

Annotated Bibliography

ENGR 3510 Project

February 12, 2020

The purpose of this project is to design a force transducer for our wind tunnel that is capable of measuring both lift and drag. Other features may be added as desired by the group.

You can add comments with

CB: Do this

. Make sure to put your initials. It will do weird things to the text; that's fine. Citations are made with [1] where Dolan2016 could be replaced with any citation key.

CB: An annotated bibliography is a list of references with descriptions summarizing their content and importance to the work at hand.

1. [2] This article studies the affects that vortexes cause on the lift and drag components of different types of wings. This article provides useful information as to what to expect within some force calculations as well as how to prepare the calculations in the first place. However, this document used some extremely technical language that was hard to follow. Furthermore, many of the discussed results and calculations are methods that are not familiar and therefore harder to follow.
2. [5] This article mostly explained a type of measuring system that helps measure different forces on an object within a wind tunnel. This is done through exploring the applications of said system as well as issues and fixes with the measurements of forces within a wind tunnel. This article provides some useful information into how the forces within a wind tunnel are measured with current devices and what purpose they are measured for. I found section 1 of the article to be most useful with my current knowledge as it was more of an summary versus an in-depth exploration. There was a decent amount of information that I did not understand, however. I did not understand the discussion on anisotropy within the article. It appeared in multiple sections, and I could not understand what it was or what its impact was. There were also some discussions of bridges and signals that I could not follow in relation to the gauges used in some of the systems.
3. [4] The author writes about the components of wind tunnels and their purpose in drag force measurements. The paper discusses different ways drag force is measured, such as floating-element on oil and load cell measuring. The different styles of drag force measuring can be useful to know from this paper. However, load cell measuring is a little tricky to understand and I have not yet grasped the concept.

4. [3] This article talks about the three main components of wind tunnel balances, External, internal, and Rotary. A useful part of this document is the it talks some about calibration in wind tunnels. There is one part about data gathering equipment in wind tunnels, it would be useful if these were expounded upon in detail.
5. [6] This reference explains how strain gages work. Since our solution will likely need a strain gage, we'll start here for looking at material.

References

- [1] Erin L Dolan. "Course-based Undergraduate Research Experiences: Current knowledge and future directions". In: *National Research Council Commissioned Paper* (2016), pp. 1–34. URL: http://sites.nationalacademies.org/cs/groups/dbasse/site/documents/webpage/dbasse{_}177288.pdf.
- [2] P. Gerontakos and T. Lee. "Lift-induced drag of a cambered wing for Re less than 1 million". In: *Experiments in Fluids* 42.3 (2007), pp. 363–369. ISSN: 07234864. DOI: 10.1007/s00348-006-0242-6.
- [3] Miguel A González et al. *Components of a Wind Tunnel Balance: Design and Calibration*. Tech. rep. URL: www.intechopen.com.
- [4] Li Nan. "The methods of drag force measurement in wind tunnels". In: January (2013).
- [5] V. Portman et al. "A 6-DOF isotropic measuring system for force and torque components of drag for use in wind tunnels : Innovative design". In: *International Journal of Mechanics and Materials in Design* 5.4 (2009), pp. 337–352. ISSN: 15691713. DOI: 10.1007/s10999-009-9106-6.
- [6] Earl J. Wilson. "Strain-Gage Instrumentation". In: 12.2 (1996), pp. 235–259. ISSN: 07490739. DOI: 10.1016/S0749-0739(17)30281-X.