMENTS | Show the judges what you have achieved. | 10% * |
| PRE-MISSION BRIEFING | Include personnel resourcing for the flight mission, communication procedures, and go/no-go criteria. | 10% * |

**Other Components**

| PARAMETER | OBJECTIVE | PERCENTAGE |
|---|---|---|
| Q&A | Judges may ask questions related to the presentation. Judges will pose a hypothetical question to gather a teams sense of fallback plans should a technical issue arise during flight mission. | N/A |
| MISSION PLANNER SOFTWARE ASSESSMENT | Teams will be presented with a mock mission. Teams will need to have Ardupilot Mission Planner software loaded onto the computer they are using and will share their screen with the judges. Teams must program the mission planning software to achieve the mission objective. Failure to correctly execute command(s) will nullify the current and subsequent commands and the scoring will stop. Consider factors such as "automated take-off" and the setting of a home point as prerequisites to a successful mission. Teams will have 15 minutes to complete this objective. A judge will time the presentation, may provide a 2-minute warning, and cut off extended presentations as needed. | 25% * |
| OTHER SCORING FACTORS | Aspects such as clarity, accuracy, logic, precision, relevance, depth, and suitability will be factored into the score. | 5% * |

**Indicates these values are adjusted for the final compeition.*
*In order to compete, each team member must successfully pass UAS4STEM ground school. In the case of a tie, team average ground school scores will be utilized to determine placement. Allowances for technical difficulties that may arise during virtual competitions will be at the discretion of the judges.*

of 75 feet apart
- Return to launch for landing

4.2.1.1. The proof-of-flight video shall identify the school and the team name. The video shall show the ground control station screen and aircraft flight. A link to the team's proof of flight video posted as a private video on the internet (YouTube is preferred) shall be submitted before the virtual preliminary competition. The video shall not exceed 3 minutes in length.

4.2.2. The virtual preliminary competition will include these components: a Flight Readiness Review (FRR) presentation that includes a video showcasing UAS4STEM, and a 15 minute Mission Planner software assessment in which teams are required to use Ardupilot Mission Planner as if they are programming their UAS mission. **The points available are referenced in the scoring guide.**

4.2.2.1. The FRR is a presentation during which the teams substantiate, with data, their plans to safely accomplish the mission. The FRR shall not exceed 20 minutes in duration. A judge will time the presentation, may provide a 2-minute warning, and stop the presentation if needed.

4.2.2.2. The intention is to demonstrate to the judges that the team is ready to compete safely. in the flight mission phase of the competition. The FRR shall address the mission tasks the team plans to achieve during flight See scoring guide for more information.

## 4.3 INTERNATIONAL COMPETITION (FINALS)

The international competition is in-person and attendance is by invitation only, extended to the highest scoring teams from the virtual preliminary competition. Teams are responsible for all associated travel, room and board costs. **Any changes from the preliminary competition requirements are outlined below.** No "virtual" mission planner assessment is conducted during the finals.

*SPECIAL NOTE:*
*There may be funding opportunities available for teams that can help with the costs of attending the International Competition (finals). Please reach out with any questions to the UAS4STEM staff.*

### 4.3.1. FRR PRESENTATION

The FRR is a scored element worth 30% of the final score.

4.3.1.1. Teams may use their aircraft or ground control station to demonstrate various aspects of the briefing. Teams may have access to digital displays to present slides or brief video elements. TEAMS MAY NOT POWER UP THE AIRCRAFT. ONLY ONE ELECTRONIC DEVICE, LAPTOP OR TABLET MAY BE USED FOR BRIEFING.

4.3.1.2. Developmental Test Results parameter now worth **(25%)**

4.3.1.3. Evidence of Mission Accomplishments now worth **(15%)**

4.3.1.4. Pre-Mission Briefing,now worth **(15%)**

4.3.1.5. Other Scoring Factors now worth **(10%)**

*REGARDING PRESENTATIONS:*
*We may allow the general public to come in and view the oral presentations at nationals. Representatives from other teams (including students, team managers, parents) will not be allowed to view presentations of competitors during the event. Presentations may be recorded and made available for all teams and public to view next season. Team presentations represent the best of the best. We want new teams to have a great example to follow as they get started.*

**SAMPLE MAP**
Red outline: No-fly-zone boundary
Blue outline: Waypoint sequence
Green outline: Search area
White star: Designated take/off and landing area
White circle: Payload delivery search area

### 4.4. PRE-FLIGHT SAFETY INSPECTIONS

All UAS are subject to a safety inspection by designated officials. Safety inspections may include a physical inspection, a fail-safe check, and flight termination check.

4.4.1. The safety inspections are not a scored element. All decisions of the safety inspector(s) shall be final.

4.4.2. Physical inspection of the aircraft may include:

4.4.2.1. Verify all components are adequately secured to vehicle.

4.4.2.2. Verify rotor structural attachment integrity.

4.4.2.3. Visual inspection of all electronic wiring.

4.4.3.4. Verification of fail-safe mode operation covered by manual override and pilot-commanded flight termination.

4.4.3. If teams make any hardware changes to their UAS between prelims and finals, a new proof-of-flight video is required prior to final competition.

4.4.4. The GCS shall provide sufficient information to operators on a continuous basis to ensure that it is operating within no-fly/altitude boundaries.

4.4.4.1. The aircraft shall be capable of manual override by the safety pilot during all flight operations.

4.4.4.2. The flight termination system (kill switch), activated by a single switch, shall be capable of overriding all flight modes to terminate the flight.

4.4.4.3. The aircraft shall automatically Return-to-Launch (RTL) then land after loss of primary communications link signal within 5 seconds.

### 4.5. FLIGHT MISSION REQUIREMENTS

4.5.1. The flight mission evaluates the teams' ability to conduct a mission operation with their vehicle. This is the culminating event and a scored element of the competition.

4.5.2. A lead judge will be assigned to each team at the flight line. It is important that all team members follow the instructions of the judges. There will be additional judges assigned who are focused on different aspects of the competition (imagery, autonomy, safety, teamwork, etc.) depending on which tasks the team is planning to accomplish.

4.5.3. Only systems presented in the FRR, inspected by safety inspectors, and included in the preflight brief will be permitted to fly.

4.5.3.1 In order to compete, each team member must successfully pass UAS4STEM ground school.

4.5.3.2 In the case of a tie, team average groundschool scores will be utilized to determine placement.

4.5.4. OPERATIONAL TIMELINE

4.5.4.1. Setup Time = 15 minutes maximum. Setup time begins when the team arrives at the flight line. A judge will be assigned to each team and will start a dedicated stopwatch after communicating with the team. After the fifteen setup minutes have elapsed, the flight timer will start regardless of the team's readiness to launch the mission.

4.5.4.2. Flying Time = 30 minutes maximum.

4.5.4.2.1. Flying time shall start at the declaration by the Judge who will have a dedicated mission clock stopwatch. TEAMS MUST KEEP THEIR OWN TIME. ONCE ON THE CLOCK A TEAM MAY NOT ASK NON-STUDENT TEAM MEMBERS FOR REMAINING TIME.

4.5.4.2.2. A team may elect to cycle through the takeoff and landing sequence during the flying time more than once for a variety of valid reasons (change batteries, load payload, etc). No points will be lost, but flying time continues to be used.

4.5.4.2.3. Flying time stops when the vehicle has completed flight (landed, crashed, or terminated) and the team has disconnected flight battery. The lead judge will confirm with the team captain that the flying time period has stopped.

4.5.5. MISSION LIMITATIONS

4.5.5.1. Mission Boundaries
During the entire mission, aircraft shall remain in controlled flight and within the no-fly-zone boundary. A specific no-fly-zone boundary definition will be provided to teams prior to conducting the flight mission. Any vehicle appearing uncontrolled or moving beyond the no-fly-zone boundary during autonomous flight will be subject to immediate manual override. Failure of manual override will result in flight termination. Maximum flight altitude will be 200 ft. AGL unless otherwise specified.
4.5.5.2. Takeoff
Takeoff shall take place within the designated takeoff/ landing area, shown on the competition map.
4.5.5.2.1. Takeoff under manual control with transition to autonomous flight will be permitted but does not count as an autonomous takeoff.
4.5.5.2.2. The first takeoff will be scored, regardless if it is manual or autonomous. Only autonomous takeoff attempts on the first takeoff will earn points.
4.5.5.3. Landing
Landing shall take place within the designated takeoff/landing area shown on the competition map.
4.5.5.3.1. Landing under manual control is permitted.
4.5.5.3.2. Only a successful autonomous landing attempt on the first landing will be scored.

## 5. APPROVED COMPONENTS

Laptop guidelines

- Each team must provide their own laptop computer.
- Only a single laptop will be allowed on the flight line and with the team during the oral presentation.
- One additional monitor may be used on the flight line. This monitor may only display information from the computer and may NOT be used as an additional video viewing device. Example. You may duplicate a display on a laptop, or this can be the primary display for a desktop. It may not display video from the aircraft.

**5.1.** Teams will need to purchase UAS components that comply with provided specifications (see appendix for additional detail).
**5.2.** Reminder, a maximum of 2 video displays may be used during the competition.
**5.3.** Teams are provided shade, a folding table, chairs and a single electrical power extension cord. Teams should plan to provide their own power strip, if required.

## 6. ADDITIONAL FLIGHT OPERATIONS DETAIL

The flight mission has been divided into a series of parameters. Teams do not need to complete every parameter. The available parameters are listed in the Flight Operations Scoring Chart.

6.1. Payload Delivery Specifications
6.1.1. Payload delivery mechanism must be designed and built by team members. No commercially available payload mechanisms allowed.
6.1.2. Payload delivery mechanism must be powered by primary battery source.
6.1.3. Payload delivery mechanism(s) may be removable and installed only for the drop portion of the event.
6.1.4 No portion of the payload delivery mechanism may remain attached to payloads after delivery.
6.1.5. Payload details:
6.1.5.1. Teams may use any 8oz water bottle. Bottle must be unmolested, as in, complete without any modifications other than removal from larger case to individual unit. If team is using their own water bottles the team must notify judges prior to beginning your flight operations. If teams are not providing their own water bottles at competition, randomized 8oz water bottles

### POI KEY:

TARGET 01 (water)

TARGET 02 (med-kit)

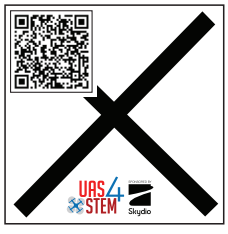
TARGET 03 (chocolate)

DELIVERY 01 (Water)

DELIVERY 02 (Med-kit)

DELIVERY 03 (chocolate)

DELIVERY (MOVER)




All stationary targets will be ~4' x 4'. Moving target will be ~3'x3'. See layout example to left.

# FLIGHT OPERATIONS SCORING

| PARAMETER | OBJECTIVE | POINTS |
|---|---|---|
| GROUND CONTROL STATION (GCS) DISPLAY ITEMS | Accurately display current aircraft position. GCS must also display airspeed and altitude to operators and judges. **This is a minimum requirement for flight approval.** | N/A |
| INITIAL AUTONOMOUS TAKEOFF | To receive points on the first takeoff attempt, teams must achieve a controlled autonomous takeoff. Takeoff is complete when drone reaches an altitude > or = 100 ft. and hovers for a minimum of 5 seconds. Team must initiate the takeoff. Takeoff must take place within the designated takeoff and landing area. | Failure to meet objective = 0 points<br>Autonomous takeoff = 4 points<br><br>Maximum 4 points |
| WAYPOINT NAVIGATION | SPINS will be provided to teams at the beginning of the flight operations. Teams must capture waypoints and commands in sequence based on the SPINS. Waypoints and commands will not be within 30 ft. of any "no-fly-zone" boundary. While in autopilot control waypoints must be accurate to within 30 ft accuracy, and maintain navigation within 50 ft. along the planned flight path. Any mission planner command may be utilized. Failure to complete previous command will nullify subsequent commands. Team must announce to the judges which waypoint and command is being attempted. During this objective, teams may be able to identify the location of POI's (listed in 6.1.5. and below) so long as the SPINS are not interrupted. | Each successful command in sequence = 1 point<br><br>Maximum 10 points |
| INITIAL AUTONOMOUS LANDING | To receive points for this parameter, on the first landing attempt, teams must achieve a controlled autonomous landing. Team must initiate the landing. Landing must take place within the designated takeoff and landing area. | Failure to meet objective = 0 points<br>Autonomous landing = 4 points<br><br>Maximum 4 points |
| PAYLOAD IDENTIFICATION, PICKUP, AND DELIVERY | Seven POIs will be in the flight area. Three of these POIs are pickup targets having one of the following payload items located at the center of the X: bottle of water, medical kit, and a Hersheys chocolate bar. Four of these POIs will be delivery targets. Three of which correspond to a particular payload.<br><br>Team must communicate their intentions to judging staff prior to initiating each payload delivery.<br><br>STATIONARY TARGETS (4' x 4'):<br>Payload must be picked up and delivered to it's corresponding delivery target. Teams may descend to 0 altitude for delivery. Only intact and unmolested payloads will be scored. Failed/ prematurely dropped payload deliveries will not be scored.<br><br>OPTIONAL MOVING TARGET (3' x 3'):<br>Deliver any one payload to moving target. Officials will stop the movement of the target at the completion of the delivery attempt (when the drone reaches a minimum of 20' altitude after delivery). Movement of the target is triggered at the start of this objective. This target can accept delivery of any payload. | For each attempted target delivery (measured from center of each target to the nearest point of payload):<br>STATIONARY TARGETS:<br>0 ft. to 2 ft. = 10 points<br>2 ft. to 4 ft. = 8 points<br>4 ft. to 6 ft. = 6 points<br>6 ft. to 8 ft. = 4 points<br>8 ft. to 10 ft. = 2 points<br>MOVING TARGET:<br>Payload misses target = 0 points<br>Payload contacts target = 5 points<br>If payload remains on target, additional points are awarded as follows:<br>0 in. to 5 in. = 15 points<br>5 in. to 10 in. = 14 points<br>10 in. to 15 in. = 13 points<br>15 in. to 20 in. = 12 points<br>20 in. to target edge = 11 points<br><br>Maximum 40 points |
| AUTONOMY | Between one and ten points are awarded at judge's discretion as to the level of autonomomy incorporated by teams for each pickup or delivery attempted. To score, pickup of payload must acheive at least 5 ft. above target | Payload pickup = 1-10 points<br>Payload delivery = 1-10 points<br><br>Maximum of 60 points |
| OVERALL SAFETY SCORE | Between zero and ten points are awarded at judge's discretion as to the safety considerations incorporated by teams. | Maximum of 10 points |

will be utilized.
6.1.5.2. Medical kits will be provided for teams to use at the competition. *(Thrive First Aid Kit [100 Pieces] 7.5 inches long x 4.5 inches wide x 3.0 inches thick, weighing ~.3lbs)* If team would like to practice with the same style kit, utilize the following link: https://a.co/d/b9XN6MV
6.1.5.3. Chocolate bars will be 1.55 oz. Hershey brand bar.

## 7. SAFETY REQUIREMENTS

### 7.1. FLIGHT OPERATIONS

7.1.1. Flight operations of any type involve some level of risk to personnel and property. It is the responsibility of all personnel involved in and around flight operations to identify, evaluate, and mitigate risks to the maximum extent possible.
7.1.2. When teams are conducting flight tests, extra precautions must be in place to protect team members and others.
7.1.3. It is recommended that teams use an experienced RC pilot to act as their safety pilot for test flights. The safety pilot for competition flights must be a student team member.

### 7.2. OTHER

7.2.1. No more than ten (10) team members will be allowed in the mission area.
7.2.2. Closed toe shoes are required to be worn during safety inspections, flight line operations, or when rotors are powered. Anyone wearing open-toed shows will not be allowed to participate in any activity on the flight line.

**Officials have the right to disqualify an individual or a team for any reason.**

# APPENDIX

### AIRFRAME SPECIFICATIONS

- Quadcopter configuration (4 motors)
- 625mm maximum frame size (measured from one side of an arm to the other)
- Additional processors are allowed, but must cost less than $250 USD.
- Autopilot system must cost less than $600 USD Manufacture Suggested Retail Price (MSRP), including the Global Positioning System (GPS)
    - This is a retail cost, meaning that even if a more expensive autopilot is donated, it is not allowed.
    - It does not have to be a Pixhawk variant, but Pixhawk is recommended
- Maximum of 8 channels
    - These include 4 for the motors, leaving four open to be utilized as the team sees fit
- Options include a camera gimbal, pickup, and drop mechanism controls
- If you use 2 for the gimbal, that leaves only 2 channels for pickup and drop mechanism(s)
- Maximum 4S 5200 battery size (any “C” rating) Batteries may be changed as often as necessary during the competition
- Maximum propeller size 11”
- Up to a 1080p video camera
    - Camera Manufacturer’s Suggested Retail Price (MSRP), must be less than $100 USD
- Digital video is allowed
    - Camera and receiver Manufacturer’s Suggested Retail Price (MSRP), must be less than $250 USD combined
- Up to a 250mw video transmitter
- Any antenna may be used for the video feed system
- 2.4 Ghz RC control system. Any brand legal in the US
- One primary Ground Control Station (GCS) – Meaning only 1 laptop allowed on the flight line
- Maximum of 2 video receivers allowed during the competition
    - One can attach directly to the GCS
- Recommended telemetry radio RFD 900+
- One additional sensor may be utilized. Sensor must be less than $50 USD MSRP.

### DRONE COMPONENT SOLUTIONS

To purchase a complete bundle of drone components for UAS4STEM, we have partnered with ReadymadeRC as well as John Beavers who supplies equipment to UAS industry partners. Visit **www.readymaderc.com** and search “UAS4STEM” or **www.quadzilladrone.com** to learn more about available options.

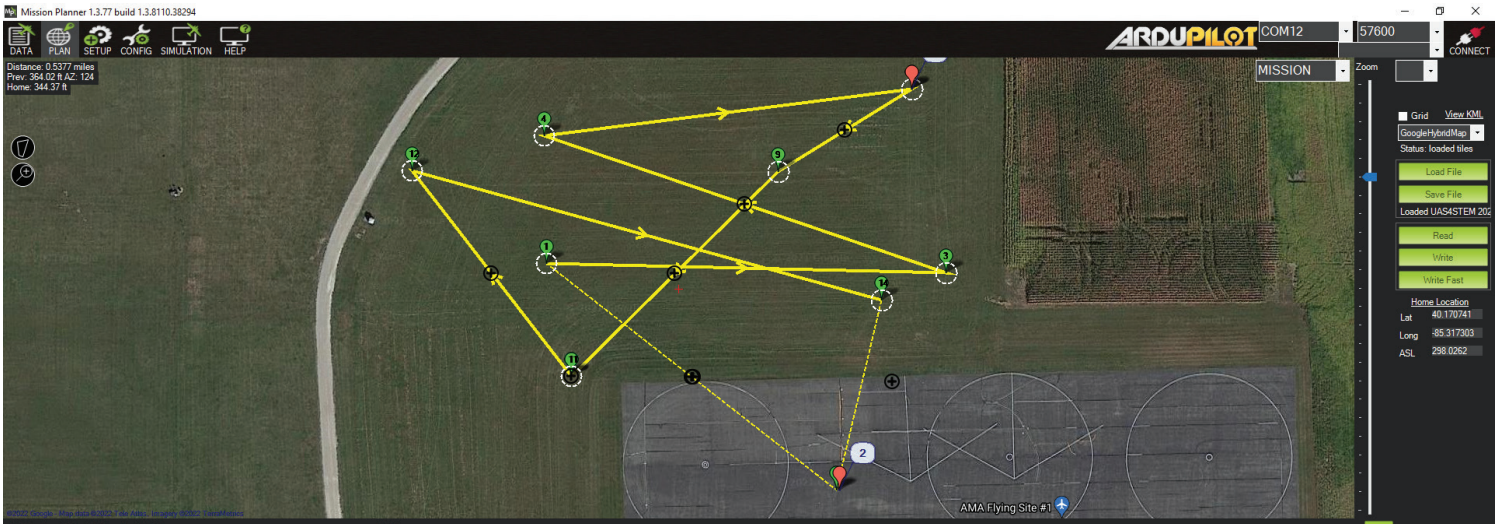
If there are any questions about an airframe or components, please contact UAS4STEM National Director Archie Stafford at archies@modelaircraft.org

SAMPLE MISSION SET:

1. Fly to Waypoint 40.171337°, -85.318303° at 90’ and hold for 3 seconds
2. Fly to Waypoint 40.171313°, -85.316926° at previous altitude while pointing the nose of the aircraft at your takeoff point
3. Fly to Waypoint 40.171674°,-85.318312° while climbing to 175’ and make the aircraft rotate to face due north upon arrival at waypoint
4. Fly to Waypoint 40.171797°, -85.317044° while descending to 100’ and perform 2 circles around the point in either direction
5. Fly to Waypoint 40.171580°, -85.317505° descending to 75’ while pointing the nose at the previous waypoint
6. Fly to Waypoint 40.171041°, -85.318218° while climbing to 150’ and descend to 50’ once at the waypoint
7. Fly to Waypoint 40.171582°, -85.318768° at the previous altitude and rotate the aircraft in either direction 2 turns
8. Fly to Waypoint 40.171242°, -85.317147° while climbing to 100’ and stop for 15 seconds

*(Solution located on next page)*

## NOTES




WP Radius 10 | Loiter Radius 60 | Default Alt 400 | Relative | Verify Height | Add Below | Alt Warn 0 | Spline

| | Command | Delay | | | | Lat | Long | Alt | Frame | Delete | | | Grad % | Angle | Dist | AZ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | WAYPOINT | 3 | 0 | 0 | 0 | 40.171337 | -85.318303 | 90 | Relative | X | | | 25.5 | 14.3 | 364.8 | 308 |
| 2 | DO_SET_ROI | 0 | 0 | 0 | 0 | 40.170741... | -85.31729... | 0 | Relative | X | | | 0 | 0 | 0 | 0 |
| 3 | WAYPOINT | 0 | 0 | 0 | 0 | 40.171313 | -85.316926 | 90 | Relative | X | | | 38.8 | 21.2 | 249.1 | 26 |
| 4 | WAYPOINT | 0 | 0 | 0 | 0 | 40.171674 | -85.318312 | 175 | Relative | X | | | 20.8 | 11.8 | 416.9 | 289 |
| 5 | CONDITION_YAW | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Relative | X | | | 0 | 0 | 0 | 0 |
| 6 | WAYPOINT | 0 | 0 | 0 | 0 | 40.171797 | -85.317044 | 100 | Relative | X | | | -21.0 | -11.9 | 364.1 | 83 |
| 7 | LOITER_TURNS | 2 | 0 | 5 | 0 | 0 | 0 | 0 | Relative | X | | | 0 | 0 | 0 | 0 |
| 8 | DO_SET_ROI | 0 | 0 | 0 | 0 | 40.171797 | -85.317044 | 0 | Relative | X | | | 0 | 0 | 0 | 0 |
| 9 | WAYPOINT | 0 | 0 | 0 | 0 | 40.17158 | -85.317505 | 75 | Relative | X | | | 49.7 | 26.4 | 168.5 | 238 |
| 10 | WAYPOINT | 0 | 0 | 0 | 0 | 40.171041 | -85.318218 | 150 | Relative | X | | | 26.8 | 15.0 | 289.5 | 225 |
| 11 | WAYPOINT | 0 | 0 | 0 | 0 | 40.171041 | -85.318218 | 50 | Relative | X | | | -∞ | -90.0 | 100.0 | 180 |
| 12 | WAYPOINT | 0 | 0 | 0 | 0 | 40.171582 | -85.318768 | 50 | Relative | X | | | 0.0 | 0.0 | 249.9 | 322 |
| 13 | LOITER_TURNS | 2 | 0 | 0 | 0 | 0 | 0 | 0 | Terrain | X | | | 0 | 0 | 0 | 0 |
| 14 | WAYPOINT | 15 | 0 | 0 | 0 | 40.171242 | -85.317147 | 100 | Terrain | X | | | 155.6 | 57.3 | 866.6 | 105 |

## NOTES

SCAN ME

# UAS4STEM CHALLENGE

AUTHORIZED AMA STEAM PROGRAM

## UAS4STEM is a drone engineering challenge like no other!

Students work in a team to build, code, and fly. It's a drone competition for everyone, with both beginner and advanced categories. Our competition allows you to participate from ANYWHERE in the world!

### THE MISSION:

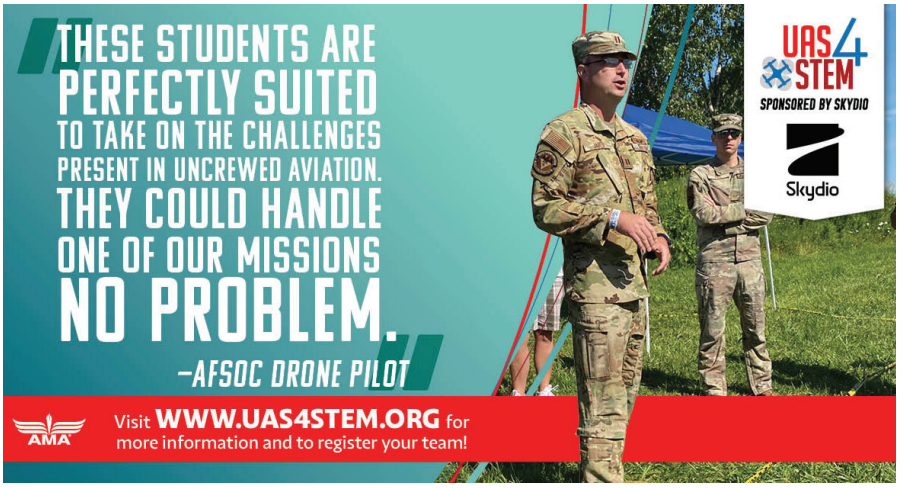
Your team has been called upon to provide rapid response using a small Uncrewed Aircraft System (sUAS) that can support a special mission. Beginner teams must search and locate points of interest, while Advanced competitors must also retrieve and deliver supplies.

### THE CHALLENGE:

Teams must come together to design and build their drones, successfully complete the UAS4STEM ground school, learn to safely operate their aircraft, conduct manual and autonomous operations, and incorporate AI to maximize points within the challenge.

### BENEFITS TO STUDENTS:

- A career path to an emerging STEM field
- Interactions with aviation professionals
- ~100 hours of technical skills experience
- Individual insurance coverage included
- Optional 2.5M primary site insurance
- AMA membership for all participants
- EAA membership for lead manager
- Leadership development
- Time management skills
- Troubleshooting skills
- Communication skills
- Public speaking skills
- Teamwork skills
- Prize funding

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