

## Regular Class: Competition Scoring

### Technical Design Report (TDR): xx/50 pts

- The TDR must include the following: A selection of the overall vehicle configuration, wing planform design including airfoil selection, drag analysis including three-dimensional drag effects, aircraft stability and control, power plant performance including both static and dynamic thrust, and performance prediction.
- 2D Drawings must be submitted with the center of gravity and center of lift marked in the format of the standard aeronautical 3-view orthographic projection, following the the ANSI-Y14.5M standard.
- A Payload Prediction Curve must be included to represent an engineering estimate of the aircraft's lift performance at variable altitude densities while carrying the calculated Predicted Payload, "P".

### Flight Demonstration Readiness Review (FDRR): xx/50 pts

- Teams are to present at competition on the mission overview, preflight predictions (payload), mission hardware & software pedigree and readiness, competition first time events & mission risks, outstanding major milestones prior to competition, team roles and responsibilities, and post flight risk planning.

### Final Flight Score (FFS): Scoring variable based on the FFS equation below.

- A flight attempt is scored if the plane takes off within 100 feet and lands within the 400-foot landing zone.
- PPB is scored if two people unload the payload from the aircraft within one minute after the flight attempt.
- After each successful flight, payload must be increased for the next attempt by adding an empty bottle or replacing one with a filled bottle (see Airframe and Payload requirements for details).

#### Scoring Equation:

$$FFS = \text{Final Flight Score} = (FS_1 + FS_2 + FS_3)/3 + PPB$$

#### Where:

$$FS = \text{Flight Score} = 4(EB) + 15(FB)$$

$$PPB = \text{Payload Prediction Bonus} = \text{MAX}(10 - (FS - PS)^2, 0)$$

$$EB = \text{Count of EMPTY BOTTLES (\#)}$$

$$FB = \text{Count of FILLED BOTTLES (\#)}$$

$$PS = \text{Predicted Maximum Flight Score (\#)}$$

## Regular Class: Key Design Requirements

### Airframe and Payload:

- Takeoff weight may not exceed 55 pounds when fully loaded with the payload ( $W_{\text{Payload}}$ ).
- Fixed-wing configuration only. Wingspan = [72", 120"]; min chord length = 4"; max fuselage length = 120".
- Payload consists of standard 2-liter cylindrical plastic bottles, carried internally in enclosed cargo bays.
  - o Empty bottles weigh between 1.0–4.0 lbs.
  - o Filled bottles weigh  $\geq 4.0$  lbs.
- Payload design shall not contribute to the structural integrity of the airframe.
- Cargo must not shift in flight and must remain fully enclosed during the mission.
- There must be no chord steps or discontinuities, and the wingtip chord length must be at least 4".
- The aircraft cannot be solely reliant on aerodynamic control surfaces for steering during taxing.
- Fiber reinforced plastics are prohibited except when using commercially available props or landing gear.

### Electronics and Propulsion Systems:

- The aircraft shall be propelled by a single electric motor, driving the prop(s) at the motor RPM.
- Propeller limits: Must use 2 propellers (12" diameter) or 4 propellers (9" diameter).
- Must be powered by a commercially available one 4-cell (14.8 V) LiPo pack, maximum 2200 mAh capacity.
- The aircraft shall employ a 2.4 GHz radio control system with a functional fail-safe system.
- Receiver must use a separate battery or BEC, and the system must function with the arming plug removed.