



## **ASME IAM3D Virtual Competition 2022 Rules & Submission Guidelines**

**\*This set of rules will be used for E-Fest Digital (Virtual Event)\***

**ATTENTION E-FESTERS! Please read this important announcement about  
ASME E-Fests® in 2021 & 2022**

ASME E-Fest Digital (March 25-26, 2022) and affiliated competitions will NOT be held in-person. They will continue to be virtual for academic year '21-'22.

ASME will be hosting a series of year-long digital events including a E-Fest Careers 2021 (November 13), competition “how to” webinars and much more. Please visit <http://efests.asme.org> for more details.

**[Watch the IAM3D Facebook page for updates!](#)**

### **Objective**

The objective is to design, test, and manufacture a “D.I.R.T.”-GBRCV (Design, Integration, Research, and Test – Ground Based Remote Controlled Vehicle) using additive manufacturing and an iterative design process that will demonstrate your teams design and testing skills! Be creative! It doesn't just have to just drive. Jump, flip, tow, float, hover, or even carry a payload. Extra ground-based functionality is encouraged!

This year's competition will be held by proxy video submission.

### **Deadlines**

Submission due date is Feb. 1, 2022. Late submission will be accepted for as long as possible but at a daily point penalty. Late submission judging cannot be guaranteed and is based on judge schedule availability.

### **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 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](#).

## **Competition Safety Requirements & Safety Equipment**

All teams/team members must wear safety glasses while assembling and working on or driving their vehicles. Teams will not be allowed to compete without safety glasses. Teams are required to provide their own safety glasses. Additional personal protection equipment (PPE) is recommended but not required. Teams with video submissions showing dangerous actions may be disqualified at the judging committee's discretion. ALL teams/team members should follow all local ordinances related to COVID-19 and gathering in person.

This year's competition is limited to ground based and jumping operations. No sustained flying will be allowed.

## **Design Report (Required)**

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

- Individual CAD drawings for every part created using additive manufacturing
- Exploded CAD assembly drawing of all parts created using additive manufacturing
- Analyses: Expected vehicle performance, part specifications, and structural simulations
- Design for manufacture and assembly analysis (DFMA)  
<https://en.wikipedia.org/wiki/DFMA>
- Design for additive manufacturing analysis (DFAM)  
[https://en.wikipedia.org/wiki/Design\\_for\\_additive\\_manufacturing](https://en.wikipedia.org/wiki/Design_for_additive_manufacturing)
- Design Iterations and physical testing information
- 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 describe the testing, design, and function of the vehicle. The design report should be included with your team's submission package.

## **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 were produced using additive manufacturing. Teams will be required to design and construct their vehicle's chassis 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. If an unnecessary number of additive parts are used to serve one function, it would be left under the judge's discretion to reduce the number of parts counted for the additive manufacturing score. Additive manufacturing through any traditional form of line fed or powder-based process will be allowed. Any form of commercially available additive manufacturing material/process will be allowed.

A short video detailing your vehicle's number of additive parts used shall be included with your submission.

## **Testing**

Testing will be an integral part of this year's competition. We expect testing to be a significant portion of your design report. Please describe in detail why you tested, how you tested, what you tested, what was the outcome, and what, if any, changes it prompted in your design. Design early and often. Take pictures and video. Record all of your data. Bend it, break it, crash it, SEND IT! (jump it), and put it through the elements. Ensure that any testing follows your university's safety protocols and general policies. Points will be based on creativity, usefulness of test, data retrieved, design changes based on data retrieved, and the outcome of those design changes.

A short video detailing your vehicles testing shall be included with your video submission.

## **Required Commercially Purchased Parts**

Safety is a criterion that nearly every engineering design considers. For this reason, some parts of this competition will require commercially purchased parts and are considered to be exceptions to the use of additive manufacturing parts score.

- All Electronics (example: electronic controllers, cameras, FPV...)
- Electrical Wire
- Electric Motors
- Batteries/Power sources
- Fasteners/Bolts/Nuts

Other parts may be deemed exceptions to the use of additive manufacturing parts score and will be left to the judge's discretion.

## **Vehicle & Vehicle Size Constraints**

The vehicle size constraints are as follows:

20 Inch Length

14 Inch Width

12 Inch Height

This does not include the device controller, FPV equipment, or payload. Vehicles are allowed to transform to any dimensions as long as it does so on its own and under its own power.

A portion of the video submission will need to show your team measuring the dimensions to ensure that your vehicle dimensions are compliant.

## **Vehicle Safety Provisions**

All teams shall hold a safety briefing prior to arming their vehicle for any reason during the creation of your team's video submission. All team members that will be attending the physical demonstration (if allowed at your university) are required to attend the safety briefing. No one will be allowed on the course during the demonstration. Race viewing will only be allowed from outside the obstacle course at a safe viewing distance and everyone, including spectators, must have safety glasses on.

All pilots must have an arming switch feature on their controller. Pilots may use FPV to pilot the vehicle. Goggles and ground stations are allowed. All country, state, and local regulations must be followed when driving, testing, and filming your vehicle. If you are driving or testing your vehicle on university grounds, please ensure that you connect with your faculty advisor or university administrators to secure appropriate permissions before doing so. This year's competition is limited to ground based and jumping operations. No sustained flying will be allowed.

Failure to adhere to the above provisions constitutes a possible disqualification. Disqualifications will be at the discretion of the judging team.

All video submissions will be scrutinized for safety. Any infractions of the above tasks will be subject to penalty score and will be at the discretion of the judging team.

## **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.

### **Maximum battery specs:**

4S

4.2 Volts per cell

Springs may be used with the following static 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. Umbilical controls may not be used.

## **First Person Visual (FPV)**

No one will be allowed on the physical course while vehicles are in motion. If you do decide to use FPV, be prepared to record your vehicle's demonstration and provide your videos to the judging staff. Providing your video to the judging staff will signify your permission for ASME and IAM3D to use all provided videos for advertisement purposes. Some videos showcasing your team may be uploaded to the ASME E-Fest YouTube channel and/or the ASME E-Fest video gallery with some team highlights on Facebook/Instagram.

## **Course**

This year's course will be designed by you. Each team may use whatever resources are available to them. You will want to design multiple courses for testing, and demonstrating your vehicles abilities. Extra ability's = extra points. At a minimum there should be the following demonstrations:

- Testing
- All terrain / environment abilities
- Freestyle trick abilities
- Long jump
- Performance, speed, and cornering

We understand that resources may be hard to come by so course materials are intentionally not specified. We encourage the creative use of “whatever is around” materials. We also understand that people have the option to run the race video as many times as it takes to get it perfect. For this reason, we are allowing it and there will be no time score, only ability scores. Speed, agility, and the ability to efficiently traverse any obstacles will be considered for the ability scoring. The ability score will be subjective and up to the discretion of the judging panel.

## **Scoring**

There are three ways to score points.

**Design Report** - 5000 Points possible

**Use of Additive Manufacture Parts Video** - 5000 Points possible

**Video Submission** - 5000 points possible

## **Video Guidelines**

### **Use of additive video- 5-minute video limit (Required)**

- Do a run through video of your assembled vehicle. Point out all of the parts of your vehicle including non-additive manufactured parts.
- Present the ratio of additive manufactured parts and non-additive manufactured parts

### **Obstacle Courses Video - 10-minute video limit (Required)**

- Include a video of any courses that were used to demonstrate the performance of your vehicle. Make sure that judges can clearly see what you are showcasing

### **Team Video - 5-minute video limit (Required)**

- Showcase your team and your team’s hard work.
- Include technical design and testing discussion - why you chose your design and how you came to the final design through an iterative design process.
- Also include any design features you deem as innovative. We would like to see how you included creative design features.

### **Additional Videos (FPV ECT) – (not Required)**

## **Video Submission, ASME Release Form(s) & E-Fest Digital Registration**

E-Fest Digital (March 25-26, 2022) registration is required for team captains and team members. There is no fee to register for E-Fest Digital or IAM3D. Once your E-Fest Digital

competition registration is complete, team captains and team members will be directed to a Google form to:

1. Upload team design reports
2. Upload Use of Additive Video, Obstacle Course Video, Team Video and “other videos”
3. Sign an ASME Video Release Form (required by all team members and team captains)

### **Prizes & Winners**

- 1<sup>st</sup> place - \$500
- 2<sup>nd</sup> place - \$300
- 3<sup>rd</sup> place - \$150
- IAM3D competition winners will be announced during E-Fest Digital on Saturday, March 26, 2022 during the awards ceremony.