Aircraft Systems - Other Description

NASA DFRC 2008 Fire Mission
UAS COA Application Attachment

NASA Dryden Flight Research Center (DFRC) has procured from General Atomics – Aeronautical Systems Incorporated, an MQ-9 Reaper aircraft and a Ground Control Station (GCS). DFRC has assigned the number "NASA 870" to the aircraft, registered it as N870NA, and renamed it "Ikhana" (pronounced ee-kah-nah, a Native American word from the Choctaw Nation meaning intelligent, conscious, or aware).

"Track changes" is used in this document to highlight the significant differences in the attachment between the 2008 plans versus last years' 2007 WSFM plans. Change tracking (and hence "change bars") have been suppressed for editorial and non-philosophical changes.

Scientific instruments/systems have been added to the NASA Ikhana 870 aircraft to support the science and research requirements of the Western States Fire Missions (WSFM). The pod from last year's 2007 WSFM is again installed on Ikhana in an under wing position. These instruments are installed using existing MQ-9 power distribution and command/telemetry resources provided with the basic aircraft from General Atomics. Equipment to support the 2008 WSFM is located in a custom designed under wing pod, and in the nose bay of the Ikhana aircraft.

1. **Fire Pod** – All science/research equipment installed into the aircraft is electrically isolated from aircraft flight critical power, command and telemetry systems. All science/research equipment installed into the Fire Pod is passive in the sense that no forms of electrical field, or laser beam is being purposefully emitted from the aircraft to collect science data. The "fire sensor" is primarily a 12 channel infrared (IR) line scanning imager with supporting electronics. NASA DFRC is creating a new under wing pylon to attach the existing WSFM Fire pod to the Ikhana aircraft. The pod was previously designed, manufactured and built under contract to NASA DFRC to contain some of the science and research equipment that drive the need for the WSFM. The pylon and pod have followed the NASA processes: SP-6105 NASA Systems Engineering Handbook (see attached file), and DHB-R-001 Structural Design, Proof Test, and Flight Test Envelope Guidelines for design, manufacturing and installation (see attached file). The Fire Pod and pylon has passed a detailed review of the airworthiness and flight safety of the structure, installation, and operation by NASA DFRC management per NASA DFRC Airworthiness and Flight Safety Review Process DCP-X-009 (see attached file) and NASA DFRC Airworthiness and Flight Safety Review Guidelines DHB-X-001 (see attached file). This NASA DFRC management review process will include a detailed review of dynamic stability (flutter) that includes results from a ground vibration test (GVT) of the aircraft, pod, and pylon. The pod and instrument is the same flown on the Ikhana aircraft during the NASA 2007 Western States Fire Mission flights. Initial Ikhana

flights of the new pylon with the existing pod will be conducted within R-2508 airspace.

The fire sensor imager has ~12 nm scan width with the aircraft at FL400+, and ~6 nm from about FL200. The imager uses a passive IR line scanning system. The fire sensor has on-board science data recording capability.

2. **Piggyback payload(s) and instrumentation** – All science/research equipment installed into the aircraft is electrically isolated from aircraft flight critical power, command and telemetry systems. The payloads may have on-board science data recording equipment. One or more "piggyback" science or research experiments may have equipment installed in the nose bay of the aircraft. All science/research equipment installed into the aircraft for the WSFM is passive in the sense that no form of electrical field, or laser beam is being purposefully emitted from the aircraft to collect science data. These piggyback payloads are installed using custom hardware for the Ikhana aircraft. NASA DFRC has designed, manufactured and built this custom interfacing hardware per the NASA processes: SP-6105 NASA Systems Engineering Handbook, NASA DFRC Flight Systems Development Process DOP-R-301, and/or NASA DFRC Systems Engineering System Design and Review DOP-M-008 (see attached files). Prior to flight, the installation and operation of all equipment will have passed a detailed review of the airworthiness and flight safety of the structure, installation, and operation by NASA DFRC management per NASA DFRC Airworthiness and Flight Safety Review Process DCP-X-009 (see attached file) and NASA DFRC Airworthiness and Flight Safety Review Guidelines DHB-X-001 (see attached file).