**Project SKY NET**

**Futuristic Innovative Technologies**

**Presented by**

**FIT**

cFOUO For Official Use Only: Controlled Unclassified Information

Participating Members:

Andrew Thomas, Spenser Gorenflo, Connor Hill

Dhwanil Desai, Nisarg Shah, Miles Medearis, Aayana Nedd, Mariana Villalabeitia Arenas

Dylan Huss, Bria Booth, Suleyman Gokdemir

|  |  |  |
| --- | --- | --- |
| **Rev.** | **Date** | **Revision Notes** |
| 0 | 8/23/2021 | Initial release by FIT |
| 1 | 9/30/2021 |  |

***Student Contribution:***

All students contributed equally.

***Table of Contents:***

[***1.*** ***Scope*** 5](bookmark://_Toc43130217#_Toc43130217)

[***2.*** ***Applicable Documents*** 5](bookmark://_Toc43130218#_Toc43130218)

[***3.*** ***System Requirements*** 5](bookmark://_Toc43130219#_Toc43130219)

[**3.1.** ***System Definition*** 5](bookmark://_Toc43130220#_Toc43130220)

[***3.1.1.*** ***General Description*** 6](bookmark://_Toc43130221#_Toc43130221)

[***3.1.2.*** ***Operational Requirements*** 6](bookmark://_Toc43130222#_Toc43130222)

[***3.1.3.*** ***Maintenance Concept*** 7](bookmark://_Toc43130223#_Toc43130223)

[***3.1.4.*** ***Functional Analysis and System Definition*** 8](bookmark://_Toc43130224#_Toc43130224)

[***3.1.5.*** ***Allocation of Requirements*** 11](bookmark://_Toc43130225#_Toc43130225)

[***3.1.6.*** ***Functional Interfaces and Criteria*** 12](bookmark://_Toc43130226#_Toc43130226)

[***3.2.*** ***System Characteristics*** 13](bookmark://_Toc43130227#_Toc43130227)

[***3.2.1.*** ***Performance Characteristics*** 13](bookmark://_Toc43130228#_Toc43130228)

[***3.2.2.*** ***Physical Characteristics*** 14](bookmark://_Toc43130229#_Toc43130229)

[***3.2.3.*** ***Effectiveness Requirements*** 15](bookmark://_Toc43130230#_Toc43130230)

[***3.2.4.*** ***Reliability*** 15](bookmark://_Toc43130231#_Toc43130231)

[***3.2.5.*** ***Maintainability*** 15](bookmark://_Toc43130232#_Toc43130232)

[***3.2.6.*** ***Usability (Human Factors)*** 16](bookmark://_Toc43130233#_Toc43130233)

[***3.2.7.*** ***Supportability*** 16](bookmark://_Toc43130234#_Toc43130234)

[***3.2.8.*** ***Transportability / Mobility*** 16](bookmark://_Toc43130235#_Toc43130235)

[***3.2.9.*** ***Flexibility*** 16](bookmark://_Toc43130236#_Toc43130236)

[***3.2.10.*** ***Sustainability*** 17](bookmark://_Toc43130237#_Toc43130237)

[***3.2.11.*** ***Safety*** 17](bookmark://_Toc43130238#_Toc43130238)

[***3.2.12.*** ***Security*** 17](bookmark://_Toc43130239#_Toc43130239)

[***3.3.*** ***Design and Construction*** 17](bookmark://_Toc43130240#_Toc43130240)

[***3.3.1.*** ***CAD/CAM Requirements*** 17](bookmark://_Toc43130241#_Toc43130241)

[***3.3.2.*** ***Materials, Processes, and Parts*** 18](bookmark://_Toc43130242#_Toc43130242)

[***3.3.3.*** ***Mounting and Labelling*** 18](bookmark://_Toc43130243#_Toc43130243)

[***3.3.4.*** ***Electromagnetic Radiation*** 18](bookmark://_Toc43130244#_Toc43130244)

[***3.3.5.*** ***Interchangeability*** 19](bookmark://_Toc43130245#_Toc43130245)

[***3.3.6.*** ***Workmanship*** 19](bookmark://_Toc43130246#_Toc43130246)

[***3.3.7.*** ***Testability*** 19](bookmark://_Toc43130247#_Toc43130247)

[***3.3.8.*** ***Economic Feasibility*** 19](bookmark://_Toc43130248#_Toc43130248)

[***3.4.*** ***Documentation / Data*** 19](bookmark://_Toc43130249#_Toc43130249)

[***3.5.*** ***Logistics*** 19](bookmark://_Toc43130250#_Toc43130250)

[***3.5.1.*** ***Maintenance Requirements*** 19](bookmark://_Toc43130251#_Toc43130251)

[***3.5.2.*** ***Supply Support*** 19](bookmark://_Toc43130252#_Toc43130252)

[***3.5.3.*** ***Test and Support Equipment*** 20](bookmark://_Toc43130253#_Toc43130253)

[***3.5.4.*** ***Personnel and Training*** 20](bookmark://_Toc43130254#_Toc43130254)

[***3.5.5.*** ***Facilities and Equipment*** 20](bookmark://_Toc43130255#_Toc43130255)

[***3.5.6.*** ***Packaging, Handling, Storage and Transportation*** 20](bookmark://_Toc43130256#_Toc43130256)

[***3.5.7.*** ***Computer Resources*** 20](bookmark://_Toc43130257#_Toc43130257)

[***3.5.8.*** ***Technical Data*** 21](bookmark://_Toc43130258#_Toc43130258)

[***3.5.9.*** ***Customer Service*** 21](bookmark://_Toc43130259#_Toc43130259)

[***3.6.*** ***Producibility*** 21](bookmark://_Toc43130260#_Toc43130260)

[***3.7.*** ***Disposability*** 21](bookmark://_Toc43130261#_Toc43130261)

[***3.8.*** ***Affordability*** 22](bookmark://_Toc43130262#_Toc43130262)

[***4.*** ***Test and Evaluation*** 22](bookmark://_Toc43130263#_Toc43130263)

[***5.*** ***Quality Assurance Provisions*** 22](bookmark://_Toc43130264#_Toc43130264)

[***6.*** ***Distribution and Customer Service*** 23](bookmark://_Toc43130265#_Toc43130265)

[***7.*** ***Acronyms*** 23](bookmark://_Toc43130266#_Toc43130266)

[***8.*** ***References*** 24](bookmark://_Toc43130267#_Toc43130267)

[***Appendix 1 - Existing System Descriptions*** 25](bookmark://_Toc43130268#_Toc43130268)

# ***Scope***

****This preliminary system specification has been created as an addendum to the primary UAV System Specification document and is to be used for educational purposes. It does not capture the full system specifications, nor does it include system requirements outside of this system unless a modification has been identified to those systems for this system to be fully integrated.

The scope of this document is to establish the sub-system level requirements from a performance, design, development and system level test perspective to integrate upgraded navigation technology into existing AUAVs, to make use of the latest technology to allow for continuous navigation information even in an electronic warfare (EW) jamming environment. Today’s encounters with agents of foreign governments may include such operations to confuse, destroy or otherwise compromise the mission of identification of illegal activity at the border.

Specifically, the project is to provide an add-on upgraded Navigation Unit (the system) that is to provide position, altitude and attitude data to the existing flight computer sub-system.

During the flight, the navigation sub-system provides a continuous stream of data to the flight computer to allow autonomous decision algorithms to properly calculate the AUAV position relative to programmed boundaries. This data is also fed to the mission control computers to allow AUAV command and control operators to see what is happening with the AUAV and to make real time mission decisions.

# ***Applicable Documents***

The processes and standard operating procedures referenced within this specifications document:

* 1. Military Standards

MIL-STD-499 for SYSTEM ENGINEERING MANAGEMENT (17 JUL 1969).

* 1. Federal Aviation Administration (FAA) Standards

FAA part 107 Unmanned Aircraft Systems (UAS)

# ***System Requirements***

This section covers all functional, nonfunctional, human-centered, and applicable system life-cycle requirements.

## ***System Definition***

The system is mainly made of hardware and software components with logistics and maintenance support. The fully operational system can stream data about the AUAV position even in an EW environment. This system takes advantage of the latest GPS receiver technology and spatial measurement systems to provide the AUAV with a robust information stream to allow for confident mission decisions.

### ***General Description***

The Navigation unit of the AUAV provides real time data to the flight computer to allow autonomous decisions about movement of the aircraft. This data allows the AUAV system to maneuver out of harm’s way (autonomously or manually directed) and to maintain visibility of the target with onboard optical systems.

The software consists of custom source code to detect GPS and IMS commands from the flight computer data stream for routing to the GPS and IMS respectively. This code is contained within the command routing processor (1.2.2). There is also custom source code contained in the data conditioning processor (1.2.1) to encrypt, buffer and packetize the data received from the IMU and GPS.

### ***Operational Requirements***

(Need, Mission, Use Profile, Distribution, Life Cycle)

The navigation sub-system is required for several stakeholder requirements:

S.R. 04 – The actions taken by the AUAV while operating autonomously shall be performed in a safe manner as to prevent injury or death.

S.R. 05 - The AUAV shall provide continuous situational awareness of the environment and its surroundings.

S.R. 15 - The AUAV shall not lose its position or report a false position in the presence of EW countermeasures.

S.R. 17 - The AUAV shall provide target standoff distance to protect the AUAV and provide noise abatement and concealment.

Stakeholder requirements 04,05 and 15 are directly impacted by the navigation sub-system while requirement 17 is indirectly coupled because the navigation sub-system input is needed for the flight computer to make effective decisions about the AUAV position. The navigation sub-system contains a sensor suite that is necessary for AUAV flight operations (manual or autonomous). These sensors provide necessary feedback to both the flight computer sub-system and the mission control center operator about that attitude, altitude and position of the AUAV system. The navigation sub-system is part of the larger AUAV system, and all these pieces work together to successfully accomplish the mission needs.

### ***Maintenance Concept***

The navigation subsystem shall support the function of updating firmware via transmission link with its mission control center. The supplier will train onsite maintenance technicians to perform any required maintenance and upgrade functions.

The supplier has a 24/7 customer support center available with trained engineers ready to assist in troubleshooting any issues that the customer may encounter. This option is available up to 120 hours of time covered under contract. Additional time shall be billable to the U.S. Department of Defense.

If the system cannot be repaired on-site, the supplier maintains a full repair capability down to component level at their corporate headquarters. Hardware can be returned to that facility if necessary. This service is without cost during the stated warranty period. After that time, the return evaluation and repair shall be billable to the U.S. Department of Defense.

### ***Functional Analysis and System Definition***

Discussion

When the AUAV is programmed for a target area and launched, the navigation sub-system provides real time data to the flight computer about the position, altitude and attitude of the AUAV. This information is used by autonomous onboard systems to calculate position relative to programmed GPS “fences” in order to determine the appropriate flight control action necessary. This data is also processed by the mission control center computer systems to provide the AUAV operator with display indications that enable the operator to make manual flight control changes as necessary.

The navigation sub-system is divided into several distinct functions. These functions are depicted in the figure below:

1.1 Power Distribution

1.2 Processor

1.2.1 Data Conditioning Processor

1.2.2 Command Routing Processor

1.3 Inertial Measuring Unit

1.4 GPS

1.4.1 Receiver

1.4.2 CRPA Antenna

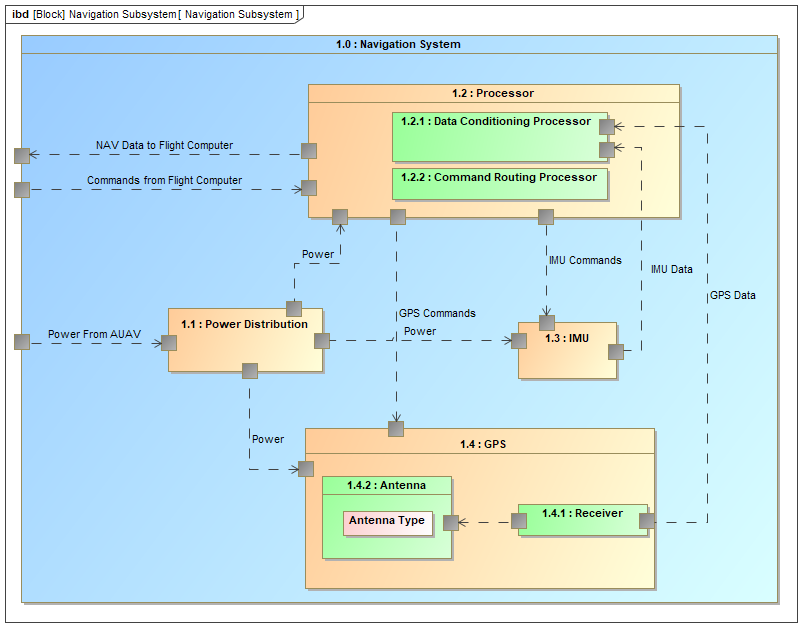


Figure 1 System Functional Block Diagram

The hardware consists of a GPS antenna (1.4.2) which receives the GPS radio frequency (RF) signal and then transfers the signal to the GPS receiver (1.4.1). The GPS receiver (1.4.1) converts the RF signal into GPS data. This data is then transferred over to the data conditioning processor (1.2.1) which prepares the data for transfer to the flight computer sub-system. The Inertial measurement unit (IMU) (1.3) senses the attitude of the AUAV and transfers data to the data conditioning processor (1.2.1) which prepares the data for transfer to the flight computer sub-system. Commanding for the IMU (1.3) and the GPS (1.4) are received from the flight computer and are then detected, processed and split by the command routing processor (1.2.2) and prepared for transfer to the IMU (1.3) and GPS receiver (1.4.1) respectively. This sub-system also contains power distribution functions (1.1) that prepares and converts the voltages necessary for each of the sub-system components. These pieces make up the navigation sub-system for the AUAV system.

Requirements

* + - 1. The system shall be capable of sensing the AUAVs heading.
      2. The system shall be capable of sensing the AUAVs elevation.
      3. The system shall be capable of sensing the AUAVs position relative to the ground.
      4. The system shall regulate the incoming power voltage to prevent power surges.
      5. The system shall transform the incoming power voltage to suit components.
      6. The system shall provide resistance to jamming from an EW environment

### ***Allocation of Requirements***

* + - 1. Power
         1. The system shall consume a maximum of 25 Amperes
         2. The system shall operate with a 12 VDC input
         3. The system shall provide internal filtering and conditioning for the sub-system components.
      2. Signal Environment
         1. The system shall operate properly in a jamming environment.
      3. Composition
         1. The system shall include a GPS receiver unit
         2. The system shall include a GPS antenna type CRPA.
         3. The system shall include an inertial measurement unit (IMU)
         4. The system shall include a processing unit.
         5. The system shall include a power conditioning and distribution unit.

### ***Functional Interfaces and Criteria***

Discussion

The navigation sub-system interfaces directly with the flight computer sub-system. Commanding is received from the flight computer subsystem for the IMS and GPS pieces of the navigation sub-system. The GPS and IMS data is packaged within the navigation sub-system and then transferred back to the flight computer sub-system. The navigation sub-system sensors provide attitude and position data to fulfil the operational requirements listed in section 3.1.2. The navigation sub-system does not make autonomous decisions, but its data is required for the flight computer to make these decisions properly. This data is also provided to the mission control center for the AUAV operator to make manual control decisions as well. The navigation sub-system data is critical to proper AUAV operations.

Requirements

* + - 1. The system shall interface with and provide data to the flight computer sub-system.
      2. The system shall interface with and accept commands from the flight computer sub-system.
      3. The system shall receive Global Positioning System (GPS) Data.
      4. The system shall provide altitude data to the flight computer sub-system
      5. The system shall provide speed data to the flight computer sub-system
      6. The system shall provide attitude data (roll, pitch and yaw) to the flight computer sub-system
      7. The system shall allow firmware updates from the flight computer sub-system.
    1. ***Environmental Conditions***
       1. Not applicable—reserved for future use

## ***System Characteristics***

### ***Performance Characteristics***

* + - 1. The system shall have a data transfer rate of a maximum of 150 Mbits/sec.
      2. The system shall operate at full performance for all temperatures ranging from -40.0 degrees Fahrenheit [-40 degrees Celsius] and +120.0 degrees Fahrenheit [+48.9 degrees Celsius], inclusively.
      3. The system shall operate at full performance for all atmospheric pressures ranging from -9.0 pounds per square inch absolute [-62.1 kilopascals absolute] and 0.0 pounds per square inch absolute [0.0 kilopascals absolute], inclusively.
      4. The system shall be able to measure the UAV flight speed from 0.0 miles per hour [0.0 kilometers per hour] to 158.45 miles per hour [255.00 kilometers per hour], inclusively, within a tolerance of +/- 5 miles per hour [8 kilometers per hour].
      5. The system shall be able to measure the UAV flight altitudes from ground level to a maximum of 25,000 feet above mean sea level [7.62 kilometers], inclusively, with a tolerance of +/- 3.0 feet [0.914 meters].
      6. The system shall be able to measure the UAV flight spatial position (latitude and longitude) with a tolerance of 1/25th of a second [3.6 feet].
      7. The system shall operate with the UAV experiencing g-forces 0 and 0.5 in the negative direction.
      8. The system shall operate with the UAV experiencing a bank angle between 0 and 40 degrees.

### ***Physical Characteristics***

* + - 1. The system shall be contained within an 17 ft3 [ 0.481 m3] space inside the UAV.
      2. The system weight shall not exceed 100 pounds [20.41 kilograms].
      3. The system shall be self-contained regarding component packaging.

### ***Effectiveness Requirements***

* + - 1. The system shall maintain an Operational Availability of at least 98%.

### ***Reliability***

* + - 1. The system shall have an Instantaneous Reliability of at least 99%.
      2. The system shall have a Mean Time Between Failure (MTBF) of at least 10 years.
      3. The mean time to repair (MTTR) shall be a maximum of 8 hours.

### ***Maintainability***

* + - 1. The system shall not result in down time of more than 16 hours due to regular system maintenance.
      2. The system shall require complete system inspection after every 1000 hours of flight time.
      3. The system shall have the ability to self-check and perform software updates within 4 hours prior to operation time.
      4. The system shall allow for quick updating of software by maintenance personnel with an intermediate skill level.
      5. The system shall have a built-in-test (BIT) protocol incorporated into the controller to allow for easier maintenance.
      6. The system BIT function shall store BIT error files onto onboard memory.
      7. The system shall transmit BIT error files to the mission control center within 30 seconds of receipt of error.
      8. The company shall maintain the capability of repairing individual modules. That is if a module fails, it should be replaced with a spare at the customer site and the failed module transported to the factory where it can be repaired by personnel with high skill levels.
      9. All documentation for the maintenance schedules and procedures shall be provided for the system as part of the contractual deliverables.
      10. The system should be maintained with existing tools and equipment.
      11. Supplier shall provide all specialty tools required for routine maintenance.

### ***Usability (Human Factors)***

* + - 1. The system shall be designed so that it can be operated by a single operator with intermediate skills. Intermediate skills in this case is defined as High School Graduate with 9th grade reading/writing level with no prior work experience and around 40 hours of training plus some on-the-job training.

### ***Supportability***

* + - 1. The system shall support different data transfer protocols.

### ***Transportability / Mobility***

* + - 1. The system shall accommodate ease of transport during system integration and maintenance.
      2. The system shall be easily deployable and transported when not under any operational mode.
      3. The system shall be capable of being transported safely by commercial air cargo or common carrier.
      4. The system shall in no way sustain damage while being transported.

### ***Flexibility***

* + - 1. The system shall be designed to be flexible by making use of functional modularity that will allow for cost effective modification or repair.

### ***Availability***

* + - 1. Not applicable—Reserved for future use

### ***Sustainability***

* + - 1. The system shall be designed with system recycling in consideration.
      2. The system shall have the minimal infrared heat signature and acoustic emission to support environmental sustainability.

### ***Security***

* + - 1. The system shall incorporate secure data encryption for all stored data (mission planning files, flying logs, maps).
      2. The system shall incorporate a special security token to modify or upload new software to the controller modules.
      3. The system shall continue to operate properly while climbing to 20,000 feet of altitude at a climb rate of 30 feet per second while UAV is being actively attacked.
      4. The system shall report BIT status on command as requested to determine state of health in the event of an attack.

## ***Design and Construction***

### ***CAD/CAM Requirements***

* + - 1. All dimensioning shall be presented as imperial units with metric units presented in brackets after the imperial units.
      2. Electrical design drawings shall be modeled on software compatible with Autodesk AutoCAD.
      3. Mechanical design drawing shall be modelled on software compatible with PTC Creo Parametric.
      4. Mechanical failure analysis shall be modelled on software compatible with ANSYS Workbench.
      5. Logical simulations shall be modelled on software compatible with MATLAB.
      6. Testing software scripts shall be generated on software compatible with MATLAB.

### ***Materials, Processes, and Parts***

* + - 1. The system shall incorporate standard hardware fasteners to maintain uniformity with the preexisting hardware.
      2. The system shall incorporate materials that resist corrosion during all operational modes.
      3. The system shall use approved processes dictated by the FAA for aerospace application.

### ***Mounting and Labelling***

* + - 1. Electrical components shall be labeled with regulatory classification statements.
      2. Electrical component input and output pinouts shall be identified with identification labels.
      3. Electrical components shall be labeled with safety warnings.

### ***Electromagnetic Radiation***

Electromagnetic radiation or emf will be present in small amounts due to the inherent nature of the electronics within the housing. To retain full control and reliability of the controller and its constituent parts, this requirement is necessary.

* + - 1. No element of the system shall emit electromagnetic radiation levels of more than 5 milligauss.

### ***Safety***

* + - 1. The system shall not present any safety hazards to maintenance personnel.
      2. The system shall not present safety hazards to the user during operation under either autonomous, or non-autonomous flight modes.
      3. The system shall not interfere with the transponder of the AUAV.

### ***Interchangeability***

* + - 1. The system shall be designed using interchangeable parts that can be easily switched when repairs arise.

### ***Workmanship***

* + - 1. Workmanship standards for material selection and manufacturing processes shall conform to the quality standards of the client.

### ***Economic Feasibility***

* + - 1. The system shall have an installed cost of a maximum of USD $25 million for 22 UAVs.

## ***Documentation / Data***

* + 1. Maintenance schedules and procedures shall be included as part of the contractual deliverables to the Client in the final acceptance documentation.

## ***Logistics***

### ***Maintenance Requirements***

To Be Determined.

### ***Supply Support***

* + - 1. All vendors shall support the supplied product for the life of the UAV program.
      2. All contractor shall support the product for the life of the UAV program.

### ***Test and Support Equipment***

* + - 1. Software support utilities shall be developed for unit testing and verification and for debugging procedures.
      2. The developed system shall be capable of being tested by the Supplier and Client software engineering teams.

### ***Personnel and Training***

* + - 1. A user interface document shall be developed for the training of UAV operators.
      2. A user interface document shall be developed for the training of maintenance personnel.

### ***Facilities and Equipment***

* + - 1. The system shall conform to all UAV facility and applicable equipment standards.

### ***Packaging, Handling, Storage and Transportation***

The entirety of the system is very fragile and susceptible to damage from vibration, heat and electromagnetic discharge while not housed in UAV system infrastructure. Care should be exercised when unit is being transported from within the facility or to other remote locations.

* + - 1. Loose electrical components shall be packaged in ESD protected packaging.
      2. Loose components shall be placed in temporary frames that are guarded from shock.
      3. All transportation personnel shall receive sufficient training on handling of the components.
      4. Components shall be stored in a climate-controlled environment.

### ***Computer Resources***

* + - 1. The system utilities, test and support equipment, and all other tools shall be compatible with Windows 10 OS or later.

### ***Technical Data***

* + - 1. A quality control dossier shall be created per UAV.
      2. An Operation Manual shall be created per site.
      3. A Maintenance Manual shall be created per site.
      4. One (1) copy of software test results shall be included in the handover Quality Control documentation.
      5. One (1) copy of mechanical test result data shall be included in the handover Quality Control documentation.
      6. Four (4) copies of the Operation Manual shall be included in the handover documentation.
      7. Four (4) copies of the Maintenance Manual shall be included in the handover documentation.
      8. One (1) copy of the system design dossier shall be included in the handover documentation.
      9. One (1) copy of the As-installed Software shall be included in the handover documentation.

### ***Customer Service***

* + - 1. The Supplier shall provide a customer support contact number which shall be staffed 24 hours a day to respond to queries.

## ***Producibility***

The system is a custom design unique to this specific UAV configuration. There are no instances where mass production would be warranted.

* + 1. The system shall be producible using manufacturing documents.
    2. The software shall be downloadable.
    3. The software shall be able to be installed by a trained user.

## ***Disposability***

The proper disposal of the system and its component parts is important to ensure data security and that no substances are released that are harmful to human health and the environment.

* + 1. Components shall be properly sanitized prior to disposal.
    2. All data storing hardware shall be re-formatted prior to disposal.

## ***Affordability***

* + 1. The system shall be cost competitive when compared to its peer group.

# ***Test and Evaluation***

System testing and evaluation shall be conducted during each phase of the system life cycle. The system shall be tested in a tiered approach, verifying each of the system requirement of the system requirements described in Section 3, while also validating the functionality of the system. The following levels and types of testing shall be performed:

Analytical and Simulation Evaluation: This involves evaluation and analysis of computer simulations for various system components.

Type 1 Testing: Evaluation of initial models and development builds for the component software. Testing shall be performed at the Supplier’s facilities using Supplier’s test tools and resources.

Type 2 Testing: Evaluation of the system prototype and initial integration of the system components. Testing shall be performed at the Supplier’s facilities using the Supplier’s test tools and resources.

Type 3 Testing: Evaluation of the final implementation of the system. Testing shall be conducted at the Supplier’s facilities and Client’s base of operations using the Supplier’s test tools and resources.

# ***Quality Assurance Provisions***

All system level tests will be witnessed by representatives of the Supplier’s Quality Assurance discipline along with the software engineering and systems engineering teams to ensure the test procedures are conducted as documented.

All inspection and testing documentation shall be provided to the Client in the final acceptance documentation.

# ***Distribution and Customer Service***

The system shall be installed within, and integrated into, the UAVs existing systems at Supplier’s workshop by Supplier’s personnel. The Client’s technicians shall be invited to witness all applicable Type 1, 2 and 3 testing. Aerial acceptance testing and hand-over shall be performed at the original base of operations.

Supplier shall provide 2-days of onsite training for the technicians and operators as each UAV location. Operation and Maintenance manuals shall be provided for each UAV. Supplier shall provide a 1-year warranty on parts and workmanship. Additionally, the Supplier shall provide a customer support contact number which shall be staffed 24 hours a day to respond to queries.

# ***Acronyms***

|  |  |
| --- | --- |
| AUAV | Autonomous Unmanned Aerial Vehicle |
| BIT | Built-In-Test |
| CRPA | Controlled Radiation Pattern Antenna |
| FAA | Federal Aviation Administration |
| GPS | Global Positioning System |
| MTBF | Mean Time Between Failure |
| MTTR | Mean Time to Repair |
| OEM | Original Equipment Manufacturer |
| RF | Radio Frequency |
| SAE | Society of Automotive Engineers |
| SOH | State of Health |
| TCU | Turbocharger Control Unit |
| UAV | Unmanned Aerial Vehicle |
| VDC | Volts Direct-Current |

# ***References***

SECURE System Specification Rev 1 July 1,2020

SECURE Design Dossier Rev 2 July 1, 2020

# 