Paper ID: 49277
oral
student

IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
Ignition - Primary Space Education (1)

Author: Ms. Madison Bowersox
University of Alabama in Huntsville, United States

Mr. Creighton McIntyre
University of Alabama in Huntsville, United States
Mr. Prathmesh Anantwar
UAHuntsville, United States
Mr. Kyle Clark
University of Alabama in Huntsville, United States
Mr. Abhee Singh
University of Alabama in Huntsville, United States
Ms. Ruth May
University of Alabama in Huntsville, United States
Dr. Christina Carmen
University of Alabama in Huntsville, United States

FROM CONCEPT TO REALITY: A UNIQUELY DESIGNED PROJECT BASED LEARNING WIND TUNNEL AND ITS IMPACT ON K-12 STUDENTS

Abstract

The purpose of the tabletop wind tunnel project for Kindergarten through 12th grade (K-12) Science, Technology, Engineering and Mathematics (STEM) Education was to design, model, analyze, and build a tabletop wind tunnel for the University of Alabama in Huntsville (UAH) American Society of Mechanical Engineers (ASME) student section. The wind tunnel will be used for STEM outreach purposes by both the UAH ASME section and the North Alabama Section of ASME (NAS ASME). The tabletop wind tunnel was designed and built by senior Mechanical and Aerospace Engineering (MAE) undergraduate students as part of UAH MAE Product Realization Capstone Design Class (CDC). The UAH student design team utilized Commercial-Off-The-Shelf (COTS) parts, components, and materials available anywhere in the world so that other universities may replicate additional wind tunnels. The wind tunnel is durable, reliable, and easily transportable while also demonstrating and measuring lift with a variable angle of attack for lightweight test articles, with a minimum velocity of 20 miles per hour (MPH). After diligent analysis and testing, the design team determined that the most effective design incorporates a square cross-section throughout the test section, a pull-through airflow system, and a sliding stinger in order to enable a tactile procedure for measurement of lift. Since 2013, five tabletop wind tunnels have been designed and built by UAH Product Realization CDC students and delivered to north Alabama schools. Additionally, primary, secondary, and post-secondary education students in South Africa have been impacted, via the Cape Peninsula University of Technology (CPUT) and UAH partnership known as the ALLiance for International Excellence among the future Space workforce (ALLIES). The latest effort includes a new ALLIES partnership with two universities in Costa Rica - the Universidad Autonoma de Centro America (UACA) and Universidad Latina de Costa Rica (ULCR). The wind tunnel is designed to be easily replicable such that international educational entities can build additional units for STEM educational outreach efforts. The present paper will detail the methodologies and research required for the design and production of the easily replicable wind tunnel, as well as the educational impact on the UAH engineering design team and K-12 students exposed to the wind tunnel.