



Overview

For 2022 only, **Droneworks: Drone Duel** is a fast-paced drone competition with an emphasis on **manual** flight skills. Participants compete in a series of one (1) minute, head-to-head duels against other teams. Participants will also study the principles of flight and **research** the use of drones in a specified theme area to create a **research poster**.

There will be no autonomous coding.



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

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

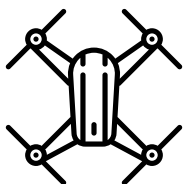
Team of 1-2 Students
2 Teams per Chapter

Pilot and Spotter may switch roles during competition.



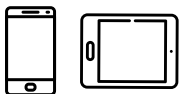
Safety Glasses

Safety glasses required for ALL participants



Drone

- A. With all components attached, drone must not exceed the following dimensions:
- a. 8 in (20 cm) width
 - b. 8 in (20 cm) length
 - c. 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)



Smartphone or tablet to fly drone

- B. Drone weight (with all components attached) must not exceed 3.5 oz (100 g).
- C. Propeller guards/cage may be used if, once attached, the overall drone size does not exceed the dimensions listed above.
- D. A tablet/smartphone may be used for manual flight.
- E. A gamepad controller may be used for manual flight.
- F. First Person View (FPV) goggles are not allowed.



Gamepad (Optional)



No FPV Allowed

A list of suggested drones is posted on the Droneworks website (www.droneworksite.com)



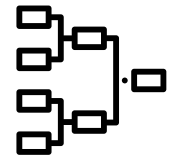
Event Components



Research Poster



Manual Flight



Head-to-Head Tournament



Research Poster

40 points

Given the theme listed below, create a **research poster** illustrating and explaining **up to three (3) ways** drones may be used related to the theme.



Research Poster

- A. Poster may be no larger than 22 in. x 28 in.
- B. Poster may be paper or poster board.
- C. Any color poster is acceptable
- D. Any medium may be used. (e.g. pencil, paint, marker, photographs)
- E. Any photographs or digital media used must be properly credited in Research Bibliography.

Poster front 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)**

Poster back must contain:

1. Event title, conference city and state, year, and team/chapter ID number
2. **Research Bibliography** citing sources of research information and illustrations/photos



Ratings Criteria

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

2022 Theme: Drones & Animals

From pets to bull riding and from fishing to eagle sanctuaries, people in Oklahoma love animals. Identify up to three (1-3) ways a drone may be used to interact with animals.





Definitions

Airspace – The “Airspace” is the drone’s competition environment. It is an area 10 ft. long x 10 ft. wide. The Quests, Helipad, and Reset Pads are all part of the Airspace.

Autonomous Flight – A flight in which the Drone operates and reacts only to sensor/camera inputs and to commands pre-programmed by the Team onto the Drone Control System. Human control of the Drone is not permitted during this time.

Disqualified – A Team that is “Disqualified” from a Duel will not receive a score for the Duel.

Drone Control System – The “Drone Control System” is the hardware and software used to control a Drone. It includes the smartphone, tablet, or computer used to program/code the Drone. Only the Pilot may operate the Drone Control System.

Duel – Two (2) teams challenge each other to a “Duel” to complete a manual flight Quest. A Duel lasts one (1) minute. The team to complete the Quest first or score the most points within one (1) minute wins the Duel.

Emergency Landing – For safety reasons, a competition official may ask the Pilot to Land or Power Down the Drone immediately.

End of the Duel – As the Duel ends, if the Drone is moving, it must be Powered Down immediately and left in place. Changes after the End of the Duel do not count. The Drone may be retrieved when the judge gives the OK.

Handle/Handling – Quests are to be completed by Pilot operation in Manual Flight. A Spotter is allowed to hand-rescue or “Handle” the Drone and/or detached parts only during the Manual Flight Quests. A Spotter is not allowed to interact with any part of the Quests.

Helipad – The “Helipad” is the 2 ft. x 2 ft. square marked with the letter “H.” It is where the Drone is to be placed before Takeoff.

Hot Table – The “Hot Table” is the table designated for a Team to connect their Drone to the Drone Control System before the Duel begins.

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 score.

Manual Flight – A flight in which the Pilot operates the Drone.

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 adjacent to the Airspace from where the Pilot controls the Drone during a Duel. 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.

Reset Pad – “Reset Pads” are 1 ft. x 1 ft. squares located in each corner of the airspace. If a drone unintentionally stops during the Duel and no power is applied to the drone propellers, the Spotter may enter the Airspace, pick up the drone, and move it to a Reset Pad or the Helipad to continue competition.

Quest - A “Quest” is a simple, manual flight challenge such as flying through hoops, popping balloons, or landing on multiple platforms.

Score – After the End of the Duel, the judge discusses what happened and inspects the Airspace with the Team. If the Team agrees with everything, the score is final. 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 Helipad before Takeoff. The Spotter remains outside the Airspace unless the Drone is Powered Down. When 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 Helipad. Power may not be applied to the Drone until the Duel begins. Once the Spotter is completely outside the Airspace, the judge will start the countdown (“3, 2, 1, Go”) and the Duel begins. At that time, the Pilot may apply power to the Drone to “Takeoff” for Manual Flight or start the Autonomous Flight program.

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.



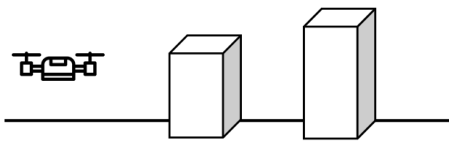
Manual Flight (Head-to-Head Tournament)

40
points

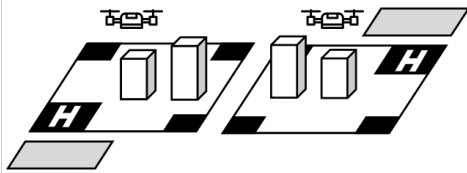
To challenge the participants' flying skills, teams **manually** pilot their drone through various **quests**. Two (2) teams challenge each other to a **duel** to complete the quest. The team to complete the quest first or score the most points within **one (1) minute** wins the duel. Duels continue between teams in a **tournament** style until only one team remains undefeated. **Multiple quests** will be given.



1. A Quest is given. (Ex. Land on the boxes.)



2. Challenge another team to Duel to complete the Quest.



1-Min. Duel

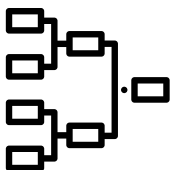
3. A Duel lasts 1-minute. The team to complete the Quest first or score the most points wins the Duel.

Ties broken by team that scores first. If neither teams scores, a coin will be flipped.

4. Win the Duel and challenge another team to Duel.



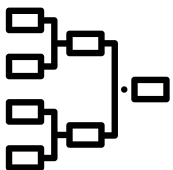
4. Lose and wait for another Quest to be given.



5. Duels continue tournament style until only one team remains undefeated.



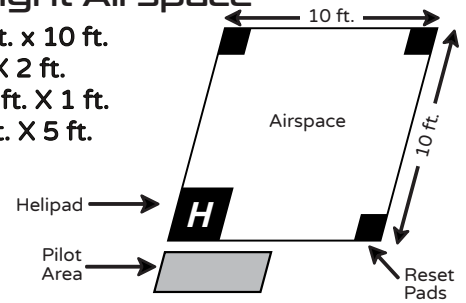
6. At least twelve (12) teams will advance to the Semifinal Tournament.



7. A Semifinal Quest will be given. Duels continue tournament style until only one team remains undefeated. Teams will be awarded points based on their Semifinal tournament ranking.

Manual Flight Airspace

Airspace - 10 ft. x 10 ft.
Helipad - 2 ft. X 2 ft.
Reset Pads - 1 ft. X 1 ft.
Pilot Area - 3 ft. X 5 ft.



Manual Flight Rules

- A. The duel lasts **one (1:00) minute** and the timer never pauses.
- B. The quests and point values will be revealed on-site.
- C. The duel specifications are as follows:
 - 1. Only two (2) teams 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 smartphone/tablet.
 - 3. Only a team that is next to fly should be at the hot table.
 - 4. Teams may have spare parts (e.g., propellers, batteries) available, but must supply their own parts.
 - 5. At flight time, the drone will be placed on the helipad.
 - 6. Power cannot be applied to the propellers until the duel begins.
 - 7. The duel will begin with a countdown ("3, 2, 1, Go"). At that time, the drone may takeoff.
 - 8. The drone must be in contact with the helipad when the word "go" is announced. Takeoff before the official start will result in disqualification for the duel.
 - 9. 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.
 - 10. 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.
 - b. If the drone unintentionally stops during the duel and no power is applied to the drone propellers, the spotter may enter the airspace, pick up the drone, and move it to the helipad or reset pads to continue the duel.
 - c. The spotter may not touch any part of the quests. A violation of this rule will result in disqualification.
 - 11. If the team consists of one (1) participant, the participant may act as both the pilot and the spotter.



12. If the team consists of two (2) participants, the pilot and spotter may switch roles at any time.
 13. Participants will not be penalized for accidental contact with quests and/or airspace elements.
 14. Intentional damage to quests will result in disqualification.
 15. Participants will be asked to crash land or ground their drone if it poses a threat to any individuals or goes beyond the airspace.
 16. Drones that fly outside the airspace will be disqualified.
 17. If a team completes a quest before the end of the duel, the judge will declare a winner.
 18. At the end of the duel, 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. Quests completed after the end of the duel will not be scored.
 19. The judge will discuss what happened with the participants, announce the score, and declare a winner.
 - a. In the event of a tie score, the first team to score a point will be used as a tiebreaker.
 - b. If neither team scores a point, a coin will be flipped to determine the winner.
 - c. Any challenges must be made at this time and come from participants who are actively competing, not an advisor, parent, or non-competing student.
 - d. If the participants do not agree with something, the lead judge will make the final decision.
 20. Duels continue in a tournament style until only one (1) team remains undefeated.
 - a. If there is an odd number of teams for pairing during the duel, the first losing team will get a “do over” and will be allowed to duel again against another team.
 - b. The undefeated team will be declared the winner of the quest.
 - c. Winner and runner-up will advance to the Semifinal Tournament.
- C. Participants will be offered **multiple quests** at the discretion of the event coordinator.
- D. A minimum of **twelve (12) teams consisting of quest winners and runners-up will compete in the Semifinal Tournament.**
1. A Semifinal Quest will be given.
 2. Tournament-style duels to complete the quest will continue until one team remains undefeated.
 3. Teams will be awarded points based on their Semifinal tournament ranking.
 4. Points will be awarded as follows:
 - a. Semifinal participation - 15 points
 - b. Each duel won - 5 points
 - c. Final duel won - 10 points

- E. Only competing participants and event officials may be in the event area.
1. All other spectators, including coaches/ advisors, parents, coordinators, and non-competing students, must remain in the designated spectator area throughout the duration of the round.
 2. Participants will be disqualified if a spectator, including a coach/advisor or parent, interferes with a flight.
- F. 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 crash land or ground their aircraft if its flight course poses a threat to any individuals or goes beyond the boundaries of the airspace.
- F. The smartphone/tablet/computer must remain untouched while a participant is placing the drone on the helipad.
- G. Participants will adhere to all safety rules and directions of event officials.

Battery Safety

- A. Participants should always be present during the charging of a lithium polymer (LiPo) battery.
- B. Never charge a battery that is puffy or punctured.
- C. Stop charging immediately if a battery heats up.
- D. 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 a smartphone/tablet/computer. Any team violating this rule is subject to disqualification.
- B. Teams need to 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.registerychapter.com/tsa/ok/Main.asp



Go/No Go Specifications

- Before judging the entry, ensure that the items below are present; indicate presence with tick box.
- If an item is missing, leave the tick box blank.

Research poster was submitted

Judges: Tick one box (1-5 points) on each separate line to indicate the level the team has achieved. If the poster is exemplary, please make a brief comment in the Exemplary box.

RESEARCH POSTER (40 points)					Record scores of each row
MINIMAL 1 point	DEVELOPING 2 points	ADEQUATE 3 points	PROFICIENT 4 points	EXEMPLARY 5 points	
How is the poster exemplary?					
INVESTIGATE - Poster details 1-3 drone uses that were well researched using 300 words or less.					
<input type="checkbox"/> Little understanding of drone use related to theme	<input type="checkbox"/> Basic understanding of drone capabilities related to theme	<input type="checkbox"/> Clear understanding of drone capabilities related to theme	<input type="checkbox"/> In-depth understanding of drone capabilities related to theme	<input type="checkbox"/>	
<input type="checkbox"/> Minimal or no research evident	<input type="checkbox"/> Little evidence of research from one source	<input type="checkbox"/> Partial evidence of research from more than one source	<input type="checkbox"/> Clear, detailed research from a variety of sources	<input type="checkbox"/>	
CREATE - Poster includes 2-3 illustrations/photos that compliment the drone use research.					
<input type="checkbox"/> Incorrect number of illustrations/photos (2-3)	<input type="checkbox"/> Minimal use of illustrations/photos	<input type="checkbox"/> Use of illustrations/photos reflects good technical skill	<input type="checkbox"/> Use of illustrations/photos is excellent, high aesthetic quality	<input type="checkbox"/>	
<input type="checkbox"/> Unclear or missing theme	<input type="checkbox"/> Illustrations/photos do not compliment research and theme	<input type="checkbox"/> Illustrations/photos add to research and theme	<input type="checkbox"/> Illustrations/photos enhance research and theme	<input type="checkbox"/>	
COMMUNICATE - Poster layout and design effectively present drone research to viewer.					
<input type="checkbox"/> Design is sloppy/disorganized	<input type="checkbox"/> Poor choice of layout and/or hard to follow	<input type="checkbox"/> Design has good points	<input type="checkbox"/> Aesthetically pleasing to the eye, research typed or neatly handwritten	<input type="checkbox"/>	
<input type="checkbox"/> Leaves an unfavorable impression	<input type="checkbox"/> Not professional	<input type="checkbox"/> Okay, but some details may distract from overall quality	<input type="checkbox"/> Good design principles incorporated into design and layout	<input type="checkbox"/>	
EDUCATE - Research Bibliography cites robust sources of information for research and illustrations/photos.					
<input type="checkbox"/> Research is inadequate or missing	<input type="checkbox"/> Resources listed, but improperly cited	<input type="checkbox"/> Research from poor or questionable sources	<input type="checkbox"/> Clear, detailed research from a variety of credible sources	<input type="checkbox"/>	
<input type="checkbox"/> Minimal resources are referenced	<input type="checkbox"/> Single reference source and/or missing illustration/photo citations	<input type="checkbox"/> Citations of research from more than one source	<input type="checkbox"/> All resources are properly cited	<input type="checkbox"/>	

RESEARCH POSTER SUBTOTAL (40 points)

MANUAL FLIGHT (40 points)		
SEMIFINAL PARTICIPATION	SEMIFINAL DUELS WON	FINAL DUEL WON
<input type="checkbox"/> 15 points	<input type="text"/> X 5 points each	<input type="checkbox"/> 10 points

MANUAL FLIGHT SUBTOTAL (40 points)

(Add the RESEARCH POSTER SUBTOTAL and the MANUAL FLIGHT SUBTOTAL.) **TOTAL (80 points)**