

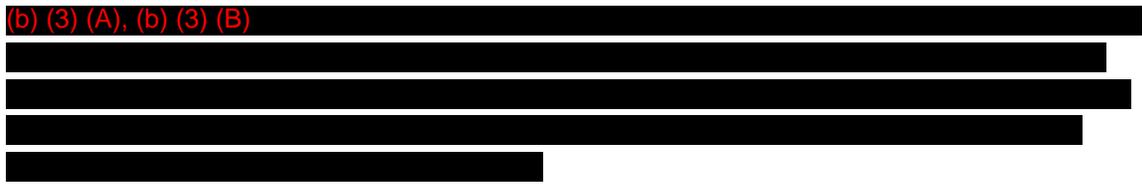
Aircraft Type and Model Description

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.

(b) (3) (A), (b) (3) (B)



1. **UAS System** – The Ikhana system can potentially have 3 components: (a) The Ikhana aircraft, (b) a “Launch and Recovery Element (LRE)” GCS, and (c) a Mission Control Element (MCE) GCS. For the Western States Fire Missions, the Ikhana GCS will act as the LRE and the MCE, and consequently, there will only be 2 components (aircraft and GCS).

1.1. **Ikhana (MQ-9) aircraft** – General Atomics Aeronautical Systems Inc., Rancho Bernardo, California manufactures the Ikhana (MQ-9) aircraft. The aircraft are designed to be flown by a pilot or in an autonomous mode. Autonomous pre-planned responses may be overridden from the ground control station at the discretion of the pilot.

1.2. **GCS** – The GCS functions as the aircraft cockpit. A single GCS is planned for use as the LRE and MCE. See Figure 1. The GCS can control the aircraft either within line of sight (LOS) or over the horizon (OTH) via a combination of satellite relay and terrestrial communications. Control of an aircraft may be passed between ground control stations at any time during the mission. For the Western States Fire Missions, there are no plans to pass control between ground control stations.

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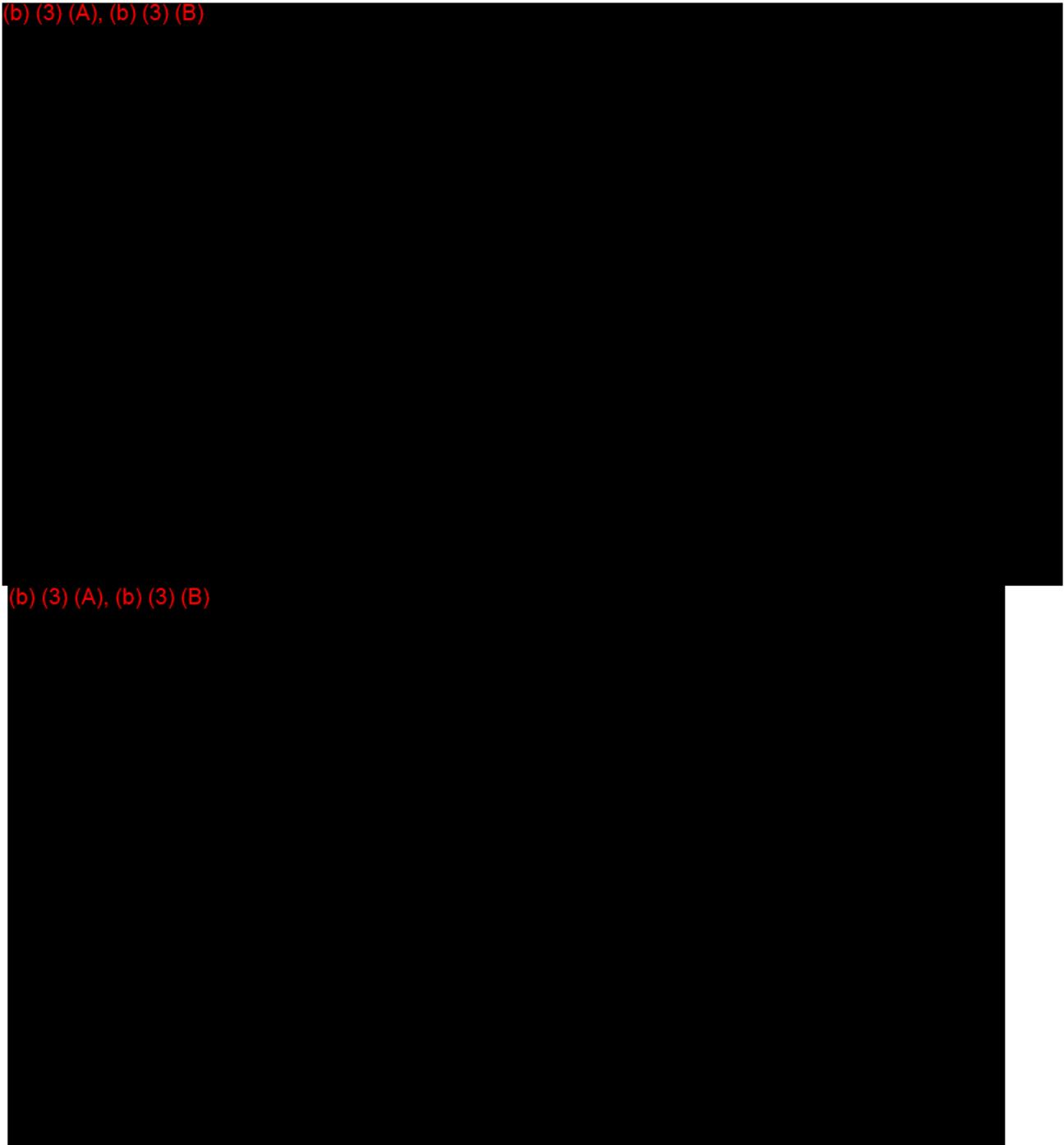
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2. Aircraft Physical Characteristics.

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2.2. **TSO Certified Equipment** – The aircraft has several pieces of TSO certified equipment. Identification of TSO certified equipment on the aircraft is ongoing by DFRC. The current list of identified TSO equipment is in the TSO Certified Equipment Attachment to this COA application.

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2.4. **Data Links** – The MQ-9 system provides continuous command and control communications from the GCS to the aircraft via LOS and/or SatCom as described above. These links allow real-time dynamic vehicle control and command updates by the pilot and also provide continuous monitoring of the health and status of the aircraft.

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2.6. **Lighting** – The Ikhana aircraft is equipped with standard aircraft position lights and anti-collision strobe lights. All external lighting can be controlled by the pilot from the GCS.

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2.8. **Standard GCS Situational Awareness Displays** – In the GCS, there are 3 basic types of displays available to the pilot in the GCS. The first type is a navigational map (“tracker display”) that shows real-time aircraft position (from downlink telemetry). The pilot can select any of several maps for this display. The second type is the “heads-up display” (HUD) that shows real-time aircraft telemetry (rate of climb, altitude, heading, etc) displayed over a pilot selected camera view on the aircraft. The third type is system/subsystem monitoring displays. These displays can be selected by flight crew members to show digital and/or chart recorder style aircraft information to investigate potential aircraft anomalies in-flight.

2.9. **Additional GCS Situational Awareness Displays** - NASA DFRC has installed several additional situational awareness displays into the GCS. The first is connected to a standard computer with internet access. This computer is isolated from all other computer networks in the GCS. This computer is used by the pilots to access and display all the National Weather Service (NWS) NOAA weather information that is available on the internet. Additionally, military weather information is available through Edwards AFB website access. The second display, is used with the FalconView product to provide additional tracker map capability to the Mission Director and to the pilots. The FalconView display can be “brought-up” at any of the workstations in the GCS. The third capability allows any of the above mentioned displays to be switched to any of the monitors in the GCS. This means that if there is something important for the pilot to see on the workstation #2 display, in a matter of 10 seconds, that display can be also routed to a monitor situated for easy viewing by the pilot. The fourth situational awareness display is

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2.11. **Aircraft Data Recording Capability** – The aircraft has no standard on-board data recording capability. NASA DFRC and installed science payloads generally have an installed science data recording capability.

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