

		ASN	2008-WSA-11-COA	
		Case Status	EXP RED	
		Date Created	01/03/2008	
		Date Submitted	03/26/2008	
Proponent Organization		Sponsor	NASA ARC	
		Attn Of	(b) (6)	
		Address	Aviation Management Office	
		Address2	Mail Stop 158-1	
		City	Moffett Field	
		State	CA	
		Postal Code	94035	
		Telephone	(b) (6)	
		Email	(b) (6)	
Declaration		Declaration(a)	Yes	
		Declaration(b)	Yes	
Point of Contact		Representative	(b) (6)	
		Address	MS 248-3	
		Address2	NASA ARC	
		City	Moffett Field	
		State	CA	
		Postal Code	94035	
		Telephone	(b) (6)	
		Email	(b) (6)	
Operational Description	Requested Effective Period	Beginning		
		End		
			Light out operation	Yes
			VFR operation	Yes
			FR operation	No
			Day operation	Yes
			Night operation	No
			Program Executive Summary	The Autonomous Rotorcraft Project (ARP) operates two Yamaha RMAX helicopters that have been retrofitted with the necessary avionics for autonomous flight. ARP has been operating the two RMAX helicopters and conducting autonomous flight research at Moffett Federal Airfield since 2001. Three prior COAs have been issued for the operation at Moffett.  The current request is for low-level operations at the MOUT site located at Ft. Ord near Monterey, CA. for the purpose of conducting obstacle field navigation research.
			Operational Summary	The RMAX helicopters will operate within the confines of the Ft. Ord MOUT site located at 36 deg 37' 12 6" N, 121 deg 44' 55.4" W. The entire MOUT site is contained within a 200 x 200 meter square. All operations will be conducted between the surface and 100 ft above ground level (AGL). Maximum altitude will be 450 ft above MSL.
	Location		State	CA
			County	Monterey
		Nearest Airport	MARINA MUNI	
		AOR	California - Northern	
Class Of Airspace		Class-A		
		Class-B		
		Class-C		
		Class-D		
		Class-E		
		Class-G	Yes	
	System Description		Aircraft Type	
		Aircraft Type And Model Description Attachment	1	
		Control Station Attachment	1	
		Communications System Attachment	1	
		List Certified Components (TSO) Attachment	1	
		Other Attachment	0	
Performance Characteristics		Climb Rate (feet/Minute)	400	
		Descent Rate (feet/Minute)	400	
		Turn Rate (Degrees/Second)	20	
	Cruise Speed	Maximum	40	
		Minimum	0	
		Approach Speed	0	
	Operating Attributes	Maximum MSL	1000	
		Minimum MSL	0	
		Gross Takeoff Wt	200 0	
		Launch/Recovery Attachment	1	
Airworthiness		FAA Type Certificate		

		If No FAA Certificate (Public Aircraft Only) Attachment	1	
Procedures		Lost Link/Mission Procedures Attachment	1	
		Lost Communications Procedures Attachment	1	
		Emergency Procedures Attachment	1	
Avionics/Equipment		Equipment Suffix Type	X	
		GPS	Yes	
		Moving map indicator (Command Station)	Yes	
		Tracking capability	No	
		TCA/MCAS	No	
		ELT	No	
	Transponder		Transponder On	No
			Off	
			Standby	
			Ident	
			Mode S	
			Mode C	
		Transponder Retuneable in Flight		
Lights		Landing	No	
		Position/Navigation	No	
		Anti-collision	No	
		Infrared (IR)	No	
Spectrum Analysis Approval		Data Link	Yes	
		Data Link Attachment	0	
		Control Link(s)	Yes	
		Control Link Attachment	0	
		Operations utilizing Radio Control (R/C) frequencies as described in Title 47 CFR 95	Yes	
		NTIA/FCC Authorization Attachment	1	
ATC Communications	Transmitter VHF Band	VHF Band	Yes	
		Quantity	1	
		In-Flight Retunable	Yes	
	Transmitter UHF Band	UHF Band	Yes	
		Quantity	3	
		In-Flight Retunable	Yes	
	Transmitter HF band	HF Band	No	
		Quantity		
		In-Flight Retunable	No	
	Receiver VHF Band	VHF Band	Yes	
		Quantity	1	
		In-Flight Retunable	Yes	
Receiver UHF Band	UHF Band	Yes		
	Quantity	3		
	In-Flight Retunable	Yes		
Receiver HF band	HF Band	No		
	Quantity			
	In-Flight Retunable	No		
Guard (Emergency) Frequencies VHF Band	VHF Band	No		
	Quantity			
Guard (Emergency) Frequencies UHF Band	UHF Band	No		
	Quantity			
Instantaneous Two-Way Voice	Direct to pilot	Yes		
	SATCOM	No		
	Relay via aircraft	No		
Electronic Surveillance/Detection Capability		EO/IR	No	

		Terrain detection	No
		Weather/icing detection	No
		Radar	No
		Other Attachment	0
		Electronic detection systems	No
		Electronic detection systems attachment	0
		Radar observation	No
		NAS Operational Capability Attachment	0
Visual Surveillance/ Detection Capability	Maximum Distance from UA	Vertical	1000 Feet
		Horizontal	0.2 Nautical Miles
		Airborne based (Chase Aircraft)	No
		Ground based	Yes
		Visual observation from one or more ground sites	Yes
		Forward or side looking cameras	No
		Attachment for All	0
Aircraft Performance Recording		Flight data recording	Yes
		Control station recording	Yes
		Voice Recording	Yes
Flight Aircrew Qualifications	Pilots	Private (Written)	Yes
		Private (Certified)	No
		Instrument	No
		Commercial	No
		Air Transport	No
		Unique Trained Pilot	Yes
		Unique Trained Pilot Description	Trained by Yamaha in the operation of the RMAX helicopter (see attached).
		DOD certified/trained	No
		Other Certified Training	Yes
		Trained on FAR Part 91 Requirement	Yes
		Medical Certification Class (FAA or DOD equivalent)	2
		Currency Status	Current second class medical certification.
		Duty Time Restrictions	None.
Single UAS Control	Yes		
		UAS Description	The External Pilot (EP) performs all pre-flight checks; flies the aircraft as required for each test sequence; and, has final responsibility for the safe operation of the aircraft. The EP is equipped with the flight control RC transmitter, the EP checklist, the Test Card, and a UHF radio for communication with the Ground Control Station. The EP is current, qualified, and approved to fly the RMAX; is familiar with overall mission objectives and procedures; is familiar with prior practice of the prescribed flight maneuvers; familiar with the maneuver sequences prescribed for each flight; and familiar with crew coordination requirements.
		Total Numbers of UAS Controlled	1
	Observers	Private (Written)	No
		Private (Certified)	No
		Instrument	No
		Commercial	No
		Air Transport	No
		Unique Trained Pilot	No
		Unique Trained Pilot Description	NA
		DOD certified/trained	No
		Other Certified Training	No
		Trained on FAR Part 91 Requirement	Yes
		DOD Certified Training Attachment	1
		Medical Certification Class (FAA or DOD equivalent)	2
		Currency Status	Current second class medical certification.
		Duty Time Restrictions	None.
		Single UAS Control	Yes
		UAS Description	The Safety Observer (SO) watches for potential hazards such as other operating aircraft, approaching vehicles, or birds, and advises the EP of such hazards; ensures that the test vehicle stays within the assigned airspace at all times; monitors ATC tower radio frequency at all times; conducts radio communications with ATC using standard pilot to ATC procedures; remains physically alongside the EP and maintains communication with the EP; ensures that a handheld fire extinguisher is readily available during all operations. SO equipment includes a UHF radio, a VHF radio, and a flight operations mobile phone.
		Total Numbers of UAS Controlled	1

Special Circumstances		Special Circumstances	<p>The MOUT site is close to the Class C airspace of Monterey Peninsula Airport and it was difficult to determine if it is inside the Class C boundary.</p> <p>The RMAX does not have a transponder. If there is a Mode C transponder requirement then an alternative mitigation is needed. Current NASA COAs at Moffett Field within the Mode C veil of SFO have been approved without transponders as long as the UAS can be controlled via two separate control links on different frequencies. This is also the case with RMAX, since it can be controlled by the GCS on 900 MHz or by the External Pilot on 72 MHz.</p>
-----------------------	--	-----------------------	--

Flight Operations Area/Plan

Type	User Defin	Point	Loc ID	Degree	Distance	Latitude	Longitude	MSL Ceilin
USER DEFINED ARE	Ord	MOUT		1				

---

---

Total Map Attachment 2

<u>MSL Floor</u>	<u>Maximum</u>	<u>Minimum</u>	<u>S Radius</u>	<u>SUA Description</u>	
		36-37-12.60N		121-44-55.40W	450

---

---

0

20

0

1.0