ATTENTION E-FESTERS! Please read this important announcement about ASME E-Fests® and ASME EFx® Events in the academic years 2022 & 2023

We will be returning to IN-PERSON ASME EFx® events in the academic year 2022-2023! EFx events will be IN-PERSON locally organized throughout the world and several EFx events will include our ASME competitions. Please visit the ASME E-Fest website for an updated list of events at https://efests.asme.org/. Events will be added as they are confirmed.

ASME will ALSO continue to host our two signature FULLY virtual events: E-Fest Careers (Nov. 12, 2022) and E-Fest Digital (March 25, 2023).

We encourage students, competitors, and faculty members to take advantage of the learning experiences provided by both our competitions and other digital offerings throughout the year. Questions may be directed to efests@asme.org.

Not all EFx events will have every competition available. Check that IAM3D® is available at that event before registering.

2023 IAM3D® Competition Rules
Hovercraft Resupply Vehicle Design Competition

When natural disasters occur it often leaves thousands of people without food, water, or power. The 2023 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 vehicle's 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 pick up and carry a payload through a ground course and deliver the payload to its final destination.

Deadlines
Registration - Varies per event and will be available on the E-Fest website: https://efests.asme.org/
Design Report -The submission due date is one month prior to the first competition date. Details are located in the submission of the design report section.

Registration
All team captains & team members will be required to register for BOTH the competition AND the EFx they are attending through the E-Fest website. There is no fee to register for IAM3D®, however EFx events will require a modest event fee. Registration dates are based per event. **Not all EFx events will have every competition available. Check that IAM3D® is available at that event before registering. A minimum of three competing teams must be registered for the event to occur.**

Eligibility
Every participant must be a student member of ASME who is enrolled as an undergraduate in a baccalaureate, community college or associate engineering/engineering technology degree program or was enrolled in one of those programs within one year of the competition date (must still be a dues-paying member). 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
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 the design report and use of additive manufacturing parts scores.

Scoring for all events will be held on a global score board located on the ASME website.

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

- Individual CAD drawings for every part created using additive manufacturing
- Formal vehicle CAD drawing with bill of materials
- Exploded CAD assembly drawing of all parts created using additive manufacturing
- Analyses: Expected vehicle performance, part specifications, structural simulations
- Design for manufacture and assembly analysis (DFMA)
  Example: https://en.wikipedia.org/wiki/DFMA
- Design for additive manufacturing analysis (DFAM)
  Example: https://en.wikipedia.org/wiki/Design_for_additive_manufacturing
- The design process, design Iterations
- All Aspects of your testing. Describe in detail why you tested, how you tested, what you tested, what was the outcome, and what changes it prompted in your design. Provide all relevant data and outcomes.

There are no paper length or format requirements, but design reports should be professional and contain sufficient detail to recreate your process/design. Late report submissions will be accepted but a 30 points penalty for each day 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 IAM3D@asme.org

In the email, the subject line should include: ASME IAM3D – EFx <NAME of EFx Event>

The email body includes the following team information:

- University name / Project name
- Team captain name & contact information (tel/email)
- Chapter Advisor and Chapter President's name and contact information
- Number of students on the competition team

The design report submission due date is one month prior to the first competition date of the event you will be participating in. Late submission will be accepted for as long as possible but at a penalty of 30 points per day late. Due to time constraints scoring of late submissions will be attempted but is not guaranteed.

Due date example:
Competition first date is 4/5/2023
Design report due 3/5/2023 by midnight at your university's local time.

Use of Additive Manufactured 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 was 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

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 exceptions to the part number score:

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

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 are allowed but those that are found to reduce structural integrity or deemed to be 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 vehicle run. The team will be given 2 minutes to set up 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 drop off zone the time trial will stop when the vehicle comes to rest in the parking stall.

Course layout and floor requirements are located in Appendix 1

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 their own and under their 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.

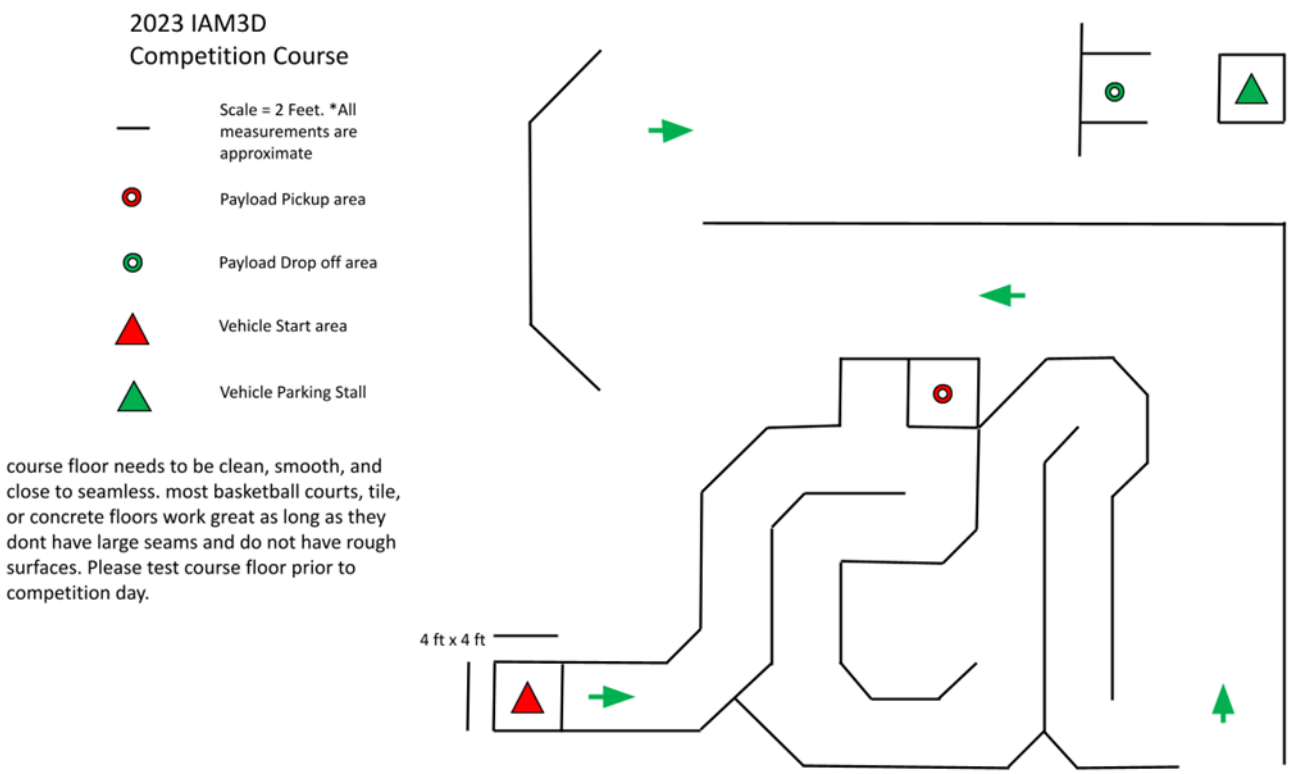
Additional questions may be emailed to IAM3D@asme.org

Prizes & Winners

- 1st place - $500
- 2nd place - $300
- 3rd place - $150
- IAM3D® competition winners will be announced at the local EFx event.

Watch the IAM3D® Facebook page for updates.

Appendix 1
2023 IAM3D® Hovercraft Resupply Vehicle Competition Course



course floor needs to be clean, smooth, and close to seamless. most basketball courts, tile, or concrete floors work great as long as they dont have large seams and do not have rough surfaces. Please test course floor prior to competition day.

Smooth Surfaces

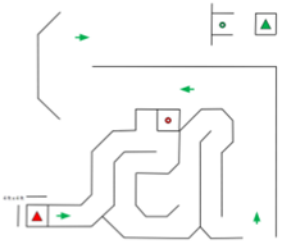
Seamless

large seams can cause cavitation of the air pocket. Taping of seams can work but the tape can also provide a seam that a vehicle can be caught on. Seamless = best.

Alternative floor materials are acceptable as long as it is a smooth, stiff, close to seamless surface that can be walked on without deforming.

Course Wall Material

Course walls are depicted as black lines.



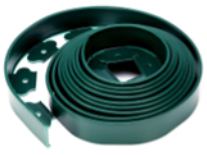
Course walls Materials can be anything that is at least 1 inch tall and can be taped down to the floor. Try to provide a wall that will not snare the vehicle if the vehicle bumps along the wall.

Example Materials:

Lumber

Brick

Plastic Edging



Pipe