



VANILLA AIRCRAFT

Vanilla Aircraft's non-stop, unrefueled 56-hour test flight on November 30, 2016 was submitted for a world duration record for combustion-powered unmanned aerial vehicles in the 50-500 kilogram subclass

NASA is at the forefront of exploring distant locations from outer space to remote territories on Earth. It takes ingenuity and innovative technology to reach these locations and send back information so we can learn about them. In an effort to improve our understanding of the Arctic and Antarctica, NASA sought a unique aircraft solution. This aircraft needed to fly a long distance without refueling to some of the coldest locations on the planet.

PROJECT

Long endurance aircraft designed to operate in very cold conditions

MISSION DIRECTORATE

Science

PHASE III SUCCESS

A DOD contract worth over \$1 million to build an aircraft to improve ground communications in remote areas

SNAPSHOT

Vanilla Aircraft designed a record-breaking aircraft that can travel far distances to collect data in very cold climates by innovating existing technologies through a joint effort funded by NASA and DOD

VANILLA AIRCRAFT

2822 Mary Street
Falls Church, VA
www.vanillaaircraft.com

Vanilla Aircraft, a company in Falls Church, Virginia that specializes in long endurance unmanned aircraft systems (UAS), designed just the solution for NASA as part of the Small Business Innovation Research (SBIR) program. The aircraft, referred to as the VA001 UAS, can cover thousands of square miles of treacherous terrain in a single flight and withstand bone chilling temperatures dropping below -40°F on one tank of fuel. The UAS is designed to carry instruments that can gather critical information on a continuous basis for research missions including cryospheric studies which explores locations on Earth where water is frozen into ice or snow.

This economical aircraft also helps save money. The Vanilla Aircraft UAS can complete longer missions than the typical UAS so fewer are needed. Fewer aircraft missions translates into reduced maintenance costs and crew support. One may think that a longer mission would require more fuel, but that's not the case with this UAS. This ultra-efficient aircraft consumes an unusually small amount of fuel per hour compared to most other aircraft, manned or unmanned.

"We focused on making an affordable UAS that was scalable to large operations, and pushed the performance boundaries by innovating around existing standard technologies. By leveraging our experience in long range aerodynamics, we used proven aircraft design techniques to accommodate commercially available diesel engines which had not been done before," according to Neil Boertlein, VA001 Chief Engineer.

The Vanilla Aircraft flight crew and New Mexico State University UAS test site crew with the VA001 aircraft after a world record duration flight



Vanilla Aircraft found a way to incorporate an engine in their UAS that runs on jet grade fuel – referred to as JP8 – which is typically used by the US military to power Humvees and jet fighters. This type of fuel, which contains corrosion inhibitors and anti-icing additives, is crucial for conducting research in the Arctic or Antarctica. This was an important part of the aircraft design in order to travel in the toughest and coldest conditions.

The initial NASA SBIR funding to develop the Vanilla Aircraft UAS evolved into a partnership with U.S. Department of Defense (DOD) which was interested in using the aircraft for multiple mission scenarios. Once the craft design was finalized and built through NASA's SBIR program, Vanilla Aircraft received a DOD contract worth over \$1 million to build a second prototype UAS and conduct test flights. These funds came from the Naval Air System Command and the Defense Advanced Research Projects Agency, a DOD agency responsible for the development of emerging technologies for use by the military.

According to NASA Research Engineer Geoff Bland, "This is a very good example of how agencies can fund the same technology together to help achieve different goals."

A non-stop, unrefueled 56-hour test flight on November 30, 2016 not only proved Vanilla Aircraft could meet both NASA and DOD's needs, it also qualified for a world duration record for combustion-powered unmanned

aerial vehicles in the 50-500 kilogram subclass. In fact, the aircraft landed with fuel on board for an additional 90 hours of flight.

The VA001 UAS carried 20 pounds of actual and simulated payload, flying at 6,500 to 7,500 feet above mean sea level on the test flight. This payload included a Naval Air Systems Command-provided radio relay which operated continuously throughout the flight to demonstrate communications functionality, and a NASA-provided multispectral imaging system to demonstrate remote sensing.

Vanilla Aircraft is working with manufacturers to build airframes based on the design developed under SBIR and plans to make these products available for commercial use next year.

"The SBIR seed funding was critical in enabling us to push the envelope of UAS performance," according to Jeremy Novara, Chief Operating Officer. "NASA is playing a critical role in using UASs to conduct important research to better understand our world and we are thrilled that our UAS can help in this effort."



Timelapse photo of flight path taken during Vanilla Aircraft's record flight

"NASA SBIR seed funding was critical in enabling us to push the envelope of UAS performance."

VANILLA AIRCRAFT
CHIEF OPERATING OFFICER
JEREMY NOVARA