MCHE 201: Introduction to Engineering Design
Spring 2019 – Mini-Project 2

Assigned:	Thursday, January 31st
Init. Report:	~~Friday, February 8th, 5pm~~ Sunday, February 10th, 5pm
Presentation:	Friday, February 22nd, 5pm
Final Report:	Friday, February 22nd, 5pm

Assignment: Develop and document a conceptual design to compete in the ARLISS competition. (This is a paper-only design.)

The design process will be reported through written reports and a video presentation, both of which should introduce the chosen design and support its choice using the design tools.

The submission will entail a first, initial submission, which we will review in meetings between each team and an instructor. Following that review, a final version of the report and a presentation will be submitted.

Initial Submission: The initial report should be submitted via email:

- to joshua.vaughan@louisiana.edu
- with subject line `TeamX-MCHE201-MP2-initial` where the `X` in `TeamX` is your team number, and
- all team members copied on the submission email.

The report should be attached to the email as a single pdf with file name `TeamX-MCHE201-MP2-initial.pdf` where the `X` in `TeamX` is your team number.

Final Submission: The final report and presentation should be submitted via email:

- to joshua.vaughan@louisiana.edu
- with subject line `TeamX-MCHE201-MP2` where the `X` in `TeamX` is your team number, and
- all team members copied on the submission email.

The email should include:

- a single pdf of the report with file name `TeamX-MCHE201-MP2.pdf` where the `X` in `TeamX` is your team number, and
- a link to your team's presentation on vimeo.

Note: Submissions with incorrect filenames or submitted as multiple images/pdfs will be rejected.

1 Assignment Details

1.1 ARLISS

ARLISS, A Rocket Launch for International Student Satellites, is an initiative to provide students with hands-on experience in the design, construction, and launch of space systems. The ARLISS contest is held annually on the Black Rock Playa (a dry lake bed) in Nevada in September. Members of the AERO-PAC rocket club provide rockets like that shown in Figure 1 to launch the student "satellites" to approximately 12,000 feet. ARLISS is an international event, where Japanese participants far outnumber American.

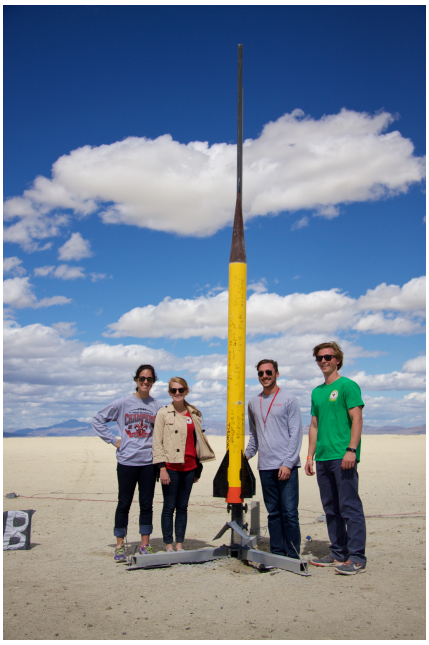

Fig 1: An AERO-PAC Rocket

There are two main classes of competition at ARLISS. CanSat-class devices must be the size and weight of a twelve-ounce beverage can. Open-class devices must fit inside a cylinder of approximately 146mm in diameter and 240mm in length and must have a mass less than 1050 grams. Within each class, there are a number of launch objectives that serve as the basis for competition. The most popular objective is the "Comeback" competition of each class, where the devices must autonomously navigate to a predetermined target location, simulating landing a spacecraft on other planets. In order to win the contest, the device must stop within 100 meters of the target and be closer than other competitors. Furthermore, the team must be able to prove that the device was under control and not just falling out of the sky. More details and links to more information can be found in the final page to this document.

1.2 Project Timeline and Deliverables

Each team will develop a design for an Open-Class ARLISS entry. This is a paper-only design project; no prototype will be built. Teams will report on their design and design process twice during this project. An initial report will submitted, then reviewed in a meeting with a course instructor. Following this meeting, each team should develop their final report report and presentation, incorporating the suggested revisions.

The timeline for the project is shown in Table 1.

Table 1: Mini-Project 2 Timeline

01/31/19	Team Assignment
02/08/19	Initial Report Due at 5pm
02/22/19	Final Design Presentation and Report Due at 5pm

1.3 Reporting

In both the initial and final reports, the ARLISS final design should be reported in no *more* than 4 pages of text, excluding the abstract and figures. The report needs to present the design, the design process, alternative concepts, and how the final design was chosen among the alternatives. Support for the choice of the final design should includes reporting on the House of Quality, the Specification Sheet, the Function Tree, at least two alternative designs, and a third-level concept evaluation matrix.

The final report must be submitted via email by 5pm on February 22. The file naming and email-subject-line specifications outlined on the first page of this document should be followed.

A suggested outline for the final report is attached to this document. You may also refer to Chapters 10–13 of the textbook and/or the **C.R.A.W.LAB** Style Guide, found at:

http://shared.crawlab.org/CRAWLAB_StyleGuide.pdf

Formatting requirements, a pre-submission checklist, and a report template, including a LaTeX source file, can also be found on the class website.

1.4 Report Review Meetings

Following submission of the initial report and prior to the submission of the final report, each team must meet with one of the course instructors to review the report, design tools, and ARLISS designs. This meeting must be attended by all team members. Failing to attend will result in a failing grade for this part of the assignment.

1.5 Final Presentations

Because of our large class size, you will create a video presentation and post it online. It must posted by 5pm on February 22. The presentation should cover the information contained in the final report and follow a similar outline. This presentation is limited to 5 minutes per team.

All presentations must adhere to the specifications for the video submission posted on the class website.

Suggested ARLISS Report Outline

Title Page

Abstract – Standalone summary of the report's contents, on a separate page

I. Introduction
- Introduce the problem and its challenges
- End with a "roadmap" sentence outlining what is in the remainder of the report

II. Final Design
- Present the functionality of the final design
- Start with a complete system discussion and work toward detail
- Use computer-generated sketches to support your description
- Label key parts in the sketches, matching labels to the text description
- Provide dimensions to give the scale of the structure and its key components

III. Problem Understanding
- Give concise presentation of the problem understanding process followed
- As support, include and discuss:
  - House of Quality
  - Specification List
  - Function Tree
- For all tools, identify the most important parts in relationship to *this* design project

IV. Concept Evaluation
- Present two alternative designs (So, the report should include three total designs.)
- Support the selection of your final design via Evaluation Matrices

V. Conclusions
- Summarize what was presented in the report
- *No* new information is presented here

VI. References (if needed)

Additional ARLISS Information

Location:	Black Rock Desert, NV
General Date:	Early-to-Mid September
Goal:	Autonomously navigate to a predetermined target after being launched to approximately 12,000ft.

Open Class Specifications:

- Must fit into a 146mm diameter, 240mm deep cylinder
- Must be less than 1050g
- Must not contain any potentially explosive components
- Must operate autonomously

In order to win the competition, a device must:

- Meet the specifications above
- Autonomously navigate to and stop within 100m of the a target location
- Provide proof that the device was under control

Links to Additional Information:

- ARLISS Homepage – http://www.arliss.org
- Full ARLISS rulebook – http://cl.ly/2O0i2x1l3s1y
- UL Lafayette Flickr Albums
  - 2014 – https://flic.kr/s/aHsk2LRZYC
  - 2015 – https://flic.kr/s/aHsk6Xt1hc
  - 2016 – https://flic.kr/s/aHskC3FrAj
  - 2017 – https://flic.kr/s/aHskQREGFS
  - 2018 – https://flic.kr/s/aHsmorEUtX
- UL Lafayette Vimeo Channel – http://vimeo.com/channels/ularliss
- A paper discussing the project – http://cl.ly/2T1u3p081G2p
- Current and Past Georgia Tech Teams
  - http://singhose.marc.gatech.edu/RescueBot/
  - http://singhose.marc.gatech.edu/cansat/
- Other Videos
  - http://youtu.be/zKTUsB7F0PY
  - http://youtu.be/AxJ9xw85ync
  - http://youtu.be/DT9EWJVINz4
  - http://youtu.be/0sqJvJoJUD0