



## Overview

Participants will demonstrate their knowledge of drones by participating in **manual** flight missions related to a specified theme area. Teams also study the principles of flight and research the use of drones in a specified theme area to create a **digital research poster**. Details about the flight missions and theme area will be posted on the Droneworks website ([www.droneworksite.com](http://www.droneworksite.com)). Semifinalists will be **interviewed** about their digital research poster.



- One (1) Pilot
- One (1) Spotter

In a Team of one (1) participant, the individual may serve as both Pilot and Spotter.

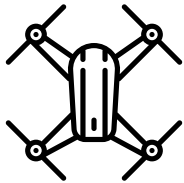
**Team of 1-2 Students**  
**2 Teams per Chapter**

Pilot and Spotter may switch roles during competition.



Safety Glasses

**Safety glasses required for ALL participants**



Drone

A. With all components attached, drone must not exceed the following dimensions:

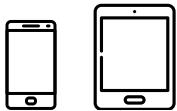
- 9 in (30 cm) width
- 9 in (30 cm) length
- 5 in (13 cm) height

(as measured from the surface the drone is resting upon to the highest point of the drone, with all its components attached)



Gamepad Controller

C. Drone weight (with all components attached) must not exceed 3.5 oz (100 g).



Smartphone/Tablet  
(Optional)

D. Propeller guards/cage may be used if, once attached, the overall drone size does not exceed the dimensions listed above.

E. A gamepad controller or smartphone/tablet may be used for manual flight.




F. First Person View (FPV) goggles are not allowed.



No FPV Allowed

A list of suggested drones is posted on the Droneworks website ([www.droneworksite.com](http://www.droneworksite.com))

## Event Components

Preliminary Round		Semifinal Round
		
Digital Research Poster	Manual Drone Flight	Interview

## Procedure

### Digital Research Poster (Pre-Conference) (Preliminary Round)



- Participants are given a **theme** related to the use of drones in real-world applications.
- Participants will create a **digital research poster** explaining up to three (3) ways drones may be used in relation to the theme.

### Manual Drone Flight (On-Site) (Preliminary Round)



C. Participants are provided a series of designated **flight missions** and point values.



D. More information on the theme and flight missions are available on the [Droneworks website](http://www.droneworksite.com).



E. Participants will complete the missions **manually**.



1-min

F. Participants will have a **one (1:00) minute** attempt to complete flight missions **manually** to score the most points.



x3

G. All participants will be given **up to three (3) attempts** of manual flight to achieve their best score by completing the flight missions.



H. The **preliminary round score** from the digital research poster and top two (2) manual flight attempts will determine the **twelve (12) semifinalists**.

### Semifinal Interview (On-Site) (Semifinal Round)



I. Semifinalists participate in an on-site **interview** about their digital research poster. The **top ten (10) finalists** will be announced at the conference awards ceremony.



## Definitions

**Airspace** – The “airspace” is the drone’s competition environment. It is an area 10 ft. long x 10 ft. wide. It also has a virtual ceiling of 10 ft. The *missions* and *landing pad* are both part of the “airspace”.

**Attempt** - An “attempt” is when a team competes within the *airspace*. The drone takes off one or more times from the *landing pad* and tries to complete as many *missions* as possible. “Attempts” last **one (1:00) minute**, and the timer never pauses.

**Drone** - A quadcopter that meets the required specifications.

**Drone Control System** – The “Drone Control System” includes the gamepad controller and/or smartphone/tablet used to control the *drone* for *manual flight*. Only the *pilot* may operate the “Drone Control System”.

**Emergency Stop** – For safety reasons, a judge may ask the *pilot* to force land or *power down* the *drone* immediately.

**End of the Attempt** – As the *attempt* ends, if the *drone* is moving, it must be *powered down* immediately and left in place. Points scored after the “end of the attempt” do not count. The *drone* may be retrieved when the judge gives the okay.

**Handle/Handling** – *Missions* are to be completed by the *drone* by *pilot* operation in *manual flight*. A *spotter* is allowed to hand-rescue or “handle” the *drone* and/or detached parts, but, if the *drone* is outside the *landing pad*, there will be a resulting *penalty*. A *spotter* is not allowed to interact with any part of the *missions*.

**Hot Table** – The “hot table” is the table designated for a *team* to connect their *drone* to the *Drone Control System* before the *attempt* begins. At the “hot table” and during the *attempt* are the only times when a *drone* may be connected to the *Drone Control System*.

**Land/Landed** - The condition where the *drone* is not in flight and is motionless for at least two (2) seconds. An *emergency stop* or forced landing may not be used to complete missions.

**Landing Pad** – also “Helipad”. It is the 2 ft. x 2 ft. square marked with the letter “H.” A *drone* is to be placed entirely within the “landing pad” before *takeoff*. *Drones* that are *powered down* and within the *landing pad* may be *handled* without *penalty*.

**Manual Flight** – A flight in which the *pilot* directly operates the *drone*.

**Mission** - A “mission” is an element or structure within the *airspace* and is an opportunity for the *drone* to earn points. Requirements are written in the form of tasks that must be observed by the judge as they happen.

**Out of Bounds** - A *drone* may temporarily fly “out of bounds” of the *airspace*. A judge may order an *emergency stop* if there is an immediate safety issue or a drone is “out of bounds” excessively.

**Penalty** - A *spotter* may *handle* a *drone* and/or detached parts and/or spare parts only within the *landing pad*. Instances of *handling* a *drone* and/or detached parts outside the *landing pad* will result in a **minus 2 (-2) points** scoring “penalty” each time. A *team* can get up to five (5) such penalties for a **maximum of -10 penalty points**.

**Pilot** – The “pilot” is the participant responsible for operating and controlling the *drone*. The “pilot” must always remain in the *pilot area* unless the *team* has only one (1) member acting as both *pilot* and *spotter*.

**Pilot Area** – The designated area outside the *airspace* from where the *pilot* controls the *drone* during an *attempt*. Only the *pilot* may be in the “pilot area”.

**Powered Down** – The condition where the *drone* is not in flight, there is no power to the *drone*, and the propellers are not spinning.

**Score Sheet** – After the *end of the attempt*, the judge discusses what happened and inspects the *airspace* with the *team*, *mission by mission*. If the *team* agrees with everything, they sign the “score sheet”. If the team doesn’t agree with something, the lead judge makes the final decision.

**Spotter** – The “spotter” is the participant responsible for placing the *drone* on the *landing pad* before *takeoff*. The “spotter” remains outside the *airspace* unless the *drone* is *powered down*. If the *drone* is *powered down*, the *spotter* may enter the *airspace* to *handle* a *drone* that has crashed.

**Takeoff** – The *spotter* places the *drone* on the *landing pad*. Power may not be applied to the *drone* until the *attempt* begins. Once the *spotter* is completely outside the *airspace*, the judge will start the countdown (“3, 2, 1, go”) and the *attempt* begins. At that time, the *pilot* may apply power to the *drone* to “takeoff” for *manual flight*.

**Team** – A “team” consists of one to two (1-2) participants with one (1) serving as *pilot* and one (1) serving as *spotter*. In a “team” of one (1) participant, the individual may serve as both *pilot* and *spotter*.



### Digital Research Poster (Pre-Conference)

40 points

Create a **digital research poster** illustrating and explaining **up to three (3) ways drones may be used** related to the given theme.



Digital Research Poster (PDF)

- A. Digital poster must be submitted as a **2-page PDF**.
- B. Poster may be **no larger than 22 in. x 28 in.**
- C. Color or grayscale is acceptable
- D. Any medium may be used. (e.g. digital, pencil, paint, marker, photographs)
- E. Physical poster may be created, photographed, and submitted as a PDF file.
- F. Any photographs or digital media used must be properly credited in Research Bibliography.

**First page must contain:**

- 1. Theme
- 2. Research description in **300 words or less**
- 3. Research description may be handwritten or typed
- 4. Hand drawn or digital **illustrations/photos (2-3)**

**Second page must contain:**

- 1. Team/chapter ID number
- 2. **Research Bibliography** citing sources of research information and illustrations/photos

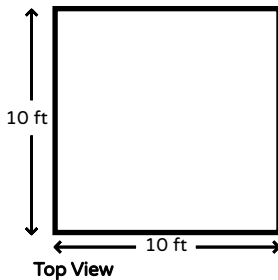


**Ratings Criteria**

- Theme Research
- Illustrations/Photos
- Layout and Design
- Research Bibliography



### Airspace



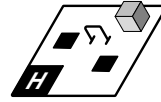
The airspace is the area where the drone flies. It is an area 10 ft. long x 10 ft. wide. It also has a virtual ceiling of 10 ft. Netting is hung to isolate the drones from spectators.



### Manual Drone Flight

120 points

To challenge the participants' **manual** flying skills, teams pilot their drone through various **theme-based missions**. Teams attempt to complete missions and score the most points within **one (1) minute**.



- 1. Theme-based missions are released on the [Droneworks website](#)

**During the Competition**



- 2. At the **hot table**, participants power up their drone and connect it to their **Drone Control System**.



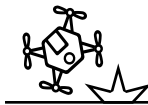
- 3. Only one (1) team at a time competes within the airspace.



- 4. The **pilot** stays outside the airspace and controls the drone from within the **pilot area**.



- 5. The **spotter** places the drone on the **landing pad**. An attempt begins with a countdown.



- 6. The **spotter** remains outside the airspace unless the drone **stops**, but may retrieve it and return it to the landing pad for **additional flights**.



**1-Min. Manual Attempt**

- 7. Participants will have a **one (1:00) minute** attempt to complete flight missions **manually**. **The timer never pauses.**



- 8. After an **attempt**, a judge discusses what happened, mission by mission. If the **team** agrees with everything, they sign the **score sheet**.



x3

- 9. Participants will be given **up to three (3) attempts** to achieve their best score by completing the flight missions.



- 10. The **preliminary round score** from the digital research poster and top two (2) manual flight attempts will determine the **twelve (12) semifinalists**.











### Semifinal Interview

40 points

Semifinalists participate in an on-site **interview** about their digital research poster. The **top ten (10) finalists** will be announced at the conference awards ceremony.




## Manual Flight Overview

- A.  Participants choose which missions to complete **manually** to score the most points.
- B. The missions, mission dimensions, and mission point values will be posted on the [Droneworks website](https://www.droneworks.com).
- C. Various points will be assigned for each mission accomplished.
- D. Missions do not need to be navigated in any specific order.
- E.  The **manual** flight attempt lasts **one (1:00) minute** and the **timer never pauses**.
- F. ++ Participants will be given **up to three (3) attempts** to achieve their best score by completing the flight missions.
- G. ++ The **lowest scoring flight attempt will be dropped**. The **top two (2) manual flight attempts will be added together** to determine the total flight score.




## Drone Flight Rules

 The **manual** flight attempt specifications are as follows:

1. Only one (1) team will be allowed in the competition area.
2. A **hot table** will be set up for teams to power up the drone and connect to the Drone Control System.
  - a. Only a team that is next to fly should be at the hot table.
  - b. Teams may have spare parts (e.g., propellers, batteries) available, but must supply their own parts.
3. At flight time, the drone will be placed on the **landing pad**.
  - a. Power cannot be applied to the propellers until the attempt begins.
  - b. The attempt will begin with a countdown (“3, 2, 1, Go”). At that time, the drone may takeoff.
  - c. The drone must be in contact with the landing pad when the word “go” is announced. Takeoff before the official start will result in disqualification for the attempt.
4. Only one (1) team member will be allowed in the pilot area. This team member will serve as the **pilot**.
  - a. The pilot may only control the drone from the pilot area.
  - b. No drone may takeoff until all persons are outside the airspace.
5. A second team member will serve as the **spotter**.
  - a. The spotter must remain outside the airspace while power is applied to the drone propellers.



## Drone Flight Rules

- b. If the drone unintentionally stops during the attempt and no power is applied to the drone propellers, the spotter may enter the airspace, pick up the drone, and move it to the landing pad to continue the attempt.
  - c.  **If the drone is handled outside the landing pad, there will be a penalty.**
  - d. If a part of the drone becomes detached during the attempt, it may be retrieved after the attempt is scored and there is no penalty. If the spotter retrieves the detached part during the attempt, there will be a penalty.
  - e. The spotter may make repairs or switch batteries if the drone is within the landing pad.
  - f. The spotter may not touch any part of the missions. A violation of this rule will result in disqualification of the offending team.
6. If the team consists of one (1) participant, the participant may act as both the pilot and the spotter.
7. If the team consists of two (2) participants, the pilot and spotter may switch roles between attempts, but only one (1) team member will be allowed in the pilot area.
8. **Missions do not need to be navigated in any specific order. Points are awarded based on successfully completing individual missions.**
9. **Missions may be attempted multiple times, but only the highest-scoring, single attempt will be recorded.**
10. Participants will not be penalized for accidental contact with mission and/or airspace elements.
11. Intentional damage to missions will result in disqualification.
12. Participants will be asked to crash land or ground their drone if it poses a threat to any individuals or goes out of bounds excessively.
13. At the end of the attempt, everything must be preserved as-is.
  - a. If the drone is moving, it must be landed, and the propellers powered down.
  - b. The drone must be left in place.
  - c. Missions completed after the end of the attempt will not be scored.
13. The judge will discuss what happened with the participants, mission by mission.
  - a. If the participants agree with everything on the score sheet, they sign the sheet, and the score is final.
  - b. Any challenges must be made at this time and come from participants who are actively competing, not an advisor, parent, or non-competing student.
  - c. If the participants do not agree with something, the lead judge will make the final decision.



14. **Combined scores** for the **top two (2) highest scoring flight attempts** will be the Flight Score.
  - a. Participants will be given up to three (3) flight attempts to achieve their best score based on the discretion of the event coordinator.
  - b. The **lowest scoring flight attempt will be dropped.**
15. Only competing participants and event officials may be in the event area.
  - a. All other spectators, including coaches/advisors, parents, coordinators, and non-competing students, must remain in the designated spectator throughout the duration of the attempt.
  - b. Participants will be disqualified if a spectator, including a coach/advisor or parent, interferes with a flight.
15. Judges may inspect the drone at any time before, during, or after the attempt.
16. Any additional rules, regulations, or guidelines established by the event coordinator must be followed.



### Drone Safety

- A. Power cannot be applied to the propellers unless the drone is within the airspace.
- B. Participants may not fly in an intentionally dangerous manner.
- C. Participants may not fly their drone over or near other individuals.
- D. Participants may only fly their drone when instructed to do so by a judge.
- E. Participants will be asked to emergency stop or crash their drone if its flight course poses a threat to any individuals or excessively goes out of bounds of the airspace.
- F. The Drone Control System must remain untouched while a participant is placing the drone on the landing pad.
- G. Participants will adhere to all safety rules and directions of event officials.



### Battery Safety

- A. Participants may only connect a battery to the drone when the drone is on the hot table and told to do so by an event official.
- B. Participants should always be present during the charging of a lithium polymer (LiPo) battery.
- C. Never charge a battery that is puffy or punctured.
- D. Stop charging immediately if a battery heats up.
- E. Lithium Polymer battery fires are chemical fires that do not require oxygen to burn, so if a battery ignites:
  1. Place the battery in a metal bucket of sand, then cover the battery with an additional layer of sand.
  2. Place a plastic bag of sand over the battery.



### Wireless Network Safety

- A. Only drones within the netted airspace or “on-deck” at the hot table are to be powered on and connected to the Drone Control System. Any team violating this rule is subject to disqualification.
- B. Teams should change their drone Wi-Fi name (e.g. TELLO-A9BBB3) to their official TSA Team ID number (e.g. T9999). The official TSA Team ID is available in your chapter account at [www.registermychapter.com/tsa/ok/Main.asp](http://www.registermychapter.com/tsa/ok/Main.asp)



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# Droneworks : MS 2024 RATINGS FORM

**Judges:** Using minimal (1-4 points), adequate (5-8 points), or exemplary (9-10 points) performance levels as a guideline in the rating form, record the scores earned for the event criteria in the column spaces to the right. A score of zero (0) is acceptable if the minimal performance for any criterion is not met.



## DIGITAL RESEARCH POSTER (40 points)

CRITERIA	Minimal performance	Adequate performance	Exemplary performance
	1-4 points	5-8 points	9-10 points
<b>Theme Research</b> (X1)	There is little or no evidence of understanding drone capabilities.	There is some evidence of research and understanding of drone capabilities and use.	There is solid evidence of in-depth research and understanding of drone capabilities and use.
<b>Illustrations/Photos</b> (X1)	Poster does not have correct number of illustrations/photos (2-3) or is missing theme.	Use of most illustrations/photos reflects good technical skill; illustrations add to the research and theme.	Use of illustrations/photos is excellent, illustrations enhance research and theme. They are of high aesthetic quality.
<b>Layout and Design</b> (X1)	The design is sloppy, there is poor choice of layout; the poster is not professional, and/or it leaves an unfavorable impression.	The design has good points, but some details may distract from the overall quality.	Poster is aesthetically pleasing, and all design principles are well incorporated into the design and layout.
<b>Research Bibliography</b> (X1)	The research is inadequate, and/or very few credible sources are referenced.	The research is adequate, and it includes a few credible sources.	The research is comprehensive, and credible resources are included.

Record scores of each row


### DIGITAL RESEARCH POSTER SUBTOTAL (40 points)



## MANUAL DRONE FLIGHT (120 points)

ATTEMPT #1	ATTEMPT #2	ATTEMPT #3

(Drop the LOWEST ATTEMPT score and add together the two (2) HIGHEST ATTEMPT scores.)

### DRONE FLIGHT SUBTOTAL (120 points)

### PRELIMINARY SUBTOTAL (160 points)



## SEMIFINAL INTERVIEW (40 points)

CRITERIA	Minimal performance	Adequate performance	Exemplary performance
	1-4 points	5-8 points	9-10 points
<b>Knowledge</b> (X1)	There is little or no evidence of understanding drone capabilities.	There is some evidence of research and understanding of drone capabilities and use.	There is solid evidence of in-depth research and understanding of drone capabilities and use.
<b>Application</b> (X1)	Use of drone as solution to problem(s) presented in an illogical manner.	Use of drone as solution to problem(s) communicated adequately.	Use of drone as solution to problem(s) presented clearly and concisely.
<b>Delivery</b> (X1)	Communication of the drone solution is unclear and/or the team is uncertain in its interview.	Communication of the drone solution is somewhat logical and the team is generally well-spoken.	Communication of the drone solution is clear, concise, and logical. The team is natural and effective in their delivery.
<b>Team Participation</b> (X1)	Majority of the interview is made by one member of the team; the partner may be disengaged.	Both team members are generally engaged in the interview, though one member may take on more responsibility.	Both team members are actively involved in the interview and show understanding of the drone solution.

### SEMIFINAL INTERVIEW SUBTOTAL (40 points)

(To arrive at the TOTAL score, add all subtotals.)

### TOTAL (200 points)

