NASA Dryden Flight Research Center

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This past year was a busy one at NASA for unmanned aircraft system (UAS) activities, especially at the Dryden Flight Research Center. NASA's version of the General Atomics Predator-B, the Ikhana, conducted its first missions for NASA, during the final days of 2007 the US Air Force officially transferred two pre-production Global Hawk aircraft to NASA Dryden, and three small UAS test areas were officially designated within the restricted airspace of Edwards Air Force Base for use by both government and industry. In addition, a new research program began flight testing a futuristic Blended Wing Body aircraft as a UAS.

The highlight of the year at Dryden from a UAS point of view was the very successful series of flights the Ikhana conducted in partnership with NASA Ames, the US Forest Service, the National Interagency Fire Center, and the National Oceanic and Atmospheric Administration (NOAA). Thanks to the support and cooperation of the FAA, a broad Certificate of Authorization was issued that allowed the Ikhana to operate at 7 kilometers over a nearly 1.1 million square kilometer area. The project team filed point to point flight plans with loiter delays at each wildfire for imaging using an advanced infrared sensor. The flexibility provided by this approach allowed the missions to be exceptionally successful; Ikhana logged 88 hours on 8 flights, imaging 62 fires over 8 western states. Imagery was transmitted through the aircraft satellite communication system to on-scene fire incident commanders.

In addition to the mission described above the Ikhana is preparing to conduct a research experiment for NASA aeronautics to make precise measurements of its wing shape in flight using an advanced fiber-optic sensor system. Those missions should be complete by the time this article is published. In addition, development is underway of a capability that will allow research flight control laws or navigation algorithms (to support collision avoidance work) to be flown without compromising the integrity of the baseline flight control system. By not modifying the baseline flight control system, significant time and money can be saved. Additional work is anticipated from a variety of organizations for sensor development, science missions, and other UAS related work.

The arrival of two pre-production Global Hawk airframes to support NASA science missions as well as other customers has created a great deal of activity. A partnership with Northrop Grumman, the manufacturer of the Global Hawks, has been established to assist in creating an operational capability. The first flight of NASA's Global Hawk is expected by the end of the calendar year. The first science mission is scheduled for the spring of 2009.

Boeing Phantom Works' subscale Blended Wing Body technology demonstration aircraft began flight testing in the summer of 2007. The UAS, designated the X-48B by the Air Force, is designed to mimic the aerodynamic characteristics of a full-scale large cargo transport aircraft with the same blended wing body shape.

In cooperation with the U. S. Air Force at Edwards Air Force Base, NASA has created 3 separate test areas specifically for small UAS (SUAS) that can be used by government, industry, and the international community for developmental testing, acceptance testing, or capability demonstration for potential customers. The test areas were established in response to the need of the industry to legally conduct flight research and development activities while the Federal Aviation Administration (FAA) develops policy and regulation to allow such activities to occur in civil airspace, and to respond to the increasing use by NASA and the Department of Defense of small UAS to conduct basic aeronautics research.

Located approximately 700 m above sea level in the Mojave Desert, the test range at Edwards provides many opportunities for UAS testing of all types. The dry lakebeds, clear skies, and low humidity provide ideal test conditions. Two test areas are approximately 1.85 km^2 with altitude ceilings of 150 and 900 m above ground level respectively. The third test area is approximately 19 km^2 with a ceiling of approximately 2.4 km above ground level. If necessary, area boundaries and ceilings can be increased with proper coordination and review. Several companies took advantage of this airspace in 2007 and their utilization is expected to continue through 2008 when they will be joined by several university and government organizations.

NASA's Dryden Flight Research Center is not the only NASA Center involved in UAS. Both NASA Ames Research Center and Langley Research Center have developed SUAS to satisfy a variety of testing needs. In addition NASA's Wallops Flight Research Facility has used SUAS in support of NASA science missions.

Interest in UAS continued to grow throughout the community beyond NASA as evidenced by the Dept. of Defense organizing a senior group within the Office of Secretary of Defense to provide broad policy guidance to the already established UAS Airspace Integration Joint Integrated Product Team. In addition the scientific community united with the encouragement of the NOAA to represent the broad science interest in UAS. NOAA has also placed a liaison officer at NASA Dryden to assist NOAA in building a UAS capability. Both the FAA and RTCA Special Committee 203 continued to make significant progress on regulation and policy issues, all of which will benefit the UAS community.

At the agency level, it is likely that NASA will begin to play a more visible role in UAS activities of all types, especially those related to the development of the Next Generation Air Transportation System in the United States. NASA Dryden is at the forefront of this activity and continues to try to aid the international UAS community by applying its skills to acquire the data needed by the regulatory agencies to make informed decisions, supporting operations to further mature UAS capabilities, and provide a location where research and development can occur to sufficiently advance the state of the art of UAS so that someday soon UAS may be full participants in civil airspace operations around the globe. Only by working cooperatively across organizations and geographic boundaries can the challenges of UAS civil operations be effectively solved.