



Maryland Engineering Challenges™
2011
Cargo Airplane Guide

Supported By:

American Institute of Aeronautics and Astronautics (Baltimore Section)
Glenn L. Martin Maryland Aviation Museum

Level:

High School—Grades 9 to 12

Important Dates:

Coaches' Information Session
Thursday, November 11, 2010
4:00 pm – 7:00 pm

Coaches' Hands-On Workshop
Saturday, January 29, 2011
10:00 a.m. – 2:00 p.m.
at GLM MD Aviation Museum

Registration required, information available at November session

Registration Deadline and Written Report Due
Friday, January 28, 2011
4:00 pm

Competition Date:
February 12, 2011
9:00 am – 12:00 pm
at GLM MD Aviation Museum

Snow Date
TBA

Important Information:

The Coaches' Information Session will be held at:
Baltimore Museum of Industry, 1415 Key Highway, Baltimore MD 21230

The Coaches' Hands-On Workshop and Cargo Airplane Competition will be held at: the Education Center of the Glenn L. Martin Maryland Aviation Museum at Martin State Airport. Directions will be sent to Coaches after the January 28 registration deadline.

For information about engineering requirements, contact Thomas Milnes at thomas.milnes@jhuapl.edu



For registration information or general questions about the Maryland Engineering Challenges, contact Melinda Cané at mcane@thebmi.org. Detailed information about the competition event will be sent to Coaches after the registration deadline.

To register a team, adult Coaches should go to <http://tp1.clearlearning.com/hshealey/EC.tp4>. Please note there is a \$5 PER COACH registration fee. Only one Coach is needed per team, although a team may have as many adult helpers as needed.

Written reports must be submitted AS HARD COPIES, either by mail or in person, to:
BMI, 1415 Key Highway, Baltimore MD 21230

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 841386 (rated 0-20 volts at 2 amps).

Engineering Team Requirements:

Each team may consist of 1 to 10 students

Design & Construction Standards:

- Teams may request a supply kit (one motor and one propeller) from the BMI; contact Melinda Cané at mcane@thebmi.org
- 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.
- Electrical connection to power pole is via telephone wall jack and wire. Electrical polarity for power pole is black -, red +, green -, yellow +
- NO COMMERCIAL KITS are permitted.

Performance 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 # 850747 or # 851508 and KELVIN digital power supply item # 841386 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 as high as the pylon pivot point 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

Competition value: 20 points

ORAL REPORT

Competition value: 20 points

DESIGN & CONSTRUCTION

Competition value: 30 points.

PERFORMANCE DEMONSTRATION

Competition value: 30 points

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” which should be read in connection with this document. The Guide to Entry also gives detailed requirements for the design report at the high school level.

GOOD LUCK TO YOUR TEAM!