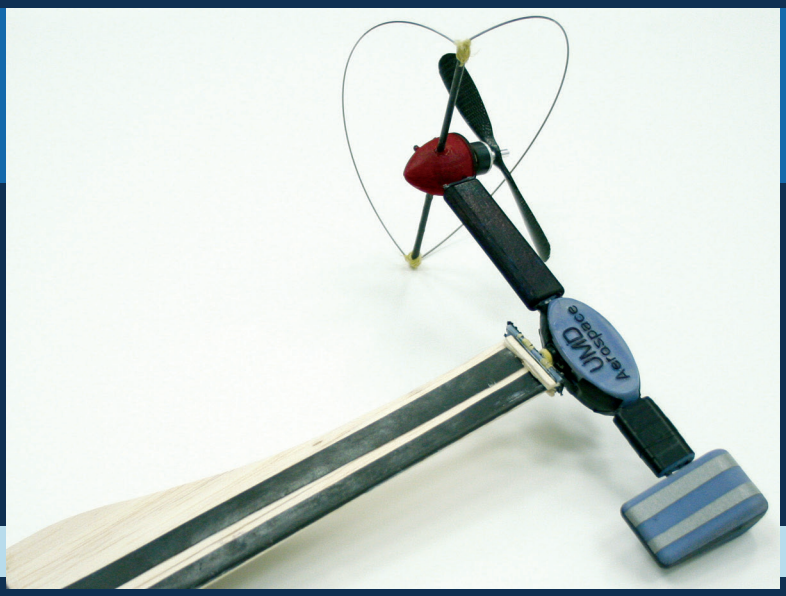
TOP FLIGHT



University of Maryland Enhances Research Validity with Objet 3D Printer

"Objet 3D printing technology has substantially improved our research and testing capabilities, enabling us to achieve new discoveries and recruit the best and brightest emerging engineers."
— Prof. Darryll Pines,
University of Maryland

The University of Maryland has improved aerospace research by using 3D printing to compress the prototype development cycle.

For over 50 years, the Department of Aerospace Engineering at the University of Maryland A. James Clark School of Engineering has achieved breakthroughs in understanding flight, exploring space and designing aerospace components, vehicles and systems. The school's research laboratories focus on areas such as advanced propulsion, composites and hypersonics. Among its distinguished alumni are aviation pioneer Glenn L. Martin and former U.S. National Aeronautics and Space Administration (NASA) head Michael D. Griffin.

The department has received funding from the U.S. Army for a wide range of projects including the analysis of alternate modes of flight for potential military applications. As part of their research in this area, faculty and Ph.D students frequently subject numerous identical prototypes to the same experiment over and over to ensure testing validity. This requires engineers to create multiple, often tiny, test objects with 100 percent identical characteristics.

At a Glance

Challenges
- University of Maryland researchers sought to reduce errors, increase productivity and improve the validity of research findings

Solution
- Objet Eden350V 3D Printer

Results
- Significantly reduced errors and costs
- Increased validity of results
- Sped up the testing process by one year

Objet Eden350V selected as the best solution due to high resolution, accuracy and durability of models

For years the department sought a better way to produce large volumes of highly accurate prototypes. Recently, under the direction of Professor Darryll Pines, former department chair and now dean of the Clark School, several 3D printing technologies were explored to improve the testing process. "Objet was selected based on its exceptional resolution, accuracy, printing detail and durability," said Pines, who oversaw the department's acquisition of the Objet Eden350V™ 3D Printer.

The Objet Eden 3D Printer had an immediate impact on productivity. "Our 3D printer reduces the prototype development cycle by a full year and yields a cost savings of approximately $80,000 per year," said Evan R. Ulrich, graduate research assistant candidate in the department. "It eliminates the need to pay for prototype material such as aluminum and plastics that outside vendors marked up by nearly 1000%. Most importantly, our Objet 3D Printer enhances the validity of our research findings by ensuring that test objects are always 100% identical."

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According to Ulrich, all aspects of the testing apparatus are now constructed with the Objet 3D Printer. “There’s no waiting on other people, as we can produce our models inhouse much faster than before,” he said. “This machine has fundamentally improved our overall process, revolutionizing our research capabilities.”

Pioneering the next generation of aerospace breakthroughs

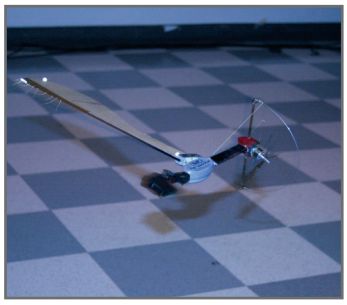
One application was in the study of how insects avoid obstacles during flight. The department employed the Objet Eden 3D Printer in the design and manufacture of a structure used on board small helicopters to test for close obstacle avoidance. “The Objet Eden system reduced by months the time required to complete this research,” Ulrich said.

Ulrich uses the Objet 3D Printer to study flight patterns of winged plant seeds falling from trees for potential applications in unmanned aerial vehicles (UAVs). “UAVs are often limited by the power required to simultaneously maintain flight and operate onboard electronics,” Ulrich said. The flight mode exhibited by winged seeds requires little to no power. Using the Objet Eden 3D Printer he was able to cost effectively test numerous design iterations leading to the invention of the smallest controllable robotic samara to date. A samara is a controllable monocopter that can autorotate like a maple seed and fly like a helicopter.

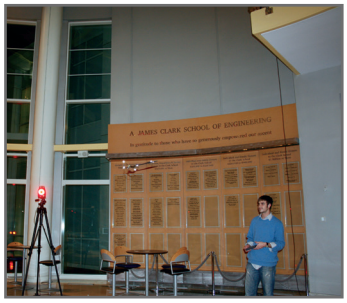
In addition, Ulrich and fellow students used the Objet Eden 3D Printer to create a model for the annual Cessna/Raytheon Missile Systems Student Design/Build/Fly competition. Run by the American Institute for Aeronautics and Astronautics, the contest challenges students to design, fabricate and fly an unmanned, electric-powered, radio-controlled aircraft. The students’ model had a four-foot wingspan and was built to close tolerances for accurate wind tunnel testing. The Maryland team finished very high in the competition and the companies that supplied the wind tunnels were so impressed that they researched the potential of Objet 3D Printers for their own testing processes, according to Ulrich.

“Objet 3D Printers can help engineers and those who train them to better execute technical research studies,” said Pines. “It represents the future of aerospace studies and will surely help our best minds achieve the next generation of scientific breakthroughs.”

Department of Aerospace Engineering requires large numbers of prototypes.



The Objet Eden350V was selected based on its exceptional resolution and accuracy.



The 3D Printer reduced the prototype development cycle by a year.

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