

# 1 Project Overview

The Laboratory for Temporal Logic (LTL) in Aerospace at the University of Cincinnati is designing a new, free-and-open-source, easy-manufacture (i.e. 3-D printable with COTS components) Unmanned Aerial System (UAS). The UAS will be designed specifically to maximally support System Health Management (SHM) capabilities needed to safely create intelligent, autonomous UAS.

## 2 Initial Design Estimates

This section is a collaboration of tables and graphs which illustrate some initial 2-D flight characteristics for different airfoils. This information will be used in order to make a decision for which airfoil will be used on the 3-D printable UAS. This 3-D printable UAS will fly at relatively low Reynold's numbers. The analysis in this section is performed using the open-source software XFLR5. All airfoils have been analyzed for a range of Reynold's numbers, as well as a range of angle of attack. The Reynold's numbers for this analysis have been ranged from 2,000 to 333,000, based on the historical flight regime for typical small UASs. This gives a range of speeds from 15 m/s to 25 m/s. The angle of attack has been ranged from 0 degrees to 15 degrees which is a reasonable range of AOA for this flight regime and allows us to visualize the stall AOA for all Reynold's numbers.

### 2.1 SD7003

This airfoil is a commonly used glider airfoil. Max thickness location is further forward than typical glider airfoils.