No certificate may be issued unless a completed application form has been received (14 C.F.R. 91, 101, and 105).

US Department of Transportation
Federal Aviation Administration

APPLICATION FOR CERTIFICATE OF WAIVER OR AUTHORIZATION

Form Approved: O.M.B. No. 2120-0027

APPLICANTS - DO NOT USE THESE SPACES

Region	Date

Action
☐ Approved ☐ Disapproved - *Explain under "Remarks"*

Signature of authorized FAA representative

INSTRUCTIONS

Submit this application in triplicate (3) to any FAA Flight Standards district office.

Applicants requesting a Certificate of Waiver or Authorization for an aviation event must complete all the applicable items on this form and attach a properly marked 7.5 series Topographic Quadrangle Map(s), published by the U.S. Geological Survey (scale 1:24,000), of the proposed operating area. The map(s) must include scale depictions of the flightlines, showlines, race courses, and the location of the air event control point, Police dispatch, ambulance, and fire fighting equipment. The applicant may also wish to submit photographs and scale diagrams as supplemental material to assist in the FAA's evaluation of a particular site. Application for a Certificate of Waiver or Authorization must be submit- ted 45 days prior to the requested date of the event.

Applicants requesting a Certificate of Waiver or Authorization for activities other than an aviation event will complete items 1 through 8 only and the certification, item 15, on the reverse.

1. Name of organization	2. Name of responsible person
Federal Highway Administration & Meggitt Defense Systems-Texas, C/O Florida Department of Transportation	Chester H. Chandler / Florida Department of Transportation

3. Permanent mailing address	House number and street or route number	City	State and ZIP code	Telephone No.
	605 Suwannee St./MS90	Tallahassee	FL 32399-0450	850/414 4980

4. FAR section and number to be waived

5. Detailed description of proposed operation *(Attach supplement if needed)*

See Supplement No. 1 (attached)

6. Area of operation *(Location, altitudes, etc.)*

In the vicinity of Opa-Locka Airport (Miami-Dade County, FL) along the route indicated in 5. above at an altitude of between 1500 and 2000 feet.

7a. Beginning *(Date and hour)*	b. Ending *(Date and hour)*
June 3, 2001 1:00 PM June 4, 2001 12:00 PM (Noon)	June 3, 2001 2:30 PM June 4, 2001 1:30 PM

8. Aircraft make and model (a)	Pilot's Name (b)	Certificate number and rating (c)	Home address *(Street, City, State)* (d)
See Supplement No. 3 (attached).			

April 16, 2001

Ms. Patricia Graham
Airspace Specialist
FAA – Southern Region
P.O. Box 20636
Atlanta, GA 30320
ATTN.: ASO-520.10

RE: FHWA/Meggitt Defense Systems-TX/Florida DOT - Application for Certificate of Waiver or Authorization – UAV Flight Operations Proposed June 3 and 4

Dear Ms. Graham:

I am pleased to forward to you a completed FAA Form 7711-2 – Application for Certificate of Waiver or Authorization on behalf of the Federal Highway Administration, Meggitt Defense Systems-TX and the Florida Department of Transportation for UAV flight operations proposed June 3 and 4 in Miami-Dade County, Florida. The application includes four supplements.

The UAV proposed for these flights is the Meggitt Defense Systems-TX Sentry HP, an outstanding aircraft with an outstanding performance and safety record. To date, 136 Sentry HPs have been produced for the US Army, the US Navy, the FBI and others. Although the actual number of flight hours accumulated by the Sentry program in its 14 years of operations is not available for security reasons, the total is in the thousands. During over 800 hours of factory acceptance flights logged since January 1, 1996, there have been only four accidents, summarized as follows:

Date	Cause	Damage	Corrective Action
01/96	Engine seized on takeoff (first flight of engine in new configuration, no subsequent problems.)	Class A	Exhaust/cooling systems redesigned
05/97	Pitch gyro, improperly wired	Class A	FCS production procedure changed
10/97	Pilot error, extreme attitude	Class A	Control handoff procedure revised
04/98	Pilot error, stall turning final	Class A	Final approach speeds recalculated

The purpose of the proposed UAV flight operations is to demonstrate surface transportation management capabilities of the UAV through video surveillance techniques. If this application is approved by the FAA, these UAV flight operations will become an official program item for the Intelligent Transportation Society of America's Eleventh Annual Meeting and Exposition – *ITS: Connecting the Americas* -- occurring June 4-7 at the Miami Beach Convention Center. We anticipate that approximately 100 delegates from the annual meeting and exposition, transportation officials from all over the world, will be in attendance at each of our two UAV flight operations.

Intelligent transportation systems development and deployment is a critical element in the Florida Department of Transportation's surface transportation plan. We believe that UAV capabilities provide great promise with respect to our future deployments of intelligent transportation systems. For example, UAVs could be used for: routine traffic management surveillance, incident management, and emergency evacuation procedures. Other public agencies could benefit as well; agriculture crop management, forest fire management and law enforcement uses come readily to mind.

I would like to thank you for your assistance with our application to this point. And, I look forward to corresponding with you to resolve any issues you may have associated with our application. I may be reached at 850/414-4980 if you should have any questions or concerns.

Sincerely yours,

Chester H. Chandler III, P.E.
ITS Manager

cc: Ken Morefield, Florida Department of Transportation
Stan Powell, Meggitt Defense Systems - TX
Chung Tran, Federal Highway Administration

CHC:er

Enclosure: FAA Form 7711-2 dated 4/16/01

▶ *ITEMS 9 THROUGH 14 TO BE FILLED OUT FOR AIR SHOW/AIR RACE WAIVER REQUESTS ONLY.*

9. The air event will be sponsored by:

10. Permanent mailing address	House number and street or route number	City	State and ZIP code	Telephone No.

11. Policing *(Describe provisions to be made for policing the event.)*

12. Emergency facilities *(Mark all that will be available at time and place of air event.)*

☐ Physician ☐ Fire truck ☐ Other - *Specify* _____

☐ Ambulance ☐ Crash wagon _____

13. Air Traffic control *(Describe method of controlling traffic, including provision for arrival and departure of scheduled aircraft.)*

14. Schedule of Events *(include arrival and departure of scheduled aircraft and other periods the airport may be open.)*

Hour (a)	Date (b)	Event (c)

If sufficient space is not available, the entire schedule of events may be submitted on separate sheets, in the order and manner indicated above.

Please Read > The undersigned applicant accepts full responsibility for the strict observance of the terms of the Certificate of Waiver or Authorization, and understands that the authorization contained in such certificate will be strictly limited to the above described operation.

15. Certification - I CERTIFY that the foregoing statements are true.

Date	Signature of Applicant
4-16-01	

Remarks

The following supplements are attached hereto, and made a part of, this application:

Supplement No. 1-Detailed Description of Proposed Operation
Supplement No. 2-Table of Waypoints
Supplement No. 3-UAV Physical Characteristics And UAV Flight Performance Characteristics
Supplement No. 4-Airworthiness Letter of Meggitt Defense Systems-Texas

Supplement No. 1

Detailed Description of Proposed Operation

5. Description and Purpose of the Flights. Joint demonstration flights of one unmanned aerial vehicle (UAV) by: Federal Highway Administration, Florida Department of Transportation and Meggitt Defense Systems – Texas. UAV flights are to depart from, and return to, Opa-Locka Airport (Miami-Dade County, FL – Lat 25-54.00 N, Long 80-17.51 W) and overfly portions of the following surface highways: Florida's Turnpike, Interstate 95, North Miami Beach Blvd., Biscayne Blvd., Hallandale Beach Blvd., and the Palmetto Expwy. Note: A table of waypoints of the exact overfly route is provided at Supplement No. 2. Principal purpose of the flights is to demonstrate surface transportation management capabilities of the UAV through video surveillance techniques. Each flight, on each day, is expected to last approximately 45 minutes.

Method of Pilotage and Proposed Method to Avoid Other Air Traffic. Four means of pilotage of the UAV will be maintained at all times:

1) manually, by the Meggitt Defense Systems – Texas UAV command and control operator (CCO) housed in the ground control station (line of sight data link); the CCO has accumulated over 20 years of experience with UAV flight operations.
2) manually, by the external pilot on the surface, next to the ground control station (line of sight data link); at times, particularly associated with takeoff and landing, the UAV will be piloted manually by the external pilot via line of sight data link.
3) manually, by the chase aircraft UAV pilot – seated behind the pilot and co-pilot/visual observer (Futaba radio controller); a Florida Highway Patrol-provided chase aircraft (Cessna aircraft), with a Meggitt Defense Systems – Texas flight team member on board as co-pilot/visual observer and another flight team member on board as the chase aircraft UAV pilot, will shadow the UAV during all phases of the flights, i.e., all flight activity will be conducted at all times within the visual line of sight of the co-pilot/visual observer and chase aircraft UAV pilot; thus, the co-pilot/visual observer and chase aircraft UAV pilot will provide a level of safety for the UAV flights equivalent to "see & avoid."
4) autonomously, assisted by the global positioning system (GPS); the UAV will primarily be piloted autonomously by the onboard avionics (flight control system, mission computer, GPS receiver and attitude heading reference system) to provide for a precise tracking and altitude along the overfly route.

Coordination, Communication and Compliance with Air Traffic Control. The Meggitt Defense Systems – Texas flight team will be in instantaneous direct two-way communication at all times with all affected ATC facilities. The CCO and the flight team in the ground control station will be monitoring all local control tower frequencies during the flight operations. The CCO shall comply with all ATC clearances and instructions. The flight team will issue appropriate NOTAM(s) for each UAV flight operation.

Flight Operation Termination Procedures and Other Safety Actions. In the event of loss of data link, the UAV will be piloted manually by the chase aircraft UAV pilot, or autonomously by the onboard avionics (preprogrammed to orbit locally). In the event of a required mission abort above 200 ft., the flight operation shall be terminated by the automatic deployment of the emergency recovery parachute. (The parachute deploys automatically in the event a departure from controlled flight occurs.) This recovery method has been exercised four times, all successfully, and the UAV was recovered with repairable damage and no collateral property damage. In the event of a required mission abort during takeoff and landing, or otherwise below 200 ft., the UAV will be handled according to the checklist for the particular emergency. The CCO shall be responsible at all times for all collision avoidance maneuvers with nonparticipating aircraft and the safety of persons and property on the surface.

Meteorological Conditions Affecting Flight Operations. No UAV flight operations shall be conducted at any altitude where there are clouds or obscuring phenomena of more than five-tenths coverage and not less than 500 feet from the base of any cloud – or the simpler version of UAV flight operations shall be conducted in VFR conditions.

Supplement No. 2

UAV Route

Table of Waypoints

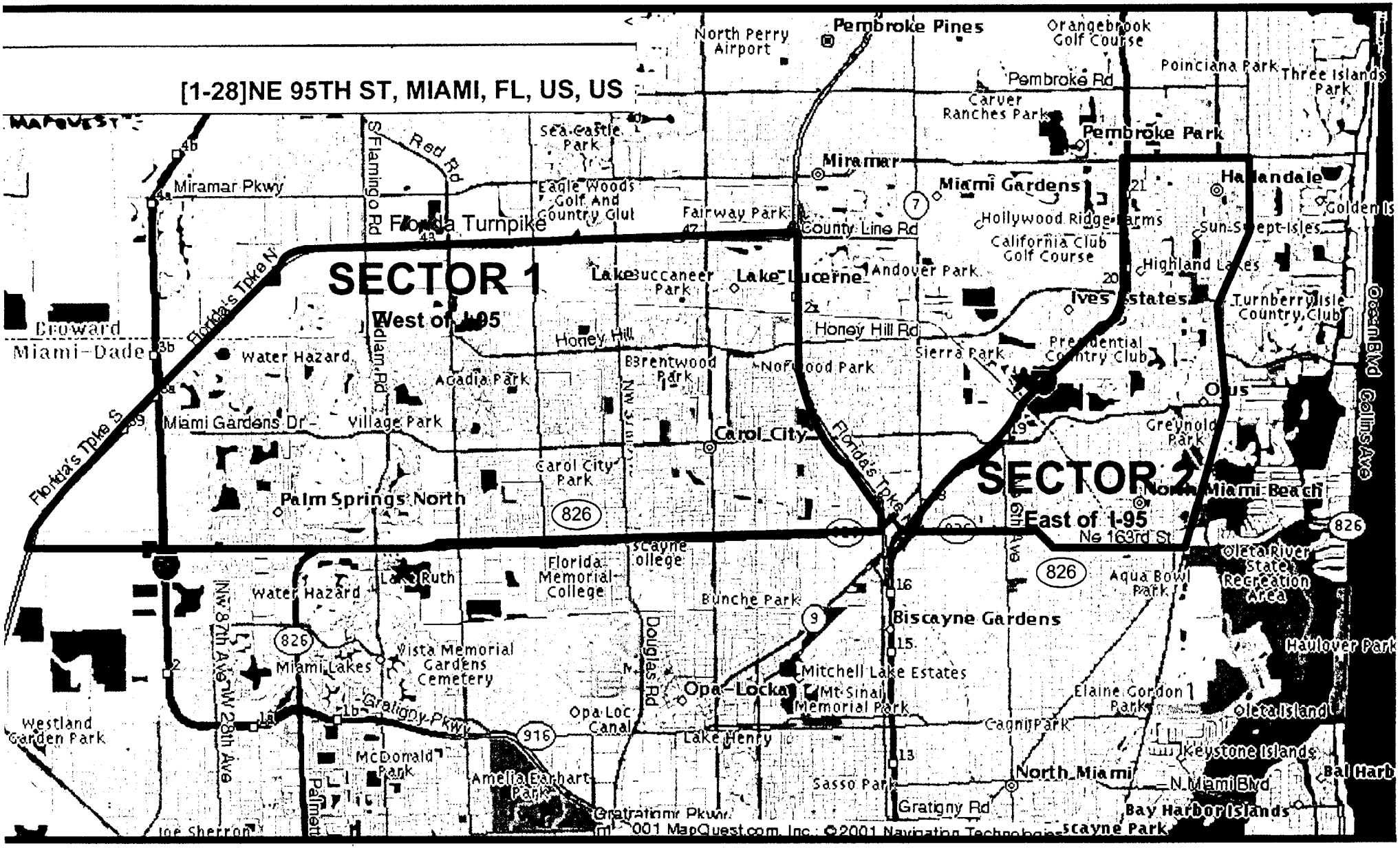
Note: 1. Readings were taken using a MAGELLAN GPS 3000 XL

2. Measurements are in Degrees - Minutes - Decimal Seconds

SECTOR 1 - West of I-95		
	GPS Coordinates (DD-MM.SS)	
Location Address	North or South	East or West
Opa-Locka Airport - Northwest Corner	25-54.00 N	80-17.51 W
NW 57 Ave and SR 826	25-55.49 N	80-17.59 W
SR 826 and NW 67 Ave	25-55.50 N	80-18.52 W
SR 826 just before bend heading South	25-55.49 N	80-19.10 W
I-75 West of SR 826 Bend (S of Miami Gardens Dr)	25-55.49 N	80-20.99 W
TPK West of SR 826 Bend (1 Mile N of Okeechobee)	25-55.49 N	80-22.58 W
TPK NB @ beginning of NE curvature	25-55.58 N	80-22.54 W
2nd point on curve	25-55.73 N	80-22.46 W
3rd point on curve	25-55.79 N	80-22.42 W
4th point on curve	25-55.83 N	80-22.39 W
5th point heading straight NE direction	25-55.89 N	80-22.32 W
TPK Just before I-75	25-56.87 N	80-21.13 W
TPK before canal - 1 mile past I-75	25-57.77 N	80-20.03 W
TPK after canal beginning EB curve	25-57.98 N	80-19.78 W
2nd point on EB curve	25-58.06 N	80-19.65 W
3rd point on EB curve	25-58.11 N	80-19.58 W
4th point on EB curve	25-58.18 N	80-19.42 W
5th point on EB curve	25-58.22 N	80-19.24 W
6th point on EB curve	25-58.23 N	80-19.12 W
7th point on EB curve (end of bend)	25-58.24 N	80-19.07 W
1/2 mile before Red Road	25-58.24 N	80-18.65 W
Slight bend @ NW 57 Ave	25-58.24 N	80-17.99 W
TPK - 1 mile west of East of 57 Ave	25-58.27 N	80-16.84 W
TPK and NW 37 Ave	25-58.31 N	80-17.75 W
TPK and NW 27 Ave	25-58.34 N	80-14.82 W
TPK @ Toll Plaza	25-58.35 N	80-14.32 W
TPK after Toll Plaza	25-58.36 N	80-14.11 W
TPK South towards Miami	25-58.32 N	80-13.79 W
TPK South 1 mile before NW 199 Street	25-58.17 N	80-13.78 W
TPK South at NW 199 Street	25-57.69 N	80-13.77 W
TPK South at entrance ramp from 199 ST - Curve begins	25-57.23 N	80-13.75 W
2nd point on curve	25-57.06 N	80-13.72 W
3rd point on curve	25-56.73 N	80-13.56 W
4th point on curve (end of curve)	25-56.53 N	80-13.40 W
TPK @ Toll Plaza before GGI	25-56.15 N	80-13.01 W
TPK - 1/2 mile South of Toll Plaza - Curve	25-55.99 N	80-12.84 W
2nd point on curve	25-55.94 N	80-12.80 W
3rd point on curve (end of curve)	25-55.84 N	80-12.75 W
CENTER OF GOLDEN GLADES INTERCHAN	25-55.64 N	80-12.73 W

SECTOR 2 - EAST of I-95		
	GPS Coordinates (DD-MM.SS)	
Location Address	North or South	East or West
NE 167 ST and NW 2nd Ave	25-55.64 N	80-12.30 W

NE 167 ST and NW 1st Ave	25-55.67 N	80-12.21 W
NE 167 ST and NW 8th Ave - curve	25-55.72 N	80-11.08 W
2nd point on curve	25-55.72 N	80-11.00 W
3rd point on curve	25-55.68 N	80-10.99 W
4th point on curve (end of curve)	25-55.57 N	80-10.74 W
NE 163 ST and NE 11 Ave	25-55.52 N	80-10.59 W
NE 163 ST and NE 18 Ave	25-55.55 N	80-09.88 W
NE 163 ST and Biscayne Blvd.	25-55.57 N	80-09.24 W
Biscayne and NE 171 ST	25-55.85 N	80-09.12 W
Biscayne and NE 183 ST	25-56.70 N	80-08.85 W
Biscayne and NE 186 ST	25-56.83 N	80-08.82 W
Biscayne and NE 187 ST	25-56.89 N	80-08.80 W
Biscayne and NE 188 ST	25-57.04 N	80-08.79 W
Biscayne and Ives Dairy Road	25-55.77 N	80-08.81 W
Biscayne and 208 ST	25-58.04 N	80-08.71 W
Biscayne and 213 ST	25-58.34 N	80-08.57 W
Biscayne and 214 ST	25-58.50 N	80-08.52 W
Biscayne and SE 7 ST	25-58.64 N	80-08.52 W
Biscayne and Hallandale Beach Blvd.	25-59.12 N	80-08.54 W
Hallandale and I-95	25-59.10 N	80-08.92 W
I-95 Entrance ramp from Hallandale	25-58.87 N	80-09.97 W
bend 1 along I-95	25-58.76 N	80-09.98 W
bend 2	25-58.60 N	80-09.98 W
bend 3	25-58.12 N	80-09.94 W
bend 4	25-57.92 N	80-09.94 W
bend 5	25-57.78 N	80-09.98 W
bend 6	25-57.62 N	80-10.09 W
bend 7	25-57.36 N	80-10.50 W
bend 8	25-57.27 N	80-10.63 W
bend 9	25-56.92 N	80-11.05 W
bend 10	25-56.83 N	80-11.14 W
bend 11	25-56.71 N	80-11.21 W
bend 12	25-56.62 N	80-11.26 W
bend 13	25-56.44 N	80-11.46 W
bend 14	25-56.37 N	80-11.54 W
bend 15	25-56.33 N	80-11.62 W
bend 16	25-56.29 N	80-11.72 W
bend 17	25-56.25 N	80-11.82 W
bend 18	25-56.20 N	80-11.91 W
I-95 SB @ HOV - Connects to GGI from here	25-55.00 N	80-12.16 W
GGI and SR 826 Westbound	25-55.78 N	80-12.74 W
Slight curve before NW 12 Ave	25-55.72 N	80-12.81 W
Heading straight Westbound	25-55.70 N	80-12.86 W
SR 826 and NW 27 Ave	25-55.60 N	80-14.60 W
SR 826 and NW 32 Ave	25-55.57 N	80-15.10 W
SR 826 and NW 37 Ave	25-55.58 N	80-15.66 W
SR 826 and NW 47 Ave	25-55.54 N	80-16.59 W
bend 1	25-55.54 N	80-16.73 W
bend 2	25-55.54 N	80-16.87 W
SR 826 and NW 57 Ave	25-55.52 N	80-17.54 W


[1-28]NE 95TH ST, MIAMI, FL, US, US
SECTOR 1
West of I-95
SECTOR 2
East of I-95
Florida Turnpike
Pembroke Pines
North Perry Airport
Pembroke Park
Miramar
Miami Gardens
Hallandale
Carol City
Palm Springs North
Biscayne Gardens
North Miami
North Miami Beach
Opa-Locka
Miami Lakes
Broward
Miami-Dade
826
916
Miramar Pkwy
Miami Gardens Dr
NW 87th Ave
NW 27th Ave
Douglas Rd
Gratigny Pkwy
Honey Hill Rd
County Line Rd
NE 163rd St
Biscayne Blvd
Collins Ave
Florida's Turnpike
Florida Memorial College
Scayne College
Oleta River State Recreation Area
Haulover Park
Oleta Island
Keystone Islands
Bay Harbor Islands
Scayne Park
Mitchell Lake Estates
Mt Sinai Memorial Park
Vista Memorial Gardens Cemetery
Amelia Earhart Park
McDonald Park
Westland Garden Park
Lake Henry
Opa Loc Canal
Sasso Park
Cagni Park
Elaine Gordon Park
Aqua Bowl Park
Bunche Park
Lake Ruth
Water Hazard
Acadia Park
Village Park
Brentwood Park
Norwood Park
Carol City Park
Lake Buccaneer Park
Lake Lucerne
Andover Park
Fairway Park
Eagle Woods Golf And Country Club
Sea Castle Park
Orangebrook Golf Course
Carver Ranches Park
Poinciana Park
Three Islands Park
Hollywood Ridge Farms
California Club Golf Course
Highland Lakes
Ives Estates
Turnberry Isle Country Club
Sierra Park
Presidential Country Club
Greynolds Park
Oleta
MAPQUEST
©2001 MapQuest.com, Inc. ©2001 Navigation Technologies

Supplement No. 3

UAV Physical Characteristics And UAV Flight Performance Characteristics

UAV Physical Characteristics

Configuration: The UAV used in these flights is the Meggitt Defense Systems – Texas Sentry HP air vehicle configured with a Sony CCD nose video camera with auto iris and a 3 degree down tilt (providing a 30 degree color picture view to the ground control station), FLIR Systems Inc. Ultra 7000 dual sensor airborne imaging system and a conventional, wheeled landing gear

Length: 11.02 ft.

Wingspan: 12.8 ft.

Gross Weight: 325 lbs.

Method of Propulsion: Herbrandson Dyad 290, 27 hp

Fuel Capacity: 10 gallons/60 lbs.

Color: light gray; wing and tail tips painted high-visibility orange

Lighting: standard aircraft lighting (anti-collision lights and position lights) and high intensity strobes (IAW 14 CFR 23.1401) during all phases of flights; see also letter at Supplement No. 4 attached hereto

Transponder: transponder is an altitude encoding transponder (IAW 14 CFR 91.215) and will be set on a code assigned by ATC; the CCO will have the capability to reset the transponder code and activate the Ident feature in flight; UAV shall reset transponder to 7600 if loss of VHF/UHF ATC coordination and communications occurs; UAV shall reset transponder to 7700 if loss of data link and/or navigational capability occurs

UAV Flight Performance Characteristics

Top Speed: 110 kts.

Cruise Speed: 75 kts.

Maximum Altitude: 16,000 ft.

Rate of Climb: 500 ft./min.

Range/Endurance: 100 nautical miles/8 hours

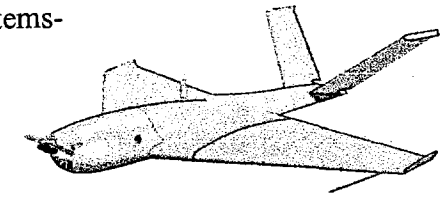
Means of Recovery: Power-assisted parachute landing at 56 kts. maximum – 10 kts. minimum – landing roll on wheels less than 50 ft.; conventional landing on wheels – landing roll less than 400 ft.

Note: Please see the Meggitt Defense Systems – Texas web site at: www.sentryuav.com for additional information about the company and its products.

Supplement No. 4

Airworthiness Letter of Meggitt Defense Systems-Texas

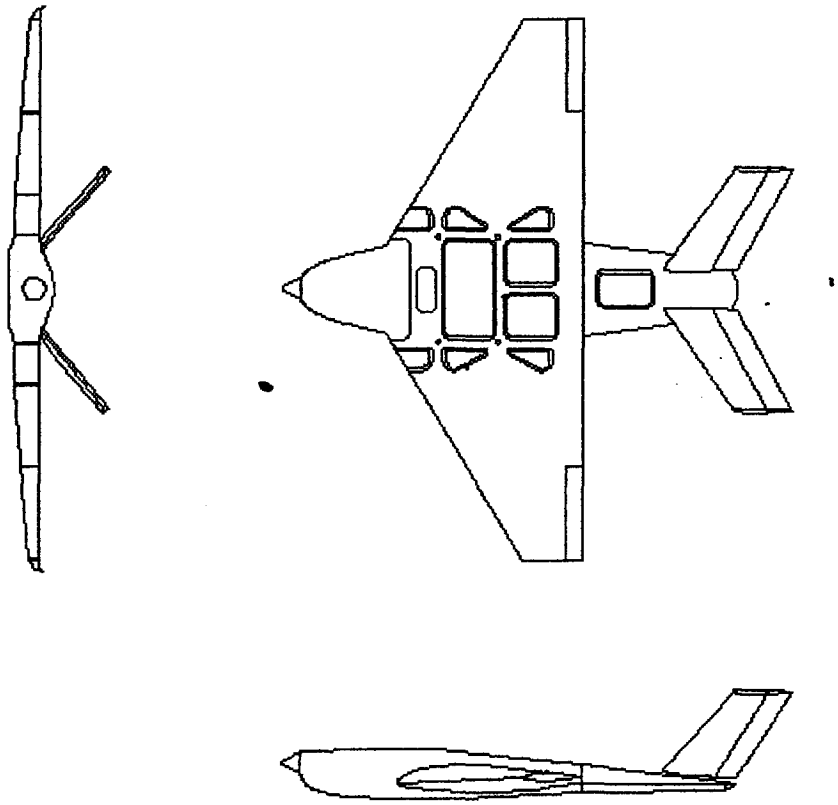
MEGGITT DEFENSE SYSTEMS - TEXAS



Date: April 10, 2001

Subject: Sentry HP Remotely Operated Aircraft (ROA) Airworthiness

Background: Meggitt Defense Systems – Texas, formerly known as S-TEC Unmanned Technologies, Inc., has been producing Sentry ROAs since 1986. Since then, its design has evolved over a number of variants, growing in weight and capability to the latest model, the Sentry HP. To date 136 Sentries have been produced and over 800 hours of factory acceptance flights accumulated in addition to the many hours flown by numerous organizations who maintain and fly the Sentry. The autopilot system used in the Sentry is manufactured by Meggitt Avionics who produces FAA approved autopilots for OEM and after market general aviation airplanes. Additionally, Meggitt manufactures the compass system, master control module, and transponder used in the Sentry. The Sentry powerplant is manufactured under military specifications and is used in a variety of ROAs worldwide. The airframe was designed by aeronautical engineers and has undergone wind tunnel and altitude cambers testing. The Sentry is made of carbon fiber composite material and light weight metal support brackets for securing components to the airframe. The onboard transponder codes can be set/and or changed, along with an IDENT feature at anytime through the Ground Control Station. The navigational lights and strobes are FAA approved light assemblies and installed in accordance with FAA standards (see attached letter). Sentry customers are U.S. Government, including U.S. Army, U.S. Navy, and FBI. The Sentry HP description, characteristics, performance, and primary payload follows.



CHARACTERISTICS:

Length, ft:	11.02	**Wing Span, ft:**	12.8
Gross Weight, lbs:	325	**Payload Weight, lbs:**	75
Fuel Capacity, lbs:	60	**Fuel Type:**	Gasoline/Aviation Gas
Engine Make:	Herbrandson Dyad 290	**Power, hp:**	27
Structure:	Carbon fiber	**Navigation:**	6 Channel Differential Ready GPS
Guidance:	S-TEC 750A(i) DFCS		
Data Link(s):	Microwave (S-Band)	**Data Rate(s), bps:**	9600

PERFORMANCE:

Endurance, hrs:	8.0	**Range nm:**	100
Max Speed, kts:	110	**Stall Speed, kts:**	50
Altitude, ft:	16,000		
Takeoff Means:	Pneumatic Launcher, Wheeled, or Dolly		
Navigation Modes:	Preprogrammed (100 waypoints)/autonomous/direct control		
Landing Means:	Conventional (wheels or skids)/parafoil/parachute		

SENSOR(S): VIDEO: EO/IR Cameras, FLIR, Inc

Aaron S. Powell
Operations Manager

MEGGITT

MEGGITT DEFENSE
SYSTEMS - TEXAS

One S-TEC Way
Municipal Airport
Mineral Wells, TX
76067-9236
USA
tel 940/328-1197
fax 940/328-0753

www.sentryuav.com

Date: April 10, 2001

Subject: Sentry ROA External Lights

To: Whom It May Concern

Meggitt Defense Systems-Texas manufacturer of the Sentry Remotely Operated Aircraft (ROA) installs the AeroFlash Signal, 28 volt, Three Light System, Part Number 156-0049 on each air vehicle. This light system has an FAA Parts Manufacturer Approval (PMA). The light system includes wiring, power supply, navigation, position, and strobe lights.

The onsite Designated Alteration Station (DAS) staff engineer was consulted before procuring this light package and for light(s) installation locations to ensure compliance with CFR, Title 14, Part 23, Subparts 23.1385-1401. The light package specifications/capabilities and airframe installation locations are compliant with CFR, Title 14.

Aaron S. Powell
Operations Manager