



INTERNATIONAL AERIAL ROBOTICS COMPETITION

MISSION 9 Simulation Challenge Rules

As a way to continue development of IARC MISSION 9 systems, the Organizers of the IARC have created an online challenge to all registered MISSION 9 teams. The Simulation Challenge will allow IARC teams to develop online video simulations of MISSION 9 showing how their aerial robot will conduct the mission from beginning to end.

Here are the details:

ENTERING THE CHALLENGE

1. The Simulation Challenge entry form can be found at: http://www.aerialroboticscompetition.org/simulation_challenge.php and is due no later than March 1, 2021.
2. Participation in the Simulation Challenge is optional, but the top three simulations will be posted at the Official IARC website and these winning teams will have their entry fee waived (returned) for the 2021 competition year.
3. Only teams that have submitted valid IARC Applications for 2020 or 2021 prior to March 1 of 2021 are eligible (applications can be submitted at: <http://www.aerialroboticscompetition.org/entryform.php> — note that the Application Fee is not required until the normal June 1, 2021 deadline.)

CHALLENGE RULES

1. Create a simulation of your aerial robot conducting MISSION 9 from beginning to end. This is an actual simulation, not just Computer Generated Imagery (CGI movie) of your aerial robot. The simulation should utilize a physics-based model with actual decision-making algorithms where applicable.
2. For evaluation, the teams must make the human-readable simulation code available to the Judges. This will not be released to other teams.
3. A three-dimensional graphical representation must be provided demonstrating the simulation outputs in a web browser. WebGL must be used to render the outputs in a web browser. The WebGL interface needs to be publicly accessible without the need for any dependencies, third-party plugins, or software beyond Firefox and Chrome. It cannot be assumed that the user of the simulation has anything installed beyond that or

will be running the simulation back-end on their local machine. This needs to be an internet facing interface and any dependencies must be handled on the server side. Assume you have no client side control beyond what the browsers afford you by default.

4. Compatibility must be checked with a minimum of the latest available stable releases of the Chrome and Firefox web browsers. Pages must validate as HTML5 compliant and can conform to WebGL 1.0 (preferred) per

<https://www.khronos.org/registry/webgl/specs/latest/1.0/> or WebGL 2.0 per

<https://www.khronos.org/registry/webgl/specs/latest/2.0/>.

5. Textual or slider controls must be available for the following variables so the evaluating judges can view the simulation's response to changes in environmental states:

- (a) sea state [range = 0 to 3]
- (b) wind speed [range = 0 to 150 kph]
- (c) wind direction [range = 0 to 360°]
- (d) flight speed [range = 0 to 150 kph]
- (e) flight endurance [minutes of stored energy = 0 to 15 minutes]

6. The following shall be assumed constant in the simulation:

Air Pressure and Air Temperature = 20° C (293.15 K, 68° F) and 1 atm (101.325 kN/m², 101.325 kPa, 14.7 psia, 29.92 in Hg, 407 in H₂O, 760 torr). Density 1.204 kg/m³ (0.075 pounds per cubic foot). Sun Angle = 55° elevation and 212° azimuth. Assume that the mast and both pylons are along a line extending from East to West with the mast to the East of the pylons.

7. Teams shall include (as a minimum) the following level of detail in their simulations above any beyond the parameters required above in item 5:

- (a) aerial robot weight (if a mother ship and sub vehicles are used, then the individual weights of each)
- (b) changes in weight due to dropping of ballast, fuel consumption, separation of sub vehicles
- (c) weight transferred to/from the mast if grappled
- (d) inertias
- (e) ground effect enhancements

9. An example of the best simulations will be posted at the IARC website as links to team WebGL presentations for a single set of parameters (sea state, wind speed, etc.).

JUDGING

Entries will be judged on, or soon after March 1, by the American and Asia/Pacific Venue Judges. Winners will be announced on the IARC website and the top three winning entries' WebGL examples will be posted at (or linked to) the IARC website. In addition, other simulations receiving honorable mention will also be showcased there.

General questions about the 2021 Simulation Challenge should be addressed to the Organizers on the IARC SLACK Forum

(<http://www.aerialroboticscompetition.org/slack.php>).

NOTIONAL WEBGL INTERFACE

