

## APPENDIX B

### NAVAIR Flight Clearance for the Aeronautics Defense Systems (ADS) Model Aerostar UAV

The areas addressed in the Navy's assessment of the Aerostar UAS are attached below, and any differences between the Aerostar S/N 602 (PMA-263) and NMSU PSL TAAC systems (S/N 617 & S/N 618) have also been included. These differences are the result of analyses performed by the manufacturer, PMA-263, and NMSU PAL TAAC. Included in the reviews were discussions of configuration differences that generally involved reliability, handling, and system upgrades/improvements. Many of these changes have occurred from recommendations made by PMA-263 to Aeronautics Defense Systems (ADS). TAAC is part of this manufacturer's users group that ensures flight safety of the Aerostar UAS.

*The baseline configuration for aircraft 617 and 618 has matured since the construction of aircraft 602. Improvements in manufacturing and configuration have been incorporated by Aeronautics and have been tested and accepted in Israel for domestic, military and research/development flights. PSL has also operated the system, tested the components in restricted airspace to verify the proper operation of the system, and validates that these changes and/or modifications introduced no adverse effect on airworthiness.*

### NAVAIR Flight Clearance for the Aerostar UAV

\* indicates difference between NAVAIR and TAAC requirement, TAAC difference is noted below the NAVAIR item and begins with TAAC in blue.

PAAUZYUW RULSABU1234 2692012-UUUU--RHMCSUU.  
ZNR UUUUU  
P 262012Z SEP 05 ZYB  
FM COMNAVAIRSYSCOM PATUXENT RIVER MD//4.0P//  
TO AIRTEVRON TWO ONE PATUXENT RIVER MD//55RW10A-UAV//  
INFO COMNAVAIRSYSCOM PATUXENT RIVER MD//4.1.1.2/4.4.2/  
5.0D/4.0P//  
NAVTESTWINGLANT PATUXENT RIVER MD//55TW3AA//  
BT  
UNCLAS //N13034//  
MSGID/GENADMIN/COMNAVAIRSYSCOM/4.0P//  
SUBJ/UAV INTERIM FLIGHT CLEARANCE FOR AEROSTAR UNMANNED AERIAL  
/VEHICLE SYSTEM//  
REF/A/DOC/NAVTESTWINGLANT/131436ZSEP2005//  
REF/B/MSG/COMNAVAIRSYSCOM/052017ZAUG2005//  
REF/C/DOC/NAVAIR/29JUL2003/NOTAL//  
REF/D/DOC/DEFENSE SYSTEMS/29JUN2003/NOTAL//  
REF/E/DOC/NAWCAD/19JAN2004/NOTAL//  
REF/F/DOC/NAVAIR/28SEP2004//  
NARR/REF A IS FLIGHT CLEARANCE AMENDMENT REQUEST FOR AEROSTAR UAV  
SYSTEM.  
REF B IS THE CURRENT AEROSTAR BASELINE FLIGHT CLEARANCE.  
REF C IS AEROSTAR DESIGN INFORMATION PRESENTED BY (b) (6)  
AT THE AEROSTAR FLIGHT CLEARANCE MEETING DTD 29 JUL 2003.  
REF D IS THE AERONAUTICS AEROSTAR SYSTEM DESCRIPTION DOCUMENT.  
REF E IS STRESS ANALYSIS REPORT OF AERONAUTICS AEROSTAR UAV,  
DOCUMENT NO. 990001, REV C.  
REF F IS NAVAIRINST 13034.1C, FLIGHT CLEARANCE POLICY FOR AIR  
VEHICLES AND AIRCRAFT SYSTEMS.//  
POC (b) (6) /AIR 4.0P FLIGHT CLEARANCE/PATUXENT RIVER MD  
/TEL (b) (6) /EMAIL: (b) (6) //  
GENTEXT/REMARKS/1. UAV INTERIM FLIGHT CLEARANCE FOR AEROSTAR  
UNMANNED AERIAL VEHICLE SYSTEM.  
IRT REF A, FLIGHT CLEARANCE IS GRANTED FOR AEROSTAR UAV SYSTEM.  
CHANGES TO REF B FLIGHT CLEARANCE INCLUDE:  
A. REFS: UPDATES REQUEST AND CURRENT CLEARANCE INFORMATION.

B. PARA 2, CONFIGURATION: UPDATED CONFIGURATION IN PARA 2.H.

C. PARA 5, TIME PERIOD: REVISED EXPIRATION DATE.

THIS CLEARANCE CANCELS AND SUPERSEDES REF B AND IS SUBJECT TO THE FOLLOWING LIMITS AND CONDITIONS, PER REFS C AND D.

2. CONFIGURATION: BASELINE AEROSTAR UAV SYSTEM AS FOLLOWS:

A. DIMENSIONS: 21 FT WINGSPAN, 15 FT LENGTH

B. PAYLOAD: (WITH OR WITHOUT)

\* (1) BAI SERIES 52 PAN, TILT, ZOOM ELECTRO-OPTICAL CAMERA.

\* (2) BAI SERIES 66 PAN, TILT, ZOOM ELECTRO-OPTICAL CAMERA.

**TAAC**

1. *CONTROP DSP pan, tilt, 22.5x continuous optical zoom FLIR, 20x continuous optical zoom Electro-Optical CCD camera.*
2. *Forward-look camera.*
3. *CONTROP Quad pan, tilt, optical zoom FLIR*
4. *D Stamp, EO pan/tilt/zoom stabilized camera*

*Note: Payloads for the Aerostar are driven by mission requirements. All payloads must remain under 110 lbs and the aircraft shall be weighed and balanced when payloads are changed as per manufacturers' specifications. Payloads and sensor configurations will be assessed for each mission specific requirements as well as changing from one special purpose operations to another to determine that these interrelationships have not introduced any adverse effect on airworthiness.*

(3) REMOTE PAYLOAD COMMAND RECEIVER INSTALLED.

(4) FORWARD LOOK CAMERA.

(5) STROBE LIGHT.

(6) IFF.

(7) FREEWAVE TRANSCEIVER.

(8) PC-104 PAYLOAD CONTROLLER.

\* (9) POP-200 PAYLOAD.

(10) 12DS PAYLOAD.

(11) PAYLOAD INTERFACE BOX (PIB).

\* C. ENGINE: 2-STROKE, TWO CYLINDER, 290 CC

**TAAC**

*Engine: 2-stroke, 2 cylinder, 498cc, 38 HP Zanzoterra.*

\* D. AVIONICS: UNIVERSAL MINIATURE AVIONICS SYSTEM (UMAS)

**TAAC**

1. *Unmanned Multi-Application System (UMAS) – takes inputs from Indicated Airspeed (IAS) sensor, Pressure Altitude sensor, GPS, Magnetic Compass and Vertical Gyro Unit (2).*
2. *2 x VGU.*
3. *IFF – mode 3*
4. *GPS – 8 channel. Position ± 15m, Ground Speed ± 2 kts, Altitude ± 100 ft.*
5. *10 servos – each operating on independent channels. Provides redundant control for rudders, flaps, aileron, and elevator. All servos interchangeable except throttle and nose wheel steering.*

\* E. UPLINK: PRIMARY: UHF OR S BAND, SECONDARY: UHF

**TAAC**

*Uplink: Primary: C band, Secondary: UHF*

\* F. DOWNLINK: L BAND

**TAAC**

*Downlink: C band*

\* G. INTERNAL FUEL: 98 POUNDS MAX

**TAAC**

*Internal Fuel: 60-Liter capacity*

H. SOFTWARE:

(1) UMAS AUTOPILOT: VER 2.28

(2) MCS-LRS RTC: VER 1.21

(3) MCS-LRS PC: VER 1.5.2.430

- (4) FLASH333: VER 3.08
- (5) PCP PAYLOADS: VER 2.0.0.045

3. LIMITS:

- A. GROSS WEIGHT/CG: 440 LB MAX/MID CG (ON WING SPAR)
- \* B. AIRSPEED: 110 KIAS MAX, 45 KIAS MIN EXCEPT AS REQUIRED FOR TAKEOFF AND LANDING (AUTOPILOT LIMIT).

**TAAC**

*Airspeed: 80 KIAS max, 55 KIAS min except as required for takeoff and landing (autopilot limit).*

- \* C. ANGLE OF BANK: 60 DEG MAX (AUTOPILOT LIMIT).

**TAAC**

*Angle of Bank: 45 deg max (EP control), 30 deg max (IP control) – Autopilot limit.*

- D. SHIPBOARD OPS NOT AUTHORIZED.
- E. FLIGHT TEST AUTHORIZED IN CONFINED/PROTECTED RANGE RESTRICTED MILITARY USE AIRSPACE.
- F. FAA APPROVAL MUST BE OBTAINED FOR FLIGHTS OUTSIDE RESTRICTED MILITARY USE AIRSPACE.
- G. FLIGHTS WITHOUT AUTOPILOT ENGAGED PROHIBITED EXCEPT FOR EMERGENCY RTB. RTB MANDATORY IF AUTOPILOT FAILS IN FLIGHT.
- H. WHEN RATES MODE (AUTOPILOT OFF) REQUIRED, USE SMOOTH, NON-ABRUPT INPUTS AND REMAIN WITHIN AIRSPEED AND BANK ANGLE OF PARA 3.B AND 3.C.
- I. FUEL REQUIRED: ONLY 100LL AVGAS MIXED WITH LUBRICATING OIL IN THE FOLLOWING RATIOS:
  - \* (1) 25:1 (4 PERCENT) FUEL TO OIL RATIO FOR FIRST 100 ENGINE OPERATING HOURS

**TAAC**

*Fuel required: 100 LL avgas mixed with lubricating oil in the following ratio: 50:1 fuel to oil ratio.*

- (2) 50:1 (2 PERCENT) FUEL TO OIL RATIO FOR ANY ADDITIONAL ENGINE OPERATING HOURS

- \* J. ENGINE LUBRICATING OIL: CHEVRON TCWIII 2-STROKE OIL

**TAAC**

*Engine lubricating oil: TCWIII 2-stroke oil.*

4. SPECIAL WARNINGS, CAUTIONS AND NOTES:

-----WARNING-----

- \* A. TO AVOID RADIATION HAZARDS, PERSONNEL SHALL STAY CLEAR OF THE FOLLOWING EMITTERS BY THE DISTANCE INDICATED WHEN THEY ARE OPERATING:
  - (1) THREE (3) FEET FROM THE ADT TRANSMIT ANTENNA
  - (2) SIX (6) FEET WHEN IN FRONT OF THE GDT ANTENNA
  - (3) NINE (9) INCHES (23 CENTIMETERS) FROM THE FREEWAVE TRANSCEIVER

**TAAC**

- 1. UAV – low: 40cm high: 1m
- 2. UHF – low: 60cm high: 2.5m
- 3. GDT – low: 4m high: 11m

-----WARNING-----

- B. OPERATION SHOULD BE CONDUCTED AWAY FROM ANTENNAS OF ACTIVE RADIO-FREQUENCY (RF) TRANSMITTERS AND RADARS, ESPECIALLY THOSE OPERATING AT HIGH POWER LEVELS. THIS IS BECAUSE AIR VEHICLE CONTROL OR NAVIGATION COULD POSSIBLY FALL VICTIM TO RF-INDUCED DISRUPTION. AEROSTAR ELECTRONIC/ELECTRICAL EQUIPMENT HAS NOT BEEN WELL-DESIGNED OR TESTED FOR IMMUNITY AGAINST RF ENERGY. RF DISRUPTION FROM OTHER AEROSTAR OR OTHER UAV SYSTEMS IS ALSO POSSIBLE, PERHAPS IMPAIRING CO-LOCATIONAL OPERATION OF THESE SYSTEMS.

-----NOTE-----

C. SUCCESSFUL COMPLETION OF AN ELECTROMAGNETIC COMPATIBILITY (EMC) SAFETY-OF-FLIGHT TEST (SOFT) IS REQUIRED PRIOR TO FIRST FLIGHT WITH NEW OR MODIFIED ELECTRONIC/ELECTRICAL EQUIPMENT.

-----NOTE-----

D. ENSURE THAT THE WEIGHT AND BALANCE EFFECTS OF ANY SUBSEQUENT CONFIGURATION CHANGES SHALL BE DOCUMENTED AND RECORDED PRIOR TO FLIGHT. WEIGHT AND BALANCE MUST BE VERIFIED AND WITHIN LIMITS PRIOR TO FLIGHT.

-----NOTE-----

E. VISUAL INSPECTION SHALL BE PERFORMED FOLLOWING EACH FLIGHT FOR MATERIAL DEFORMATION AND OTHER DAMAGE IAW REF D CHECKLISTS. IF DEFORMATION IS FOUND, A MORE IN-DEPTH INSPECTION SHALL BE REQUIRED AND REPORTED TO NAVAIR STRUCTURES 4.3.3.2 OR 4.3.3.3.

-----NOTE-----

F. MAXIMUM TIME FOR ENGINE MAINTENANCE ACTIONS (READ IN TWO COLUMNS):

- (1) EVERY 25 ENGINE HOURS: REPLACE SPARK PLUGS AND CHECK FOR HEAT DISTRESS
- (2) EVERY 50 ENGINE HOURS: DECARBONIZE ENGINE
- (3) EVERY 150 ENGINE HOURS: REPLACE CRANKSHAFT ENCASING OIL SEALS
- (4) EVERY 450 ENGINE HOURS: RETIRE ENGINE FROM SERVICE PERMANENTLY

**TAAC**

**NOTE: Maximum time for engine maintenance actions:**

- 1. Every 10 hours: change spark plugs, inspect engine for wear.
- 2. Every 50 hours: return engine to Aeronautics for overhaul.

5. TIME PERIOD: THIS FLIGHT CLEARANCE EXPIRES 30 SEP 2010.

6. POINTS OF CONTACT:

- A. (b) (6), AIR-4.1.1.5, CLASS DESK SMALL UAV, (b) (6)
- B. (b) (6), AIR-4.1.2.2, MUDO TEAM LEADER, (b) (6)
- C. (b) (6), AIR-4.11.6.3, (b) (6)
- D. (b) (6), PMA-263, (b) (6), (b) (6)
- E. (b) (6), AIR-4.11.6.3, (b) (6), (b) (6)
- F. (b) (6), FLIGHT CLEARANCE SUPPORT, (b) (6)

G. INFORMATION REGARDING THE AIRWORTHINESS OFFICE AND PROCESS, INCLUDING A LISTING OF ALL CURRENT INTERIM FLIGHT CLEARANCES ISSUED BY NAVAIR 4.0P AND 24/7 CONTACT NUMBERS, CAN BE FOUND AT OUR WEBSITE: AIRWORTHINESS.NAVAIR.NAVY.MIL. OUR GLOBAL BY EMAIL AT [AIRWORTHINESS@NAVY.MIL](mailto:AIRWORTHINESS@NAVY.MIL).

7. OTHER REMARKS:

- A. SUFFICIENT PERFORMANCE DATA INFORMATION (REF E) HAS BEEN GENERATED AND PROVIDED TO CERTIFY THE AIR VEHICLE FOR FLIGHT OPERATIONS OUTSIDE CONFINED/PROTECTED RANGES.
- B. THE UMAS IS DESIGNED TO RETURN HOME IF BOTH PRIMARY AND SECONDARY UPLINKS ARE LOST. RETURN HOME FUNCTIONS WERE VERIFIED IN FLIGHT WITH THE AEROSKY AND AEROLIGHT BY SWITCHING OFF BOTH UPLINKS AND ALLOWING THE UAVS TO RETURN TO PROGRAMMED RETURN POINT AND ORBIT AT PROGRAMMED AIRSPEED AND ALTITUDE
- C. PER REF F, THIS FLIGHT CLEARANCE PROVIDES NAVAIR AIRWORTHINESS CERTIFICATION SUBSEQUENT TO A DESIGN ENGINEERING REVIEW. IT DOES NOT AUTHORIZE AIRCRAFT/SYSTEM MODIFICATION, NOR DOES IT SATISFY NAVAIR REQUIREMENTS FOR CONFIGURATION MANAGEMENT OR CONTROL. REFER TO OPNAV4790.2J FOR POLICY GUIDANCE ON CONFIGURATION MANAGEMENT AND MOD

AUTHORITY.//

BT

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(b) (6), TESTWINGLANT FCCO, AIR-4.OP, 09/26/2005