$3.6 MILLION
NASA Funding at Vanderbilt in FY 2021

NASA project will develop and test safety management for ‘air taxis’

Vanderbilt engineers are part of a NASA-funded, multi-institution effort to develop safety systems for a mode of transportation that doesn’t exist yet—small, commercial, autonomous planes that move people by air between locations in large, crowded cities. Autonomous, or self-piloted, airplanes must communicate with each other. They must respond to hazards, from weather and equipment malfunction to “uncooperative” other aircraft, to prevent collisions and crashes. And all this must unfold in real time, in defined corridors separate from existing air traffic routes but without continuous air control support on the ground. To that end, the $2.5 million, three-year project will develop and test the foundations of safety management for advanced urban air mobility. It is hoped these eVTOLs, or electric vertical takeoff and landing aircraft, will reduce fossil fuel consumption and traffic congestion.

Vanderbilt rocketeers place second in NASA launch competition

Vanderbilt University Aerospace Design Laboratory’s rocket placed second in the 2021 NASA Student Launch Competition. The Vanderbilt team also won NASA’s Educational Engagement Award for their innovative virtual rocketry workshops for middle and high school students. The team has had unprecedented success with seven national championships in the last nine years: 2013, 2014, 2015, 2016, 2018, 2019 and 2020.

This year, NASA challenged teams to design a lander that could right itself when deployed from the rocket on descent from apogee at an altitude between 500 and 1,000 feet. Vanderbilt’s Mantis lander, when readied for rocket flight, was a whopping 14 pounds with sophisticated leveling and locomotive capabilities and the ability to withstand a hard landing. In addition to containing a system to upright itself, NASA required the landers to level to within 5 degrees of vertical and then take a 360-degree panoramic image of the location and transmit the image back to the team. Teams were not required to travel to Huntsville, Alabama, to complete the project and compete. Instead, they were permitted to complete their competition launch at a National Association of Rocketry or Tripoli Rocket Association-sanctioned launch in their respective local areas. The team was also able to do a live demonstration of the Mantis lander during U.S. Space Force General Jay Raymond’s visit to Vanderbilt this past summer.

The NASA student launch competition is a NASA-conducted and aerospace industry-evaluated engineering design challenge built around a NASA mission. It is an intense eight-month contest involving payload and rocket designs, project reports, design reviews, outreach activities, and website design, followed by a grand finale launch each April. The Marshall Space Flight Center Office of STEM Engagement manages the student launch to stimulate innovation and advance NASA’s mission through collaboration with educational institutions.
Digital Sky Survey maps the entire sky, providing new data to Vanderbilt astronomers

The fifth generation of the Sloan Digital Sky Survey is collecting data about the universe for Vanderbilt University astronomers and other project members to use to explore the formation of distant galaxies and supermassive black holes, and to map the Milky Way. The SDSS-V will make full use of existing satellites, including NASA’s Transiting Exoplanet Survey Satellite mission, to lead to new discoveries. The discovery of a newly formed exoplanet by astronomers aided by Vanderbilt research in June 2020 boosted the potential for a joint effort with SDSS data. SDSS-V will magnify the exoplanet discoveries from TESS. The combination of SDSS-V and TESS data will enable researchers to confidently identify the most promising planets whose atmospheres the team will study for habitability with the upcoming Twinkle mission. SDSS-V will continue to transform astronomy by building on a 20-year legacy of pathbreaking science, shedding light on the most fundamental questions about the origins and nature of the universe. It demonstrates all the hallmark characteristics that have made SDSS-V so successful in the past: open sharing of data, inclusion of diverse scientists, and collaboration across numerous institutions.

Tennessee Space Grant Consortium

Vanderbilt is the lead institution for the Tennessee Space Grant Consortium, a NASA educational program which is composed of affiliate institutions from around the state. Each state, as well as Washington, D.C., and Puerto Rico, has a Space Grant Consortium as part of the NASA National Space Grant and Fellowship Program. The goal of the Space Grant Consortia is to inspire students from K-12 through the graduate level to become excited about and pursue further education and careers in NASA-related fields and the greater STEM arena. The TSGC provides scholarships and fellowships to undergraduate and graduate students at participating institutions, sponsors undergraduate competition teams, promotes research and teacher training, conducts outreach activities throughout the state, and supports Tennessee student participation in NASA summer programs. During FY 2020, and despite the impact of COVID-19, TSGC directly funded 56 university students throughout Tennessee, including eight at Vanderbilt. Many other students participated in TSGC’s various programs and gained valuable hands-on experiences.

Using satellite imagery to examine underwater volcanoes

Vanderbilt Earth scientists from the College of Arts and Science received funding from NASA to use satellite imagery to examine underwater volcanic eruptions’ ripple effect on the planet’s atmospheric processes. With more than 80 percent of volcanic eruptions occurring in the oceans, they are disproportionately understudied despite their significant impact on the environment. During an eruption, plumes of ash and toxic sulfur dioxide can spew into the sky. Afterward, rafts of pumice—floating volcanic rock—can drift over the water’s surface, disturbing the atmosphere and affecting marine life. Underwater, molten lava can heat nutrient-rich water from the seafloor, allowing it to rise toward the surface. With the information retrieved using NASA’s Moderate Resolution Imaging Spectroradiometer and Visible Infrared Imaging Radiometer Suite instruments, and assessment of submarine eruption frequency and style, the team will be able to develop conclusions from the impact of underwater volcanoes on cloud formation and radiative effects.

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