UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION - FEDERAL AVIATION ADMINISTRATION

SPECIAL AIRWORTHINESS CERTIFICATE

A	CATEGORY/DESIGNATION	EXPERIMENTAL (UNMANNED AIRCRAFT)	
	PURPOSE	RESEARCH AND DEVELOPMENT OR MARKET SURVEY OR CREW TRAINING	
B	MANU-FACTURER	NAME N/A	
		ADDRESS N/A	
C	FLIGHT	FROM N/A	
		TO N/A	
D	N- 220AW		SERIAL NO. 07020323
	BUILDER HONEYWELL INTERNATIONAL		MODEL gMAV
E	DATE OF ISSUANCE 04/15/09		EXPIRY 04/14/10
	OPERATING LIMITATIONS DATED 04/15/09		ARE PART OF THIS CERTIFICATE
	SIGNATURE OF FAA REPRESENTATIVE CARMEN ALVAREZ		DESIGNATION OR OFFICE NO. SW MIDO-42

SUPERSEDED

Any alteration, reproduction or misuse of this certificate may be punishable by a fine not exceeding $1,000 or imprisonment not exceeding 3 years, or both. THIS CERTIFICATE MUST BE DISPLAYED IN THE AIRCRAFT IN ACCORDANCE WITH APPLICABLE TITLE 14, CODE OF FEDERAL REGULATIONS (CFR).

FAA Form 8130-7 (07/04) *SEE REVERSE SIDE* *NSN: 0052-00-693-4000*

A	This airworthiness certificate is issued under the authority of Public Law 104-6, 49 United States Code (USC) 44704 and Title 14 Code of Federal Regulations (CFR).
B	The airworthiness certificate authorizes the manufacturer named on the reverse side to conduct production fight tests, and only production flight tests, of aircraft registered in his name. No person may conduct production flight tests under this certificate: (1) Carrying persons or property for compensation or hire: and/or (2) Carrying persons not essential to the purpose of the flight.
C	This airworthiness certificate authorizes the flight specified on the reverse side for the purpose shown in Block A.
D	This airworthiness certificate certifies that as of the date of issuance, the aircraft to which issued has been inspected and found to meet the requirements of the applicable CFR. The aircraft does not meet the requirements of the applicable comprehensive and detailed airworthiness code as provided by Annex 8 to the Convention On International Civil Aviation. No person may operate the aircraft described on the reverse side: (1) except in accordance with the applicable CFR and in accordance with conditions and limitations which may be prescribed by the Administrator as part of this certificate; (2) over any foreign country without the special permission of that country.
E	Unless sooner surrendered, suspended, or revoked, this airworthiness certificate is effective for the duration and under the conditions prescribed in 14 CFR, Part 21, Section 21.181 or 21.217.

April 15, 2009

U.S. Department
of Transportation
Federal Aviation Administration

Southwest Region
Arkansas, Louisiana,
New Mexico, Oklahoma,
Texas

Manufacturing Inspection District Office
2601 Meacham Blvd., SW MIDO-42
Ft. Worth, Texas 76137-0182

Operating Limitations
Experimental: Research and Development, Market Survey, and/or Crew Training

Registered Owner Name:	**Aircraft Builder:**
Honeywell International	Honeywell International
Registered Owner Address:	**Year Manufactured:**
9201 San Mateo Blvd., NE	2007
Albuquerque, NM 87113-2227	**Aircraft Serial Number:**
Aircraft Description:	07020323
Micro Unmanned Air Vehicle	**Aircraft Model Designation:**
Aircraft Registration:	gMAV
N220AW	**Engine Model:**
	3W56iB2-CS

SURRENDERED

The following conditions and limitations apply to all unmanned aircraft system (UAS) flight operations for the Honeywell gMAV while operating in the National Airspace System (NAS).

1. General Information.

a. Integrated system. For the purposes of this special airworthiness certificate and operating limitations, the Honeywell gMAV operated by Honeywell International is considered to be an integrated system. The system is composed of the following:

(1) Honeywell gMAV, S/N 07020323

(2) UAS control station(s), fixed, mobile, or ground-based.

(3) Telemetry, launch, and recovery equipment.

(4) Communications and navigation equipment, including ground and/or airborne equipment used for command and control of the Honeywell gMAV UAS.

(5) Equipment on the ground and in the air used for communication with other members of the flight crew, observers, air traffic control (ATC), and other users of the NAS.

b. Compliance with 14 CFR part 61 (Certification: Pilots, Flight Instructors, and Ground Instructors) and part 91 (General Operating and Flight Rules). Unless otherwise specified in this document, the UA pilot-in-command (PIC) and Honeywell International must comply with all applicable sections and parts of 14 CFR including, but not limited to, parts 61 and 91.

c. Operational requirements.

(1) No person may operate this UAS for other than the purpose of research and development, market survey, and/or crew training, to accomplish the flight operations outlined in Honeywell International program letter dated 04/14/2009, which describes compliance with § 21.193(d), Experimental certificates: General, and has been made available to the UA PIC.

(2) This UAS must be operated in accordance with applicable air traffic and general operating rules of part 91 and all additional limitations herein prescribed under the provisions of § 91.319(i), Aircraft having experimental certificates: Operating limitations.

(3) Honeywell International must accumulate at least 50 flight hours under its experimental airworthiness certificate before customer crew training is permitted, in accordance with § 21.195(d), Experimental certificates: Aircraft to be used for market surveys, sales demonstrations, and customer crew training.

d. UA condition. The UA PIC must determine that the UA is in a condition for safe operation, and in a configuration appropriate for the purpose of the intended flight.

e. Multiple-purpose operations. When changing between operating purposes of a multiple purpose certificate, the operator must determine that the aircraft is in a condition for safe operation and appropriate for the purpose intended. A record entry will be made by an appropriately rated person (that is, an individual authorized by the applicant and acceptable to the FAA) to document that finding in the maintenance records.

f. Operation exceptions. No person may operate this UA to carry property for compensation or hire (§ 91.319(a)(2)).

g. UA markings.

(1) This UA must be marked with its U.S. registration number in accordance with part 45 or alternative marking approval issued by the FAA Production and Airworthiness Division (AIR-200).

(2) This UA must display the word *Experimental* in accordance with § 45.23(b), Display of marks, unless otherwise granted an exemption from this requirement.

h. Required documentation. Prior to conducting the initial gMAV flight operations, Honeywell International must forward a copy of the gMAV Special Airworthiness Certificate, Operating Limitations and Program Letter to the following FAA personnel:

(1) Mr. Roger Trevino, System Support Specialist, FAA Central Service Area, System Support Group, AJO2-C2, email: roger.trevino@faa.gov, fax: 817-222-5547.

(2) Richard Posey, Aviation Safety Inspector, Production and Airworthiness Division, AIR-200, 950 L'Enfant Plaza SW, 5th Floor, Suite 500, Washington, DC 20024, telephone (202) 385-6378, email richard.posey@faa.gov.

i. Change in registrant address. Section 47.45, Change of address, requires that the FAA Aircraft Registry be notified within 30 days of any change in the aircraft registrant's address. Such notification is to be made by providing AC Form 8050-1, Aircraft Registration Application, to the FAA Aircraft Registration Branch (AFS-750) in Oklahoma City, Oklahoma.

j. Certificate display and manual availability. The airworthiness and registration certificates must be displayed, and the aircraft flight manual must be available to the pilot, as prescribed by the applicable sections of 14 CFR, or as prescribed by an exemption granted in accordance with 14 CFR part 11, General Rulemaking Procedures, to Honeywell International.

2. Program Letter. The Honeywell International gMAV program letter, dated 04/14/2009, will be used as a basis for determining the operating limitations prescribed in this document. All flight operations must be conducted in accordance with the provisions of this document.

3. Initial Flight Testing.

a. Requirements. Flight operations must be conducted within visual line of sight of the pilot/observer. Initial flight-testing must be completed upon accumulation of 50 flight hours. Following satisfactory completion of initial flight testing, the operations manager or chief pilot must certify in the records that the aircraft has been shown to comply with § 91.319(b). Compliance with § 91.319(b) must be recorded in the aircraft records with the following, or a similarly worded, statement:

> "I certify that the prescribed flight test hours have been completed and the aircraft is controllable throughout its normal range of speeds and throughout all maneuvers to be executed, has no hazardous operating characteristics or design features, and is safe for operation."

b. Aircraft operations for the purpose of market surveys, sales demonstrations, and customer crew training. These operations cannot be performed until 50 flight hours have been accomplished. An entry in the maintenance records is required as evidence of compliance.

4. Authorized Flight Operations Area.

a. Description of the authorized flight operations area. The containment area for flight test will be on the property of the Laguna Pueblo, New Mexico. This area is approximately 60 miles west of the Honeywell International facility. It is a remote, desert terrain area with restricted access controlled by the government of the Laguna Pueblo. The attached map shows the layout and the operational area. Population areas near the site are (1) State Hwy 279 which runs through the southwest section, (2) a small housing community approximately 0.5 miles to the northwest, and (3) Interstate 40 approximately 5.5 miles to the south.

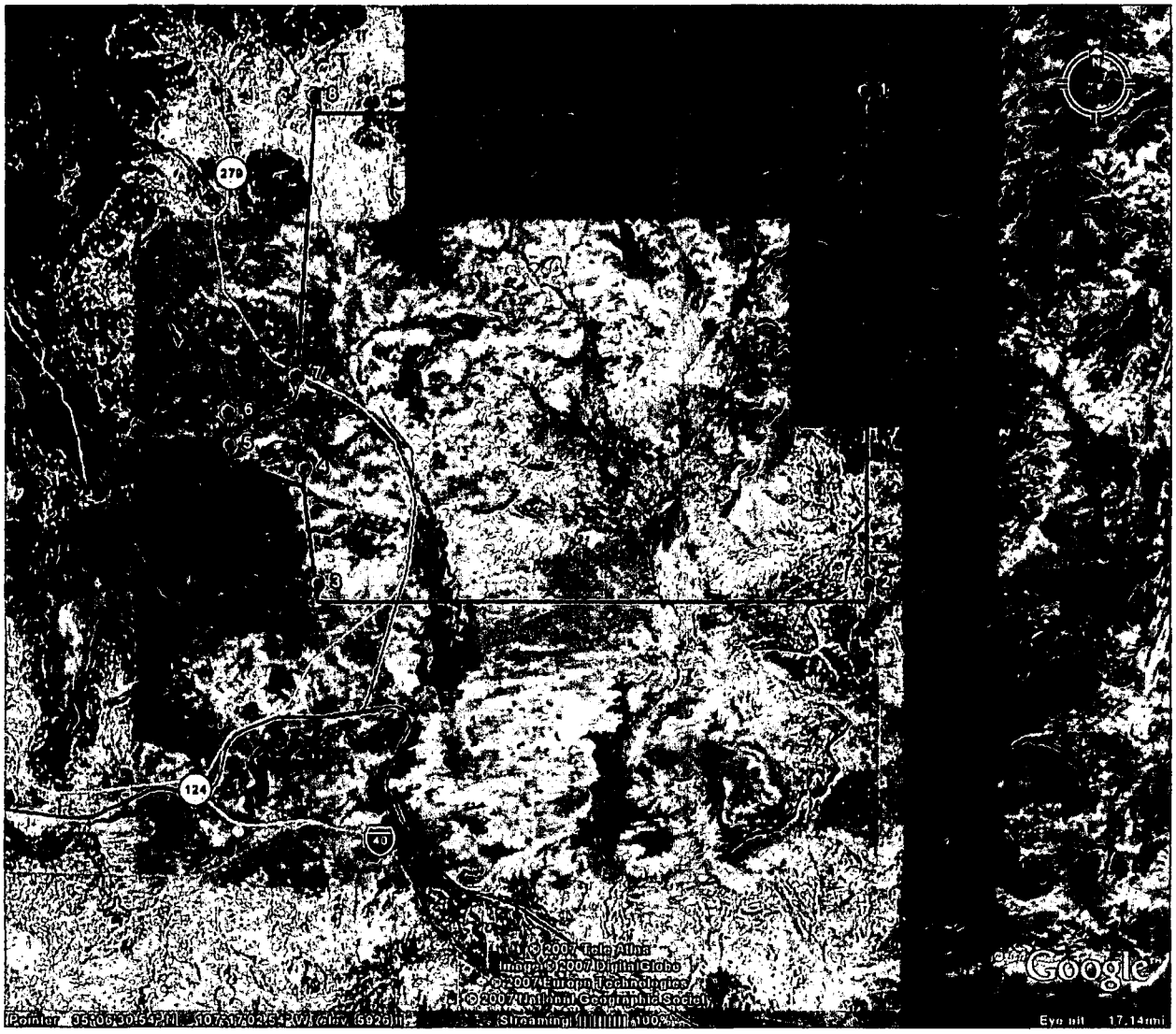


Figure1. Boundary for Flight Operations

b. Flight test area. The containment area is in Class G airspace. **The aircraft shall not be flown above an altitude of 400 ft AGL.** The vertices points of the area are shown below:

Laguna Flight Test Area

WPT	Latitude	Longitude	(Leg) Distance
1	35°12'5.17"N	107°12'27.57"W	(1-2) ~7.732
2	35° 5'21.43"N	107°12'23.70"W	(2-3) ~8.710
3	35° 5'21.25"N	107°21'37.06"W	(3-4) ~1.833
4	35° 6'56.33"N	107°21'50.36"W	(4-5) ~1.230
5	35° 7'15.29"N	107°23'5.06"W	(5-6) ~0.466
6	35° 7'39.59"N	107°23'6.48"W	(6-7) ~1.207
7	35° 8'9.70"N	107°21'59.07"W	(7-8) ~4.440
8	35°12'1.02"N	107°21'39.65"W	(8-1) ~8.678

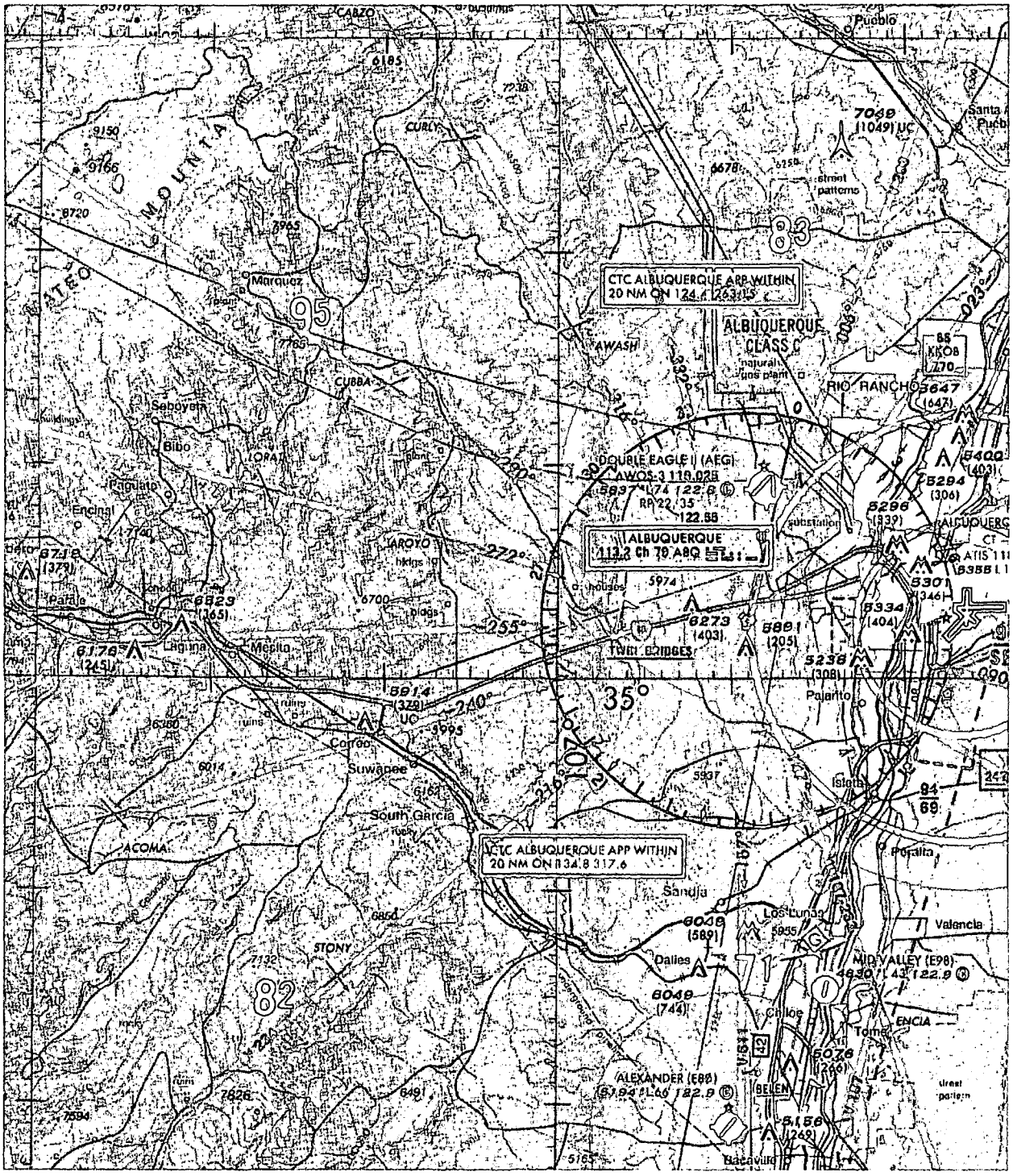


Figure 2. Aeronautical Chart of Albuquerque Area showing Test Site

c. Authorized flight times and conditions. All flight operations must be conducted during daylight hours under visual flight rules (VFR).

d. Criteria for remaining in the flight test area. The UAS PIC must ensure all UA flight operations remain within the lateral and vertical boundaries of the flight test area.

Furthermore, the UAS PIC must take into account all factors that may affect the capability of the UA to remain within the flight test area. This includes, but is not limited to, considerations for wind, gross weight, and glide distances.

e. Incident/accident reporting. Any incident/accident and any flight operation that transgresses the lateral or vertical boundaries of the flight test area or any restricted airspace must be reported to the FAA within 24 hours. This information must be reported to the Unmanned Aircraft Program Office, AIR-160. AIR-160 can be reached by telephone at 202-385-4636 and fax at 202-385-4641. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov. Further flight operations must not be conducted until the incident is reviewed by AIR-160 and authorization to resume operations is provided to Honeywell International.

5. UA Pilots and Observers.

a. UA PIC roles and responsibilities.

(1) The UA PIC must perform crew duties for only one UA at a time.

(2) All flight operations must have a designated UA PIC. The UA PIC has responsibility over each flight conducted and is accountable for the UA flight operation.

(3) The UA PIC is responsible for the safety of the UA as well as persons and property along the UA flight path. This includes, but is not limited to, collision avoidance and the safety of persons and property in the air and on the ground.

(4) The UA PIC must avoid densely populated areas (§ 91.319) and exercise increased vigilance when operating within or in the vicinity of published airway boundaries.

b. UA PIC certification and ratings requirements.

(1) The UA PIC must hold and be in possession of, at a minimum, an FAA private pilot certificate, with either an airplane, rotorcraft, or powered-lift category; and single or multiengine class ratings, appropriate to the type of UA being operated.

(2) The UA PIC must have, and be in possession of, a valid second-class airman medical certificate issued under 14 CFR part 67, Medical Standards and Certification.

c. UA PIC currency, flight review, and training.

(1) No person may act as pilot in command of an unmanned aircraft unless that person has made at least three takeoffs and three landings in manned aircraft within the preceding 90 days acting as the sole manipulator of the flight controls.

(2) The UA PIC must maintain currency in unmanned aircraft in accordance with Honeywell International company procedures.

(3) The UA PIC must have a flight review in manned aircraft every 24 calendar months in accordance with § 61.56, Flight review.

(4) The UA PIC must have a flight review in unmanned aircraft every 24 calendar months in accordance with Honeywell International procedures.

(5) All UA PICs must have successfully completed applicable Honeywell International training for the UAS.

d. Supplemental UA pilot roles and responsibilities.

(1) Any additional UA pilot(s) assigned to a crew station during UA flight operations will be considered a supplemental UA pilot.

(2) A supplemental UA pilot assists the PIC in the operation of the UA and may do so at the same or a different control station as the PIC. The UA PIC will have operational override capability over any supplemental UA pilots, regardless of position.

(3) A supplemental UA pilot must perform crew duties for only one UA at a time.

e. Supplemental UA pilot certification. The supplemental UA PIC need not be a certificated pilot, but must have successfully completed a recognized private pilot ground school program.

f. Supplemental UA pilot currency, flight review, and training.

(1) All UA pilots must maintain currency in unmanned aircraft in accordance with Honeywell International company procedures.

(2) All UA pilots must have a flight review in unmanned aircraft every 24 calendar months in accordance with Honeywell International procedures.

(3) All UA pilots must have successfully completed applicable Honeywell International training for the UAS.

g. Observer roles and responsibilities. The task of the observer is to provide the UA PIC(s) with instructions to maneuver the UA clear of any potential collision with other traffic. To satisfy these requirements:

(1) The observer must perform crew duties for only one UA at a time.

(2) At no time will the observer permit the UA to operate beyond the line-of-sight necessary to ensure maneuvering information can be reliably determined.

(3) At no time will the observer conduct his/her duties more than 2000 ft laterally or 400 ft vertically from the UA.

(4) An observer must maintain continuous visual contact with the UA to discern UA attitude and trajectory in relation to conflicting traffic.

(5) The 2000 ft lateral limit is the maximum range allowed and that a practical distance may be something less, with the determination of such at the discretion of the applicant. Therefore, it will remain the responsibility of the applicant to insure the safety of flight and adequate visual range coverage to mitigate any potential collisions.

(6) Observers must continually scan the airspace for other aircraft that pose a potential conflict.

(7) All flight operations conducted in the flight test area must have an observer to perform traffic avoidance and visual observation to fulfill the see-and-avoid requirement of § 91.113, Right-of-way rules: Except water operations.

h. Observer certification.

(1) All observers must either hold, at a minimum, an FAA private pilot license or must have successfully completed specific observer training acceptable to the FAA. An observer does not require currency as a pilot.

(2) All observers must have in their possession a second-class airman medical certificate issued under part 67.

i. Observer training.

(1) All observers must be thoroughly trained, be familiar with, and possess operational experience with the equipment being used. Such training is necessary for observation and detection of other aircraft for collision avoidance purposes as outlined in Honeywell International program letter.

(2) All observers must have successfully completed applicable Honeywell International training for the UAS.

6. Equipage. The UAS must be equipped with operable navigation, position, and/or strobe/anti-collision lights. Strobe/anti-collision lights must be illuminated during all operations.

7. Communications.

a. Before UA flights. Before conducting operations, the frequency spectrum used for operation and control of the UA must be approved by the Federal Communications Commission or other appropriate government oversight agency.

b. During UA flights.

(1) Appropriate air traffic frequencies must be monitored during flight operations.

(2) Honeywell International must contact the local Albuquerque Air Route Traffic Control Center (ARTCC), at (505)-856-4571 in the event of an aircraft fly-away that breaches the flight test area.

(3) All UA positions must maintain two-way communications with each other during all operations. If unable to maintain two-way communication, the UA PIC will expeditiously return the UA to its base of operations while remaining within the flight test area and conclude the flight operation.

8. Flight Conditions.

a. Daylight operations. All flight operations must be conducted during daylight hours in visual meteorological conditions (VMC), including cloud clearance minimums as specified in § 91.155, Basic VFR weather minimums. Flight operation in instrument meteorological conditions (IMC) is not permitted.

b. Prohibitions.

(1) The UA is prohibited from aerobatic flight, that is, an intentional maneuver involving an abrupt change in the UA's attitude, an abnormal acceleration, or other flight action not necessary for normal flight. (See § 91.303, Aerobatic flight.) If aerobatic flight is anticipated, it must be thoroughly discussed during the safety evaluation and be appropriately described in the operating limitations.

(2) Flight operations must not involve carrying hazardous material or the dropping of any objects or external stores.

(3) Each UA must be operated by only one control station at a time. A control station may not be used to operate multiple UAS.

c. Notice to airman. Honeywell International must request the issuance of a Notice to Airman (NOTAM) through the local FAA Automated Flight Service Station at least 24 hours before flight operation. The following information shall be provided:

(1) Name, address, and telephone number of the person giving notice.
(2) Nature of the activity.
(3) Date, time, and duration of the activity.
(4) Size of the affected area in nautical mile radius and affected altitudes.
(5) Location of center of affected area.
(6) Location of center of affected area in relation to nearest VOR/DME or VORTAC.

9. Flight Termination and Lost Link Procedures.

a. Flight termination. In accordance with Honeywell International program letter, dated 04/14/2009, flight operations must be discontinued at any point that safe operation of the UA cannot be maintained or if hazard to persons or property is imminent.

b. Lost link procedures. In the event of lost link, the UA must provide a means of automatic recovery that ensures airborne operations are predictable and that the UA remains within the flight test area. The observer and all other UAS controls stations, and the appropriate ATC facility will be immediately notified of the lost link condition and the expected UA response.

10. Maintenance and Inspection.

a. General requirements. The UAS must not be operated unless it is inspected and maintained in accordance with the Honeywell Maintenance Manual for Small Unmanned Aerial Systems (SUAS) Micro Air Vehicle (MAV) MMTM8532075-100, Rev. 2, dated 12/16/08, or later accepted FAA revision. Honeywell International must establish and maintain aircraft maintenance records (see paragraph 10(d) below).

b. Inspections. No person may operate this UAS within the preceding 12 calendar months unless it has had a condition inspection performed according to the FAA accepted Honeywell Maintenance Manual for Small Unmanned Aerial Systems (SUAS) Micro Air Vehicle (MAV) MMTM8532075-100. The UAS must also have been found to be in a condition for safe operation. This inspection will be recorded in the UAS maintenance records as described in paragraph 10(d) below.

c. Authorized inspectors. Only those individuals trained and authorized by Honeywell International and acceptable to the FAA may perform the inspections and maintenance required by these operating limitations.

d. Maintenance and inspection records. Maintenance and inspections of the UAS must be recorded in the UAS maintenance records. The following information must be recorded:

(1) Maintenance record entries must include a description of the work performed, the date of completion for the work, the UAS's total time-in-service, and the name and signature of the person performing the work.

(2) Inspection entries must contain the following, or a similarly worded, statement: *I certify that this UAS was inspected on (date), in accordance with the scope and detail of the (applicant name) Inspection and Maintenance Program, and was found to be in a condition for safe operation.*

(3) UAS instruments and equipment required to be installed must be inspected and maintained in accordance with the requirements of the Honeywell Maintenance Manual for Small Unmanned Aerial Systems (SUAS) Micro Air Vehicle (MAV) MMTM8532075-100. Any maintenance or inspection of this equipment must be recorded in the UAS maintenance records.

11. Information Reporting. Honeywell International will provide the following information to **donald.e.grampp@faa.gov** on a monthly basis. A copy of the report shall be provided to AIR-200.

a. Number of flights conducted under this certificate.

b. Pilot duty time per flight.

c. Unusual equipment malfunctions (hardware or software).

d. Deviations from ATC instructions.

e. Unintended entry into lost link flight mode that results in a course change.

12. Revisions and Other Provisions.

a. Experimental certificates, program letters, and operating limitations. The experimental certificate, FAA-accepted Honeywell International program letter, and operating limitations cannot be reissued, renewed, or revised without application being made to the Fort Worth Manufacturing Inspection District Office, in coordination with AIR-200. AIR-200 will be responsible for FAA Headquarters internal coordination with the Aircraft Certification Service, Flight Standards Service, Air Traffic Organization, Office of the Chief Council, and Office of Rulemaking.

b. Certificates of waiver or authorization. No Certificate of Waiver or Authorization (COA) may be issued in association with this experimental certificate unless coordinated with the Fort Worth MIDO and AIR-200.

c. Amendments and cancellations. The provisions and limitations annotated in this operational approval may be amended or cancelled at any time as deemed necessary by the FAA.

d. Reviews of revisions. All revisions to Honeywell International FAA-accepted Inspection and Maintenance Program must be reviewed and accepted by the Albuquerque Flight Standards District Office (FSDO). The Albuquerque FSDO can be reached at telephone number (505) 764-1200.

13. UAS Modifications.

a. Software and system changes. All software and system changes will be documented as part of the normal maintenance procedures and will be available for inspection. All software and system changes must be inspected and approved per the Honeywell Maintenance Manual for Small Unmanned Aerial Systems (SUAS) Micro Air Vehicle (MAV) MMTM8532075-100. All software changes to the aircraft and control station are categorized as major changes, and must be provided in summary form at the time they are incorporated.

b. Major modifications. All major modifications, whether performed under the experimental certificate, COA, or other authorizations, that could potentially affect the safe operation of the system, must be documented and provided to the FAA before operating the aircraft under this certificate. Major modifications incorporated under COA or other authorization need to be provided only if the aircraft is flown under these authorizations during the effective period of the experimental certificate.

c. Submission of modifications. All information requested must be provided to AIR-200.

End of Limitations

April 15, 2009
Issued at Albuquerque, NM

Carmen Alvarez
Aviation Safety Inspector (Mfg)
Fort Worth Manufacturing Inspection District
Office, MIDO-42
2601 Meacham Blvd.
Fort Worth, Texas 76137

I certify that I have read and understand the operating limitations and conditions that are a part of the special airworthiness certificate, FAA Form 8130-7, issued on April 15, 2009, for the purposes of research and development or market survey or crew training.

This special airworthiness certificate is issued for Honeywell International gMAV, serial number 07020323, registration number N220AW.

Applicant (signature) Date: 4/15/09

Name: Vaughn Fulton
Title: Honeywell Unmanned Aerial Systems Program Manager
Company: Honeywell International

Carmen Alvarez
Manufacturing Inspection District Office
2601 Meacham Blvd
Ft. Worth, TX 76137-4298

Carmen,

I am returning the Special Airworthiness Certificate for N220AW per our conversation last week. Honeywell has transferred ownership of this vehicle to the Miami-Dade County Police Department in Miami, FL. I have also returned the registration certificate to the Civil Registry Office in Oklahoma City, OK.

Thanks
Ragon

Ragon

Honeywell

Honeywell International Inc
Honeywell Aerospace - Albuquerque
9201 San Mateo Blvd., N.E.
Albuquerque, New Mexico 87113-2227
505 828-5000

07 August 2009

Federal Aviation Administration
Manufacturing Inspection District Office
2601 Meacham Blvd
Ft. Worth, TX 76137-4298

Subject: Surrender of Operating Limitations for N220AW

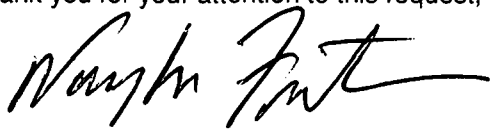
Attention: Carmen Alvarez, Aviation Safety Inspector

Honeywell International Inc, 9201 San Mateo Blvd. NE, Albuquerque, NM 87113, is returning the Operating Limitations and the Program Letter associated with N220AW. The Special Airworthiness Certificate – Experimental Category has previously been returned. This should complete the surrender of airworthiness documentation for N220AW.

Honeywell no longer requires an airworthiness certificate for this aircraft as ownership has been transferred to the Miami-Dade County Police Department in Miami, Florida. The registration certificate for N220AW has been returned to the Civil Registry Office in Oklahoma City, OK.

Please find enclosed the original Operating Limitations document and the Program Letter document. Should you need any additional information or if you have any questions, please contact Ragon Michael, FAA Liaison (505-828-5526).

Thank you for your attention to this request,



Vaughn Fulton PMP
Honeywell Unmanned Aerial Systems Program Manager
505-828-7895 (office)
505-307-8380 (cell)
vaughn.fulton@honeywell.com

Enclosure(s)
Operating Limitations N220AW
Program Letter N220AW

FAA FORM 8130-6, APPLICATION FOR U.S. AIRWORTHINESS CERTIFICATE

Form Approved O.M.B. No. 2120-0018
09/30/2007

U.S. Department of Transportation
Federal Aviation Administration

APPLICATION FOR U.S. AIRWORTHINESS CERTIFICATE

INSTRUCTIONS - Print or type. Do not write in shaded areas; these are for FAA use only. Submit original only to an authorized FAA Representative. If additional space is required, use attachment. For special flight permits complete Sections II, VI and VII as applicable.

I. AIRCRAFT DESIGNATION

1. REGISTRATION MARK	2. AIRCRAFT BUILDER'S NAME (Make)	3. AIRCRAFT MODEL DESIGNATION	4. YR. MFR.	FAA CODING
N220AW	Honeywell International	gMAV	2007	
5. AIRCRAFT SERIAL NO.	**6. ENGINE BUILDER'S NAME (Make)**	**7. ENGINE MODEL DESIGNATION**		
07020323	3W	3W56iB2-CS		
8. NUMBER OF ENGINES	**9. PROPELLER BUILDER'S NAME (Make)**	**10. PROPELLER MODEL DESIGNATION**	**11. AIRCRAFT IS (Check if applicable)**	
1	AAI	38573-4190-1		IMPORT

II. CERTIFICATION REQUESTED

APPLICATION IS HEREBY MADE FOR: (Check applicable items)

A	1		STANDARD AIRWORTHINESS CERTIFICATE (Indicate Category)		NORMAL		UTILITY		ACROBATIC		TRANSPORT		COMMUTER		BALLOON		OTHER	
B		✓	SPECIAL AIRWORTHINESS CERTIFICATE (Check appropriate items)	Unmanned Aircraft														
	7		PRIMARY															
	9		LIGHT-SPORT (Indicate Class)		AIRPLANE		POWER-PARACHUTE		WEIGHT-SHIFT-CONTROL		GLIDER		LIGHTER THAN AIR					
	2		LIMITED															
	5		PROVISIONAL (Indicate Class)	1		CLASS I												
				2		CLASS II												
	3		RESTRICTED (Indicate operation(s) to be conducted)	1		AGRICULTURE AND PEST CONTROL		2		AERIAL SURVEY		3		AERIAL ADVERTISING				
				4		FOREST (Wildlife Conservation)		5		PATROLLING		6		WEATHER CONTROL				
				0		OTHER (Specify)												
	4	✓	EXPERIMENTAL (Indicate operation(s) to be conducted)	1	✓	RESEARCH AND DEVELOPMENT		2		AMATEUR BUILT		3		EXHIBITION				
				4		AIR RACING		5	✓	CREW TRAINING		6	✓	MARKET SURVEY				
				0		TO SHOW COMPLIANCE WITH THE CFR		7		OPERATING (Primary Category) KIT BUILT AIRCRAFT								
				8		OPERATING LIGHT-SPORT	8A		Existing Aircraft without an airworthiness certificate & do not meet § 103.1									
							8B		Operating Light-Sport Kit-Built									
							8C		Operating light-sport previously issued special light-sport category airworthiness certificate under § 21.190									
	8		SPECIAL FLIGHT PERMIT (Indicate operation(s) to be conducted, then complete Section VI or VII as applicable on reverse side)	1		FERRY FLIGHT FOR REPAIRS, ALTERATIONS, MAINTENANCE, OR STORAGE												
				2		EVACUATION FROM AREA OF IMPENDING DANGER												
				3		OPERATION IN EXCESS OF MAXIMUM CERTIFICATED TAKE-OFF WEIGHT												
				4		DELIVERING OR EXPORTING		5		PRODUCTION FLIGHT TESTING								
				6		CUSTOMER DEMONSTRATION FLIGHTS												
C	6		MULTIPLE AIRWORTHINESS CERTIFICATE (check ABOVE "Restricted Operation" and "Standard" or "Limited" as applicable)															

III. OWNER'S CERTIFICATION

A. REGISTERED OWNER (As shown on certificate of aircraft registration) — IF DEALER, CHECK HERE →

NAME	ADDRESS
Honeywell International	9201 San Mateo Blvd NE Albuquerque, NM 87113-2227

B. AIRCRAFT CERTIFICATION BASIS (Check applicable blocks and complete items as indicated)

	AIRCRAFT SPECIFICATION OR TYPE CERTIFICATE DATA SHEET (Give No. and Revision No.) N/A		AIRWORTHINESS DIRECTIVES (Check if all applicable AD's are complied with and give the number of the last AD SUPPLEMENT available in the biweekly series as of the date of application) Bi-Weekly 2009-08, dated 13 April 2009
	AIRCRAFT LISTING (Give page number(s)) N/A		SUPPLEMENTAL TYPE CERTIFICATE (List number of each STC incorporated) N/A

C. AIRCRAFT OPERATION AND MAINTENANCE RECORDS

CHECK IF RECORDS IN COMPLIANCE WITH 14 CFR Section 91.417	TOTAL AIRFRAME HOURS	3	EXPERIMENTAL ONLY (Enter hours flown since last certificate issued or renewed)
	15.5 hours		0

D. CERTIFICATION - I hereby certify that I am the registered owner (or his agent) of the aircraft described above, that the aircraft is registered with the Federal Aviation Administration in accordance with Title 49 of the United States Code 44101 et seq. and applicable Federal Aviation Regulations, and that the aircraft has been inspected and is airworthy and eligible for the airworthiness certificate requested.

DATE OF APPLICATION	NAME AND TITLE (Print or type)	SIGNATURE
14 April 2009	Vaughn Fulton, Senior Program Manager UAS	Vaughn Fulton 4/14/09

IV. INSPECTION AGENCY VERIFICATION

A. THE AIRCRAFT DESCRIBED ABOVE HAS BEEN INSPECTED AND FOUND AIRWORTHY BY: (Complete the section only if 14 CFR part 21.183(d) applies.

2	14 CFR part 121 CERTIFICATE HOLDER (Give Certificate No.)	3	CERTIFICATED MECHANIC (Give Certificate No.)	6	CERTIFICATED REPAIR STATION (Give Certificate No.)
5	AIRCRAFT MANUFACTURER (Give name or firm)				

DATE	TITLE	SIGNATURE

V. FAA REPRESENTATIVE CERTIFICATION

(Check ALL applicable block items A and B)

A. I find that the aircraft described in Section I or VII meets requirements for — ✓ THE CERTIFICATE REQUESTED; 4 AMENDMENT OR MODIFICATION OF CURRENT AIRWORTHINESS CERTIFICATE

B. Inspection for a special permit under Section VII was conducted by: FAA INSPECTOR; FAA DESIGNEE; CERTIFICATE HOLDER UNDER; 14 CFR part 65; 14 CFR part 121 OR 135; 14 CFR part 145

DATE	DISTRICT OFFICE	4	DESIGNEE'S SIGNATURE AND NO.	1	FAA INSPECTOR'S SIGNATURE
4-15-09	SW-MIDO-42				Carmen Alvarez

VI. PRODUCTION FLIGHT TESTING

A. MANUFACTURER

NAME	ADDRESS

B. PRODUCTION BASIS *(Check applicable item)*

- ☐ PRODUCTION CERTIFICATE *(Give production certificate number)* →
- ☐ TYPE CERTIFICATE ONLY
- ☐ APPROVED PRODUCTION INSPECTION SYSTEM

C. GIVE QUANTITY OF CERTIFICATES REQUIRED FOR OPERATING NEEDS

DATE OF APPLICATION	NAME AND TITLE *(Print or Type)*	SIGNATURE

VII. SPECIAL FLIGHT PERMIT PURPOSES OTHER THAN PRODUCTION FLIGHT TEST

A. DESCRIPTION OF AIRCRAFT

REGISTERED OWNER	ADDRESS
BUILDER *(Make)*	**MODEL**
SERIAL NUMBER	**REGISTRATION MARK**

B. DESCRIPTION OF FLIGHT — CUSTOMER DEMONSTRATION FLIGHTS ☐ *(Check if applicable)*

FROM	TO	
VIA	**DEPARTURE DATE**	**DURATION**

C. CREW REQUIRED TO OPERATE THE AIRCRAFT AND ITS EQUIPMENT

☐ PILOT ☐ CO-PILOT ☐ FLIGHT ENGINEER ☐ OTHER *(Specify)*

D. THE AIRCRAFT DOES NOT MEET THE APPLICABLE AIRWORTHINESS REQUIREMENTS AS FOLLOWS:

E. THE FOLLOWING RESTRICTIONS ARE CONSIDERED NECESSARY FOR SAFE OPERATION: *(Use attachment if necessary)*

F. CERTIFICATION – I hereby certify that I am the registered owner (or his agent) of the aircraft described above; that the aircraft is registered with the Federal Aviation Administration in accordance with Title 49 of the United States Code 44101 et seq. and applicable Federal Aviation Regulations; and that the aircraft has been inspected and is safe for the flight described.

DATE	NAME AND TITLE *(Print or Type)*	SIGNATURE

VIII. AIRWORTHINESS DOCUMENTATION (FAA/DESIGNEE use only)

✓	A. Operating Limitations and Markings in Compliance with 14 CFR Section 91.9, as applicable.		G. Statement of Conformity, FAA Form 8130-9 *(Attach when required)*
✓	B. Current Operating Limitations Attached		H. Foreign Airworthiness Certification for Import Aircraft *(Attach when required)*
✓	C. Data, Drawings, Photographs, etc. *(Attach when required)*		I. Previous Airworthiness Certificate Issued in Accordance with 14 CFR Section _____ CAR _____ (Original Attached)
✓	D. Current Weight and Balance information Available in Aircraft		
CA ✗	E. Major Repair and Alteration, FAA Form 337 *(Attach when required)*	✓	J. Current Airworthiness Certificate Issued in Accordance with 14 CFR Section 21.191(a)(c)(d)(e) *(Copy Attached)*
✓	F. This inspection Recorded in Aircraft Records		K. Light-Sport Aircraft Statement of Compliance, FAA Form 8130-15 *(Attach when required)*

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION - FEDERAL AVIATION ADMINISTRATION

SPECIAL AIRWORTHINESS CERTIFICATE

A	CATEGORY/DESIGNATION	EXPERIMENTAL (UNMANNED AIRCRAFT)		
	PURPOSE	RESEARCH AND DEVELOPMENT OR MARKET SURVEY OR CREW TRAINING		
B	MANU-FACTURER	NAME	N/A	
		ADDRESS	N/A	
C	FLIGHT	FROM	N/A	
		TO	N/A	
D	N- 220AW		SERIAL NO.	07020323
	BUILDER	HONEYWELL INTERNATIONAL	MODEL	gMAV
E	DATE OF ISSUANCE	04/15/09	EXPIRY	04/14/10
	OPERATING LIMITATIONS DATED	04/15/09	ARE PART OF THIS CERTIFICATE	
	SIGNATURE OF FAA REPRESENTATIVE CARMEN ALVAREZ		DESIGNATION OR OFFICE NO. SW MIDO-42	

Any alteration, reproduction or misuse of this certificate may be punishable by a fine not exceeding $1,000 or imprisonment not exceeding 3 years, or both. THIS CERTIFICATE MUST BE DISPLAYED IN THE AIRCRAFT IN ACCORDANCE WITH APPLICABLE TITLE 14, CODE OF FEDERAL REGULATIONS (CFR).

FAA Form 8130-7 (07/04) *SEE REVERSE SIDE* *NSN: 0052-00-693-4000*

A	This airworthiness certificate is issued under the authority of Public Law 104-6, 49 United States Code (USC) 44704 and Title 14 Code of Federal Regulations (CFR).
B	The airworthiness certificate authorizes the manufacturer named on the reverse side to conduct production fight tests, and only production flight tests, of aircraft registered in his name. No person may conduct production flight tests under this certificate: (1) Carrying persons or property for compensation or hire: and/or (2) Carrying persons not essential to the purpose of the flight.
C	This airworthiness certificate authorizes the flight specified on the reverse side for the purpose shown in Block A.
D	This airworthiness certificate certifies that as of the date of issuance, the aircraft to which issued has been inspected and found to meet the requirements of the applicable CFR. The aircraft does not meet the requirements of the applicable comprehensive and detailed airworthiness code as provided by Annex 8 to the Convention On International Civil Aviation. No person may operate the aircraft described on the reverse side: (1) except in accordance with the applicable CFR and in accordance with conditions and limitations which may be prescribed by the Administrator as part of this certificate; (2) over any foreign country without the special permission of that country.
E	Unless sooner surrendered, suspended, or revoked, this airworthiness certificate is effective for the duration and under the conditions prescribed in 14 CFR, Part 21, Section 21.181 or 21.217.

April 15, 2009

U.S. Department
of Transportation
Federal Aviation Administration

Southwest Region
Arkansas, Louisiana,
New Mexico, Oklahoma,
Texas

Manufacturing Inspection District Office
2601 Meacham Blvd., SW MIDO-42
Ft. Worth, Texas 76137-0182

COPY

Operating Limitations
Experimental: Research and Development, Market Survey, and/or Crew Training

Registered Owner Name:	**Aircraft Builder:**
Honeywell International	Honeywell International
Registered Owner Address:	**Year Manufactured:**
9201 San Mateo Blvd., NE	2007
Albuquerque, NM 87113-2227	**Aircraft Serial Number:**
Aircraft Description:	07020323
Micro Unmanned Air Vehicle	**Aircraft Model Designation:**
Aircraft Registration:	gMAV
N220AW	**Engine Model:**
	3W56iB2-CS

The following conditions and limitations apply to all unmanned aircraft system (UAS) flight operations for the Honeywell gMAV while operating in the National Airspace System (NAS).

1. General Information.

a. Integrated system. For the purposes of this special airworthiness certificate and operating limitations, the Honeywell gMAV operated by Honeywell International is considered to be an integrated system. The system is composed of the following:

(1) Honeywell gMAV, S/N 07020323

(2) UAS control station(s), fixed, mobile, or ground-based.

(3) Telemetry, launch, and recovery equipment.

(4) Communications and navigation equipment, including ground and/or airborne equipment used for command and control of the Honeywell gMAV UAS.

(5) Equipment on the ground and in the air used for communication with other members of the flight crew, observers, air traffic control (ATC), and other users of the NAS.

b. Compliance with 14 CFR part 61 (Certification: Pilots, Flight Instructors, and Ground Instructors) and part 91 (General Operating and Flight Rules). Unless otherwise specified in this document, the UA pilot-in-command (PIC) and Honeywell International must comply with all applicable sections and parts of 14 CFR including, but not limited to, parts 61 and 91.

c. Operational requirements.

(1) No person may operate this UAS for other than the purpose of research and development, market survey, and/or crew training, to accomplish the flight operations outlined in Honeywell International program letter dated 04/14/2009, which describes compliance with § 21.193(d), Experimental certificates: General, and has been made available to the UA PIC.

(2) This UAS must be operated in accordance with applicable air traffic and general operating rules of part 91 and all additional limitations herein prescribed under the provisions of § 91.319(i), Aircraft having experimental certificates: Operating limitations.

(3) Honeywell International must accumulate at least 50 flight hours under its experimental airworthiness certificate before customer crew training is permitted, in accordance with § 21.195(d), Experimental certificates: Aircraft to be used for market surveys, sales demonstrations, and customer crew training.

d. UA condition. The UA PIC must determine that the UA is in a condition for safe operation, and in a configuration appropriate for the purpose of the intended flight.

e. Multiple-purpose operations. When changing between operating purposes of a multiple purpose certificate, the operator must determine that the aircraft is in a condition for safe operation and appropriate for the purpose intended. A record entry will be made by an appropriately rated person (that is, an individual authorized by the applicant and acceptable to the FAA) to document that finding in the maintenance records.

f. Operation exceptions. No person may operate this UA to carry property for compensation or hire (§ 91.319(a)(2)).

g. UA markings.

(1) This UA must be marked with its U.S. registration number in accordance with part 45 or alternative marking approval issued by the FAA Production and Airworthiness Division (AIR-200).

(2) This UA must display the word *Experimental* in accordance with § 45.23(b), Display of marks, unless otherwise granted an exemption from this requirement.

h. Required documentation. Prior to conducting the initial gMAV flight operations, Honeywell International must forward a copy of the gMAV Special Airworthiness Certificate, Operating Limitations and Program Letter to the following FAA personnel:

(1) Mr. Roger Trevino, System Support Specialist, FAA Central Service Area, System Support Group, AJO2-C2, email: roger.trevino@faa.gov, fax: 817-222-5547.

(2) Richard Posey, Aviation Safety Inspector, Production and Airworthiness Division, AIR-200, 950 L'Enfant Plaza SW, 5th Floor, Suite 500, Washington, DC 20024, telephone (202) 385-6378, email richard.posey@faa.gov.

i. Change in registrant address. Section 47.45, Change of address, requires that the FAA Aircraft Registry be notified within 30 days of any change in the aircraft registrant's address. Such notification is to be made by providing AC Form 8050-1, Aircraft Registration Application, to the FAA Aircraft Registration Branch (AFS-750) in Oklahoma City, Oklahoma.

j. Certificate display and manual availability. The airworthiness and registration certificates must be displayed, and the aircraft flight manual must be available to the pilot, as prescribed by the applicable sections of 14 CFR, or as prescribed by an exemption granted in accordance with 14 CFR part 11, General Rulemaking Procedures, to Honeywell International.

2. Program Letter. The Honeywell International gMAV program letter, dated 04/14/2009, will be used as a basis for determining the operating limitations prescribed in this document. All flight operations must be conducted in accordance with the provisions of this document.

3. Initial Flight Testing.

a. Requirements. Flight operations must be conducted within visual line of sight of the pilot/observer. Initial flight-testing must be completed upon accumulation of 50 flight hours. Following satisfactory completion of initial flight testing, the operations manager or chief pilot must certify in the records that the aircraft has been shown to comply with § 91.319(b). Compliance with § 91.319(b) must be recorded in the aircraft records with the following, or a similarly worded, statement:

> "I certify that the prescribed flight test hours have been completed and the aircraft is controllable throughout its normal range of speeds and throughout all maneuvers to be executed, has no hazardous operating characteristics or design features, and is safe for operation."

b. Aircraft operations for the purpose of market surveys, sales demonstrations, and customer crew training. These operations cannot be performed until 50 flight hours have been accomplished. An entry in the maintenance records is required as evidence of compliance.

4. Authorized Flight Operations Area.

a. Description of the authorized flight operations area. The containment area for flight test will be on the property of the Laguna Pueblo, New Mexico. This area is approximately 60 miles west of the Honeywell International facility. It is a remote, desert terrain area with restricted access controlled by the government of the Laguna Pueblo. The attached map shows the layout and the operational area. Population areas near the site are (1) State Hwy 279 which runs through the southwest section, (2) a small housing community approximately 0.5 miles to the northwest, and (3) Interstate 40 approximately 5.5 miles to the south.

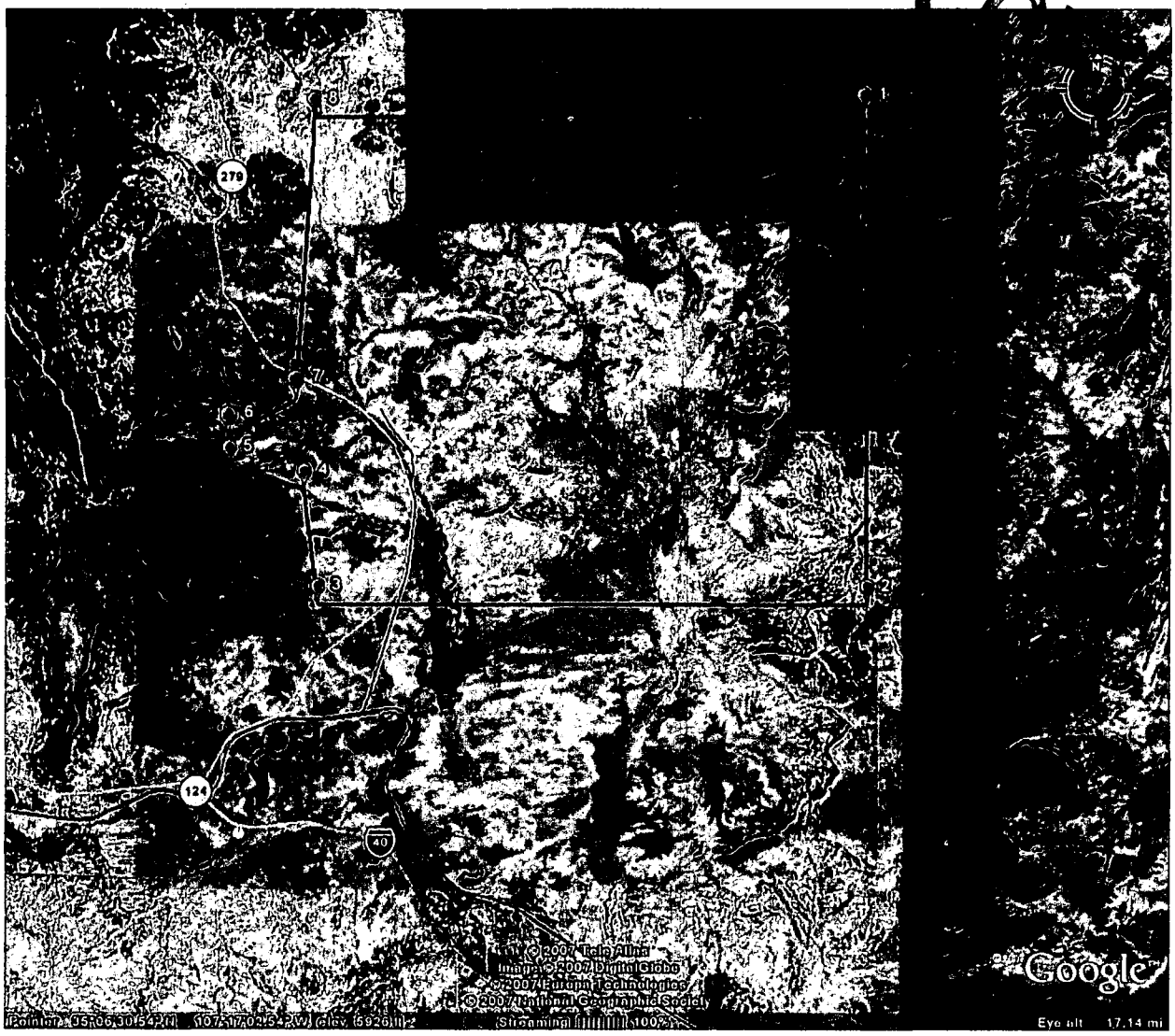


Figure1. Boundary for Flight Operations

b. Flight test area. The containment area is in Class G airspace. **The aircraft shall not be flown above an altitude of 400 ft AGL.** The vertices points of the area are shown below:

Laguna Flight Test Area

WPT	Latitude	Longitude	(Leg) Distance
1	35°12'5.17"N	107°12'27.57"W	(1-2) ~7.732
2	35° 5'21.43"N	107°12'23.70"W	(2-3) ~8.710
3	35° 5'21.25"N	107°21'37.06"W	(3-4) ~1.833
4	35° 6'56.33"N	107°21'50.36"W	(4-5) ~1.230
5	35° 7'15.29"N	107°23'5.06"W	(5-6) ~0.466
6	35° 7'39.59"N	107°23'6.48"W	(6-7) ~1.207
7	35° 8'9.70"N	107°21'59.07"W	(7-8) ~4.440
8	35°12'1.02"N	107°21'39.65"W	(8-1) ~8.678

Figure 2. Aeronautical Chart of Albuquerque Area showing Test Site

c. Authorized flight times and conditions. All flight operations must be conducted during daylight hours under visual flight rules (VFR).

d. Criteria for remaining in the flight test area. The UAS PIC must ensure all UA flight operations remain within the lateral and vertical boundaries of the flight test area.

Furthermore, the UAS PIC must take into account all factors that may affect the capability of the UA to remain within the flight test area. This includes, but is not limited to, considerations for wind, gross weight, and glide distances.

e. Incident/accident reporting. Any incident/accident and any flight operation that transgresses the lateral or vertical boundaries of the flight test area or any restricted airspace must be reported to the FAA within 24 hours. This information must be reported to the Unmanned Aircraft Program Office, AIR-160. AIR-160 can be reached by telephone at 202-385-4636 and fax at 202-385-4641. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov. Further flight operations must not be conducted until the incident is reviewed by AIR-160 and authorization to resume operations is provided to Honeywell International.

5. UA Pilots and Observers.

a. UA PIC roles and responsibilities.

(1) The UA PIC must perform crew duties for only one UA at a time.

(2) All flight operations must have a designated UA PIC. The UA PIC has responsibility over each flight conducted and is accountable for the UA flight operation.

(3) The UA PIC is responsible for the safety of the UA as well as persons and property along the UA flight path. This includes, but is not limited to, collision avoidance and the safety of persons and property in the air and on the ground.

(4) The UA PIC must avoid densely populated areas (§ 91.319) and exercise increased vigilance when operating within or in the vicinity of published airway boundaries.

b. UA PIC certification and ratings requirements.

(1) The UA PIC must hold and be in possession of, at a minimum, an FAA private pilot certificate, with either an airplane, rotorcraft, or powered-lift category; and single or multiengine class ratings, appropriate to the type of UA being operated.

(2) The UA PIC must have, and be in possession of, a valid second-class airman medical certificate issued under 14 CFR part 67, Medical Standards and Certification.

c. UA PIC currency, flight review, and training.

(1) No person may act as pilot in command of an unmanned aircraft unless that person has made at least three takeoffs and three landings in manned aircraft within the preceding 90 days acting as the sole manipulator of the flight controls.

(2) The UA PIC must maintain currency in unmanned aircraft in accordance with Honeywell International company procedures.

(3) The UA PIC must have a flight review in manned aircraft every 24 calendar months in accordance with § 61.56, Flight review.

(4) The UA PIC must have a flight review in unmanned aircraft every 24 calendar months in accordance with Honeywell International procedures.

(5) All UA PICs must have successfully completed applicable Honeywell International training for the UAS.

d. Supplemental UA pilot roles and responsibilities.

(1) Any additional UA pilot(s) assigned to a crew station during UA flight operations will be considered a supplemental UA pilot.

(2) A supplemental UA pilot assists the PIC in the operation of the UA and may do so at the same or a different control station as the PIC. The UA PIC will have operational override capability over any supplemental UA pilots, regardless of position.

(3) A supplemental UA pilot must perform crew duties for only one UA at a time.

e. Supplemental UA pilot certification. The supplemental UA PIC need not be a certificated pilot, but must have successfully completed a recognized private pilot ground school program.

f. Supplemental UA pilot currency, flight review, and training.

(1) All UA pilots must maintain currency in unmanned aircraft in accordance with Honeywell International company procedures.

(2) All UA pilots must have a flight review in unmanned aircraft every 24 calendar months in accordance with Honeywell International procedures.

(3) All UA pilots must have successfully completed applicable Honeywell International training for the UAS.

g. Observer roles and responsibilities. The task of the observer is to provide the UA PIC(s) with instructions to maneuver the UA clear of any potential collision with other traffic. To satisfy these requirements:

(1) The observer must perform crew duties for only one UA at a time.

(2) At no time will the observer permit the UA to operate beyond the line-of-sight necessary to ensure maneuvering information can be reliably determined.

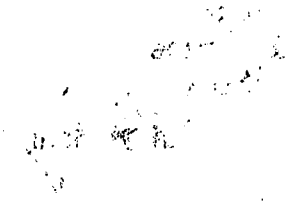
(3) At no time will the observer conduct his/her duties more than 2000 ft laterally or 400 ft vertically from the UA.

(4) An observer must maintain continuous visual contact with the UA to discern UA attitude and trajectory in relation to conflicting traffic.

(5) The 2000 ft lateral limit is the maximum range allowed and that a practical distance may be something less, with the determination of such at the discretion of the applicant. Therefore, it will remain the responsibility of the applicant to insure the safety of flight and adequate visual range coverage to mitigate any potential collisions.

(6) Observers must continually scan the airspace for other aircraft that pose a potential conflict.

(7) All flight operations conducted in the flight test area must have an observer to perform traffic avoidance and visual observation to fulfill the see-and-avoid requirement of § 91.113, Right-of-way rules: Except water operations.



h. Observer certification.

(1) All observers must either hold, at a minimum, an FAA private pilot license or must have successfully completed specific observer training acceptable to the FAA. An observer does not require currency as a pilot.

(2) All observers must have in their possession a second-class airman medical certificate issued under part 67.

i. Observer training.

(1) All observers must be thoroughly trained, be familiar with, and possess operational experience with the equipment being used. Such training is necessary for observation and detection of other aircraft for collision avoidance purposes as outlined in Honeywell International program letter.

(2) All observers must have successfully completed applicable Honeywell International training for the UAS.

6. Equipage. The UAS must be equipped with operable navigation, position, and/or strobe/anti-collision lights. Strobe/anti-collision lights must be illuminated during all operations.

7. Communications.

a. Before UA flights. Before conducting operations, the frequency spectrum used for operation and control of the UA must be approved by the Federal Communications Commission or other appropriate government oversight agency.

b. During UA flights.

(1) Appropriate air traffic frequencies must be monitored during flight operations.

(2) Honeywell International must contact the local Albuquerque Air Route Traffic Control Center (ARTCC), at (505)-856-4571 in the event of an aircraft fly-away that breaches the flight test area.

(3) All UA positions must maintain two-way communications with each other during all operations. If unable to maintain two-way communication, the UA PIC will expeditiously return the UA to its base of operations while remaining within the flight test area and conclude the flight operation.

8. Flight Conditions.

a. Daylight operations. All flight operations must be conducted during daylight hours in visual meteorological conditions (VMC), including cloud clearance minimums as specified in § 91.155, Basic VFR weather minimums. Flight operation in instrument meteorological conditions (IMC) is not permitted.

b. Prohibitions.

(1) The UA is prohibited from aerobatic flight, that is, an intentional maneuver involving an abrupt change in the UA's attitude, an abnormal acceleration, or other flight action not necessary for normal flight. (See § 91.303, Aerobatic flight.) If aerobatic flight is anticipated, it must be thoroughly discussed during the safety evaluation and be appropriately described in the operating limitations.

(2) Flight operations must not involve carrying hazardous material or the dropping of any objects or external stores.

(3) Each UA must be operated by only one control station at a time. A control station may not be used to operate multiple UAS.

c. Notice to airman. Honeywell International must request the issuance of a Notice to Airman (NOTAM) through the local FAA Automated Flight Service Station at least 24 hours before flight operation. The following information shall be provided:

(1) Name, address, and telephone number of the person giving notice.
(2) Nature of the activity.
(3) Date, time, and duration of the activity.
(4) Size of the affected area in nautical mile radius and affected altitudes.
(5) Location of center of affected area.
(6) Location of center of affected area in relation to nearest VOR/DME or VORTAC.

9. Flight Termination and Lost Link Procedures.

a. Flight termination. In accordance with Honeywell International program letter, dated 04/14/2009, flight operations must be discontinued at any point that safe operation of the UA cannot be maintained or if hazard to persons or property is imminent.

b. Lost link procedures. In the event of lost link, the UA must provide a means of automatic recovery that ensures airborne operations are predictable and that the UA remains within the flight test area. The observer and all other UAS controls stations, and the appropriate ATC facility will be immediately notified of the lost link condition and the expected UA response.

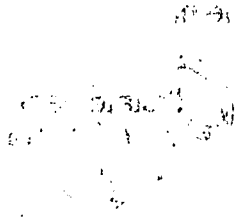
10. Maintenance and Inspection.

a. General requirements. The UAS must not be operated unless it is inspected and maintained in accordance with the Honeywell Maintenance Manual for Small Unmanned Aerial Systems (SUAS) Micro Air Vehicle (MAV) MMTM8532075-100, Rev. 2, dated 12/16/08, or later accepted FAA revision. Honeywell International must establish and maintain aircraft maintenance records (see paragraph 10(d) below).

b. Inspections. No person may operate this UAS within the preceding 12 calendar months unless it has had a condition inspection performed according to the FAA accepted Honeywell Maintenance Manual for Small Unmanned Aerial Systems (SUAS) Micro Air Vehicle (MAV) MMTM8532075-100. The UAS must also have been found to be in a condition for safe operation. This inspection will be recorded in the UAS maintenance records as described in paragraph 10(d) below.

c. Authorized inspectors. Only those individuals trained and authorized by Honeywell International and acceptable to the FAA may perform the inspections and maintenance required by these operating limitations.

d. Maintenance and inspection records. Maintenance and inspections of the UAS must be recorded in the UAS maintenance records. The following information must be recorded:



(1) Maintenance record entries must include a description of the work performed, the date of completion for the work, the UAS's total time-in-service, and the name and signature of the person performing the work.

(2) Inspection entries must contain the following, or a similarly worded, statement: *I certify that this UAS was inspected on (date), in accordance with the scope and detail of the (applicant name) Inspection and Maintenance Program, and was found to be in a condition for safe operation.*

(3) UAS instruments and equipment required to be installed must be inspected and maintained in accordance with the requirements of the Honeywell Maintenance Manual for Small Unmanned Aerial Systems (SUAS) Micro Air Vehicle (MAV) MMTM8532075-100. Any maintenance or inspection of this equipment must be recorded in the UAS maintenance records.

11. Information Reporting. Honeywell International will provide the following information to **donald.e.grampp@faa.gov** on a monthly basis. A copy of the report shall be provided to AIR-200.

a. Number of flights conducted under this certificate.

b. Pilot duty time per flight.

c. Unusual equipment malfunctions (hardware or software).

d. Deviations from ATC instructions.

e. Unintended entry into lost link flight mode that results in a course change.

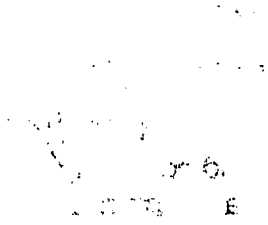
12. Revisions and Other Provisions.

a. Experimental certificates, program letters, and operating limitations. The experimental certificate, FAA-accepted Honeywell International program letter, and operating limitations cannot be reissued, renewed, or revised without application being made to the Fort Worth Manufacturing Inspection District Office, in coordination with AIR-200. AIR-200 will be responsible for FAA Headquarters internal coordination with the Aircraft Certification Service, Flight Standards Service, Air Traffic Organization, Office of the Chief Council, and Office of Rulemaking.

b. Certificates of waiver or authorization. No Certificate of Waiver or Authorization (COA) may be issued in association with this experimental certificate unless coordinated with the Fort Worth MIDO and AIR-200.

c. Amendments and cancellations. The provisions and limitations annotated in this operational approval may be amended or cancelled at any time as deemed necessary by the FAA.

d. Reviews of revisions. All revisions to Honeywell International FAA-accepted Inspection and Maintenance Program must be reviewed and accepted by the Albuquerque Flight Standards District Office (FSDO). The Albuquerque FSDO can be reached at telephone number (505) 764-1200.



13. UAS Modifications.

a. Software and system changes. All software and system changes will be documented as part of the normal maintenance procedures and will be available for inspection. All software and system changes must be inspected and approved per the Honeywell Maintenance Manual for Small Unmanned Aerial Systems (SUAS) Micro Air Vehicle (MAV) MMTM8532075-100. All software changes to the aircraft and control station are categorized as major changes, and must be provided in summary form at the time they are incorporated.

b. Major modifications. All major modifications, whether performed under the experimental certificate, COA, or other authorizations, that could potentially affect the safe operation of the system, must be documented and provided to the FAA before operating the aircraft under this certificate. Major modifications incorporated under COA or other authorization need to be provided only if the aircraft is flown under these authorizations during the effective period of the experimental certificate.

c. Submission of modifications. All information requested must be provided to AIR-200.

End of Limitations

April 15, 2009
Issued at Albuquerque, NM

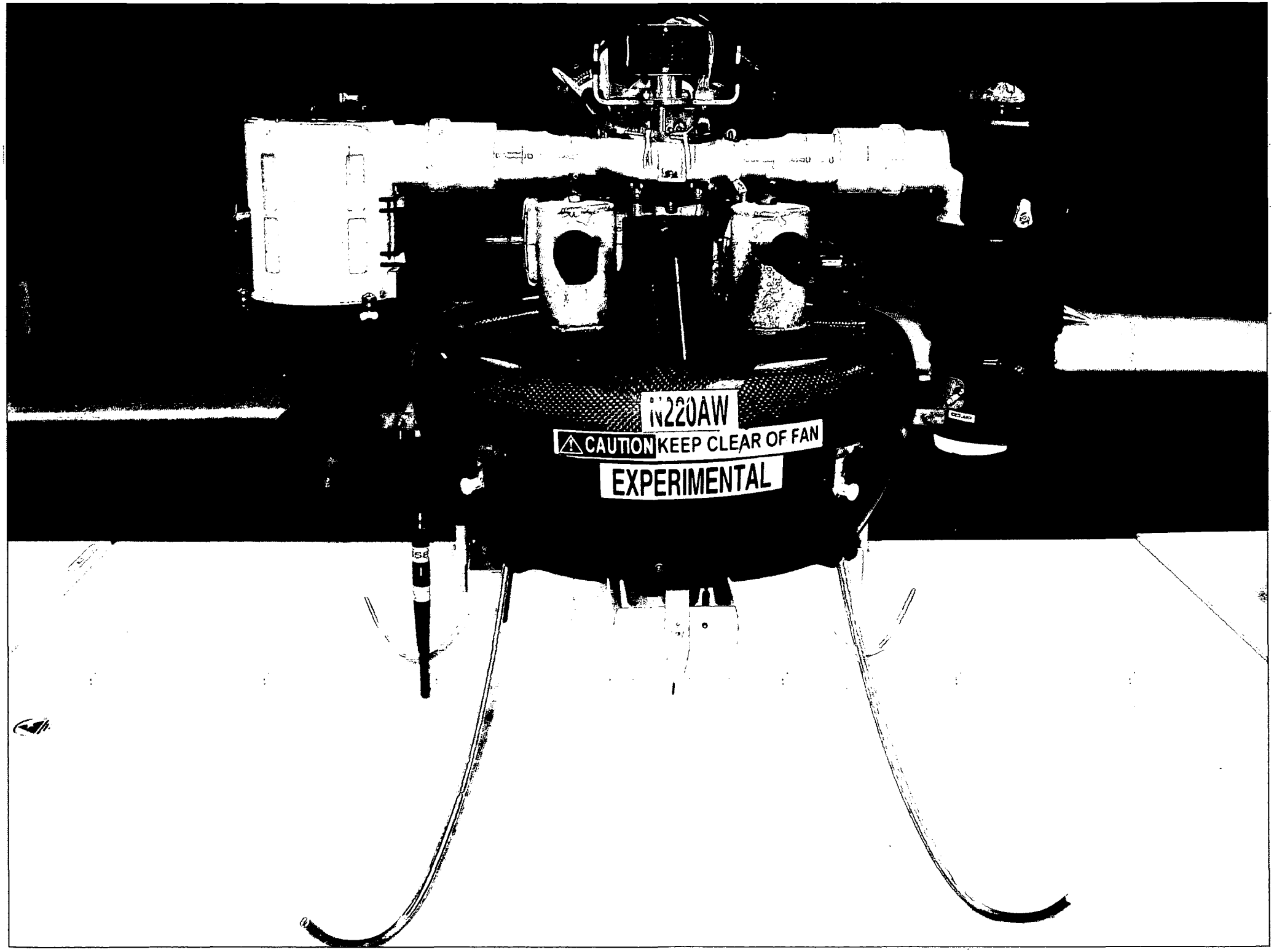
Carmen Alvarez
Aviation Safety Inspector (Mfg)
Fort Worth Manufacturing Inspection District
Office, MIDO-42
2601 Meacham Blvd.
Fort Worth, Texas 76137

I certify that I have read and understand the operating limitations and conditions that are a part of the special airworthiness certificate, FAA Form 8130-7, issued on April 15, 2009, for the purposes of research and development or market survey or crew training.

This special airworthiness certificate is issued for Honeywell International gMAV, serial number 07020323, registration number N220AW.

Applicant (signature) Date: 4/15/09

Name: Vaughn Fulton
Title: Honeywell Unmanned Aerial Systems Program Manager
Company: Honeywell International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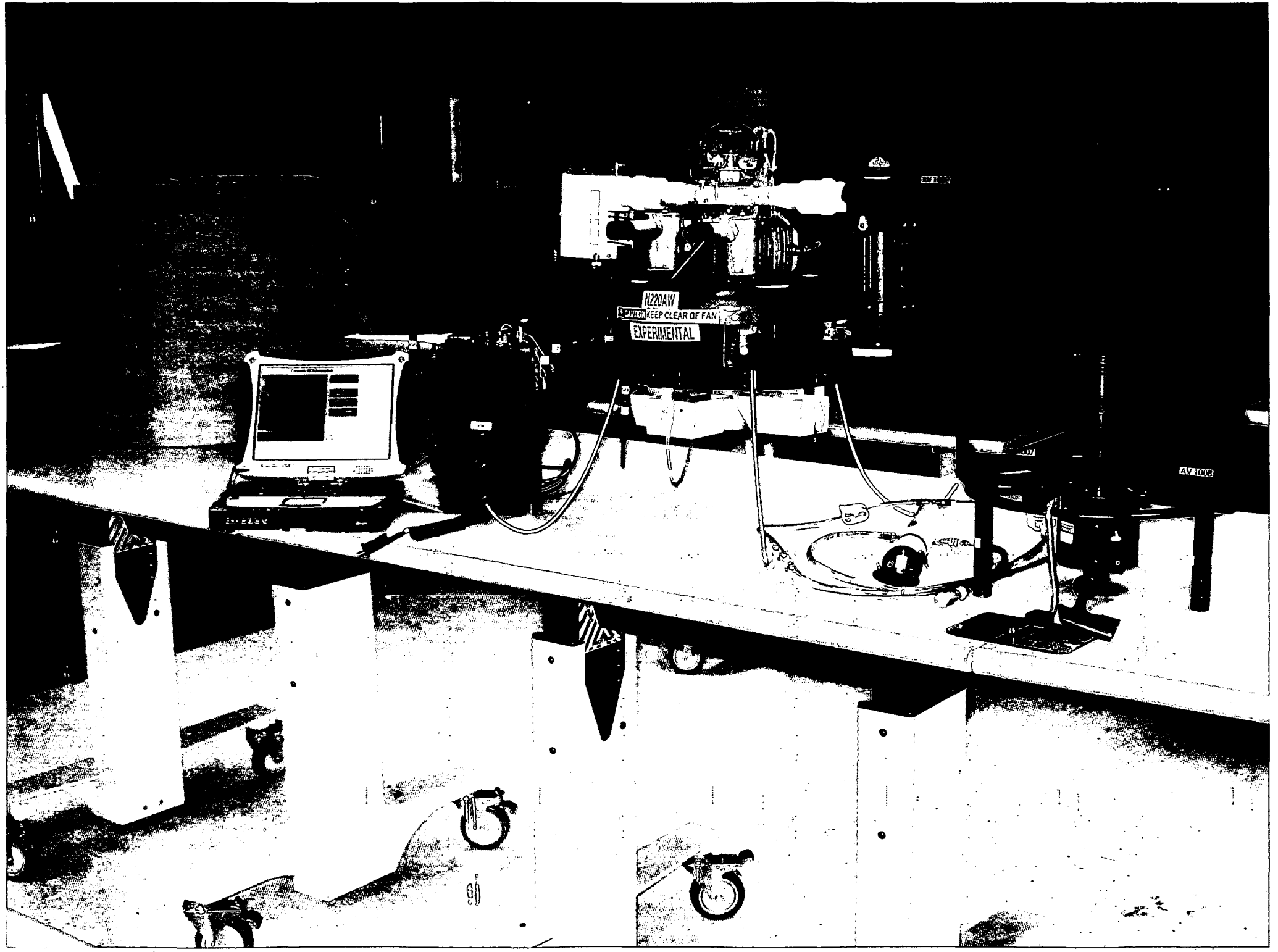
EXPERIMENTAL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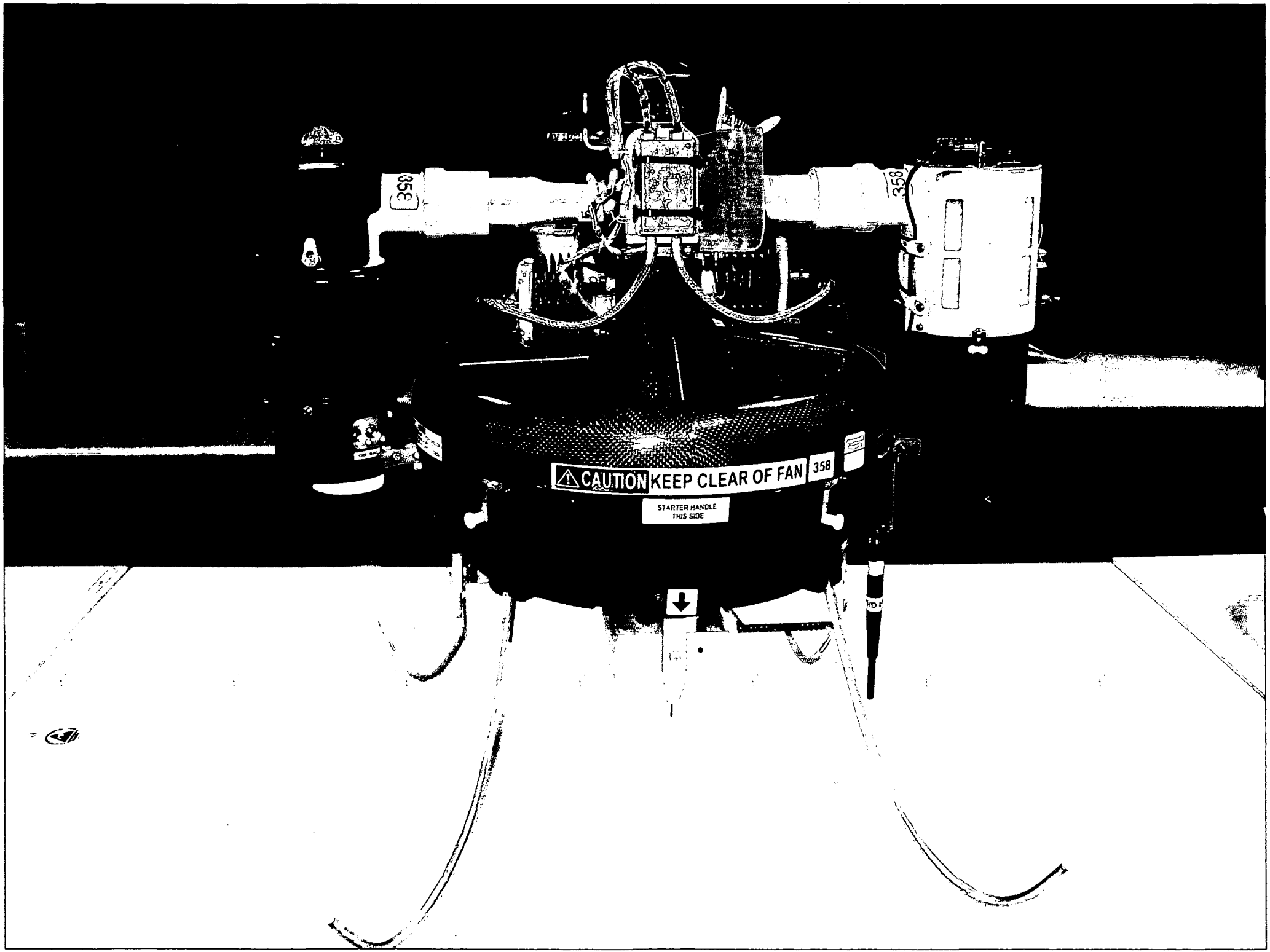
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REGISTRATION NOT TRANSFERABLE

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION - FEDERAL AVIATION ADMINISTRATION
CERTIFICATE OF AIRCRAFT REGISTRATION

This certificate must be in the aircraft when operated.

NATIONALITY AND REGISTRATION MARKS **N** 220AW

AIRCRAFT SERIAL NO. 07020323

MANUFACTURER AND MANUFACTURER'S DESIGNATION OF AIRCRAFT

HONEYWELL INTERNATIONAL GMAV
ICAO Aircraft Address Code: 50360426

ISSUED TO

HONEYWELL INTERNATIONAL
9201 SAN MATEO BLVD NE
ALBUQUERQUE NM 87113-2227

CORPORATION

This certificate is issued for registration purposes only and is not a certificate of title. The Federal Aviation Administration does not determine rights of ownership as between private persons.

It is certified that the above described aircraft has been entered on the register of the Federal Aviation Administration, United States of America, in accordance with the Convention on International Civil Aviation dated December 7, 1944, and with Title 49, United States Code, and regulations issued thereunder.

U.S. Department of Transportation
Federal Aviation Administration

DATE OF ISSUE
July 30, 2008

ACTING ADMINISTRATOR

AC Form 8050-3 (5/2008) Supersedes previous editions

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AC Form 8050-3 (5/2008) Supersedes previous editions 220AW

TO:
HONEYWELL INTERNATIONAL
9201 SAN MATEO BLVD NE
ALBUQUERQUE NM 87113-2227

Program Letter for Unmanned Aircraft Systems for an Experimental Certificate

Registered Owner Name: Honeywell International **Registered Owner Address:** 9201 San Mateo Blvd. NE Albuquerque, NM 87113-2227 **Aircraft Description:** Micro Unmanned Aerial Vehicle **gMAV Model** **Aircraft Registration:** N220AW	**Aircraft Builder:** Honeywell International **Year Manufactured:** 2007 **Aircraft Serial Number:** 07020323 **Aircraft Model Designation:** gMAV **Engine Model::** 3W56iB2-CS **Propeller Model:** AAI# 38573-4190-1 P/N for FAN

1. Overview of Project. The applicant must provide a general explanation and overview of the project, indicating any past flight history or experience for consideration. The applicant should provide enough detail for the FAA to understand the program's purpose and need for an experimental certificate for a UAS, including the following:

a. Definition of the experimental purpose. Provide a definition of the experimental purpose(s) under which the aircraft is to be operated (14 CFR § 21.191, Experimental certificates).

Honeywell International is seeking authorization for an experimental certificate under 14 CFR 21.191 (a) Research and Development, (c) Training of Applicant Flight Crews, and (f) Marketing Surveys.

b. Description of the purpose/scope of the experimental program. Provide a description of the purpose/scope of the experimental program for each experimental purpose sought (§ 21.193(b) and (d), Experimental certificates: General).

Honeywell International has previously been granted a Special Airworthiness Certificate-Experimental Category on another similar MAV vehicle. We have been operating that vehicle for the purposes described below since December 2007. Expansion of our operations to include additional vehicles provides capability to augment our current research and development, crew training, and market survey activities.

The application of small ducted fan vehicles provides new opportunities for surveillance and reconnaissance uses. Research and development to determine feasibility of lightweight components involving such areas as navigation, guidance, transponder and altitude reporting, sensors, control effectors, acoustics, gimbals, cameras, battery/generators and the like require flight testing in an air vehicle environment. Research and development activities also include evaluation of cooperative algorithms such as formation flight, search patterns, and communication relay algorithms. These operations include research and development on both hardware and software components.

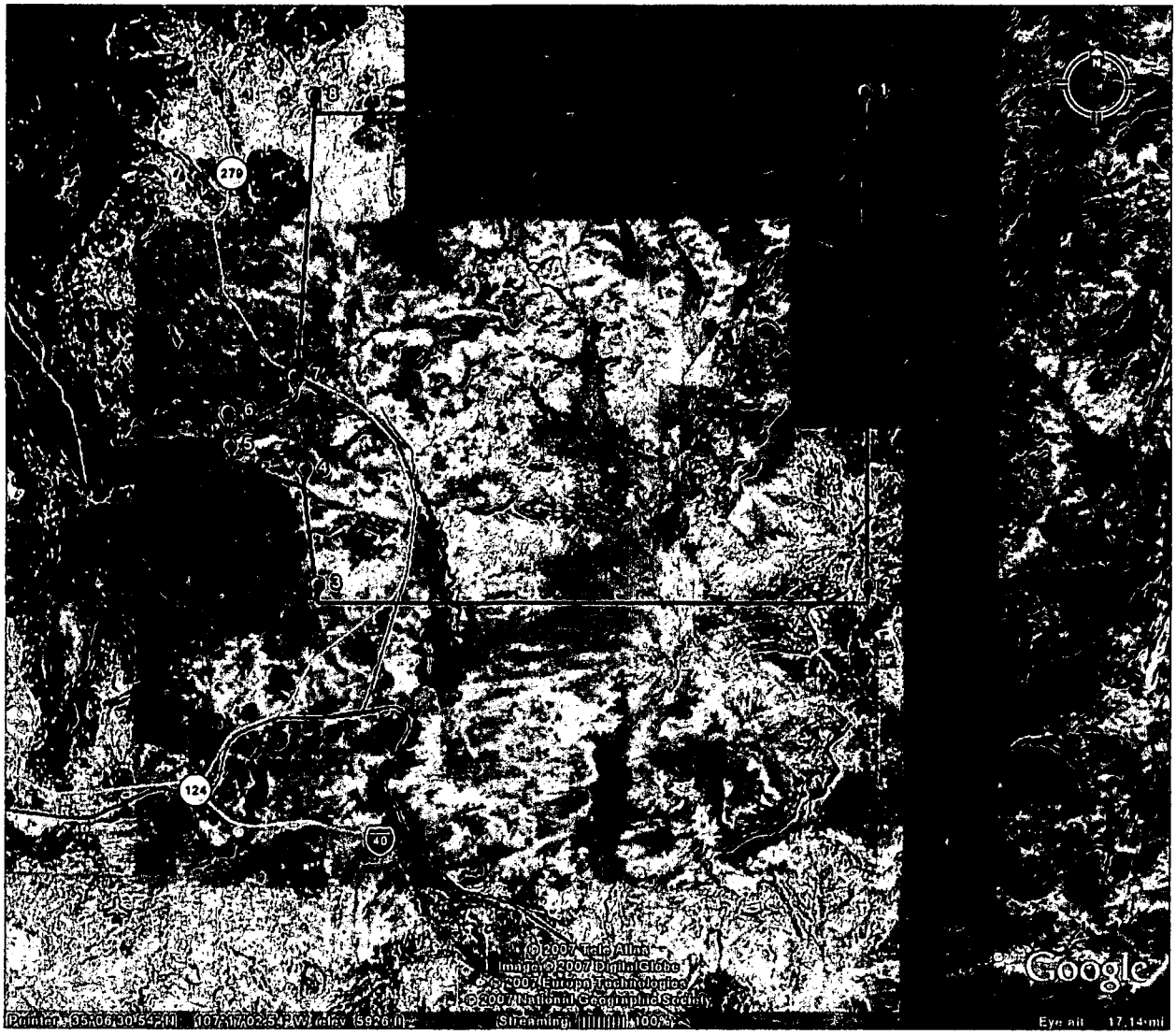
In addition, it is the purpose of our operation under this item to continue company and customer training in the operation and maintenance of the micro air vehicle system. This also provides the capability for Honeywell International to demonstrate the micro air vehicle system in an operational setting for potential customers and for suitability to their specific needs.

2. Definition of Flight Areas. Provide a definition of the area(s) in which the experimental flights will be conducted, including the following:

a. The areas over which the flights are to be conducted and the address of base operation (§ 21.193(d)(3)).

(a) The area for flight test is the same as currently authorized by our existing Operational Limitations for a previous vehicle. The area for flight test is located on the property of the Laguna Pueblo, New Mexico. This area is approximately 60 miles from the Honeywell facility. It is a remote, desert terrain area with access controlled by the government of the Laguna Pueblo. The attached Google map shows the layout and the operational area.

Population areas near the site are (1) State Hwy 279 which runs through the southwest section, (2) a small housing community approximately 0.5 miles to the northwest, and (3) Interstate 40 approximately 5.5 miles to the south.



` Boundary for Test Operations

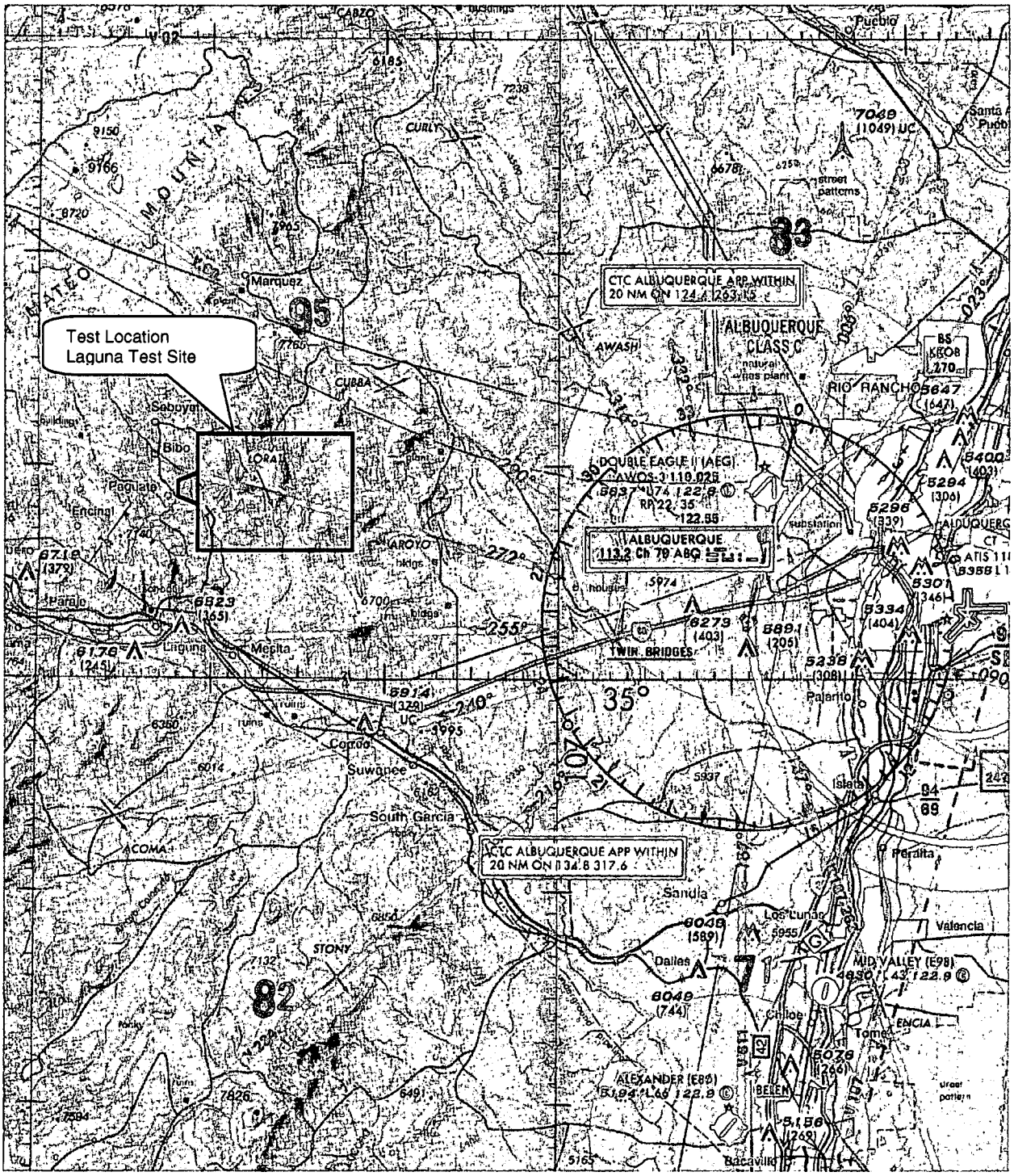
b. The proposed flight test area using latitude and longitude on an aeronautical chart or aerial photograph. For example, if the perimeter of the proposed flight test area is in the shape of a rectangle, the latitude and longitude of the corners must be stated. The distance of each leg of the perimeter must be stated.

(b) The operation area is in Class G airspace. The corner points of the area are shown below:

Laguna Flight Test Area

WPT	Latitude	Longitude	(Leg)	Distance
1	35°12'5.17"N	107°12'27.57"W	(1-2)	~7.732
2	35° 5'21.43"N	107°12'23.70"W	(2-3)	~8.710
3	35° 5'21.25"N	107°21'37.06"W	(3-4)	~1.833
4	35° 6'56.33"N	107°21'50.36"W	(4-5)	~1.230
5	35° 7'15.29"N	107°23'5.06"W	(5-6)	~0.466
6	35° 7'39.59"N	107°23'6.48"W	(6-7)	~1.207
7	35° 8'9.70"N	107°21'59.07"W	(7-8)	~4.440
8	35°12'1.02"N	107°21'39.65"W	(8-1)	~8.678

The following chart shows the location with respect to the Albuquerque metropolitan area and the Albuquerque International Sunport.



Aeronautical Chart of Albuquerque Area showing the Test Site

c. Airspeed, altitude, number of flight hours, number of flights, and program duration for each test flight area.

(c) The MAV can operate at a maximum airspeed of 50 knots (typical flight are 30 knots and below). The maximum altitude is limited in the airborne computer to be between 100 – 400 ft AGL. Maximum operating duration is approximately 40 minutes depending upon the existing density altitude. Accelerated operations could involve up to three vehicles, so total operational hours could be up to 8 hours and could occur up to 3 times per week. However, typical operations would be two flights per day, and typically 1 per week or 1 every two weeks.

d. Class of airspace to be used.

(d) The MAV operates in Class G airspace.

e. Whether minimum fuel requirements of 14 CFR § 91.151, Fuel requirements for flight in VFR conditions, will be met.

(e) No, minimum fuel requirements of 14 CFR § 91.151 will not be met. The MAV is a small unmanned vehicle and is only capable of holding approximately 2.5 lbs of fuel (~ 0.4 gal). Depending upon the engine power loading, the anticipated flight time is less than 1 hour.

f. Whether flight testing will include payload testing, if the operation is for flight testing.

(f) The MAV payload is a camera only. There are no jettisonable payloads.

g. Considerations that need to be taken into account regarding payloads.

(g) The MAV payload is a camera only. There are two separate camera payloads, each identical in weight and envelope dimensions, so that weight and cg are the same regardless of payload.

h. Whether the aircraft will perform any aerobatic maneuvers.

(h) No, the MAV will not perform any aerobatic maneuvers.

i. Flight conditions, for example, VFR and visual meteorological conditions (VMC).

(i) The MAV operations for the Laguna test site will be limited to daytime VFR.

3. Aircraft Configuration. Attach three-view drawings or three-view dimensioned photographs of the aircraft (see § 21.193(b)(4)). Describe UAS configuration, including the control station. Include a description of aircraft/system performance characteristics including the following:

a. Wing span.

(a) The MAV is a small ducted-fan design and does not have "traditional" wings. Its duct diameter is 11 inches inner diameter, and 13.5 inches outer diameter.

b. Length.

(b) The MAV height is 23 inches with landing legs installed.

c. Powerplant.

(c) The MAV powerplant is an air-cooled, 2 cylinder, 56cc gasoline engine rated at 4 horsepower. The engine vendor is 3W, located in Frankfurt, Germany.

d. Maximum gross takeoff weight.

(d) The max gross weight is 18.4 pounds. Empty weight is 15.8 pounds.

e. Fuel capacity.

(e) The MAV fuel capacity is 0.4 gallons (approximately 2.5 pounds).

f. Payload capacity.

(f) The MAV does not have jettisonable payloads. The payload consists of one (from a choice of two) interchangeable camera configurations. They are designed to be identical in weight so regardless of payload configuration, no changes are required for the control laws.

g. Maximum altitude.

(g) The MAV mission control program is initialized to limit operations to 400 ft AGL or less. The maximum operational altitude for the MAV is 9000 ft (density altitude).

h. Endurance.

(h) The MAV mission time is less than 1 hour (typically 40 minutes).

i. Maximum airspeed.

(i) The MAV maximum airspeed is 50 Knots (~72 KPH).

j. Control/data frequencies.

(j) See item 14 for specific frequency list.

For the ground control station,

Command/Control MicroHard Transmitter/Receiver ~ L-Band

Video Radio Receiver ~ L3 Communication (VNTXL-2A) 2.4 GHz

VHF handheld (tunable), direct to ATC

For the MAV,

Command/Control MicroHard Transmitter/Receiver ~ L-Band

Video Radio Transmitter ~ Microhard Systems Inc (MHX920) 920 MHz

For the Observers,

Handheld Com, direct to Pilot

During operations:

(1) Appropriate air traffic frequencies must be monitored during flight operations.

(2) Honeywell International must contact the local Albuquerque Air Route Traffic Control Center (ARTCC), at (505)-856-4571 in the event of an aircraft fly-away that breaches the flight test area.

(3) All UA positions must maintain two-way communications with each other during all operations. If unable to maintain two-way communication, the UA PIC will expeditiously return the UA to its base of operations while remaining within the flight test area and conclude the flight operation.

k. Guidance and navigation control.

(k) The navigation system for the MAV utilizes a GPS sensor along with a blended AHRS feature to provide navigation capability if GPS drops out. Flight profiles are uploaded prior to flight and the vehicle can autonomously navigate to the profile. There is also capability to manually override the autonomous control if necessary.

4 Initial Flight Testing

Honeywell International's flight operations shall be conducted within visual line of sight of the pilot/observer. Initial flight-testing must be completed upon completion of 50 flight hours before being used for customer demonstrations, market surveys, or customer crew training. Compliance with § 91.319(b) must be recorded in the aircraft records with the following, or a similarly worded, statement:

> "I certify that the prescribed flight test hours have been completed and the aircraft is controllable throughout its normal range of speeds and throughout all maneuvers to be executed, has no hazardous operating characteristics or design features, and is safe for operation."

5. Inspection and Maintenance (part 91, (General Operating and Flight Rules) subpart E, (Maintenance, Preventive Maintenance, and Alterations).

a. Description of the program. Describe the inspection and maintenance program that will be used to maintain the aircraft and related systems, including ground stations and/or other support systems.

(a) Honeywell's maintenance program is the same as reviewed with our previous experimental vehicle applications and accepted during December 2007 and July 2008. Per request, it also includes identification of required inspection intervals.

Honeywell's maintenance program is tailored for US Army guidelines. It consists of three basic portions: (1) field/operator level maintenance, (2) company/armorer level tasks, and (3) depot level tasks. Each level focuses on more detailed activities. At the field/operator level, basic tasks include inspection for obvious airframe/fan, engine, payload pod abnormalities. Since this level is aimed at the operator, tools are limited and only minor tasks are possible. These can include replacement of various items such as antennas, batteries, and payload pods. Major repair/maintenance must be performed at the depot (or laboratory) level. The company/armorer level is an in-between level where, depending upon the tools available, it may be possible to perform some disassembly and re-assembly. Honeywell's maintenance manual has been updated and is included as an attachment.

b. Required documentation. Provide a copy of the flight manual, if applicable; current weight and balance report; and equipment list.

(b) Honeywell's Operator's Manual is as dated July 2008 or later approved FAA revision.

Honeywell's operator's manual provides checklists for performing a flight. This includes set-up, pre-flight, flight planning, tuning, launch, flight, landing, trouble-shooting, and emergency procedures. Honeywell's operator's manual has been updated and is included as an attachment.

Weight and balance are preplanned and controlled by the payload pod configuration. Two payload pods are available, both are weight controlled and can only be attached in a know configuration. Consequently, the weight and balance for the vehicle is that same no matter which payload is selected.

6. Pilot Qualification (14 CFR §§ 61.3, Requirement for certificates, ratings, and authorizations, and 61.5, Certificates and ratings issued under this part).

a. Pilot qualifications. Describe the qualifications for each pilot.

(a) Honeywell's MAV training course has not been modified from the training program associated with our previous experimental application in July 2008. Honeywell's MAV training course does not impose prerequisite requirements on attending US military personnel. However, for operation under the Experimental

Certificate, Honeywell International intends to utilize current, qualified civil pilots as the PIC.

b. Pilot certifications. Pilots must be qualified/certificated in the appropriate category of aircraft, that is, rotorcraft, powered lift, and airplane.

(b) Honeywell's training class is specific to the MAV.

c. Pilot training. Describe the internal training program to qualify pilots.

(c) Honeywell's training class is a multi-day class that combines both classroom instruction and hands-on operations. The expectation is that each student will demonstrate sufficient knowledge and skill to pass the required exams and be certified by the instructor. The training class includes the following major sections:

- System and equipment overview
- System capabilities and limitations
- Pre-flight check-out
- Safety requirements
- Maintenance requirements
- Hands on activities

d. Qualifications and training of observers. Describe the qualifications and training of observers. Observer training is required for observers to communicate to the pilot any instructions required to remain clear of conflicting traffic. Acceptable observer training as a minimum must include, but is not limited to, knowledge about the following—

(1) The rules and responsibilities described in §§ 91.111 (Operating near other aircraft), 91.113 (Right-of-way rules: Except water operations), and 91.155 (Basic VFR weather minimums);

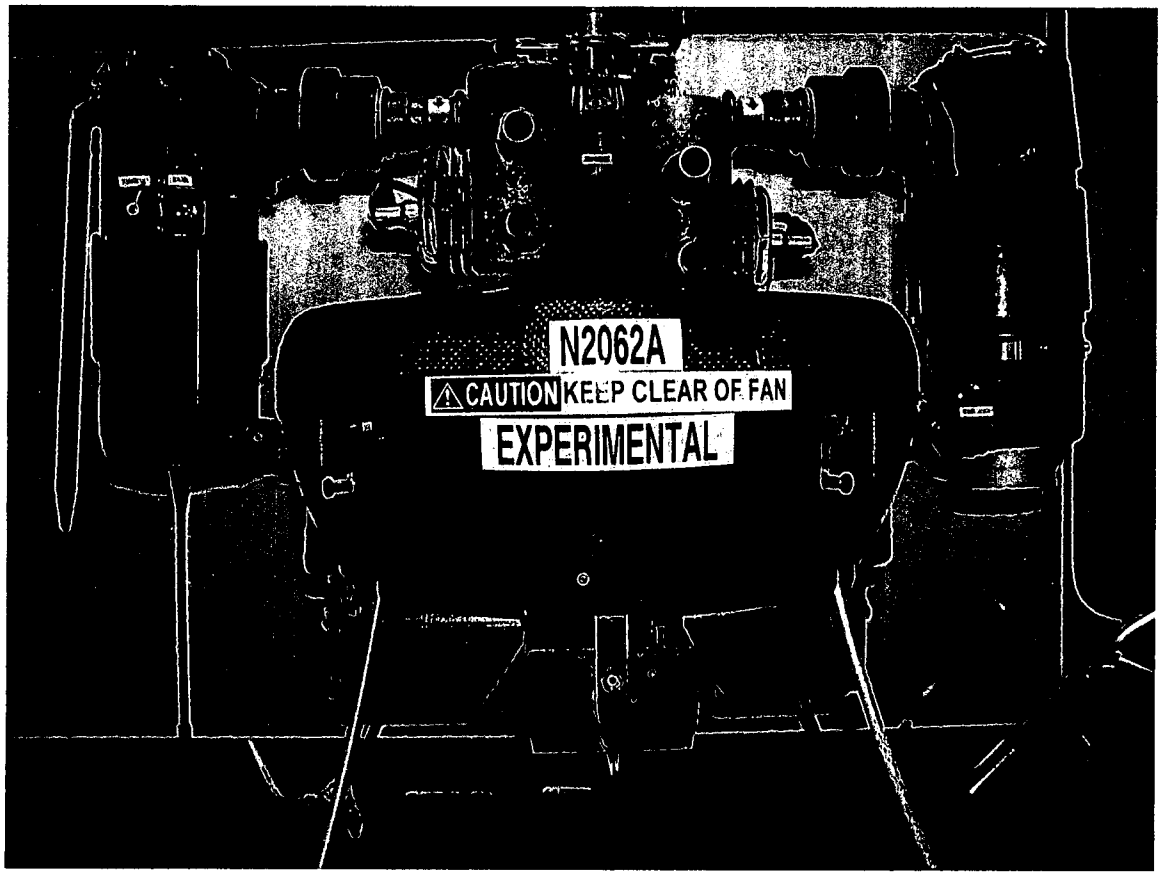
(2) Air traffic and radio communications, including the use of approved ATC/pilot phraseology; and

(3) Appropriate sections of the *Aeronautical Information Manual.*

(d) Honeywell's training for observers is described in section 12 of the training syllabus. It specifically includes scanning of the assigned airspace, air traffic and radio communications, and recognition of anomalous MAV flight behaviors. Honeywell's training class is focused on the pilot/operator, but includes all aspects of support to the flight team. This includes instruction applicable to observers such as communication protocol and scanning techniques.

7. Aircraft Registration and Identification Marking (14 CFR part 45). All UAS are required to be registered and identified with the registration number. Aircraft must be marked in accordance with part 45 or alternative marking approval issued by AIR-200.

(6) Under our previous application for experimental category, Honeywell petitioned the FAA administrator (AIR-200) for an alternate marking procedure. This alternate procedure was approved and the approval indicated it was applicable to all other vehicles of the same configuration. This approval allows for smaller size letters for the "Experimental" and "N" number identifications. This letter is kept with the airworthiness certificate. The approved alternate marking is shown in the following picture (although the picture is obsolete, it shows location of the markings). The registered number for this airworthiness certificate application is N220AW.



8. ATC Transponder and Altitude Reporting System Equipment and Use (§ 91.215, ATC transponder and altitude reporting equipment and use). Describe the aircraft altitude reporting system.

(7) The MAV does not have a transponder. The MAV does generate location and altitude data from its navigation system which uses GPS data and baro altitude as a cross-reference to the GPS altitude data. The communication downlink includes reporting of MAV lat-lon position and altitude to the ground control station. This data is available to be displayed on the pilot/operator's view pad. Alerts are also programmed for deviations from the planned flight path.

9. Method for See-and-Avoid (§ 91.113). Describe in what manner, or by what means, the requirement to see-and-avoid other aircraft will be met. Describe the expected performance of the chase plane.

(8) The MAV does not have an onboard transponder. See and Avoid operations relies on the use of ground observers in communication with the pilot-in-command to advise/warn of any approaching air traffic. Ground observers are positioned at vantage points that allow unobstructed views of the airspace along the predetermined flight path. Under our current Operating Limitations (07/31/08), these observers are positioned such that at no time will the MAV be more than 2000 feet from an observer. Observers are trained in scan techniques and in communication protocol with the pilot-in-command as part of the Honeywell training program.

10. Safety Risk Management. Provide a safety checklist that identifies and analyzes the hazards of UAS operations described in the program letter. (See a sample safety checklist in appendix C to this order.) Additional information is available by contacting the FAA Aviation Safety Inspector.

(9) The configuration of this vehicle is the same as that governed by our current Operating Limitations (07/31/08) and has the same identified potential hazards. The safety checklist provided with that application is also applicable to this vehicle. Per direction of AIR-160, the need to provide a separate safety checklist for this vehicle of the same configuration is waived.

11. System Configuration. Provide a description of the aircraft system configuration and all onboard and ground-based equipment.

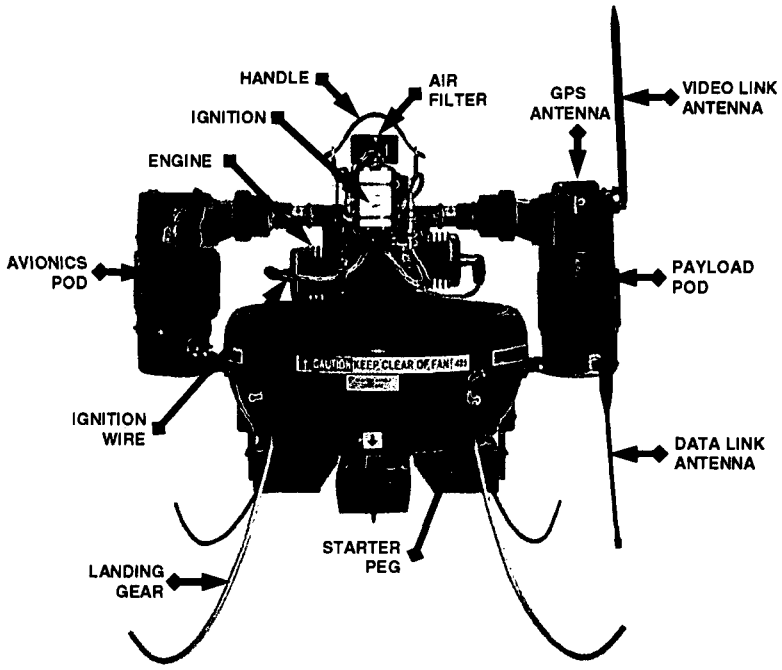
(10) The system is a backpackable gasoline powered lift-augmented ducted fan Vertical Take Off & Landing (VTOL) Air Vehicle (AV).

The system is comprised of the following components:

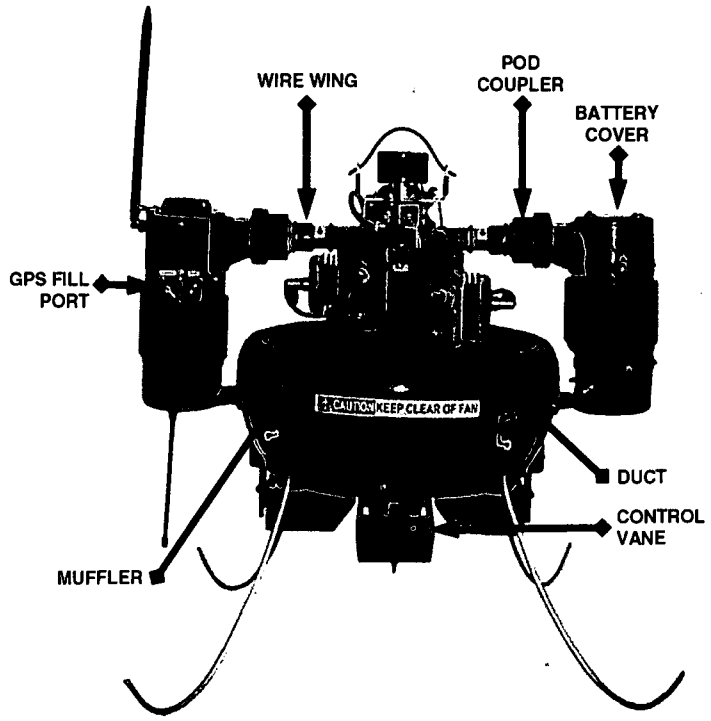
- Air Vehicle (x2)
    - Electro-Optical (EO) camera (gimbaled), or
    - Infra-Red (IR) camera (gimbaled)
- Ground Control Station (GCS)
- Support Equipment

The Air Vehicle is comprised of the following components:

- Core Airframe (i.e., engine, duct, fan, stators, vanes, servos)
- Payload Pod (i.e., cameras, GPS, radios)
- Avionics Pod (i.e., Flight Management Unit (FMU), Inertial Measurement Unit (IMU), Video Control, Power)



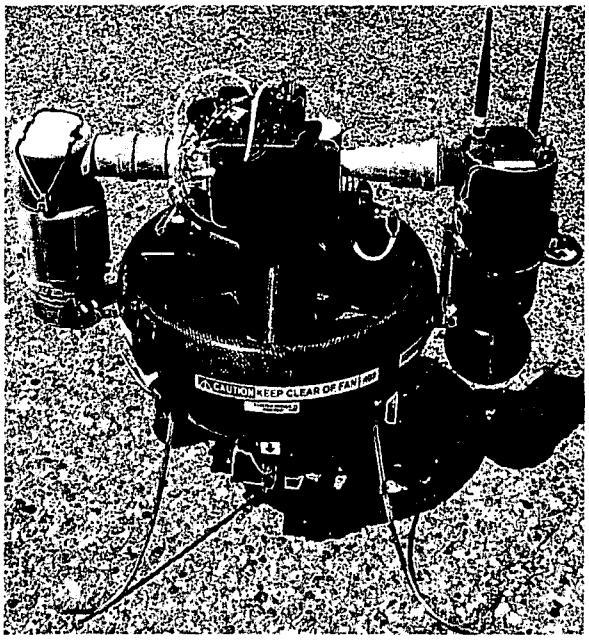
Front View of MAV



Back View of MAV

The Air Vehicle is equipped with a C2 & video link radio. Radios can utilize up to 8 selectable channels.

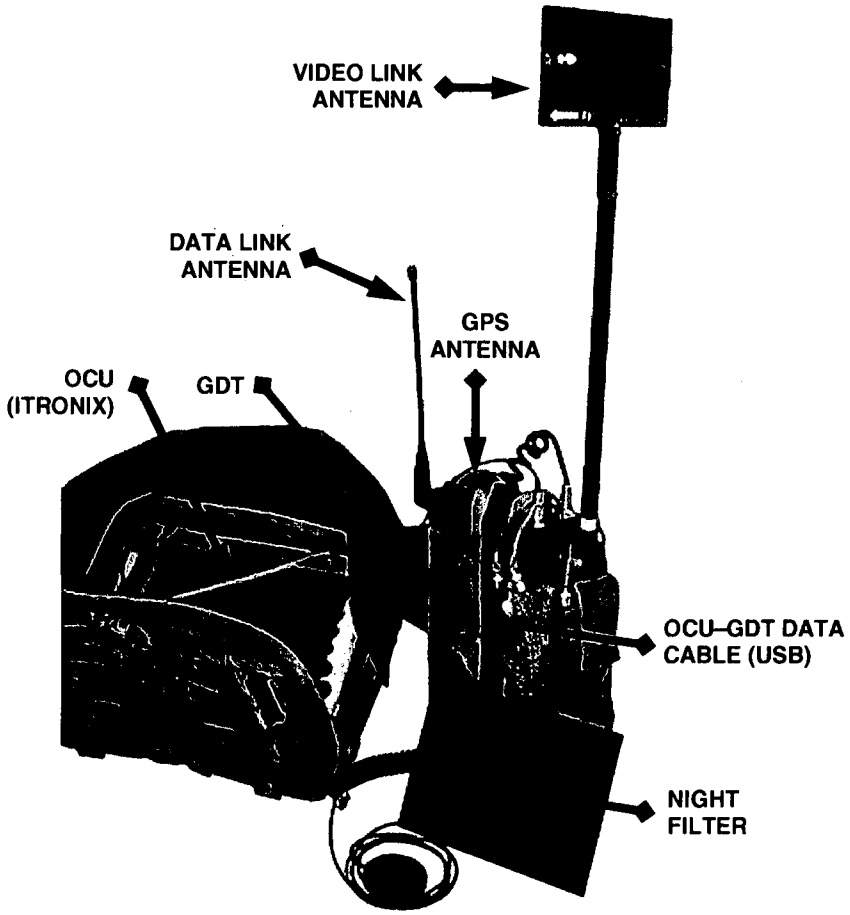
System is equipped with 2 interchangeable payload pods: a gimbaled EO camera or a gimbaled IR camera (as shown in the following picture).



GCS is the Command & Control (C2) interface to the AV which includes flight planning/execution, manual control & video display/storage.

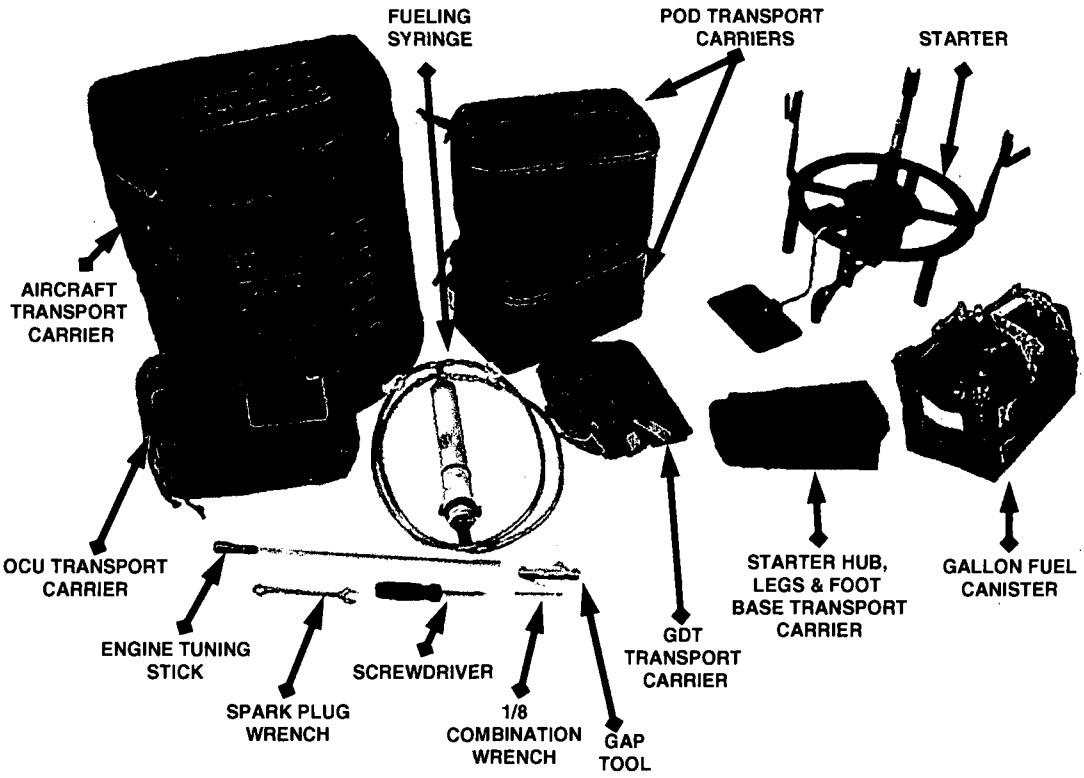
GCS is comprised of the following:

- Operator Control Unit (OCU)
    - Itronix Duo Touch, or Panasonic Toughbook 19
- Ground Data Terminal (GDT)



The Support Equipment is comprised of the following:

- Tool Kit (tuning stick, screwdriver, spark plug wrench, $^1/_8$ combination wrench & gap tool)
- Starter
- AV, OCU, GDT & Pod Transport Carriers
- Fueling Syringe
- Gallon Fuel Canister
- Garrison Charging System
- Field Charging System



12. System Safety — Flight Termination and Lost Link. Describe/explain the expectation of aircraft flight if fuel is starved. Describe/explain aircraft lost link and emergency recovery procedures. Provide an explanation of the flight termination system in detail.

(11) The MAV is a ducted-fan vehicle. It relies upon the engine thrust to sustain flight. If the engine is starved, the vehicle will lose thrust and the MAV flight path will become a gravity dominated ballistic trajectory with an eventual ground impact. The potential impact area can be somewhat defined by assuming a worst case (40 Kt airspeed at maximum altitude of 500 ft AGL) scenario. The anticipated impact area is constrained to approximately 378 feet from power loss.

Using $d = \frac{1}{2} gt^2$ for time to fall due to gravity, and computing the time to impact

$t^2 = 2 (500)/32.174 \sim 31 \text{ sec}^2$

$t \sim 5.6$ sec

consequently, even if the MAV could sustain 40 kt horizontal speed, it would impact the ground in ~ 5.6 sec, (using 1 kt ~ 1.688 ft/sec) then the MAV would travel a horizontal distance of approximately [40 * 1.688 * 5.6] or ~378 feet from the point of loss of power. Note that under manual control (max speed is 15 ft/sec) the worst case impact would be ~ 85 ft down range.

This represents a worst case scenario. In actuality, the MAV would not be able to sustain a horizontal speed with loss of power, and the operating altitude is typically less than 400 ft AGL; consequently, the potential ground impact would be significantly less than the 378 ft number. The flight termination system relies upon this engine/thrust relationship, in that, special circuitry to inhibit the engine ignition has been designed and implemented which upon command will immediately "kill" the engine causing the MAV to lose power. This circuitry can be activated from a prominent switch on the vehicle and also remotely from the operators control unit.

The MAV was initially designed to comply with mission constraints specified by DARPA for the US Army. Some constraints required the capability to be operated by a single soldier and also to operate either autonomously or under manual control. With operation anticipated to be conducted in the presence of multiple obstructions to the communication line-of-sight, a "lost link" mode of operation was required. Determination of "lost link" is based upon a heartbeat signal from the ground control station. If this signal is not periodically received by the MAV, the MAV executes its "lost link" response. The default time for the determination is 30 seconds; however, this can be changed by the pilot/operator down to a minimum of 15 seconds. This "lost link" mode has several features. Selectable behaviors for the "lost link" mode can be programmed by the pilot/operator prior to flight. The pilot/operator knows the status of the communication link via the CWA display. If the MAV is in a "lost link" state, a message will appear on the ground station that "lost link" is active and the pilot/operator will not have communication with the vehicle. There will also be a red box around the vehicle status at the bottom of the operator control unit.

The MAV has a "return-home mode" that is activated by a lost link in either the manual or autonomous modes. This "return-home mode" is programmable as part of the mission profile. The options are:

(1) retrace path to home (this is the default behavior), or

(2) fly direct to "Rally" point (The rally point may be set by the pilot/operator, if the pilot/operator desires it to be different than the launch point. Otherwise, the default for the rally point is the launch point.), or

(3) ascend to 400 ft AGL, hover, and attempt to reacquire link, and

(4) if link is not reacquired, then continue with the flight profile as programmed.

The lost link response is based on pilot/operator selection. The only time this is not executed is in an AHRS mode. If the GPS is invalid and the NAV solution is AHRS and

the MAV has lost link, the MAV performs (at that location) an emergency land at 1 ft/s downward.

There is a single method for emergency manual flight termination. On the operator control unit, there is an "EK" box at the top that is red.

WARNING

Should the AV lose positive control, immediately command ENGINE KILL EK via GCS.

This is the "engine kill" selection. If selected, the message will appear asking the pilot/operator if this operation is desired. Once the operator selects "yes", the command is sent to the vehicle and the avionics on the vehicle kills the engine by inhibiting the ignition sequence. This operation requires two overt actions by the pilot/operator to transmit the "engine kill" command.

13. Command and Control. Provide a description of the system and/or procedures for command and control of the UAS.

(12) The MAV UAS is designed to support the US Army mission with multiple airborne vehicles. The MAV system utilizes a command/control protocol that allows communication on a specific frequency and also requires a unique vehicle identification code. Each MAV system requires its own ground control station tuned to the appropriate frequency for the MAV it is controlling. Uplink communication with the MAV includes manual override steering commands and a "heartbeat" signal. The MAV system utilizes a "heartbeat" signal to detect any loss of uplink signal between the ground control station and the airborne MAV. Unless this signal is periodically received/processed by the MAV, the MAV will initiate a "lost link" procedure and return home. Downlink communication provides the ground control station with the MAV location and also provides health data used for caution, warnings, and alerts.

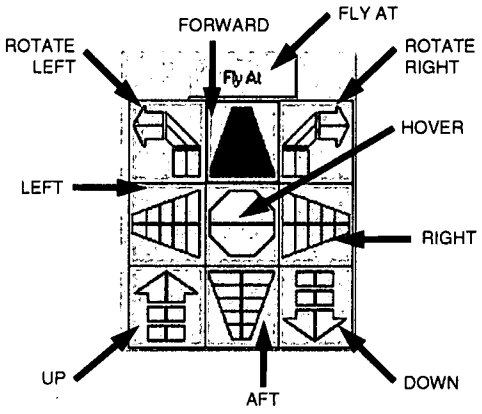
Command and control (C2) of the MAV is accomplished via a laptop style computer. This allows a pilot/operator interface that is easy to interpret for the MAV position/location, provides feedback for vehicle health status, and also allows the pilot/operator to easily input commands through a stylus. The pilot/operator does not actually command the vehicle effectors, but issues steering (up, down, left, right, forward, aft) commands on a "rosette" palette to the automatic control system. The interface layout for manual commands is shown below:

NOTE
Rosette displays feedback to the operator in the form of requested (blue) vs. accepted (green) commands.

1. Left / Right / Forward / Aft:
   a. 3 ft/s (2 mph / 3 kph)
   b. 6 ft/s (4 mph / 7 kph)
   c. 9 ft/s (6 mph / 10 kph)
   d. 12 ft/sec (8 mph / 13 kph)
   e. 15 ft/sec (10 mph / 16 kph)

2. Up:
   a: 3 ft/s (2 mph / 3 kph)
   b: 6 ft/s (4 mph / 7 kph)
   c: 9 ft/s (6 mph / 10 kph)

3. Down:
   a. 1 ft/s ($^1/_2$ mph / 1 kph)
   b. 2 ft/s (1 mph / 2 kph)
   c. 3 ft/s (2 mph / 3 kph)



4. Rotate Left / Right:
   a. 3 deg/s
   b. 9 deg/sec
   c. 27 deg/sec

The MAV can navigate in autonomous mode from an unloaded flight profile. The manual override provides the pilot/operator with an interface to suspend or change the profile.

14. Control Stations. Provide a description of the ground/airborne stations used to control the UAS.

(13) The Air Vehicle is equipped with a C2 & video link radio. Radios can utilize up to 8 selectable channels in the military band. Each MAV/GCS can be configured with a unique vehicle ID, such that multiple vehicles can be airborne, but each MAV will only respond to the ground station transmitting its unique vehicle identifier. In addition, this feature allows a second GCS to be utilized to establish C2 with the air vehicle in case the primary GCS has a failure.

GCS is the Command & Control (C2) interface to the AV which includes flight planning/execution, manual control & video display/storage. Once initialized, the Ground Control Station receives vehicle status via a command downlink, and video on a separate dedicated downlink. The C2 portion provides the pilot/operator with vehicle position and key system health status. The GCS has a compliment of Caution, Warning, Advisory messages that are displayed for the pilot/operator. The pilot/operator can issue the flight termination command (EK) from the GCS input screen.

The characteristics of the GCS are as follows:

PARAMETER	CHARACTERISTIC
Control	Active Digitizer Touch Screen (Stylus)
Alerts	Audio & Visual
Navigation	Commercial Polaris Link GPS
Battery	OCU (Itronix): 1.8 hrs [3.5 hrs w/external] (rechargeable) OCU (Panasonic): 3.6 hrs (rechargeable) GDT: 3.8 hrs (rechargeable)
Weight	OCU (Itronix): 4 lbs or 4.9 lbs w/external battery OCU (Panasonic): 5 lbs GDT: 5.3 lbs. (including battery)
Size	OCU (Itronix): 10.6 in. x 7.2 in. x 1.7 in. or 10.6 in. x 7.2 in. x 2.3 in. w/external battery OCU (Panasonic): 10.7 in. x 8.5 in. x 1.9 in.

PARAMETER	CHARACTERISTIC
	GDT: 11.8 in. x 5.8 in. x 2.5 in.
Operating Temp	-10° to 140°F (-23° to 60°C)

15. Control Frequencies. Provide a description/listing of the frequencies used to control the UAS.

(14) Honeywell has an FCC Experimental License to operate at the military frequencies for Laguna operations. Honeywell is pursuing an additional FCC license to cover additional alternate radios. The following table is a default table of frequencies available. This table is software controlled (and uploaded prior to flight) to correspond to the set of frequencies preferred by the particular military site where operations are being conducted. All frequency ranges listed below will be covered by the Honeywell FCC License.

	Command/Control	**Video**
	MicroHard Radio MX 920 Model MHX920	**L3 Communication Model VNTXS-2A**
Channel	**902-928 (MHz)**	**2.3-2.5 (GHz)**
Channel 1	902-928 MHz (Freq Hop)	2.300
Channel 2	902-928 MHz (Freq Hop)	To Be Determined
Channel 3	902-928 MHz (Freq Hop)	To Be Determined
Channel 4	902-928 MHz (Freq Hop)	To Be Determined
Channel 5	902-928 MHz (Freq Hop)	To Be Determined
Channel 6	902-928 MHz (Freq Hop)	To Be Determined
Channel 7	902-928 MHz (Freq Hop)	To Be Determined
Channel 8	902-928 MHz (Freq Hop)	2.500

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