COLLEGE OF ENGINEERING
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

**Research and Creative Experience for Undergraduates Program (RCEU)**
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# Investigation of the Onset of Cavitation in Additively Manufactured Venturis

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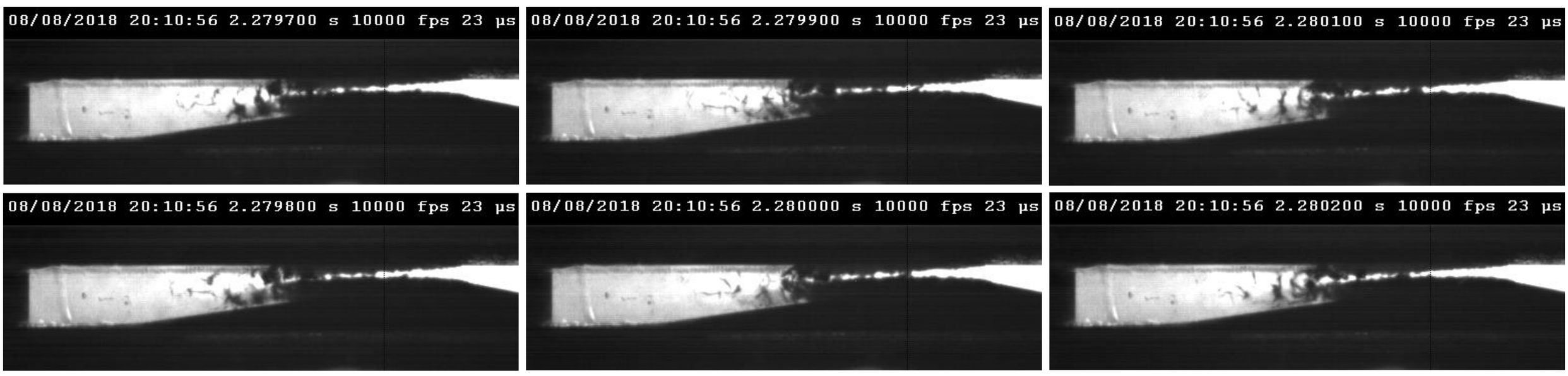
## Introduction

Additive manufacturing processes create parts with wavy and rough surfaces. The goal of this project was to design and construct a test apparatus for the purpose of examining the effect of these surface features on the cavitation process, with the intent of using high speed photography for preliminary analysis.

## Results

Initial runs of the system have been achieved and preliminary footage has been obtained. This footage, along with lessons learned from the construction of the current test apparatus, will be used to guide the design of future test apparatuses, which will have greater observational capabilities.




Images of cavitation occurring in the testing apparatus, taken using a Phantom v711 high-speed camera. Progresses top-to-bottom, left-to-right

## Conceptual Framework

Venturis are devices commonly used in the aerospace industry in a wide variety of applications. Cavitating venturis are useful for controlling pressure and mass flow in a system. When a relatively large amount of liquid is forced through a small throat area in such a device, the corresponding velocity increase causes the pressure in regions of the flow to drop below some critical pressure. In these regions, the liquid will undergo a phase change to vapor, forming cavitation bubbles.

## Impact

In the aerospace industry, fluid system components have traditionally been machined and smoothly finished. The properties of these parts are well-understood. Additive manufacturing has the potential to produce more complex internal geometries, expanding the scope of what is possible, but these components have higher surface roughness and waviness. This project will help characterize and study the effects of these surface features in high velocity fluid flows.

**Key References**

1. Barre, S., Rolland, J., Boitel, G., Goncalves, E., & Patella, R. F. (2009). Experiments and modeling of cavitating flows in venturi: Attached sheet cavitation. European Journal of Mechanics - B/Fluids, 28(3), 444-464. doi:10.1016/j.euromechflu.2008.09.001

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