Overview

The Vertical Flight Technical Society invites student teams to participate in the 7th Annual VFS Micro Air Vehicle (MAV) Student Challenge. The Challenge will take place at the University of Pennsylvania. This electric-powered vertical take-off and landing (VTOL) MAV competition seeks to encourage interest in autonomous/unmanned aircraft technology as well as small air vehicle design and fabrication. Teams may choose to design either a remotely-controlled system or a fully-autonomous system. However, every team must have a safety pilot and the ability to remotely control the aircraft in the event of unexpected or unacceptable aircraft behavior.

Theme: WASHINGTON’S FIGHT (OR FLIGHT) FOR LIBERTY

The Story
This year’s event features a demonstration of how MAV’s can be used for good. Today’s latest technologies are combined with Philadelphia history to bring a twist to George Washington’s quest for liberty during his troop’s historical crossing of the Delaware River.

December 19, 1776: George Washington’s army has arrived at McKonkey’s Ferry with over 2,000 men. Many of the men, however, are injured and rations are severely low. In the retreat across New Jersey, Washington has lost precious supplies, and crossing the near frozen Delaware River has been nearly impossible. To make matters worse, many of the men’s enlistments are due to expire before Christmas, and several soldiers are wanting to leave the the army when their commission is up. Morale is extremely low among the troops and George Washington is fully aware of his distressed situation. He has a plan, however. He has a secret weapon that no one has ever heard of, or seen before: a MAV he refers to as LIBERTY. Developed long before the first manned airplane flight and as a predecessor to Perley’s Aerial Bomber, LIBERTY was invented by a New York inventor named Hirschberg. Hirschberg invented LIBERTY so that mail, food rations, and medical supplies could be expedited to soldiers in need. Washington would be the first to use Hirschberg’s MAV and he had a specific mission that he knew would guarantee victory. However, it is critical that the mission be carried out exactly as planned. You and your MAV pilots are desperately needed to fly LIBERTY and successfully carry out Washington’s secret mission. Washington is counting on you to help his troops regain their morale and bring them nourishment so they can continue their battle for America’s freedom.

Figure 1: Washington Crossing the Delaware by Emanuel Leutze, 1851 (The Metropolitan Museum of Art)
The Challenge

Washington’s secret MAV mission is the following:
The MAV must take-off from Thomas Paine’s helipad (Target 1), hover, and pick up a sealed brown paper lunch bag containing a new pamphlet entitled “The American Crisis”. The sealed paper lunch bag has a braided wire loop at the top of the closed bag for pick up and transport. This pamphlet with words of courage, strength, and hope are just what the soldiers need to lift soldier morale. Before leaving the helipad (Target 1), the MAV must hover for 10 seconds above the house and then pick up the bag containing the pamphlet. After picking up the bag, hover for 10 seconds. The continued mission for the remotely piloted MAV (A) and for an autonomous MAV (B) are described below:

(A) Remotely pilot the MAV and travel north along the western shore of the Delaware River. Climb over a 6 ft high (1.83m) barrier net and make visual contact with McKonkey’s Ferry (say out loud). The MAV must then cross over the Delaware river at the McKonkey’s Ferry location and then successfully drop off the bag on the New Jersey side of the river. To avoid British and Hessian encampments between McKonkey’s Ferry and Trenton, the MAV must climb over a 4 ft (1.22m) high net and under an obstacle 2 feet (0.61m) above ground before arriving at Camp Washington (target 3) to pick up a bag of food supplies. After picking up the package, hover for 10 seconds, and then fly back to Thomas Paine’s helipad (target 1) using the reverse route and crossing the river only at McKonkey’s Ferry. Obtain visual of the helipad (say out loud) and drop off the food delivery package. The package should land as close to target 1 bulls eye as possible. Then proceed with a safe landing within 3 ft (0.91m) of the helipad. You’ll refuel back at the helipad in preparation for delivering the package of food the next day. This is your last segment for the mission.

(B) Send an autonomous MAV and travel north along the western shore of the Delaware River. Climb over a 6 ft high (1.83m) barrier net and make visual contact with McKonkey’s Ferry (say out loud). The MAV must then cross over the Delaware river at the McKonkey’s Ferry location and then successfully drop off the bag on the New Jersey side of the river. To avoid British and Hessian encampments between McKonkey’s Ferry and Trenton, the MAV must climb over a 4 ft (1.22m) high net and under an obstacle 2 feet (0.61m) above ground before arriving at Camp Washington (target 3) to pick up a bag of food supplies. After picking up the package, hover for 10 seconds, and then fly back to Thomas Paine’s helipad (target 1) using the reverse route and crossing the river only at McKonkey’s Ferry. Obtain visual of the helipad (say out loud) and drop off the food delivery package. The package should land as close to target 1 bulls eye as possible. Then proceed with a safe landing within 3 ft (0.91m) of the helipad. You’ll refuel back at the helipad in preparation for delivering the package of food the next day. This is your last segment for the mission.

The first package delivery will weigh between 20 and 25 grams (0.7-0.9 oz.) and the second will be between 25 and 30 grams (0.9-1.06 oz). The packages will be a closed paper lunch bag with a braided wire loop at the top of the closed bag that can be used for picking up and transport. Further design limitations and requirements are described throughout the rest of this document. Points will be awarded primarily for successful completion of mission stages. Other elements such as flying characteristics, vehicle innovation, and time for mission completion serve as tie-breaking metrics.

Point of Contact: Please address any questions to Joseph Gillman at MAV2019@ahsphillypa.org.
**Required Competition Elements:** All teams must participate in the following final competition elements in order to be eligible for awards.

1. **Task A: Design A Digital Presentation using PowerPoint with a 5-10 Minute Verbal presentation.** A projector and computer only will be provided. Please bring presentation on a flash drive.

   Each finalist team must prepare a digital presentation:
   - Team member introductions
   - Air vehicle design process
   - Autonomy elements (hardware and software)
   - Package delivery elements
   - Ground control system capabilities, and
   - Safety systems

   Discussion regarding challenges or any innovative aspects of the design are encouraged. The total presentation should be kept under 10 minutes per team.

2. **Task B: LIBERTY’S Mission: 10 min**

   The flight demo includes the following elements:
   - Take-off from helipad and hover for 10 seconds.
   - After hovering for 10 seconds, pick up the bag containing pamphlet and hover for 10 seconds
   - Fly over 6 ft (1.83m) high barrier net/ Line-of Sight (LOS) boundary
   - Cross over the Delaware river within 3 lateral feet (0.91m) of McKonkey's Ferry centerline
   - Fly and obtain visual recognition of the drop-off point (NJ side of McKonkey's Ferry)
   - Drop off package (as close to bulls eye of target as possible)
   - Climb over a 4 ft (1.22m) high net and also under an obstacle 2 ft (0.61m) above ground; placements of these obstacles subject to random placement
   - Proceed to Target 3 (Camp Washington), noting visual recognition of Target 3
   - Pick up the food package from Target 3 and hover for 10 seconds
   - Proceed back to base reversing the route (Paine’s helipad, Target 1) and note visual recognition of the target
   - Drop off the package (as close to bulls eye of target as possible)
   - Proceed with a safe landing within 3 ft (0.91m) of the base helipad

   All elements must be performed in an efficient, well-controlled manner. Each team will have ten (10) minutes to attempt the mission.

   Teams may conduct either a fully-autonomous mission or a remotely-piloted mission (manual flight) using an onboard vision system. For manual flight, teams will switch to camera-based flight after crossing the initial six foot net which will also serve as a line-of-sight (LOS) boundary. All aircraft must remain within the Mission Boundary during flight, and each team must have a safety pilot ready to override the autonomous systems in case of unacceptable aircraft behavior.

   **Awards** – The team with the highest score in each of the following groups will receive a cash award, as determined by the panel of judges. Entrants in all categories must be able to fly the mission without violating any of the competition rules.
• Best Autonomous Target Search
• Best Remotely-Controlled Target Search
• Most Innovative Vehicle Design
• New Participant Award

Several participant awards may also be given. As in past years, the total prize money this year will be based on the contributions received from various event sponsors, and is set at $5,000 USD. The competition will also be included in the VFS publication *Vertiflite*. The July/August 2018 *Vertiflite* article discussing the 2018 MAV competition is provided below as a typical example.

![Figure 2: MAV Student Challenge Article Published in the July/August 2018 Vertiflite.](image-url)
Who Can Apply

Team Restrictions

Competition is restricted to teams of full-time university and/or high-school students. At least one member of the team must be a current VFS Student Member at the time of entry. High-school teams are encouraged to find a university or industry mentor to help guide progress through various competition milestones. Teams must have at least one member registered for the VFS Forum. Teams may request discounts or waivers for VFS Forum registration fees to allow student participants in the competition. If there are more than two teams per university, the competition coordinators reserve the right to disallow participation to limit the number of teams.

Vehicle restrictions

The competition is restricted to aircraft with the following properties:

Configuration (each is a requirement):
- Vertical takeoff and landing (VTOL) as well as hover capability
- Any number of rotors/propellers
- Onboard flight-stabilization
- Onboard camera(s) needed for mission – Multiple cameras are allowed.
- Standard communication (preferred 2.4 GHz)

Space, Weight, and Power (SWAP):
- Electric-powered vehicles only (no gas-powered vehicles)
- Weight < 500g (17.6 oz) including batteries (not including the delivery packages)
- Size < 45 cm (17.7 inches) in any dimension

Safety:
- “Kill Switch”: Dedicated hardware RC kill switch or remote-operation button command. Vehicle equipped to instantly cut power upon receiving “kill” command.
- All aircraft must include the capability to be flown remotely by a qualified safety pilot. This remotely-piloted mode must be able to override all autonomous

Payload Description

1. The “Delivery Package” is a sealed, lunch size bag with a braided loop at the top for transport with Thomas Paine’s “The American Crisis”. Other paper may be added such that the total weight is between 20 and 25 grams (0.7 - 0.9 oz). No modifications of the Delivery Package, including punctures, cuts, or other means that expose the inside of the bag are allowed in order to carry it. A small piece of tape on the bottom of the package or some other means will be used to keep the bag from moving when the MAV is hovering above. A picture of the bag with braided wire to be added later is shown below: Dimensions are subject to change.

2. The “Pickup Package” of food is also a sealed lunch bag of the same kind, but its weight will be between 25 and 30 grams (0.9-1.06oz).
Obstacle Description

The obstacles in this year’s course are the Delaware River which will be laid out on the floor in blue. The line of sight boundary is represented by a 6 foot (1.83m) tall net or other rectangular obstacle (could be cardboard or foam board). The river may only be crossed in either direction at McKonkey’s Ferry. After dropping off the initial package (pamphlet) there is a movable four foot high net which must be flown over, and a second obstacle that must be flown under less than two feet off the ground. For these mobile obstacles, the exact positioning and directional orientation will be determined on the day of the competition and they may change for each run at the discretion of the judges.
Selection and Competition Schedule

The team applications will undergo a gated review process involving several steps. These stages are outlined here and described in further detail below the schedule diagram.

1. **Gate 1:** Paper submission, including a Team Information Form as well as an abstract about the intended design.

2. **Gate 2:** A video submission of aircraft capabilities and safety measures.

3. **Gate 3:** A demonstration of safety features and vehicle capabilities prior to the Final Demo.

4. **Final competition** at the VFS Forum.

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**Gate 1: Paper Submission (Due by January 31, 2019)**

Each participant team shall submit a completed **team information form** and an abstract with the following information:

- Team description, with key student and faculty members (1 page). Please include the major and year of each student team member. (For example: John Smith: Aerospace Engineering, 1st Year Masters Student).
- Vehicle specification and capabilities (1 page),
- Onboard-System and Remote-Operation development proposal (2 pages),
- Preliminary project schedule and plan to final demo (1 page).

This information will be used to judge relative progress of the teams and develop a preliminary ranking of teams. Preliminary ranking results will not be disclosed but will be incorporated into the final selection. Please send a completed team form along with your paper proposal to Joseph Gillman at MAV2019@ahsphillypa.org by 5 p.m. EST (GMT-5) **31 January 2019**, with subject “2019 VFS MAV competition.”
Gate 2: Video Evidence of Competition Readiness (Due by 16 March 2019)

I. Each team shall submit a short system design description document with the following information:
   - Final vehicle & system configuration description (2 pages),
   - Vehicle Autonomy and Remote operation capabilities, including target tracking results (2 pages),
   - Package Delivery and Pickup System description,
   - Gaps to address before final demo (1 page).

II. Additionally, teams will submit a video showing the current flight capabilities of the aircraft. The following items must be included in the video for all teams:
   - Measurement of the vehicle dimensions and weight,
   - Stable hover capability
   - Ability of the vehicle to fly a simple course
   - Target recognition capability using the on-board camera system
   - Obstacle avoidance using only onboard systems
   - Preliminary proof of a package drop-off & pickup capability

Teams entering the remotely-operated category:
   - Clearly show the vehicle operating through the transition to a remote operator, as it crosses the LOS boundary.
   - Show that the aircraft can be flown using only onboard cameras as visual cues, for a stable hover as well as for the obstacle avoidance and delivery/pickup portions of the flight.

Teams entering the autonomous category:
   - Ensure that the video is recorded while the autonomous mode is active, where possible. Verbally indicate when the vehicle is being flown remotely.
   - Clearly show the real-time ground-station or recorded target-feedback information relevant to the delivery/pickup site recognition and obstacle avoidance.
   - Demonstrate a takeover of the safety pilot, showing the transition from autonomous to remotely-controlled flight.

These results should be included in the paper submission as well for Gate 2.

Finalists Teams Selection (Announced by 8 April 2019)

Finalist teams will be selected using the Gate 1 and Gate 2 submissions in conjunction with the following criteria:

- Prior experience,
- Aircraft design diversity,
- Proof of vehicle readiness,
- Vehicle weight/size and constraints, and
- Plan realism.

The panel will select (approximately) six finalist teams on 8 April 2019 for participation in the VFS Forum competition.

Final Competition

The final competition will take place in conjunction with the 75th VFS International Annual Forum & Technology Display in Philadelphia, PA. The Task A presentations and Task B flight demonstrations will be held on Monday, 13 May 2019 starting at 9AM local time. Prior to this final flight demonstration, teams are required to arrive 0745 AM to conduct safety checks of their vehicles. Dry-run trials will also be allowed, as time allows. Please see the Ratings Structures section below for further details.
During the final competition, the teams will conduct Task A and Task B discussed earlier, in two separate categories: fully-autonomous aircraft will be scored against each other, separate from the manually-controlled vehicles. Teams will be rated according to the following metrics by an independent panel of judges from industry and academia. All teams will be asked to turn any radio transmitters off when they are not flying the course to prevent interfering with the other teams.

Note: Additional personal or industry aircraft may fly the course after the competition for demonstration purposes, but these will not be eligible for an award. All aircraft must be registered with the competition coordinator Joseph Gillman at MAV2019@ahsphillypa.org and cleared through a safety review prior to flight on the course.

Ratings Structures

**Safety Review – Quick Safety Checks Prior to the Competition**

Finalist teams are required to arrive in advance of the 9AM event time (no earlier than 745AM) for an informal safety check with the judges. The purpose of this check is to ensure that all “kill” switch systems are properly designed and transfers from autonomous to manual operation are possible, in the event of unexpected aircraft behavior. Teams may be asked to demonstrate short flights as part of this demonstration. Judges will contact finalist teams prior to the competition date to schedule each team’s safety check. Dry-runs may also be conducted at the safety review, as time allows.

**Task A – Design Presentation and Flight Demo**

The metrics for Task A (Presentation and Free-flight Demo) are provided in table below. The rating IDs A1-A5 will be combined in a specific weighted formula (to be disclosed in the Final Rules) in order to construct an overall score. Teams without functioning aircraft may be allowed to present their intended designs during the presentation portion of the competition, if time allows. Please contact the competition coordinator to request this.

<table>
<thead>
<tr>
<th>Task A</th>
<th>Design and Innovation Metrics</th>
<th>Rating ID (0-5)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Originality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not off-the-shelf, involves innovative engineering, solved challenging integration issues, unique capabilities</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td><strong>Presentation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear, easy to understand, good graphics, good speaking presence</td>
<td>A2</td>
<td></td>
</tr>
<tr>
<td><strong>System Engineering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor-integration, remote pilot &amp; GCS capabilities; antenna/wiring/sensor installation, craftsmanship.</td>
<td>A3</td>
<td></td>
</tr>
<tr>
<td><strong>Maturity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ruggedness, Field readiness, completeness of design, autonomy-readiness, potential for sensors.</td>
<td>A4</td>
<td></td>
</tr>
<tr>
<td><strong>Teamwork</strong></td>
<td></td>
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<tr>
<td>Inter-disciplinary teams, team “intangibles,” leadership shown.</td>
<td>A5</td>
<td></td>
</tr>
</tbody>
</table>
**Task B – Washington’s Mission for LIBERTY**

As discussed earlier, Task B is essentially a package delivery mission, with several obstacles to avoid between the home base and the drop-off/pickup area. Aircraft must use only local information (onboard sensors and programming) to navigate the course and recognize areas of interest. The aircraft may offload some of the processing to the ground station if necessary, but teams are encouraged to include as much processing as possible in the onboard system. All vehicles must navigate through the air to find and pick up/drop off packages. Landings during the mission are allowed only for the purposes of dropping off and picking up packages as well as departing from/returning to the home base.

Points will be awarded for successful completion of each stage of the mission, as outlined below. These points represent maximum award points, and reduced numbers may be awarded based on partial completion—at the discretion of the judges. An additional qualitative assessment similar to the one used in previous years will be conducted for each mission phase, but this will only be used for tie-breaking purposes.

Teams will have a maximum of 10 minutes for flight attempts. More than one attempt at completing the mission is possible within that time, and the team’s intent to start a second attempt should be clearly announced. Each attempt must start from the home base and include all the mission elements, in order. Each flight will be separately scored by the judges.

Each MAV is expected to conduct the following mission, in this order:

1. Liftoff and pickup first package, then hover above the helipad, at a height of 2 m (6.6 ft.) above ground level (AGL). (1 point)
2. Takeoff and fly North (right, in diagram below) and cross the river only at McKonkeys ferry, within 3 ft of the centerline of the ferry. (1 point)
3. Recognize the “Delivery” location, and hover above it at 1-2 meters (3.3-6.6 ft.) for 5 seconds. (2 points)
   Teams should verbally announce when the aircraft has recognized the delivery location, and judges will confirm that the ground station shows this result.
4. Drop the package on the “Delivery” location. The envelope must land within 1.5 meters (5 ft.) of the center of the “Delivery” area. Aircraft may land to drop off the package. (2 points)
   Note: No points will be awarded for this part if the aircraft takes off with the package after landing.
5. Fly over and under the 2 obstacles.
6. Recognize the “Pickup” location, and hover above it at 1-2 meters (3.3-6.6 ft.) for 5 seconds. (2 points)
   Teams should again verbally announce when the aircraft has recognized the “Pickup” location, and judges will confirm that the ground station shows this result.
7. Pick up the envelope at the “Pickup” location. Aircraft may land to pick up the package. (3 points)
   Note: The aircraft must still have the package when it flies away to keep all points.
8. Return to base, using the reverse of the above route, and traversing the same obstacles. (1 point)
9. Perform a stable hover over the home base at 2 m (6.6 ft.) AGL for at least 5 seconds. (1 point)
10. Perform a controlled landing on the home base with the package. (2 points if the package is returned, 1 point if not.)

Figure 8 shows the details of the competition area. The “Line of Sight” (LOS) boundary is the threshold beyond which an operator located near the base switches to onboard-camera-based control, as the vehicle moves into the right. The home base and mission boundary markings will remain the same as the 2018 designs, and the “Delivery” area will use the previous “target” design. An additional design is added for the “Pickup” location. Note that the Pickup Package will be located near the center of the Pickup Area and may obscure the image.

Details for each are depicted in Figure 9, Figure 10, Figure 11, and Figure 12, respectively. For autonomous operation, these “images” can be used by video-processing algorithms for target and home-base search and hover-hold operations. Although the delivery/pickups location area is roughly known, the exact location and orientation of each area of interest is unknown and may change from team to team.

Under no circumstance shall a vehicle overshoot the mission boundary by more than 1 m (3 ft.). Vehicle altitude...
is strictly limited to 4.5 m (15 ft.) AGL. Note that the overall dimensions in the diagram below are approximate in both location and scale and are subject to change based on space availability at the Forum location.

Note that the compass shown in Figure 8 is merely to align the room to the story. The room may or may not be aligned in this direction so do not use it for autonomous flight planning purposes. On one 65-foot long side of the area is a solid wall and on the other are columns spaced equally apart. These columns and walls are just outside the caution tape border. Also the floor of the venue is colored an alternating white and black pattern as shown in Figure 9. There are flags and chandeliers above the maximum allowed MAV height, and the kill-switch is meant to have been activated well before nearing any of these high obstacles.

Figure 8: Approximate Layout of the Competition and Areas of Interest.

Figure 9: Venue location, before tables removed and obstacles placed for MAV competition; approximate location of boundary shown.
For Task B, an additional qualitative assessment of the vehicle will be recorded for tie-breaking purposes. The panel of judges will use the following criteria (rating ID Q1-Q7) during each of the mission phases to rate the vehicle. All teams are encouraged to use the following criteria to guide their design.

<table>
<thead>
<tr>
<th>Task B, Mission Phase</th>
<th>Qualitative Criteria</th>
<th>Rating ID (0-5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take off &amp; Hover</td>
<td>2 m (6 ft.) hover height above base. Metrics: Time to stable hover &amp; Hover stability.</td>
<td>Q1</td>
</tr>
<tr>
<td>En Route to Delivery/Pickup Area</td>
<td>Transition to this phase with clearly-announced user signal. Metrics: Qualitative smoothness of transitions and Time to reach delivery area.</td>
<td>Q2</td>
</tr>
<tr>
<td>Obstacle Avoidance</td>
<td>Avoid obstacles between the home base and the target search area. Metrics: Successful avoidance, Smoothness of flight around obstacles.</td>
<td>Q3</td>
</tr>
<tr>
<td>Target Search</td>
<td>Remote operator or Autonomous system will use only onboard camera(s) to find each target. Metrics: Time to find target, Operator involvement</td>
<td>Q4</td>
</tr>
<tr>
<td>Target Acquisition</td>
<td>Establish a stable hover for at least 5 seconds over each delivery/pickup location target. Smoothly transition between searching, hover, and drop-off/pickup. Metrics: Lateral target tracking error, Stable roll/pitch performance</td>
<td>Q5</td>
</tr>
<tr>
<td>En Route Return to Base</td>
<td>Transition to this phase with user signal. Remote operator can use LOS. “Base” can use homing beacons for autonomous RTB. Metrics: Qualitative smoothness of transitions, Time to acquire stable hover over base</td>
<td>Q6</td>
</tr>
<tr>
<td>Hover and Landing</td>
<td>Acquire stable hover 2 m (6 ft.) above base before landing. Metrics: Hover and landing performance, distance from center.</td>
<td>Q7</td>
</tr>
</tbody>
</table>
The disqualification rating will be given in case the vehicle violates the vehicle and demonstration limits. The following criteria will disqualify a team during final competition and nullify all mission points for the team.

<table>
<thead>
<tr>
<th>Disqualification Criteria</th>
<th>DQ Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle weight or size outside of stipulated limits.</td>
<td>DQ1</td>
</tr>
<tr>
<td>Flight above 4.5 m (15 ft.) AGL</td>
<td>DQ2</td>
</tr>
<tr>
<td>Loss of package.</td>
<td>DQ3</td>
</tr>
<tr>
<td>Overshooting the mission boundary by &gt;1 m (3 ft.).</td>
<td>DQ4</td>
</tr>
<tr>
<td>Failure for the Remote Operator to:</td>
<td>DQ5</td>
</tr>
<tr>
<td>- Use only the onboard camera to stay within bounds.</td>
<td></td>
</tr>
<tr>
<td>- Switch to onboard camera beyond the LOS boundary.</td>
<td></td>
</tr>
</tbody>
</table>

The ratings A1-A5 and points from the mission will be combined in a specific weighted formula to decide the three prize winners for the VFS competition. Ties will be determined using criteria Q1-Q7. Runners-up will receive participation awards. All prize awards are subject to availability of competition sponsors and award funds.

**Expenses and Support**

VFS **will not** provide any travel or accommodation support for finalist teams, or pay or reimburse any other expenses. Teams are responsible to raise funds for travel, accommodation, equipment transportation, and storage, if necessary. It is recommended that three team members attend the final demonstration in order to provide necessary support and safety operations. VFS may be able to consider a waiver or discount for VFS Forum registration fees for student participants. Please ask your advisers about signing up as a volunteer for the Forum, and contact the event organizer if additional support is needed.

VFS will provide on-site storage, power extension cords or power strips, and desk space for equipment checks and repair. Teams wishing to use projectors/digital media or require other equipment for the Task A presentation should contact Joseph Gillman at MAV2019@ahsphillypa.org prior to the event. Projectors and presentation screens may not be available for the competition.

**Disclaimers**

VFS assumes no responsibility for any actions caused by any participants of the MAV Student Challenge. These rules are subject to change. Final rules and updates will be published at www.vtol.org/mav and will be provided to all registered entrants.

Participation in the competition explicitly gives permission to VFS International to use photographic, video, documentation or other records of the competition and all competitors for educational and promotional purposes. The competition event, participant schools and team names may be the subject of a VFS Vertiflite article, web page postings, or other publicity.
7th Annual VFS Micro Air Vehicle (MAV) Student Challenge Team Information Form

Team Name: ______________________________________________________________

School/Department Name: __________________________________________________

(Limit of 2 teams per school/university. If more, VFS may decide to accept only first two entrants.)

Point of Contact (Faculty, Email, Phone No.): _________________________________

Forum Tech Session Presentation (if any): _________________________________

(Optional – not required.)

**Electric MAV Details**

Type (Quad rotor, Helicopter, etc.): __________________________________________

Weight (without batteries): _________________________________________________

Weight (with batteries): ____________________________________________________

Dimensions (all inclusive): ________________________________________________

GCS Interface (data-link, RC, etc.): _________________________________________

Sensor Payload: __________________________________________________________

Max Speed (if known): _____________________________________________________

Describe the implementation of remote-control operated power-kill switch:

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Describe the Current Autonomous/Control Capabilities:

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**Submission:** Please send a completed team form along no later than (NLT) **31 January 2019** to Joseph Gillman at MAV2019@ahsphillypa.org, with subject “2019 VFS MAV Competition.” Teams must submit a follow-up Gate-2 “paper & video” proposal NLT **16 March 2019**. Files >5MB in size should be transmitted via the VFS Hover MAV site. A link to this site can be requested from Joseph Gillman at MAV2019@ahsphillypa.org. Teams will be notified of final acceptance NLT **8 April 2019**.