NOAA UAS Working Group
Marine debris surveys, Northwestern Hawaiian Islands

Description of Communications
(Revised 8/2/2007)

The following three communication links are part of the UAS:

1) Direct operator control of the aircraft is accomplished via a command link that is established using a FHSS (Frequency Hopping Spread Spectrum) transmitter operating in the 2.4GHz range. Visual line-of-sight between the operator and aircraft is necessary for the operator to maintain effective control over the aircraft. If necessary, the command link hardware can be reconfigured to utilize the VHF frequencies of 50MHz or 72MHz.

2) Flight data is continually transmitted from the aircraft to the base station via a FHSS MaxStream 9XTend Radio Frequency Module operating in the 902-928 MHz frequency range. This link is also used to upload new waypoints to the autopilot.

3) The sub-system to telemeter video data from the onboard camera to the base station is still under development and will be accomplished using a separate radio link that will likely operate in the 900 MHz or 2.4 GHz range.

The UA is designed to fly a preset survey pattern without the need for operator intervention. Flight data (#2) and video image data (#3) are continuously telemetered to the base station from the UA and operations are conducted so as to maintain continuous #2 and #3 telemetry throughout the flight. The theoretical maximum separation distance of approximately 20 miles is limited by the RF module, antenna configurations, and environmental factors. The actual max separation distance is likely to be considerably less when operating in real-world conditions.

In the event that #2 and/or #3 telemetry is lost, the UA will continue to fly its survey pattern and land at a predetermined waypoint. If link #2 is re-established, flight data telemetry will resume and new or revised waypoints can be uploaded to the autopilot.

When in visual range (i.e. the aircraft is approximately 3-5 miles away from the base station), the operator can activate the command link (#1) and take control of the aircraft. When the command link (#1) is active, the flight data link (#2) and Video link (#3) continue to operate. At anytime the operator can return control to the autopilot.