NASA Global Hawk pilots face challenges flying hurricane missions

August 9 2012, By Beth Hagenauer

NASA's Global Hawk crew prepare for a flight. Mission manager Matt Graham (left) and pilots Tom Miller (center) and Phil Hall of NOAA monitor the aircraft prior to take off. Image: NASA / Tony Landis

NASA's Hurricane and Severe Storm Sentinel, or HS3, mission will be a complex one for the pilots flying NASA's Global Hawk aircraft from the ground. The mission, set to begin this month, will be the first

deployment for the unmanned aircraft away from their regular base of operations at the Dryden Flight Research Center on Edwards Air Force Base, Calif. In addition the pilots will be operating the aircraft from two locations on opposite coasts.

After the upload of specialized science equipment is complete, the two Global Hawks will fly from one coast of the United States to another over sparsely populated areas and open water to reach NASA's Wallops Flight Facility in Virginia.

NASA Wallops was selected as a deployment site because the area of scientific interest is the Atlantic Ocean, especially the eastern Atlantic where hurricanes begin to form. Flights from the U.S. East Coast take less transit time to the target than those from NASA Dryden and allow the aircraft to travel further out over the Atlantic and collect data for a longer period of time.

Waiting at Wallops will be a mobile ground control center, mobile payload operations center and Ku-band satellite dish – all necessary for operation of the high-altitude and long-endurance aircraft. Scientists, maintenance personnel and three pilots will support flights from Wallops.

NASA's Global Hawk Mobile Operations Facility is a portable ground control station that can be transported anywhere for remote operations. The facility will be moved to NASA's Wallops Flight Facility in Virginia for the Hurricane and Severe Storm Sentinel mission. Image: NASA / Tony Landis

During take off and landing of the Global Hawk, the aircraft must be in line-of-sight communications with the pilot. The pilots deployed to Wallops will manage this activity from the Global Hawk Mobile Operations Facility, handing off operation of the aircraft to Dryden after reaching an altitude of approximately 30,000 feet.

Additional pilots sitting in Dryden's Global Hawk Operations Center will receive the verbal hand-off via telephone, cross check data links with pilots at Wallops, and assume responsibility for the aircraft's operation

until the mission is completed when the landing operation transfers back to Wallops. This close coordination alleviates the necessity to deploy a larger number of pilots.

When an unmanned aircraft is in the air, the ground-based pilots maintain continual contact with Federal Aviation Administration air traffic control specialists.

The interesting scenario for HS3 is that the pilots are in California's Mojave Desert, talking with East Coast controllers through a radio located on the aircraft. When flying in oceanic airspace, pilots talk with international controllers over telephone. This communication is vital as air traffic controllers provide the altitude and number of other aircraft sharing the same area of the U.S.'s National Airspace System and international air space as the NASA aircraft. When the Global Hawk reaches an altitude of between 60,000 and 65,000 feet, there are few aircraft competing for space.

Although the flight path of the Global Hawk is pre-programmed into the aircraft's flight control computers prior to a mission, pilots are able to override the flight plan to accommodate the scientists' requests. The scientists will observe flights from the mobile payload operations facility at Wallops where information will stream onto computer monitors from their instruments. The payload manager at Wallops will send the scientists' request for change in altitude or course to Dryden's mission director in the control room with the pilots at Dryden. The pilots operating the Global Hawk change the flight path by entering a new heading, airspeed or altitude on the primary flight display.

All Global Hawk pilots are rated to fly manned aircraft. The pilots commented that it is possible to become so engaged during a Global Hawk flight that it seems like a flying a manned aircraft. They add that much of the sensory information available to pilots of manned aircraft is

missing for the unmanned aircraft pilots. It is not possible to smell the fuel, see the weather and terrain, hear the engine starting, or feel the movement from a ground control center. An unmanned aircraft pilot is dependent upon computers and their displays for updates on the health of the vehicle.

The Global Hawk pilots will have to deal with turbulence in the hurricane flights. Fortunately, the cruise altitude is above most of the unstable air associated with that weather phenomenon. In addition, an instrument measuring turbulence was adapted and will be installed with the science payload.

Global Hawk pilots will be well-prepared for the Hurricane and Severe Storm Sentinel mission. They spend hours planning missions, flying a simulator and have a support team in the "cockpit" consisting of a co-pilot, mission director and control room operator. Many are seasoned from flying this type aircraft for the military. Although their tools are a mouse, keyboard and computer displays, the NASA Global Hawk pilots find their work challenging and are proud of the job they do to support the U.S. science community.

Provided by NASA