

## Maryland Engineering Challenges 2018 Cargo Airplane Challenge

Middle School Level – Grades 6 to 8

High School Level – Grades 9 to 12

Supported

By:

American Institute of Aeronautics and Astronautics, Mid-Atlantic Section

Engineer Contact:

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### Important Dates

#### Coaches' Information Session

⇒ **Thursday, November 16, 2017** **4:00 p.m. to 7:00 p.m.**

This "drop-in" event is designed for adults interested in coaching a team to stop by and chat with engineers. Find out if a particular Challenge is a good fit for your students. The Information Session is not required and there is no cost. Registration is strongly encouraged. Contact James at [jkeffer@thebmi.org](mailto:jkeffer@thebmi.org)

#### Coaches' Hands-On Workshop

⇒ **Saturday, January 27, 2018** **Beginning at 10:00 a.m.**

Learn the practical aspects of this Challenge. Work with engineers to explore design and construction aspects of the project. Especially helpful for first-time Coaches and/or those with little previous engineering knowledge. Registration required prior to 1/24/18. Contact James at [jkeffer@thebmi.org](mailto:jkeffer@thebmi.org)

#### Registration and Written Report Due

⇒ **February 23, 2018** **Prior to 4:00 p.m.**

In order to be a registered team, each team must have their adult Coach do the following:

- Register online at <http://survey.constantcontact.com/survey/a07eekcihgzi7939g1n/start>
- AND submit the team's Written Report as a HARD COPY to the Baltimore Museum of Industry
- AND pay a \$5 Coach's Fee, details at <https://48278.blackbaudhosting.com/48278/MEC-Coach-Fee>

#### Cargo Airplane Competition

⇒ **March 4, 2018** **Doors open at 9:00 a.m.**

Full details about the Challenge will be emailed to Coaches after the registration deadline.

**Questions about Challenge specifications or judging should be sent to the Engineer Contact:**

Tom Milnes [thomas.milnes@jhuapl.edu](mailto:thomas.milnes@jhuapl.edu)

**Other questions?** James Keffer [jkeffer@thebmi.org](mailto:jkeffer@thebmi.org)

## THE CHALLENGE

Students will design and construct an electrically-powered model aircraft to fly a tethered flight of at least one lap without cargo, followed by a second tethered flight of one lap carrying as much cargo as possible. Both laps will use power supplied by a power pole, limited by the maximum output of the transformer, KELVIN Digital Power Supply # 841051 ( 16V – [www.kelvin.com](http://www.kelvin.com) ).

## ENGINEERING TEAM REQUIREMENTS

Each team may consist of 1 to 10 students. There is no limit to the number of teams a school may have.

## DESIGN AND CONSTRUCTION STANDARDS

- Teams may request one free supply kit (one motor, one propeller, and two wheels) from the BMI. *Kits will be available at the November Coaches' Information Session or you may request your kit(s) by contacting James at [jkeffer@thebmi.org](mailto:jkeffer@thebmi.org) after November 1, 2016.*
- Additional kits may be purchased from BMI for \$2 each.
- Teams must use a KELVIN electric motor, item # 850647, one of which is supplied in each kit. The motor must be installed in the airplane so as to be visible to the judges on the day of the competition.
- Teams may substitute their own propeller for the one in the kit.
- Teams are responsible for building wings, fuselage, and cargo.
- Cargo may not have lift-increasing or drag-reducing properties for the airplane as a whole.
- No lighter-than-air devices are permitted.
- Length, width, and height must all be less than 3 feet.
- The new power pole design Kelvin #851508 will be used. Direct attachment is by part #870118. Sponsors will provide a connection via alligator clips to dual wires from plane if needed.
- NO COMMERCIAL KITS are permitted.

## PERFORMANCE DEMONSTRATION GUIDELINES

- The airplane must fly a successful lap while tethered, first with plane empty, then with cargo.
- Power must be supplied by the KELVIN power pole item # 851508 and KELVIN digital power supply item # 841051 (16V) provided by the judges.
- No more than two minutes will be allowed for any attempt.

## EVALUATION STANDARDS

- A lap will be considered successful when the plane flies at least 8" high continuously for a complete circle.
- Tethers must be long enough so that the distance from the pylon's center point to the plane's centerline is at least 10 feet when the plane is tethered.
- THE JUDGES HAVE FULL AUTHORITY TO INTERPRET THE LETTER AND SPIRIT OF THE RULES

This challenge involves four main components: the design and construction of the project, a written report, an oral report, and the performance demonstration.

|                           |                                      |
|---------------------------|--------------------------------------|
| Written Report            | <i>Competition value: 20 points</i>  |
| Oral Report               | <i>Competition value: 20 points</i>  |
| Design & Construction     | <i>Competition value: 30 points.</i> |
| Performance Demonstration | <i>Competition value: 30 points</i>  |

An outline of what is required for each of these components, and general guidance on preparing for the competition, is given in the "Middle School Guide to Entry" and the "High School Guide to Entry" which should be read in connection with this document. The Guide to Entry also gives detailed requirements for the design report at the middle and high school level, respectively.

**GOOD LUCK TO YOUR TEAM!**