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R2: 28 February 2011
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20 April 2010

AWR YMQ-18A20100420R3

MEMORANDUM FOR YMQ-18A Hummingbird Unmanned Aircraft Systems (b) (6), (b) (3) 10 USC 130b
(b) (6), (b) (3) 10 USC 130b USSOCOM, 7701 Tampa Point Blvd, MacDill AFB, FL 33621-5323.

SUBJECT: Airworthiness Release (AWR) for Operation of USSOCOM YMQ-18A Hummingbird Unmanned Aircraft System (UAS) (AWR YMQ-18A20100420R1) (TN 92453RevB)

1. Scope: This memorandum constitutes a Qualification Level 3 Airworthiness Release (AWR) for the YMQ-18A Hummingbird Unmanned Aircraft A006 for pilot training operation in Class D airspace of Southern California Logistic Airport, SCLA (VCV) and the transit corridor between VCV and R2515. Revision 2 of this AWR supersedes Revision 1 entirely.
2. Validity: This AWR is only valid with a Federal Aviation Administration (FAA) approved USSOCOM Certificate of Authorization (COA). This AWR terminates on 30 October 2011 or upon change in configuration of the subject equipment, or upon issuance of a later AWR, whichever occurs first. This AWR is only valid for operation of aircraft tail number A006 at SCLA, Victorville CA.
3. Appendices: This memorandum and its appendices shall be carried in the logbook, controlling Ground Control Station (GCS), and aircraft historical record file.

Appendix A - Restrictions and Operating Information
Appendix B - Configuration and Installation Detail
Appendix C - Inspections, Maintenance, and Logbook Instructions
Appendix D - Reference List


4. The points of contact (POC) are (b) (6), (b) (3) 10 USC 130b
(b) (6), (b) (3) 10 USC 130b (b),
(b) (3)

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25 April 2011

SUBJECT: Airworthiness Release (AWR) for Operation of YMQ-18A Hummingbird
Unmanned Aircraft System (UAS) (AWR YMQ-18A20100420R3) (TN 92453B)

(b) (6), (b) (3) 10 USC 130b



(b) (6)



Aviation Engineering

SUBJECT: Airworthiness Release (AWR) for Operation of YMQ-18A Hummingbird Unmanned Aircraft System (UAS) (AWR YMQ-18A20100420R3) (TN 92453B)

Appendix A - Restrictions and Operating Information:

WARNING

The YMQ-18A Hummingbird UAS has not completed full airworthiness qualification. All flight operations shall be conducted in a manner to minimize exposure to manned aircraft, populated ground areas and cross roadways open to civil traffic at an angle between 45 to 90 degrees.

WARNING

Accidental operation of the YMQ-18A Hummingbird UAS outside of active restricted airspace and/or the FAA approved COA shall be immediately reported to Air Traffic Control (ATC) / Range Control. The operator shall make immediate actions to correct the flight path and/or follow ATC/Range Control direction.

WARNING

The YMQ-18A Hummingbird UAS has not undergone Explosive Atmosphere testing. A serious fire or explosion may result if the aircraft is powered while flammable vapors are present during ground or flight operations. The precautions in paragraph 3 of this appendix shall be observed in order to ensure safe operations.

WARNING

The YMQ-18A Hummingbird UAS has not undergone complete electromagnetic environmental effects (E3) testing. The aircraft may experience erroneous data reports, and/or loss of control of aircraft, and/or loss of control of payload. Operators shall avoid sources of electromagnetic fields such as but not limited to transmitters, power lines, and cell towers.

WARNING

The YMQ-18A Hummingbird UAS Human-Machine Interface (HMI) has not been evaluated. The performance, accuracy and efficiency of the HMI are unknown. The system should be used with extreme caution.

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WARNING

The YMQ-18A Hummingbird UAS does not have a sense and avoid system. Mid-air collision is a risk. All flight operations shall be conducted to ensure that minimum separation standards are maintained per USSOCOM COA.

WARNING

In the event that the landing gear is not fully deployed or any other anomaly that would prevent a safe landing, the aircraft will be required to perform an emergency landing at a predetermined location. The area will be sanitized of personnel with an exclusion zone of 1200 feet radius from the planned touchdown coordinates.

WARNING

The YMQ-18A Hummingbird UAS is restricted to a maximum flight altitude of 20,000 feet due to PW207D Engine Certification limit.

WARNING

The PW-207D gas turbine engine in this configuration does not have over-speed protection. A personnel exclusion zone of 295 feet radius is required during all high speed ground operations.

CAUTION

The YMQ-18A Hummingbird UAS has not been tested for the effects of lightning. Flight operations shall be restricted to no less than 25 nautical miles from lightning activity.

CAUTION

The YMQ-18A Hummingbird UAS has not been qualified for the effects of icing. Flight operations are not authorized in known or forecast icing conditions. The aircraft will return to base if any icing is detected on the aircraft either by visual observation with onboard camera or by an ice detection system.

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CAUTION

The YMQ-18A Hummingbird UAS has not been qualified for the effects of precipitation. Flight operations shall be restricted from flight into or during measureable precipitation activity within the operational area. In the event of inadvertent flight into precipitation activity the aircraft shall make every attempt to exit the activity.

CAUTION

The YMQ-18A Hummingbird UAS has not been qualified to MIL-STD-810G environmental temperature extremes to demonstrate that the equipment functions satisfactorily/safely. Therefore; the system may not operate or may cease operation when exposed to extreme temperatures, low pressure environments, and other non-standard climatic conditions. If conditions are entered that are outside of past experience, proceed with caution.

CAUTION

The YMQ-18A Hummingbird UAS has not been qualified to MIL-STD-810G environmental temperature extremes. The aircraft shall not operate at altitudes or temperature conditions beyond which the backup batteries can safely provide power to the aircraft. The backup battery system shall be capable of providing adequate power to descend and land at an alternate ditching location IAW page 7 of Emergency Procedures ref D-5.

CAUTION

The YMQ-18A Hummingbird UAS has not been qualified to MIL-STD-810G environmental effects or qualified to meet Federal Aviation Regulation (FAR) Part 29.1001 requirements. No off loading of fuel in-flight is permitted.

1. The aircraft operating instructions, procedures, and limitations shall be in accordance with references D-1 through D-5, D20, D21 (as applicable) A160T Operators Check List, ref D-1; Ground Handling and Servicing Procedures, ref D-2; Ground Operating Procedures, ref D-3; Aircraft Pre-Flight Check List, ref D-4; A160T Emergency Procedures, ref D-5 and this AWR. In the event of conflict between these documents, the information in this AWR and COA shall prevail.
2. Flight of the A160T Hummingbird UAS is restricted to Visual Meteorological Conditions (VMC).

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3. Due to lack of Safety of Flight (SOF) Explosive Atmosphere testing, the following precautions shall be observed in order to ensure safe flight:

a. The aircraft shall be un-powered and grounded IAW reference D-1 thru D-5 (as applicable) and Ground Handling and Servicing Procedures ref D-2, Section 3.0, page 14 during refueling operations.

b. Ground operations of the aircraft shall be conducted at the greatest distance practical (no less than 50 feet) from all other aircraft and fuel depots.

c. If the aircraft is electrically powered during ground operations other than refueling, the crew shall assure that sufficient ventilation and airflow exists around the vehicle to prevent accumulation of hazardous/flammable vapors.

4. Because the specific temperatures for material allowable are unknown, the rotor blades must spin a minimum of 10 minutes prior to take off for composite blade and fuselage cooling when the ambient temperature is 100°F or above and exposed to direct sun light.

5. Because the specific temperatures for the material allowable are unknown, the YMQ-18A aircraft must not be left on the tarmac in direct sunlight for extended periods of time when the ambient temperature is 100°F or above. The aircraft should be sheltered or covered until ready for flight to avoid radiation heating.

6. Due to lack of static testing of the main rotor (MR) blade integration with the MR hub, the fatigue values are defined by analysis/FEM, it is required that the RPM's do not exceed 340. If an exceedance does occur, AED must be notified and concur with continued operations prior to next flight.

7. Use of data links is limited to approved frequencies for all ground and flight operations. Data link frequencies shall be de-conflicted through the local frequency manager/coordinator prior to conducting operations.

8. An appropriate Lost Link Return Home Point shall be set such that the aircraft will not exit the approved operational airspace during lost link flight and meet the 1200 feet safe recovery exclusion zone.

9. Flight over populated areas is prohibited.

10. In the event of loss of control, local ATC/Range Control and the chase aircraft/observers shall be notified immediately.

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11. In the event of an engine failure or other catastrophic failure, local ATC/Range Control and chase aircraft/observer will be notified immediately and the aircraft shall be ditched over the appropriate Lost Link Return Home Point if possible. If not possible to make the Lost Link Return Home Point, every effort shall be made to visually inspect the probable impact area prior to committing to ditching location and must avoid populated areas.
12. The flight path of the aircraft shall be within reach of pre-established ditching.
13. During preflight someone other than the operator shall verify that the Lost Link Return Home Point is entered correctly.
14. Local ATC/Range Control shall be notified with a flight plan or flight strip prior to departure, to aid in airspace de-confliction.
15. Verified loss of any aircraft flight critical subsystem or Ground Control Station (GCS) or Mobile Ground Control Station (MGCS) flight critical sub-system shall require return to the appropriate Return Home Point.
16. All flight operations shall be conducted with a GCS or MGCS as the primary launch and recovery station. Flights requiring use of the remote GCS shall be in accordance with Remote Terminal User's Guide ref D-17.
17. Operations and Airspace de-confliction outside of the restricted airspace shall be IAW the FAA COA.
18. Any procedural deficiencies or flight anomalies detected during operations shall be corrected, annotated, and reported to the POC listed in paragraph 4 of this AWR.
19. Antennae patterns and nulls have not been fully evaluated. The command and control link margin should be monitored closely until antenna performance has been validated and nulls are identified.
20. Prior to first flight with the stated aircraft configuration, a comprehensive EMI/EMC check must be completed. Any unexplained EMI/EMC anomalies shall be resolved prior to first flight and results provided to AED in writing.
21. Hand-off of aircraft control between primary launch GCS or MGCS to an alternate GCS or MGCS is not permitted in the VCV class D airspace or the transit corridor to R2515.

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22. Aircraft flight monitoring of structural limits shall be IAW Structural Analysis Report ref D-6 with the following exceptions:

- Max gross vehicle weight with payload is 5500 lbs.
- Max acceleration in Z is 2 g.
- Max decent rate of aircraft landing touchdown without ARGUS is 8 fps (480 fpm)
- Max decent rate of aircraft landing touchdown with ARGUS is 6 fps (360 fpm)
- 2 Piece TR hub max flap moment is 1702 in-lb
- 2 Piece TR hub max lag moment is 1422 in-lb
- 1 Piece TR hub max flap moment is 1830 in-lb
- 1 Piece TR hub max lag moment is 1530 in-lb

23. Pilot training flights can only be conducted with an approved instructor.

24. Aircraft A006 is not approved for stub wing or in the sling load configuration during pilot training flights.

25. Emergency or inadvertent jettison of a cargo sling load requires an airworthiness inspection of the primary bulk-head.

26. Ground and Flight operations are only approved with installation of the 2 piece tail rotor hub PN: UAA 35-723 and legacy pitch control cross-beam, PN: UAA 35-024.

27. Tail rotor pitch control cross-beam Boeing Part Number UAA 35-024; 2 piece tail rotor hub, Boeing Part Number UAA 35-723 and tail rotor pitch control shaft Boeing Part Number AAA 64-099, are restricted to 132 flight hours. These parts must be removed and identified as a non-flight-approved part once 132 flight hours have been reached.

28. The tail rotor 2 piece hub Teflon spacers PN: UAA35-081 is restricted to 64 flight hours.

29. The Main Rotor (MR) speed is restricted to 85% = 340 rpm.

30. Aircraft forward flight is restricted to a maximum of 100 knots.

31. Commander's Corner:

a. The YMQ-18A Hummingbird Unmanned Aircraft System (UAS) has not completed full airworthiness qualification testing.

b. Since this is a developmental aircraft in its initial stages of flight testing, every effort should be made to ensure an incremental approach is used and approved during envelope expansion. Strict adherence to the Operators Instructions, maintenance requirements and regimented test processes are required to reduce the risk of loss of aircraft, property damage and personnel injury.

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c. The content of this AWR is based on information provided to AED in Appendix D, references 1-21, from technical interchange with aircraft manufacturer, and physical inspection of the YMQ-18A aircraft. Many issues have been found and are addressed in AWIS 09-022 Rev 3 provided to USSOCOM (b) (6), (b) (3) 10 on 11 February 2011. Risk was accepted, reference D-19. USC 130b

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Appendix B - Configuration and Installation Detail:

1. Configuration- This aircraft is not a production representative aircraft. Therefore the configuration of this aircraft is defined in Airworthiness Substantiation Document, ref D-9, and flight Test Plan, ref D-10. Any deviations to this configuration shall be approved in writing by the Aviation Engineering Directorate (POC in cover memorandum paragraph 4) for this AWR to be valid.
2. The Boeing YMQ-18A formerly known as the A160 Hummingbird is a four blade Unmanned Aircraft System (UAS) rotorcraft utilizing an organic two-speed drive system and a Pratt & Whitney PW207D turboshaft engine. The following equipment has been removed from A006: MD-500 cargo hook, Enhanced Position Location Radio System (EPLRS), Iridium and SatCom.
3. This AWR is approved for Software version 3.2.18, Rev T with the interim Navigation Sensor Unit (NSU) divergence correction and successful completion of ground test and results provided to AED in writing.

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Appendix C - Inspections, Maintenance, and Logbook Instructions:

1. In the event any operating limit, or limits established by this release are exceeded, in addition to the normal entry in flight log all limits that were exceeded shall be entered/noted and appropriate inspections shall be performed prior to next flight.

2. Aircraft Logbook Entries:

a. A copy of this AWR shall be inserted in the logbook and the following entry shall be noted: "Operate within limitations and restrictions specified in the enclosed airworthiness release dated 28 February 2011."

b. A weight and balance record (form DD365 recommended) shall be maintained and kept on file in each aircraft's log book and weight and balance book maintained by the operator.

c. Make the following entry: "Perform visual inspection of FOR and AFT bulk-head and landing gear as required by enclosed airworthiness release dated 28 February 2011." if a hard landing, inadvertent or emergency jettison of slung load event occurs.

d. Make the following entry: "Performed EMI/EMC check as required by the enclosed airworthiness release dated 28 February 2011." prior to first flight of each aircraft with this configuration. Provide a copy of completes EMI/EMC check list to the POC in paragraph 4 of this AWR prior to flight operations.

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Appendix D - Reference List:

1. YMQ-18A Unmanned Aerial System (UAS), A160T Operator's Checklist, Document No. AUS 07D0404-E, Version 2.7, 18 February 2010.
2. YMQ-18A Hummingbird Unmanned Aerial System (UAS) Ground Handling and Servicing Procedures, TO MT-A160T-CL-2, Document No. AUS 07D0169, Change 1, 22 March 2010.
3. Boeing A160 Ground Operating Procedures; DCMA Palmdale GFI (b) (6), (b) (3) 10 USC 130b Signature Approval, 21 May 2008.
4. YMQ-18A Hummingbird Unmanned Aircraft System (UAS) Aircraft Pre-Flight Checklist, Document No. AUS07D406-A, Version 2.1, 19 December 2009.
5. YMQ-18A Hummingbird Unmanned Aircraft system (UAS), A160T Emergency Procedures, Document No. AUS09D0405-E, Version 2.6, 15 February 2010.
6. Structural Analysis Report Rev B, AUS07D0205, 14 April 2010.
7. YMQ-18A Hummingbird Unmanned Aerial System (UAS) Electronic Component Removal and Installation Procedures, TO MT-A160T-CL-3, Document No. AUS 07D0170, Change 0, 5 November 2007.
8. YMQ-18A Hummingbird Unmanned Aerial System (UAS) Mechanical Component Removal and Installation Procedures, TO MT-A160T-CL-4, Document No. AUS 07D0171, Change 0, 15 January 2008.
9. Airworthiness Substantiation Document, AUS09D0461, Rev D, 19 February 2010.
10. A160 Flight Test Plan, AUS09D0462, Rev E, 14 January 2010.
11. A160 Stipulations on Operator and Instructor Qualifications, 13 July 2009.
11A. A160 Crew Coordination Training, 19 January 2009.
12. A160T Aircrew Training Manual, 22 January 2009.
13. Boeing A160 Instructor Pilot Training Guide, 26 March 2009.
14. Boeing A160 LSO Flight Guide, 18 March 2009.
15. Boeing A160 RSO Flight Training Guide, 19 March 2009.
16. Software Configuration Control and Verification Document, AUS09D0413, Rev 3.2.18, 5 July 2010.

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17. Remote Terminal User's Guide, Version 1.0, 20 January 2010.
18. FAA Certificate of Authorization for operating the A160T UAS in Class D airspace of Southern California Logistic Airport, SCLA (VCV) and the transit corridor Class G and E Airspace between VCV and R2515 at or below 13,000 MSL.
19. SSRA, 25 February 2011, System Safety Risk Acceptance (SSRA) for operation on the YMQ-18A Unmanned System (UAS) Helicopter at Victorville, CA and OCONUS Ground and Flight Operations.
20. A160T Operators Checklist – fuel Addendum, 27 August 2010.
21. Boeing A160 Flight Operations Procedures, DCMA Palmdale GFF130b
Signature Approval, 1 May 2009.

(b) (6), (b) (3) 10 USC

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