

		ASN	2008-WSA-12-COA
		Case Status	EXP RED
		Date Created	03/26/2008
		Date Submitted	03/27/2008
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	<p>This request is for a renewal of COA 2007-118761-A which expires on June 5, 2008. There are no modifications or changes to what is being requested.</p> <p>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 this operation.</p> <p>Research topics for ARP include mission planning, autonomous landing, and obstacle field navigation. The results of this research have been published at numerous technical conferences and in technical journals.</p>
		Operational Summary	The RMAX helicopters are flown approximately once per week for a period of approximately three (3) hours. During these operational periods the helicopters spend approximately half the time airborne. The helicopters are flown one at a time -- no multi-UAV operations are conducted. Over the past six years the aircraft have flown an average of 50 hours per year.
	Location	State	CA
		County	Santa Clara
		Nearest Airport	MOFFETT FEDERAL AFLD
		AOR	California - Northern
	Class Of Airspace	Class-A	
		Class-B	
		Class-C	
		Class-D	Yes
		Class-E	
		Class-G	
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	No
		On	
		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	No
		Quantity	
		In-Flight Retunable	No
	Transmitter UHF Band	UHF Band	Yes
		Quantity	3
		In-Flight Retunable	No
	Transmitter HF band	HF Band	No
		Quantity	
		In-Flight Retunable	No
	Receiver VHF Band	VHF Band	No
		Quantity	
		In-Flight Retunable	No
	Receiver UHF Band	UHF Band	Yes
		Quantity	3
		In-Flight Retunable	No
	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

Electronic Surveillance/ Detection Capability		Relay via aircraft	No
		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)	Yes
		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 trunking radio for communication with the ATC Tower and Ground Control Station. The EP is current, qualified, and approved to fly the RMAX by the FPO; 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	<p>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 the ATC tower 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.</p> <p>SO equipment includes a UHF trunking radio for communications with tower and a flight operations mobile phone.</p>
		Total Numbers of UAS Controlled	1
Special Circumstances		Special Circumstances	<p>This request is for a renewal of COA 2007-118761-A which expires on June 5, 2008. There are no modifications or changes to what is being requested. The operating areas include a larger region and an air taxi area (see attachments). Special Provisions 9 and 10 in COA 2007-118761-A describe the rules for concurrent UAS operations with manned aircraft and this capability is requested again.</p> <p>Moffett Field is within the Mode C veil of SFO. The RMAX does not have a transponder, so an alternative mitigation is needed. Current NASA COAs at Moffett Field 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 AREA	NUQ		1					

Total Map Attachment 2

MSL Floor	Maximum	Minimum	Radius	SUA Description	
	37-24-58.11N			122-02-56.91W	1000

0

40

0

3.0