

American Aerospace Advisors, Inc.
1279 Gulph Creek Drive
Radnor, Pennsylvania 19087

APPLICATION FOR EXPERIMENTAL LICENSE

1. INTRODUCTION

This engineering attachment is submitted on behalf of American Aerospace Advisors, Inc. ("AAAI"). AAAI requests Experimental License Authority to operate the equipment shown herein for the purpose of mobile remote control and communications data linkage for an unmanned aircraft vehicle ("UAV") pursuant to Parts 15 and/or 18 of the Commission's regulations. The FCC 442 form does not directly specify options for mobile ground control to airborne communication systems.

Separate systems are employed for remote control of the unmanned aircraft vehicle ("UAV") and communications data linkage. The RF Data Link equipment operates in the 2400-2483 MHz ISM band; the RF C2 Link equipment operates in the 902-928 MHz band. Spread spectrum technology is utilized.

The remote control system is critical to stable and safe operation and control of the UAV. The proposed EIRP of the vehicle-mounted tracking antenna is 80.35 W (49.05 dBm) in the 2400-2483 MHz ISM band. Transmitter power and antenna gain combinations are permissible within this frequency range which permit as much as 158 W (52 dBm) EIRP. Experimental authority is requested to use the equipment as configured as shown in the attached figures. Tests conducted under the requested Experimental License will determine the reliable service range for both the remote control system (RF Data Link Equipment) and telemetry (RF C2 Link Equipment). The tests will also allow AAAI to improve any proprietary algorithms to the control and telemetry systems, EMC compatibility, and provide operational data for this system.

A transponder is specified for the UAV. This equipment is required for the aircraft. The transponder operates in the 1090 MHz band with 11M0P1D emission. The MicroAir T2000AAV (FCC ID NS901P5) and the Sagetech XPS-TR Mode S transponders are approved for Part 15 and Part 87 use under Commission regulations.

2. EMISSIONS:

The MicroHard MHX-910 spread spectrum transceiver is rated at +30 dBm (1 watt) in the 902-928 MHz band. The emission designator is 350kF1D.

The Persistent Systems WR-RTR2-03030303 spread spectrum transceiver (Quad Radio Router) is rated at +27.8 dBm (0.6 W) in the 2402-2438 MHz band. This equipment is FIPS140 Level 2 validated and is on GSA Schedule GS-35F-0168Y. Typical 802.11 2.4 GHz band emission designator is 22M0G1D.

3. INTERFERENCE

The propagation mode for this equipment effectively is free space. The ground-based equipment will operate in a ground to air mode, and the aircraft equipment will transmit using omni or "blade" antennas to the vehicle-mounted control equipment.

Band pass filters are employed with each emitter to contain the emissions within the specified band width. These filters are denoted in the block diagram for each system.

AAAI does not believe the 80.35 W (49.05 dBm) emission from the ground-based 2.4 GHz RF Data Link will create objectionable interference. The antenna is directed upward toward the unmanned aircraft. The time duration the 2.4 GHz RF Data Link antenna will be directed on the ground is during UAV takeoff and landing. AAAI does not believe this system will create objectionable interference to other airborne or space based systems.

4. RADIATION HAZARD COMPLIANCE

AAAI proposes to operate this equipment in FULL COMPLIANCE with the Commission's non-ionizing electromagnetic radiation ("NIEMR") requirements. The appropriate contours for radiation compliance are 3.05 mW/cm² for the 902-928 MHz systems, and 5 mW/cm² for the 2.4 GHz RF C2 Link equipment.

The required clearance for the 902-928 MHz system with 0.824 W EIRP is 0.2 meter (calculated at 915MHz). In normal use, the 902-928 MHz antennas are well out of contact range by staff or observers. Bench test personnel should observe this clearance unless a suitable resistive, shielded dummy load is substituted for the antenna.

The required clearance for the 2.4 GHz ground-based, vehicular mounted station is one (1) meter with 49.05 dBm (80.35 W) radiated from the dish antenna. This determination is calculated for antenna boresight. Since the antenna is auto-rotatable, the roof area of the vehicle is off limits when the equipment is energized.

5. PROPOSED TEST LOCATIONS

Upon grant of the experimental license, AAAI proposes to test the complete system at two locations initially. The two locations are Cape May, New Jersey, and the government proving ground at Warren Grove, New Jersey. Maps showing the proposed test areas are attached since the electronic FCC 442 form does not allow for detail definition of the service area.

Cape May operations will originate from the United States Coast Guard station, using a decommissioned helicopter takeoff/landing area near coordinates N Lat. 38° 56' 41"- W. Lon. 74° 52' 48". The proposed operational test area for Cape May is primarily over the Atlantic Ocean, within 30 kilometers of the coast line. The tests will be coordinated with Coast Guard and Federal Aviation Administration officials. EMC compatibility of the aircraft/aircraft control equipment will be tested, along with EMC compatibility with nearby Coast Guard shore or vessel equipment.

AAAI requested FAA airspace clearance for 700 ft AGL over land and 15,000 ft AGL over water for the Cape May flight operations.

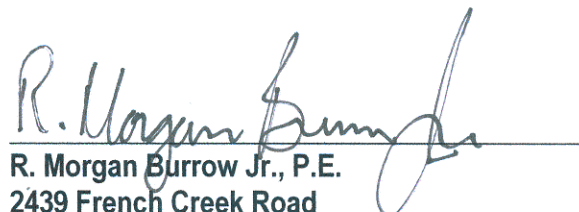
The Warren Grove, New Jersey location is a United States military test range. This range is located west of Barnegat, New Jersey. An aircraft landing strip is located on the grounds of the test range near coordinates N. Lat. 39° 41' 49" – W. Lon. 74° 23' 57". The Warren Grove facility occupies approximately 9,400 acres of land within the New Jersey Pine Barrens. There is ample area to test the UAV and the associated control system over land without the risk of tests conducted over populated areas. The tests will be coordinated with military officials in charge of the Warren Grove facility. UAV flights at Warren Grove will be conducted at 5,000 feet AGL or lower.

6. EQUIPMENT

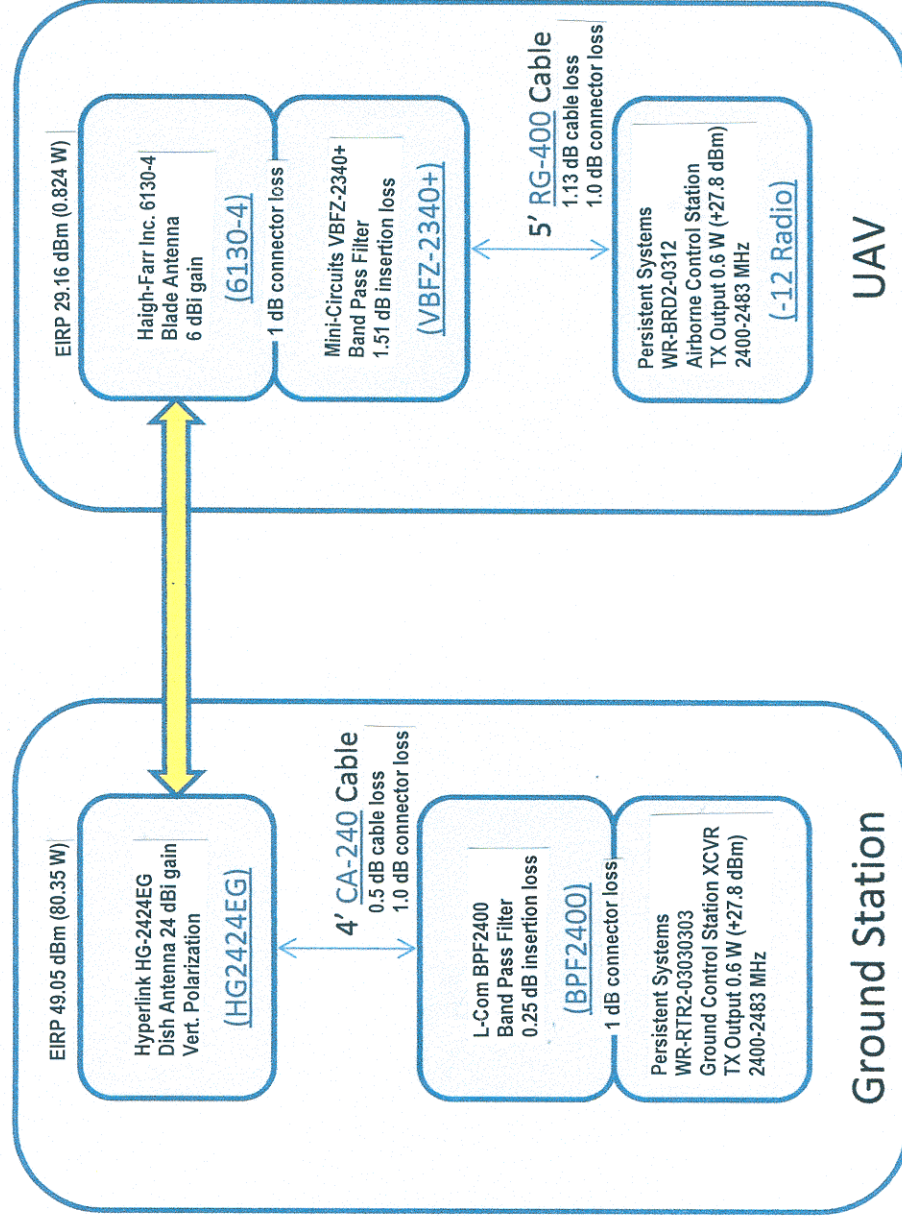
The system block diagrams provide the make and model of the transceivers, bandpass filters, interconnect line, and antennas. The transmitters are commercial and have FCC registration. Losses inherent at UHF frequencies include connector and interconnect line losses, and insertion losses of band pass filters. A conservative value of 1 dB is used for connector losses. Manufacturer data is used for cable and bandpass filter insertion losses. Antenna gain data is from manufacturer's data. These losses are used to determine the EIRP of the transmit systems.

7. SUMMARY

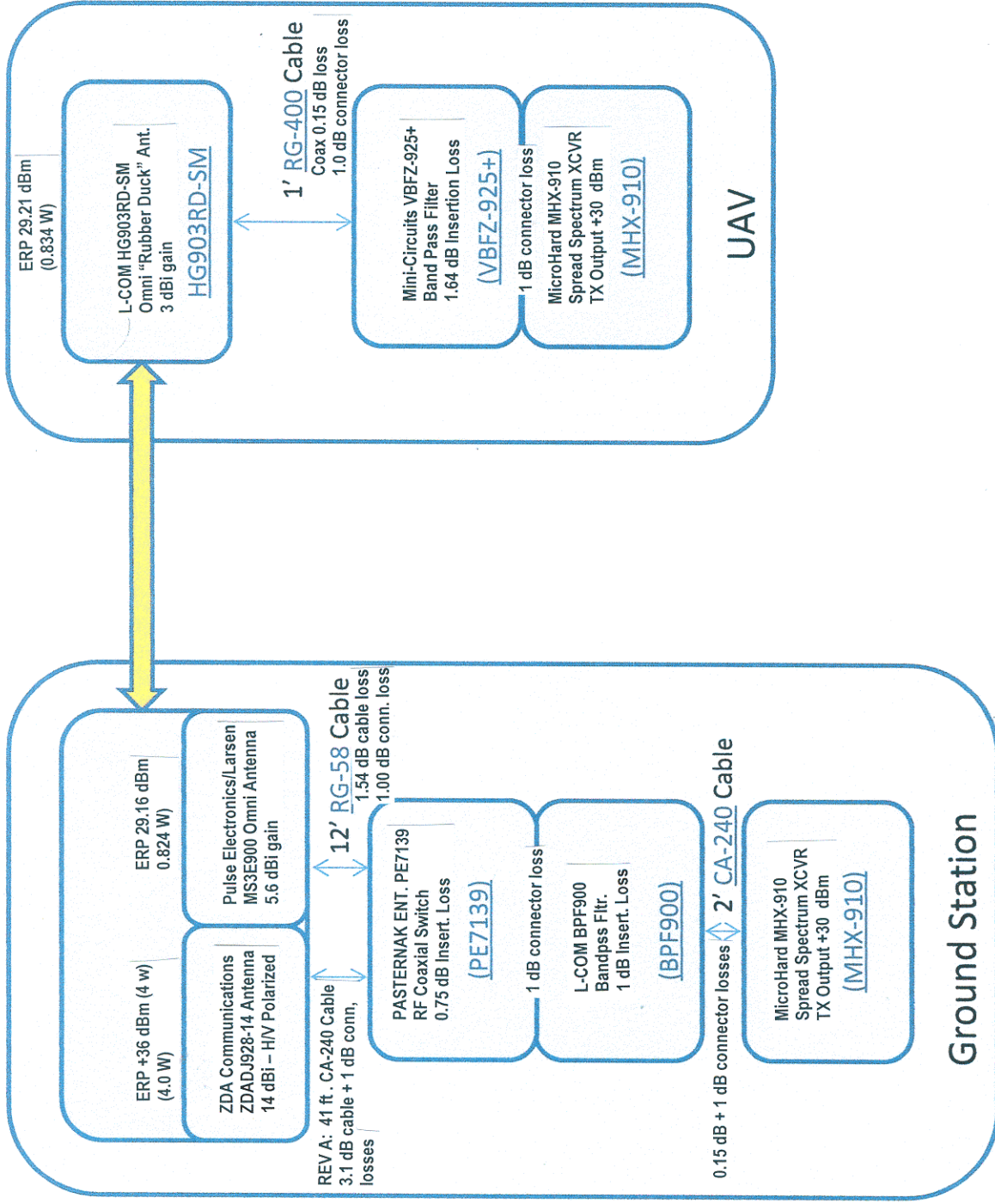
American Aerospace Advisors, Inc. ("AAAI") requests experimental license authority to operate the equipment specified in this application for aircraft control and data transmission purposes. No known further information is required to conform this application.


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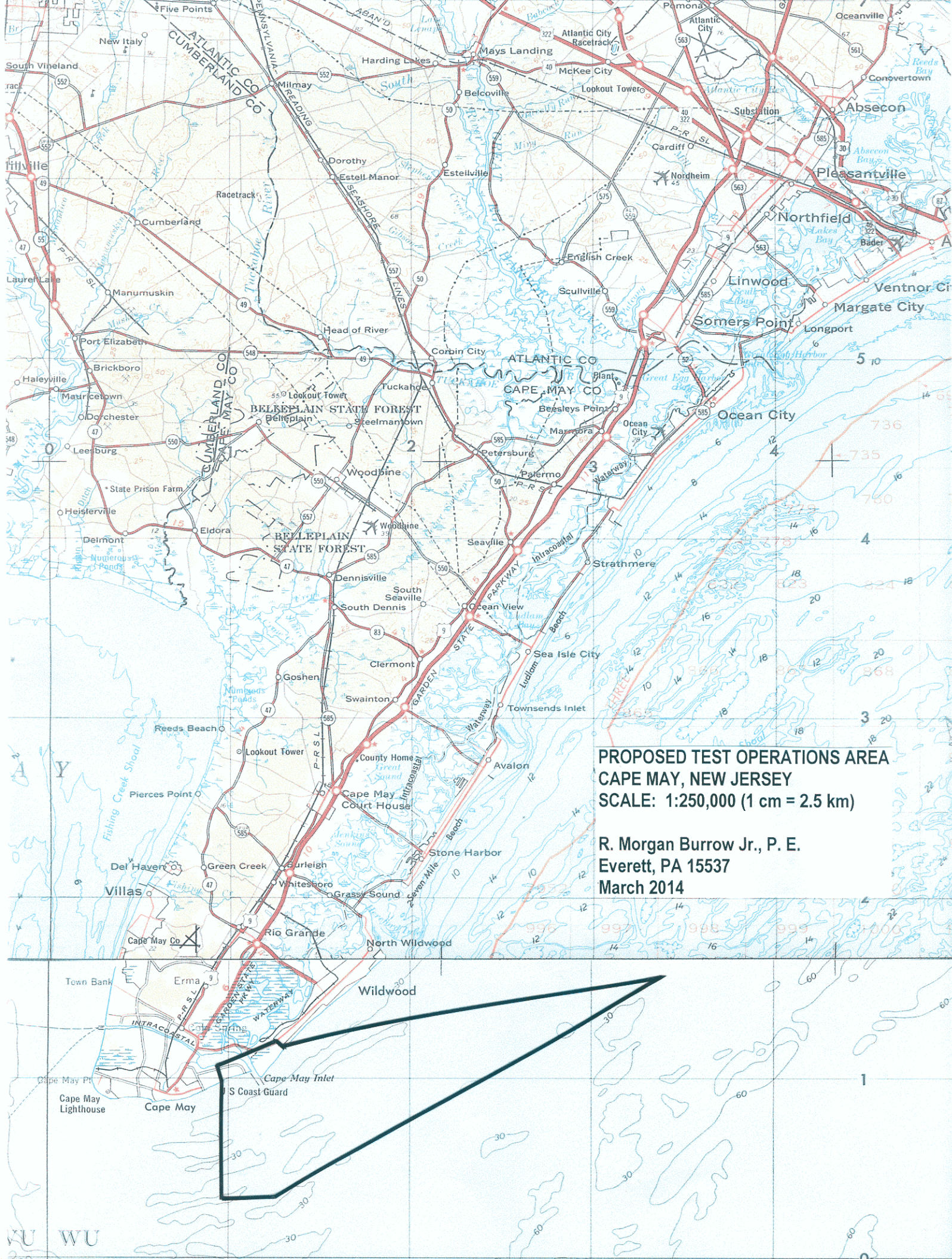
31 March 2014.



RF Data Link Equipment



RF C2 Link Equipment



PROPOSED TEST OPERATIONS AREA
CAPE MAY, NEW JERSEY
SCALE: 1:250,000 (1 cm = 2.5 km)

R. Morgan Burrow Jr., P. E.
Everett, PA 15537
March 2014



Memorandum for UAS COA CASE 2013-ESA-67-COA

Subject: Flight Operations Area
Doc. No.: AED004064
Date: August 17, 2013
Prepared by: David W. Yoel, UAS Systems Engineer, Contractor, Unmanned Aircraft System Initiative, New Jersey Institute of Technology, Dyoel@American-Aerospace.net, 484-995-0709, for Dr. Michael Chumer, Director

In discussions with the FAA and local ATC we will request a COA area defined by an area extending from the point labeled:

- Pt 1: Latitude 38°57'6.40"N; Longitude 74°53'38.84"W, northeast to
Pt 2: Latitude 38°57'23.83"N; Longitude 74°51'18.39"W, southeast to
Pt 3: Latitude 38°57'9.24"N; Longitude 74°50'57.81"W, southeast to
Pt 4: Latitude 38°56'6.88"N; Longitude 74°46'3.64"W, northeast to
Pt 5A: Latitude 39°1'58.90"N; Longitude 74°31'11.59"W, southeast to
Pt 6A: Latitude 38°59'11.72"N; Longitude 74°27'25.07"W, southwest to
Pt 7A: Latitude 38°48'22.92"N; Longitude 74°41'18.01"W, west to
Pt 8A: Latitude 38°48'29.69"N; Longitude 74°52'48.49"W, and return northwest to the point labeled Pt 1.



Figure 1. Figure 2: COA Airspace request.

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The airspace extends from the airstrip approximately 10NM south to a point 3.5 miles north of the northern boundary of Warning Area W-386 and extends east 10NM. The southeastern boundary extends northeastward 17NM to a point approximately 3.5 miles from the southwestern edge of Warning Area W-107C. The northeast edge extends approximately 4.4 NM to a point 3.5 miles southwest of the southwest corner of W-107C. The edge then extends southwest 14.5NM remaining clear of the 10NM SIE VOR. Finally, the edge then extends approximately 4NM northwest to the landing strip.

This area is specifically requested to enable launch and landing operations from the unused airfield at the US Coast Guard Training Center Cape May which provides access to airspace over the Atlantic Ocean.



Figure 2: Former Coast Guard Air Station in Cape May.



Figure 3. Unused runway at Cape May Coast Guard Station.

Other airspace considerations include:

- 1) V139 extends southwest to northeast directly adjacent to the Coast Guard Station. Thus, Class E airspace extends from 1200' MSL over the field and 4NM laterally on either side of the Airway.
- 2) There is another Class E 700' MSL and up boundary surrounding KWWD that extends into the requested COA area south and east of the Coast Guard Station.

The altitudes associated with the COA are 5500' MSL to 15000' MSL in the eastern section of the COA (east of Pt 4), 1700' MSL to 10000' MSL in the southwestern area. The base of the airspace is to remain inside of Class E, which generates the requirement of constant two-way radio communication with Air Traffic Control. In order to remain well clear of transiting aircraft in the V139 and KWWD Class E airspace, we propose a 500' separation in airspace over the Air Station—surface to 700' MSL out to the perimeters of the V139 and KWWD airspace described above.

Signed,

Dr. Michael Chumer
UAS Initiative
New Jersey Institute of Technology

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