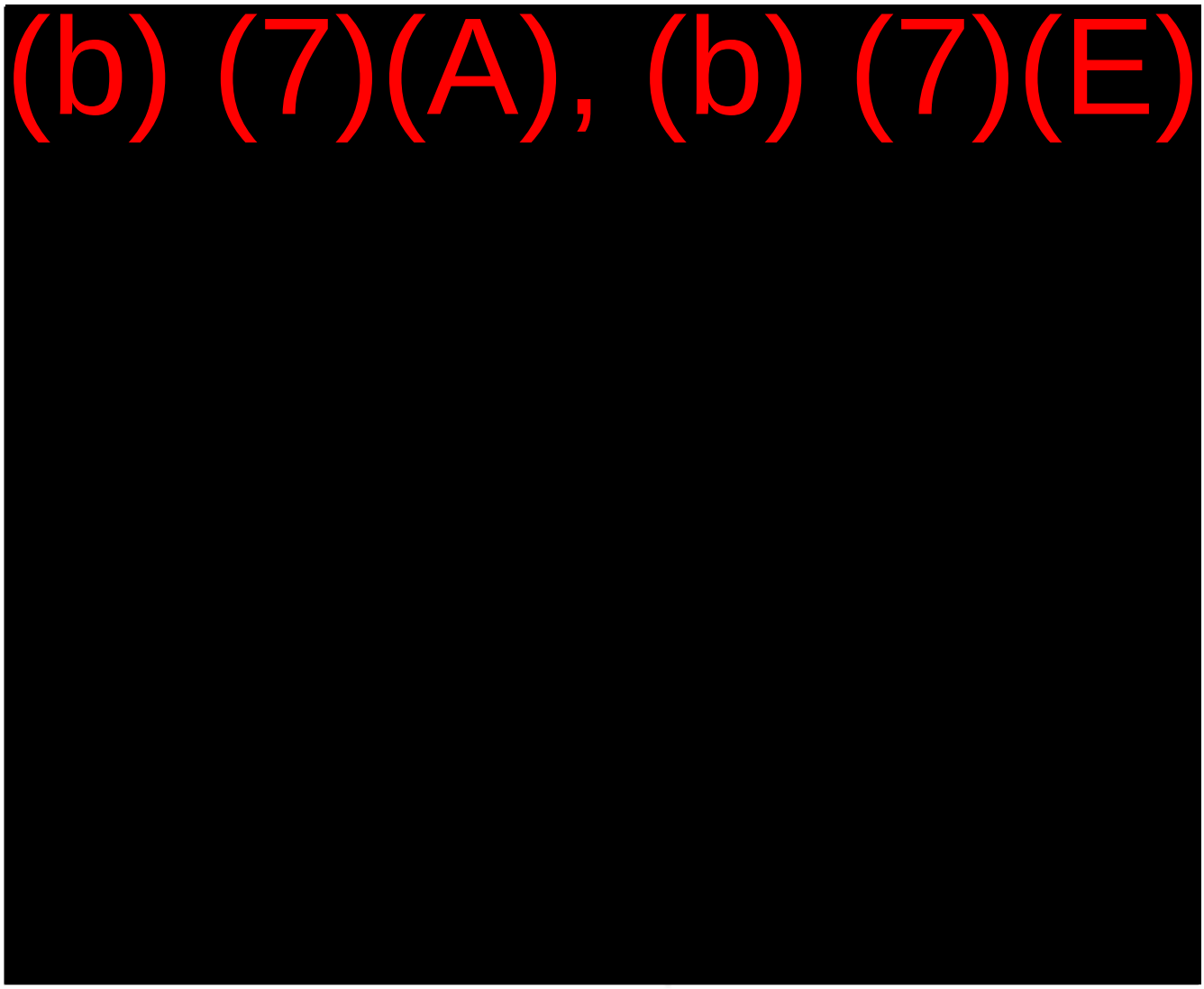


3.2.5.4.4 System Diagnostics

a. As part of the system diagnostics, the system shall (T) be capable of being commanded from the GCS to move each flight control surface (ailerons, flaps, tails, and cowl flap servo-actuator), and verify proper position versus command and slew rate.

b. The system diagnostics shall (T) also be capable of monitoring, displaying, and recording health status and warnings, to include variables such as temperature, voltage, and current for selected systems. The health status shall (T) include BIT, and provide Flight Critical warnings and Red limit warnings to alert the operator of a failed or degraded condition.

3.2.5.4.5 System Diagnostics and Support – The CBP UAV system shall initially be operated and maintained under a Contractor Logistics Support (CLS) contract (T).

3.2.5.5 Transportability

3.2.5.5.1 The CBP UAV System shall (T) be capable of being configured for (or de-configured from) sea, ground, or air transport in 8 (T) 4 (O) hours or less, and not: Overload a designated transport medium and, Require special handling or specialized loading procedures (temperature limits, pressure limits, power source required, protective service or sensitive/classified)

3.2.5.5.2 Ground Transportability – The DHS CBP UAV System shall (T) be ground transportable using standard commercial vehicles available to DHS which do not exceed the ordinary and customary restrictions imposed by individual states and/or the federal government.

3.2.5.5.3 Rail Transportability – The CBP UAV System shall (T) be capable of rail transport and be capable of meeting the Gabarit International de-Chargement (GIC) rail clearance diagram requirements. The CBP UAV System should (O) be capable of withstanding rail impacts without damage at speeds of up to (b) (7)(E)

3.2.5.5.4 Air Transportability - Each component of the CBP UAV system shall (T) be transportable within the cube and weight constraints of a U.S. Coast Guard C-130H aircraft.

3.2.5.5.5 Marine Transportability – The CBP UAV System shall (T) be capable of transport by marine vessels of the U.S. Coast Guard (USCG).

3.3 MATERIAL DEFINITION

3.3.1 Materials

The materials used in the CBP UAV System shall (T) be suitable for operation in marine environments, and for extended periods of storage. Materials should (O) resist degradation when exposed to the service life environments. This includes utilization of corrosion resistant protective finishes and corrosive resistive materials.

3.3.1.1 Hazardous, Toxic and Ozone Depleting Chemicals Prevention

The use of toxic chemicals, hazardous substances, or ozone-depleting chemicals (ODC) shall (T) be avoided. When unavoidable, the hazardous substances, toxic chemicals, or ODCs shall (T) be safety compliant, and regulation compliant in accordance with local, state, and federal regulations. DHS's objective is to prevent hazardous and toxic materials and ozone depleting materials at the source.

3.3.1.2 Recycled, Recovered, or Environmentally Preferable Materials

Recycled, recovered, or environmentally preferable materials should (O) be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3.2 Computer Hardware and Software

The CBP UAV System should (O) contain non-proprietary software and follow an Open Systems Architecture, including open specifications for interfaces, services, and formats.

3.3.2.1 Computer Hardware Requirements

The CBP UAV System shall (T) use computer hardware capable of integrating into the existing CBP network architecture.

3.3.2.1.1 Data Storage and Main Memory Reserve Capacity – The CBP UAV System shall (T) possess 50% or more reserve capacity for program instruction memory for each system processor, and 50% or more reserve capacity for data storage devices, evaluated under worst-case loading conditions.

3.3.2.1.2 Processing Speed/Throughput Reserve Capacity – The CBP UAV System shall (T) provide 50% or more reserve capacity in throughput for each system processor, evaluated under worst-case loading conditions. Techniques, such as bank switching, used to address memory requirements should (O) not degrade the computer system performance during operational missions.

3.3.2.1.3 Input / Output (I/O) Channel Requirements – The I/O channel throughput for each system processor shall (T) have 50% or more reserve capacity, with serial channels possessing a 50% or more reserve baud capacity, evaluated under worst-case loading conditions.

3.3.2.1.4 Processor and Firmware Enhancements – Processors shall (T) be upwardly-scaleable to yield faster execution, reduce life cycle costs, and mitigate obsolescence. The processors may be replaced by, or augmented by, another processor having an identical instruction set or instruction superset and memory architecture (word length and addressing scheme). Firmware should (O) be compatible with existing and planned hardware configurations and allow for system enhancements.

3.3.2.2 Computer Software

The CBP UAV software shall (T) be modular and scaleable and be classified as either operational software or support software. Operational software includes programs executed to fulfill the CBP UAV System's mission and BIT software. BIT software includes programs for readiness test, fault detection, performance monitoring, maintenance data retrieval, and special test capabilities integral to the system. Support software includes capabilities required for the production, verification, and maintenance of all software and for the test and maintenance of system equipment.

3.3.2.2.1 Firmware – Contractor developed / controlled computer programs that are stored in Read-Only-Memory (ROM), Programmable ROM (PROM), or other similar memory should (O) be considered firmware. Included are computer programs and data loaded into memory that cannot be dynamically modified by the computer during processing.

3.3.2.2.2 Programming Languages – The CBP UAV System software shall (T) be Higher Order Languages (HOL) which follow ANSI, IEEE, or equivalent standards. The use of assembly language or low level code is restricted to processing-time-constrained and memory-constrained functions.

3.3.2.2.3 Commenting Standards – Standards shall (T) be established and utilized for embedding comments in source code. The comment standards for banners, headers, and special comments shall be as described in contractor-approved standards or an equivalent methodology.

3.3.2.2.4 Error and Diagnostic Messages – The CBP UAV System software shall (T) possess on-line error and diagnostic messages and require no additional interpretation by the user. The messages should (O) include a textual description of the condition, time of occurrence, required operator actions, and data processor and software execution status when applicable. Error and diagnostic messages are uniquely identifiable and shall be recorded or trapped. Errors detected in the processing of a command or function should (O) result in an alert to the operator and the erroneous command or function ignored. Alerts shall (T) be immediately displayed to the operator upon error detection.

3.3.2.2.5 Character Set Standards – Character sets shall conform to commercial standards (T).

3.3.2.2.6 Software Security – The CBP UAV System software shall (T) possess the capability to be protected from unauthorized, intentional or unintentional, modification.

3.3.2.2.7 Fault Tolerance – The CBP UAV System software shall (T) prevent single point failures from disabling the entire system.

3.3.2.2.8 Computer Program Regeneration – CBP UAV System software shall (T) be capable of being regenerated via the source code as stored in the central repository. Patches to CBP UAV software are not considered source code.

3.3.3 Electromagnetic Environmental Effects (E3)

The individual communication and electronic equipment/subsystems utilized on the CBP UAV System shall (T) be inter- and intra-system/platform electro-magnetically

compatible to ensure that system/platform operational performance requirements are met. The performance of the CBP UAV System shall (T) not be degraded when exposed to its operational electromagnetic environment (natural or man-made).

3.3.3.1 Electromagnetic Compatibility (EMC)

All new or modified CBP UAV System SRAs or modified portions of interface subsystems shall (T) not interfere with, or be interfered by the operation of any other aircraft equipment or ground control station subsystem. The electromagnetic compatibility (EMC) of the CBP UAV System shall allow full use of its SIGINT payload.

3.3.3.2 Electromagnetic Vulnerability (EMV)

The CBP UAV System shall (T) be electro-magnetically compatible with the external electromagnetic environment (EME) as referenced in Table 1E of MIL-STD-464. All CBP UAV System equipment shall (T) be compatible with the EME on and around airfields, DHS facilities and equipment, and the EME generated onboard the aircraft under mission conditions.

Table 3-3-3: External EME for Fixed Wing Aircraft, Excluding Shipboard Operations

Frequency Range (MHz)	Electric Field (V/m -rms)	
	Peak	Average
(b) (7)(E), (b) (7)(A)		

3.3.3.3 Electromagnetic Interference (EMI)

The generation of an electromagnetic environment by new or modified LRUs and the susceptibility of new or modified LRUs to an electromagnetic environment shall (T) be controlled within the limits of MIL-STD 461E. The following emissions and susceptibility requirements shall apply: CE102, CE106, CS101, CS103, CS104, CS105, CS114, CS115, CS116, RE102, RE103, and RS103. Bonding resistance between the aircraft grounding surface and any Systems Replaceable Assembly (SRA) is to be 2 milli-ohms or less.

3.3.3.4 Electromagnetic Radiation Hazards (HERP, HERF, HERO)

The CBP UAV System shall (T) protect personnel, ordnance and fuel from the hazardous effects of electromagnetic and electrostatic energy. Hazards of Electromagnetic Radiation to Personnel (HERP), Hazards of Electromagnetic Radiation to Fuel (HERF), and Hazards of Electromagnetic Radiation to Ordnance (HERO) concerns shall be addressed. The electromagnetic radiation hazard criteria of MIL-STD 464 are applicable.

3.3.3.5 Electrostatic Discharge (ESD)

The CBP UAV System shall (T) control and dissipate the build-up of electrostatic charges caused by precipitation static (p-static), fluid flow, air flow, and other charge generating mechanisms to aircraft fuel ignition and ordnance hazards, to protect personnel from shock hazards, and to prevent performance degradation or damage to electronics.

3.3.4 Safety

3.3.4.1 System Safety

The CBP UAV System shall (T) function / operate in a safe manner in accordance with MIL-STD-882 or its equivalent.

3.3.4.2 Safety Provisions

The CBP UAV System shall (T) ensure against degradation or negation of safety features during operations, maintenance, storage, and shipping. The CBP UAV System should (O) have fail-safe features with adequate redundancy, and be capable of being rendered safe during emergency or abnormal situations.

The CBP UAV System should (O) minimize the probability and severity of injury to personnel during all activities including set-up, operation, maintenance, and tear-down throughout the life cycle of the equipment. The system shall (T) not induce electrical shock or thermal shock type injuries, and the operator's stations designed to minimize inadvertent operator encounters with edges, shelves, and other station protuberances.

If laser illuminator operations are expected, laser safety goggles shall be available on site so if the laser illuminator would not shut off, and the payload could not be retracted, at least it can land while still radiating and not injure anyone on the ground at the GCS site.

3.3.5 Security

The UAV system shall (T) comply with current security requirements as imposed by national policy to be capable of evolving to meet state-of-the-art technological advances designed to protect information from unwanted exploitation. The UAV system shall (T) be protected from an Information Systems Security (INFOSEC) perspective, which would include, but not be limited to, such services as confidentiality, availability, and integrity of information that is processed, stored, or transmitted.

3.4 LOGISTICS

The CBP UAV system shall initially be operated and maintained under a Contractor Logistics Support (CLS) contract (T). The CBP UAV System emphasizes maintainability, commonality, reliability, and accessibility of components to reduce maintenance, supply, support equipment, and manpower requirements.

3.4.1 Support Equipment

The CBP UAV System should (O) use Support Equipment (SE) that is common to DHS/CBP aviation. New/peculiar CBP UAV SE shall (T) be capable of operating in CBP UAV environments specified herein.

3.5 CHARACTERISTICS OF SYSTEM ELEMENTS

3.5.1 Aircraft

3.5.1.1 Design Life

The aircraft shall (T) have a design life that minimizes the Aircraft Total Ownership Costs (TOC) over 15,000 flight hours and 10 years.

3.5.1.2 Aircraft Performance

Characteristics of the aircraft are contained below and based on International Standard Atmosphere (ISA) standard day conditions with aircraft weight complement of payloads and the amount of fuel needed to accomplish the specific mission.

3.5.1.2.1 (b) (7)(A), (b) (7)(E)

calculated for loiter at a 10,000 ft mean sea level (MSL) altitude, maximum endurance flight profile, under ISA day conditions.

3.5.1.2.2 (b) (7)(A), (b) (7)(E)

3.5.1.3 Operating Altitude

3.5.1.3.1 (b) (7)(A), (b) (7)(E)

3.5.1.3.2 The aircraft shall (T) be capable of reaching this operating altitude during the transit phase of flight, i.e., before reaching the patrol area.

3.5.1.3.3 The aircraft should (O) be capable of operating in level flight at the altitude allowing maximum line of sight reception by the Communication Relay and Signals Interception Payload specifications.

3.5.1.3.4 (b) (7)(A), (b) (7)(E)

3.5.1.4 Signatures

(b) (7)(A), (b) (7)(E)

3.5.1.5 Other

3.5.1.5.1 Shall (T) provide sufficient electrical power to operate all aircraft subsystem functions (including any draw by deicing equipment) plus all sensor subsystems simultaneously with a 20 percent reserve after losses.

3.5.1.5.2 Shall (T) provide a voice relay capability to enable beyond-line-of-sight (BLOS) communication between aircraft operators and air traffic controllers.

3.5.1.5.3 (b) (7)(A), (b) (7)(E)

3.5.1.5.4 Shall (T) provide a sufficiently low electromagnetic interference (EMI) environment to preclude being a hazard to ground personnel or

degradation of the specified Communication Relay and Interception Payloads subsystem.

3.5.1.5.5 Shall (T) have lost link and mission abort procedures permanently stored in the onboard mission management computer.

3.5.1.5.6 (b) (7)(A), (b) (7)(E)

3.5.1.5.7 Weight

a. A mission ready aircraft shall (T) be capable of being emplaced by no more than four (T) two (O) people to support and perform the movement of the aircraft from its mover/storage site to the launch/recovery site and then back to the mover/storage site. The aircraft weight should (O) have a positive margin between mission weight and gross vehicle weight.

b. Weight Variations: Weight changes to components and subsystems should (O) not adversely affect required flying qualities and performance.

3.5.1.5.8 (b) (7)(A), (b) (7)(E)

3.5.1.5.9 Handling Qualities – The Flight Control System shall (T) limit maximum allowable roll and pitch angles, automatically provide coordinated flight in cruise phases of flight, and provide stall protection in order to prevent departure from controlled flight scenarios.

a. (b) (7)(A), (b) (7)(E)

b. Autonomous Emergency Recovery. The aircraft shall (T) have the capability to automatically deviate to a pre-determined alternate recovery site in contingency situations so that the aircraft can be successfully recovered by either automatic or manual control.

c. Flight Outside the Flight Envelope. The CBP UAV shall (T) possess sufficient control power and response rate to safely return to the Aircraft operating flight envelope through the automatic flight control system.

d. Transfer of Flight Control Modes. Engagement, disengagement or changes to the aircraft flight control mode shall (T) be achievable and not result in dangerous stability or control characteristics.

3.5.1.5.10 Aircraft Environmental Conditions – In addition to the CBP UAV System environmental conditions specified in Section 3.2, the aircraft shall be able to operate and withstand the conditions specified below.

(b) (7)(A), (b) (7)(E)

3.5.1.5.11 Aircraft Modes of Operation – The aircraft shall (T) be capable of flying pre-programmed mission profiles independent of navigational assistance from the GCS, and be capable of being controlled via the Air Vehicle Operator's Console with manual flight control functions. With loss of the data link, the CBP UAV System shall (T) attempt to reestablish data link while continuing on the pre-programmed flight path and mission profile. When data link is not re-established within a predetermined time period, the aircraft shall (T) be capable of fully autonomous flight to a pre-designated point and perform an autonomous emergency recovery. The aircraft mission phase main modes of operation are:

a. Pre-launch. In this mode, all aircraft pre-launch activities are accomplished. The aircraft will accomplish pre-launch activities using the data link or ground cable connected between the GCS and the aircraft.
b. Launch. In this mode, manual or automatic aircraft launch is accomplished.
c. Flight. In this mode, flight activities are accomplished.
d. Recovery. In this mode, aircraft recovery is accomplished.

3.5.1.5.12 In-Flight Operations – The aircraft shall (T) have the following in-flight capabilities:

a. Autonomous navigation and flight between multiple, selected waypoints.
b. Automatic loiter and track on command.
c. Automatic execution of lost-link procedures to reacquire the data link in the event of data link loss of contact.

d. Automatic return to a pre-planned recovery area when a lost data link connection is not reacquired within a predetermined period of time. Automatic refers to a series of pre-programmed steps that allow the mission planners to set waypoints, altitudes, speeds, execution time (the period of time after lost link), holding, climbing, descending, and landing instructions.

e. Autonomous execution of emergency procedures due to electrical generator failure or other critical aircraft subsystem failure.

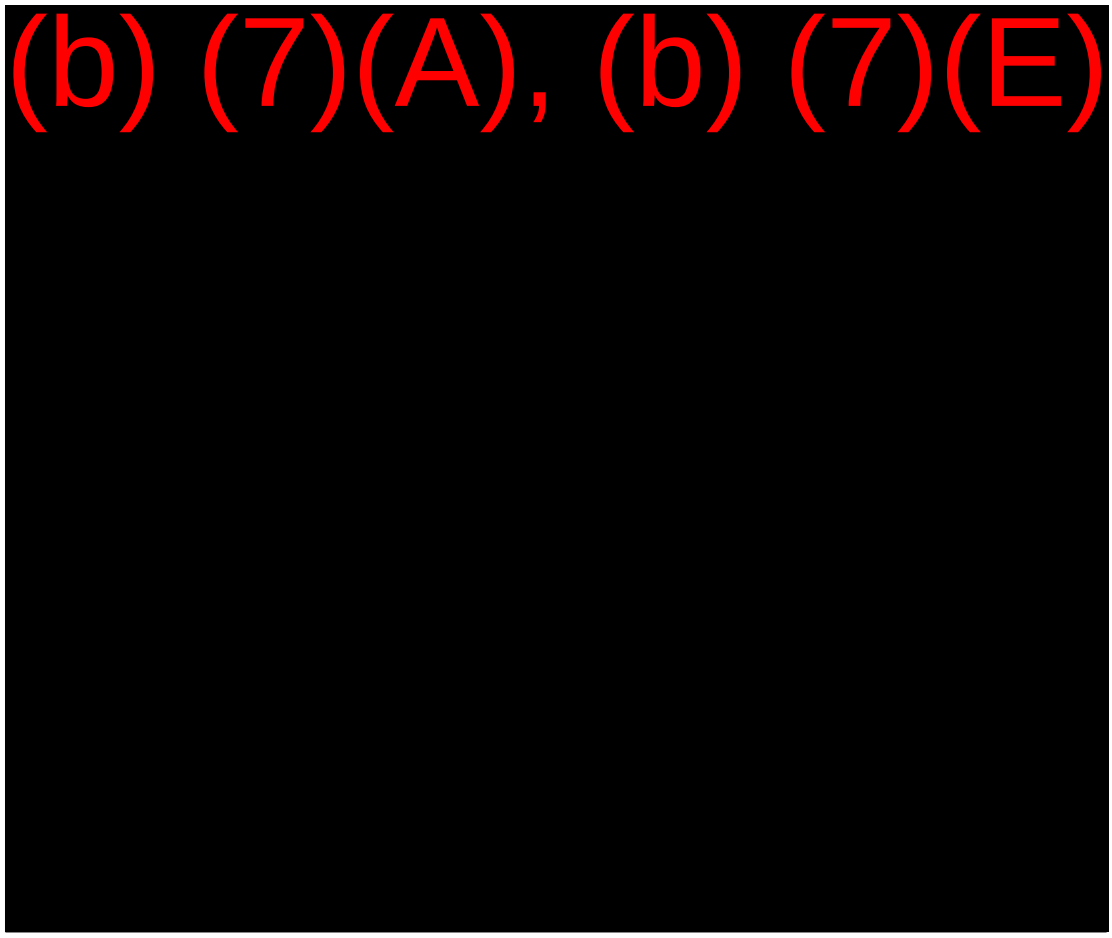
3.5.1.5.13 The aircraft should (O) have the onboard, in-flight, self-contained ability to detect traffic that may present a conflict, evaluate flight paths, determine traffic right-of-way, and maneuver well clear (or as required); this is known as "sense and avoid" capability.

3.5.1.6 Aircraft Functional Requirements

The aircraft shall contain the necessary equipment to maintain control of the aircraft subsystems, communicate with the GCS, provide communication relay, and perform its missions.

3.5.1.6.1 Air Vehicle Data Link – The aircraft shall contain the Airborne SATCOM Terminal (AST) as defined in Section 3.5.9.

3.5.1.6.2 (b) (7)(A), (b) (7)(E)



and (4) control the radio system when the UAV is on the ground and while in flight.

3.5.1.6.3 Identification Friend or Foe (IFF) – The aircraft shall have an IFF Mode IIIC and IV identification system capability, (T) shall be capable of automatic or manual in-flight programming (T), and should have Mode S and a Precision Locator Information (PLI) transponder capability (O). It should also conform with FAA regulations for altitude encoding transponders specified via 14 CFR section 91.215.

3.5.1.6.4 Locator Beacon – The aircraft shall (T) possess the capability to emit a locator signal compatible with existing USCG and FAA-capable search and rescue systems.

3.5.1.6.5 Navigation Lights – The aircraft shall (T) have a navigation, position, and anti-collision (strobe) lighting system which is compliant with Federal Aviation Administration regulations regarding flight in the national aerospace and be capable of being activated or deactivated from the GCS and takeoff and landing system. The CBP UAV System should (O) contain anti-collision lighting having an operator-selectable capability for Night Vision Device (NVD) or for visible light range.

3.5.1.6.6 Navigation – The aircraft shall (T) have the following modes of navigation, be capable of switching between all modes as necessary to meet mission requirements, and meet all requirements for CBP operations. Loss of GPS or INS source/functionality should (O) not result in a loss of navigation solution or flight safety.

a. Global Positioning System (GPS) Navigation - Aircraft navigation solution is calculated using only GPS data.
b. Inertial Navigation System (INS) Navigation - Aircraft navigation solution is calculated using an internal INS sensor.
c. Aided Navigation – Aircraft navigation solution is calculated using a weighted combination of multiple navigation sensors.
d. Present Position Navigation – Aircraft navigation solution is updated using the current aircraft present position as determined from external references such as mark on top or derived from internal system or sensor updates.

3.5.1.6.7 Sense and Avoid System Requirements – Sense-and-avoid is the onboard, self-contained ability to detect traffic that may present a conflict, evaluate flight paths, determine traffic right-of-way, and maneuver well clear (or as required) in accordance with (IAW) FAA regulatory guidance. Sense-and-avoid systems should (O) provide a minimum traffic detection capability as described in ASTM-2411.

3.5.1.6.8 Payload Provisions – The aircraft shall (T) incorporate a payload capability that provides the following functions or provisions:

a. Support operation of two or more sensors simultaneously in straight and level flight conditions.
b. Provide a total payload weight capacity of at least (b) (7)(A), (b) (7)(E)
c. Provide a total internal payload volume of at least five cubic feet.
d. Provide an interface, via the payload ICD, to support operation of 1 or more payloads.
e. Provide aircraft position, attitude, and other flight information to the payloads.
f. The aircraft shall (T) have a meteorological sensor with the capability to calculate and report winds aloft, measure temperature (±1° C), relative humidity (±2% between 0% and 80% relative humidity and ±3% between 80% and 100% relative humidity), and barometric pressure (±0.1 inches (3.37 millibars) of mercury.

3.5.1.6.9 Aircraft Servicing – The aircraft shall (T) incorporate the following functions or provisions.

a. Possess an embedded gravity (T) pressure (O) fuel and de-fuel capability
b. Withstand and remain operational after a fresh water wash of the airframe and engine
c. Possess lift and hoisting (hard) point capable of supporting a mission ready aircraft
d. Use reasonably available commercial fuel such as AVGAS, JP-5 and JP-8 (T) and diesel (O) fuels
e. Possess a single point grounding plug
f. Ground Operation Provisions. All aircraft components should (O) be capable of being operated to accomplish system maintenance, training, and / or system preparation by either an external auxiliary power unit for at least 30 minutes under worse case thermal and environmental conditions without external cooling.

3.5.2 Payload

3.5.2.1 Types of Initial Payloads

KPP 6: The aircraft shall (T) be capable of simultaneously operating combinations of two or more of the following payloads, without degrading payload or aircraft performance, while in flight: EO/IR/laser illuminator, Synthetic Aperture Radar (SAR)/Ground Moving Target Indicator (GMTI), signals interception, and communications relay.

3.5.2.2 Flight Operation

The payloads shall (T) operate within the flight envelope and under the same climatic, altitude, and operating conditions as the CBP UAV System.

3.5.2.3 Payload Tracking and Pointing

3.5.2.3.1 Automatic Tracking – Applicable payloads shall (T) be capable of automatically tracking a human-sized, single moving object and keep a stationary object in the center of that sensor's Field of View (FOV). Tracking accuracy should (O) be sufficient to allow target designation at the specified ranges.

3.5.2.3.2 Geographic Pointing – Applicable payloads shall (T) be able to automatically point at a specified geographic location within the payload's field of regard (FOR). In conjunction with the air vehicle's automatic loiter capability, the payload should (O) be able to maintain constant surveillance and track on a designated geographic point.

3.5.2.3.3 Fixed Pointing – Applicable payloads shall (T) be able to continuously point at a fixed azimuth and depression.

3.5.2.3.4 Target Marking – Applicable payloads shall be able to mark 4 (T) 8 (O) targets and then be able to automatically return to the marked target after panning away from the target.

3.5.2.4 Payload Control

The payloads shall (T) be capable of being controlled manually by an operator in the GCS, or an SCT, or automatically controlled via the mission plan. Payload command and controls shall (T) be accomplished independent of aircraft command and controls.

3.5.2.5 Data Display

Applicable payloads shall (T) supply the coordinates for payload center FOV to the CBP UAV System for display in the GCS, SCT, and RVT, and imagery and payload status indications for display to the operator.

3.5.2.6 Payload Cooling System

If applicable, the payload detector cooling system shall (T) be a closed-loop, self-contained system, and not require charging prior to flight.

3.5.2.7 Sensor Metadata

Applicable sensors shall (T) be capable of providing sensor specific metadata for imagery embedding. Typical sensor metadata elements include: FOV, focal length, azimuth angle, depression angle, sensor type, time stamp, sensor settings, and sensor motion information (roll, pitch, and yaw).

3.5.2.8 Payload Interfaces

The contractor shall provide non-proprietary payload interface specifications for integrating specified payloads into the UAV system. Installation / loading of payload elements into the CBP UAV System shall (T) not require modification of aircraft, GCS, or RVT core operating software.

3.5.3 Electro-optical/Infra-red/Laser Illuminator

The Electro-optical/Infra-red (EO/IR) sensor provides real time (video) imagery support under all environmental conditions in which the CBP UAV System operates. The EO/IR payload capability shall (T) include a day/night passive imagery sensor, and laser illuminator (class 3B or less).

3.5.3.1 EO/IR/Laser Illuminator Airborne Suite

3.5.3.1.1 (b) (7)(A), (b) (7)(E)

3.5.3.1.2

3.5.3.1.3 Shall (T) be capable of autotrack, autofocus, and autoscan functions.

3.5.3.1.4 Shall (T) be capable of focusing on the exterior of the aircraft during flight.

3.5.3.1.5 (b) (7)(A), (b) (7)(E)

3.5.3.1.6

3.5.3.1.7

3.5.3.1.8

3.5.3.1.9 Shall (T) provide National Television Standards Committee (NTSC)-formatted video transmission.

3.5.3.1.10 (b) (7)(A), (b) (7)(E)

3.5.3.1.11 Shall (T) be capable of marking a target into a retrievable database.

3.5.3.1.12 (b) (7)(A), (b) (7)(E)

3.5.3.1.13

3.5.4 Synthetic Aperture Radar (SAR)

Moving-target-indicator (MTI) radar modes have the ability to detect targets in the presence of radar confounding land terrain and can be superimposed on radar images of the terrain to better indicate the environmental context of detected objects.

3.5.4.1 SAR Airborne Suite

3.5.4.1.1 (b) (7)(A), (b) (7)(E)

3.5.4.1.2

3.5.4.1.3

3.5.4.1.4

3.5.4.1.5

3.5.4.1.6

3.5.5 Signals Interception

3.5.5.1 Signals Interception Airborne Suite

3.5.5.1.1 (b) (7)(A), (b) (7)(E)

3.5.5.1.2

3.5.5.1.3 (b) (7)(A), (b) (7)(E)

3.5.5.1.4

3.5.5.1.5 UAV shall (T) be able to output formatted data reports to ground units.

3.5.5.1.6 The signals intercept airborne suite shall (T) be suitable for integration and operation on a UAV with respect to size, weight, and power.

3.5.5.1.7 (b) (7)(A), (b) (7)(E)

3.5.6 Communication Relay

3.5.6.1 Communications Relay Airborne Suite

3.5.6.1.1 Shall provide 20 (T) 36 (O), secure, voice channels with Data Encryption Standard (DES) and Advanced Encryption standard (AES) encryption (selectable) (T) in addition to the channel reserved for air traffic control communication. The installed system shall be compatible with current in-place ground communications systems as specified in section 3.5.1.6.2.

3.5.6.1.2 This multi-channel radio relay suite shall provide frequency selection from the GCS, embedded secure communications, and broadcast capability (T) and incorporate payload data broadcast capability (O).

3.5.7 Hyper-spectral Imaging Sensor (HIS) System

The sensor payload should include the option for a hyper-spectral imaging (HSI) sensor (imaging spectrometer) system (O). The sensor and its associated data transmission, analysis, and display subsystems should (O) be capable of producing images with numerous spectral bands for each pixel, and correcting the spectral radiance of each pixel for source illumination, source geometry, atmospheric effects, and sensor effects. Further, the sensor/analysis system should (O) be capable of spectral matching or unmixing in order to display images clearly highlighting selected materials or conditions on the ground. The sensor/analysis system should (O), after a period of configuration and training, be capable of producing such displays in near real time, to enable rapid response by ground personnel, to the detected conditions. The sensor package should (O) be mechanically, thermally and electrically compatible with the payload capabilities of the aircraft, and should be suitably rugged for extended flight operations. This payload should only be required to be carried concurrent with the EO/IR, laser illuminator, satellite tracker and communication relay payloads (O).

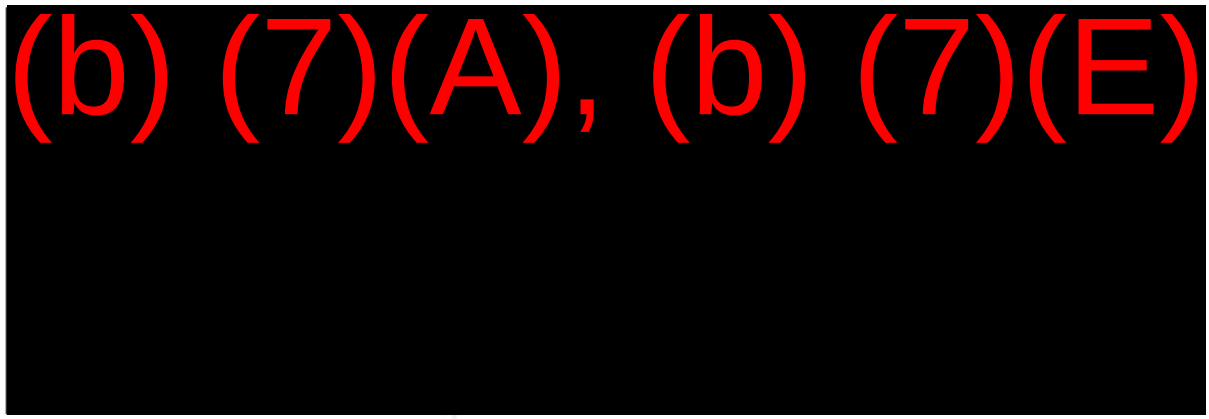
3.5.8 Ground Control Station (GCS)

The GCS is the command and control center for the CBP UAV System. Each GCS controls and monitors aircraft via the Link Segment. The Link Segment receives telemetry and imagery data from the aircraft and transmits command and control data to the aircraft from the GCS. Operationally, the GCS shall support: multiple aircraft command and control; Link Segment command and control; embedded communication relay; mission payload command and control; imagery annotation and imagery processing functions; and tactical communications with the users. The CBP UAV System should (O) be incorporated and integrated into each border patrol sector internal command and control system. The operational flight control programs (OFP) shall be isolated, via hardware and/or software, from the mission planning, mission support, payload interface, and data handling software segments. The OFP shall have DO-178B Level B certification. The isolated sub-components (non-flight critical) shall have DO-178B Level C certification and be isolated such that any change or replacement of a sub-component does not require re-certification of the OFP.

3.5.8.1 GCS Architecture

The GCS workstations shall (T) be capable of hosting all functionality associated with NATO STANAG 4586 Level 1 through 5 control of the aircraft and payload.

3.5.8.1.1 Environmental Conditions



3.5.8.1.2 GCS Communications – The GCS shall (T) allow for external and internal voice tactical communications among the flight crew members (Mission Commanders, Pilots, Payload Operator), the Tactical Supervisors, and maintenance support personnel as required.

3.5.8.2 Ground System Communications

The GCS system ground communications shall (T) conform to the following standards, provisions, or capabilities:

3.5.8.2.1 Use DHS standard tactical communications equipment and procedures for ground CBP UAV components.

3.5.8.2.2 Contain a minimum of two (T) four (O) AN/ARC-210/RT-1851. The AN/ARC-210/RT-1851 Warrior Multimode Integrated Communications System provides 2-way multimode voice and data communications over the 30-400 MHz frequency range in either normal, secure or jam-resistant modes via line-of-sight (LOS) or satellite communications (SATCOM) links. The Rockwell Collins RT-1851(C) is a programmable Digital Communication System and is a fully digital transceiver that provides transfer of data, voice and imagery. It supports Bandwidth Efficient Advanced Modulation (BEAM) technology providing superior bandwidth efficiency. BEAM technology provides data transfer rates up to 100 kb/s LOS and 80 kb/s SATCOM in a 25 kHz channel. The UHF/VHF CBP UAV System communications capability shall (T) be digital data capable and interface with standard DHS systems, architectures, and protocols. The radios should (O) be integrated into the internal voice communication suite of the GCS. Other key features shall (T) be:

a. Software re-programmable in the field via MLVS
b. Compatible with existing 1553 controllers for ARC-210
c. Control via 1553, C-12561A remote control, or RCU-8150 remote control
d. Interoperable with a variety of high power amplifiers, low noise amplifiers, tunable filters and interference cancellation systems
e. Fully compliant with ICAO ED-23B
f. 8.33 kHz operation
g. Hardware shall support software-only upgrades for: BEAM, CSEL COSPAS-SARSAT Receive (406 MHz), SATURN, VDL modes 2 and 3 (data), DAMA B, and VDL mode 3 voice

3.5.8.2.3 All radio and telephone communications are to be interoperable with National Security Agency (NSA) approved encryption systems.

3.5.8.2.4 Communication equipment should (O) have an additional tap for use of payload data by external imagery systems.

3.5.8.2.5 If any commercial or non-developmental items (NDI) subsystems are used in the GCS, all applicable DHS, National, and International spectrum management policies and regulations are to be satisfied.

3.5.8.2.6 The GCS shall (T) be able to import National Geospacial-Intelligence Agency (NGA) Digital Terrain Elevation Data (DTED), Digital Feature Analysis Data (DFAD), Compressed Arc Digitized Raster Graphics (CADRG) and scanned hard-copy maps.

3.5.8.3 GCS Data Recording

The GCS shall (T) have provisions for the following:

a. Recording aircraft up-link and down-link command and control data, payload data, and internal and external voice communications, and video in standard US (NTSC and MPEG 2) format, as well as
b. Provide links for further dissemination of payload data.
c. Support the ability to have 3rd party application display real-time and recorded Aircraft positional (X, Y, Z, Heading, Pitch, Roll), payload positional information (Heading, Pitch, Roll), and video information.
d. Interface through HTTP(s) server or direct connection to ground station equipment provided by the vendor.
e. Positional and payload information shall adhere to the DIS standard or other agreed in advance open published protocol data unit (PDU) based standard.
f. Video, payload and positional information shall be published in groups to allow for real-time to near real-time integration of the UAV information into larger fused 2-D and 3-D visualization environments.
g. Unclassified test data streams in the above formats shall be provided as development samples, along with supporting integration and implementation documentation to provide third party application designers.

3.5.8.4 Mission Planning

The GCS shall (T) be capable of providing the following automated mission planning functions:

a. Import of National Geospatial-Intelligence Agency (NGA), Digital Terrain Elevation Data (DTED), Digital Feature Analysis Data (DFAD), and Compressed Arc Digitized Raster Graphics (CADRG).
b. Point and click route planning to include terrain avoidance warning, fuel calculations, and payload search area information.
c. Aircraft pre-programming and system checks to include Built-in-Test (BIT).
d. Weight and balance calculations for takeoff, climb, cruise, descent, and landing performance based on weight, drag index and environmental conditions.
e. Provide a minimum of two common and redundant operator consoles.
f. Provide the capability to connect Directorate communication networks via the GCS and data terminals.
g. All situational awareness displays and data terminals shall provide sufficient information for the pilot or analyst to maintain adequate orientation of vehicle position and state.
h. Upload mission planning data to the aircraft while on the ground.

3.5.8.5 Mission Control

During the mission, the GCS shall (T) be capable of:

a. Controlling one airborne aircraft and its payloads while performing mission planning/power-on preflight simultaneously on a second aircraft.
b. Controlling at least one aircraft and payload without the use of external communication/data relay stations at a distance of 150 nm, line-of-sight (LOS) permitting.
c. Controlling at least one aircraft and payload throughout the desired operational area and with the use of no more than two communication/data relay stations (or satellites).
d. Providing the capability to override automated/pre-programmed inputs to the aircraft and payload.
e. Be able to turn on and off aircraft equipment.
f. Providing the means to pass control of the payloads to an SCT.
g. Changing the mission plan and uploading the new mission plan to the aircraft using the command and control data link.

3.5.8.6 General Physical Characteristics for the GCS and Takeoff and Landing System

3.5.8.6.1 Environmental Control – Heating and cooling vents shall (T) be provided for all occupied spaces in the CBP UAV GCS. At outside ambient temperatures of -40° F, the heating system maintains an effective temperature of at least 64° F within the personnel space; at outside ambient temperatures of 122° F, the cooling system maintains an effective temperature of no greater than 84° F within the personnel space. Personnel shall (T) be provided an acoustical environment which should not cause personnel injury, interfere with voice or any other communications, cause fatigue, or in any other way degrade system effectiveness.

3.5.8.6.2 Electrical Power – The CBP UAV System ground equipment shall (T) use standard U.S. electrical power sources, available with standard mobile electrical power sources, integrated to supply the appropriate electrical power on a continuous operation. The CBP UAV System ground equipment shall (T) be capable of restoring and/or maintaining electrical back-up power in sufficient time to avoid critical mission data loss, computer memory loss, or loss of aircraft control. The CBP UAV System's mission objectives should (O) continue to be achievable after restoration of electrical power. The CBP UAV System should (O) have electrical/electronic equipment protection devices to prevent power surge/power failure damage.

3.5.8.6.3 Lightning Protection – The GCS system shall (T) meet the lightning requirements as defined in MIL-STD-464, paragraph 5.4. Indirect lightning effects for CBP UAV System ground equipment should (O) be considered and mitigated.

3.5.9 Link Segment

3.5.9.1 General Description

3.5.9.1.1 The Link Segment shall (T) include consists of redundant control links and non-redundant sensor data links.

3.5.9.1.2 The aircraft shall (T) also be able to use either command and control link for air vehicle command, control, and aircraft feedback, however, the primary data link shall be the main link for payload data transmission.

3.5.9.1.3 If the CBP UAV System determines the primary command and control link to be unusable, it shall (T) switch automatically to the secondary data link in such a manner to continue successful and safe aircraft flight and mission operations. The CBP UAV System should (O) allow operator selection of data links. The Link Segment should (O) provide the capability for encrypting the primary and secondary command and data links.

3.5.9.1.4 A "zeroize" capability to clear encryption codes and keys automatically (initiated with imminent loss of flight) or manually shall (T) be required.

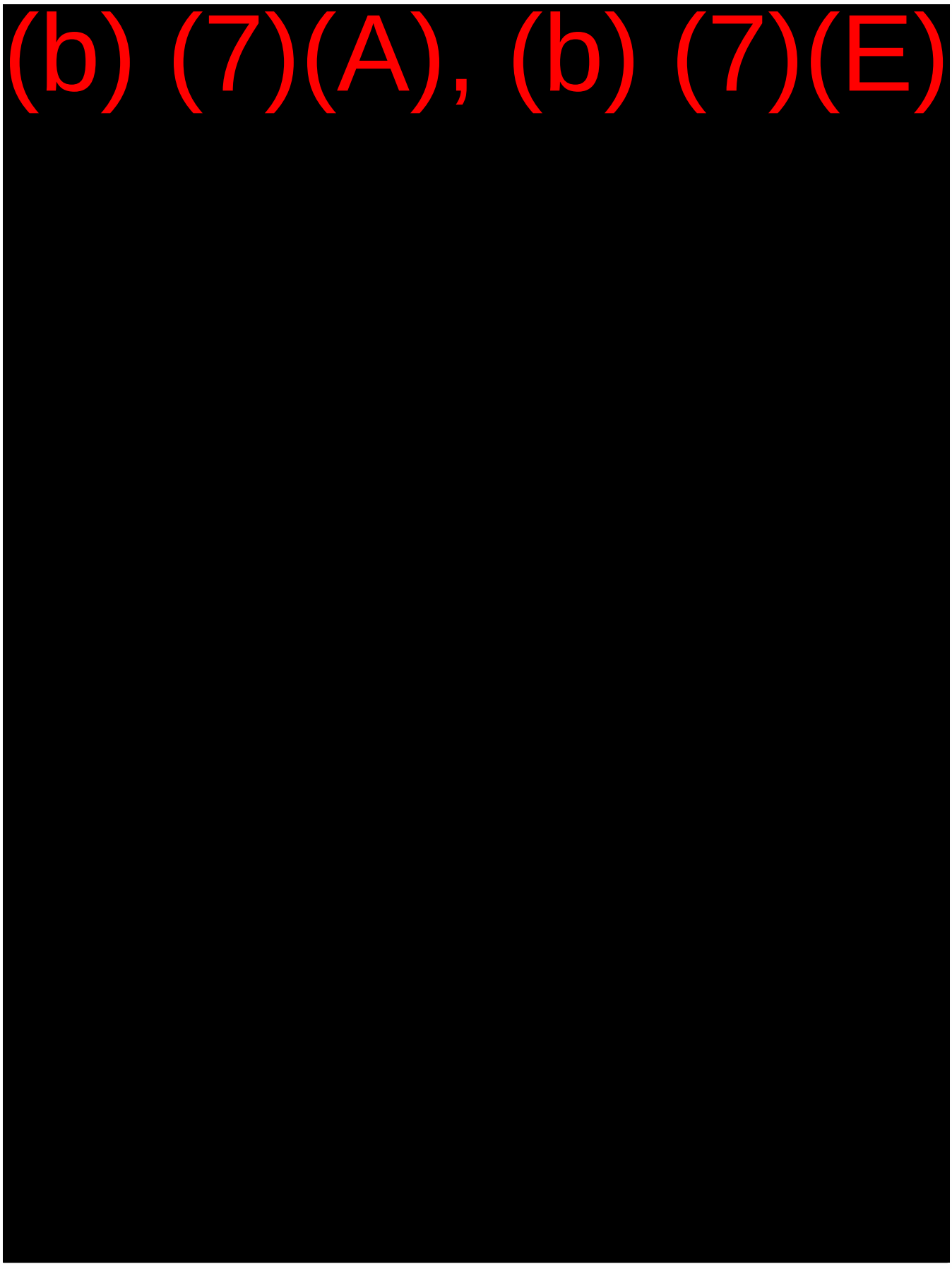
3.5.9.1.5 The Link Segment should (O) provide redundancy for aircraft C^2, be electronically steerable, support multiple frequencies and multiple full-duplex channels simultaneously, be anti-jam with low probability of intercept, be capable of supporting both unidirectional and omni-directional communications simultaneously, and support simultaneous communication with two airborne aircraft at the same time.

3.5.9.1.6 The Link Segment should (O) provide data distribution (imagery and system data) from the aircraft to the GCS, SCT, and RVT, via discrete and selectable frequencies and also provide imagery to "on the move" CBP agents in vehicles or on foot.

3.5.9.2 Command Link Suite Performance

3.5.9.2.1 (b) (7)(A), (b) (7)(E)

3.5.9.2.2


(b) (7)(A), (b) (7)(E)