Welcome WSGC 2016 CRL

- Agenda
  - Welcome
  - Competition Logistics
  - Competition Dates
  - Slides from teams
  - Rocket motor selection/information
  - Questions and Answers
This Years Teams

- Teams competing in 2016
  - 12 11 Teams

- WSGC Affiliate Schools with entries include:

  Carthage College
  Marquette Univ.
  Marathon County/UW-Sheboygan
  Milwaukee School of Engineering
  Ripon College
  UW Madison
  UW Milwaukee
  UW Oshkosh
  UW Platteville
  UW River Falls
  UW Washington County
  UW Whitewater
Model Rocket Flights

- **Purpose:**
  - Demonstrate the team can fly a simple rocket

- **Results:**
  - All Teams completed the required flights
  - Some teams need to read the requirements more closely - photos, before and after, not just video
  - At least one team went above and beyond flying a small scale, high-powered version
Carthage College
Red Hawk Rocketry Pre Flight Demo 2016

Members: Bobby Appieton, Anthonon Ryan-Ceres, James Izewski, Dabid Knapp
2016 CRL Badger Ballistics’ Demo Flight

Badger Ballistics’ CRL demo flight November 14th, 2015 at Waisman Fields

Pre-flight

Post-flight

Setup
Small Model Rocket Flight
Univ. Wis. Oshkosh

Demo Launch
Univ. Wis. – Platteville

Smaller Scale Model

Altitude of 784 ft.  
Flew on a G88-SS
Univ. Wis. – River Falls

Pre-Launch on top left....
FROM LEFT: Raven Hernandez, Laura Lusardi, Laura Parmeter, Marium Asif, Kelsey Kolell
2016 Competition

True-Scale Model

Flight Mission

<table>
<thead>
<tr>
<th>True-Scale Model</th>
<th>Accuracy of Model</th>
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</thead>
<tbody>
<tr>
<td>Apogee Window</td>
<td>2500 – 3500 ft</td>
</tr>
<tr>
<td>Flight Accuracy</td>
<td>- Predict flight of Rocket</td>
</tr>
<tr>
<td></td>
<td>- Compare to actual apogee</td>
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Constraints

<table>
<thead>
<tr>
<th>Rocket Motors to select from:</th>
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<tbody>
<tr>
<td>Ceseroni (38 mm)</td>
</tr>
<tr>
<td>567I125-10A</td>
</tr>
<tr>
<td>601I350-16A</td>
</tr>
<tr>
<td>634I540-16A</td>
</tr>
<tr>
<td>648J285-15A</td>
</tr>
<tr>
<td>684J290-15A</td>
</tr>
<tr>
<td>649J335-15A</td>
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<tr>
<td>658J357-17A</td>
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</tbody>
</table>
2016 Competition Parameters

- “True Scale Model” of an actual, rocket or.
- “Successful flight”
- Apogee between 2500 and 3500 ft
- Elec. deployment with motor deploy backup. **REQ’D**
- Downed rocket location aid.
- Accuracy of apogee from simulation vs. actual flight will determine flight winner.
The following slides show the rocket/missiles selected by each team for the scale model.
Carthage College

- Black Brant II
Marquette Rocket Design

Prahaar Rocket
- Length: 7.3 meters
- Diameter: 0.42 meters

Marquette Design
- Length: 53.75 inches
- Diameter: 3 inches
- Motor: Cesaroni 6341540-16A
Mercury Redstone

- First flight in 1960
- Last flight in 1961
- Manufactured by Chrysler
- 83.38 ft in length
- 78,000 lb thrust
- 66,000 lb in weight
- Used for sub-orbital launch for astronauts
- Used to propel the first American into space
Rocket Choice is the V2 Rocket

Our model so far

With a current Competition Motor choice of (38 mm) 6011350-16A
Badger Ballistics’ Rocket Choice: Aggregat-4/V2

- Length: 36.581”
- Diameter: 4.2”
- Motor: J357
The motor we selected is the J290. The scale for our rocket will be 1:3.42.
Black Brant II

Height: 8.45 m
Width (body): .44 m
Span Diameter: 2.1 m

Scale length: 126.75 cm
Scale Width (body): 6.6 cm
Scale Span Diameter: 31.5 cm

Planned motor: 5671125-10A
Orbital ATK Pegasus XL

Length: 40in
Diameter: 3in

Selected motor: CTI PRO38 I540-WT
ROCKETTES VOSTOK LAUNCH
VEHICLE 8K72K

Cesaroni J335

Manufacturer: Cesaroni Technology
Entered: May 12, 2008
Last Updated: Jun 26, 2014
Mfr. Designation: 6491335-15A
Common Name: J335
Motor Type: reload
Diameter: 38.0mm
Length: 36.7cm
Total Weight: 627g
Prop. Weight: 342g
Cert. Org.: Canadian Association of Rocketry
Cert. Designation: J335-15A
Cert. Date: Apr 7, 2008
Cert. End: Apr 30, 2013
Average Thrust: 335.5N
Warhawkateers Preliminary Design
Rocket: Black Brant II
Competition Flight

Flight

- **Successful flight requires:**
  - Launch
  - Stable, vertical ascent
  - Apogee between 2500 ft and 3500 ft
  - Electronically deployed recovery system must successfully deploy
  - Rocket must be recovered in flyable as-is condition
Competition Flight

Flight cont.

- Flight Scoring:
  - Successful flight
  - Max. Altitude
  - Flight score:

\[
\text{Flight Score} = 20 (\text{for successful flight}) \\
+ 80 \left( 1 - \frac{(\text{Actual Apogee} - \text{Predicted Apogee})}{\text{Predicted Apogee}} \right)
\]
5 Components of the Competition

- Design Report (written) (25%)
- Flight Readiness Presentation (oral) (15%)
- Flight (35%)
- Post Flight Performance Report (written) (15%)
- Education Outreach (Outreach Form) (10%)

Total 100%
Tools and Tips

- Links for forms and additional information at:
  - https://spacegrant.carthage.edu/students/tools-and-tips/
  - CRL Competition Calendar
  - W9 Tax Form (for award winning teams)
  - Media Release Form (Adults or Minors) for items to be posted on WSGC Website
  - What you Need to Know
  - Competition Handbook
  - Education Outreach Form
  - Expense Reimbursement Form
### Timetable

<table>
<thead>
<tr>
<th>Activity</th>
<th>Date</th>
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<tbody>
<tr>
<td>Kickoff Meeting <em>(In Person &amp; Online)</em></td>
<td>24-Oct-2015</td>
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<tr>
<td>Budget and Demo Flight Deadline</td>
<td>08-Jan-2016</td>
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<tr>
<td>Design Update Meeting <em>(Online)</em></td>
<td>14-Jan-2016</td>
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<tr>
<td>Interim Progress Report</td>
<td>18-Feb-2016</td>
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<tr>
<td>Q&amp;A Meeting <em>(Online)</em></td>
<td>25-Feb-2016</td>
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<tr>
<td>Design and Safety Review Meeting <em>(In Person, EAA, Oshkosh)</em></td>
<td>19-Mar-2016</td>
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<tr>
<td>Design Reports Due to WSGC</td>
<td>04-Apr-2016</td>
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<tr>
<td>Design Presentations <em>(In Person)</em></td>
<td>22-Apr-2016</td>
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<tr>
<td>Launch <em>(In Person)</em></td>
<td>23-Apr-2016</td>
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<tr>
<td>Post Flight Performance Report</td>
<td>09-May-2016</td>
</tr>
<tr>
<td>Final Reimbursement Request Deadline</td>
<td>01-Jun-2016</td>
</tr>
</tbody>
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*Dates are subject to change or may be rescheduled due to weather or other factors.*
- Brief report
- Include rocket/missile selected
  - Actual and scaled dimensions
- Photos of rocket components
- Approximate percentage of assembly completion

- Teams attendance REQUIRED
- EAA AirVenture Museum, Oshkosh
- Rocket in 90% assembled condition
  - Documentation showing true-size and scaled dimensions
  - Ready to describe deviations from actual rocket/missile
  - Shockcord should be installed, anchored to motor mount
  - Parachute not installed
  - Does not have to be painted
  - Selected paint scheme duplicating a historic image of the rocket/missile
Design Report

- Purpose: to communicate the engineering and design effort involved
- Research info about chosen rocket/missile
  - Purpose of the Rocket
  - Date of Use
  - Country of Origin
  - Actual size and weight
  - Any additional information specific to the Rocket
  - Image of the Rocket
Design Report cont.

- Adjustments from scale to achieve safe, stable flight, removable components
- Analysis of predicted performance
- SHOW the design and construction
  - (pictures, diagrams, etc.)
- 25 page MAX.
- Due in advance of presentation
Flight Readiness Presentation

- Purpose: to communicate the design and engineering effort involved
- Organization and presentation important
- VISUAL AIDS
- Rocket Appearance
- 10 minutes (7 for presentation, 3 for Q&A)
- Friday evening before launch
Post Flight Performance Report

Material that must be included, at a minimum:

- Cover Page
- Flight Performance Comparison Sheet
  - Table of performance characteristics
  - Plot: “Acceleration Performance Comparison of Predicted and Actual”
- Discussion of Results
  - Compare predicted and actual apogees, describe and defend possible reasons for differences
  - Compare predicted and actual accelerations, describe and defend possible reasons for differences
  - Discussion of how flight could have been improved
Education Outreach

- Purpose
  - Spread the word and share the excitement

- Example Possibilities
  - Meet with a K-12 class or student organization to explain how rockets work.
  - Make a presentation in the community or to a group on campus to describe the rocket competition and your team’s design.
  - Make a presentation to a group on campus describing opportunities at NASA or through the WSGC that are available to students before they graduate.
Flight Data Recorder

- **Featherweight Raven 3**
  - WSGC Flight Data Recorder (FDR) will be used to gather flight data ONLY
  - Teams must allow properly vented space for the FDR
  - FDR’s will be issued for use at the launch and retrieved from each team immediately following recovery

Image enlarged for clarity. Actual size only 1.80" x 0.8" x 0.55."
Motor Selection

- All Teams should have specified their motor by now
- If your team has not specified their motor you must email the WSGC with your selection ASAP
  - Identify your team
  - Identify your team’s school
  - Specify your rocket motor from the list of motors
  - Add any comments or questions about your motor selection
- Motor selection should be completed by 22-Jan-2016