NASA Dryden Flight Research Center

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UAS Related Activities at NASA's Dryden Flight Research Center

By the time this article is published NASA's Dryden Flight Research Center should have completed its refurbishment and initial flights of one the pre-production Global Hawk aircraft it received from the U.S. Air Force. NASA Dryden has an agreement with the Global Hawk's manufacturer, Northrop Grumman, to partner in the refurbishment and flight operations of the vehicles.

The National Oceanic and Atmospheric Administration (NOAA) has also partnered on the project and is assisting NASA with project management and pilot responsibilities for the aircraft. NASA and NOAA will be using the Global Hawks to conduct earth science research. The earth science community is increasing utilizing UAS of all sizes and capabilities to collect important data on a variety of issues including important global climate change issues. To pursue the data collection needs of the science community there is a growing demand for international collaboration with respect to operating UAS in global airspace. For example one proposed mission for the Global Hawks is a polar ice monitoring mission. Such a mission would involve operating in several countries' airspace.

The need to coordinate UAS airspace access requirements is vital. International forums such as those offered by UVS International are essential in fostering the necessary coordination and communication to gain the necessary access.

Operations of NASA's Ikhana aircraft continued this past year. The Ikhana is a modified Predator B UAS. One particular interesting experiment was the fiber optic wing shape sensor evaluation. In this experiment the Ikhana was fitted with six hair-like fibers located on the top surface of its wings to provide more than 2,000 strain measurements in real time. With a combined weight of less than two pounds, the fibers are so small that they have no significant effects on aerodynamics. To validate the new sensors' accuracy, the research team is comparing results obtained with the fiber optic wing shape sensors against those of 16 traditional strain gauges co-located on the wing alongside the new sensors. The Fiber Optic Wing Shape Sensor system measures and displays the shape of the aircraft's wings in flight. The system also has potential for improving aircraft safety when the technology is used to monitor the aircraft structure. Fiber optic-based sensing technology could aid development of active control of an aircraft's wing shape. Controlling a wing's shape in flight would allow it to take advantage of aerodynamics and improve overall aircraft efficiency. It could also be critically important in providing data for controlling large flexible wings like those typically used on high altitude long endurance UAS.

A UAS dedicated to research at NASA Dryden is the X-48B blended wing body research aircraft. Flight tests with the 500-pound, remotely piloted test vehicle are now in a block 4 phase involving parameter identification and maneuvers to research the limits of the engine in stall situations. X-48B flight-testing is taking place at Dryden with center staff providing critical support to a Boeing-led project team that also includes the U.S. Air Force Research Laboratory in Dayton, Ohio, and Cranfield Aerospace Ltd., of Bedford, England. The aircraft has performed well and flight data has been consistent with wind-tunnel data attained with the first of the two blended wing body research vehicles.

NASA's participation in the blended wing body research effort is focused on fundamental, advanced flight dynamics and structural design concepts within the Subsonic Fixed Wing project, part of the Fundamental Aeronautics program managed through NASA's Aeronautics Research Mission Directorate. Potential benefits of the aircraft include increased volume for carrying capacity, efficient aerodynamics for reduced fuel burn and possibly significant reductions in noise due to propulsion integration options.

NASA Dryden continues to support the UAS industry by facilitating access to three specially designated test areas on Edwards Air Force Base for the development of small UAS. Since current regulation in the United States precludes developmental flights of UAS without an experimental certificate from the FAA this option is seen as both convenient and cost effective to many developing smaller UAS.

Interest and awareness continues to grow about UAS in the community responsible for designing the next generation air transportation system in the United States. Known as NextGen and led by the Joint Planning and Development Office (JPDO) this organization will be developing an operational concept for UAS operating in the United States. The JPDO is harmonizing its efforts with the Single European Sky Air Traffic Management Research (SESAR) program and will certainly extend that cooperation with respect to integrating UAS into the future air transportation concepts. Here again is another example where forums like those provided by UVS International play an important role in creating global harmonization and understanding that will aid such cooperative efforts.