2019 ASME IAM3D Competition Rules
Hovercraft Resupply Vehicle Design Competition

When natural disasters occur it often leaves thousands of people without food, water, or power. The 2019 ASME IAM3D Hovercraft competition tasks university students to use additive manufacturing and an iterative design process to create an unmanned emergency resupply hovercraft that can traverse many mediums to deliver lifesaving aid to those in need. One submittal, a design report showing your vehicles detailed design will be required prior to participating in the physical obstacle course.

Objective

The objective is to design and manufacture a hovercraft using additive manufacturing that will pickup and carry a payload through a ground course and deliver the payload to its final destination.

Registration

Teams will be required to register at least one month prior to the ASME E-Fests start date where your team will be competing. Late registration will be accepted but a small point penalty will be incurred based on the number of days after the target registration date that the registration email is received.

Eligibility

Every participant must be a student member of ASME who is enrolled as an undergraduate in a baccalaureate or associate engineering/engineering technology degree program or was enrolled within one year of the competition date. All competitors agree to abide by the ASME Engineering Code of Ethics.

Safety Equipment

At a minimum all teammates must wear safety glasses while assembling and working on vehicles. All members of the team on the course must also be wearing safety glasses while on the course. Teams will not be allowed to compete without safety glasses, and teams must provide their own safety glasses.

Scoring

There will be three ways to score points.

- Design Report - 500 Points possible
- Use of Additive Manufacture Parts - 500 Points possible
- Obstacle course - 1200 points possible (Time Based)

  Time Weighting Equation: $1200 - (4\ X\ (Time\ elapsed\ in\ seconds))$

Teams that go over 5 minutes will receive an obstacle course score of zero but will keep design report and use of additive manufacture parts scores.

Design Report

The design report should address at a minimum the following points:

- Individual CAD drawings for every part created using additive manufacturing
- CAD outline drawing and bill of materials

- Expected performance, specifications, and simulations
- Design for manufacture and assembly analysis (DFMA)
- Design for additive manufacturing analysis (DFAM)
- Design process and recorded design iterations

There are no paper length or format requirements but design reports should be professional and contain sufficient detail to describe the design and function of the vehicle. The design report will be due one month before the ASME E-Fests start date where your team will be competing. Design report scores will be provided publicly at the start of the competition. Late report submissions will be accepted but a small point penalty will be incurred based on the number of days after the target submission date that the report email is received. Due to time constraints scoring of late submissions will be attempted but is not guaranteed.

Submission of design report

To officially submit your design report email your document in PDF form and team information to Iam3dstaff@gmail.com

In the email body include the following team information:

- University name
- Project name
- Chapter Advisor name and contact information
- Chapter Presidents name and contact information
- Team contact information (Email address, phone number, physical location)
- Number of students on the competition team

Use of Additive Manufacture Parts

This competition strives to provide experience in additive manufacturing and an iterative design process. To ensure the spirit of the competition scoring will be heavily weighted on what percentage of parts on your team's vehicle were produced using additive manufacturing. All designs of additive manufactured parts must be original, designed, and created by the competing team. The use of preexisting designs will be grounds for disqualification.

Score weighting equation:

$$\left(\frac{Number\ of\ parts\ created\ using\ additive\ manufacturing}{Total\ number\ of\ parts(minus\ exceptions).}\right) X\ (Total\ Final\ Score)$$

Example:

$$\left(\frac{30\ \ parts\ created\ using\ additive\ manufacturing}{50\ Total\ number\ of\ parts(minus\ 10\ exceptions).}\right) X\ (Total\ Final\ Score\ of\ 500) = 375\ points$$

The hovercraft skirt can be made of multiple components but will be considered as one part. To maintain the spirit of the competition, sub components that are created with an unnecessary number of parts to increase the use of additive score may be considered as one part and will be left to the judge's discretion.

There will be some exceptions to components that should not be counted in the "total number of parts". The following components that when not created using additive manufacturing are considered as exceptions to the part number score:

Electronics	Batteries
Electrical Wire	Propellers
Electric motors	Fasteners (Bolts, nuts, washers)

Production through any traditional form of line fed or powder based additive manufacturing will be allowed. Any form of commercially available non toxic additive manufacturing material will be allowed. Alternative forms of additive production that are found to reduce structural integrity enough to be considered unsafe may be disqualified and will be left to the judge's discretion.

Obstacle course

Up to three students will be allowed to enter the course during their vehicles run.
The team will be given 2 minutes to setup and ready their vehicle. Vehicles will be required to stay on the ground for the entire race. Intentional flying will be grounds for disqualification. After the payload is deposited in the payload zone the time will stop when the vehicle comes to rest in the parking stall.

A separate document will detail the dimensions of the physical course.

Payload

The payload will be a 3D printed (PLA) two inch cube with 60% infill and four outer shells. The competition payload will be provided by the competition staff.

Vehicle Spatial Constraints

A judge will measure dimensions to ensure that your vehicle would fit inside of a 24 inch cube. Everything that will be physically on the course shall fit inside the prescribed dimensions. This does not include the device controller, FPV goggles, or payload. Vehicles are allowed to transform to any dimensions as long as it does so while on the course and only by doing so on its own and under its own power. Keep in mind the course's dimensions!

Energy Sources

All electrical energy for the device must be provided by commercially produced rechargeable batteries. Student designed and manufactured energy sources will not be allowed. Springs may be used with the following size constraints.

- ½ Inch diameter maximum.
- 2 inch length maximum.

Controls

Devices may be controlled via remote control through a transmitter/receiver radio link. As an exception to the rechargeable battery rule, a radio transmitter may have its own batteries and these batteries do not have to be rechargeable. The transmitter/receiver radio link may be any commercially available model controller. All radio controllers will be impounded and shut off during the competition, except during the team's attempt. Umbilical controls` may not be used.

Additional questions may be emailed to Iam3dstaff@gmail.com

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Scale = 2 Feet. *All measurements are approximate

Payload Pickup area

Payload Drop off area

Vehicle Start area

Vehicle Parking Stall