**The 2020 UAV Zika Challenge**

* **OVERVIEW:**

The mission of your team is to design, build, assemble, test and fly an open source Unmanned Aerial Vehicle that finds standing water. With your UAV, you identify if the standing water possesses dangerous mosquito diseases like Malaria, Dengue Fever and Zika Virus. These diseases are deadly and or can cause severe health problems for pregnant women, children, elderly people and even people in excellent health. As our climate continues to change, Mosquito Control and has become an extremely critical public health concern and challenge.

* **INTENT OF COMPETITION:**

It is important to understand this event incorporates aeronautical engineering, electrical engineering and mechanic engineering in a hands-on design, build and fly student UAV Quadcopter competition. **This competition strives to focus students on solving real world problems by applying and creating UAV technology.**

* **ELIGIBILITY:**
  + 3 Teams of 2 to 6 members per team per chapter
  + An Unmanned Aerial Vehicle UAV quadcopter drone based on the provided specifications in this document.
* **PROCEDURE:**
  + When UAV Quadcopter is out of the competition tent area, all propellers must be removed. NO EXCEPTIONS.
  + Present UAV Quadcopter Portfolio (see required contents of portfolio)
  + Present UAV Quadcopter for inspection and interview.
  + Be ready for coordinator and judges to ask questions about UAV Quadcopter build.
  + Pit Area Assignment (Event Coordinator will provide a designated area for UAV Team to work on and prepare their UAV Quadcopter for fly)
  + 1st First Mission, seek and identify infected areas.
  + 2nd Mission, fly to pesticide loading station and acquire a pesticide payload.
  + 3rd Mission drop pesticide payload on infected standing water.
  + 4th Mission successfully fly back and land on launch station.
  + Interview with judges regarding design, fabrication, programming and pilot training for
* **ATTIRE:**TSA competition attire is required for this event.
* **REGULATIONS:**
  1. **SAFETY IS MOST IMPORTANT!**
  2. When a team member enters the competition tent field, only at the direction of the event coordinator may the team member mount propellers. The team member may ask the event coordinator to mount propellers if the event coordinator has not indicated they may mount the propellers.
  3. The event coordinator will inspect the UAV Quadcopter’s mounted propellers to ensure safe operation.
  4. When UAV Quadcopter is outside of competition tent area, all propellers must be removed. **NO EXCEPTIONS**.
  5. When the competition and or practice session is under way and a UAV Quadcopter is in the competition tent flying all UAV Quadcopters in the pit area or outside the pit area must be **POWERED OFF**. This is an Automatic disqualification if this occurs.
  6. All batteries will be inspected prior to flight practice and the competition.
  7. All UAV Quadcopters must fly with a propeller guard.
  8. Landing gear should be adjustable or adaptable in size to cover a variety of mission requirements and payload sizes.
  9. All competitors must provide, at UAV Quadcopter judges inspection a 2” white UAV Quadcopter portfolio binder with clear transparent front and back covers.
  10. The UAV Quadcopter portfolio binder front cover (in the front sleeve of the 2” binder) must have:
      + The competition Name “The 2020 UAV Zika Challenge”.
      + The city name where the Florida TSA State competition is held.
      + Blank line for team identification number to be filled in prior to UAV Quadcopter inspection by the judges.
  11. The UAV Team must consist of 2 – 6 competitors performing the following roles (each team member must where an adhesive badge on shirt of their role…names not allowed):
      + Pilot
      + Mission Specialist
      + Flight Mechanic
      + Power Manger (controls all the electric charging station and batteries).
      + UAV Quadcopter Engineering and/or Designer (1-2 persons).
      + UAV Quadcopter Equipment Manager
      + UAV Programmer
      + Team manager
      + Back up pilot
      + Back up mission specialist
      + Back up flight mechanic
      + Command and Control Specialist and Spotters
* **UAV QUADCOPTER SPECIFICATIONS:**
  1. Competing Unmanned Aerial Vehicles MUST HAVE four motors and four propeller blades.
  2. UAV Quadcopter must be assembled from open sourced parts. The UAV Quadcopter can be purchased as a kit that can be built, reconfigured, changed and modified with different components.
  3. The UAV Quadcopter frame structure and **required propeller guards** can made from plastic, wood, 3D printed materials (carbon fiber, pla plastic, abs plastic, resin, metal combined plastic or resin).
  4. Competitors must document all components in their open source bill of materials (BOM) spread sheet in their portfolio binder of their UAV Quadcopter.
  5. Competitors must provide a wiring schematic drawing of their UAV Quadcopter components (modules) in their portfolio binder with associated wiring of component to components.
  6. Competitors must provide an ANSI orthographic/iso projection (top, front, right & isometric views) of their competing UAV Quadcopter, with all dimensions that define their UAV Quadcopter. Competitors may have 1-4 drawings that defines their competing UAV Quadcopter in their portfolio binder.
  7. Competitors must document in their portfolio, a photo log (4”x 6” printed photographs mounted to an 8.5” x 11” paper inside of a clear sheet protector) of each step of their build. From motors to frame mount to final flight ready UAV Quadcopter. Showing all steps of mounting electronic speed controllers, video transmitters, flight controllers, cameras, antennas, etc., all being mounted and wired.
  8. Competitors must document in their portfolio, flight programming software for flight functioning and stabilization. (i.e., Q-Ground Control, Beta flight, etc.). Plus, any additional software and hardware used for mission function (robotic software, microcontroller software for Arduinos, raspberry pies, etc.).
  9. Battery packs must only be commercially available lithium-ion batteries that are purchased from open sourced 3rd parties (i.e. Amazon, hobby shops, etc.).
  10. In the pit area, battery chargers and batteries, as they are being charged must be placed on the fireproof welding blanket in the Charging Area.
  11. The UAV Quadcopter propellers can be in size from 4” (101mm) to 6” (152mm) in overall length.
  12. To determine the specified acceptable functioning size of the UAV Quadcopter, the UAV Quadcopter will be measured diagonally, from the outsized propeller shaft upper left to the outside lower right propeller shaft or vice versa.
      1. Sizes can be from 8” (203mm) to 12” (304mm) in outside motor propeller size diagonally.
      2. The UAV Quadcopter must fit with propeller guards, inside a 15” x 15” go-no-go box for pre-flight inspections by the judges
* **The UAV Quadcopter Competition Specifications:**
  1. No propellers are mounted on UAV Quadcopter outside of the tent.
  2. Pit location is on a first come, first serve basis as determined by the Event Coordinator.
  3. Teams bring to pit area, for inspection, primary UAV Quadcopter and a backup UAV Quadcopter, radio controller(s), chargers, batteries, fireproof blanket(s), tools box, power strip, 3-prong electrical extension cord, replacement parts, spare parts and UAV Quadcopter engineering portfolio and all necessary computers and associated software for the competition.
  4. All equipment, portfolio, tools, chargers and computers are to be arranged for inspection and safety check. Upon completion of the inspections students will be at their pit area for interview question and answer session for the judges.
  5. Team members must have the adhesive badge on their shirt, with role, function team identification number **ONLY**. No names are to be listed.
  6. Florida TSA will provide radios for the spotters, pilot and mission specialist. Teams may bring their own radios for spotting purposes only and no communication to outside event people.
  7. Judges will check UAV Quadcopter start up and motor reviving at the end of the inspection.
  8. Judges will check to see if UAV Quadcopter meets competition and specifications.
  9. Teams will be given a one-time 30-minute session to correct any problems to prevent disqualification for not being competition flight ready.
  10. Teams will draw numbers for placement for flight and mission competition times.
  11. During all competitors in the flight competition area, UAV Quadcopters and radios in the pit area are to be turned off and powered down.
  12. Start of Pre-flight check:
      + **ONLY**, the flight mechanic will bring to the competition tent the UAV Quadcopter with necessary tools, propeller mounting nuts and the four unmounted propellers.
      + Pilot will pretest the UAV Quadcopter, **at the event coordinator’s direction** the motor spinning up and revive test **without** propellers mounted in closed tent area.
      + Once success spinning and revive test is successfully completed, then, at the event coordinators direction, the flight mechanic will be allowed to mount propellers onto the UAV Quadcopter and communicate to the pilot mission specialist the UAV Quadcopter is ready for flight.
  13. **The Mission:**
      + The Search and Remediate Mission: 10 minutes.
      + Pilot will fly quadcopter via FPV or visual flight. Mission Specialist must use FPV (goggles, video screen, phone, etc) to identify targets and complete payload operations.
      + 1st Mission, from the launch station, search and identify infected areas, by mission specialist and possibly the pilot. Fly back to the launch pad and then proceed to pesticide load station after successful landing for 10 seconds.
      + Spotters can communicate the UAV Quadcopter’s location to the pilot and mission specialist, but not the status of the areas as being infected or not infected. These areas will be covered to prevent spotters from seeing the possible area of standing water being infected or not infected.
      + 2nd Mission, fly to pesticide loading station and acquire a pesticide payload.
      + 3rd Mission drop pesticide payload on infected standing water.
      + 4th Mission successfully fly back and land on launch station.
  14. Judges and coordinator will tally up the successful drops on the positive affected areas and deduct point from the misplaced pesticide payloads on negative tested areas.
  15. Judges and the event coordinator in the case of a tie, will rearrange the challenge to increase the difficulty of the mission for the Tie-breaker to determine the Zika Challenge winner.
  16. Points rubric is currently in development and will provided on November 1 on the Florida TSA Website.
  17. Awards:
      + 1st place trophy
      + 2nd place trophy
      + 3rd place trophy
      + Top ten finishing pins for top ten finishing teams and team members.