GENERAL ATOMICS
AERONAUTICAL

Accepted DG Nov/18/2021

REVISED FORMAT

PROGRAM LETTER

for

MOJAVE UAS

N450MV

September 16, 2021

Prepared By:

GENERAL ATOMICS AERONAUTICAL SYSTEMS, INC. (GA-ASI)
14200 Kirkham Way
Poway, California 92064

REPORT NUMBER: ASI-21942 Rev D

TITLE: Program Letter for N450MV Mojave UAS

PROGRAM: Special Airworthiness Certification - Experimental Category (SAC-EC)

PREPARED BY: Brent Warner — Digitally signed by Brent Warner Date: 2021.09.20 11:38:45 -07'00'

Brent Warner — DATE
Program Manager, FAA Certification/Commercial
Special Purpose UAS
GA-ASI

APPROVED BY: Stephan Dupourque — Digitally signed by Stephan Dupourque Date: 2021.09.20 11:18:26 -07'00'

Stephan Dupourqué — DATE
Sr Program Manager, FAA Certification/Commercial
Special Purpose UAS
GA-ASI

Rev Letter	Date	Revised By	Approved By	Remarks
A	06/14/2021	B.Warner	S.Dupourque	Initial Release
B	6/29/2021	B.Warner	S.Dupourque	Addressed FAA feedback
C	7/15/2021	B.Warner	S.Dupourque	Addressed FAA feedback
D	9/16/2021	B.Warner	S.Dupourque	Expanded request to include more than one flight test at all airfields currently approved within our existing COAs

GA-ASI PROGRAM LETTER FOR N450MV UNMANNED AIRCRAFT SYSTEM (UAS), SAC-EC

REGISTERED OWNER NAME: General Atomics Aeronautical Systems Inc.	**AIRCRAFT BUILDER:** General Atomics Aeronautical Systems Inc.
REGISTERED OWNER ADDRESS: 14200 Kirkham Way Poway, CA 92064	**AIRCRAFT SERIAL NUMBER:** GA-9-1276
AIRCRAFT DESCRIPTION: Mojave UAS [based on Army Gray Eagle (Predator A) design]	**AIRCRAFT MODEL DESIGNATION:** UWA97000-50
AIRCRAFT REGISTRATION: N450MV	**ENGINE MODEL:** Rolls Royce M250-B17F
YEAR MANUFACTURED: 2021	**PROPELLER MODEL:** MT-Propeller MTV-5-1-D-C-F-R(A)

1. INTENDED OPERATION AND HOW IT MEETS THE DESIRED PURPOSE

1.1 This SAC-EC request is to complete successful test flights of the GA-ASI prototype UAS Mojave within the FOFs listed in Section 3 and in GA-ASI civil COAs. N450MV is a Mojave aircraft (UWA97000-50), with the design based on the Gray Eagle ER MQ-1C flown by the United States Army since 2009. The overall Army Gray Eagle program just accumulated over 1 million flight hours since 2004 with over 250 UAS.

1.2 General Atomics Aeronautical Systems Inc. (GA-ASI) requests an Experimental Certificate to conduct test flight operations under 14 CFR 21.191(a) of the Mojave UAS at the facilities listed in Section 3 for the following purpose:

- (a) Research and Development – Testing new aircraft design concepts, new aircraft equipment, new aircraft installations, new aircraft operating techniques, and/or new uses for aircraft.
- Throughout this document, Pilot in Command (PIC) refers to the pilot seated at the controls. For the Mojave test flight(s), FAA rated pilots will occupy both seats.
- Payloads: Flights may be conducted with the aircraft in a captive carry weapons configuration. The captive carry "weapons" will be inert mass simulators. No launches or releases of weapons / stores will be conducted from the Mojave UA under Experimental Certification authority. During payload flights, all carriage and release equipment will be pinned to prevent release of stores.

  Upon completion of a payload installation, a logbook entry will be completed confirming installation was successfully completed and requiring Weight & Balance re-calculation prior to flight. Once payload is removed, another logbook entry is completed stating payload was successfully removed and requiring another Weight & Balance re-compute.

- Prior to flight, payloads are evaluated for proper characteristics to insure aircraft remains safe during all phases of flight. Payloads will never cause aircraft to exceed overall MGTOW specified in each PL/SCL.

2. DESCRIPTION OF PAST FLIGHT HISTORY

As of 09/9/2021:

Flight Hours	0.7 hours
Number of Flights	1 flights
Flight Hours Since Last EC	0.7 hours

Table 2-1: Flight History

3. DEFINITION OF FLIGHT AREAS

Address of Base of Operations: Experimental flights will be conducted from the following Flight Operations Facilities (FOF).

Gray Butte Flight Test Facility (04CA)
25500 East Avenue R-8
Palmdale, CA 93591
(661) 233-6000

El Mirage Flight Test Facility (99CL)
73 El Mirage Airport Road
Adelanto, CA 92301
(760) 388-8100

General Atomics-ASI (KLGF)
Yuma Proving Ground
Laguna Army Airfield/Bldg.2882
Yuma, AZ. 85366

GA-ASI Flight Test and Training Center (FTTC) (KRDR)
Flight Operations
122 Grand Sky Blvd
Emerado, ND 58228

3.1 Mojave Will Be Operated In Accordance With The Following Provisions:

3.1.1 Mojave operations requiring an airborne Visual Observer (VO) will be conducted under VMC and follow 14 CFR 91.155 cloud clearance requirements. All Ground Observers (GO) will be located in close enough proximity to controlling GCS to assure clear hand-held radio communication.

3.1.2 GA-ASI, and/or its representatives, are responsible at all times for collision avoidance with non-participating aircraft and the safety of persons or property on the surface with respect to the Mojave.

3.1.3 The chase aircraft with an airborne Visual Observer (VO) or Ground Observer (GO) will perform "see and avoid" duties for the UAS. All GO will be located in close enough proximity to controlling GCS to assure clear hand-held radio communication.

3.1.4 Mojave operations requiring an airborne VO will be conducted under Visual Meteorological Conditions and follow 14 CFR 91.155 cloud clearance requirements.

3.1.5 The UAS and chase plane will have position and strobe lights on at all times. If any of these systems on either aircraft are inoperative the flight will be cancelled.

3.1.6 During UAS operations, two-way radio communication will be maintained between the UAS pilots and the appropriate FAA ATC facility. If communication cannot be maintained by the UAS pilots, or the chase plane in an emergency, with the appropriate FAA ATC facility, the UAS will expeditiously return to its FOF and remain in the traffic pattern until two-way radio communication can be re-established, or terminate the flight.

3.1.7 Unless specifically authorized in the FAA Operating Limitations and/or FAA Form 7711-1 UAS COA, the Mojave operator shall control only one UAS at any one time.

3.1.8 For night operations, all aircrews to include GO and chase plane pilots/observers will receive night operations training prior to conducting any night flights. All aircrew must be in place 30 minutes prior to night operations to assure dark adaptation. While conducting or supporting night operations, all personnel shall adhere to night operations procedures in GA-ASI General Operations Manual, ASI-09415.

3.1.9 Mojave operations will be performed under the established quality management system for engineering, production, delivery, servicing, and ground and flight operations in a manner that is continually surveyed and acceptable in accordance with established GA-ASI procedures.

3.1.10 Mojave UA will not perform any aerobatic maneuvers as defined by 14 CFR 91.303.

3.1.11 Mojave aircrew will adhere to the minimum fuel requirements contained in 14 CFR 91.151, for Visual Flight Rules (VFR) flights.

3.2 Gray Butte (04CA) / El Mirage (99CL), CA. Flight Operations

When operating from the Gray Butte/El Mirage flight operations facilities, Mojave UAS flight operations will be conducted in accordance with VFR below 12,500' MSL in the Local Operations Area (LOA), defined by the coordinates and diagram below.

Flight operations in the Victorville (KVCV) Class D airspace must be coordinated per the procedures listed in the applicable FAA Form 7711-1 UAS COA. KVCV Class D airspace is defined as a 6NM radius circle centered at N34°35'51" W117°22'59", extending from the surface to 5,400' MSL.

Gray Butte/El Mirage Lost Link procedures are per applicable FAA Form 7711-1 UAS COA.

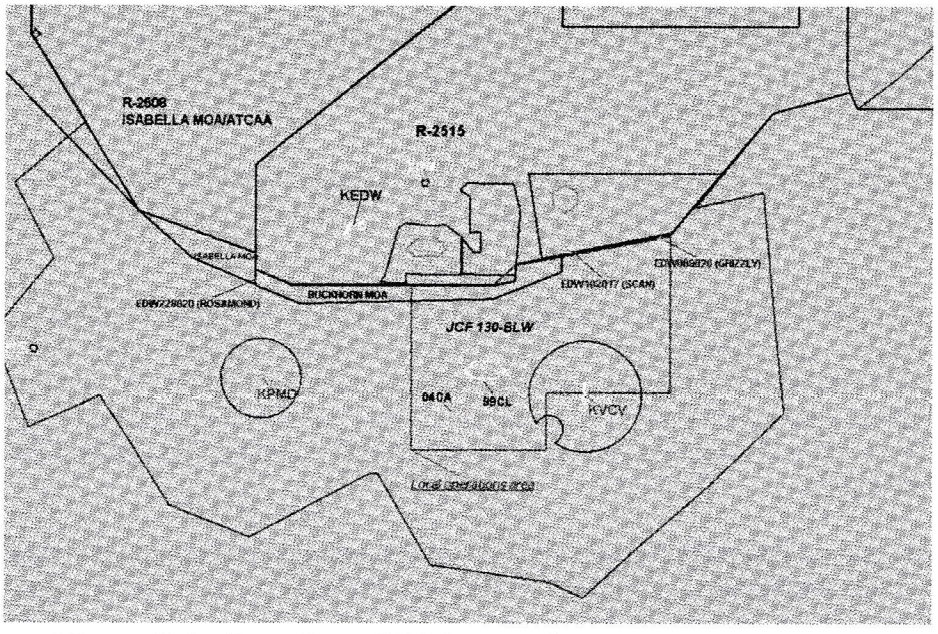

Figure 3-1. Gray Butte/El Mirage LOA (Light Red Outline)

3.2.1 UAS operations at Gray Butte or El Mirage airfields will be conducted with the Mojave operator and at least one VO or GO, who is/are in direct communication with the UAS operator, providing see-and-avoid duties for the UAS. The GO is responsible for maintaining visual contact with the aircraft at all times.

3.2.2 High Desert TRACON (Joshua Approach) may provide traffic advisories to the chase aircraft during a UAS operation. In the event that controller workload prohibits this service, or two-way radio communications cannot be maintained, the Mojave operation may be canceled.

3.2.3 Per applicable FAA Form 7711-1 UAS COA, GA-ASI will coordinate the UAS flight with High Desert TRACON two-hours prior to the operation for transponder code(s). The chase aircraft transponder will be on standby while in formation with the Mojave, but shall be turned on when separated. The Mojave transponder will be turned on and set to the ATC assigned code any time Mojave is flying. In the case of a transponder failure on either the Mojave or the chase aircraft, the Mojave operation shall be terminated.

3.2.4 GA-ASI UAS operations shall be in accordance with the Special Notice for UAS Operations in Southern California, as published in the FAA Airport / Facility Directory (A/FD), Southwest U.S. Volume. The A/FD provides a continuous notice of UAS activity, thus covering Mojave operations in accordance with this letter.

3.3 Yuma Proving Grounds, AZ. Flight Operations

When operating from Laguna Army Airfield (KLGF), all flight operations shall be conducted VFR within the lateral and vertical boundaries of KLGF Class D and G airspace, defined as that airspace extending upward from the surface to and including 1,700' MSL within a 3.5 NM radius of Laguna AAF (32°51'53"N, 114°23'35"W); excluding the airspace within Restricted Area R2306 and R2307, when they are in effect.

See and Avoid duties are conducted with the Mojave operator and at least one GO, who is/are in direct communication with the Mojave operator, providing advisories for the UA while operating within KLGF airspace.

The Class D airspace area is effective during the specific dates and times established in advance by a NOTAM. The effective date and time will thereafter be continuously published in the Airport/Facility Directory.

KLGF flight operations shall be conducted per applicable FAA Form 7711-1 UAS COA, which also references the Laguna-GA Letter of Agreement (LOA).

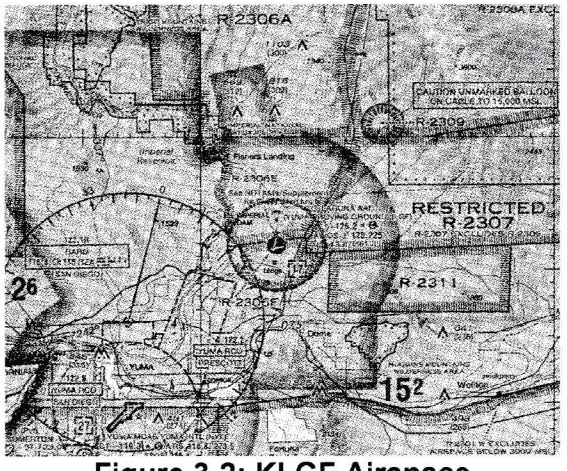

Figure 3-2: KLGF Airspace

3.4 Grand Forks (GFAFB/KRDR), ND. Flight Operations

When operating from GFAFB/KRDR, North Dakota, flight operations shall be conducted in accordance with the Letter of Agreement (LOA) with KRDR ATC and applicable FAA Form 7711-1 UAS COA. UAS operations within the Class D may be conducted from the surface (911') to 3,400' MSL, with the Mojave operator and at least one GO, who is/are in direct communication with the UAS operator, providing see-and-avoid duties for the UAS while operating in KRDR airspace.

The approved areas for flight operations are: (1) KRDR Class D, (2) RNAV approach path, and (3) the two areas depicted below in Figure 3-3. Route of flight to the approved areas for flight operations shall be conducted in accordance with the LOA and GFAFB Instruction 13-204, Airfield and Air Traffic Operations, and the applicable FAA Form 7711-1 UAS COA. Route of flight must de-conflict with the Temporary Flight Restriction, when in effect, located at GFAFB.

UAS pilot/operator must adhere to the 319th Operations Support Squadron (AMC) and Tenant Sublease LOA and GFAFB 13-204. Launch and recovery of the UA shall only be accomplished while KRDR Air Traffic Control Tower is operating and Class D airspace is active. If operating IFR with both the UAS and a chase plane, UAS and chase aircraft will depart and enter KRDR Class D in flight formation.

Lost Link procedures for within the Grand Forks region are per applicable FAA Form 7711-1 UAS COA.

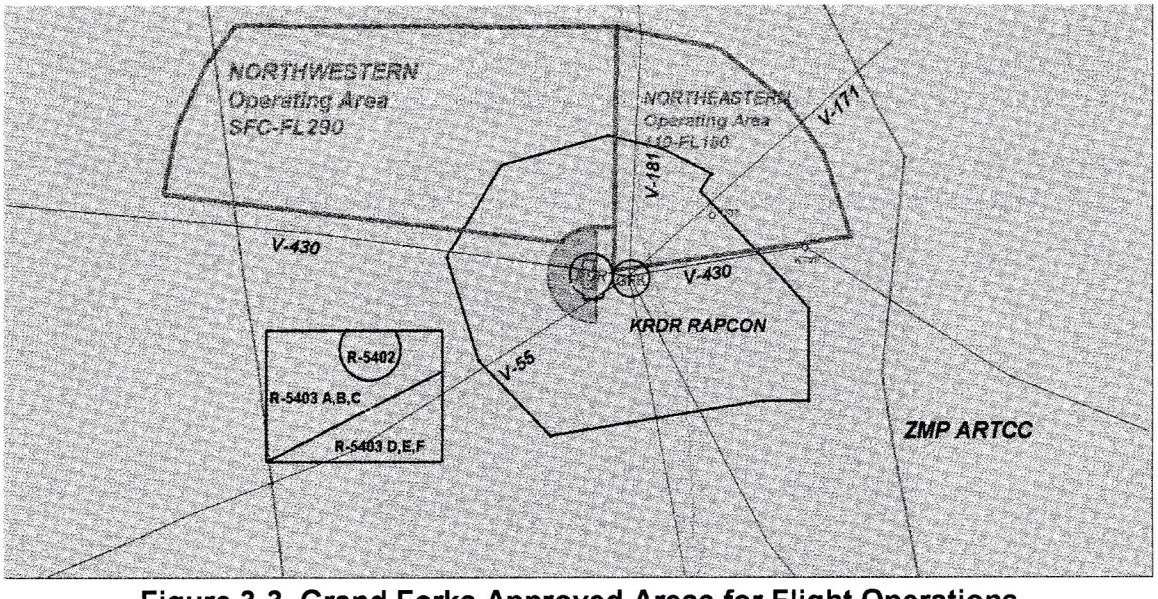

Figure 3-3. Grand Forks Approved Areas for Flight Operations

3.4.1 Ground Based Sense and Avoid (GBSAA) System with Electronic Observer (EO) for Beyond Visual Line of Sight (BVLOS) operations at GFAFB.

GA-ASI operates BVLOS with an EO for IFR and VFR operations, day and night, while operating from surface to FL280 in Class E and D airspace within 60 NM of the Airport Surveillance Radar (ASR-11) at GFAFB, under the jurisdiction of GFAFB Airport Traffic Control Tower (KRDR), Grand Forks Radar Approach Control (RAPCON), and Minneapolis Air Route Traffic Control Center (ZMP). Details of the GBSAA system are found in ASI-20169 (FTTC GBSAA Operating Procedures and Standardization Manual).

Following are BVLOS Operations Summary of Procedures.

- BVLOS operations:
  - EO functions as a substitute for chase plane VO by utilizing GBSAA, which includes ASR-11 traffic data and ADS-B In traffic data displayed on Radar Visualization Software
- Concept of Operations:
  - If necessary, the EO shall provide traffic callouts to the pilot
  - Departure consists of a climb to above 10,000' MSL into the preferred operations area
  - Extended Operations:
    - Two BVLOS operations areas within Grand Forks area that are authorized per our applicable FAA COA are the Northwestern and Northeastern regions, as depicted in Figure 3-3.
- Procedural Requests:
  - Request ATC assist in any loss of GBSAA capability, for mitigation of 14 CFR 91.113 as an emergency operation.
- Emergency Procedures:
  - Lost Link: Per applicable FAA Form 7711-1 UAS COA
  - Lost communication with GO: Per applicable FAA Form 7711-1 UAS COA
  - Lost communication with EO: EO shall be co-located with the pilot
  - Radar Visualization Outage:
    - Pilot will immediately declare an emergency
    - Confirm with ATC UA intended profile (heading, altitude, speed)
    - Pilot will be prepared to provide multiple position reports including: fix, radial, distance, and provide time estimates for the next fix on the route of flight until electronic or visual observation is re-established

3.4.2 Camp Grafton Operations Area, North Dakota

Operations over Camp Gilbert C. Grafton Training Center Range Complex (CGTC), located at RDR 246/054 DME, will be conducted per applicable FAA Form 7711-1 UAS COA.

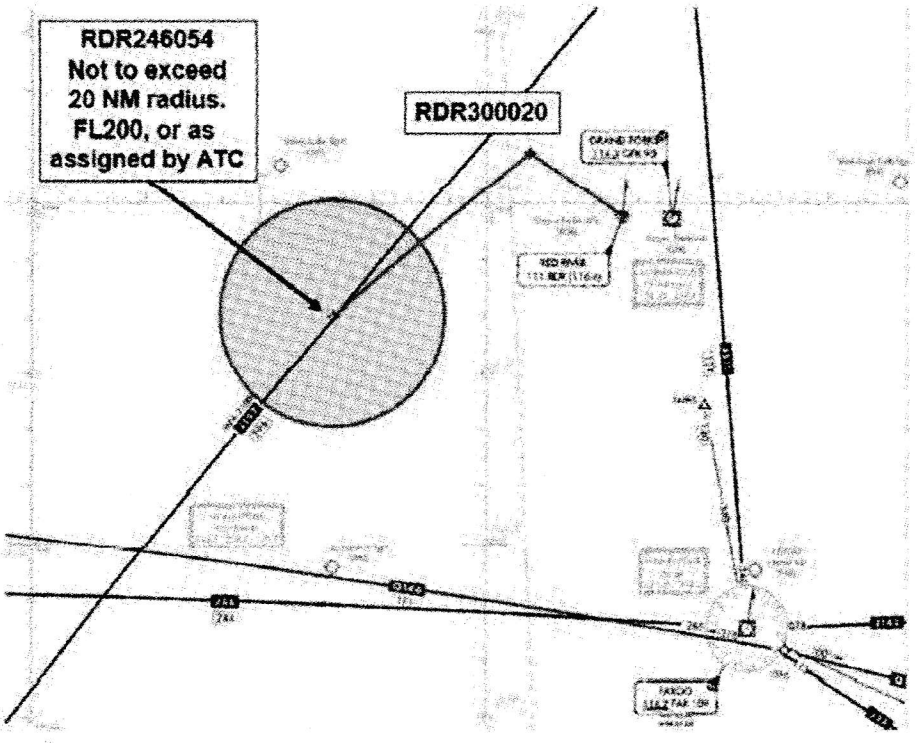

Figure 3-4: Camp Grafton Operations Area

To RDR246 / 054DME	FRD (fix/radial/ distance)	Coordinates	Lost Link / Lost Comms	Flight Termination Point (FTP) / Altitude
KRDR	Grand Forks Air Force Base	N 47°57.68' W 097°24.05'	MOLLE (RDR308/003.3) 2,500' MSL	MOLLE 2,500' MSL
MOLLE	RDR308/003.3	N 47°59.75' W 097°27.91'	MOLLE (RDR308/003.3) 2,500' MSL	MOLLE 2,500' MSL
	RDR300/020	N 48°09.13' W 097°48.53'	RDR317/028 > Descend to 10,000' MSL > REAPR > MOLLE (Descend to 3,000' MSL)	MOLLE 3,000' MSL
	RDR246/054	N 47°40.33' W 098°40.36'	Reverse flight plan route (FPR) at assigned altitude to RDR317/028 > Descend to 10,000' MSL > REAPR > MOLLE (Descend to 3,000' MSL)	MOLLE 3,000' MSL
Delay	Orbit radius as assigned by ATC, centered on RDR246/054	IVO N 47°40.33' W 098°40.35'	Reverse flight plan route (FPR) at assigned altitude to RDR317/028 > Descend to 10,000' MSL > REAPR > MOLLE (Descend to 3000' MSL)	MOLLE 3,000' MSL
	RDR300/020	N 48°09.13' W 097°48.53'	RDR317/028 > REAPR/RDR302/008 > MOLLE (3,000' MSL)	MOLLE 3,000' MSL
MOLLE	RDR308/003.3	N 47°59.75' W 097°27.91'	MOLLE 2,500' MSL	MOLLE 2,500' MSL
KRDR	Grand Forks Air Force Base	N 47°57.68' W 097°24.05	MOLLE (RDR308/003.3) 2,500' MSL	MOLLE 2,500' MSL

Table 3-1: KRDR to Camp Grafton (RDR246054)

3.5 Transit Routes

Route coordination requirements, flight procedures, altitudes, waypoints, and Lost Link details are all per referenced FAA Form 7711-1 UAS COA:

West Coast COA **2021-WSA-101-SAC-REV3**:

- Gray Butte (04CA) / El Mirage (99CL) Local Operations and Transit to/from Edwards (R-2515)
- Edwards (R-2515) to/from Twentynine Palms (KTNP/R-2501)
- Edwards (R-2515) to/from Yuma (KLGF/R-2306)
- Yuma (KLGF/R-2306) to/from Creech AFB (KINS/R-4806)
- Yuma (KLGF/R-2306) to/from Twentynine Palms (KTNP/R-2501)
- Edwards (R-2515) / Yuma (KLGF/R-2306) to/from White Sands Missile Range (R-5107) - South Route
- Edwards (R-2515) to/from White Sands Missile Range (R-5107) - North Route
- Edwards (R-2515) to/from coastal Warning Area (W-289S)
- Yuma (KLGF/R-2306) / Edwards (R-2515) to/from Texas "Mano Box"
- Yuma (KLGF/R-2306) / Edwards (R-2515) to/from FTTC (KRDR)

North Dakota COA **2021-CSA-97-SAC-REV2**:

- FTTC (KRDR) to/from U.S.-Canadian Border

4. AIRCRAFT AND SUPPORT EQUIPMENT CONFIGURATION

GA-ASI manufactured the Mojave UAS in Poway, California. The Mojave UA is the airborne element of the Mojave UAS. The complete system is comprised of a single Mojave aircraft, a Ground Control Stations (GCS), Line Of Sight (LOS) communications systems, and a compliment of support equipment.

The Mojave UA is controlled by a pilot who is located in a GCS. A pair of cameras mounted in the nose of the aircraft provides the pilot with a forward view using either daylight television or IR video. Control commands are transmitted from the GCS to the aircraft by a ground-based datalink terminal.

The GCS incorporates workstations that allow operators to plan missions, control and monitor the aircraft along with payload sensors, and exploit received images. The LOS communications system provides control of the aircraft during launch and recovery operations and in support of local area flight operations.

Mojave Specifications:

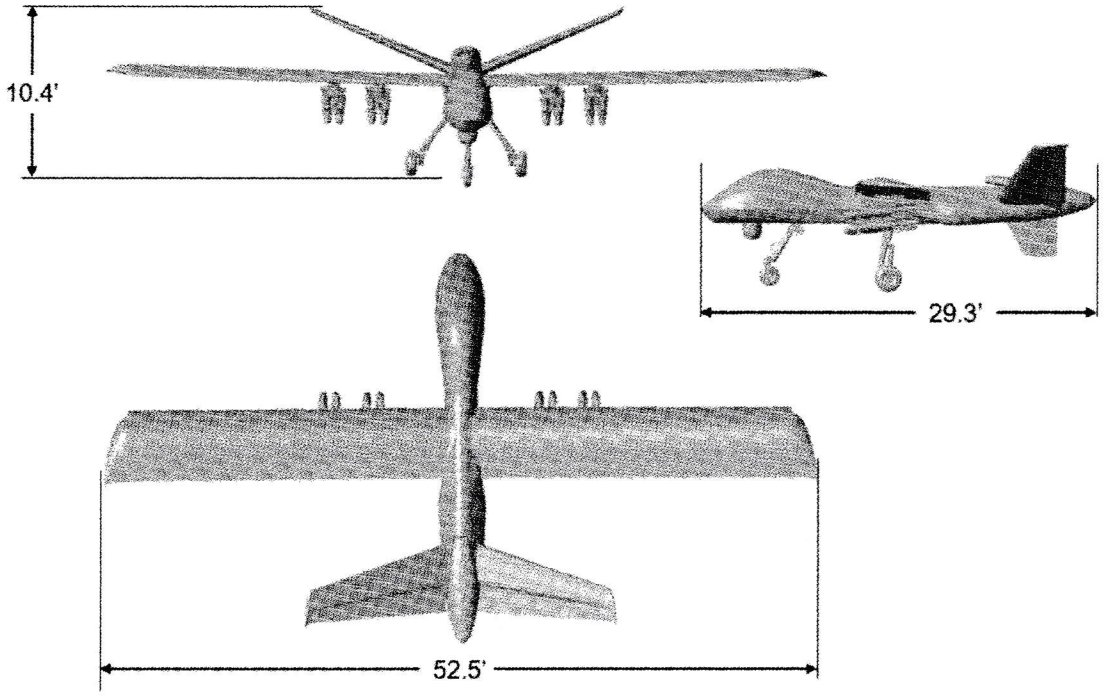

Figure 4-1. Mojave Aircraft Dimensions (feet)

4.1 Icing Detection Systems

Mojave is not equipped with an ice detector unit and is not designed for operations in icing conditions.

The aircraft is equipped with nose camera lens heaters and a heated IR lens which can be activated by the pilot to ensure forward visibility.

4.2 Propulsion System

The Mojave power plant is a Rolls Royce M250-B17F turboprop with a 5-blade propeller installed in a pusher configuration.

The engine bay contains the engine and critical accessories supporting various aircraft subsystems.

4.3 Inspection and Maintenance (M&I)

N/A for R&D only flights

4.4 Pilot Qualification

Mojave is a prototype UAS and will be flown by two senior FAA rated pilots and qualified as company test pilots. They maintain a FAA Commercial Pilot certificate

with instrument rating, hold a valid second class medical certificate issued under 14 CFR 67, and have achieved substantial flight experience operating all series of GA-ASI UAS models. In addition, during any flight with Mojave, a test engineer who is considered a Subject Matter Expert in the operation of this aircraft will be present in the GCS to assist the pilots.

4.5 Identification and Registration Marking

The aircraft will be outfitted with external identification / markings in accordance with 14 CFR 45.21.

4.6 ATC Transponder Equipment and Use

This Mojave UAS uses an altitude reporting transponder capable of modes A and C. Once the squawk code is programmed into the transponder in the aircraft before takeoff, it cannot be changed in flight, nor can the operating modes be changed. GA-ASI shall coordinate authorization (to include lost link) in advance of the flight with the appropriate ATC Facilities. Such coordination shall not become routine to bypass CFR requirements and will be requested just for this Mojave model for the number of flights required to successfully complete the flight test plan, while staying within line of sight range of the El Mirage facility.

4.7 Method For See and Avoid

The pilot in command of the Mojave UAS is responsible for seeing and avoiding other traffic. To assist the pilot, an observer either in a chase plane (VO) or on the ground (GO) will be used to provide "see and avoid" as required. These observers will maintain real time audio contact with the pilots.

The task of the observer is to provide the pilot of the UAS with advisory information to enable the pilot to maneuver the UAS clear of any other traffic. Observers must continually scan the airspace for other aircraft that pose a potential conflict. GOs and VOs must not allow the aircraft to operate beyond the visual line-of-sight limit and must be able to see the aircraft and the surrounding airspace throughout the entire flight.

Observers must be able to determine the UA's altitude, flight path, and proximity to all aviation activities and other hazards (e.g., terrain, weather, structures) sufficiently to comply with 14 CFR 91.111, 91.113, and 91.115, and prevent the UA from creating a collision hazard. The chase plane shall maintain a reasonable proximity, and shall position itself relative to the UA in such a manner to reduce the hazard of collision, per 14 CFR 91.111.

UAS pilots and observers shall perform crew duties for only one UA at a time. Observer duties shall be dedicated to the task of observation only, concurrent duty as a pilot is not authorized. Observer personnel are trained in Right-of-Way Rules (14 CFR 91.113) and Operating Near Other Aircraft (14 CFR 91.111) per ASI-09415.

See Section 3.4.1 for GBSAA operations at FTTC.

4.8 Control Stations

The Mojave aircraft will be controlled by a pilot in command from a Block 15 GCS. The GCS can be located in a building or in a portable shelter. For a list of the applicable model numbers, please refer to the N450MV Safety Checklist. The GCS incorporates two identical side-by-side Pilot/Sensor Operator (PSO) workstations. For Mojave, both PSO seats are assigned to Experimental Test Pilots and will be setup with identical configurations. A centrally mounted switch, under the control of the pilot in command, determines which of the PSO workstations has been assigned control of the aircraft and it can be changed in flight by conducting a "rack swap", in as little as 10 seconds, dependent upon the time it takes the aircrew to execute the applicable checklist. The switch essentially toggles the modes of the PSO stations permitting pilot control to be transferred in the case of a PSO malfunction, providing control redundancy for the pilot, if transfer-time permits.

Both PSO stations are connected to the data links. The operating mode of the PSO (pilot vs sensor) and the selected display configuration determines what downlink information is displayed.

The aircraft is operated by a pilot, and is also capable of flying pre-programmed missions with oversight by the pilot. The aircraft will be controlled with a GCS utilizing a C-band data link operating LOS. The pilot will maintain contact with ATC via UHF/VHF radio in the GCS. Alternate ATC communications are through the chase aircraft (in an emergency).

Pilot Configuration - To provide the pilot's control function, the display and control features of the PSO station are usually configured as follows:

- Video Screens – displays imagery captured by a fixed field-of-view nose camera. The nose camera view is the background or "underlay" of information presented. The overlay to the nose camera video is a HUD style format that shows primary aircraft system operational and performance parameters. The video screen display supports the pilot's responsibilities of aircraft system monitoring and performing takeoffs and landings. Additionally, they display a moving symbol of the aircraft over a map (Tracker Display).
- Headset / Microphone Audio – The headset and microphone operate the same as in a manned aircraft. The headset enables the pilot to communicate with the flight crew, ATC, and other aircraft pilots. In addition to aerial communication, the headset also enables the pilot to communicate with ground crew equipped with similar headsets on the flight line.
- Flight Controls – Pilot control is performed through a console-mounted joystick for pitch and roll commands, and ruddervator pedals with embedded foot brake controls. Ruddervator pedals jointly control the ruddervators and nose wheel steering, with gear down, and the brake function permits differential control of the main landing gear brakes. In addition, the console also has control levers

for engine power and flap control. Landing gear retraction and deployment are activated through a joystick button and trigger switch, interlocked with airspeed limits to prevent inadvertent ground retraction.

- Keyboard – The keyboard is used in conjunction with the flight controls for overall aircraft system control. Information entered via the keyboard may include waypoints for flight path navigation, radio frequencies for communication, etc.
- Aircraft Control Switch – The aircraft control switch determines which of the two flight crew positions has active control of the aircraft. The switch is located within ready access of the pilot. The aircraft control switch enables the pilot in command to designate the PSO workstation to perform all the vehicle control and monitoring activities.

The following figure depicts the common Block 10/15 (Legacy) GCS configuration.

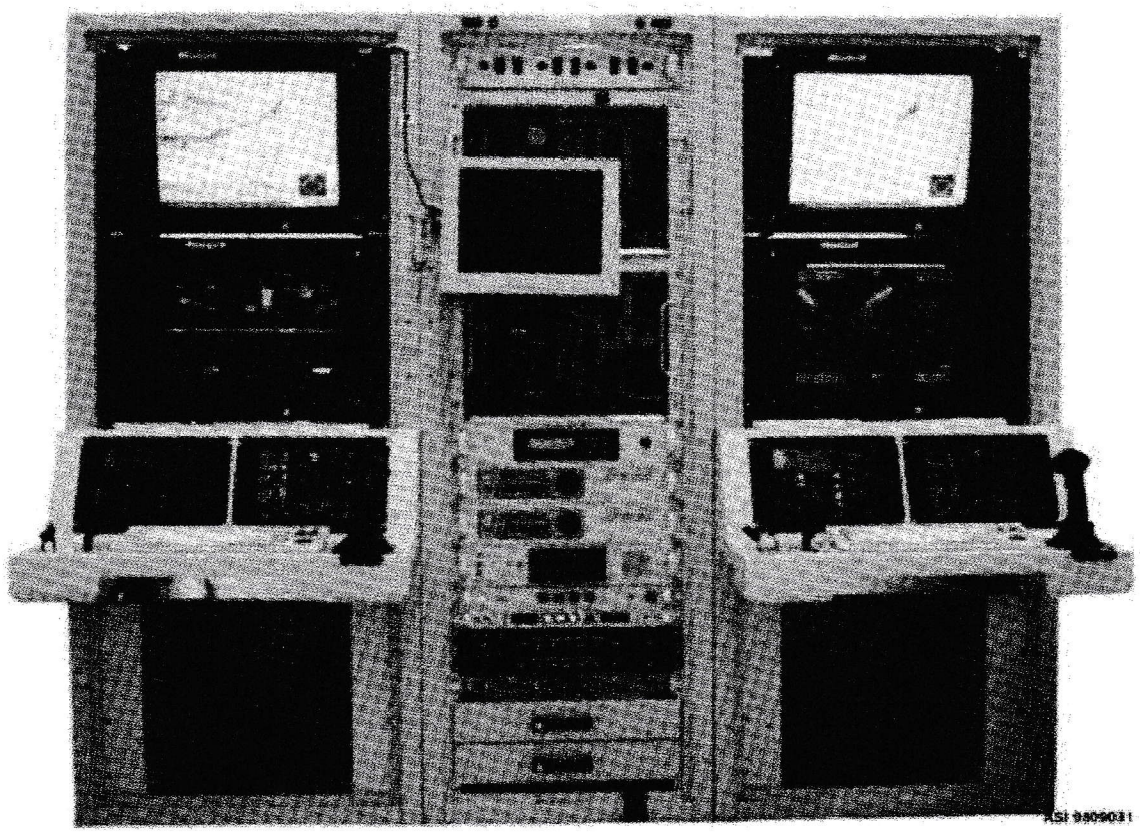

Figure 4-2. Block 10/15 (Legacy) Ground Control Station

5. SAFETY AND RISK MITIGATION

The N450MV FAA Safety Checklist, ASI-21541, will be submitted for consideration prior to the aircraft's EC inspection.

5.1 System Safety – Lost Link

Lost Link safety equipment is described in the applicable Safety Checklist and operational procedures detailed in the applicable FAA Form 7711-1 UAS COA.

The Mojave system redundancies maintain high levels of UAS operational integrity permitting continued control of the UAS throughout its mission, from launch through recovery. This is the principal means of maintaining containment of operations within the agreed upon locations and altitudes. In the event of lost link, there are several Flight Termination modes within the Mojave system.

Lost Link Mission: This flies a predetermined course in order to reestablish datalink. This function is the same as used across all GA-ASI platforms and is implemented within the triplex flight computers, therefore having the same integrity as the flight critical elements.

Prevention of fly away due to loss of all three flight computers is accomplished by the tail servos moving full trailing edge up and engine controls set to shut down. This is effected by the servo electronics programmed to move to preprogrammed positions after loss of valid flight computer commands. The engine control electronics similarly default to engine out at loss of flight computer propulsion commands.

To assist in voice communications capability for these emergency cases, backup radios are contained in the GCS. If the backup radios cannot establish communications, the crew utilizes a land/cell/sat phone and calls the appropriate controlling agency. Landline phones function without power.

5.2 Command and Control

The datalink consists of a radio frequency command link (CL) and return link (RL) that establish full duplex communications between the airborne datalink terminal in the aircraft and the ground-based datalink terminals associated with the GCS. A continuous stream of control commands is transmitted to the aircraft, and the aircraft transmits a continuous stream of status and imagery data to the GCS.

Command and Control can only be maintained by a LOS datalink system, operated on c-band frequencies. Aircraft control commands are entered from PSO work stations inside the GCS. These commands are routed to the selected GDT/PGDT where they are incorporated into the uplink.

If engine failure occurs and UA is beyond glide distance of the recovery airfield, the pilot will attempt to find a touchdown point that is clear of people and structures.

6. CERTIFICATION CATEGORY

a. Maximum Gross Takeoff Weight (MGTOW): 4,600 lbs
b. Maximum airspeed: 157 KIAS
c. Maximum aircraft altitude: 25,000' Pressure Altitude
d. Is this the first flight of the aircraft: No
e. Are you requesting night operations: Yes, see Section 3.1.8.
f. Are you requesting operations in IMC: No
g. Are flights BVLOS from GCS: No
h. Distance between operating area and a towered airport: Review Section 3 for diagram of each airfield.

APPENDIX A: ACRONYMS

The following is an alphabetical listing of acronyms used in this document.

04CA	General Atomics Gray Butte Airfield, CA
99CL	General Atomics El Mirage Airfield, CA
A&P	Airframe and Powerplant
A/FD	FAA Airport/Facility Directory
AAF	Army Airfield
AOA	Angle of Attack
AGL	Above Ground Level
AFB	Air Force Base
AMOC	Alternative Method of Compliance
ARTCC	Air Route Traffic Control Center
ASI	(General Atomics) Aeronautical Systems Inc
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
ATLC	Automatic Takeoff and Landing Control
ATLS	Automatic Takeoff and Landing System
BLOS	Beyond Line-of-Sight (i.e. SATCOM)
BVLOS	Beyond Visual Line-of-Sight (i.e. GBSAA)
C2	Command and Control
CFR	Code of Federal Regulations
CG	Center of Gravity
CGCS	Certified Ground Control Station
CGTC	Camp Grafton Training Center, ND
CL	Command Link
CNPC	Control-Non-Payload-Communications datalink
COA	FAA Certificate of Waiver or Authorization (FAA Form 7711-1)
COTS	Commercial off the Shelf
DEEC	Digital Electronic Engine Control
EC	(FAA) Experimental Certification/Certificate
EO	Electronic Observer
EGI	Embedded GPS/INS
ER	(General Atomics) Extended Range aircraft configuration
FAA	Federal Aviation Administration
FOF	Flight Operations Facility
FTTC	(General Atomics) Flight Testing/Training Center, Grand Forks, ND
GA-ASI	General Atomics Aeronautical Systems, Inc.
GBSAA	Ground Based Sense and Avoid radar system
GCS	Ground Control Station
GDT	Ground Data Terminal
GFAFB	Grand Forks Air Force Base, ND
GO	Ground Observer
GSE	Ground Support Equipment
HUD	Heads-Up Display
IAW	In Accordance With
I/O	Input/Output
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
INS	Inertial Navigation System
INS	(KINS) Creech Air Force Base Airport, NV
IR	Infrared Radiation
ISR	Intelligence, Surveillance, and Reconnaissance
JCF	FAA Joshua Control Facility
KIAS	Knots Indicated Airspeed
KTAS	Knots True Airspeed

LGF	(KLGF) Laguna Army Airfield, AZ
LL	Lost Link
LOA	Letter of Agreement
LOP	Letter of Procedure
LOS	Line of Sight
LRE	Launch/Recovery Element
LRU	Line Replaceable Unit
M&I	Maintenance and Inspection
MGTOW	Mass Gross Takeoff Weight
MSL	Mean Sea Level (in units of feet)
MOA	FAA Military Operating Area
NAS	National Airspace
NLT	No Later Than
NM	Nautical Miles
PCA	Primary Containment Area
PGDT	Portable Ground Data Terminal
PIC	Pilot-in-Command
PPR	Prior Permission Request
PSO	Pilot/Sensor Operator
RAMTS	Ruggedized Aircraft Maintenance Test Station
RAPCON	Radar Approach Control
RCM	Redundant Control Module
RDR	(KRDR) Grand Forks Air Force Base Airport, ND
RL	Return Link
RLOS	Radio Line-of-Sight
SATCOM	Satellite Communications
SUA	FAA Special Use Airspace
TRACON	Traffic Control
UA	Unmanned Aircraft
UAS	Unmanned Air System
VCV	(KVCV) Victorville Airport, CA
UHF	Ultra-high Frequency
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VO	Visual Observer (Airborne)
YPG	Yuma Proving Ground, AZ
ZLA	FAA Los Angeles Center
ZMP	FAA Minneapolis Air Traffic Control Center