**Seaplane Challenge**

In 1919, the U.S. Navy’s NC-4 became the first aircraft to cross the Atlantic Ocean. This historic achievement followed 2 years of development and testing that changed the way aircraft were engineered in the United States. Nearly 100 years later, the U.S. Navy is still leading the way in Sea-Based Aviation.

The Seaplane Challenge is a Sea-Based Aviation STEM competition. The goal is to design and build a remote controlled seaplane to complete a series of challenges. Individuals or teams may participate.

Materials

* 1 Hobbyzone Champ Ready-to-Fly kit (<http://www.horizonhobby.com/products/champ-rtf-HBZ4900>)
  + Control electronics (radio transmitter, receiver/servo/speed control “brick”) and the power system (motor, gearbox, propeller, and battery) will be sourced from this kit
  + Any or all of airframe, wings, tail, and hardware may be used
  + Modifications of any kind may be made to any part of the kit, however no other commercially available components are allowed
  + Additional batteries of the same type may be used
* 2-3mm foam sheet (e.g. Depron, <http://www3.towerhobbies.com/cgi-bin/wti0001p?&I=LXADGB&P=7>)
* 1/8” square balsa or hardwood stick
* Adhesives (including tape)

Design Rules

* Aircraft must be a remotely controlled electrically powered seaplane
* Aircraft must fit into a box measuring 24” x 24” x 12” ready to fly
* Any configuration is allowed (e.g. biplane, delta, canard, floatplane, flying boat, flying wing)
* Changes are allowed for different challenges, with the following limitations
  + Reconfiguration is allowed but parts or pieces may not be added or removed (complete aircraft must be carried at all times)
  + All changes must be reversible and repeatable
  + Every configuration must conform to all design specifications
* Any building technique is allowed
* If a team determines that their aircraft does not perform as expected, modifications of any kind may be made (up to and including building a new aircraft)
  + Design will be considered a new aircraft; any points earned for completed challenges will not count
  + Previously completed challenges may be repeated for new design, time permitting
* Aircraft must have a name and the name shall be visible on the aircraft

Competition Rules

* Points are awarded to aircraft (not teams) in each of the challenges
* Aircraft do not need to compete in every challenge
* Teams may enter multiple aircraft
* Tuning and repairs are allowed during the competition
* Multiple pilots may fly each aircraft, however each pilot may only fly one aircraft if a team has multiple aircraft
* During a flight, only the active pilot and a spotter are allowed at the flight line
* A designated aircraft handler will place the aircraft in the starting box at the beginning of each challenge attempt and remove the aircraft from the box after the attempt
* If an aircraft is unable to return to the starting box, recovery will be performed by facility personnel. If an aircraft requires special handling, these instructions may be relayed to the recovery personnel, however no guarantee is made as to the condition of an aircraft if a recovery is necessary.
* Flying aircraft must remain inside the designated flight operations area. If an aircraft flies outside of this area, the challenge attempt is immediately forfeit. If an aircraft flies outside the designated area 3 times, the aircraft is disqualified
* If an aircraft is operated in an unsafe manner, it may be immediately disqualified
* Each challenge is individually scored with points awarded based on the order of finish and interval between finishers
  + 10 points maximum for 1st place with other finishers awarded points pro-rated according to percentage behind leader
  + 0 points for not attempting or completing a challenge

Challenges

1. Takeoff
   1. From a standstill in the starting box, the time needed to achieve flight as defined by lift-off from the surface with no part of the aircraft touching the water
   2. Five attempts are permitted
   3. Shortest time wins
2. Return to Base
   1. From a standstill in the starting box, aircraft takes off, flies around an obstacle, lands, and returns to the starting box
   2. Aircraft must be in the air while negotiating the obstacle
   3. Time stops when aircraft is on the water and in the starting box
   4. Three attempts are permitted
   5. Shortest time wins
3. Payload
   1. From a standstill in the starting box, aircraft takes off with as much additional payload as the team chooses
   2. Aircraft must remain airborne for a minimum of 15 seconds
   3. Five total attempts are permitted, payload weight may be changed for each attempt
   4. Best three attempts count towards score
   5. The same battery must be used for all attempts
   6. Highest total payload carried aloft (sum of three scored attempts) wins
4. Climb and Glide
   1. From a standstill in the starting box, 30 seconds of motor run time is permitted to climb to altitude
   2. After 30 seconds (or less, if desired), motor is shut off and aircraft glides for as long as possible
   3. Longest glide duration wins
      1. If a pilot elects to shut motor off prior to 30 seconds, the difference is added to the glide time
5. Duration
   1. From a standstill in the starting box, aircraft takes off and stays aloft for as long as possible
   2. Up to 3 aircraft will fly simultaneously
   3. Pilot may optimize flight path, however a generally counter-clockwise (left turn) circuit will be followed
   4. Aircraft must make a controlled landing and return to starting box within 30 seconds of landing
   5. Longest duration wins
      1. 1 second bonus for each second less than 30 that it takes to return to starting box after landing
      2. 1 second penalty for each second greater than 30 that it takes to return to starting box after landing
      3. Maximum penalty of 60 seconds if unable to return to starting box
      4. 90 second penalty if aircraft is entirely unable to move on the water (e.g. upside-down, propeller will not turn, etc)

Poster

Each team will produce a poster (36” x 48” tri-fold) for each aircraft design entered in the competition focusing on the engineering, tradeoffs, and calculations used to arrive at the aircraft design. The poster should highlight the advantages of the design and benefits from the design choices. Judges will review posters and a team representative will be present to answer questions. Posters will be judged on technical content, completeness, appearance, and how well the team representative addresses any questions posed by the judges.

Awards

Awards will be given in the following categories:

1. Overall – total score for all challenges and poster
2. Take-off performance – combination of challenges 1 and 3
3. Flight performance – combination of challenges 2, 4, and 5
4. Poster and Design
5. “Spirit of the NC-4” Award – for the team that best overcomes technical obstacles during the competition to complete the challenges