

## **Control Station Description**

### **NASA DFRC Ikhana Local Area**

### **UAS COA Application Attachment**

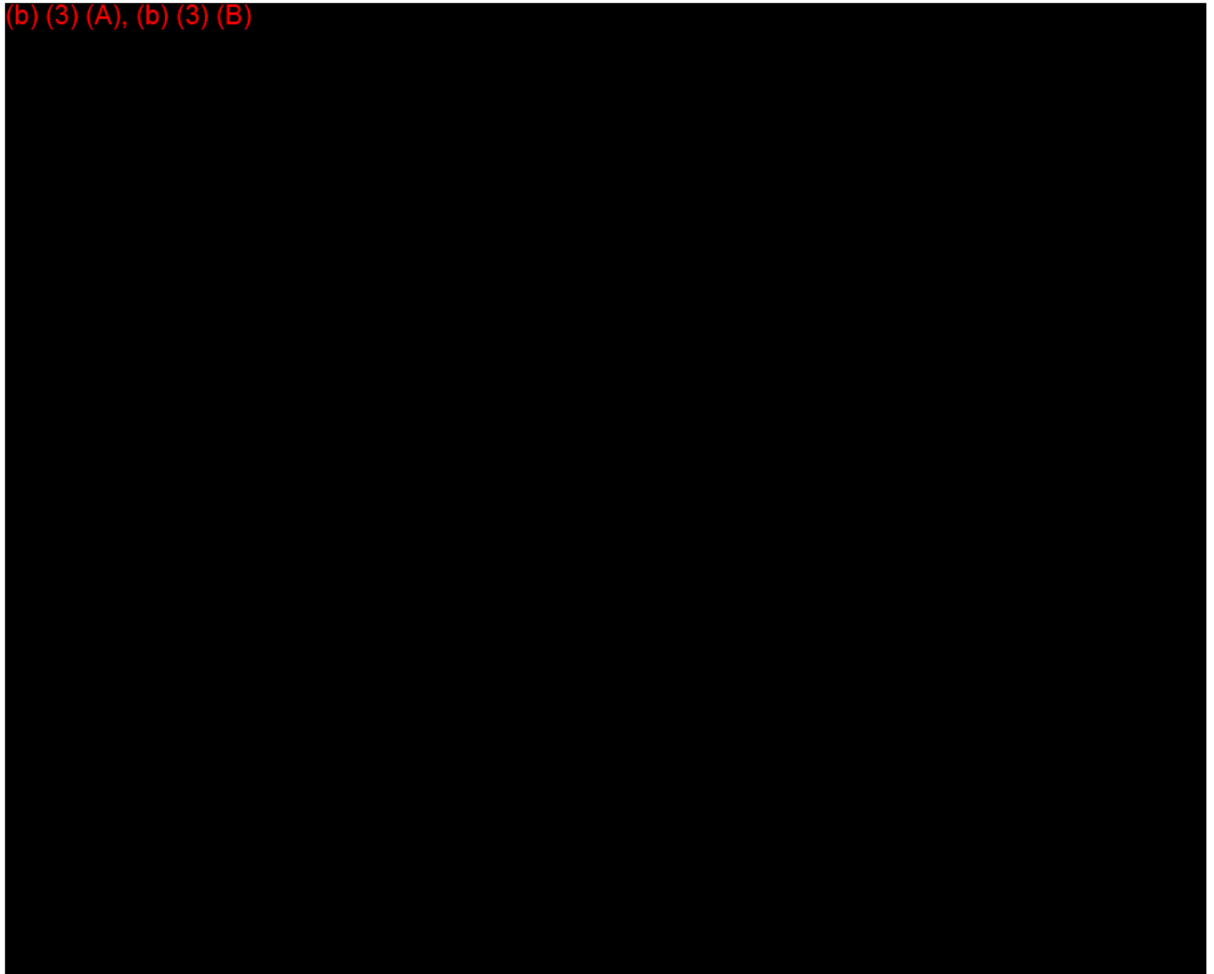
NASA Dryden Flight Research Center (DFRC) has procured from General Atomics – Aeronautical Systems Incorporated, an MQ-9 Reaper aircraft and a Ground Control Station (GCS). DFRC has assigned the number “NASA 870” to the aircraft and renamed it “Ikhana” (pronounced ee-kah-nah, a Native American word from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

Two GCSs will be utilized for launch, en route and recovery of the Ikhana aircraft when delivered to Gray Butte Field Airport or returning to R-2515. Ferry flights from NASA DFRC delivering the aircraft to Gray Butte Field Airport (04CA) will initially be controlled by the NASA DFRC GCS. Ferry flights returning the aircraft to NASA DFRC will initially be controlled by a General Atomics GCS at Gray Butte Field Airport. During ferry flights control of the aircraft will be handed off from one GCS to the other. Maintenance check flights will utilize a General Atomics GCS at Gray Butte Field (04CA) or El Mirage (99CL) airports.

Described below are both the standard and modified MQ-9 Pilot/Sensor Operator (PSO) workstations being utilized. Standard GCSs are located and operated by General Atomics at Gray Butte Field and el Mirage airports. NASA DFRC operates a modified GCS located at Edwards AFB.

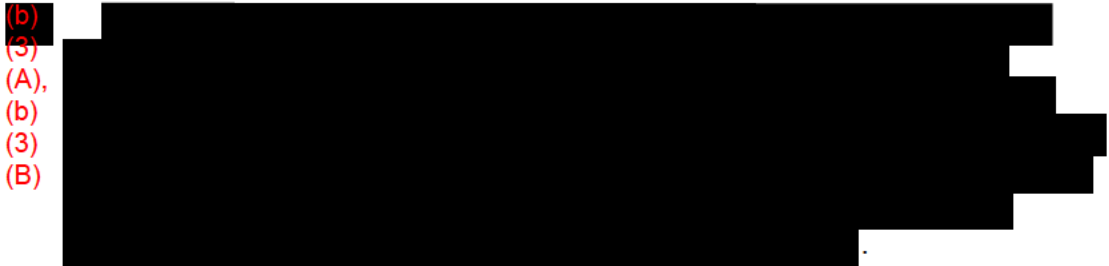
As delivered from General Atomics, the DFRC Ikhana GCS control station contained only the standard MQ-9 Pilot/Sensor Operator (PSO) workstation and supporting electrical equipment. See Figure 1 for an illustration of the PSO workstation. After receipt of the Ikhana GCS, NASA DFRC modified the Ikhana GCS to add additional data display and analysis stations to support NASA research missions. NASA DFRC has not modified the standard MQ-9/Ikhana PSO control station as provided by General Atomics.

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



1. **Control Station General Description** – The Ikhana Control Station components make up the Launch and Recovery Element (LRE), and the Mission Control Element (MCE) of a standard MQ-9 operation. The Ikhana control station has the following elements; the GCS itself, the line of sight (LOS) antenna enclosure, and the mobile SatCom ground station. NASA DFRC has also created the LOS antenna enclosure because of the physical distances between the DFRC Ikhana GCS site and the Edwards AFB runways.

(b)  
(3)  
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1.1.2. **Additional Data Display and Analysis Workstations** – These include several multifunction engineering workstations, an upgraded intercom system, and large flat panel displays for situational awareness.

1.2. **LOS Antenna Enclosure** – An antenna enclosure is required by NASA because of the long distance between the hangars/buildings of the Dryden Flight Research Center from the Edwards AFB runways. The antenna enclosure is built to support 2 standard MQ-9 portable ground data terminals (PGDTs) with redundant power supplies, automatic power switching between power supplies, air conditioning for the electronics, and monitoring capability from the Ikhana GCS. The enclosure is commonly referred to as the “PGDT trailer”, or the Semi-Mobile UAS Radiation Facility (SMURF). Command/telemetry switching between the 2 PGDTs is controlled within the GCS. The enclosure is designed to be deployable and transportable via truck or aircraft, during operations will normally be positioned very close to the Ikhana aircraft. Additionally, a internet camera system is installed to allow personnel in the GCS to directly observe activities around the aircraft. The antenna enclosure and GCS use fiberoptic links for communication of commands and telemetry.

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

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