NASA successfully tests shape-changing wing for next generation aviation

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NASA successfully completed flight tests of a morphing wing technology. Flap angles were adjusted from -2 degrees up to 30 degrees during the six months of testing. Credit: NASA

NASA researchers, working in concert with the Air Force Research Laboratory (AFRL) and FlexSys Inc., of Ann Arbor, Michigan, successfully completed initial flight tests of a new morphing wing technology that has the potential to save millions of dollars annually in fuel costs, reduce airframe weight and decrease aircraft noise during takeoffs and landings.

The test team at NASA's Armstrong Flight Research Center in Edwards, California, flew 22 research flights during the past six months with experimental Adaptive Compliant Trailing Edge (ACTE) flight control surfaces that offer significant improvements over conventional flaps used on existing aircraft.

"Armstrong's work with ACTE is a great example of how NASA works with our government and industry partners to develop innovative technologies that make big leaps in efficiency and environmental performance," said Jaiwon Shin, associate administrator for NASA's Aeronautics Research Mission Directorate at the agency's headquarters in Washington. "This is consistent with the agency's goal to support the nation's leadership in the aviation sector."

AFRL began work with FlexSys in 1998 through the Small Business Innovative Research (SIBR) program. AFRL and FlexSys developed and wind tunnel tested several wing leading and trailing edge designs for various aircraft configurations through 2006. In 2009, AFRL and NASA's Environmentally Responsible Aviation (ERA) project agreed to equip a Gulfstream III jet with ACTE flaps designed and built by FlexSys, incorporating its proprietary technology.

ACTE technology, which can be retrofitted to existing airplane wings or integrated into entirely new airframes, enables engineers to reduce wing structural weight and to aerodynamically tailor the wings to promote improved fuel economy and more efficient operations while also

reducing environmental and noise impacts.

"The completion of this flight test campaign at Armstrong is a big step for NASA's Environmentally Responsible Aviation Project," said ERA project manager Fay Collier. "This is the first of eight large-scale integrated technology demonstrations ERA is finishing up this year that are designed to reduce the impact of aviation on the environment."

Flight testing was key to proving the concept's airworthiness. The test aircraft was flown with its experimental control surfaces at flap angles ranging from -2 degrees up to 30 degrees. Although the flexible ACTE flaps were designed to morph throughout the entire range of motion, each test was conducted at a single fixed setting in order to collect incremental data with a minimum of risk.

"We are thrilled to have accomplished all of our flight test goals without encountering any significant technical issues," said AFRL Program Manager Pete Flick, from Wright-Patterson Air Force Base in Ohio. "These flights cap 17 years of technology maturation, beginning with AFRL's initial Phase 1 SBIR contract with FlexSys, and the technology now is ready to dramatically improve aircraft efficiency for the Air Force and the commercial aviation industry."

All the primary and secondary objectives for the test were successfully completed on schedule and within budget. The results of these flight tests will be included in design trade studies performed at NASA's Langley Research Center in Hampton, Virginia, for designing future large transport aircraft.

More information: For more information on NASA's research in next generation aircraft, visit: www.nasa.gov/subject/7565/future-aircraft/

Provided by NASA

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