3 (U) Requirements

3.1 (U) SuR Definition

3.1.1 (U) Orbit/System Description

(U) The concept of operations for JLENS is based on a surveillance radar providing wide area surveillance data and a slewable fire control radar providing b(3) and engagement quality fire control data b(3) This architecture provides the operational commander with the flexibility to match the sensor payload to the unique requirements of an individual theater.

(U) The JLENS concept is based on utilizing two proven, fielded 71M™ class aerostats, see 6.2, built by TCOM. For the Surveillance and Fire Control Systems, the standard 71M™ aerostat will be enlarged to 74M™ to account for the weight of the payloads and the operating temperature range. The JLENS Surveillance Radar (SuR) and IFF are located on one aerostat along with a communications payload. The Fire Control Radar (FCR), IFF, and a common communications payload are located on the second aerostat. The SuR and FCR IFF electronics are common; however, the IFF antennas are different. Ground based processing stations and other ground support equipment (GSE) are located at the base of each aerostat accompanied by the Mobile Mooring Station (MMS). A notional drawing of the JLENS Orbit is presented in Figure 1.

(U) Each JLENS system is made up of three of the four Prime Items. The four JLENS Prime Items are: Platform, SuR, FCR, and Communication and Processing Group (CPG). The Surveillance System uses all the prime items except the Fire Control Radar. The Fire Control System is composed of the same prime items as the Surveillance System except for radar which is the Fire Control Radar.

(U) JLENS has the capability to be a full participant on the Joint Link-16 network used for air defense surveillance, cueing, and coordination. JLENS will also have the capability to operate on the Navy Cooperative Engagement Capability (CEC) network. This collection of communications capabilities will allow JLENS to seamlessly participate in active air defense.

b(3)

(U) Each aerostat is powered from the ground through an 80 kVA tether. The tether also provides two-way fiber optic communications between the platform payloads and the processing station via the CPG fiber optic interface.

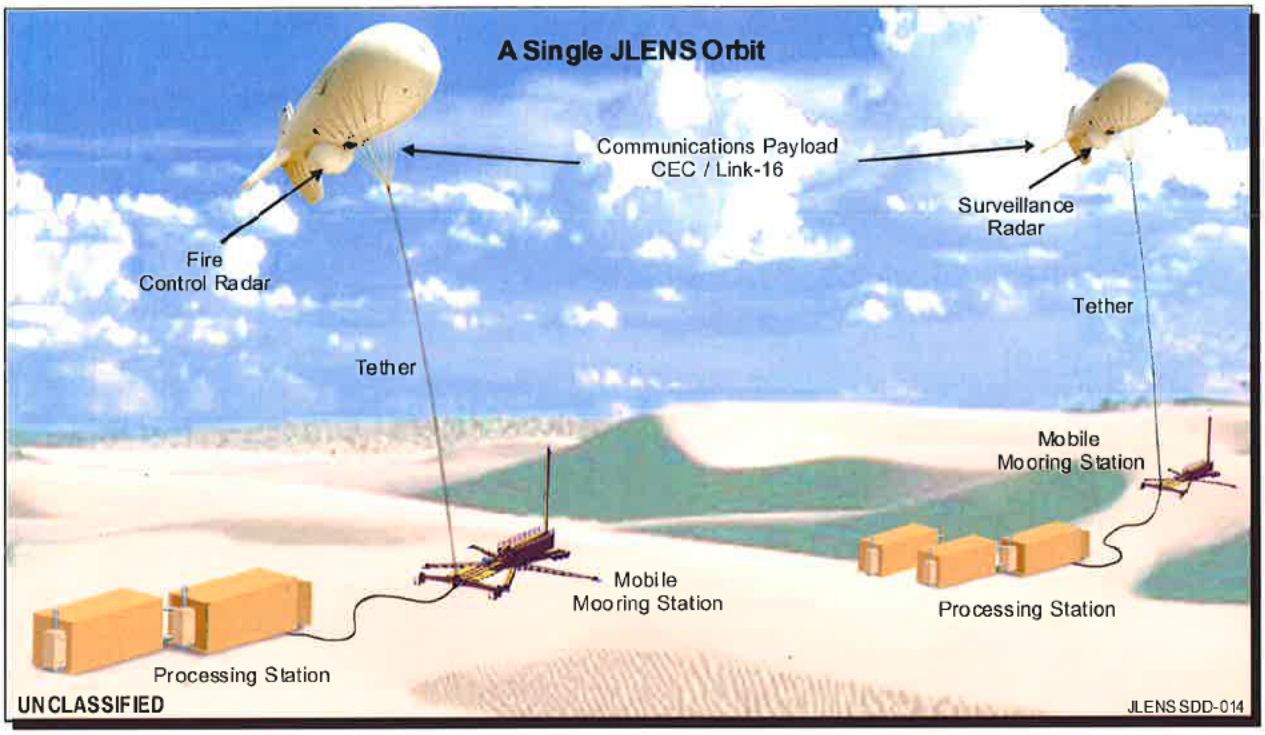

FIGURE 1. (U) JLENS Orbit Notional Pictorial

FIGURE 2. (U) DELETED

b(1)

JLENS SURVEILLANCE RADAR (SuR) PRIME ITEM DEVELOPMENT SPECIFICATION (PIDS) (U)	4U884	6	G	5219665
TITLE	CAGE CODE	SH NO.	REV LTR	NUMBER

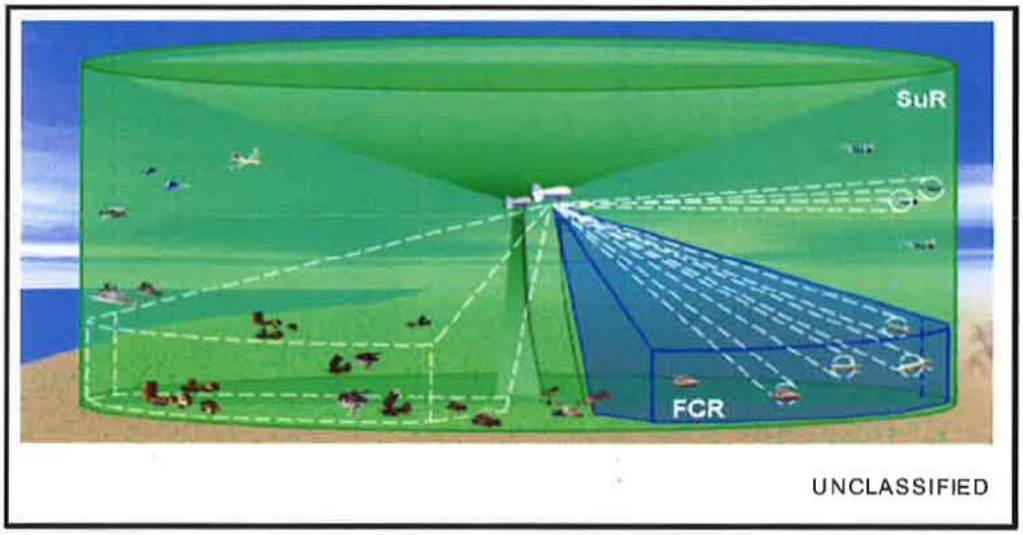

FIGURE 3. (U) Conceptual View of JLENS Radar Coverage

b(1)

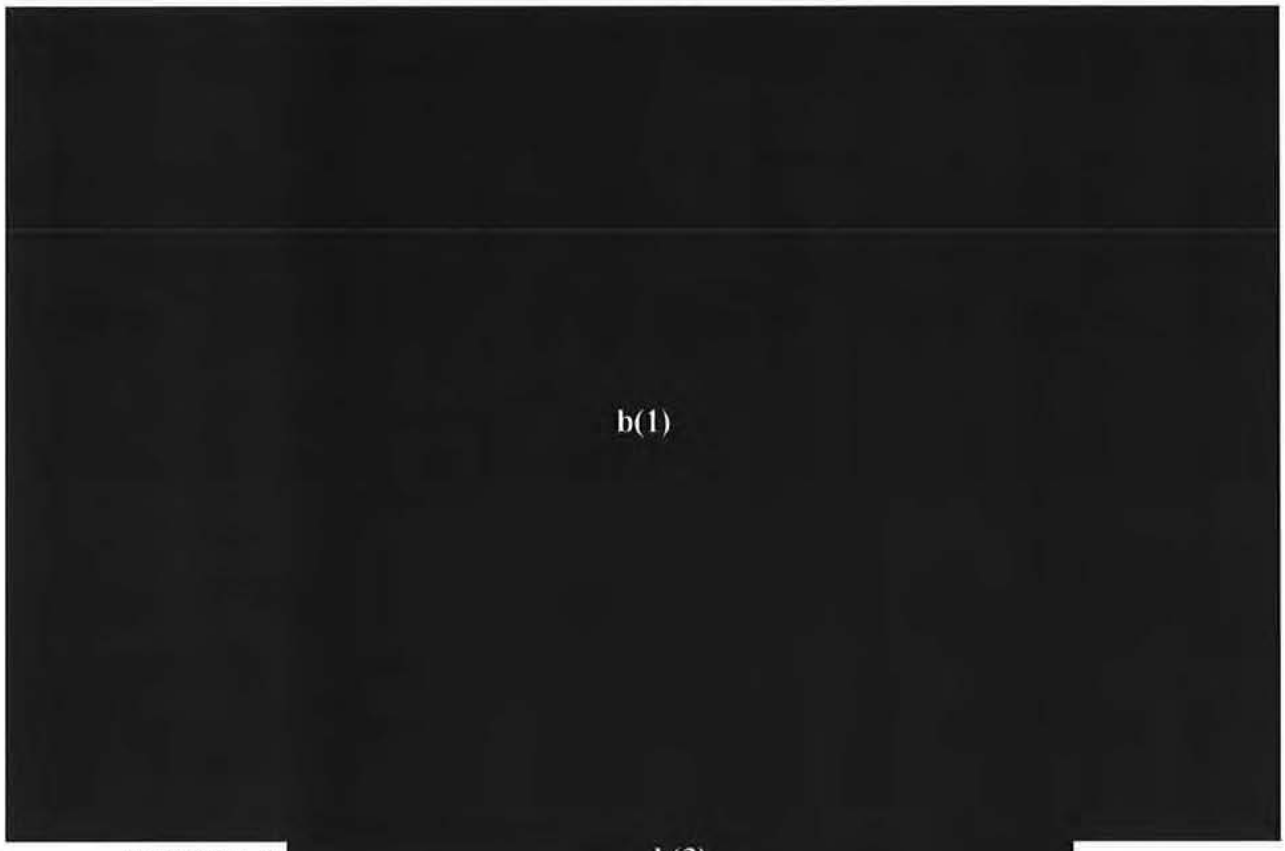

FIGURE 4. b(3)

3.1.2 (U) Surveillance Radar (SuR) Prime Item Description

(U) The Surveillance Radar (SuR) consists of an airborne Aerostat based payload and signal and radar data processors located within the ground based Surveillance System Communication and Processing Group as illustrated in Figure 1. The airborne and ground based elements of the SuR are connected by the Platform tether, which provides power to the airborne element and fiber-optic communications between the airborne and ground based elements.

(U) The basic enabling technologies for the SuR have remained intact during the radar's conceptual design period over the past several years. These technologies, key to meeting the JLENS challenging requirements, have been maturing in Raytheon's legacy programs which are leveraged to benefit the SuR. Based on these enabling technologies, the SuR conceptual design has evolved over time to progressively address the customer's requirements. The SuR conceptual design has been enhanced as the result of the Raytheon engineers and personnel from the United States Army program office. With the customer's participation, the SuR design benefited from the frequent guidance from the Army program

office intended to improve the utility of the system for the end user, thereby meeting the requirements set forth in the MIS-PRF-55628.

(U) The terms CPG and Communication and Proccssing Group that appear, herein, refer to the Surveillance System Communication and Processing Group, unless otherwise stated.

3.1.3 (U) Missions

(U) The SuR has four missions, each associated with a distinct target type (1): Air Breathing Target (ABT), (2) Surface Moving Target (SMT), (3) Tactical Ballistic Missile (TBM), and (4) Large Caliber Rocket (LCR). All four missions cover 360° in azimuth angle, and include search (that is, surveillance), track acquisition and confirmation, and track updating. In each mission the SuR uses a single elevation bar scan that covers b(3) and is stabilized at a fixed mission-specific elevation angle. The processing flow for the missions is shown in Figure 5. As shown in the figure, the processing station controls mission selection and receives all SuR target reports.

(U) In addition to providing continuous 360° wide area surveillance, the SuR incorporates an Identification Friend or Foe (IFF) system (a non-development item, AN/APX-113) to support the Single Integrated Air Picture capability of the JLENS orbit.

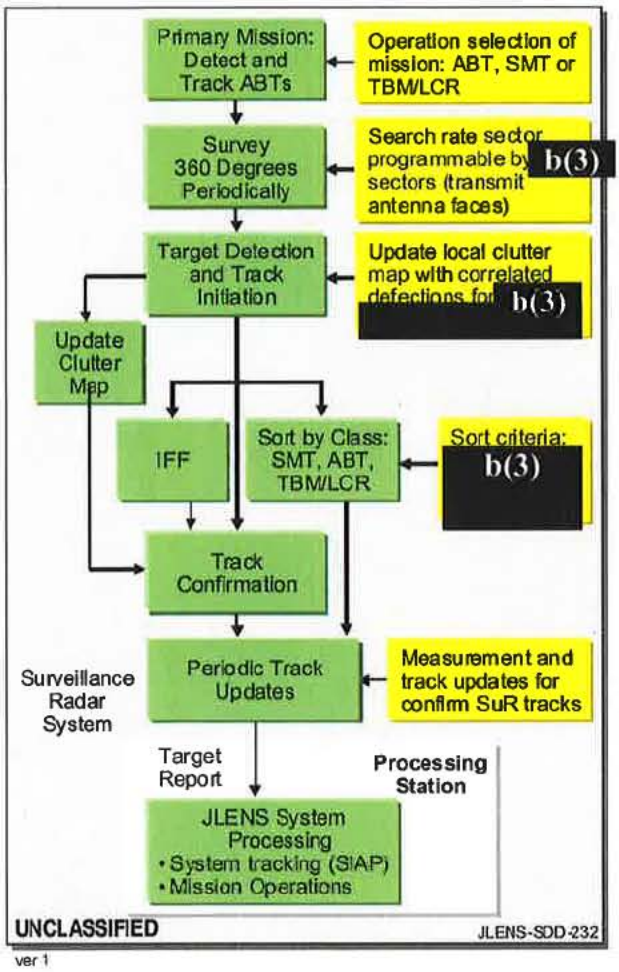

FIGURE 5. (U) SuR Functional Flow Block Diagram

3.1.3.1 (U) Primary Mission - Air Breathing Targets (ABT)

(U) The primary mission of the JLENS Orbit is defined as providing detection data, track data, and support of engagements of Land Attack Cruise Missiles (LACMs) and other air breathing targets (ABTs) with no a priori knowledge of the target.

(U) Note: Targets are assumed to fall within the target parameters in 3.1.4.1, Table I.

3.1.3.2 (U) Secondary Missions

(U) The secondary missions are defined as:

a. (U) To provide detection data, track data, and launch point estimates of Tactical Ballistic Missiles (TBMs) as defined in 3.1.4.2 with no a priori knowledge of the target.

b. (U) To provide detection data, track data, and launch point estimates of Large Caliber Rockets (LCRs) as defined in 3.1.4.3 and with no a priori knowledge of the target.

c. (U) To provide surveillance, detection data, and track data of Surface Moving Targets (SMTs) as defined in 3.1.4.4 with no a priori knowledge of the target.

3.1.4 (U) Threat

3.1.4.1 (U) Air Breathing Targets (ABTs)

b(1)

TABLE I. b(1)

~~SECRET/NOFORN~~

b(1)

~~SECRET/NOFORN~~

b(1)

TABLE II. b(1)

b(1)

b(1)

(U) Table III summarizes ABT characteristics and operational envelopes. Performance will be summarized for the threats defined in Table III.

TABLE III. (U) ABT Threat Characteristics

~~SECRET/NOFORN~~
b(1)
~~SECRET/NOFORN~~

3.1.4.2 (U) Tactical Ballistic Missiles (TBMs)

b(7)(e)

TABLE IV. (U) TBM Characteristics

~~SECRET/NOFORN~~
b(1)

b(1)

3.1.4.3 (U) Large Caliber Rockets (LCRs)

b(1)

TABLE V. (U) LCR Characteristics

b(1)

3.1.4.4 (U) Surface Moving Targets (SMTs)

(U) Surface Moving Targets (SMTs) threat characteristics are defined per Table VI.

TABLE VI. (U) SMT Characteristics

~~SECRET/NOFORN~~
b(1)
~~SECRET/NOFORN~~

3.1.4.5 b(3)

b(3)

3.1.4.5.1 b(3)

b(1)

TABLE VII. b(3)

~~SECRET/NOFORN~~
b(1)
~~SECRET/NOFORN~~

3.1.4.5.2 b(3)

b(1)

TABLE VIII. b(3)

~~SECRET/NOFORN~~
b(1)
~~SECRET/NOFORN~~

3.1.4.5.3 b(3)

b(1)

FIGURE 6. b(3)

3.1.5 (U) SuR States and Modes

(U) The SuR provides operational capabilities to support both wartime and peacetime missions through the use of the SuR states and modes. The SuR may transition between these states and their modes.

3.1.5.1 (U) Storage State

(U) The Storage State ensures the availability of the system after long or short periods of storage. It consists of the short-term and long-term storage modes. The SuR normally transitions into and out of the storage state from/to the deployment state. *This state is a non-operational state.*

3.1.5.1.1 (U) Short-Term Storage Mode

(U) The SuR equipment is placed in short-term storage mode with the owning organization when mission requirements require the unit to perform functions other than their normal missions. The b(3) The equipment is placed in the short-term storage without pre-conditioning and is maintained at a reduced maintenance level. b(3) The items are to be removable by the operator using standard tools. b(3) b(3) The equipment is returned to operations in accordance with the appropriate technical manuals and guidance documents. Transition from this mode to the operational state is within the emplacement timeline defined in the requirements. *This mode is a non-operational mode.*

3.1.5.1.2 (U) Long-Term Storage Mode

(U) The SuR equipment is placed in long-term storage mode when mission requirements do not require the equipment for both peacetime and wartime operations. The equipment may remain stored through the duration of its service life. The system equipment is prepared and pre-conditioned for transition into long-term storage in accordance with the appropriate technical data b(3) The equipment is returned to operations in accordance with the appropriate technical data and guidance documents. *This mode is a non-operational mode.*

3.1.5.2 (U) Movement State

(U) For the SuR, the movement state consists solely of the transport mode for intra-theatre and inter-theatre shipment independent of the means of transportation to be used. *This state is a non-operational state.*

3.1.5.2.1 (U) Transport Mode

(U) In the transport mode, all SuR equipment will be readied for transportation in a unique configuration that is independent of the means of transport to be used. All SuR equipment is transportable by C-17 and C-5 fixed-wing military aircraft for strategic airlift, sealift, and/or rail. The SuR is transportable by C-130 intra-theater. Transitions to the transport mode are conducted using the battery's own organic equipment or the transportation unit's special handling equipment. It remains in the transport configuration until it arrives at its final destination. *This mode is a non-operational mode.*

3.1.5.2.2 (U) March Order Mode

(U) Since the SuR equipment will be readied for transportation in a unique configuration that is independent of the means of transport to be used. All SuR equipment will be packaged in transportation fixtures and stowed in 8'x8'x20' ISO containers. As a result, there are no March Order unique requirements applicable to the SuR. This means that whenever the surveillance system is in the Movement State, the SuR will be in the Transport mode. Thus, there is no March Order Mode applicable to the SuR.

3.1.5.3 (U) Deployment State

3.1.5.3.1 (U) Emplace Mode

(U) The emplace mode includes the physical positioning and physical integration of the SuR. The SuR equipment transitions to the emplace mode upon arrival at its designated location. After physical positioning and integration of the SuR hardware on the aerostat, the SuR can begin initialization of individual prime items. Initialization is the power-up sequence for the individual prime items that ends with the system ready to begin configuration for an assigned mission. *This mode is non-operational.*

3.1.5.3.2 (U) Displace Mode

(U) The displace mode provides the capabilities to transition SuR equipment to march order configurations prior to entering the movement state. The assigned crews shut down, disassemble, and stow all deployed equipment in preparation for movement. *This mode is a non-operational mode.*

3.1.5.4 (U) Operations State

(U) The operations state begins with the SuR being configured for a mission and continues through all tactical operations. The operations state also includes maintenance activities on a non-interfering basis. The operations state also includes a moored configuration where the SuR can be in either the Configuration or the Preventive Maintenance mode. The transition from the operations state, moored configuration, to the operations state, at altitude configuration, is through the deployment state. *This state is an operational state.*

3.1.5.4.1 (U) Configuration Mode

(U) The configuration mode provides the ability for the operators to build and implement a mission profile. The mission profile contains the performance parameters for the SuR to meet the tasks in the assigned mission. The configuration mode can be entered as many times as is necessary during

operations to change the performance parameters due to mission assignment change. *This mode is an operational mode.*

3.1.5.4.2 (U) Tactical Mode

(U) The tactical mode provides the capability to perform all mission operations assigned to the SuR to include: surveillance, detection, tracking, and IFF interrogations. The SuR operates in the tactical mode concurrent with the configuration mode. In this mode, the radar may or may not be radiating, depending on desired operations. The SuR transitions to the tactical mode, through the configuration mode, when emplacement functions are completed. The SuR transitions out of the tactical mode when ordered to stand down. *This mode is an operational mode.*

3.1.5.4.3 (U) Training Mode

(U) Since the only SuR command/control interface is through the CPG, the surveillance sensor has no independent way of determining that the entire surveillance system is in the Training mode. As a result, there are no training unique requirements applicable to the SuR. This means that whenever the surveillance system is in the Operations State, the SuR will be in either the Configuration or the Tactical mode. Thus, there is no Training Mode for the SuR.

3.1.5.4.4 (U) Operations Sustainment Mode

(U) When in the Operations State, the SuR requires neither re-fueling, re-supply or re-training of JLENS personnel. As a result, there are no unique Sustainment mode requirements applicable to the SuR. This means that whenever the surveillance system is in the Operations State, the SuR will be in either the Configuration or the Tactical mode. Thus, there is no Sustainment Mode for the SuR.

3.1.5.5 (U) Maintenance State

3.1.5.5.1 (U) Corrective Maintenance Mode

(U) The corrective maintenance mode is for repair of SuR failures resulting in unscheduled maintenance actions. Repair is defined as the restoration or replacement of parts to return the end items to an operational condition and maintain efficient operations. This mode is a non-operational mode.

3.1.5.5.2 (U) Preventive Maintenance Mode

(U) The preventive maintenance mode allows the JLENS crew to perform scheduled PMCS designed to extend and ensure the operational readiness of the SuR. Preventive maintenance tasks may be conducted

on individual prime items on a non-interference basis with system operation as long as safety policies and procedures allow. Transition to and from the preventive maintenance mode can occur from the storage, transportation, or operation states. This can be either an operational or non-operational mode.

(U) The only identified PMCS tasks for the SuR are periodic refilling/replacement of the payload coolant fluid and periodic update of cryptographic keys.

3.2 (U) SuR Characteristics

3.2.1 (U) Performance Characteristics

(U) [SuR-19] The Surveillance Radar **shall** operate as a sensor either as part of a stand-alone Surveillance System or as part of a complete JLENS Orbit.

3.2.1.1 (U) Missions

3.2.1.1.1 (U) General

(U) [SuR-887] The Surveillance Radar **shall** perform the following non-simultaneous missions upon receipt of a mission selection command from the CPG:

a. (U) Air Breathing Target (ABT) surveillance

b. (U) Tactical Ballistic Missile (TBM) target surveillance

c. (U) Large Caliber Rocket (LCR) target surveillance

d. (U) Surface Moving Target (SMT) surveillance.

3.2.1.1.2 (U) Air Breathing Targets (ABT) Mission

3.2.1.1.2.1 (U) Power-Aperture Figure of Merit (PAFOM)

b(1)

b(1)

b(1)

b(1)

3.2.1.1.2.2 (U) Combined Phase and Amplitude Noise

b(1)

TABLE IX. (U) Total Combined Phase and Amplitude Modulated Noise Level

~~SECRET~~
b(1)
~~SECRET~~

3.2.1.1.2.3 (U) Accuracies

3.2.1.1.2.3.1 (U) Range Accuracy

b(1)

b(7)(e)

b(1)

b(1)

3.2.1.1.2.3.2 (U) Radial Velocity Accuracy

b(1)

3.2.1.1.2.3.3 (U) Azimuth and Elevation Accuracy

(U) Surveillance radar measurements of target azimuth and elevation are random variables of the form $x = \mu + \beta + \varepsilon$, where x is the measured value, μ is the true (but unknown) value, β is the residual (unknown but bounded) bias, and ε is a zero mean random error with a standard σ_ε, which is known or can be estimated. In addition, the standard deviation of the random error is a function of the target azimuth and elevation with respect to the receive antenna of the Surveillance Radar. Finally, the standard deviation σ_t of the "total" angle measurement error is defined by $\sigma_t^2 = \sigma_\varepsilon^2 + \beta^2$. The standard deviations of the Surveillance Radar azimuth and elevation total measurement errors, exclude errors arising from the Surveillance System latencies, the JLENS Orbit latencies, and the effects of target maneuvers.

b(1)

b(1)

b(1)

b(1)

b(1)

b(7)(e)

where

b(1)

b(1)

b(1)

where

b(1)

b(1)

b(1)

b(1)

where

b(1)

b(1)

b(1)

b(1)

where

b(1)

b(1)

3.2.1.1.2.3.4 (U) Radial Velocity Accuracy

b(1)

3.2.1.1.2.4 (U) Detection

3.2.1.1.2.4.1 b(1)

b(1)

b(1)

3.2.1.1.2.4.2 b(1)

b(1)

3.2.1.1.2.5 (U) Tracking

3.2.1.1.2.5.1 (U) False Tracks

b(1)

3.2.1.1.3 (U) Surface Moving Targets (SMT) Mission

3.2.1.1.3.1 (U) Detection

b(1)

3.2.1.1.3.2 (U) Tracking

b(1)

3.2.1.1.3.3 (U) False Tracks

b(1)

3.2.1.1.4 (U) Tactical Ballistic Missiles (TBM) Mission

3.2.1.1.4.1 (U) Tracking

(U) [SuR-934] The Surveillance Radar **shall** track TBMs, as defined in 3.1.4.2, during ascent phase while the TBM is b(3) appropriate for the current mission.

3.2.1.1.4.2 (U) Launch Point Estimates

b(1)

3.2.1.1.5 (U) Large Caliber Rockets (LCR) Mission

3.2.1.1.5.1 (U) Tracking

(U) [SuR-941] The Surveillance Radar **shall** track LCRs, as defined in 3.1.4.3, during ascent phase while the LCR is b(3) appropriate for the current mission.

3.2.1.1.5.2 (U) Launch Point Estimates

b(1)

3.2.1.2 (U) Functions

3.2.1.2.1 (U) Surveillance

b(1)

b(1)

3.2.1.2.2 (U) Provide Track Data

(U) The Surveillance Radar provides track data to be used for cues by another system.

(U) [SuR-964] The Surveillance Radar track report for all confirmed tracks **shall** include:

a. (U) Surveillance Radar track number

b. (U) Time of detection

c. (U) Track state estimate, including position and velocity, in ECEF coordinates

d. (U) Track covariance matrix

e. (U) Point of track origin (position of the target at the first detection used to create the track)

f. (U) Latest radar measurement data used to update the track

g. b(1)

h. b(1)

(U) [SuR-6436] The Surveillance Radar measurement data in the confirmed track report **shall** include:

a. (U) Measured azimuth, elevation, b(3)

b. (U) Estimated position of the radar at the time of detection b(3)

(U) [SuR-6433] The Surveillance Radar track report for confirmed LCR and TBM tracks **shall** additionally include:

a. (U) Acceleration components

b. (U) Launch point estimate with error ellipse.

3.2.1.2.3 (U) System Resource Management

(U) [SuR-7490] The Surveillance Radar **shall** synchronize its internal clock to b(3) time.

3.2.1.2.4 (U) Identification Friend or Foe (IFF)

3.2.1.2.4.1 (U) IFF Range

b(1)

b(1)

b(1)

3.2.1.2.4.2 (U) IFF Modes

(U) [SuR-74] The Surveillance Radar **shall** include an on-board IFF system which includes an interrogator that supports modes 1, 2, 3/A, C, 4, 5 (level 1 and level 2), and is compatible with DoD IFF systems.

(U) [SuR-9871] The Surveillance Radar **shall** include an on-board IFF system which includes a transponder that supports modes 1, 2, 3/A, C, 4, 5 (level 1 and level 2), and S and is compatible with DoD IFF systems.

3.2.1.2.5 (U) Location, Position, and Alignment

3.2.1.2.5.1 (U) Inertial Navigation System

(U) [SuR-78] The Surveillance Radar **shall** include a GPS-aided inertial navigation system.

3.2.1.2.5.2 (U) Global Position System (GPS)

3.2.1.2.5.2.1 b(3)

(U) [SuR-82] b(3)

3.2.1.2.5.2.2 (U) Global Air Traffic Management (GATM)

(U) This section is not applicable to this document.

3.2.1.2.5.2.3 (U) Initialization Utilizing GPS

b(3)

3.2.1.3 (U) Additional Capabilities

3.2.1.3.1 (U) Test Capabilities

3.2.1.3.1.1 (U) Sector Blanking Control

b(1)

b(1)

3.2.1.3.1.2 (U) ERP Control

b(1)

3.2.1.3.2 (U) Latency

b(1)

3.2.1.3.3 (U) Azimuth and Elevation Coverage

(U) [SuR-882] The Surveillance Radar, in the default (non-sector blanked) surveillance mode, **shall** continually cover 360 degrees (non-simultaneous) in azimuth.

b(1)

b(1)

b(1)

3.2.1.3.4 (U) Target Tracking

3.2.1.3.4.1 (U) Maximum Number of Tracks

b(1)

a. (U) The targets are uniquely resolvable b(3)

b. (U) The targets are described in 3.1.4.1 *Air Breathing Targets* including Table I and Table III

c. b(1)

3.2.1.3.4.2 (U) Track Initiation

b(1)

3.2.1.3.4.3 (U) Drop Track

(U) [SuR-6431] The Surveillance Radar **shall** drop track for all track numbers specified in a drop track command from the CPG.

3.2.1.3.5 (U) Operational Bandwidth

3.2.1.3.5.1 (U) Tunable Bandwidth

b(1)

3.2.1.3.5.2 (U) Performance Bandwidth

b(1)

3.2.1.3.5.3 b(1)

b(1)

3.2.1.3.5.4 b(1)

b(1)

3.2.1.3.5.5 b(1)

b(1)

3.2.1.3.6 ~~(S)~~ Emissions Control (EMCON)

b(1)

b(1)

3.2.1.3.7 (U) Failure Degradation

(U) [SuR-840] The Surveillance Radar **shall** b(3)

3.2.1.3.8 (U) Temperature Control

3.2.1.3.8.1 (U) Operation From Cold Start

(U) [SuR-838] The Surveillance Radar, while in the Moored Configuration, **shall** be functionally operational, see 6.2, b(3) after power is applied at an ambient temperature of -40°C.

3.2.1.3.8.2 (U) Operation From Hot Start

(U) [SuR-6968] The Surveillance Radar, while in the Moored Configuration, **shall** be functionally operational, see 6.2, b(3) after power is applied at an ambient temperature of 49°C.

3.2.1.3.8.3 (U) Temperature for Maintenance

(U) [SuR-2261] For maintenance, the Surveillance Radar, when configured into the Surveillance System which is in the Moored configuration and at an ambient temperature between -40°C and 49°C, **shall** be able to be brought to the temperature necessary for ground functionality testing.

3.2.1.3.8.4 (U) Coolant Constraints

(U) [SuR-2249] The Surveillance Radar **shall** use coolant per IDS Specification H308499 (Coolant, Glycol Based, Non-Silicate Formulation).

3.2.1.3.9 (U) Automatic Initialization

(U) [SuR-128] The Surveillance Radar ground equipment, upon application of power, **shall** automatically initialize, establish the communication link to the CPG, and be available to accept and respond to operator commands.

3.2.1.3.10 (U) Automatic Saturation Alleviation

(U) [SuR-866] The Surveillance Radar **shall** include automatic, default saturation alleviation method(s).

3.2.1.3.11 (U) Instrumented Range

(U) [SuR-862] The Surveillance Radar **shall** resolve range ambiguities on tracks reported to the CPG to b(3)

3.2.1.3.12 b(3)

(U) This section is not applicable to this document.

3.2.1.3.13 b(1)

b(1)

b(1)

3.2.1.3.14 (U) Prime Power

(U) [SuR-2253] The Surveillance Radar payload **shall** draw a maximum average of 15 kVA of 115/200 VAC, 400 Hz, 3-Phase power, 60 kVA of 139/241 VAC, 400 Hz, 3-Phase power, and a combined maximum average of 62 kVA for both power feeds.

(U) [SuR-6446] The Surveillance Radar payload **shall** balance the 3-Phases of the 115/200 VAC input power such that the load unbalance is NGT 10%.

(U) [SuR-8827] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors utilizing the following two power forms:

a. (U) 115/200 VAC, 400 Hz, 3-Phase power in accordance with Table I of MIL-STD-704F with the following exceptions:

1. (U) Voltage regulation expanded to ± 10%.

2. (U) Maximum normal AC voltage transient reduced from 180 Vrms to 160 Vrms

b. (U) 139/241 VAC, 400 Hz, 3-Phase power in accordance with Table I of MIL-STD-704F with the following exceptions:

1. (U) All voltages scaled by a factor of 1.2087 because MIL-STD-704F details requirements for a 115/200 VAC source not a 139/241 VAC source

2. (U) Voltage regulation expanded to ± 10%.

3. (U) Maximum normal AC voltage transient reduced from 180*1.2087 = 217.57 Vrms to 160*1.2087 = 193.4 Vrms.

(U) [SuR-8828] The Surveillance Radar payload power factors **shall** be NLT 0.85 leading or lagging for any load condition above 5 kVA for the 115/200 VAC feed.

(U) [SuR-8829] The Surveillance Radar payload power factors **shall** be NLT 0.80 leading or lagging for loads above 30 kVA and NLT 0.50 leading or lagging for loads less than 30 kVA for the 139/241 VAC feed.

(U) [SuR-9866] The Surveillance Radar payload maximum input inrush current **shall** not exceed:

a. (U) 128 Amps peak per phase for a time period of NGT 1 ms for 115/200 VAC, 400 Hz, 3-Phase Power

b. (U) 585 Amps peak per phase for a time period of NGT 1 ms for 139/241 VAC, 400 Hz, 3-Phase Power.

c. (U) 350 Amps peak per phase for a time period of NGT 0.1 s for 139/241 VAC, 400 Hz, 3-Phase Power.

(U) [SuR-6447] The Surveillance Radar payload **shall** balance the 3-Phases of the 139 VAC input power such that the load unbalance is within the limits of Figure 7 when the total load is less than or equal to 30 kVA and no greater than 3.33 percent of its total 3-phase load when the total load is greater than 30 kVA.

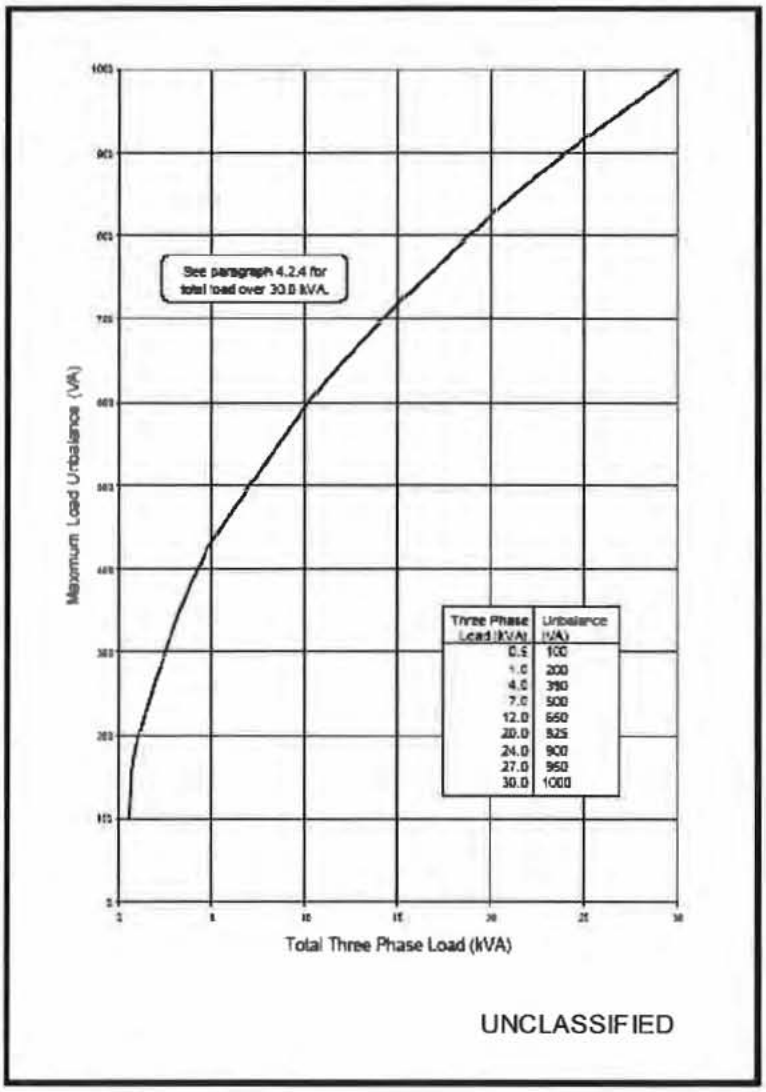

FIGURE 7. (U) Figure 1 of MIL-STD-704F

3.2.1.4 (U) Test Unique Requirements

(U) This section is not applicable to this document.

3.2.1.5 (U) Command, Control, and Communication

3.2.1.5.1 (U) Mission Profiles

3.2.1.5.1.1 (U) Implement Mission Profile

(U) [SuR-1841] The Surveillance Radar **shall** implement the mission profile when received from the CPG.

3.2.1.5.2 (U) Configuration Manual Update

3.2.1.5.3 (U) Data Recording

(U) [SuR-691] The Surveillance System **shall** have manual controls for selecting data recording details in addition to automatic recording.

3.2.1.5.4 (U) Integrity Requirements

3.2.1.5.4.1 (U) Pre-Launch Integrity Checks

3.2.1.5.4.2 (U) Manual Override

3.2.1.5.4.3 (U) Logs

(U) [SuR-410] The Surveillance Radar **shall** log the results of the pre-launch configuration checks.

(U) [SuR-8833] The SuR configuration logs from the three previous initializations **shall** be stored.

(U) [SuR-8847] The SuR **shall** report differences in the stored configuration logs IAW the JLENS system IRS.

3.2.1.6 (U) Mission Data Exchange

(U) This section is not applicable to this document.

3.2.2 (U) System Interface Requirements

3.2.2.1 (U) Internal Interface Requirements

(U) [SuR-9709] The Surveillance Radar **shall** have internal interfaces in accordance with the SuR ICD and SuR IRS.

3.2.2.1.1 (U) Physical Interfaces

3.2.2.1.1.1 (U) Platform with Surveillance Radar Payload

(U) This section is not applicable to this document.

3.2.2.1.1.2 (U) CPG Payload with the Radar Payload

(U) This section is not applicable to this document.

3.2.2.1.1.3 (U) CPG Ground Equipment with Radar Ground Equipment

(U) This section is not applicable to this document.

3.2.2.1.2 (U) Software Interfaces

3.2.2.1.2.1 (U) CPG Commands to the Surveillance Radar

(U) This section is not applicable to this document.

3.2.2.1.2.2 (U) Radar Command Acceptance from the CPG

3.2.2.1.2.2.1 (U) Surveillance Radar Command Acceptance

b(3)

3.2.2.1.2.3 (U) Radar Reports to the CPG

3.2.2.1.2.3.1 (U) Surveillance Radar Reports to the Associated CPG

(U) [SuR-2186] The Surveillance Radar **shall** provide a track report to the CPG each time a confirmed track is updated with radar measurement data.

(U) [SuR-970] The Surveillance Radar **shall** report configuration data to the Surveillance System CPG.

3.2.2.2 (U) External Interface Requirements

(U) [SuR-9708] The Surveillance Radar **shall** have external interfaces in accordance with the JLENS System ICD and JLENS System Internal IRS.

3.2.3 (U) Physical Characteristics

3.2.3.1 (U) Payload Weight

(U) [SuR-835] The Surveillance Radar payload **shall** weigh no more than 6,200 pounds, including only the SuR airborne payload hardware, the racks for SuR payload hardware external to the windscreen, and the bridge used to attach the SuR payload windscreen equipment to the platform windscreen rails and excluding fasteners between the racks and the aerostat.

(U) [SuR-6973] The total weight of the Surveillance Radar equipment mounted inside the windscreen **shall** be NGT 4500 pounds.

(U) [SuR-6974] The total weight of the Surveillance Radar equipment attached at any one location on the hull external to the windscreen **shall** be NGT 1100 pounds.

3.2.3.2 (U) Payload Cooling

(U) [SuR-6393] The Surveillance Radar components within the windscreen **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors at internal windscreen temperatures between -40°C and 55°C.

(U) [SuR-6394] The Surveillance Radar payload **shall** dissipate no more than 10,000 W into the interior of the windscreen.

3.2.3.3 (U) Dimensional Limitation

(U) [SuR-6391] All Surveillance Radar payload equipment, which is to be installed within the windscreen, **shall** fit within the volume shown in Figure 8.

(U) This interface is controlled in the JLENS System ICD by the windscreen hardware installation control drawing 5222600-500.

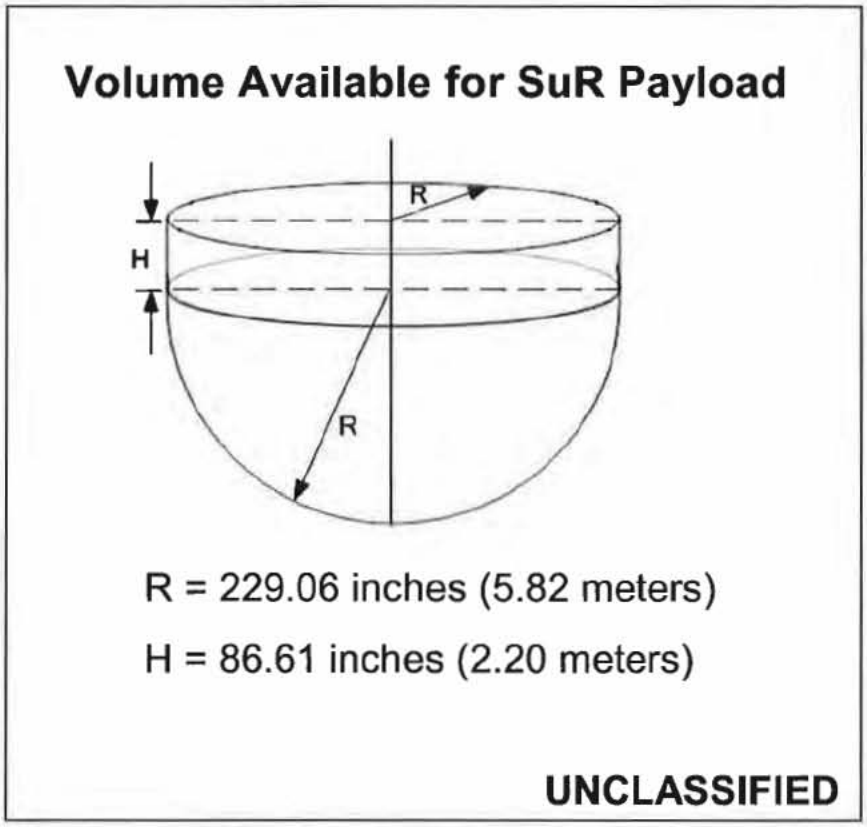

FIGURE 8. (U) Volume Available for SuR Payload

3.2.3.4 (U) Enclosure Constraints

(U) [SuR-1661] The Surveillance Radar enclosures mounted on the aerostat, exterior to the windscreen, that have the purpose to protect the equipment interior from NBC **shall** protect internal equipment from contamination caused by an NBC event as described in 3.2.5.2.8.1.

3.2.3.5 (U) Packaging Constraints

(U) This section is not applicable to this document.

3.2.4 (U) System Quality Factors

3.2.4.1 (U) Reliability

3.2.4.1.1 (U) Mean Time Between System Aborts (MTBSA)

3.2.4.1.1.1 (U) General

b(3)

3.2.4.1.1.2 (U) Airborne Equipment

b(3)

3.2.4.2 (U) Maintainability

3.2.4.2.1 (U) Mean Time To Repair (MTTR)

b(3)

3.2.4.2.2 (U) Monitoring and Fault Isolation

3.2.4.2.2.1 (U) Monitoring

(U) [SuR-833] The Surveillance Radar **shall** provide operational status and health information to the CPG.

(U) [SuR-346] The Surveillance Radar **shall** continually monitor the radar's operational status and health.

3.2.4.2.2.2 (U) Fault Storage

(U) [SuR-349] The Surveillance Radar **shall** store the detected faults either in non-volatile memory or on removable data storage media or devices.

3.2.4.2.2.3 (U) Failure Detection and Isolation

(U) [SuR-352] The Surveillance Radar **shall** detect all failures that would lead to a system critical failure using a combination of b(3)

(U) [SuR-1839] The Surveillance Radar **shall** provide an operator/maintainer the ability to correctly isolate detected faults to a single ambiguity group b(3)

3.2.4.2.2.4 b(3)

b(3)

3.2.4.2.2.5 (U) Standard Test Equipment

b(3)

3.2.4.2.2.6 (U) Non-Standard Test Equipment

(U) This section is not applicable to this document.

3.2.4.2.2.7 b(3)

b(3)

3.2.4.2.2.8 b(3)

b(3)

3.2.4.2.2.9 (U) Prognostics

(U) [SuR-8808] The Surveillance Radar **shall** provide prognostic information to support a Surveillance System prognostic capability on no less than 30% of mission critical failures. Prognostics are performed in CPG.

3.2.4.3 (U) Deleted

3.2.5 (U) Environmental Conditions

3.2.5.1 (U) Natural Environments

3.2.5.1.1 (U) Clutter and Multipath

(U) [SuR-900] The Surveillance Radar detection range, b(3) and tracking requirements **shall** be met in the Clutter and Multipath environments defined in Appendix A, unless explicitly excluded.

3.2.5.1.2 (U) Operational Altitude

b(1)

3.2.5.1.3 (U) Temperature

3.2.5.1.3.1 (U) Operations

(U) [SuR-423] The Surveillance Radar payload **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors during exposure to an atmospheric ambient temperature range of -40°C to +27°C at operational altitude.

(U) [SuR-6442] The Surveillance Radar ground equipment located in the CPG shelter **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors during exposure to an ambient temperature range of 10°C to 28°C.

3.2.5.1.3.2 (U) Storage and Movement

(U) [SuR-426] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors after exposure in the Movement or Storage

Configuration, to an ambient temperature range from -46°C to +71°C with the allowance of environmental kits and procedures for temperature extremes.

(U) [SuR-6443] The Surveillance Radar ground equipment located in the CPG shelter **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors after exposure to an ambient temperature range of -40°C to 60°C.

3.2.5.1.4 (U) Relative Humidity

3.2.5.1.4.1 (U) Operations

(U) [SuR-429] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors during exposure to a relative humidity range from 3 to 100% non-condensing.

3.2.5.1.4.2 (U) Deployment, Storage, and Movement

(U) [SuR-7882] The Surveillance System, in an appropriate operational mode, **shall** meet all performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors after exposure, while in the deployment, storage and movement configurations, to a relative humidity range from 3 to 100% non-condensing.

3.2.5.1.5 (U) Rain

3.2.5.1.5.1 (U) Blowing Rain

3.2.5.1.5.1.1 (U) Operations

(U) [SuR-436] The Surveillance Radar **shall** meet performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors b(3)

3.2.5.1.5.1.2 (U) Storage and Movement

(U) This section is not applicable to this document.

3.2.5.1.5.2 (U) Dripping Rain

3.2.5.1.5.2.1 (U) Operations

(U) [SuR-6305] The Surveillance Radar **shall** meet performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors b(3)

3.2.5.1.5.2.2 (U) Storage and Movement

(U) This section is not applicable to this document.

3.2.5.1.6 (U) Hail

3.2.5.1.6.1 (U) Operations

(U) [SuR-451] The Surveillance Radar **shall** survive during exposure to hail up to one-half inch in diameter.

3.2.5.1.6.2 (U) Storage and Movement

(U) This section is not applicable to this document.

3.2.5.1.7 (U) Snow

3.2.5.1.7.1 (U) Operations

(U) [SuR-7864] The Surveillance Radar **shall** meet performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors except sensor performance, which can degrade, during a snow falling rate of up to 2.54 cm/hour (1 inch/hour) and while the falling snow does not accumulate on the aerostat.

3.2.5.1.7.2 (U) Storage and Movement

(U) This section is not applicable to this document.

3.2.5.1.8 (U) Salt and Fog

3.2.5.1.8.1 (U) Operations

(U) [SuR-464] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors during exposure to salt atmosphere in sea locations and coastal regions for salt atmospheres defined in Appendix B.

3.2.5.1.8.2 (U) Storage and Movement

(U) [SuR-6971] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors after exposure to salt atmosphere while in the Storage and Movement States for salt atmospheres as defined in Appendix B.

3.2.5.1.9 (U) Sand and Dust

3.2.5.1.9.1 (U) Operations

(U) [SuR-472] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors (degraded sensor performance during operation is permitted) when exposed to blowing dust of up to 149 μm diameter in concentrations of up to 10 ± 7 g/m^3 (0.3 ± 0.2 g/ft^3) for velocities up to 8.9 m/s (17.3 knots) (32.04 km/hr).

(U) [SuR-7859] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors (degraded sensor performance during operation is permitted) when airborne equipment exposed to blowing sand for diameters in the range of 150 to 850 μm diameter in concentrations of up to 0.18 -0.0/+0.2 g/m^3 (0.005 -0.0/+0.0057 g/ft^3) for velocities up to 29.0 m/s (56.4 knots) (104.5 km/hr).

(U) Note: For the Tactical Mode, blowing sand does not reach operational altitude.

3.2.5.1.10 (U) Fungus

(U) [SuR-478] The Surveillance Radar **shall** be either composed of materials that inhibit fungus growth or composed of materials which are protected from environments that would encourage fungus growth.

3.2.5.1.11 (U) Wind

3.2.5.1.11.1 (U) Operational Wind Conditions

3.2.5.1.11.1.1 (U) Operational Winds with Turbulence

(U) [SuR-482] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors while being subjected to winds of up to 73 km/hr with turbulence NGT 1.98 m/s.

3.2.5.1.11.1.2 (U) Operational Wind Buffeting

(U) [SuR-6306] The Surveillance Radar **shall** meet performance requirements when exposed to wind buffeting such that the transmit antenna's vertical axis forms an angle with the local geographic vertical of NGT 10.0°.

3.2.5.1.11.1.3 (U) Operational Wind Acceleration Loading

(U) [SuR-7290] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors while being subjected to the acceleration loading due to wind as described in Table X.

TABLE X. (U) Operation Wind Acceleration Loading

UNCLASSIFIED			
	Angular Position (deg)	**Angular Acceleration** (deg/s^2)	**Linear Acceleration** (ft/s^2)
Roll (X)	± 5	± 1.5	± 2
Pitch (Y)	-10 to +20	± 4.0	± 6
Heading (Z)	±20	± 3.5	± 5
UNCLASSIFIED			

3.2.5.1.11.2(U) Survival Wind Conditions

3.2.5.1.11.2.1 (U) Steady State Winds with Turbulence

(U) [SuR-486] The Surveillance Radar payload hardware mounted external to the windscreen while either operational or non-operational **shall** survive an exposure to steady state winds of up 148 km/hr with turbulence of 3.05 m/s rms.

3.2.5.1.11.2.2 (U) Steady State Winds Only

(U) [SuR-489] The Surveillance Radar hardware mounted external to the windscreen **shall** survive an exposure to steady state winds of up to 185 km/hr.

3.2.5.1.11.2.3 (U) Survival Wind Acceleration Loading

(U) [SuR-7254] The Surveillance Radar **shall** survive being subjected to the acceleration loading due to wind as described in Table XI.

TABLE XI. (U) Survival Wind Acceleration Loading

UNCLASSIFIED			
	Angular Position (deg)	**Angular Acceleration** (deg/s^2)	**Linear Acceleration** (ft/s^2)
Roll (X)	±10	±5.0	±8
Pitch (Y)	-15 to 25	±6.0	±15
Heading (Z)	±30	±5.0	±15
			UNCLASSIFIED

3.2.5.1.12 (U) Lightning

3.2.5.1.12.1(U) Direct or Near Strike - Ground Equipment

(U) [SuR-495] The Surveillance Radar ground equipment located in the CPG shelter **shall** survive a direct b(3) single stroke lightning attachment to the Processing Station Lightning Protection System

for the b(3) lightning waveform defined as the Current Component A, single stroke, MIL-STD-464A lightning waveform.

3.2.5.1.12.2(U) Direct or Nearby Strike - Airborne Equipment

(U) [SuR-498] The Surveillance Radar airborne equipment **shall** survive a direct b(3) single stroke lightning attachment to the Aerostat Lightning Protection System for a b(3) lightning waveform as defined as a scaled down version of the Current Component A, single stroke, MIL-STD-464A lightning waveform, where the Current Component A waveform parameter Io is b(3)

3.2.5.1.12.3(U) Status Recovery

(U) [SuR-501] The Surveillance Radar **shall** return to the state, mode, and stored configuration (existing prior to a lightning strike which does not cause equipment damage) after a controlled restart (according to procedures) that does not require retrieval of the aerostat.

3.2.5.1.12.4(U) Lightning Induced Currents

(U) This section is not applicable to this document.

3.2.5.2 (U) Induced Environments

3.2.5.2.1 (U) Vibration

3.2.5.2.1.1 (U) Operational

(U) [SuR-509] The Surveillance Radar electronics **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors while being subjected to vibration levels of Figure 9.

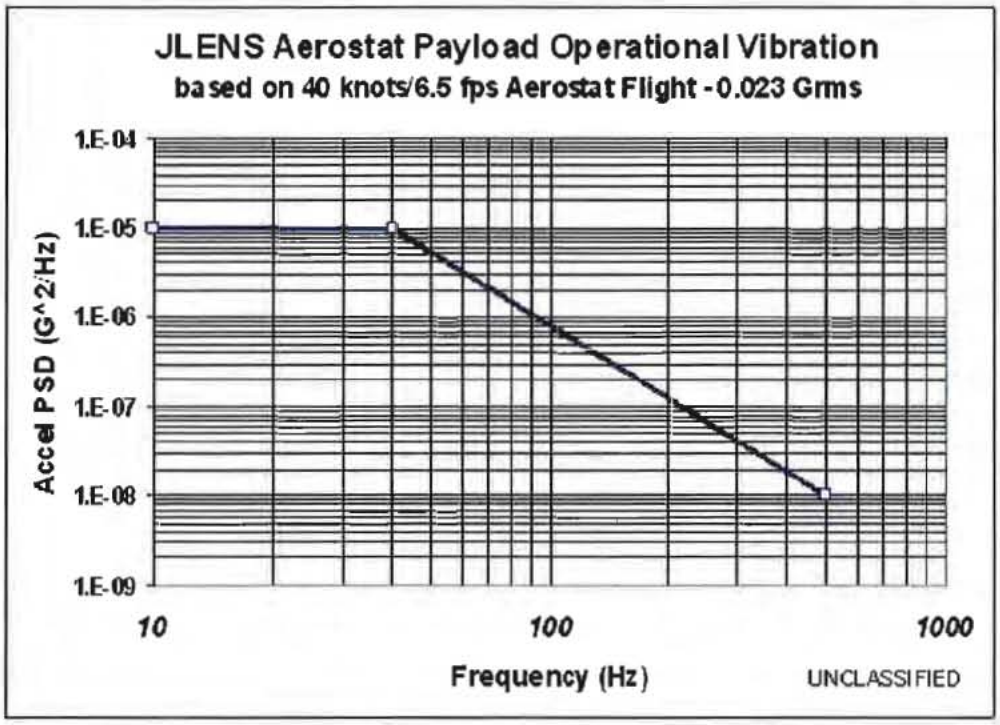

FIGURE 9. (U) Operational Vibration Power Spectral Density

3.2.5.2.1.2 (U) Non-Operational, Minimum Integrity Test

3.2.5.2.1.3 (U) Transportation Vibration Design Level

(U) [SuR-6440] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors after the hardware has been exposed, while in its transportation fixtures, to any of the vibration power spectral density curves in Figure 11.

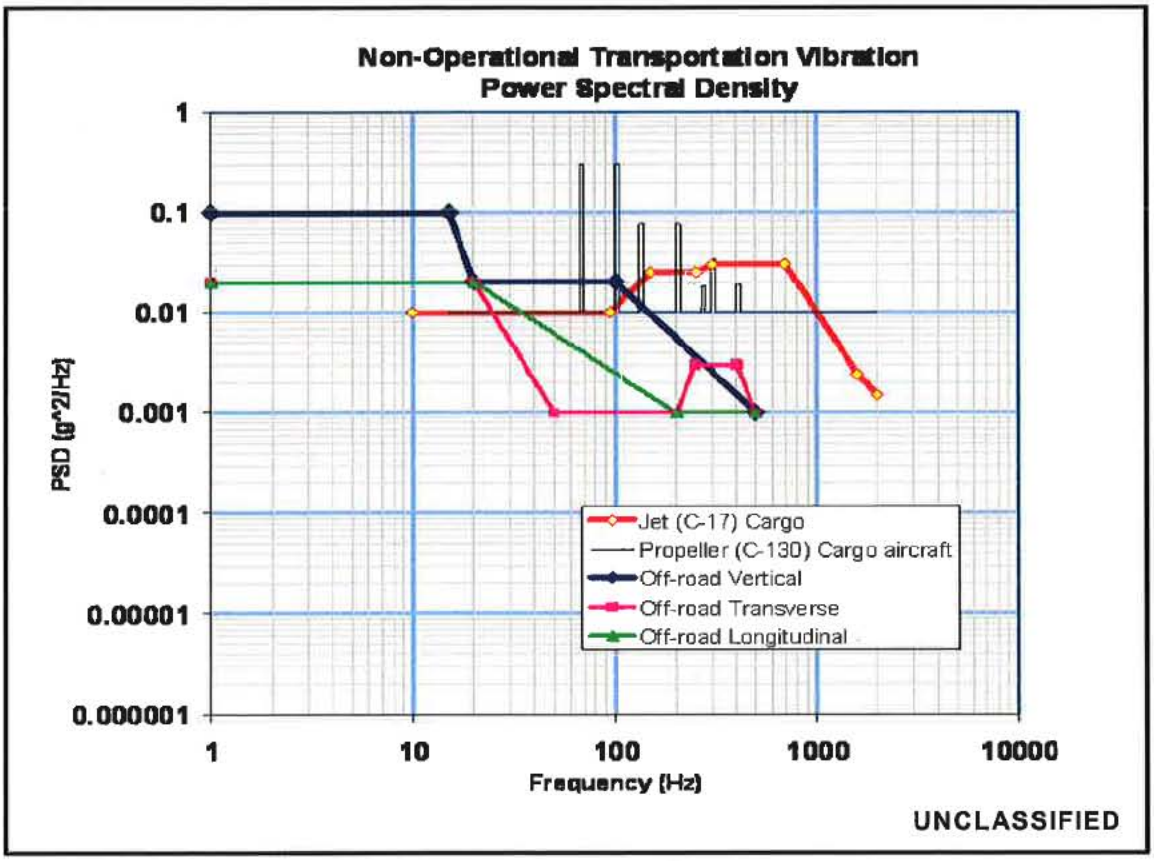

FIGURE 11. (U) Non-Operational Transportation Vibration Power Spectral Density

3.2.5.2.2 (U) Shock

3.2.5.2.2.1 (U) Functional Shock

(U) This section is not applicable to this document.

3.2.5.2.2.2 (U) Transportation Shock

(U) [SuR-519] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors after transport with exposure to shock levels of ± 5.0g in all axes applied to the transit containers.

(U) [SuR-9712] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors after the hardware, while packaged for transportation

within shock isolation fixtures and secured within the ISO container, has been exposed to a b(3) bottom edge-wise drop of the ISO container.

(U) [SuR-9711] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors after the hardware, while packaged for transportation within shock isolation fixtures and secured within the ISO container, has been exposed to a b(3) flat (bottom face) drop of the ISO container.

(U) [SuR-9872] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors after any non-fragile components, while packaged for transportation within shock isolation fixtures and secured within the ISO container, has been exposed to a b(3) flat (bottom face) drop of the ISO container.

3.2.5.2.2.3 (U) LRU Transport Shock

(U) [SuR-521] The Surveillance Radar LRUs **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors after the LRUs are dropped, with the drop height dependent on the LRU packaged weight as per Table 3.2.5.2.2 while packaged in their transit containers according to the applicable technical documentation.

TABLE 3.2.5.2.2 (U) Design Drop Height

UNCLASSIFIED	
Package Gross Weight, kg (lb)	Design Drop Height, cm (in)
0 to 9.1 (0 to 20)	76 (30)
9.2 to 18.2 (21 to 40)	66 (26)
18.3 to 27.2 (41 to 60)	61 (24)
27.4 to 36.3 (61 to 80)	46 (18)
36.4 to 45.4 (81 to 100)	38 (15)
45.5 to 68.1 (101 to 150)	31 (12)
68.2 to 113.5 (151 TO 250)	26 (10)
113.6 or greater (251 or	20 (8)

UNCLASSIFIED	
Package Gross Weight, kg (lb)	Design Drop Height, cm (in)
greater)	
UNCLASSIFIED	

3.2.5.2.2.4 (U) Bench Handling Shock

(U) [SuR-523] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors after being subjected to direct handling shock, outside of its transportation fixturing, with levels NGT ± 5.0g vertical, and ± 3.0g lateral and longitudinal.

3.2.5.2.3 (U) Ordnance

(U) [SuR-8411] The Surveillance Radar **shall** contain no electrically initiated devices (EID) or electro-explosive devices (EED).

3.2.5.2.4 (U) Electro-magnetic Environment Effects (E3)

3.2.5.2.4.1 (U) USMCEB Certification

(U) [SuR-844] The Surveillance Radar transmit spectrum **shall** be limited by the envelope in Figure 12 for a fixed center frequency (fc). GFE and COTS are, by definition, already USMCEB certifiable. This includes all GFE radios, all IFF sub-systems, all GPS sub-systems, and all weather radars which are part of the Surveillance System.

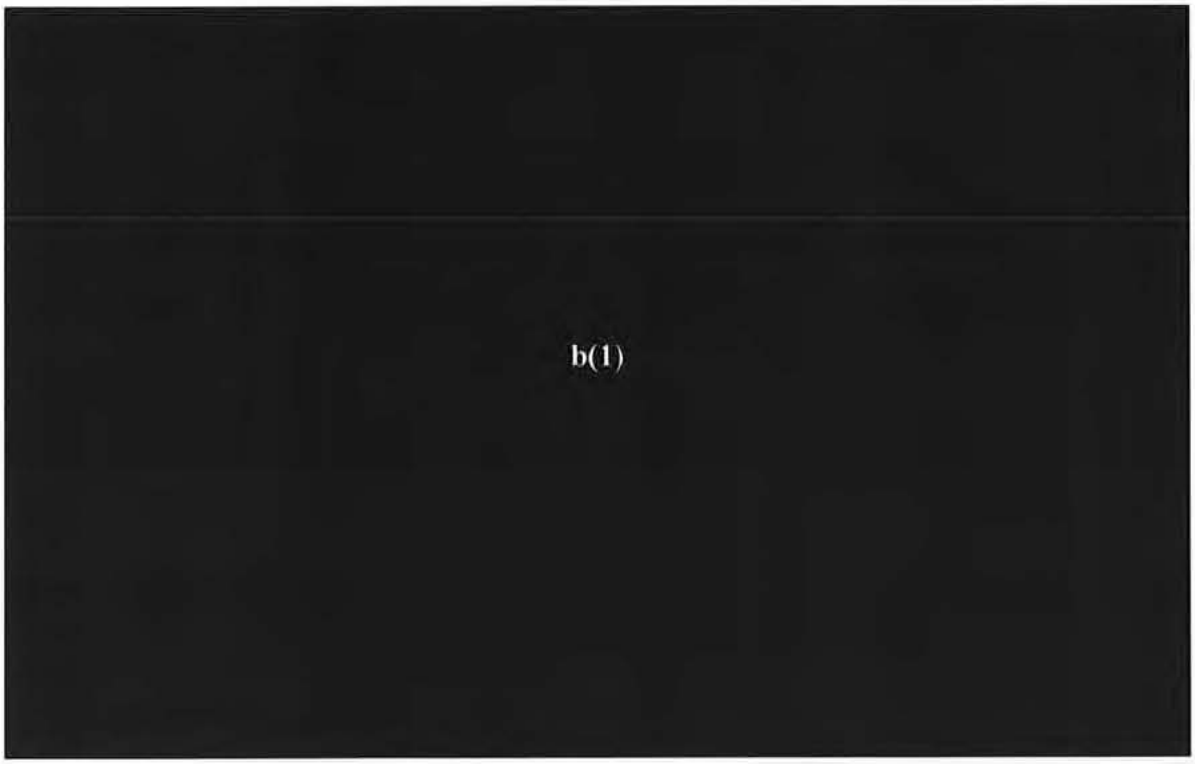

FIGURE 12. (U) Transmit Spectrum Limitations

3.2.5.2.4.2 (U) Electro-magnetic Compatibility / Electro-magnetic Interference

3.2.5.2.4.2.1 (U) Emissions

(U) [SuR-8817] The Surveillance Radar **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors in the presence of non-inband (see 6.2) intra-system radiated and conducted emissions.

(U) [SuR-6445] The Surveillance Radar **shall** control unintentional emissions per Figure 13 (see ref MIL-STD-461E), RE102-4, bottom curve, Ground Army.

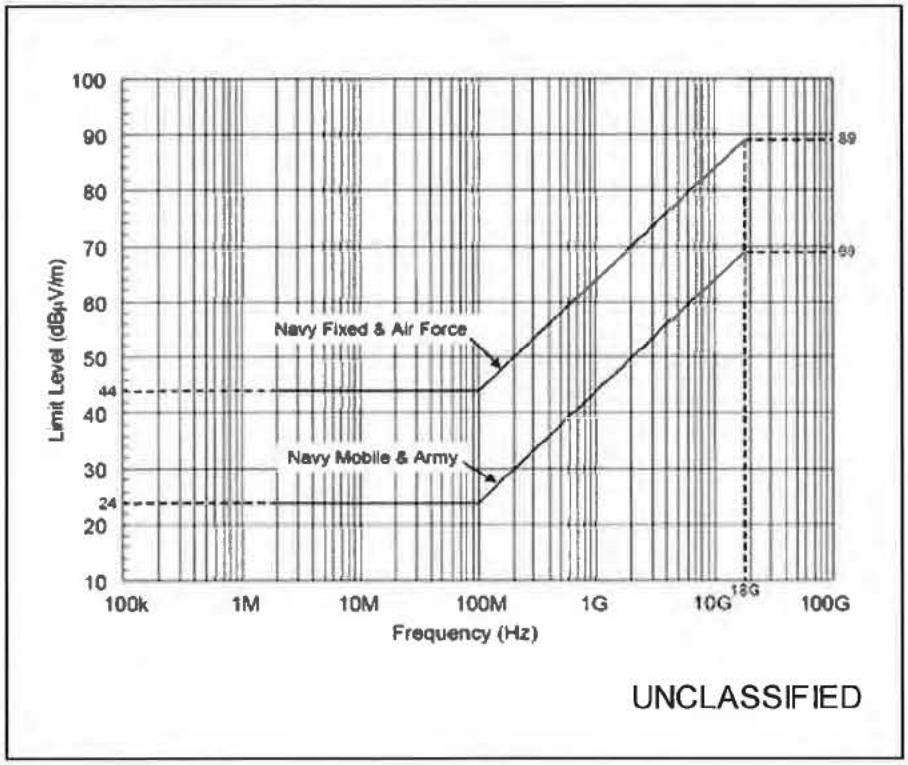

FIGURE 13. (U) Radiated Emissions Limitations

(U) [SuR-533] The Surveillance Radar **shall** control conducted emissions onto the primary power lines from the platform below the limit curve given in Figure 14, using MIL-STD-461E CE102 as guidance.

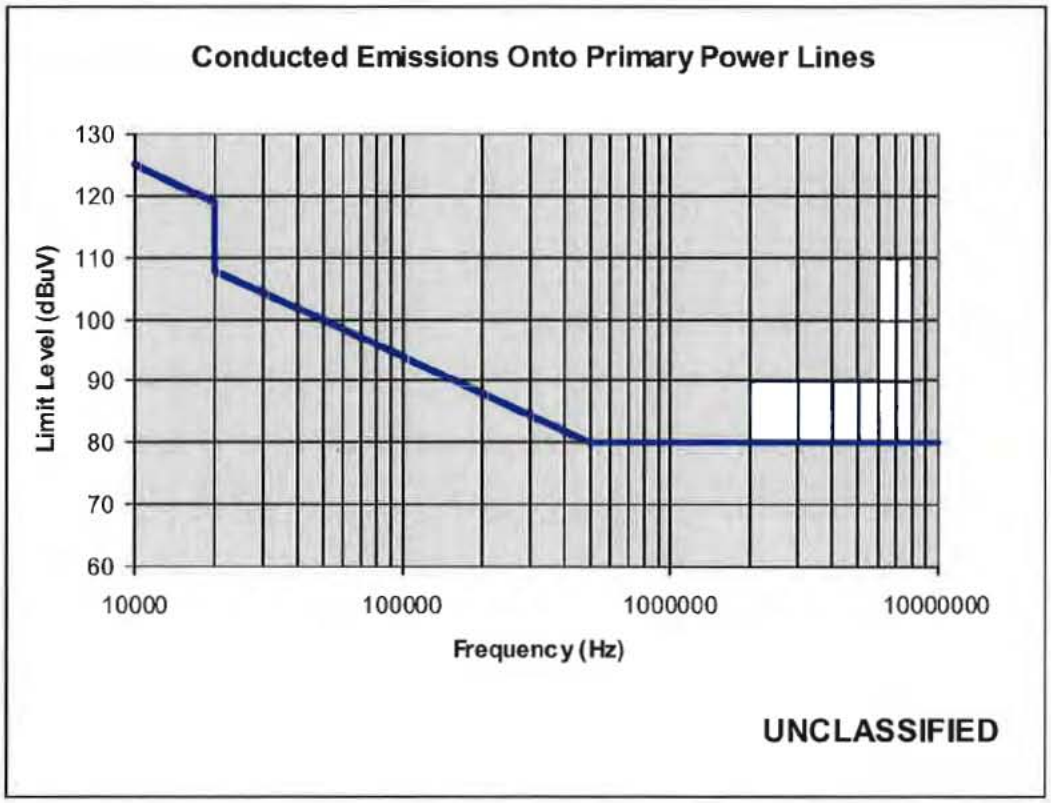

FIGURE 14. (U) Conducted Emissions Limitations

3.2.5.2.4.2.2 (U) Interference

(U) [SuR-8816] The Surveillance Radar ground equipment **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors in the presence of electromagnetic interference using MIL-STD-461E, RS103, as a guide. The "tuned frequency" referred into MIL-STD-461E, RS103, is defined as the in-band frequency in 6.2.

3.2.5.2.4.2.2.1 (U) In-Band Interference

b(1)

FIGURE 15. (U) In-band Interference Levels

(U) The IFF subsystem which is part of the Surveillance Radar airborne equipment, in the appropriate operational mode, does not meet performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors in the presence of spurious in-band electromagnetic interference.

3.2.5.2.4.2.2.2 (U) Out-of-Band Interference

(U) [SuR-534] The Surveillance System airborne equipment excluding the IFF subsystem, in the appropriate operational mode, **shall** meet performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors in the presence of spurious non-in-band (out of band) electromagnetic interference, from b(3) GFE must be compliant with MIL-STD-461E. See 6.2 for the definition of in-band frequencies for antenna-connected equipment.

(U) [SuR-8822] The IFF subsystem which is part of the Surveillance Radar airborne equipment, in the appropriate operational mode, **shall** meet performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors in the presence of spurious non-in-band electromagnetic interference, from 1 MHz to 18 GHz, b(3)

3.2.5.2.4.3 (U) Susceptibility

(U) [SuR-7378] The Surveillance Radar payload I/O circuits **shall** have sufficient EMI filters to satisfy the requirements of MIL-STD-461E: CE102, CS101, CS114, CS115, CS116, RS103, ESD, and Lightning.

(U) The frequency range of these filters may require performance from 10 kHz to 40 GHz.

(U) [SuR-8823] The Surveillance Radar airborne GPS equipment **shall** be designed in accordance with MIL-STD-461E, CS 104 b(3)

3.2.5.2.4.4 (U) Grounding and Bonding

(U) [SuR-538] The Surveillance Radar **shall** implement grounding and bonding in accordance with the electrical bonding and external grounds requirements of MIL-STD-464A.

3.2.5.2.5 b(3)

b(1)

a. (U) It is assumed that all required spares are on-site.

b. b(1)

c. (U) All airborne software can be reloaded and/or restarted to restore operation.

d. b(1)

e. (U) The Surveillance Radar is in the appropriate operational mode.

f. b(1)

g. b(1)

3.2.5.2.6 (U) Electrostatic Discharge (ESD)

3.2.5.2.6.1 (U) Line Replaceable Unit (LRU) ESD

(U) [SuR-546] The Surveillance Radar LRUs, except for GFE, **shall** meet the performance requirements in 3.2.1 Performance Characteristics and 3.2.4 System Quality Factors following exposure to an electrostatic discharge of b(3) to the chassis of the LRUs (ESD discharges directly to connector pins are excluded from this requirement).

3.2.5.2.7 b(3)

b(1)

a. (U) The target characteristics are as listed in Table I of 3.1.4.1 Air Breathing Targets

b. b(1)

c. b(1)

b(1)

b(1)

3.2.5.2.8 (U) Nuclear, Biological, and Chemical (NBC)

3.2.5.2.8.1 (U) Definitions

b(3)

b(3)

b(3)

3.2.5.2.8.2 (U) Exposure and Decontamination

3.2.5.2.8.2.1 (U) Transport Configuration

3.2.5.2.8.2.1.1 (U) Contamination/Decontamination

(U) This section is not applicable to this document.

3.2.5.2.8.2.1.2 (U) Non-GFE Transportation Enclosures

(U) [SuR-7084] Transportation enclosures which are non-GFE and delivered as part of the Surveillance Radar **shall** be able to withstand contamination/decontamination described herein such that it protects the equipment contained within the enclosure.

(U) [SuR-7863] Transportation enclosures which are non-GFE and delivered as part of the Surveillance Radar **shall** protect the equipment contained within the enclosure from damage due to:

a. (U) Temperature extremes, as needed

b. (U) Snow

c. (U) Rain

d. (U) Hail

e. (U) High humidity

f. (U) Wind

g. (U) Blowing sand

h. (U) Lightning

i b(3)

j. (U) NBC

as specified in H381794, 3.2.5 *Environmental Conditions* when in the transport configuration.

3.2.5.2.8.2.2 (U) Tactical Mode Configuration

(U) The NBC contamination survivability and the requirements of this section are applicable in the Tactical Mode configuration only. As such, survivability of airborne components is limited during operation because they are removed from the NBC event.

3.2.5.2.8.2.2.1 b(3)

b(3)

b(3)

(U) Equipment that is not practical to design as NBC contamination/decontamination survivable will be identified.

3.2.5.2.8.2.2.2 (U) Hardness

(U) This section is not applicable to this document.

3.2.5.2.8.2.2.3 (U) Restoration after NBC Event

(U) [SuR-558] The Surveillance Radar, after exposure to NBC contaminants, **shall** be restorable to an operational condition such that use of MOPP IV need not be continued, after being decontaminated using JLENS specific decontamination procedures, including replacement of contaminated components.

3.2.5.2.8.2.2.4 (U) Operate Through

b(3)

3.2.5.2.8.2.2.5 (U) NBC MOPP IV Gear

(U) [SuR-1666] The Surveillance Radar design **shall** be such that trained and acclimatized personnel can operate and maintain external mission critical equipment while wearing a full NBC protective ensemble MOPP IV gear without further contaminating the system.

3.2.6 (U) Transportation

3.2.6.1 (U) Transportation Packaging

3.2.6.1.1 (U) ISO Containers

(U) [SuR-599] The Surveillance Radar **shall** be transportable using 8.5 ft (height) by 8 ft (width) by 20 ft (length) ISO containers. ISO container sizes which differ from 8' x 8' x 20' require approval by the JLENS Government Product Manager. The DPS and SPS shelters provide an environmentally controlled environment which protects the SuR equipment installed in it from temperature, snow, rain, hail, high humidity, wind, blowing sand, lightning, etc.

3.2.6.1.2 (U) Weight in ISO Container

(U) [SuR-6439] The Surveillance Radar in its transportation fixturing **shall** weigh NGT 8000 lbs per ISO container, excluding the actual container weight.

3.2.6.1.3 (U) Transportation Performance-Oriented Packaging

(U) [SuR-601] The Surveillance Radar **shall** meet the U.S. Department of Transportation (DOT), NATO, and European Union (EU) Performance-Oriented Packaging (POP) standards for unrestricted

highway, rail, and sea transportation. The POP Program may be accessed via the Internet off the Defense Distribution Center (DDC) web page.

3.2.7 (U) Flexibility and Expansion

3.2.7.1 (U) Modularity

(U) This section is not applicable to this document.

3.2.7.2 (U) Standardization and Commonality

(U) This section is not applicable to this document.

3.3 (U) Design and Construction

3.3.1 (U) Materials

3.3.1.1 (U) General

(U) This section is not applicable to this document.

3.3.1.2 (U) Protective Coatings

(U) [SuR-1657] All exterior metal surfaces of ground based Surveillance Radar equipment and the exterior surfaces of Surveillance Radar airborne enclosures external to both the windscreen and the aerostat excluding the SEMS and Surveillance Radar support equipment **shall** be painted with Chemical Agent Resistant Coating (CARC), in accordance with H372287, with exterior topcoat 383 Green (color 34094 of Fed-Std-595).

(U) [SuR-9710] All exterior surfaces of radar airborne equipment internal to the windscreen which are visible when the windscreen is unfurled **shall** be painted with exterior topcoat 383 Green (color 34094 of FED-STD-595, this is non-CARC paint), except where paint interferes with function such as when electrical conductivity is needed.

(U) [SuR-9870] All surfaces of the Surveillance Radar SEMS unit which are exterior to the aerostat **shall** be painted with Chemical Agent Resistant Coating (CARC), in accordance with H372287, with exterior topcoat white (color 37875 of Fed-Std-595).

3.3.1.3 (U) Hazardous Materials

(U) [SuR-2126] The SuR **shall** be designed such that components containing hazardous materials listed in the EPA-17 and Class I Ozone Depleting Substances (Tables XIV and XV) are only utilized in compliance with the Raytheon JLENS Hazardous Materials Management Plan (HMMP). Note: Appendix A of the JLENS System Specification contains the aforementioned lists. Hazardous materials delivered in the final product will be identified and reported in the JLENS SuR HMMP Report.

(U) [SuR-7803] The SuR **shall** have no radioactive materials which are defined by the Nuclear Regulation Commission that have greater than 0.002 microcuries per gram or activity per item equals or exceeds 0.01 microcuries.

TABLE XIV. (U) EPA-17 Hazardous Materials

	UNCLASSIFIED
1	Benzene
2	Cadmium and Cadmium Compounds
3	Carbon Tetrachloride
4	Chloroform
5	Chromium and Chromium Compounds
6	Cyanide and Cyanide Compounds
7	Lead and Lead Compounds
8	Mercury and Mercury Compounds
9	Methylene Chloride
10	Methyl Ethyl Ketone
11	Methyl Isobutyl Ketone
12	Nickel and Nickel Compounds
13	Tetrachloroethylene
14	Toluene
15	1,1,1 - Trichloroethane
16	Trichloroethylene
17	Xylenes
	UNCLASSIFIED

TABLE XV. (U) Class I Ozone Depleting Substances

UNCLASSIFIED		
Halocarbon Number	Molecular Formula	Name
CFC-11	CCl3F	Trichlorofluoromethane
CFC-12	CCl2F2	Dichlorodifluoromethane
CFC-113	C2Cl3F3	Trichlorotrifluoroethane
CFC-114	C2Cl2F4	Dichlorotetrafluoroethane
CFC-115	C2ClF5	Chloropentafluoroethane
Halon 1011	CH2BrCl	Bromochloromethane
Halon 1202	CBr2F2	Dibromodifluoromethane
Halon 1211	CF2ClBr	Bromochlorodifluoromethane
Halon 1301	CF3Br	Bromotrifluoromethane
Halon 2402	C2F4Br2	Dibromotetrafluoroethane
CFC-13	CClF3	Chlorotrifluoromethane
CFC-111	C2ClF2	Pentachlorofluoroethane
CFC-112	C2Cl4F2	Tetrachlorodifluoroethane
CFC-211	C3Cl7F3	Heptachlorofluoropropane
CFC-212	C3Cl6F2	Hexachlorodifluoropropane
CFC-213	C3Cl5F3	Pentachlorotrifluoropropane
CFC-214	C3Cl4F4	Tetrachlorotetrafluoropropane
CFC-215	C3Cl3F5	Trichloropentafluoropropane

UNCLASSIFIED		
Halocarbon Number	Molecular Formula	Name
CFC-216	C3Cl2F6	Dichlorohexafluoropropane
CFC-217	ClF7	Chloroheptafluoropropane
Carbon Tetrachloride	CCl4	Tetrachloromethane
Methyl Chloroform	C2H3Cl3	Trichloroethane (1,1,1 Trichlorethane only)
Methyl Bromide	CH3Br	Bromomethane, Monobromomethane
UNCLASSIFIED		

3.3.2 (U) Nameplates and Product Marking

3.3.2.1 (U) Unique Identification

(U) [SuR-726] The Surveillance Radar **shall** have all equipment marked in accordance with MIL-STD-130L for unique identification with the following provisos and exceptions.

(U) Provisos to this requirement are:

a. (U) Only hardware and software items with a unit acquisition cost NLT $5,000.

b. (U) All hardware items with a unit acquisition cost less than $5,000 when they are serially managed, mission critical, or controlled inventory items.

(U) Exceptions to this requirement are as specified in MIL-STD-130L section titled *Detailed Requirements* subsection titled *Exemptions*:

a. (U) "COTS items marked with commercial identification (firm name, logo, part number, etc.), and which present no identification difficulty may be exempt from additional marking requirements. This exemption extends to COTS items identified on a VICD."

b. (U) "Parts within an assembly or a sub-assembly, that are not subject to removal, replacement, or repair or"

c. (U) "When parts are deemed too small for the application of complete marking in accordance with MIL-STD-130L section titled *Machine-readable information (MRI) marking*, a logo or other abbreviated marking [will] be substituted for the design activity identification."

3.3.2.2 (U) Labels

(U) [SuR-2092] The SuR **shall** have danger, caution, signs, labels, tags, and markings to warn of specific voltages, current, thermal, personnel lift or physical hazards including:

a. (U) Color code per ANSI Z535.1

b. (U) For potentials between 70 and 500 Volts, display "WARNING" sign and list maximum voltage.

c. (U) For potentials in excess of 500 Volts, display the "DANGER" and "HIGH VOLTAGE" signs and list maximum voltage.

d. (U) Microwave of RF Radiation warning signs, labels, or tags should be in accordance with ANSI Z535.3, ANSI Z535.4, or ANSI Z535.5.

3.3.2.3 (U) Transportation Fixture Markings

(U) [SuR-9874] Each Surveillance Radar unique transportation fixture onto which fragile components are mounted **shall** be marked with special handling procedures using MIL-STD-129P as guidance.

3.3.3 (U) Safety

3.3.3.1 (U) Hardware Safety

(U) [SuR-7810] The SuR **shall** have "high" hazards, as defined in Table XVI (see MIL-STD-882D, Appendix A), mitigated in accordance with design recommendations MIL-HDBK-454A.

TABLE XVI. (U) Mishap Risk Categories

		UNCLASSIFIED
Mishap Risk Assessment Value	Mishap Risk Category	**Mishap Risk** Acceptance Level

1-5	High	Component Acquisition Executive
6-9	Serious	Program Executive Officer
10-17	Medium	Program Manager
18-20	Low	As directed
*This table is modeled after MIL-STD-882D, Table A-IV: Example mishap risk categories and mishap risk acceptance levels.		
		UNCLASSIFIED

(U) [SuR-8873] The Surveillance Radar **shall** have high hazards mitigated by at least 3 barriers derived from independent sources, one of which must be a safety device. Safety device, barrier, and catastrophic hazards are defined in the JLENS SSPP.

(U) [SuR-7811] The SuR **shall** have "serious" hazards, as defined in Table XVI (see MIL-STD-882D, Appendix A), mitigated in accordance with design recommendations MIL-HDBK-454A.

(U) [SuR-8874] The Surveillance Radar **shall** have serious hazards mitigated by at least 2 barriers derived from independent sources, one of which must be a safety device. Safety device, barrier, and critical hazards are defined in the JLENS SSPP.

(U) [SuR-616] The SuR **shall** have failsafe means to inhibit RF radiation if radiation levels on the ground exceed the permissible levels (controlled and uncontrolled) as specified in IEEE C95.1-2005.

(U) [SuR-1817] The SuR **shall** have floor surfaces and stair and step treads that provide non-slip characteristics.

(U) [SuR-7804] The SuR **shall** have a maintenance platform which has built in safety features to mitigate falling hazards.

(U) [SuR-7805] The SuR **shall** have a configuration and/or procedures that mitigate equipment from tipping over or falling on personnel performing operations, maintenance, or training tasks.

(U) [SuR-1818] The SuR **shall** have a failsafe interlock which disables equipment motion during maintenance.

(U) [SuR-7806] The SuR **shall** have a combination of procedures, guards and safety devices to preclude contact with moving mechanical parts such as gears, fans, and belts during operation and maintenance.

(U) [SuR-7807] The SuR **shall** have lift points that are clearly labeled.

(U) [SuR-7823] The SuR **shall** comply with the applicable portions of MIL-HDBK-454A Guidelines on Personnel Hazards, Flammability, and Electrical Overload Protection.

(U) [SuR-3864] The SuR **shall** vent battery enclosures to prevent the buildup of flammable gas, as appropriate.

(U) [SuR-7812] The SuR interlocks **shall** be self-resetting.

(U) [SuR-7813] The SuR interlocks **shall** be fail-safe or redundant.

(U) [SuR-7814] The SuR **shall** have visible markings for LRUs sensitive to Electrostatic Discharge (ESD).

(U) [SuR-7816] The SuR **shall** use non-drip (self sealing) connectors for coolant lines to reduce the likelihood of coolant leakage during SuR operation and maintenance as appropriate.

(U) [SuR-7817] The SuR equipment with doors **shall** provide means to hold them open as appropriate.

(U) [SuR-7819] The SuR **shall** have Ground Fault Circuit Interrupters (GFCI) for all external outlets.

(U) [SuR-7820] The SuR high voltage circuits containing capacitors which store more than 0.25 joules **shall** have discharging devices unless they discharge to 30V or less within 2 seconds after power removal for maintenance purposes (excluding batteries).

(U) [SuR-7821] The SuR **shall** ensure that powered ends of connectors are protected from accidental contact.

(U) [SuR-7822] The SuR **shall** have a means to reduce the voltage at test points to less than 300V if the potential to be measured is in excess of 300V peak.

(U) [SuR-7818] The SuR **shall** use Commercial Off the Shelf (COTS) equipment that has been listed or certified to an appropriate commercial standard by a Nationally Recognized Test Laboratory (NRTL). Note: Examples of NRTLs are Underwriters Laboratories (UL), Canadian Standards (CSA) or TUV Rheinland (TUV). Any COTS equipment that has this certification are to be considered as having met the provisions of this requirement and accepted for use without any further modification. For any modified COTS, recertification by a NRTL will be required unless the modifications are only minor and do not alter its form, fit, or functional characteristics.

3.3.3.2 (U) Equipment Protection

(U) [SuR-1816] The SuR **shall** have over temperature detection devices to mitigate overheating hazards that result in damage to the equipment over $200K.

(U) [SuR-7825] The SuR equipment **shall** have connectors which preclude the mismating of cables in a manner which would cause malfunction, damage to equipment or hazard to personnel. Where design considerations require plug and receptacles of similar configuration in close proximity, the mating plugs and receptacles should be suitably coded or marked to clearly indicate the mating connectors.

(U) [SuR-7826] The SuR **shall** have a point on all electrically conductive chassis to serve as the common tie point for static and safety grounds as suggested in MIL-HDBK-454A, General Guidelines for Electronic Equipment, Guideline 1, Ground.

(U) [SuR-7828] The SuR equipment **shall** have exposed external metallic parts, surfaces, and shields, exclusive of antenna and transmission line terminals, at ground potential during normal operation as suggested in MIL-HDBK-454A, General Guidelines for Electronic Equipment, Guideline 1, Ground.

(U) [SuR-7827] The SuR **shall** have external conductive surfaces of equipment housing hazardous voltages grounded to a common static and safety ground point.

3.3.3.3 (U) Single Point Failures

(U) [SuR-1820] The Surveillance Radar **shall** have no single point failures that are identified by the SuR FMECA resulting in unmitigated "High" or "Serious" (HRI 1-9), see MIL-STD-882D, Appendix A, *Hazardous Condition*.(U) The assessment of the system hazards, including single point failure determination and mitigation approach, will be documented in the Hazard Tracking System (HTS) Database.

3.3.3.4 (U) Detected Faults and Failures

(U) This section is not applicable to this document.

3.3.3.5 (U) Safety Design Criteria

(U) [SuR-1825] The Surveillance Radar **shall** adhere to the SuR tailored and approved System Safety Checklist on Personnel Hazards, Flammability, and Electrical Overload Protection from MIL-HDBK-454A.

3.3.3.6 (U) Power Shut-Off

(U) [SuR-7824] The ground based Surveillance Radar equipment **shall** provide a local emergency power shutdown capability.

3.3.3.7 (U) Maintenance Electrical Power

(U) This section is not applicable to this document.

3.3.3.8 (U) High Voltage

(U) [SuR-1837] The SuR **shall** have hazards mitigated in accordance with design recommendations MIL-HDBK-454A 5.2.4, *Accidental Contact,* for all potentials between 30V and 500V.

3.3.3.9 (U) Very High Voltage

(U) [SuR-7815] The SuR **shall** have hazards mitigated in accordance with design recommendations MIL-HDBK-454A for all potentials in excess of 500 volts.

3.3.3.10 (U) High Current

(U) [SuR-7413] The SuR **shall** be designed to protect against shorting of circuits carrying more than 25A in accordance with MIL-HDBK-454A.

3.3.3.11 (U) Temperature

(U) [SuR-2088] The SuR **shall** have physical guards to prevent inadvertent exposure of personnel to surface temperatures outside the maximum/minimum (Reference MIL-STD-1472F, section titled Thermal Contact Hazards Table XXI, or less than 0 degrees Celsius) except for surface temperatures induced by climatic environment.

3.3.3.12 (U) Noise

(U) [SuR-618] The SuR **shall** support limiting personnel exposure to acoustic noise levels in accordance with MIL-STD-1474D, Steady-State Noise, Personnel Occupied Areas and MIL-STD-1472F, Acoustical Noise. Hearing protection may be required for some activities.

3.3.3.13 (U) Safety Critical Functions

(U) This section is not applicable to this document.

3.3.3.14 (U) Integrity of Program Load Modules

(U) This section is not applicable to this document.

3.3.3.15 (U) Initialization into a Safe State

(U) This section is not applicable to this document.

3.3.3.16 (U) Transition to a Hazardous Condition

(U) [SuR-2150] The Surveillance Radar **shall** permit transition to Tactical only if all prerequisite software safety checks have been satisfied.

3.3.3.17 (U) Completion of Hazardous Condition

(U) [SuR-8424] The SuR **shall** implement exception handling routines in all safety critical software to ensure, barring loss of power, that safety critical functions execute to completion. Exiting a safety critical function gracefully can be considered executing to completion.

3.3.3.18 (U) Overriding Interlocks

(U) [SuR-2135] The Surveillance Radar hardware **shall** preclude hardware interlocks from being overridden by software.

3.3.3.19 (U) Safety Critical Alerts

(U) [SuR-8422] The SuR software **shall** provide safety critical alerts, which are distinct from routine alerts, to the CPG.

3.3.3.20 (U) Hazardous Alerts

(U) [SuR-2147] The Surveillance Radar **shall** provide a hazardous condition alert to the CPG.

3.3.3.21 (U) Safety Critical Data Error Rate

(U) [SuR-9655] The Surveillance Radar **shall** have a bit error rate below 10E-9 for any interfaces carrying safety critical messages for requirements defined in Table XXI-III.

3.3.3.22 (U) Safe Shutdown

(U) [SuR-2158] The Surveillance Radar **shall** provide for a power shutdown, whether planned or unplanned, which does not create a personnel or equipment hazard.

3.3.4 (U) Human Engineering

3.3.4.1 (U) General

(U) [SuR-7830] The SuR payload **shall** have spacing of connectors and controls that is compatible with maintenance in cold weather/MOPP IV protective clothing using MIL-STD-1472F, section titled Spacing, as guidance.

(U) [SuR-7831] The SuR **shall** have controls using the guidance of MIL-STD-1472F, section titled Controls.

(U) [SuR-7833] The SuR **shall** present visual signals using the guidance of MIL-STD-1472F, section titled Visual Displays.

(U) [SuR-7832] The SuR **shall** use the guidance of MIL-STD-1472F, section titled Audio Displays for production of audio signals.

3.3.4.2 (U) Anthropometrics

(U) [SuR-7835] The SuR **shall** have reach access for inserting, adjusting, and/or removing a unit or assembly as specified in MIL-STD-1472F, section titled Physical Access.

(U) [SuR-7836] The SuR replacement units, assemblies, and connectors **shall** meet the insertion, removal, and grip force requirements in MIL-STD-1472F, section titled Design for Maintainability.

(U) [SuR-7841] The SuR **shall** have visual access for corrective and preventative maintenance tasks as specified in MIL-STD-1472F, section titled Visual Access.

(U) [SuR-7840] The SuR **shall** have access openings and clearance dimensions for inserting, adjusting, and/or removing a unit or assembly as specified in MIL-STD-1472F, section titled Physical Access.

(U) [SuR-7839] The SuR units and assemblies **shall** be configured for removal, carry, and replacement as specified in MIL-STD-1472F, section titled Weight.

(U) [SuR-7838] The SuR **shall** have interchangeable line replacement units as specified in MIL-STD-1472F, section titled Design for Maintainability.

(U) [SuR-7837] The SuR payload and ground support equipment **shall** have hardware that is maintainable and supportable by the 5th to 95th percentile of Army personnel while wearing Combat Gear and protective clothing (cold weather gear, Mission Oriented Protective Posture (MOPP) IV) in accordance with MIL-STD-1472F, sections titled Physical Accommodation and Workspace Design.

3.3.4.3 (U) Environmental Control Systems

(U) This section is not applicable to this document.

3.3.4.4 (U) Human-to-Machine Interfaces

(U) This section is not applicable to this document.

3.3.4.5 (U) Symbology

(U) This section is not applicable to this document.

3.3.5 (U) System Security

3.3.5.1 (U) Information Assurance (IA)

3.3.5.1.1 (U) Security Design and Configuration

b(3)

3.3.5.1.1.1 (U) Classified Enclave

b(3)

b(3)

3.3.5.1.1.2 (U) Confidentiality of Classified Data

b(3)

b(3)

3.3.5.1.1.3 b(7)(e)

b(3)

3.3.5.1.1.4 (U) Encryption

b(3)

b(3)

(U) [SuR-9653] The Surveillance Radar security support structure **shall** be isolated. Means of isolation may include the use of partitions and/or domains that control access to and integrity of hardware, software, and firmware that perform security functions.

(U) [SuR-9651] The Surveillance Radar **shall** incorporate identification, authentication, and access controls.

3.3.5.1.1.4.1 (U) Encryption for Data-at-Rest

(U) [SuR-6342] The SuR Computer Software Configuration Items (CSCIs) stored in the Signal and Data Processors **shall** be encrypted as Data-at-Rest when stored on the hard drives.

3.3.5.1.1.4.2 (U) Encryption Protocol

(U) [SuR-7339] The SuR software items **shall** control the encryption/decryption process as specified by the cryptographic module used.

3.3.5.1.2 (U) Enclave and Computing Environment

b(3)

3.3.5.1.3 (U) Enclave Boundary Defense

(U) This section is not applicable to this document.

3.3.5.1.4 (U) Enclave Boundary Defense

3.3.5.1.4.1 (U) Integrity of Data

(U) [SuR-9646] The Surveillance Radar **shall** implement virus protection for all servers, workstations, and mobile computing devices housed in the SuS CPG shelters.

b(3)

3.3.5.1.4.2 (U) Deleted

3.3.5.1.5 (U) Physical and Environmental

3.3.5.1.5.1 (U) Physical Security

(U) This section is not applicable to this document.

3.3.5.1.5.2 (U) Protection of Devices

(U) This section is not applicable to this document.

3.3.5.1.5.3 (U) TEMPEST

b(3)

3.3.5.2 b(3)

b(3)

3.3.5.3 b(3)

3.3.5.3.1 b(3)

b(3)

3.3.5.3.2 b(3)

b(3)

3.3.6 (U) Computer Resource Reserve Capacity

(U) [SuR-669] The Surveillance Radar, with the exception of the signal processor, **shall** be designed such that there is an inherent 50% (see glossary) data processing reserve for computer memory and computer throughput.

(U) [SuR-8848] The SuR software **shall** minimize CSCI storage size by disabling creation of the debug symbol tables and other debug information, using an optimizing compiler and deleting text strings and error messages in the SuR developed code.

3.3.7 (U) Data Recording and Storage

3.3.7.1 b(3)

b(3)

3.3.7.2 (U) Messages

b(3)

3.3.7.3 (U) Data Types

(U) [SuR-2311] The Surveillance Radar **shall** record initialization parameters, track data, IFF interrogation reports, and radar status while meeting the performance requirements in 3.2.1 Performance Characteristics. Engineering data will also be recorded as needed to evaluate system performance.

3.3.7.4 (U) Real Time

3.3.7.5 (U) Removable Storage Devices

(U) [SuR-685] The Surveillance Radar SDP **shall** only use non-volatile data storage devices (including floppy disks, hard disks, compact disks, and tapes) that can be removed using tools included in the Surveillance System ground support equipment.

3.4 (U) Documentation

3.4.1 (U) Department of Defense Information Technology Standards Registry (DISR)

(U) This section is not applicable to this document.

3.5 (U) Logistics

3.5.1 (U) Supply

(U) This section is not applicable to this document.

3.5.2 (U) Maintenance

3.5.2.1 (U) Two-Level Maintenance

(U) This section is not applicable to this document.

3.5.2.2 (U) Preventive Maintenance Checks and Services (PMCS)

3.5.2.2.1 (U) PMCS Duration

b(3)

3.5.2.2.2 b(3)

b(3)

3.5.3 (U) Vehicles, Shelters, and Trailers

(U) This section is not applicable to this document.

3.5.4 (U) Lifting and Handling Equipment

(U) [SuR-718] The Surveillance Radar **shall** be designed to use military lifting and handling equipment, unless the government approves justification for non-military equipment.

(U) [SuR-719] The Surveillance Radar **shall** be designed such that standard military vehicles can be used for handling.

3.5.5 (U) March Order and Emplacement

3.5.5.1 (U) Emplacement Time

b(3)

3.5.5.2 (U) March Order Time

b(3)

3.6 (U) Personnel and Training

(U) This section is not applicable to this document.

3.7 (U) Critical Item Characteristics

3.7.1 (U) Hardware Critical Items

3.7.1.1 (U) SuR Signal Data Processor (SSDP)

b(1)

3.7.1.1.1 (U) Location

(U) [SuR-7861] The Surveillance Radar SSDP equipment **shall** be installed inside the CPG shelters on the ground.

3.7.1.1.2 (U) Data Processing

b(1)

(U) [SuR-7330] The Surveillance Radar data processing equipment **shall** contain b(3) memory for data processing.

3.7.1.1.3 (U) Signal Processing

b(1)

(U) [SuR-7338] The Surveillance Radar signal processing equipment **shall** contain b(3) memory for signal processing.

3.7.1.1.4 b(3)

b(3)

3.7.1.2 (U) SuR Power Distribution Unit (SPDU)

(U) The SuR Power Distribution Unit (SPDU) is housed in the Equipment Enclosure (EE) where it receives the Platform 115/200 VAC, three-phase, 400Hz power and distributes 115/200 VAC, three-phase, 400 HZ power to the SuR Timing and Control Unit (STCU), SuR Digital Receiver Subsystem (SDRS), SuR Frequency Control Unit (SFCU), SuR Support Equipment Group (SSEG), SuR Element Measurement System (SEMS), and SuR Identification Friend or Foe (SIFF) through individual high power relays. The SPDU also converts the 115/200 VAC input power to +28 VDC and outputs it to the SuR Transmitter Unit (STXU) to power and control its input power relays. The output power relays are controlled via commands received from the STCU. A set of three status signals are also received from the SuR Heat Exchanger Unit (SHEU) to let the SPDU know that the coolant is flowing and within temperature constraints. The STCU will not be turned on unless these status signals are registered as OK. Another function of the SPDU is to provide transient suppression to mitigate the effects of lightning entering the Equipment Enclosure (EE). Lastly, the SPDU has a bank of circuit breakers for over-current protection on all output power forms.

3.7.1.3 (U) SuR Racks & Harness Group (SRHG)

(U) The SuR Racks and Harness Group (SRHG) provides the infrastructure for the SuR Radar. It consists of Equipment Enclosure (E2), Lightning Protection Module(s), Harnesses and Coolant Distribution System. The Equipment Enclosure (E2) provides housing and attachment for the SFCU, SDRS, STCU, SPDU, and SSEG, as well as attachment for the STXU to the aerostat. The Lightning Protection Module(s) filters transients from electrical cables coming into the E2 from outside sources, with the exception of power signals. The Harnesses include system optical and electrical cables that connect the SuR Radar components, and attachment harnesses for the SITM to the Aerostat. The Coolant Distribution System is comprised of hoses and manifolds that pass coolant from the SHEU to the SFCU, SDRS, STCU, SPDU, SSEG, and STXU and than returns warm coolant to the SHEU to be cooled for reuse in the closed loop system.

3.7.1.4 (U) SuR Heat Exchanger Unit (SHEU)

(U) The SuR Heat Exchanger Unit (SHEU) rejects heat that is generated by the SuR Radar to ambient air. The Cooling System is a closed loop system and utilizes an Ethylene Glycol/Water mix as the coolant medium. The Heat Exchanger Unit mounts via mounting beams in which the coolant pump, accumulator, and heat exchanger are mounted. The Cooling System also includes motors, air fans, a

thermostatic control valve, and an electrical coolant heater. The heater is necessary to bring the coolant (and critical components) to a suitable operating temperature from a cold start condition and also to maintain critical temperatures in certain operation modes. The SHEU, also, provides sensors and controls that monitor pressure, liquid level, flow rate, and both liquid and air temperatures. The controller(s) are remotely controlled via a serial communications interface. This data is used to ultimately configure, monitor, and maintain critical processes of the Cooling System in a processing station. The SHEU requires a service cart that provides cooling, initial liquid filling, air bleeding, pressurization, and filtering of the SuR Radar.

3.7.1.5 (U) SuR Timing & Control (STCU)

(U) The Surveillance Timing and Control Unit (STCU) is the primary interface controlling the Digital Receiver (SDRU), Frequency Controller (SFCU) and related subsystems. It coordinates operation between these various subsystems by providing control and status interfaces, timing signals, synchronous clocks and resets under control of a single board computer and various hardware timer circuits.

b(1)

3.7.1.6 (U) SuR Identification Friend or Foe (SIFF)

(U) The SuR Identification Friend or Foe (SIFF) contains a BAE developed AN/APX-113(V) IFF System, that consists of a Combined Interrogator/Transponder, RF Beamformer, RF Switch, and an antenna assembly, and other SAS developed equipment for the purpose of providing commanded IFF interrogation responses to the CPG and responding to IFF interrogations via a transponder. The SIFF will support modes 1, 2, 3A, 3C, 4, 5 (level 1 and level 2), and S (transponder function only) and is compatible with DoD IFF systems.

3.7.1.7 (U) SuR Element Measurement System (SEMS)

(U) The SuR Element Measurement System (SEMS) is a laser sensor with three fields of view. The SEMS uses a laser transmitter and receiver to determine the range to a retro-reflective target installed inside the SuS aerostat. The SEMS uses a video camera to determine the angles to the target. The angles and ranges are time tagged using the internal Global Positioning System (GPS) time sync as well as the Inertial Navigation System (INS) derived position of the SEMS itself in space. There are a total of 11 SEMS targets which are used to determine the dynamic shape of the SuS aerostat in flight.

3.7.1.8 (U) SuR Frequency Control Unit (SFCU)

b(1)

3.7.1.8.1 (U) Waveforms

b(1)

b(1)

b(1)

b(1)

3.7.1.8.2 (U) Frequency Control

b(1)

3.7.1.9 (U) SuR Digital Receiver Subsystem (SDRS)

b(1)

b(1)

b(1)

3.7.1.9.1 (U) Graceful Degradation

b(3)

3.7.1.10 (U) SuR Support Equipment Group (SSEG)

b(1)

3.7.1.11 (U) SuR Item (SITM)

b(1)

3.7.1.11.1 (U) Sidelobe Control

b(1)

3.7.1.11.2 (U) Graceful Degradation

b(1)

3.7.1.12 (U) SuR Transmitter Unit (STXU)

b(1)

3.7.1.12.1 (U) Transmit Scanning

(U) [SuR-7358] The Surveillance Radar transmit function **shall** be able to scan the transmit beam in elevation anywhere in the required total surveillance volume upon command from the SSDP.

b(1)

3.7.1.12.2 (U) Transmit Beamwidths

b(1)

b(1)

3.7.1.12.3 (U) Sidelobe Control

b(1)

b(1)

3.7.1.12.4 (U) ERP Control

(U) [SuR-7500] The Surveillance Radar transmitter **shall** be able to selectively enable/disable transmission from individual transmit plates.

b(1)

3.7.1.12.5 (U) Polarization

b(3)

3.7.1.12.6 (U) Graceful Degradation

b(3)

3.7.2 (U) Computer Software Critical Items

3.7.2.1 (U) SuR Communications and Control Processing (SCCP)

(U) SCCP acts as a translator between internal SuR components and external mission operations. SCCP accepts incoming tasking orders and command messages from mission operations, translates them, and routes them to internal SuR components. SCCP accepts status and track data from internal SuR components, translates the information, and sends it to mission operations. SCCP interfaces to either the Tactical Workstation or to the SuR C2E Interface Simulator (SCIS), but not to both simultaneously, using the C2E Message Set, which is identical for either interface.

3.7.2.2 (U) SuR C2E Interface Simulator (SCIS)

(U) SCIS emulates the mission operations interface (C2E Message Set) to support testing of the SuR software in an integrated command and control environment.

3.7.2.3 (U) SuR Data Track Processing (SDTP)

(U) SDTP processes detection reports received from the SSPD CSCI to maintain tracks of targets of interest. Detection reports are used to initiate tracks and update track files. Old tracks are removed.

3.7.2.4 (U) SuR Element Measuring Processing (SEMP)

(U) SEMP determines three dimensional positions of discrete points using azimuth and elevation angle measurement from a camera and range measurement from a rangefinder. The GPS time tagged position data is transformed to inertial coordinates and reported along with system status. The required INS/GPS information is output separately.

3.7.2.5 (U) SuR Ground Control Processing (SGCP)

(U) SGCP performs the majority of the controlling function during tactical operation - Primary & Secondary Missions, Calibration and Operability Assessmen b(3) SGCP manages and schedules commands and interfaces to other CSCIs, which includes all commands to STCP to control the radar front end.

b(3)

SGCP provides system initialization and startup control, status monitoring, system state control, Fault detection capability, and system shutdown control.

3.7.2.6 (U) SuR Signal Processing & Detection (SSPD)

(U) SSPD receives sampled signals from the Receiver and performs various functions including b(3) target detection, and parameter estimation. SSPD also provides detection reports to the SDTP (Tracker) CSCI. SSPD also performs weight application and coarse detection processing on the radar return data.

3.7.2.6.1 (U) Clutter Filter

b(1)

b(1)

(U) The filter rise line is the line connecting the y-intercept point of the filter response and a point tangent to the filter's main lobe response as shown in Figure 16.

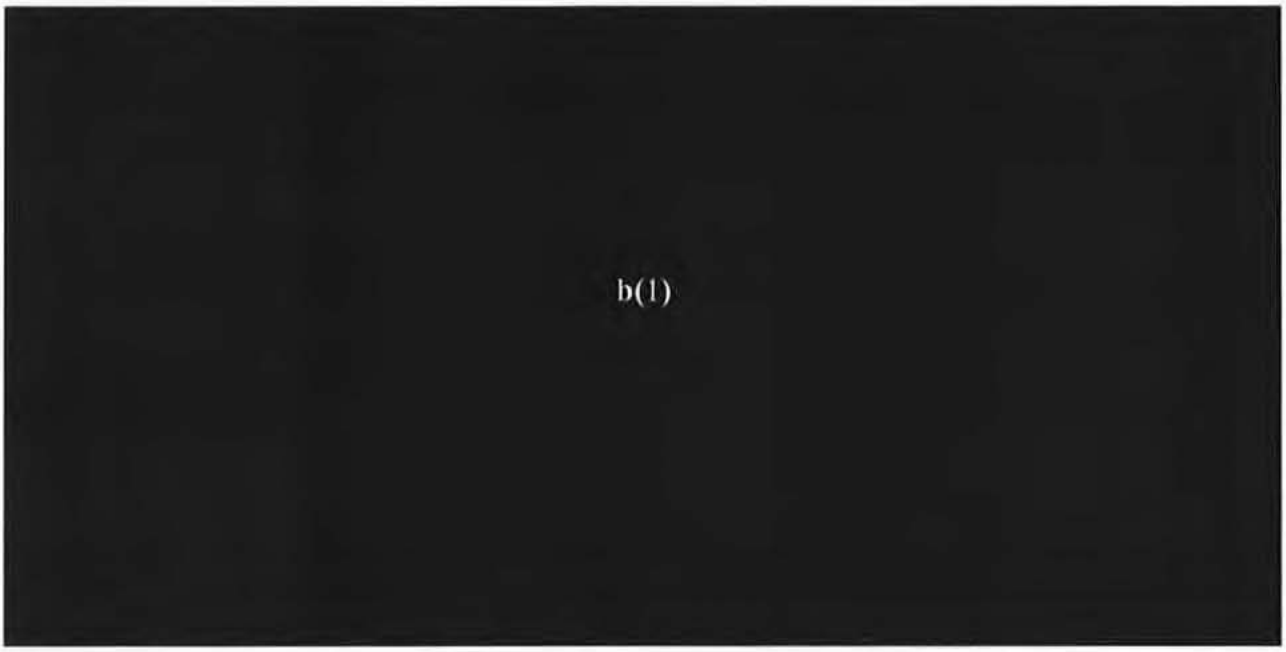

FIGURE 16. (U) Doppler Filter

3.7.2.6.2 (U) Receive Beamforming

(U) [SuR-7375] The Surveillance Radar receive function **shall** be able to simultaneously form receive beams to cover the required total surveillance volume upon command from the Signal Processing CSCI.

3.7.2.6.3 (U) Signal Processing Loss

b(1)

3.7.2.6.4 (U) SuR Clutter-to-Noise Improvement Factor

b(1)

3.7.2.6.5 (U) Adaptive Cancellation

3.7.2.6.5.1 (U) Degrees of Freedom

b(1)

3.7.2.6.5.2 (U) Cancellation Ratio

b(1)

3.7.2.7 (U) SuR Timing & Control Processing (STCP)

(U) STCP processes commands from the SSDP to control the local oscillator, waveform generator, transmitter and receiver for surveillance, calibration b(3) CPIs. STCP generates and distributes discrete timing signals. STCP collects HWCI status and sends it to the SSDP.

3.7.2.8 (U) SuR Data Collection and Analysis Processing (SDCA)

(U) SDCA provides a real-time data b(3) Through a message interface with SCCP, SDCA provides for b(3) including the application of filters.

4 (U) Verification and Quality Assurance Provisions

4.1 (U) Methods of Verification

4.1.1 (U) Demonstration (D)

(U) Demonstration is an exhibition of the operability or supportability of an item under intended service use conditions. Sufficient data for requirements verification can be obtained by observing functional operation of the system, or a part of the system, without the use of instrumentation or special test equipment beyond that inherently provided in the system being verified.

4.1.2 (U) Test (T)

(U) Test is the verification method by which the operability, supportability, performance capability or other specified qualities of an item are verified when subjected to controlled conditions that are real or simulated. These verifications may require use of special test equipment and instrumentation that is not an integral part of the system being verified to obtain quantitative data for analysis, as well as qualitative data derived from displays and indicators inherent in the item(s) for monitor and control.

4.1.3 (U) Analysis (A)

(U) Analysis is the method used to verify requirements by determining qualitative and quantitative properties and performance of the system by studying and examining engineering drawings, software, and hardware flow diagrams, software and hardware specifications, and other software and hardware documentation. It also includes performing modeling, simulation, and/or calculations and analyzing the results. Analysis techniques include interpretation or interpolation/extrapolation of analytical or empirical data collected under defined conditions.

4.1.4 (U) Inspection (I)

(U) Inspection is the verification method used to verify characteristics of an item by inspecting engineering documentation produced during development or by inspection of the product itself to verify conformance with specified requirements. Inspection is nondestructive and consists of visual inspections or simple measurements without the use of precision measurement equipment. Inspection typically applies to a single parameter or attribute with a yes/no answer.

4.2 (U) Levels of Verification

4.2.1 (U) Level D, Design

(U) Level D classes of verifications are those that can be determined in the design phase and recorded prior to any hardware being fabricated.

4.2.2 (U) Level O, Orbit

(U) Level O classes of verifications require the complete assembly of the JLENS Orbit to verify the requirement.

4.2.3 (U) Level S, System

(U) Level S classes of verifications require the complete assembly of the JLENS Surveillance System (SuS) to verify the requirement. The SuS includes the SuR on Aerostat, and combined with CPG, MMS.

4.2.4 (U) Level L, Subsystem

(U) Level L classes of verifications will be used to verify requirements allocated to Prime Item SuR specification.

4.2.5 (U) Level C, Critical Item

(U) Level C classes of verifications will be used to verify requirements allocated to Critical Item specifications.

4.3 (U) Periods of Verification

4.3.1 (U) Period CI Sell-Off, Critical Item Sell-Off

(U) Period CI Sell-Off will be the time frame where the requirement verification for the hardware critical items will be completed.

4.3.2 (U) Period FQT1, Formal Qualification Testing 1

(U) Period FQT1 will be the time frame where the requirement verification for the Build 2 Software will be completed.

4.3.3 (U) Period FVT1, Functional Verification Testing 1

(U) Period FVT1 will be the time frame where the requirement verification for the SuR System in the El Segundo System Integration Lab (SIL) will be completed, with all of the SuR system tied together and working in some reasonable fashion.

4.3.4 (U) Period FQT2, Formal Qualification Testing 2

(U) Period FQT2 will be the time frame where the requirement verification for the Build 3 Software will be completed.

4.3.5 (U) Period FVT2, Functional Verification Testing 2

(U) Period FVT2 will be the time frame where the requirement verification for the SuR System at Dugway, Utah will be completed for those tests which could not be performed in the El Segundo SIL. FVT 2 is with the SuR on the Aerostat, but during SuR testing (L), not SuS testing (S).

4.3.6 (U) Deleted

4.4 (U) Types of Verification

4.4.1 (U) Acceptance Type

(U) Acceptance verification demonstrates that the flight article complies with functional, performance and design requirements when subjected to nominal environmental conditions.

4.4.2 (U) Qualification Type

(U) Qualification verification is typically performed under extreme environmental conditions with sufficient margin included to increase confidence that the flight article will easily meet requirements during nominal operating conditions.

4.4.3 (U) Design Type

(U) Design Verification is used to substantiate designs and support formal control of flight hardware or software.

4.5 (U) Tests and Examinations

(U) Test and examination information can be found on the Verification Information Sheets (VIS) which are part of the JLENS SuR Test Plan 5218843.

4.6 (U) Tests and Examinations

TABLE XVII-I. (U) Requirements Verification Matrix (RVM)

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Requirement Object Identification Number (ROIN)	SuR Section	Verification Level	Verification Type	CI Sell-Off	FQT1	FVT1	FVT2	FQT2
SuR-19	3.2.1.0-1	S	D	N/A	N/A	N/A	T	N/A
SuR-71	3.2.1.2.4.1.0-1	C	D	I	N/A	N/A	N/A	N/A
SuR-74	3.2.1.2.4.2.0-1	C	D	I	N/A	N/A	N/A	N/A
SuR-78	3.2.1.2.5.1.0-1	C	D	I	N/A	N/A	N/A	N/A
SuR-82	3.2.1.2.5.2.1.0-1	C	D	I	N/A	N/A	N/A	N/A
SuR-88	3.2.1.2.5.2.3.0-1	L	D	N/A	N/A	D	N/A	N/A
SuR-128	3.2.1.3.9.0-1	L	D	N/A	T	N/A	N/A	N/A
SuR-346	3.2.4.2.2.1.0-2	L	D	N/A	N/A	T	N/A	N/A
SuR-349	3.2.4.2.2.2.0-1	L	D	N/A	N/A	D	N/A	N/A
SuR-352	3.2.4.2.2.3.0-1	L	D	N/A	N/A	A D	N/A	N/A
SuR-355	3.2.4.2.2.4.0-1	L	D	N/A	N/A	D	N/A	N/A
SuR-358	3.2.4.2.2.5.0-1	D	D	I	N/A	N/A	N/A	N/A
SuR-367	3.2.4.2.2.7.0-1	L	D	A	N/A	A	N/A	N/A
SuR-370	3.2.4.2.2.8.0-1	L	D	A	N/A	N/A	N/A	N/A
SuR-410	3.2.1.5.4.3.0-1	L	D	N/A	D	D	N/A	N/A
SuR-423	3.2.5.1.3.1.0-1	L	D	A	N/A	A	N/A	N/A
SuR-426	3.2.5.1.3.2.0-1	L	D	A	N/A	A	N/A	N/A
SuR-429	3.2.5.1.4.1.0-1	L	D	A I	N/A	A	N/A	N/A
SuR-436	3.2.5.1.5.1.1.0-1	L	D	A	N/A	A	N/A	N/A
SuR-451	3.2.5.1.6.1.0-1	L	D	A	N/A	N/A	N/A	N/A
SuR-464	3.2.5.1.8.1.0-1	L	D	A	N/A	A	N/A	N/A
SuR-472	3.2.5.1.9.1.0-1	L	D	A	N/A	A	N/A	N/A
SuR-478	3.2.5.1.10.0-1	D	D	A	N/A	A	N/A	N/A
SuR-482	3.2.5.1.11.1.1.0-1	L	D	A	N/A	A	N/A	N/A
SuR-486	3.2.5.1.11.2.1.0-1	L	D	A	N/A	A	N/A	N/A
SuR-489	3.2.5.1.11.2.2.0-1	L	D	A	N/A	A	N/A	N/A
SuR-495	3.2.5.1.12.1.0-1	D	D	N/A	N/A	A	N/A	N/A
SuR-498	3.2.5.1.12.2.0-1	L	D	A	N/A	A	N/A	N/A
SuR-501	3.2.5.1.12.3.0-1	L	D	N/A	N/A	D	N/A	N/A
SuR-509	3.2.5.2.1.1.0-1	L	D	A I	N/A	A	N/A	N/A

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Requirement Object Identification Number (ROIN)	SuR Section	Verification Level	Verification Type	CI Sell-Off	FQT1	FVT1	FVT2	FQT2
SuR-519	3.2.5.2.2.2.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-521	3.2.5.2.2.3.0-1	L	D	A	N/A	A	N/A	N/A
SuR-523	3.2.5.2.2.4.0-1	L	D	A	N/A	A	N/A	N/A
SuR-533	3.2.5.2.4.2.1.0-3	L	D	A I	N/A	T	N/A	N/A
SuR-534	3.2.5.2.4.2.2-1	L	D	A	N/A	A	N/A	N/A
SuR-538	3.2.5.2.4.4.0-1	L	D	I	N/A	A T	N/A	N/A
SuR-546	3.2.5.2.6.1.0-1	C	D	A	N/A	A	N/A	N/A
SuR-552	3.2.5.2.8.2.2.1.0-1	L	D	A	N/A	A	N/A	N/A
SuR-558	3.2.5.2.8.2.2.3.0-1	L	D	A	N/A	A	N/A	N/A
SuR-599	3.2.6.1.1.0-1	L	D	I	N/A	I	N/A	N/A
SuR-601	3.2.6.1.3.0-1	L	D	N/A	N/A	I	N/A	N/A
SuR-616	3.3.3.1.0-6	L	D	N/A	N/A	A T	N/A	N/A
SuR-618	3.3.3.12.0-1	L	D	T	N/A	I	N/A	N/A
SuR-658	3.3.5.2.0-1	L	D	N/A	N/A	I	N/A	N/A
SuR-662	3.3.5.3.1.0-1	C	D	D	N/A	N/A	N/A	N/A
SuR-669	3.3.6.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-685	3.3.7.5.0-1	C	D	D	N/A	N/A	N/A	N/A
SuR-691	3.2.1.5.3.0-1	L	D	N/A	T	N/A	N/A	N/A
SuR-709	3.5.2.2.1.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-712	3.5.2.2.2.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-718	3.5.4.0-1	L	D	A	N/A	A	N/A	N/A
SuR-719	3.5.4.0-2	L	D	N/A	N/A	I	N/A	N/A
SuR-726	3.3.2.1.0-1	C	A	I	N/A	N/A	N/A	N/A
SuR-731	3.5.5.1.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-734	3.5.5.2.0-1	L	D	A	N/A	A	N/A	N/A
SuR-827	3.2.4.1.1.1.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-829	3.2.4.1.1.2.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-831	3.2.4.2.1.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-833	3.2.4.2.2.1.0-1	L	D	N/A	T	N/A	N/A	N/A
SuR-835	3.2.3.1.0-1	L	A	T	N/A	I	N/A	N/A
SuR-838	3.2.1.3.8.1.0-1	L	D	A	N/A	A	N/A	N/A
SuR-840	3.2.1.3.7.0-1	C	D	A	N/A	N/A	N/A	N/A
SuR-842	3.2.1.3.6.0-1	L	D	A	N/A	A	N/A	N/A
SuR-844	3.2.5.2.4.1.0-1	C	D	T	N/A	N/A	N/A	N/A
SuR-853	3.2.1.3.5.5.0-1	L	D	N/A	T	N/A	N/A	N/A
SuR-858	3.3.7.1.0-1	C	D	N/A	N/A	A	N/A	N/A
SuR-860	3.3.7.2.0-1	C	D	N/A	N/A	A	N/A	N/A
SuR-862	3.2.1.3.11.0-1	L	D	N/A	A	T	N/A	N/A

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Requirement Object Identification Number (ROIN)	SuR Section	Verification Level	Verification Type	CI Sell-Off	FQT1	FVT1	FVT2	FQT2
SuR-866	3.2.1.3.10.0-1	L	D	N/A	T	N/A	N/A	N/A
SuR-871	3.2.1.3.4.1.0-1	L	D	N/A	T	N/A	N/A	N/A
SuR-873	3.2.1.3.4.2.0-1	L	D	N/A	T	N/A	N/A	N/A
SuR-882	3.2.1.3.3.0-1	L	D	N/A	D	N/A	D	N/A
SuR-885	3.2.1.3.3.0-2	L	D	N/A	D	N/A	N/A	N/A
SuR-887	3.2.1.1.1.0-1	L	D	N/A	N/A	N/A	N/A	T
SuR-890	3.2.1.3.1.1.0-1	L	D	N/A	T	N/A	N/A	N/A
SuR-891	3.2.1.3.1.1.0-2	L	D	N/A	T	N/A	N/A	N/A
SuR-898	3.2.5.2.7.0-1	L	D	N/A	N/A	A	T	N/A
SuR-900	3.2.5.1.1.0-1	L	D	N/A	N/A	A	A T	N/A
SuR-916	3.2.1.1.2.4.1.0-2	L	D	N/A	N/A	A	A T	N/A
SuR-922	3.2.1.1.2.5.1.0-1	L	D	N/A	N/A	D	D	N/A
SuR-934	3.2.1.1.4.1.0-1	C	D	N/A	N/A	N/A	N/A	T
SuR-937	3.2.1.1.4.2.0-1	L	D	N/A	N/A	N/A	N/A	T
SuR-941	3.2.1.1.5.1.0-1	L	D	N/A	N/A	N/A	N/A	T
SuR-944	3.2.1.1.5.2.0-1	L	D	N/A	N/A	N/A	N/A	T
SuR-946	3.2.1.1.3.1.0-1	L	D	N/A	N/A	A	N/A	T
SuR-948	3.2.1.1.3.2.0-1	L	D	N/A	N/A	N/A	N/A	T
SuR-953	3.2.1.1.3.3.0-1	L	D	N/A	N/A	N/A	N/A	T
SuR-964	3.2.1.2.2.0-2	L	D	N/A	T	N/A	N/A	T
SuR-970	3.2.2.1.2.3.1.0-2	L	A	N/A	T	N/A	N/A	N/A
SuR-1578	3.2.1.3.1.2.0-1	L	D	N/A	T	N/A	N/A	N/A
SuR-1584	3.2.1.3.13.0-1	L	D	N/A	N/A	T	N/A	N/A
SuR-1585	3.2.2.1.2.2.1.0-1	L	D	N/A	T	N/A	N/A	N/A
SuR-1608	3.2.1.1.2.3.1.0-1	L	D	N/A	N/A	A	A T	N/A
SuR-1657	3.3.1.2.0-1	L	D	I	N/A	I	N/A	N/A
SuR-1661	3.2.3.4.0-1	L	D	A	N/A	A	N/A	N/A
SuR-1666	3.2.5.2.8.2.2.5.0-1	L	D	A	N/A	A	N/A	N/A
SuR-1816	3.3.3.2.0-1	L	D	I	N/A	I	N/A	N/A
SuR-1817	3.3.3.1.0-7	D	D	I	N/A	I	N/A	N/A
SuR-1818	3.3.3.1.0-10	D	D	I	N/A	D	N/A	N/A
SuR-1820	3.3.3.3.0-1	D	D	A	N/A	A	N/A	N/A
SuR-1825	3.3.3.5.0-1	L	D	I	N/A	I	N/A	N/A
SuR-1837	3.3.3.8.0-1	L	D	I	N/A	I	N/A	N/A
SuR-1839	3.2.4.2.2.3.0-2	L	D	A	N/A	A	N/A	N/A
SuR-1841	3.2.1.5.1.1.0-1	L	D	N/A	N/A	T	N/A	N/A
SuR-2088	3.3.3.11.0-1	L	D	I	N/A	I	N/A	N/A
SuR-2092	3.3.2.2.0-1	L	D	I	N/A	I	N/A	N/A

Requirement Object Identification Number (ROIN)	SuR Section	Verification Level	Verification Type	CI Sell-Off	FQT1	FVT1	FVT2	FQT2
SuR-2126	3.3.1.3.0-1	D	D	I	N/A	I	N/A	N/A
SuR-2135	3.3.3.18.0-1	C	D	A	N/A	N/A	N/A	N/A
SuR-2147	3.3.3.20.0-1	L	D	N/A	A	T	N/A	N/A
SuR-2150	3.3.3.16.0-1	L	D	N/A	D	N/A	N/A	N/A
SuR-2158	3.3.3.22.0-1	L	D	I	N/A	D	N/A	N/A
SuR-2186	3.2.2.1.2.3.1.0-1	L	D	N/A	D	N/A	N/A	N/A
SuR-2249	3.2.1.3.8.4.0-1	L	D	I	N/A	I	N/A	N/A
SuR-2253	3.2.1.3.14.0-1	L	D	T	N/A	A	T	N/A
SuR-2261	3.2.1.3.8.3.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-2265	3.2.1.1.2.3.4.0-1	L	D	N/A	N/A	A	A T	N/A
SuR-2266	3.2.1.3.2.0-1	L	D	A	T	A	N/A	N/A
SuR-2311	3.3.7.3.0-1	L	D	N/A	N/A	D	N/A	N/A
SuR-3864	3.3.3.1.0-14	L	D	I	N/A	I	N/A	N/A
SuR-6301	3.2.1.2.4.1.0-2	L	D	N/A	T	N/A	N/A	N/A
SuR-6305	3.2.5.1.5.2.1.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-6306	3.2.5.1.11.1.2.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-6342	3.3.5.1.1.4.1.0-1	C	D	T	N/A	N/A	N/A	N/A
SuR-6351	3.3.5.3.2.0-1	L	D	N/A	N/A	T	N/A	N/A
SuR-6355	3.2.1.3.5.1.0-1	L	D	T	N/A	T	N/A	N/A
SuR-6358	3.2.1.3.5.2.0-1	L	D	A	N/A	A	N/A	N/A
SuR-6360	3.2.1.3.5.3.0-1	L	D	A	N/A	A	N/A	N/A
SuR-6362	3.2.1.3.5.4.0-1	L	D	A	N/A	A	N/A	N/A
SuR-6366	3.2.1.1.2.3.1.0-2	L	D	N/A	N/A	A	A T	N/A
SuR-6377	3.2.1.1.2.4.1.0-1	L	D	N/A	N/A	A	A T	N/A
SuR-6391	3.2.3.3.0-1	L	D	I	N/A	A	N/A	N/A
SuR-6393	3.2.3.2.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-6394	3.2.3.2.0-2	L	D	N/A	N/A	A	N/A	N/A
SuR-6396	3.2.5.1.2.0-1	L	D	A	N/A	A	N/A	N/A
SuR-6427	3.2.1.1.2.4.2.0-1	L	D	N/A	N/A	A	T	N/A
SuR-6431	3.2.1.3.4.3.0-1	L	D	N/A	T	N/A	N/A	N/A
SuR-6433	3.2.1.2.2.0-4	L	D	N/A	N/A	N/A	N/A	T
SuR-6436	3.2.1.2.2.0-3	L	D	N/A	T	N/A	N/A	T
SuR-6439	3.2.6.1.2.0-1	L	D	A	N/A	I	N/A	N/A
SuR-6440	3.2.5.2.1.3.0-1	L	D	A I	N/A	A	N/A	N/A
SuR-6442	3.2.5.1.3.1.0-2	C	D	I	N/A	N/A	N/A	N/A
SuR-6443	3.2.5.1.3.2.0-2	C	D	I	N/A	N/A	N/A	N/A
SuR-6445	3.2.5.2.4.2.1.0-2	L	D	A I	N/A	A	N/A	N/A

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Requirement Object Identification Number (ROIN)	SuR Section	Verification Level	Verification Type	CI Sell-Off	FQT1	FVT1	FVT2	FQT2
SuR-6446	3.2.1.3.14.0-2	L	D	N/A	N/A	A	N/A	N/A
SuR-6447	3.2.1.3.14.0-7	L	D	N/A	N/A	A T	N/A	N/A
SuR-6679	3.2.1.3.3.0-4	L	D	A	D	N/A	N/A	D
SuR-6968	3.2.1.3.8.2.0-1	L	D	A	N/A	A	N/A	N/A
SuR-6971	3.2.5.1.8.2.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-6972	3.3.5.1.1.0-1	L	D	N/A	N/A	I	N/A	N/A
SuR-6973	3.2.3.1.0-2	L	A	T	N/A	A	N/A	N/A
SuR-6974	3.2.3.1.0-3	L	A	T	N/A	A	N/A	N/A
SuR-6976	3.2.5.2.4.2.2.1.0-1	L	D	A	N/A	A	N/A	N/A
SuR-7083	3.2.1.3.6.0-2	L	D	N/A	N/A	T	N/A	N/A
SuR-7084	3.2.5.2.8.2.1.2.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-7099	3.2.1.2.1.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-7100	3.2.1.2.1.0-2	L	D	A T	N/A	A	N/A	N/A
SuR-7109	3.7.1.8.1.0-1	L	A	A	N/A	T	N/A	N/A
SuR-7110	3.7.1.8.1.0-2	L	A	N/A	N/A	T	N/A	N/A
SuR-7111	3.7.1.8.1.0-3	L	A	A	N/A	T	N/A	N/A
SuR-7112	3.7.1.8.1.0-4	L	A	T	N/A	T	N/A	N/A
SuR-7114	3.7.2.6.3.0-1	L	D	N/A	N/A	T	N/A	N/A
SuR-7116	3.7.1.8.2.0-1	C	A	T	N/A	T	N/A	N/A
SuR-7122	3.7.2.6.1.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-7123	3.7.2.6.1.0-2	L	D	N/A	N/A	A	N/A	N/A
SuR-7125	3.7.2.6.1.0-3	L	D	N/A	N/A	A	N/A	N/A
SuR-7128	3.7.2.6.4.0-1	L	A	N/A	N/A	A	N/A	N/A
SuR-7130	3.2.1.1.2.2.0-1	L	A	T	N/A	A	N/A	N/A
SuR-7137	3.7.2.6.5.2.0-1	L	A	N/A	N/A	A	N/A	N/A
SuR-7140	3.7.2.6.5.1.0-1	L	D	N/A	A	N/A	N/A	N/A
SuR-7254	3.2.5.1.11.2.3.0-1	L	D	A	N/A	A	N/A	N/A
SuR-7290	3.2.5.1.11.1.3.0-1	L	D	A	N/A	A	N/A	N/A
SuR-7329	3.7.1.1.2.0-1	C	A	I	N/A	N/A	N/A	N/A
SuR-7330	3.7.1.1.2.0-2	C	A	I	N/A	N/A	N/A	N/A
SuR-7337	3.7.1.1.3.0-1	C	A	A	N/A	N/A	N/A	N/A
SuR-7338	3.7.1.1.3.0-2	C	A	I	N/A	N/A	N/A	N/A
SuR-7339	3.3.5.1.1.4.2.0-1	L	D	N/A	D	N/A	N/A	N/A
SuR-7345	3.2.1.1.2.3.3.0-4	L	D	N/A	N/A	A	A T	N/A
SuR-7346	3.2.1.1.2.3.3.0-7	L	D	N/A	N/A	A	A T	N/A

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Requirement Object Identification Number (ROIN)	SuR Section	Verification Level	Verification Type	CI Sell-Off	FQT1	FVT1	FVT2	FQT2
SuR-7347	3.2.1.1.2.3.3.0-5	L	D	N/A	N/A	A	A T	N/A
SuR-7348	3.2.1.1.2.3.3.0-8	L	D	N/A	N/A	A	A T	N/A
SuR-7354	3.7.1.12.6.0-1	C	D	A	N/A	N/A	N/A	N/A
SuR-7355	3.7.1.9.1.0-1	C	D	A	N/A	N/A	N/A	N/A
SuR-7356	3.7.1.1.4.0-1	L	D	A	N/A	D	N/A	N/A
SuR-7358	3.7.1.12.1.0-1	L	A	N/A	N/A	I	N/A	N/A
SuR-7361	3.7.1.12.2.0-1	C	D	A T	N/A	N/A	N/A	N/A
SuR-7362	3.7.1.12.2.0-2	C	D	A T	N/A	N/A	N/A	N/A
SuR-7365	3.2.1.1.2.1.0-1	L	D	A	N/A	A	N/A	N/A
SuR-7367	3.7.1.12.1.0-2	C	D	A	N/A	N/A	N/A	N/A
SuR-7370	3.7.1.12.3.0-1	C	A	A	N/A	N/A	N/A	N/A
SuR-7372	3.7.1.12.3.0-2	C	A	A	N/A	N/A	N/A	N/A
SuR-7375	3.7.2.6.2.0-1	C	D	N/A	A	N/A	N/A	N/A
SuR-7378	3.2.5.2.4.3.0-1	L	D	A	N/A	A	N/A	N/A
SuR-7405	3.2.5.2.8.2.2.4.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-7413	3.3.3.10.0-1	L	D	I	N/A	A	N/A	N/A
SuR-7437	3.2.1.3.3.0-3	L	D	N/A	D	N/A	N/A	N/A
SuR-7490	3.2.1.2.3.0-1	D	D	N/A	N/A	A	N/A	N/A
SuR-7491	3.2.1.2.4.1.0-3	C	D	N/A	T	N/A	N/A	N/A
SuR-7500	3.7.1.12.4.0-1	L	A	N/A	N/A	D	N/A	N/A
SuR-7501	3.7.1.12.4.0-2	L	A	N/A	T	N/A	N/A	N/A
SuR-7698	3.7.1.12.5.0-1	C	D	I	N/A	N/A	N/A	N/A
SuR-7702	3.7.1.11.2.0-1	C	D	A	N/A	N/A	N/A	N/A
SuR-7706	3.7.1.11.1.0-1	C	D	I	N/A	N/A	N/A	N/A
SuR-7803	3.3.1.3.0-2	L	D	A	N/A	A	N/A	N/A
SuR-7804	3.3.3.1.0-8	D	D	N/A	N/A	I	N/A	N/A
SuR-7805	3.3.3.1.0-9	L	D	N/A	N/A	A I	N/A	N/A
SuR-7806	3.3.3.1.0-11	L	D	I	N/A	I	N/A	N/A
SuR-7807	3.3.3.1.0-12	L	D	I	N/A	I	N/A	N/A
SuR-7810	3.3.3.1.0-1	C	D	A	N/A	N/A	N/A	N/A
SuR-7811	3.3.3.1.0-4	L	D	A	N/A	I	N/A	N/A
SuR-7812	3.3.3.1.0-15	L	D	I	N/A	D	N/A	N/A
SuR-7813	3.3.3.1.0-16	L	D	I	N/A	A	N/A	N/A
SuR-7814	3.3.3.1.0-17	L	D	I	N/A	I	N/A	N/A
SuR-7815	3.3.3.9.0-1	D	D	A	N/A	I	N/A	N/A
SuR-7816	3.3.3.1.0-18	L	D	A	N/A	I	N/A	N/A
SuR-7817	3.3.3.1.0-19	L	D	I	N/A	I	N/A	N/A

Requirement Object Identification Number (ROIN)	SuR Section	Verification Level	Verification Type	CI Sell-Off	FQT1	FVT1	FVT2	FQT2
SuR-7818	3.3.3.1.0-24	D	D	I	N/A	I	N/A	N/A
SuR-7819	3.3.3.1.0-20	L	D	I	N/A	I	N/A	N/A
SuR-7820	3.3.3.1.0-21	D	D	I	N/A	N/A	N/A	N/A
SuR-7821	3.3.3.1.0-22	D	D	I	N/A	I	N/A	N/A
SuR-7822	3.3.3.1.0-23	L	D	I	N/A	I	N/A	N/A
SuR-7823	3.3.3.1.0-13	D	D	I	N/A	N/A	N/A	N/A
SuR-7824	3.3.3.6.0-1	C	D	A	N/A	D	N/A	N/A
SuR-7825	3.3.3.2.0-2	L	D	I	N/A	I	N/A	N/A
SuR-7826	3.3.3.2.0-3	L	D	I	N/A	I	N/A	N/A
SuR-7827	3.3.3.2.0-5	L	D	I	N/A	I	N/A	N/A
SuR-7828	3.3.3.2.0-4	L	D	I	N/A	T	N/A	N/A
SuR-7830	3.3.4.1.0-1	L	D	A	N/A	A	N/A	N/A
SuR-7831	3.3.4.1.0-2	L	D	I	N/A	I	N/A	N/A
SuR-7832	3.3.4.1.0-4	L	D	I	N/A	I	N/A	N/A
SuR-7833	3.3.4.1.0-3	L	D	I	N/A	I	N/A	N/A
SuR-7835	3.3.4.2.0-1	L	D	A	N/A	A	N/A	N/A
SuR-7836	3.3.4.2.0-2	L	D	I	N/A	I	N/A	N/A
SuR-7837	3.3.4.2.0-7	L	D	A	N/A	A	N/A	N/A
SuR-7838	3.3.4.2.0-6	C	D	A	N/A	N/A	N/A	N/A
SuR-7839	3.3.4.2.0-5	D	D	A	N/A	N/A	N/A	N/A
SuR-7840	3.3.4.2.0-4	D	D	I	N/A	I	N/A	N/A
SuR-7841	3.3.4.2.0-3	D	D	I	N/A	I	N/A	N/A
SuR-7859	3.2.5.1.9.1.0-2	L	D	A	N/A	N/A	N/A	N/A
SuR-7861	3.7.1.1.1-1	L	A	N/A	N/A	I	N/A	N/A
SuR-7863	3.2.5.2.8.2.1.2.0-2	L	D	N/A	N/A	A	N/A	N/A
SuR-7864	3.2.5.1.7.1.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-7882	3.2.5.1.4.2.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-7884	3.2.5.2.5.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-8411	3.2.5.2.3.0-1	L	D	I	N/A	I	N/A	N/A
SuR-8421	3.3.5.1.5.3.0-1	L	D	N/A	N/A	A	N/A	N/A
SuR-8422	3.3.3.19.0-1	L	D	I	N/A	T	N/A	N/A
SuR-8423	3.3.5.1.4.1.0-2	L	D	D	D	N/A	N/A	N/A
SuR-8424	3.3.3.17.0-1	L	D	N/A	A	N/A	N/A	N/A
SuR-8427	3.3.5.1.2.0-1	L	D	N/A	N/A	I	N/A	N/A
SuR-8806	3.2.1.1.2.3.2.0-1	L	D	N/A	N/A	A	A T	N/A
SuR-8808	3.2.4.2.2.9.0-1	L	D	N/A	N/A	A T	N/A	N/A
SuR-8816	3.2.5.2.4.2.2.0-1	L	D	I	N/A	A	N/A	N/A
SuR-8817	3.2.5.2.4.2.1.0-1	L	D	A	N/A	A	N/A	N/A
SuR-8822	3.2.5.2.4.2.2-2	C	D	A	N/A	N/A	N/A	N/A

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Requirement Object Identification Number (ROIN)	SuR Section	Verification Level	Verification Type	CI Sell-Off	FQT1	FVT1	FVT2	FQT2
				T				
SuR-8823	3.2.5.2.4.3.0-2	C	D	A T	N/A	N/A	N/A	N/A
SuR-8827	3.2.1.3.14.0-3	L	D	N/A	N/A	A	N/A	N/A
SuR-8828	3.2.1.3.14.0-4	L	D	N/A	N/A	A	N/A	N/A
SuR-8829	3.2.1.3.14.0-5	L	D	N/A	N/A	A T	N/A	N/A
SuR-8831	3.3.5.1.1.4.0-1	C	D	I	N/A	N/A	N/A	N/A
SuR-8832	3.3.5.1.1.2.0-2	L	A	D	N/A	T	N/A	N/A
SuR-8833	3.2.1.5.4.3.0-2	L	D	N/A	D	N/A	N/A	N/A
SuR-8842	3.2.5.2.8.2.2.1.0-2	D	D	A	N/A	N/A	N/A	N/A
SuR-8847	3.2.1.5.4.3.0-3	L	D	N/A	D	N/A	N/A	N/A
SuR-8848	3.3.6.0-2	L	D	N/A	A	N/A	N/A	N/A
SuR-8852	3.2.5.2.7.0-2	L	D	N/A	N/A	A	A	N/A
SuR-8853	3.2.5.2.7.0-3	L	D	N/A	N/A	A	A	N/A
SuR-8866	3.2.1.3.13.0-2	L	D	N/A	N/A	T	N/A	N/A
SuR-8873	3.3.3.1.0-3	L	D	I	N/A	I	N/A	N/A
SuR-8874	3.3.3.1.0-5	L	D	I	N/A	I	N/A	N/A
SuR-9646	3.3.5.1.4.1.0-1	L	D	N/A	N/A	D	N/A	N/A
SuR-9647	3.3.5.1.1.1.0-2	L	D	N/A	N/A	D	N/A	N/A
SuR-9648	3.3.5.1.1.1.0-1	L	D	N/A	A	N/A	N/A	N/A
SuR-9649	3.3.5.1.1.2.0-1	L	D	N/A	N/A	D I	N/A	N/A
SuR-9650	3.3.5.1.1.3.0-1	L	D	N/A	N/A	I	N/A	N/A
SuR-9651	3.3.5.1.1.4.0-4	L	D	N/A	N/A	D	N/A	N/A
SuR-9653	3.3.5.1.1.4.0-3	L	D	N/A	N/A	D	N/A	N/A
SuR-9654	3.3.5.1.1.4.0-2	L	D	N/A	N/A	D I	N/A	N/A
SuR-9655	3.3.3.21-1	L	D	N/A	N/A	A	N/A	N/A
SuR-9708	3.2.2.2.0-1	S	D	N/A	N/A	N/A	D	N/A
SuR-9709	3.2.2.1.0-1	S	D	N/A	N/A	N/A	D	N/A
SuR-9710	3.3.1.2.0-2	C	D	I	N/A	N/A	N/A	N/A
SuR-9711	3.2.5.2.2.2.0-3	L	D	A	N/A	A	N/A	N/A
SuR-9712	3.2.5.2.2.2.0-2	L	D	A	N/A	A	N/A	N/A
SuR-9866	3.2.1.3.14.0-6	L	D	N/A	N/A	A T	N/A	N/A
SuR-9870	3.3.1.2.0-3	C	D	I	N/A	N/A	N/A	N/A
SuR-9871	3.2.1.2.4.2.0-2	C	D	I	N/A	N/A	N/A	N/A
SuR-9872	3.2.5.2.2.2.0-4	L	D	A	N/A	A	N/A	N/A
SuR-9874	3.3.2.3.0-1	L	D	I	N/A	I	N/A	N/A
SuR-9875	3.2.1.1.2.3.3.0-6	L	D	N/A	N/A	A	A T	N/A

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Requirement Object Identification Number (ROIN)	SuR Section	Verification Level	Verification Type	CI Sell-Off	FQT1	FVT1	FVT2	FQT2
SuR-9876	3.2.1.1.2.3.3.0-9	L	D	N/A	N/A	A	A T	N/A

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4.7 (U) Requirements Applicability Constraints Matrix

(U) The Requirement Applicability Constraints Matrix (RACM) contains each requirement's mission, system states/modes, and bandwidth constraints.

TABLE XVII-II. (U) Requirement Applicability Constraints Matrix (RACM)

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SuR ID	SuR Section	Missions	b(1)	System States-Modes
SuR-19	3.2.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-71	3.2.1.2.4.1.0-1	ABT		Operations - Tactical
SuR-74	3.2.1.2.4.2.0-1	ABT		Operations - Configuration Operations - Tactical Operations - Training
SuR-78	3.2.1.2.5.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-82	3.2.1.2.5.2.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-88	3.2.1.2.5.2.3.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-128	3.2.1.3.9.0-1	N/C		Operations - Configuration
SuR-346	3.2.4.2.2.1.0-2	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-349	3.2.4.2.2.2.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-352	3.2.4.2.2.3.0-1	N/C		Operations - Tactical Operations - Training
SuR-355	3.2.4.2.2.4.0-1	ABT SMT TBM LCR		Operations - Tactical

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SuR ID	SuR Section	Missions		System States-Modes
SuR-358	3.2.4.2.2.5.0-1	N/C		Operations - Training
SuR-367	3.2.4.2.2.7.0-1	N/C		Operations - Tactical Operations - Training
SuR-370	3.2.4.2.2.8.0-1	ABT SMT TBM LCR		Operations - Tactical Operations - Training
SuR-410	3.2.1.5.4.3.0-1	N/C		Operations - Configuration Operations - Training
SuR-423	3.2.5.1.3.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-426	3.2.5.1.3.2.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-429	3.2.5.1.4.1.0-1	ABT SMT TBM LCR	b(1)	Operations - Configuration Operations - Tactical Operations - Training
SuR-436	3.2.5.1.5.1.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-451	3.2.5.1.6.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-464	3.2.5.1.8.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-472	3.2.5.1.9.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-478	3.2.5.1.10.0-1	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration

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SuR ID	SuR Section	Missions		System States-Modes
				Operations - Tactical Operations - Training
SuR-482	3.2.5.1.11.1.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-486	3.2.5.1.11.2.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-489	3.2.5.1.11.2.2.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-495	3.2.5.1.12.1.0-1	N/C	b(1)	Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Operations - Configuration Operations - Tactical Operations - Training
SuR-498	3.2.5.1.12.2.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-501	3.2.5.1.12.3.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-509	3.2.5.2.1.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-519	3.2.5.2.2.2.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-521	3.2.5.2.2.3.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-523	3.2.5.2.2.4.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training

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SuR ID	SuR Section	Missions	b(1)	System States-Modes
SuR-533	3.2.5.2.4.2.1.0-3	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-534	3.2.5.2.4.2.2-1	ABT SMT TBM LCR		Operations - Tactical
SuR-538	3.2.5.2.4.4.0 -1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-546	3.2.5.2.6.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-552	3.2.5.2.8.2.2.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-558	3.2.5.2.8.2.2.3.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-599	3.2.6.1.1.0-1	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order
SuR-601	3.2.6.1.3.0-1	N/C		Movement - Transport Movement - March Order
SuR-616	3.3.3.1.0-6	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-618	3.3.3.12.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-658	3.3.5.2.0-1	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace

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SuR ID	SuR Section	Missions		System States-Modes
				Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-662	3.3.5.3.1.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-669	3.3.6.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-685	3.3.7.5.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-691	3.2.1.5.3.0-1	N/C	b(1)	Operations - Configuration Operations - Tactical Operations - Training
SuR-709	3.5.2.2.1.0-1	N/C		Operations - Training
SuR-712	3.5.2.2.2.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-718	3.5.4.0-1	N/C		Deployment - Emplace Deployment - Displace Operations - Training
SuR-719	3.5.4.0-2	N/C		Deployment - Emplace Deployment - Displace Operations - Training
SuR-726	3.3.2.1.0-1	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace
SuR-731	3.5.5.1.0-1	N/C		Deployment - Emplace Deployment - Displace
SuR-734	3.5.5.2.0-1	N/C		Deployment - Emplace Deployment - Displace
SuR-827	3.2.4.1.1.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical
SuR-829	3.2.4.1.1.2.0-1	ABT SMT		Operations - Configuration Operations - Tactical

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SuR ID	SuR Section	Missions		System States-Modes
		TBM LCR		
SuR-831	3.2.4.2.1.0-1	N/C		Operations - Training
SuR-833	3.2.4.2.2.1.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-835	3.2.3.1.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-838	3.2.1.3.8.1.0-1	N/C		Operations - Configuration
SuR-840	3.2.1.3.7.0-1	ABT SMT TBM LCR	b(1)	Operations - Tactical
SuR-842	3.2.1.3.6.0-1	N/C		Operations - Tactical
SuR-844	3.2.5.2.4.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-853	3.2.1.3.5.5.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical
SuR-858	3.3.7.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-860	3.3.7.2.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-862	3.2.1.3.11.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-866	3.2.1.3.10.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-871	3.2.1.3.4.1.0-1	ABT		Operations - Tactical
SuR-873	3.2.1.3.4.2.0-1	ABT SMT TBM LCR		Operations - Tactical

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SuR ID	SuR Section	Missions	b(1)	System States-Modes
SuR-882	3.2.1.3.3.0-1	ABT		Operations - Tactical
SuR-885	3.2.1.3.3.0-2	TBM LCR		Operations - Tactical
SuR-887	3.2.1.1.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical
SuR-890	3.2.1.3.1.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-891	3.2.1.3.1.1.0-2	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical
SuR-898	3.2.5.2.7.0-1	ABT		Operations - Tactical
SuR-900	3.2.5.1.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-916	3.2.1.1.2.4.1.0-2	ABT		Operations - Tactical
SuR-922	3.2.1.1.2.5.1.0-1	ABT		Operations - Tactical
SuR-934	3.2.1.1.4.1.0-1	TBM		Operations - Tactical
SuR-937	3.2.1.1.4.2.0-1	TBM		Operations - Tactical
SuR-941	3.2.1.1.5.1.0-1	LCR		Operations - Tactical
SuR-944	3.2.1.1.5.2.0-1	LCR		Operations - Tactical
SuR-946	3.2.1.1.3.1.0-1	SMT		Operations - Tactical
SuR-948	3.2.1.1.3.2.0-1	SMT		Operations - Tactical
SuR-953	3.2.1.1.3.3.0-1	SMT		Operations - Tactical
SuR-964	3.2.1.2.2.0-2	ABT SMT TBM LCR		Operations - Tactical
SuR-970	3.2.2.1.2.3.1.0-2	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-1578	3.2.1.3.1.2.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-1584	3.2.1.3.13.0-1	ABT SMT TBM		Operations - Configuration Operations - Tactical

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SuR ID	SuR Section	Missions		System States-Modes
		LCR		
SuR-1585	3.2.2.1.2.2.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical
SuR-1608	3.2.1.1.2.3.1.0-1	ABT		Operations - Tactical
SuR-1657	3.3.1.2.0-1	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-1661	3.2.3.4.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-1666	3.2.5.2.8.2.2.5.0-1	N/C	b(1)	Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-1816	3.3.3.2.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-1817	3.3.3.1.0-7	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-1818	3.3.3.1.0-10	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration

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SuR ID	SuR Section	Missions	b(1)	System States-Modes
				Operations - Tactical Operations - Training
SuR-1820	3.3.3.3.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-1825	3.3.3.5.0-1	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-1837	3.3.3.8.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-1839	3.2.4.2.2.3.0-2	N/C		Operations - Tactical Operations - Training
SuR-1841	3.2.1.5.1.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-2088	3.3.3.11.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-2092	3.3.2.2.0-1	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-2126	3.3.1.3.0-1	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training

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SuR ID	SuR Section	Missions		System States-Modes
SuR-2135	3.3.3.18.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-2147	3.3.3.20.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-2150	3.3.3.16.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-2158	3.3.3.22.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-2186	3.2.2.1.2.3.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-2249	3.2.1.3.8.4.0-1	N/C	b(1)	Deployment - Emplace Operations - Configuration Operations - Tactical Operations - Training
SuR-2253	3.2.1.3.14.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-2261	3.2.1.3.8.3.0-1	N/C		Operations - Configuration Operations - Training
SuR-2265	3.2.1.1.2.3.4.0-1	ABT		Operations - Tactical
SuR-2266	3.2.1.3.2.0-1	ABT		Operations - Tactical
SuR-2311	3.3.7.3.0-1	N/C		Operations - Configuration Operations - Tactical
SuR-3864	3.3.3.1.0-14	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-6301	3.2.1.2.4.1.0-2	ABT TBM		Operations - Tactical
SuR-6305	3.2.5.1.5.2.1.0-1	ABT SMT		Operations - Tactical

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SuR ID	SuR Section	Missions	b(1)	System States-Modes
		TBM LCR		
SuR-6306	3.2.5.1.11.1.2.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-6342	3.3.5.1.1.4.1.0-1	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-6351	3.3.5.3.2.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-6355	3.2.1.3.5.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-6358	3.2.1.3.5.2.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-6360	3.2.1.3.5.3.0-1	ABT		Operations - Tactical
SuR-6362	3.2.1.3.5.4.0-1	ABT		Operations - Tactical
SuR-6366	3.2.1.1.2.3.1.0-2	ABT		Operations - Tactical
SuR-6377	3.2.1.1.2.4.1.0-1	ABT		Operations - Tactical
SuR-6391	3.2.3.3.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-6393	3.2.3.2.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-6394	3.2.3.2.0-2	ABT SMT TBM LCR		Operations - Tactical
SuR-6396	3.2.5.1.2.0-1	ABT SMT		Operations - Tactical

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SuR ID	SuR Section	Missions		System States-Modes
		TBM LCR		
SuR-6427	3.2.1.1.2.4.2.0-1	ABT		Operations - Tactical
SuR-6431	3.2.1.3.4.3.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-6433	3.2.1.2.2.0-4	SMT TBM LCR		Operations - Tactical
SuR-6436	3.2.1.2.2.0-3	ABT SMT TBM LCR		Operations - Tactical
SuR-6439	3.2.6.1.2.0-1	N/C		Movement - Transport Movement - March Order
SuR-6440	3.2.5.2.1.3.0-1	ABT SMT TBM LCR	b(1)	Operations - Configuration Operations - Tactical Operations - Training
SuR-6442	3.2.5.1.3.1.0-2	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-6443	3.2.5.1.3.2.0-2	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-6445	3.2.5.2.4.2.1.0-2	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-6446	3.2.1.3.14.0-2	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-6447	3.2.1.3.14.0-7	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-6679	3.2.1.3.3.0-4	ABT SMT TBM LCR		Operations - Tactical
SuR-6968	3.2.1.3.8.2.0-1	N/C		Operations - Configuration

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SuR ID	SuR Section	Missions		System States-Modes
SuR-6971	3.2.5.1.8.2.0-1	ABT SMT TBM LCR		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order
SuR-6972	3.3.5.1.1.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-6973	3.2.3.1.0-2	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-6974	3.2.3.1.0-3	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-6976	3.2.5.2.4.2.2.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7083	3.2.1.3.6.0-2	N/C		Operations - Tactical
SuR-7084	3.2.5.2.8.2.1.2.0-1	N/C	b(1)	Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order
SuR-7099	3.2.1.2.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7100	3.2.1.2.1.0-2	ABT SMT TBM LCR		Operations - Tactical
SuR-7109	3.7.1.8.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7110	3.7.1.8.1.0-2	ABT SMT TBM LCR		Operations - Tactical
SuR-7111	3.7.1.8.1.0-3	ABT SMT TBM LCR		Operations - Tactical
SuR-7112	3.7.1.8.1.0-4	ABT SMT		Operations - Tactical

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SuR ID	SuR Section	Missions		System States-Modes
		TBM LCR		
SuR-7114	3.7.2.6.3.0-1	ABT		Operations - Tactical
SuR-7116	3.7.1.8.2.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7122	3.7.2.6.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7123	3.7.2.6.1.0-2	ABT SMT TBM LCR		Operations - Tactical
SuR-7125	3.7.2.6.1.0-3	ABT SMT TBM LCR		Operations - Tactical
SuR-7128	3.7.2.6.4.0-1	ABT SMT TBM LCR	b(1)	Operations - Tactical
SuR-7130	3.2.1.1.2.2.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7137	3.7.2.6.5.2.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7140	3.7.2.6.5.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7254	3.2.5.1.11.2.3.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-7290	3.2.5.1.11.1.3.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7329	3.7.1.1.2.0-1	ABT		Operations - Tactical

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SuR ID	SuR Section	Missions		System States-Modes
SuR-7330	3.7.1.1.2.0-2	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-7337	3.7.1.1.3.0-1	ABT		Operations - Tactical
SuR-7338	3.7.1.1.3.0-2	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-7339	3.3.5.1.1.4.2.0-1	N/C		N/C
SuR-7345	3.2.1.1.2.3.3.0-4	ABT		Operations - Tactical
SuR-7346	3.2.1.1.2.3.3.0-7	ABT		Operations - Tactical
SuR-7347	3.2.1.1.2.3.3.0-5	ABT		Operations - Tactical
SuR-7348	3.2.1.1.2.3.3.0-8	ABT		Operations - Tactical
SuR-7354	3.7.1.12.6.0-1	N/C		Operations - Configuration Operations - Tactical
SuR-7355	3.7.1.9.1.0-1	N/C		Operations - Configuration Operations - Tactical
SuR-7356	3.7.1.1.4.0-1	N/C	b(1)	Operations - Configuration Operations - Tactical
SuR-7358	3.7.1.12.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7361	3.7.1.12.2.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7362	3.7.1.12.2.0-2	ABT SMT TBM LCR		Operations - Tactical
SuR-7365	3.2.1.1.2.1.0-1	ABT		Operations - Tactical
SuR-7367	3.7.1.12.1.0-2	ABT SMT TBM LCR		Operations - Tactical
SuR-7370	3.7.1.12.3.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7372	3.7.1.12.3.0-2	ABT SMT TBM LCR		Operations - Tactical

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SuR ID	SuR Section	Missions		System States-Modes
SuR-7375	3.7.2.6.2.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7378	3.2.5.2.4.3.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-7405	3.2.5.2.8.2.2.4.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7413	3.3.3.10.0-1	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7437	3.2.1.3.3.0-3	SMT	b(1)	Operations - Tactical
SuR-7490	3.2.1.2.3.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-7491	3.2.1.2.4.1.0-3	ABT TBM		Operations - Tactical
SuR-7500	3.7.1.12.4.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-7501	3.7.1.12.4.0-2	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-7698	3.7.1.12.5.0-1	N/C		Operations - Tactical
SuR-7702	3.7.1.11.2.0-1	N/C		Operations - Configuration Operations - Tactical
SuR-7706	3.7.1.11.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7803	3.3.1.3.0-2	N/C		N/C
SuR-7804	3.3.3.1.0-8	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order

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SuR ID	SuR Section	Missions		System States-Modes
				Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7805	3.3.3.1.0-9	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7806	3.3.3.1.0-11	N/C	b(1)	Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7807	3.3.3.1.0-12	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7810	3.3.3.1.0-1	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7811	3.3.3.1.0-4	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7812	3.3.3.1.0-15	N/C		Movement - Transport Movement - March Order

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SuR ID	SuR Section	Missions		System States-Modes
				Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7813	3.3.3.1.0-16	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7814	3.3.3.1.0-17	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7815	3.3.3.9.0-1	N/C	b(1)	Operations - Configuration Operations - Tactical Operations - Training
SuR-7816	3.3.3.1.0-18	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7817	3.3.3.1.0-19	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7818	3.3.3.1.0-24	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7819	3.3.3.1.0-20	N/C		Movement - Transport

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SuR ID	SuR Section	Missions	b(1)	System States-Modes
				Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7820	3.3.3.1.0-21	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7821	3.3.3.1.0-22	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7822	3.3.3.1.0-23	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7823	3.3.3.1.0-13	N/C		Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7824	3.3.3.6.0-1	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7825	3.3.3.2.0-2	N/C		Operations - Configuration

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SuR ID	SuR Section	Missions		System States-Modes
				Operations - Tactical Operations - Training
SuR-7826	3.3.3.2.0-3	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-7827	3.3.3.2.0-5	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-7828	3.3.3.2.0-4	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-7830	3.3.4.1.0-1	N/C	b(1)	Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7831	3.3.4.1.0-2	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7832	3.3.4.1.0-4	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7833	3.3.4.1.0-3	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace

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SuR ID	SuR Section	Missions	b(1)	System States-Modes
				Operations - Configuration Operations - Tactical Operations - Training
SuR-7835	3.3.4.2.0-1	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7836	3.3.4.2.0-2	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7837	3.3.4.2.0-7	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7838	3.3.4.2.0-6	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7839	3.3.4.2.0-5	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace

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SuR ID	SuR Section	Missions		System States-Modes
				Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7840	3.3.4.2.0-4	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7841	3.3.4.2.0-3	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order Deployment - Emplace Deployment - Displace Operations - Configuration Operations - Tactical Operations - Training
SuR-7859	3.2.5.1.9.1.0-2	ABT SMT TBM LCR	b(1)	Operations - Configuration Operations - Tactical Operations - Training
SuR-7861	3.7.1.1.1-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-7863	3.2.5.2.8.2.1.2.0-2	N/C		Storage - Short-Term Storage - Long-Term Movement - Transport Movement - March Order
SuR-7864	3.2.5.1.7.1.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-7882	3.2.5.1.4.2.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-7884	3.2.5.2.5.0-1	ABT SMT TBM		Operations - Configuration Operations - Tactical Operations - Training

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SuR ID	SuR Section	Missions		System States-Modes
		LCR		
SuR-8411	3.2.5.2.3.0-1	ABT SMT TBM LCR		N/C
SuR-8421	3.3.5.1.5.3.0-1	N/C		Operations - Configuration Operations - Tactical
SuR-8422	3.3.3.19.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-8423	3.3.5.1.4.1.0-2	N/C		Operations - Configuration Operations - Training
SuR-8424	3.3.3.17.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-8427	3.3.5.1.2.0-1	N/C	b(1)	Operations - Configuration Operations - Tactical Operations - Training
SuR-8806	3.2.1.1.2.3.2.0-1	ABT		Operations - Tactical
SuR-8808	3.2.4.2.2.9.0-1	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-8816	3.2.5.2.4.2.2.0-1	ABT SMT TBM LCR		Operations - Tactical
SuR-8817	3.2.5.2.4.2.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical
SuR-8822	3.2.5.2.4.2.2-2	ABT		Operations - Tactical
SuR-8823	3.2.5.2.4.3.0-2	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-8827	3.2.1.3.14.0-3	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-8828	3.2.1.3.14.0-4	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-8829	3.2.1.3.14.0-5	N/C		Operations - Configuration Operations - Tactical

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SuR ID	SuR Section	Missions		System States-Modes
				Operations - Training
SuR-8831	3.3.5.1.1.4.0-1	N/C		N/C
SuR-8832	3.3.5.1.1.2.0-2	N/C		N/C
SuR-8833	3.2.1.5.4.3.0-2	N/C		N/C
SuR-8842	3.2.5.2.8.2.2.1.0-2	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical Operations - Training
SuR-8847	3.2.1.5.4.3.0-3	N/C		N/C
SuR-8848	3.3.6.0-2	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-8852	3.2.5.2.7.0-2	ABT		Operations - Tactical
SuR-8853	3.2.5.2.7.0-3	ABT		Operations - Tactical
SuR-8866	3.2.1.3.13.0-2	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical
SuR-8873	3.3.3.1.0-3	N/C	b(1)	Operations - Configuration Operations - Tactical Operations - Training
SuR-8874	3.3.3.1.0-5	N/C		Operations - Configuration Operations - Tactical Operations - Training
SuR-9646	3.3.5.1.4.1.0-1	N/C		Operations - Configuration Operations - Tactical
SuR-9647	3.3.5.1.1.1.0-2	N/C		Operations - Configuration Operations - Tactical
SuR-9648	3.3.5.1.1.1.0-1	N/C		Operations - Configuration Operations - Tactical
SuR-9649	3.3.5.1.1.2.0-1	N/C		Operations - Configuration Operations - Tactical
SuR-9650	3.3.5.1.1.3.0-1	N/C		Operations - Configuration Operations - Tactical
SuR-9651	3.3.5.1.1.4.0-4	N/C		Operations - Configuration Operations - Tactical
SuR-9653	3.3.5.1.1.4.0-3	N/C		Operations - Configuration Operations - Tactical
SuR-9654	3.3.5.1.1.4.0-2	N/C		Operations - Configuration Operations - Tactical
SuR-9655	3.3.3.21-1	N/C		Operations - Configuration Operations - Tactical
SuR-9708	3.2.2.2.0-1	ABT		Operations - Configuration

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SuR ID	SuR Section	Missions	b(1)	System States-Modes
		SMT TBM LCR		Operations - Tactical
SuR-9709	3.2.2.1.0-1	ABT SMT TBM LCR		Operations - Configuration Operations - Tactical
SuR-9710	3.3.1.2.0-2	N/C		Operations - Configuration Operations - Tactical
SuR-9711	3.2.5.2.2.2.0-3	N/C		Operations - Configuration Operations - Tactical
SuR-9712	3.2.5.2.2.2.0-2	N/C		Operations - Configuration Operations - Tactical
SuR-9866	3.2.1.3.14.0-6	N/C		Operations - Configuration Operations - Tactical
SuR-9870	3.3.1.2.0-3	N/C		Deployment - Emplace Deployment - Displace Operations - Operations Sustainment Maintenance- Corrective Maintenance- Preventive
SuR-9871	3.2.1.2.4.2.0-2	ABT		Operations - Configuration Operations - Tactical Operations - Training
SuR-9872	3.2.5.2.2.2.0-4	N/C		Operations - Configuration Operations - Tactical
SuR-9874	3.3.2.3.0-1	N/C		Movement - Transport Movement - March Order
SuR-9875	3.2.1.1.2.3.3.0-6	ABT		Operations - Tactical
SuR-9876	3.2.1.1.2.3.3.0-9	ABT		Operations - Tactical

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5 (U) Preparation for Delivery

(U) This section is not applicable to this document.

6 (U) Notes

6.1 (U) Acronyms

TABLE XVIII. (U) Acronyms

b(7)(e)	
Acronym	**Phrase/Term**
A	Analysis
A	Ampere
ABCS	Army Battle Command System
ABT	Air Breathing Target
ADSAM	Air Directed Surface-to-Air Missile
AFB	Air Force Base
AGL	Above Ground Level
AMDPCS	Air and Missile Defense Planning and Control Station
b(3)	
AMRAAM	Advanced Medium Range Air-to-Air Missile
b(3)	
Ao	Operational Availability
AR-25-2	Army Regulation 25-2
ARDD	Automatic Rapid Deflation Device
ARM	Anti Radiation Missile
A-Specification	System Specification
b(3)	
b(3)	
BADGER	type of aircraft
b(3)	
b(3)	
b(3)	

(b)(7)(e)	
Acronym	**Phrase/Term**
BM/C4I	Battle Management Command, Control Communication, Computers and Intelligence
C	Celsius
C2	Command and Control
C4I	Command, Control, Communications, Computers and Intelligence
CARC	Chemical Agent Resistant Coating
CBM	Condition Based Maintenance
CCS	Communications and Control Shelter
CDS	Cross Domain Solutions
CEC	Corporative Engagement Capability
CEP	Circular Error Probability
CHS	Common Hardware and Software
CID	Combat Identification
CIO	Chief Information Officer
cm	centimeter
CNIF	Clutter-to-Noise Improvement Factor
COTS	Commercial Off-the-Shelf
CPG	Communication Processing Group (Prime Item)
D	Demonstration
DAA	(1) Designated Approving Authority (2) Designated Accrediting Authority (3) Delegated Accrediting Authority
dB	Decibels
dBsm	Decibels Referenced To One Square Meter
dBW	Decibel Watts
deg	Degrees
DIS	Distributed Interactive Simulation
DISN	Defense Information Systems Network

	(b)(7)(e)
Acronym	**Phrase/Term**
DISR	Department of Defense Information Technology Standards Registry
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DOT	Department of Transportation
E3	Electromagnetic environment effects
EA	Electronic Attack
b(3)	
EED	Electro explosive Device
EID	Electronically-Initiated Device
EMCON	Emission Control
EME	electromagnetic environment
EO/IR	Electro-Optical Infra-red
EOD	explosive ordnance disposal
b(3)	
EPA-17	Environmental Protection Agency 17 Targeted Chemicals (selected for reduction or elimination)
ERP	Effective Radiated Power
ESD	electrostatic discharge
EU	European Union
F	Frequency
FAA	Federal Aviation Administration
FCS	Fire Control System
FL	Florida
fps	feet per second
ft	foot/feet
GATM	Global Air Traffic Management
b(3)	

	(b)(7)(c)
Acronym	**Phrase/Term**
GFE	Government Furnished Equipment
GHz	Gigahertz
GPFU	Gas Particulate Filter Unit
GPS	Global Positioning System
Gs	gravities
GSE	Ground Support Equipment
b(3)	
HLA	High Level Architecture
b(3)	
HMMP	Hazardous Materials Management Plan
hr	hour
I	Inspection
IA	Information Assurance
b(3)	
IBS	Integrated Broadcast Systems
IBSI	Integrated Broadcast Systems Instruction
IDS	Intrusion Detection System
IETM	interactive electronic technical manuals
IFF	Identification Friend or Foe
ISDN	integrated services digital network
ISO	International Standards Organization
b(1)	
JLENS	Joint Land Attack Cruise Missile Defense Elevated Netted Sensor
JNN	Joint Network Node
JRE	Joint Range Extension
b(3)	
kft	kilo-feet
km	kilometer

(b)(7)(e)	
Acronym	**Phrase/Term**
kVA	kilo-Volt-Amperes
LACM	Land Attack Cruise Missile
lb	pound
LCR	Large Caliber Rocket
b(1)	
LPE	Launch Point Estimates
LRU	Line Replaceable Unit
m	Meters
MEADS	Medium Extended Air Defense System
MHz	Megahertz
MILSATCOM	Military Satellite Communications
MIL-STD	Military Standard
mm	millimeter
MSE	Mobile Subscriber Equipment
MSL	Mean Sea Level
MTBSA	Mean Time Between System Aborts
MTTR	Mean Time To Repair
NATO	North Atlantic Treaty Organization
NBC	Nuclear, Biological and Chemical
b(3)	
b(3)	
NGT	Not Greater Than
NISPOM	National Industrial Security Program Operating Manual
NIST	National Institute of Standards and Technology
NLT	Not Less Than
NM	New Mexico
NSA	National Security Agency
O	Objective

	(b)(7)(c)
Acronym	**Phrase/Term**
ORT	Operational Readiness Test
b(3)	
Pd	Probability of Detection
PDETT	Probability of Detection, Evaluation, Transfer and Track to Intercept
PE	Probability of Evaluation
PMCS	Preventative Maintenance Checks and Services
POP	Performance Oriented Packaging
PPLI	Precise Position and Location Indicator
PT1	Part of PDETT - defined in object
PT2	Part of PDETT - defined in object
RCM	Reliability Centered Maintenance
RCS	Radar Cross Section
b(7)(c)	
RF	Radio Frequency
RMS	root mean square
S	Secret
s	second
S/NF	Secret No Foreign Nationals
b(3) b(1) b(3)	
SDP	Signal Data Processor
SHF	Super High Frequency
SIL	System Integration Lab
SINR	signal-to-interference plus noise ratio
SIPRNET	Secure Internet Protocol Router Network
b(3)	
SMT	Surface Moving Target

	(b)(7)(e)
Acronym	**Phrase/Term**
b(3)	
b(3) b(3)	
STAR	System Threat Assessment Report
SATCOM	Satellite Communications
STE	Secure Telephone Equipment
STE	Special Test Equipment
STU	Secure Telephone Unit
SWT	Search-While-Track
T	Test
TACSAT	Tactical Satellite
TADIL J	Tactical Data Information Link J
TBM	Tactical Ballistic Missile
TBR	To Be Refined
TEMPEST	Transient Electromagnetic Pulse Surveillance Technology
TIDP	Tactical Interface Description Product
TLE	Target Location Error
b(3)	
TTP	Tactics, Techniques and Procedures
TWS	Track-While-Search
U	Unclassified
UHF	Ultra High Frequency
UPS	Uninterruptible Power Supply
USMCEB	U.S. Military Communications-Electronics Board
USMTF	United States Message Text Format
UT	Utah
V	volts

	b(7)(e)
Acronym	**Phrase/Term**
VFR	Visual Flight Rules
VHF	Very High Frequency
b(1)	
VMF	Variable Message Format
b(1)	
	b(7)(e)

6.2 (U) Glossary of Definitions

TABLE XIX. (U) Glossary Of Definitions

~~SECRET~~	
Term	**Definition/Meaning**
50% Reserve	It means that the system can use 66 2/3% for each computer leaving 33 1/3% as the reserve.
A safe state	A safe state is a non-empty set of "non-OFF" states that the system and/or software can be in where hazard or mishap occurrence is eliminated or at its lowest level. While OFF can be considered a safe state, it is usually not applicable in dealing with software-safety.
Accept	The term 'accept' is used in the context of a software interface to indicate that the software item that receives the message ('the receiver') acknowledges receipt (to the 'sender') and processes the contents of the message.
Act upon	The receiving prime item will acknowledge the receipt of a command/message and either place the item into its time line or respond that it will not comply.
Aerostats	The aerostat is an aerodynamically shaped, lighter-than-air vehicle that is buoyed aloft using helium as the lifting gas. The buoyant lift supports the total weight of the payload, the aerostat, electronics and tether. The aerostat is operated with sufficient lift to provide a margin of safety against precipitation consisting of rain and snow, and atmospheric turbulence. b(3)
b(3)	
Airborne Payload	The payload consists of a radar, an EO/IR sensor, and a communications payload. The sensors for the surveillance system are a surveillance radar and an IFF located on one of the aerostats. One aerostat houses the surveillance radar with a corresponding IFF, while the second aerostat houses the fire control radar with a corresponding IFF. The surveillance radar and fire control radar IFF electronics are of an identical design except for the beam forming network and the number of antennas required. There are two communications payloads,

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Term	**Definition/Meaning**
	which are of identical design, with one being located on each aerostat.
Air-Directed Surface-to-Air Concept	b(3)
Air-Directed Surface-to-Air Missile Defense	b(3)
Altitude	For the purposes of the JLENS Orbit, and its components, altitude is considered to be the vertical distance measured from mean sea level, unless otherwise stated.
Ambiguity group	A single ambiguity group is defined as no greater than five line replaceable units (LRUs).
Analysis (A)	Analysis is the method used to verify requirements by determining qualitative and quantitative properties and performance of the system by studying and examining engineering drawings, software, and hardware flow diagrams, software and hardware specifications, and other software and hardware documentation (e.g., commercial of-the-shelf (COTS) vendor documentation). It also includes performing modeling, simulation, and/or calculations and analyzing the results. Analysis techniques include interpretation or interpolation/extrapolation of analytical or empirical data collected under defined conditions.
Appropriate Operational Mode	The required mode of the system which is required for performing a function.
Associated	When referring to a Prime Item or portion thereof, the term associated means that it is the one in the same system (Surveillance or Fire Control). For example, in the Surveillance System, if the CPG is sending a message to the associated radar then the radar would be the SuR.
Associated Measurement Report (AMR)	Consists of target measurement data, (target position, velocity, and accuracy) associated with a local track
Assure	Provide availability, integrity, authentication, confidentiality, and nonrepudation of information generated or received by JLENS systems in order to prevent

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Term	**Definition/Meaning**
	unfriendly and unauthorized influence, disruption, corruption, or usurpation of human and automated decision making.
Availability	The state when data are in the place needed by the user, at the time the user needs them, and in the form needed by the user.
b(3)	
Barrier	Any mitigation technique which reduces the probability of a hazard or lessens the severity of a hazard. A mitigation technique can be a safety device (i.e. interlock), warning system, procedure, label, or training program.
Battle Management	Automated responses to command and control (C2) system control directives. Responses may include or incorporate fusion data from one or more sources or sensors, automated weapon tasking and information for summaries of performance assessment.
Be protected	Equipment is packaged in a manner such that no repair is required to assemble and perform to specifications after this event.
Benign weather	clear weather and air
Best Commercial Practices	Defined by the best of private-sector business practices.
b(3)	
b(3)	
Bypassable Interlock	A bypassable interlock is an automatic switch with a manually operated electrical bypass device to allow equipment maintenance operations on energized equipment.
C4 Node	The physical and functional grouping of communications and computer system that provide terminating, switching, and gateway access services to support information exchange.
Classification	The process and result of determining the type of platform represented in a track through an analysis of target characteristics. A classification includes whether or not a target is manned or unmanned, fixed or rotary wing, Flogger or F-15,

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Term	**Definition/Meaning**
	and tracked or wheeled vehicles. Note classification is not part of the IFF interrogations.
Clear weather and air conditions	b(3)
Combat Identification	b(3)
Comm. Out	No communication is available
Command and Control	The exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of the mission.
Communications Connectivity	The degree to which communications can be maintained throughout the chain of command.
Confidentiality	Assurance that information is not disclosed to unauthorized entities or processes.
Configuration (for manual update)	
CONOPS	A description of the desired system characteristics from an operational point-of-view.
Critical failures	Those failures which make the system no longer able to perform the mission critical functions
Critical System Characteristics	Design features that drive program risks and determine the system's success in meeting their primary and second missions, individually and as an Orbit. These include, but are not limited to Survivability, transportability, b(3) and interoperability.
b(3)	
b(3)	

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Term	**Definition/Meaning**
b(3)	
Data Registration	A process whereby data developed in a fire unit / radar coordinate system is sent externally via Link 16 or other networks to a system (or systems) with different coordinate framework, thus introducing errors.
Data Types	Initialization parameters, changed parameters, operator intervention, external messages, track data, status, CID-related products, b(3) voice communications, operator video screens/positions, and organic weather data.
Day/Night Capabilities	Day capabilities require the ability to receive reflected energy. Night capabilities require the capability to receive radiated energy.
Degradation	When radar windscreen and/or radiating elements are coated with dust, fungus, salt, sand, water or ice, radar performance degradations is permitted until the windscreen/radiating elements have been thoroughly cleaned and/or dried, and if appropriate evaluated.
Degrade	To make inferior to the normal condition, to damage. Denotes a reduction in inherent capabilities compared to those of the undegraded normal condition
Demonstration (D)	An exhibition of the operability or supportability of an item under intended service use conditions. Sufficient data for requirements verification can be obtained by observing functional operation of the system, or a part of the system, without the use of instrumentation or special test equipment beyond that inherently provided in the system being verified.
Detection	A process by which the sensor determines the existence and location of a target in sufficient detail to initiate a track without a priori knowledge of the target.
Discrimination	The process of determining whether a track is aerial or surface.
Distributed evenly (in azimuth and elevation)	
Doctrine	Standard Tactics, techniques and procedures (TTP) defined for each branch of the joint armed forces, and within each.
ECEF	The earth-centered, earth-fixed (ECEF) coordinate system (often called the geocentric frame) consists of a three-dimensional orthogonal axis frame centered at the center of mass of the earth. The x-axis extends from the center of the earth through (0, 0) latitude and longitude; the y-axis also is in the equatorial

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Term	**Definition/Meaning**
	plane and intersects the x-axis at a right (90 degree) angle; lastly, the z-axis extends from the earth center and coincides with the earth axis of rotation.
Electromagnetic Environment Effects (E3)	The impact of electromagnetic environments on the operational capability of military forces, and equipment. This encompasses compatibility, interference, vulnerability, EMP, protection, personnel hazards, ordnance, volatile materials, and natural phenomenon.
Electronic Attack	A type of warfare employing electromagnetic, directed energy, to attack personnel, facilities or equipment.
Electronic Protection	Action and procedures taken to protect personnel, facilities and equipment in the event of EA.
Emplacement Mode	In the Emplacement Mode, a system or systems is/are in the process of being unpacked and physically integrated at an operations site.
Enclave	A total network made up of all the interconnected computer systems, communication systems, and network components within some logical boundary, usually a boundary device such as a router or firewall.
Examination (E)	An element of verification that is generally non-destructive and typically includes the use of sight, hearing, smell, touch and taste; simple physical manipulation; and mechanical and electrical gauging and measurement.
External Sources	Non-organic sensors that provide cueing data to the JLENS system.
b(3)	
Fail-Safe	A design feature that ensures the system remains safe, or in the event of a failure, causes the system to revert to a state that will not cause a mishap. (From MIL-STD 882D Appendix A)
Fail-Safe Safety Device	A safety device (i.e. by-passable interlock) which if fails, does not allow the system to be in a hazardous mode. A fail-safe safety device can be

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Term	**Definition/Meaning**
	implemented by use of two independent redundant safety devices which have the ability to indicate that one is failed.
Failure	The loss of ability of a system, device or process to perform a required function. The manifestation of a fault.
Failure Detection	The process of identifying and reporting the presence of a failure within a system, device or process.
Failure Isolation	The process of determining the location of a fault to the extent necessary to effect repair.
False Tracks	A track when there is no object in the area being tracked.
Fault	A condition within a system, device or process which causes lack of ability to perform a required function. The root cause of a failure.
[redacted]	b(3)
Field of View	The volume of space in which the sensor can make detections at any instant in time. This is basically controlled by [redacted] b(3)
Fire Control Radar	Radar used to provide target information inputs to a weapon fire control system
Fire Control Support	Providing target location and trajectory information of sufficient quality to be used by the weapon system performing the engagement
Fragile Component	[redacted] b(3)
Freeware	Computer software that is made available free of charge, but which is copyrighted by its developer, who retains the rights to control its distribution, modify it and sell it in the future. It is typically distributed without its source code, thus preventing modification by its users.
Functionally Operational	Condition in which all units of the system are powered on and are capable of accepting commands and reporting status. For most units this is equivalent to being in a standby state.
Graceful	Degradation of a system or subsystem in such a manner that it continues to

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Term	**Definition/Meaning**
Degradation	operate, but provides a reduced level of service rather than failing completely.
Ground Support Equipment	Equipment which is used on the ground to support the system functions. They include modules for power conversion, power distribution, cable storage, weather monitoring equipment, and special test equipment as a subset.
Hardness	When applied to NBC, hardness is defined as the ability of a material to resist damaging effects from both chemical and biological agents and decontaminating chemicals and procedures. Hardness applies to the characteristics of a material essential to perform mission critical functions.
Hash	Value computed on data to detect error or manipulation.
Hazard	Any real or potential condition that can cause injury, illness, or death to personnel; damage to or loss of a system, equipment or property; or damage to the environment. Hazards are classified into Mishap Risk Categories by the System Safety Working Group voting members.
Hazardous Condition	Follows from the definition of *Hazard*, see 6.2 *Hazard*
Hereby	This is used when the it is in a sentence that is granting a right/privilege, etc.
High Risk	(IA) If an observation or finding is evaluated as high risk, there is a strong need for corrective measures. An existing system may continue to operate, but a corrective action plan must be put in place as soon as possible.
High-Robustness	Robustness describes the strength of mechanism b(3) and assurance properties (i.e., confidence measures taken eto ensure proper mechanism implementation) for an IA solution. The more robust a particular component is, the greater level of confidence in the protection provided to the security services it supports. High robustness security services and mechanisms provide, thorugh rigorous analysis, the most confidence in those security meachanisms. Generally b(3)
IA product	Product or technology whose primary purpose is to provide security services (for example, confidentiality, authentication, integrity, access control, or non-repudiation of data); correct known vulnerabilities; or provide layered defense against various categories of non-authorized or malicious penetrations of information systems or networks. Examples include such products as

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Term	**Definition/Meaning**
	data/network encryptors, firewalls, and intrusion detection devices.
IA-enabled product	Product or technology whose primary role is not security, but which provides security services as an associated feature of its intended operating capabilities. Examples include such products as security-enabled web browsers, screening routers, trusted operating systems, and security-enabled messaging systems.
b(3)	
In-Band Frequencies	In-band frequencies of SuR antenna-connected equipment are as defined here: b(1) b(3)
Information system	Any equipment or interconnected system or subsystems of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data and that includes computer software, firmware, and hardware. Included are computers, word processing systems, networks, or other electronic information handling systems and associated equipment.
b(3)	
Inspection (I)	Inspection is the verification method used to verify characteristics of an item by inspecting engineering documentation produced during development or by inspection of the product itself to verify conformance with specified requirements. Inspection is nondestructive and consists of visual inspections or simple measurements without the use of precision measurement equipment. Inspection typically applies to a single parameter or attribute with a yes/no answer.
Integrated Broadcast Service	b(3)
Integrity	The degree of protection for data from intentional or unintentional alteration or misuse.
Interchangeable	An item which function and physical characteristics are equivalent in performance, reliability, and maintainability, to another item with similar to

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Term	**Definition/Meaning**
	identical purposes. Exchange of these items must not require alteration of themselves or adjoining items, except for adjustment.
Interlock	An interlock is an automatic switch which eliminates all power from the equipment when an access door, cover or plate is removed.
Intermittent	Some interruptions in communications occur.
Internal Sources	Sources which are components of the JLENS Orbit.
Interoperability	The ability of systems, units, or forces to provide services to and accept services from other systems, units, or forces and to use the services so exchanged to enable them to operate effectively together. The condition achieved among communications/electronics systems or items of communications/electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their uses.
ISO Shelter	A Family of shelters built according to International Organization for Standardization specifications. These shelters can be vehicle mounted or stand-alone, and can have a variety of options depending on the intended use. The standardization facilitates handling and shipping by worldwide military and commercial carriers, shippers, charter companies, and using agencies.
Joint Data Network	The collection of near-real time communications and information system used primary at the coordination and execution levels. Family of Tactical Data Link networks where joint participants exchange situational awareness, command, and control data for joint operations.
JTAMD	Joint Theater Air and Missile Defense. The integration of joint force capabilities to destroy enemy theater aircraft and missile in flight or prior to launch or to otherwise disrupt the enemy's computers and intelligence sources.
Kill assessment data	Features derived from post-intercept radar target/debris suitable for a kill assessment determination. At a minimum this data could consist of a lost track report (providing the track was lost).
Kill assessment support	Collection and reporting of data which could aid another in determining kill assessment.
LACM	Land Attack Cruise Missile
LCR	Large Caliber Rocket.
Least privilege	Principle that requires that each subject be granted the most restrictive set of privileges needed for the performance of authorized tasks. This also applies to

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Term	**Definition/Meaning**
	system privileges that might not be needed to perform their assigned job. NOTE: Application of this principle limits the damage that can result from errors, and accidental and unauthorized use of an IS.
LEMP - Lightning Electromagnetic Pulse	An electromagnetic pulse (EMP) generated by a lightning strike or in the vicinity (within approximately 1.5 kilometers) of a lightning event.
Line-of-sight	An unobstructed path between sending and receiving antennas.
Low	A height between five hundred and two thousand feet.
Low Risk	(IA) If an observation is described as low risk, the system's DAA must determine whether corrective actios are still required or decide to accept the risk.
Machine Executable Public Domain Software Products	Software not protected by copyright laws of any nation that carries no warranties or liabilities, and may be freely used without permission of or payment to the creator.
Man lift	Work platform, either scissors lift or boom lift (cherry picker).
March Order	1. Consists of all of the actions needed to prepare the systems to move. It begins when the system commander acknowledges receipt of the order to prepare to move; and ends when the last vehicle crosses the start point designed in to the order. If no start point is designated, march order ends when the last vehicles reports ready to move. 2. Military movement using organic means. For air defense systems march order is moving in convoy to the next assigned area per higher echelon command.
Mean Logistic Time Delay	The arithmetic average of the logistic delay time associated with system failures that degrade performance below the mission reliability performance measured over an operating cycle. Causes include: spare or repair parts, documentation, test equipment and personnel inadequacy.
Medium Risk	(IA) If an observation is rated as medium risk, corrective actions are needed and a plan must be developed to incorporate these actions within a reasonable period of time.
Medium Range Resolution	Radar waveform with range resolution corresponding to [redacted] b(3) [redacted]
Mishap	An unplanned event or series of events resulting in death, injury, occupational

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Term	**Definition/Meaning**
	illness, damage to or loss of equipment or property, or damage to the environment.
Mishap Risk Category	A classification of the total risk of a hazard when considering the hazard's severity and probability altogether. See Table XVI.
Mission	The primary activity for a system or Orbit. For JLENS, missions are defined for the Orbit and also for Surveillance System and for the Fire Control system.
Mission Abort	A mission abort is the result of failure to conduct Orbit level JPS defined Mission Critical Functions. Also, to terminate a mission for a reason other than enemy action. It may occur at any point after the beginning of the mission and prior to its completion.
Mission Critical Failure	See Mission Abort
Mission Critical Functions of the Communications and Processing Group	Provide encoding and decoding of fiber-optic data. Provide communication capabilities between JLENS systems and external nodes using Link-16 and CEC. Provide a controlled environment for system personnel. Provide control stations for Mission Operations and Mission Support. Provide data and power interfaces to the radar SDP.
Mission Critical Functions of the Fire Control Radar	Contribute to the Single Integrated Air Picture. Detection of ABTs, TBMs, LCRs, and/or SMTs at ranges commensurate with the target signature. Provide handover quality track data to weapon systems in order to support the required engagement ranges. Provide Combat Identification data in order to support engagements.
Mission Critical Functions of the Platform	Platform Monitoring and Control. Lightning Protection. Electric Power Generation, Transmission, and Distribution. Payload Attachment and Support. Launch, Operation, Retrieval, and Mooring. Fiber Optic Data Transfer
Mission Critical Functions of the Surveillance Radar	Contribute to the Single Integrated Air Picture. Detection of ABTs, TBMs, LCRs, and/or SMTs at ranges commensurate with the target signature. Provide handover quality track data to the fire control system in order to support the required engagement ranges.
Mission Profile	The complete set of operating parameters for radar and communications systems to execute the assigned mission. Mission profile will include radar surveillance sectors, frequency exclusion, mission tracking priorities, network time slot allocations, doctrine, and etc.

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Term	**Definition/Meaning**
Mobile Code	Software modules obtained from remote systems, transferred across a network, and then downloaded and executed on local systems without explicit installation or execution by the recipient. Examples of mobile code include scripts (JavaScript, VBScript), Java applets, ActiveX controls, Flash animations, Shockwave movies (and Xtras), and macros embedded within Office documents.
Mode	A second-level defined descriptive system status. The systems can be in more than one mode simultaneously.
Modular connectivity point	Any attachment point which uses standard connectors, for example a hole that can be used to attach something with a nut and bolt.
Near (Lightning)Strike	A cloud-to-ground lightning strike which creates the following conditions: Electromagnetic fields from near strike lightning (cloud-to-ground) Magnetic field rate of change @ 10 meters 2.2x109 A/m/s; b(3)
Node	In network topology, a terminal of any branch of a network or a terminal common to two or more branches of a network.
Non-bypassable Interlock	An interlock that cannot be bypassed.
Non-fragile Components	b(3)
Non-operate	Is defined to mean that, while non-operating, in its deployed or non-deployed state, or in transportation, the JLENS equipment will maintain its mechanical and electrical integrity without damage, deterioration or degradation of performance, reliability or maintainability.
Off Road	Consists of moderately smooth surface made up of small rocks, sand, dirt, chert, and may have some potholes approximately 6 inches deep.
Operate	Is defined to mean that, while in operation in its deployed state, the JLENS equipment maintains its mechanical and electrical integrity without damage, deterioration, or degradation of performance, reliability or maintainability, with the singular exception that performance degradation is permissible in rain.
Operational Availability	The probability that a JLENS System is available at the start of its mission. It is a function of b(3)

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Term	**Definition/Meaning**
	b(3)
Operational Readiness Test	Ground Testing conducted prior to launch in order to help ensure that the system will operate when elevated to station at operational altitude.
Payload	The load which the aerostat is designed to lift to an operation altitude under specified conditions of operation.
b(3)	
Performance	Required performance is described in the JLENS System Specification.
Performance Degradation in b(3)	A permitted reduction in capability for a specified b(3) For JLENS, this is defined as a b(3)
Performance Specification	A specification that states requirements in term of the required results with criteria for verifying compliance, but without stating the methods for achieving the required results. A performance specification defines the functional requirements for the item, the environment in which it must operate, and interface and interchangeability characteristics. Both defense specifications and program-unique specification may be designated as a performance specification.
Periodic	Only operates non-continuously, often at a set interval.
Physical Positioning	During the emplacement mode the SuR payload hardware must be physically positioned on and secured to the aerostat.
Platform	The platform is a self-contained, rapidly deployable 71M class aerostat system that provides a platform for the sensor and communication payloads. There are four primary elements of the platform: a. Aerostat, b. Mobile Mooring Station, c. Tether Subsystem, d. Ground Support Equipment.
Platform	The Platform Prime Item elevates the sensor and communications payloads, as well as moors the aerostat to the ground station. The Platform Prime Item provides health and status data to the Processing Station. It is a self-contained, rapidly deployable 71M class aerostat system that provides a platform for the sensor and communication payloads. There are four primary elements of the platform, which are the Aerostat, Mobile Mooring Station, Tether Subsystem, and Ground Support Equipment.
POP	The Performance Oriented Packaging (POP) Program of the Defense Logistics

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Term	**Definition/Meaning**
	Agency (DLA) is intended for use by DoD and other approved agencies of the United States Government and provides assistance to obtain DoD-tested packaging in which to ship hazardous materials. It provides functionality to make labels compatible in size and format with Title 49 CFR and United Nations requirements. The POP Program may be accessed via the Internet off the Defense Distribution Center (DDC) web page.
Power Converter Module (PCM)	As part of the Ground Support Equipment (GSE), is responsible for conditioning source power and distribution of 60 and 400 Hz power for the associated system equipment.
Prepared Site	As stated above
Primary Networks	Link-16 and CEC
Primary Road	Two or more lanes, all weather, maintained, hard surface (paved) roads with good driving visibility used for heavy and high density traffic. These roads have lanes with minimum width of 2.75 m (108 inches), road crown to 2 degrees and a legal maximum gross vehicle weight /gross combat weight (GVW/GCW) for the country or state is assumed for all bridges. The Munson Test Area High Speed Paved Road Course and the Perryman Area High Speed Road Course at Aberdeen Proving Ground (APG) are representative of primary roads.
Prime Item	The four Prime Items are the Platform, Surveillance Radar, Fire Control Radar, and Communications and Processing Group.
Prime Item Design Specification (PIDS)	A document which defines requirements and design constraints for the Prime Items.
Prime Power	All prime power that is applied to a JLENS system enters the system through the associated power module which is part of the platform ground support equipment. For flight safety and other reasons, an important aerostat action that can occur is an emergency in-haul. To assure with high likelihood that sufficient power is available in this emergency, provision is made for a backup generator if commercial power fails, and if prime power is obtained from a primary generator, provision is made for an emergency or secondary generator should the primary generator fail. These power sources, commercial power, the primary generator, and the secondary generator, enter the platform's power module through a transfer switch which permits the rapid transition among these power

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Term	**Definition/Meaning**
	sources.
b(3)	
Probability of Successful Transfer	
b(3)	
Protect	Measures that are taken to keep nuclear, biological, and chemical hazards from having an adverse effect on personnel, equipment, or critical assets and facilities. Protection consists of five groups of activities: hardening of positions, protection of personnel, assuming mission-oriented protective posture, using physical defense measures and reacting to attack.
Radar Horizon	The locus of points at which the ray from a radar antenna become tangential to the Earth's surface. On the open sea this locus is horizontal but on land it varies according to the topographical features of the terrain.
Radio Silent Mode	Mode where all RF radio communication devices are not transmitting. This includes any affiliation signaling for being part of an active network.
Reliability	
Reserve Capacity	See 50% Reserve Capacity
Road Hazard	See "hazard" definition
Road March Mode	When an individual or multiple prime item(s) is/are being re-located by standard military vehicles over primary and secondary roads to a designated emplacement site.
Safety Critical Code	Safety Critical Code is any code that is used as part or all of a Safety Critical Function.
Safety Critical Data	Safety Critical Data is any data used in computations during a Safety Critical Function.
Safety Critical Function	A Safety critical function is any function that meets any of the following criteria:

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Term	**Definition/Meaning**
	a. Exercises direct command and control over the condition or state of hardware. When not performed correctly could directly or indirectly cause or allow a hazardous condition b. Monitors the state of hardware components. When not performed correctly could provide data that results in erroneous decisions by human operators or companion systems that could cause a hazard c. Safety critical functions are not only those functions that could cause hazards to exist, but they could prevent hazards by detecting the presence of a hazardous condition, providing notification that a hazardous condition exists, attempting to control or reduce the severity or probability of a hazardous condition, or returning the system to a non-hazardous condition.
Safety Device	Hardware or software, which is part of the JLENS Orbit which provides protection for personnel, the environment, military equipment or property as its primary or secondary purpose.
b(3)	
Secondary Networks	Networks which are not used for primary (CEC and Link-16) data dissemination. May include the following: a. Defense Information Systems Network (DISN) b. Military Satellite Communications (MILSATCOM) c. Super High Frequency STCOM d. Ultra High Frequency SATCOM e. Secure Telephone Unit-III (STU-III)/Secure Telephone Equipment f. Multiple Subscriber Equipment/Joint Network Node g. Secure Internet Protocol Router Network.
Secondary Road	Two lanes, all weather, occasionally maintained, hard or loose surface, (e.g. large rock, paved, crushed rock, gravel) intended for medium-weight, low density traffic. These roads have lanes with minimum width of 2.5 m (98.5 inches) and no guarantee that the legal maximum GVW/GCW for the country

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Term	**Definition/Meaning**
	or state is assured for all bridges. The Munson Test Area Improved Gravel Road Course and the Belgian Block Course, in addition to the Perryman Area Secondary Road, Course A and B at Aberdeen Proving Ground (APG) are representative of secondary roads
Security Principle of Least Privilege	Users are only allowed to access the minimum information required to perform their duties. (Access control) Requires that in a particular abstraction layer of a computing environment, every module (such as a process, a user or a program on the basis of the layer being considered) must be able to access only such information and resources that are necessary to its legitimate purpose.
Shareware	see "freeware"
SIAP	b(3)
Single point of failure	Any hardware or software that can, which is not compensated for redundancy or alternative operational procedure, whose failure would result in a mishap.
Single Scan Probability of Detection	The probability of detection achieved during a scan of the surveillance volume that includes three coherent dwells on every available azimuth transmit beam position at a fixed elevation pointing.
SMT	Any object moving on the surface with a specified b(3)
b(3)	
State	A first-level defined system descriptive status. The system is always in a singular state.
State-of-the-art	To be defined at the time of Prime Item Critical Design Readiness Review.
Subsystem	A subsystem is a set of a functions performed by specified hardware and software, which cannot operate independently to accomplish system or system-of-system requirements.
Survivability	Includes all aspects of protecting personnel, weapons, and supplies while simultaneously deceiving the enemy. Encompasses planning and locating position sites, designing adequate overhead cover, analyzing terrain conditions and construction materials, selecting excavation methods, and counter the effects of direct and indirect fire weapons. The capability of the system and

Term	Definition/Meaning
	crew to avoid or withstand a man-made hostile environment without suffering an abortive impairment of its ability to accomplish its designated mission.
Survive	When exposed to any one event which may impair the ability of a JLENS System to perform Mission Critical Functions b(3) the system may need repairs. These b(3) This definition does not include the aerostat. In the context of the platform components excluding the air vehicle, unless otherwise noted, "Survive" means that when exposed to any single threatening event, the components may need repairs. b(3)
System	The JS2 consists of two systems: fire control system and surveillance system. Each system consists of 3 of the 4 prime items. Three of the prime items are interchangeable with added hardware, and the 3rd is the associated sensor payload.
System Specification	A type of program-unique specification which describes the requirements and verification of the requirements for a combination of elements that must function together to produce the capabilities required to fulfill a mission need, including hardware, equipment, software, or any combination thereof.
System-of-Systems	The JS2 Orbit is considered a system-of systems. The Orbit is comprised of the Fire Control System and the Surveillance System, each of which can be used independently. To meet certain requirements, it is necessary that the systems be assembled into an Orbit.
Tending Toward Saturation	Industry used term to describe Relative Humidity in cold air since colder air has the capacity to hold less than warm air.
Test	Test is the verification method by which the operability, supportability, performance capability or other specified qualities of an item are verified when subjected to controlled conditions that are real or simulated. These verifications may require use of special test equipment and instrumentation that is not an integral part of the system being verified to obtain quantitative data for analysis, as well as qualitative data derived from displays and indicators inherent in the item(s) for monitor and control.
Tether	It holds the aerostat in position and is the single mechanical link between the aerostat and the Mobile Mooring Subsystem. b(3) The braid provides a

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Term	**Definition/Meaning**
	conducting path for lightning.
Tether Jacking	A semi-conducting material that drains charge from the aerostat.
Total Surveillance Volume	The volume of space in which the sensor can make detections in any of its possible missions. For the Surveillance Radar this encompasses, relative to the local horizontal plane, a b(3)
The JLENS Orbit	It is comprised of the JLENS Surveillance System and the JLENS Fire Control System with no additional hardware or equipment.
The Mobile Mooring Station (MMS)	A subsystem capable of launching and recovering the aerostat and securing it in a moored condition while weathervaning. The MMS provides the tether interfaces for power and communication. The MMS, also, provides the accessibility to the payloads for maintenance.
The Orbit	See "The JLENS Orbit"
Threat	Any entity with the means and motive to cause harm to personnel or vital resources. For air and missile defense systems threats are manned or unmanned fixed and rotary aircraft, land attack cruise missiles, and ballistic missiles. Threats could also encompass countermeasures which degrade the system and make it more vulnerable.
Transport Mode	The Transport Mode is defined as mode when a system or multiple systems is configured to meet requirements when the being transported by land (including rail), sea, or air.
Unimproved Road	Represented by the Perryman Cross-Country Course No. 1.
Unintentional Emissions	Emissions from equipment that is not intended to produce radiation.
Valid Airborne Target Track	A track on a target which complies with the parameters in 3.1.4.1 Table II.
Vulnerability	2. The characteristics of a system that cause it to suffer a definite degradation (incapability to perform the designated mission) as a result of having been subjected to a certain level of effects in an unnatural hostile environment. 3. In information operations, a weakness in information systems security design, procedures, implementation, or internal controls that could be exploited to gain unauthorized access to information or information system.

	~~SECRET~~
Term	**Definition/Meaning**
Windscreen	A streamlined air-filled compartment attached beneath the Aerostat to provided shelter to part of the sensor payloads from dust, wind and other environmental effects.
	~~SECRET~~

6.3 (U) Deleted

6.4 (U) System Traceability Matrix

TABLE XXI-I: (U) System Traceability Matrix - A-Spec

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-19	3.2.1.0-1	3.2.1.1.1.1.3.0-1	
SuR-71	3.2.1.2.4.1.0-1	3.2.1.2.2.6.1.0-1	
SuR-74	3.2.1.2.4.2.0-1	3.2.1.2.2.6.2.0-1	
SuR-78	3.2.1.2.5.1.0-1	3.2.1.2.2.7.1.0-1	
SuR-82	3.2.1.2.5.2.1.0-1	3.2.1.2.2.7.2.1.0-1	
SuR-88	3.2.1.2.5.2.3.0-1	3.2.1.2.2.7.2.3.0-1	
SuR-128	3.2.1.3.9.0-1	3.2.1.2.3.1.0-1 3.3.3.7.0-1	
SuR-346	3.2.4.2.2.1.0-2	3.2.4.2.1.0-1	
SuR-349	3.2.4.2.2.2.0-1	3.2.4.2.2.0-1	
SuR-352	3.2.4.2.2.3.0-1	3.2.4.2.3.0-1	
SuR-355	3.2.4.2.2.4.0-1	3.2.4.2.4.0-1	
SuR-358	3.2.4.2.2.5.0-1	3.2.4.2.5.0-1 3.2.4.2.6.0-1 3.2.4.2.5.0-2	
SuR-367	3.2.4.2.2.7.0-1	3.2.4.2.7.0-1	

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-370	3.2.4.2.2.8.0-1	3.2.4.2.8.0-1	
SuR-410	3.2.1.5.4.3.0-1	3.2.4.4.1.0-1 3.2.4.4.5.0-1	
SuR-423	3.2.5.1.3.1.0-1	3.2.5.1.3.1.0-1	
SuR-426	3.2.5.1.3.2.0-1	3.2.5.1.3.2.0-1	
SuR-429	3.2.5.1.4.1.0-1	3.2.5.1.4.1.0-1	
SuR-436	3.2.5.1.5.1.1.0-1	3.2.5.1.5.1.1.0-1	
SuR-451	3.2.5.1.6.1.0-1	3.2.5.1.6.1.0-1	
SuR-464	3.2.5.1.8.1.0-1	3.2.5.1.8.1.0-1	
SuR-472	3.2.5.1.9.1.0-1	3.2.5.1.9.1.0-1	
SuR-478	3.2.5.1.10.0-1	3.2.5.1.10.0-1	
SuR-482	3.2.5.1.11.1.1.0-1	3.2.5.1.11.1.0-1 3.2.5.2.2.1.0-1	
SuR-486	3.2.5.1.11.2.1.0-1	3.2.5.1.11.2.1.0-1	
SuR-489	3.2.5.1.11.2.2.0-1	3.2.5.1.11.2.2.0-1	
SuR-495	3.2.5.1.12.1.0-1	3.2.5.1.12.1.0-1	
SuR-498	3.2.5.1.12.2.0-1	3.2.5.1.12.2.0-1	
SuR-501	3.2.5.1.12.3.0-1	3.2.5.1.12.3.0-1	
SuR-509	3.2.5.2.1.1.0-1	3.2.5.2.1.1.0-1	

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-519	3.2.5.2.2.2.0-1	3.2.6.1.1.3.0-1 3.2.6.1.1.0-1 3.2.6.1.2.1.0-1 3.2.6.1.2.2.0-1 3.2.6.1.2.3.0-1 3.2.6.2.1.0-1 3.2.6.3.1.0-1 3.2.6.3.2.0-1	
SuR-521	3.2.5.2.2.3.0-1	3.2.5.2.2.2.0-1	
SuR-523	3.2.5.2.2.4.0-1	3.2.5.2.3.3.0-1	
SuR-534	3.2.5.2.4.2.2-1	3.2.5.2.5.1.2.2.0-1	
SuR-538	3.2.5.2.4.4.0-1	3.2.5.2.5.2.0-1	
SuR-546	3.2.5.2.6.1.0-1	3.2.5.2.7.0-1	
SuR-552	3.2.5.2.8.2.2.1.0-1	3.2.5.2.9.2.2.1.0-1	
SuR-558	3.2.5.2.8.2.2.3.0-1	3.2.5.2.9.2.2.3.0-1	
SuR-599	3.2.6.1.1.0-1	3.2.5.1.5.1.2.0-1 3.2.5.1.5.2.2.0-1 3.2.5.1.6.2.0-1 3.2.5.1.7.2.0-1	

SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
		3.2.5.1.9.2.0-1 3.2.5.1.11.2.2.0-1 3.2.6.1.1.1.0-1 3.2.6.3.1.0-1 3.2.3.3.0-1 3.5.3.0-1 3.5.3.0-2 3.2.5.2.9.2.1.1.0-1 3.2.6.4.2.0-1 3.2.5.2.6.2.0-1 3.2.5.1.9.2.0-2	
SuR-601	3.2.6.1.3.0-1	3.2.6.4.4.0-1	
SuR-616	3.3.3.1.0-6	3.3.3.1.0-1	
SuR-618	3.3.3.12.0-1	3.3.3.6.0-1	
SuR-658	3.3.5.2.0-1	3.3.5.2.0-1	3.3.5.2.0-1
SuR-662	3.3.5.3.1.0-1		3.2.1.2.5.0-2
SuR-669	3.3.6.0-1	3.2.1.2.3.14.0-1	
SuR-685	3.3.7.5.0-1	3.2.1.2.3.15.6.0-1 3.2.1.2.3.15.7.0-1	

SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-691	3.2.1.5.3.0-1	3.2.1.2.5.5.0-1	
SuR-709	3.5.2.2.1.0-1	3.5.2.2.2.0-1	
SuR-712	3.5.2.2.2.0-1	3.5.2.2.3.0-1	
SuR-718	3.5.4.0-1	3.5.4.0-1	
SuR-719	3.5.4.0-2	3.5.4.0-2	
SuR-726	3.3.2.1.0-1	3.3.2.1.0-1	
SuR-731	3.5.5.1.0-1	3.5.6.1.0-1	
SuR-734	3.5.5.2.0-1	3.5.6.2.0-1	
SuR-827	3.2.4.1.1.1.0-1	3.7.2.1.1.1.0-1	
SuR-829	3.2.4.1.1.2.0-1	3.7.2.1.1.2.0-1	
SuR-831	3.2.4.2.1.0-1	3.7.2.1.2.0-1	
SuR-835	3.2.3.1.0-1	3.7.2.1.4.0-1	
SuR-838	3.2.1.3.8.1.0-1	3.7.2.1.6.1.0-1	
SuR-840	3.2.1.3.7.0-1	3.7.2.1.7.0-1	
SuR-842	3.2.1.3.6.0-1	3.2.1.2.3.11.0-1 3.7.2.1.8.0-1	
SuR-844	3.2.5.2.4.1.0-1	3.2.1.2.3.9.0-1	
SuR-853	3.2.1.3.5.5.0-1	3.7.2.1.10.0-1	
SuR-858	3.3.7.1.0-1	3.7.2.1.12.1.0-1	

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-860	3.3.7.2.0-1	3.7.2.1.12.2.0-1	
SuR-862	3.2.1.3.11.0-1	3.7.2.1.13.0-1	
SuR-866	3.2.1.3.10.0-1	3.7.2.1.15.0-1	
SuR-871	3.2.1.3.4.1.0-1	3.2.1.2.1.1.1.0-1 3.7.2.1.16.1.0-1 3.7.2.2.2.0-2	3.2.1.2.1.1.2.0-1
SuR-873	3.2.1.3.4.2.0-1	3.7.2.1.16.2.0-1	
SuR-882	3.2.1.3.3.0-1	3.7.2.1.19.0-1	3.2.1.2.2.1.0-1
SuR-885	3.2.1.3.3.0-2	3.7.2.1.19.0-2	
SuR-887	3.2.1.1.1.0-1	3.2.4.4.3.0-1 3.7.2.1.20.0-1 3.7.2.1.20.0-2	
SuR-890	3.2.1.3.1.1.0-1	3.7.2.1.21.1.0-1 3.7.2.1.20.0-1	
SuR-891	3.2.1.3.1.1.0-2	3.7.2.1.21.1.0-2	
SuR-898	3.2.5.2.7.0-1	3.7.2.1.23.0-1	3.2.1.2.1.1.1.0-2
SuR-900	3.2.5.1.1.0-1	3.2.1.2.1.1.1.0-1 3.2.1.2.1.1.2.0-1 3.7.2.1.24.0-1	3.2.1.2.1.1.2.0-1

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-916	3.2.1.1.2.4.1.0-2	3.7.2.2.2.0-1	
SuR-922	3.2.1.1.2.5.1.0-1	3.7.2.2.3.0-1 3.7.2.2.3.0-2	
SuR-934	3.2.1.1.4.1.0-1	3.7.2.3.0-1 3.2.1.2.1.2.2.1.0-1	
SuR-937	3.2.1.1.4.2.0-1	3.2.1.2.1.2.2.3.0-2	
SuR-941	3.2.1.1.5.1.0-1	3.7.2.4.0-1 3.2.1.2.1.2.3.1.0-1	
SuR-944	3.2.1.1.5.2.0-1	3.2.1.2.1.2.3.3.0-2	
SuR-946	3.2.1.1.3.1.0-1	3.7.2.5.0-1	
SuR-948	3.2.1.1.3.2.0-1	3.7.2.5.1.0-1	
SuR-953	3.2.1.1.3.3.0-1	3.7.2.5.2.0-1	
SuR-964	3.2.1.2.2.0-2	3.7.2.1.14.0-1 3.7.2.1.22.1.0-1 3.7.2.1.22.1.0-2	3.2.1.2.2.4.0-1
SuR-1578	3.2.1.3.1.2.0-1	3.7.2.1.21.2.0-1	
SuR-1584	3.2.1.3.13.0-1	3.7.2.1.9.1.0-1	
SuR-1585	3.2.2.1.2.2.1.0-1	3.7.2.1.15.0-2 3.7.2.1.20.0-1	

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-1608	3.2.1.1.2.3.1.0-1	3.7.2.1.14.0-1 3.7.2.1.17.1.0-1	
SuR-1657	3.3.1.2.0-1	3.2.3.1.0-1	
SuR-1666	3.2.5.2.8.2.2.5.0-1	3.2.3.2.0-1 3.2.5.2.9.2.2.5.0-1	
SuR-1816	3.3.3.2.0-1	3.3.3.1.0-9	
SuR-1817	3.3.3.1.0-7	3.3.3.1.0-3	
SuR-1818	3.3.3.1.0-10	3.3.3.1.0-5	
SuR-1820	3.3.3.3.0-1	3.3.3.1.0-11	
SuR-1825	3.3.3.5.0-1	3.3.3.2.0-1	
SuR-1837	3.3.3.8.0-1	3.3.3.1.0-13	
SuR-1839	3.2.4.2.2.3.0-2	3.2.4.2.3.0-2	
SuR-1841	3.2.1.5.1.1.0-1	3.2.1.2.5.4.0-1 3.2.1.2.2.5.0-1 3.2.1.2.5.1.3.0-1	
SuR-2088	3.3.3.11.0-1	3.3.3.5.0-1	
SuR-2092	3.3.2.2.0-1	3.3.2.2.0-1	
SuR-2126	3.3.1.3.0-1	3.3.1.2.0-1	
SuR-2135	3.3.3.18.0-1	3.3.3.9.0-1	

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-2147	3.3.3.20.0-1	3.3.3.11.0-1	
SuR-2150	3.3.3.16.0-1	3.2.4.4.2.0-1 3.3.3.8.0-1	
SuR-2158	3.3.3.22.0-1	3.3.3.12.0-1	
SuR-2186	3.2.2.1.2.3.1.0-1	3.7.2.1.14.0-1	3.2.1.2.2.4.0-1
SuR-2249	3.2.1.3.8.4.0-1	3.7.2.1.6.4.0-1	
SuR-2253	3.2.1.3.14.0-1	3.7.2.1.5.0-1	
SuR-2261	3.2.1.3.8.3.0-1	3.7.2.1.6.3.0-1	
SuR-2265	3.2.1.1.2.3.4.0-1	3.7.2.1.14.0-1 3.7.2.1.17.2.0-1	
SuR-2266	3.2.1.3.2.0-1	3.7.2.1.18.0-1	
SuR-2311	3.3.7.3.0-1	3.7.2.1.12.3.0-1	
SuR-3864	3.3.3.1.0-14	3.3.3.1.0-7	
SuR-6301	3.2.1.2.4.1.0-2	3.7.2.1.22.2.0-1	
SuR-6305	3.2.5.1.5.2.1.0-1	3.2.5.1.5.2.1.0-1	
SuR-6342	3.3.5.1.1.4.1.0-1	3.3.5.1.2.0-5	
SuR-6351	3.3.5.3.2.0-1	3.3.5.3.0-1	3.2.2.2.2.4.0-2
SuR-6355	3.2.1.3.5.1.0-1		3.7.2.1.10.0-1
SuR-6358	3.2.1.3.5.2.0-1		3.7.2.1.10.1.0-1

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-6360	3.2.1.3.5.3.0-1		3.7.2.1.10.2.0-1
SuR-6362	3.2.1.3.5.4.0-1		3.7.2.1.10.3.0-1
SuR-6366	3.2.1.1.2.3.1.0-2		3.7.2.1.15.0-1 3.7.2.1.18.1.0-1 3.2.1.2.2.4.0-1
SuR-6377	3.2.1.1.2.4.1.0-1	3.2.1.2.2.1.0-1	
SuR-6427	3.2.1.1.2.4.2.0-1		3.2.1.2.1.1.1.0-1 3.2.1.2.2.1.0-1 3.2.1.2.2.1.0-2
SuR-6431	3.2.1.3.4.3.0-1	3.7.2.1.16.3.0-1	
SuR-6433	3.2.1.2.2.0-4	3.2.1.2.1.2.2.3.0-2 3.2.1.2.1.2.3.3.0-2	
SuR-6436	3.2.1.2.2.0-3	3.7.2.1.14.0-1	
SuR-6439	3.2.6.1.2.0-1	3.2.6.1.2.1.0-1 3.2.6.1.2.2.0-1 3.2.6.1.2.3.0-1 3.2.6.2.1.0-1 3.2.6.3.1.0-1	
SuR-6440	3.2.5.2.1.3.0-1	3.2.5.2.1.2.0-1	

SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
		3.2.6.1.1.2.0-1 3.2.6.1.2.1.0-1 3.2.6.1.2.2.0-1 3.2.6.1.2.3.0-1 3.2.6.1.2.4.0-1 3.2.6.1.2.5.0-1 3.2.6.2.1.0-1 3.2.6.2.2.0-1 3.2.6.3.1.0-1 3.2.6.3.2.0-1	
SuR-6442	3.2.5.1.3.1.0-2	3.2.5.1.3.1.0-1	
SuR-6445	3.2.5.2.4.2.1.0-2	3.2.5.2.5.1.1.0-1	
SuR-6446	3.2.1.3.14.0-2	3.7.2.1.5.0-1	
SuR-6447	3.2.1.3.14.0-7	3.7.2.1.5.0-1	
SuR-6679	3.2.1.3.3.0-4	3.2.1.2.5.1.3.0-1	
SuR-6968	3.2.1.3.8.2.0-1	3.7.2.1.6.2.0-1	
SuR-6971	3.2.5.1.8.2.0-1	3.2.5.1.8.2.0-1 3.2.5.1.8.3.0-1	
SuR-6972	3.3.5.1.1.0-1	3.3.5.1.1.0-1	

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-6976	3.2.5.2.4.2.2.1.0-1	3.2.5.2.5.1.2.1.0-1	
SuR-7083	3.2.1.3.6.0-2	3.2.1.2.3.11.0-1 3.7.2.1.8.0-1 3.2.1.2.3.11.0-2	
SuR-7084	3.2.5.2.8.2.1.2.0-1	3.2.6.4.2.0-1	
SuR-7254	3.2.5.1.11.2.3.0-1	3.2.5.1.11.2.1.0-1 3.2.5.1.11.2.2.0-1	
SuR-7290	3.2.5.1.11.1.3.0-1	3.2.5.1.11.1.0-1	
SuR-7345	3.2.1.1.2.3.3.0-4	3.7.2.1.14.0-1 3.7.2.1.17.3.0-1	3.7.2.1.15.0-1 3.7.2.1.18.3.0-1
SuR-7346	3.2.1.1.2.3.3.0-7	3.7.2.1.14.0-1 3.7.2.1.17.3.0-1	3.7.2.1.15.0-1 3.7.2.1.18.3.0-1
SuR-7347	3.2.1.1.2.3.3.0-5	3.7.2.1.14.0-1 3.7.2.1.17.3.0-1	3.7.2.1.15.0-1 3.7.2.1.18.3.0-1
SuR-7348	3.2.1.1.2.3.3.0-8	3.7.2.1.14.0-1 3.7.2.1.17.3.0-1	3.7.2.1.15.0-1 3.7.2.1.18.3.0-1
SuR-7405	3.2.5.2.8.2.2.4.0-1	3.2.5.2.9.2.2.4.0-1 3.2.3.2.0-1	
SuR-7413	3.3.3.10.0-1	3.3.3.1.0-13	

SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-7437	3.2.1.3.3.0-3	3.7.2.1.19.0-2	
SuR-7803	3.3.1.3.0-2	3.3.1.2.0-1	
SuR-7804	3.3.3.1.0-8	3.3.3.1.0-3	
SuR-7805	3.3.3.1.0-9	3.3.3.1.0-3	
SuR-7806	3.3.3.1.0-11	3.3.3.1.0-5	
SuR-7807	3.3.3.1.0-12	3.3.3.1.0-5	
SuR-7810	3.3.3.1.0-1	3.3.3.1.0-1 3.3.3.2.0-1	
SuR-7811	3.3.3.1.0-4	3.3.3.1.0-1 3.3.3.2.0-1	
SuR-7812	3.3.3.1.0-15	3.3.3.1.0-5	
SuR-7813	3.3.3.1.0-16	3.3.3.1.0-5	
SuR-7814	3.3.3.1.0-17	3.3.3.1.0-13	
SuR-7815	3.3.3.9.0-1	3.3.3.1.0-13	
SuR-7816	3.3.3.1.0-18	3.3.3.1.0-7	
SuR-7817	3.3.3.1.0-19	3.3.3.1.0-5	
SuR-7818	3.3.3.1.0-24	3.3.3.2.0-1	
SuR-7819	3.3.3.1.0-20	3.3.3.1.0-13	
SuR-7820	3.3.3.1.0-21	3.3.3.1.0-13	

SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-7821	3.3.3.1.0-22	3.3.3.1.0-13	
SuR-7822	3.3.3.1.0-23	3.3.3.1.0-13	
SuR-7823	3.3.3.1.0-13	3.3.3.1.0-7	
SuR-7824	3.3.3.6.0-1	3.3.3.2.0-1 3.3.3.3.0-1	
SuR-7825	3.3.3.2.0-2	3.3.3.2.0-1	
SuR-7826	3.3.3.2.0-3	3.3.3.2.0-1	
SuR-7827	3.3.3.2.0-5	3.3.3.2.0-1	
SuR-7828	3.3.3.2.0-4	3.3.3.2.0-1	
SuR-7830	3.3.4.1.0-1	3.3.4.0-1	
SuR-7831	3.3.4.1.0-2	3.3.4.0-1	
SuR-7832	3.3.4.1.0-4	3.3.4.0-1	
SuR-7833	3.3.4.1.0-3	3.3.4.0-1	
SuR-7835	3.3.4.2.0-1	3.3.4.1.0-1	
SuR-7836	3.3.4.2.0-2	3.3.4.1.0-1	
SuR-7837	3.3.4.2.0-7	3.3.4.1.0-1	
SuR-7838	3.3.4.2.0-6	3.3.4.1.0-1	
SuR-7839	3.3.4.2.0-5	3.3.4.1.0-1	
SuR-7840	3.3.4.2.0-4	3.3.4.1.0-1	

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-7841	3.3.4.2.0-3	3.3.4.1.0-1	
SuR-7859	3.2.5.1.9.1.0-2	3.2.5.1.9.1.0-3	
SuR-7861	3.7.1.1.1-1	3.2.5.1.7.1.0-1 3.2.5.1.9.1.0-2	
SuR-7863	3.2.5.2.8.2.1.2.0-2	3.2.5.1.5.1.2.0-1 3.2.5.1.5.2.2.0-1 3.2.5.1.6.2.0-1 3.2.5.1.7.2.0-1 3.2.5.1.9.2.0-1 3.2.5.1.11.2.2.0-1 3.2.5.2.6.2.0-1 3.2.5.1.9.2.0-2	
SuR-7864	3.2.5.1.7.1.0-1	3.2.5.1.7.1.0-2	
SuR-7882	3.2.5.1.4.2.0-1	3.2.5.1.4.2.0-1	
SuR-7884	3.2.5.2.5.0-1	3.2.5.2.6.1.0-1	
SuR-8411	3.2.5.2.3.0-1	3.2.5.2.4.1.0-1 3.2.5.2.4.2.0-1	
SuR-8421	3.3.5.1.5.3.0-1	3.3.5.1.2.0-11	
SuR-8422	3.3.3.19.0-1	3.3.3.10.0-1	

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-8423	3.3.5.1.4.1.0-2	3.3.3.7.0-1	
SuR-8424	3.3.3.17.0-1	3.3.3.8.0-1	
SuR-8427	3.3.5.1.2.0-1	3.3.5.1.2.0-7	
SuR-8806	3.2.1.1.2.3.2.0-1		3.7.2.1.15.0-1 3.7.2.1.18.2.0-1
SuR-8808	3.2.4.2.2.9.0-1	3.7.2.1.3.0-1	
SuR-8816	3.2.5.2.4.2.2.0-1	3.2.5.2.5.1.2.0-1	
SuR-8817	3.2.5.2.4.2.1.0-1	3.2.5.2.5.1.1.0-3	
SuR-8820	3.2.5.2.4.2.2.1.0-2	3.2.5.2.5.1.2.1.0-2	
SuR-8822	3.2.5.2.4.2.2-2	3.2.5.2.5.1.2.2.0-2	
SuR-8823	3.2.5.2.4.3.0-2	3.2.5.2.5.1.3.0-1	
SuR-8831	3.3.5.1.1.4.0-1	3.3.5.1.2.0-5	
SuR-8832	3.3.5.1.1.2.0-2		3.2.1.2.5.0-1 3.2.2.2.2.4.0-1 3.7.2.1.26.0-1
SuR-8842	3.2.5.2.8.2.2.1.0-2	3.2.5.2.9.2.2.2.0-1	
SuR-8843	3.2.5.2.8.2.2.1.0-3	3.2.5.2.9.2.2.1.0-1 3.2.5.2.9.2.2.2.0-1	
SuR-8852	3.2.5.2.7.0-2		3.2.1.2.1.1.2.0-2

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-8853	3.2.5.2.7.0-3		3.2.1.2.2.4.0-2
SuR-8866	3.2.1.3.13.0-2	3.7.2.1.9.2.0-1 3.7.2.1.9.2.0-2	
SuR-8873	3.3.3.1.0-3	3.3.3.2.0-1	
SuR-8874	3.3.3.1.0-5	3.3.3.2.0-1	
SuR-9646	3.3.5.1.4.1.0-1	3.3.5.1.2.0-13	
SuR-9647	3.3.5.1.1.1.0-2	3.3.5.1.1.0-3	
SuR-9648	3.3.5.1.1.1.0-1	3.3.5.1.1.0-7	
SuR-9649	3.3.5.1.1.2.0-1	3.3.5.1.1.0-9	
SuR-9650	3.3.5.1.1.3.0-1	3.3.5.1.1.0-11	
SuR-9651	3.3.5.1.1.4.0-4	3.3.5.1.1.0-5	
SuR-9653	3.3.5.1.1.4.0-3	3.3.5.1.1.0-13	
SuR-9654	3.3.5.1.1.4.0-2	3.3.5.1.2.0-5	
SuR-9655	3.3.3.21-1	3.3.3.1.0-1	
SuR-9708	3.2.2.2.0-1	3.2.2.2.0-1 3.2.2.1.0-1	
SuR-9710	3.3.1.2.0-2	3.2.3.1.0-3	
SuR-9711	3.2.5.2.2.2.0-3	3.2.5.2.3.3.0-1	
SuR-9712	3.2.5.2.2.2.0-2	3.2.5.2.3.1.0-1	

UNCLASSIFIED			
SuR ID	SuR Section	A-Spec Rev T: Section	A-Spec Annex A Rev R: Section
SuR-9870	3.3.1.2.0-3	3.2.3.1.0-3 3.2.3.1.0-2	
SuR-9871	3.2.1.2.4.2.0-2	3.2.1.2.2.6.3.0-1	
SuR-9872	3.2.5.2.2.2.0-4	3.2.5.2.3.2.0-1	
SuR-9874	3.3.2.3.0-1	3.2.5.2.3.6.0-1	
SuR-9875	3.2.1.1.2.3.3.0-6	3.7.2.1.14.0-1 3.7.2.1.17.3.0-1.0-7	
SuR-9876	3.2.1.1.2.3.3.0-9	3.7.2.1.14.0-1 3.7.2.1.17.3.0-1.0-7	
UNCLASSIFIED			

6.5 (U) Internal Traceability Matrix

TABLE XXI-II: (U) Internal Traceability Matrix

UNCLASSIFIED			
SuR ID	SuR Section	Lower Lever SuR ID	Lower Lever SuR Section
SuR-71	3.2.1.2.4.1.0-1	SuR-6396	3.2.5.1.2.0-1
		SuR-7491	3.2.1.2.4.1.0-3
SuR-88	3.2.1.2.5.2.3.0-1	SuR-7490	3.2.1.2.3.0-1
SuR-346	3.2.4.2.2.1.0-2	SuR-833	3.2.4.2.2.1.0-1
		SuR-970	3.2.2.1.2.3.1.0-2
SuR-410	3.2.1.5.4.3.0-1	SuR-8833	3.2.1.5.4.3.0-2
		SuR-8847	3.2.1.5.4.3.0-3
SuR-423	3.2.5.1.3.1.0-1	SuR-6393	3.2.3.2.0-1
		SuR-6394	3.2.3.2.0-2
SuR-426	3.2.5.1.3.2.0-1	SuR-6443	3.2.5.1.3.2.0-2
SuR-533	3.2.5.2.4.2.1.0-3	SuR-7378	3.2.5.2.4.3.0-1
SuR-669	3.3.6.0-1	SuR-8848	3.3.6.0-2
SuR-829	3.2.4.1.1.2.0-1	SuR-7354	3.7.1.12.6.0-1
		SuR-7355	3.7.1.9.1.0-1
		SuR-7702	3.7.1.11.2.0-1
SuR-835	3.2.3.1.0-1	SuR-6973	3.2.3.1.0-2
		SuR-6974	3.2.3.1.0-3
SuR-840	3.2.1.3.7.0-1	SuR-7354	3.7.1.12.6.0-1
		SuR-7355	3.7.1.9.1.0-1
		SuR-7356	3.7.1.1.4.0-1
		SuR-7702	3.7.1.11.2.0-1
SuR-862	3.2.1.3.11.0-1	SuR-7109	3.7.1.8.1.0-1
SuR-871	3.2.1.3.4.1.0-1	SuR-7329	3.7.1.1.2.0-1

UNCLASSIFIED			
SuR ID	SuR Section	Lower Lever SuR ID	Lower Lever SuR Section
		SuR-7330	3.7.1.1.2.0-2
		SuR-7370	3.7.1.12.3.0-1
		SuR-7372	3.7.1.12.3.0-2
SuR-882	3.2.1.3.3.0-1	SuR-7099	3.2.1.2.1.0-1
		SuR-7100	3.2.1.2.1.0-2
		SuR-7362	3.7.1.12.2.0-2
		SuR-7375	3.7.2.6.2.0-1
SuR-885	3.2.1.3.3.0-2	SuR-7100	3.2.1.2.1.0-2
		SuR-7358	3.7.1.12.1.0-1
		SuR-7361	3.7.1.12.2.0-1
		SuR-7375	3.7.2.6.2.0-1
SuR-898	3.2.5.2.7.0-1	SuR-7137	3.7.2.6.5.2.0-1
		SuR-7140	3.7.2.6.5.1.0-1
SuR-900	3.2.5.1.1.0-1	SuR-7370	3.7.1.12.3.0-1
		SuR-7372	3.7.1.12.3.0-2
SuR-946	3.2.1.1.3.1.0-1	SuR-7109	3.7.1.8.1.0-1
		SuR-7110	3.7.1.8.1.0-2
		SuR-7122	3.7.2.6.1.0-1
		SuR-7123	3.7.2.6.1.0-2
		SuR-7125	3.7.2.6.1.0-3
		SuR-7128	3.7.2.6.4.0-1
		SuR-7130	3.2.1.1.2.2.0-1
SuR-1578	3.2.1.3.1.2.0-1	SuR-7500	3.7.1.12.4.0-1
		SuR-7501	3.7.1.12.4.0-2
SuR-1608	3.2.1.1.2.3.1.0-1	SuR-7111	3.7.1.8.1.0-3
		SuR-7112	3.7.1.8.1.0-4
SuR-1666	3.2.5.2.8.2.2.5.0-1	SuR-1661	3.2.3.4.0-1
SuR-2253	3.2.1.3.14.0-1	SuR-8827	3.2.1.3.14.0-3

UNCLASSIFIED			
SuR ID	SuR Section	Lower Lever SuR ID	Lower Lever SuR Section
		SuR-8828	3.2.1.3.14.0-4
		SuR-8829	3.2.1.3.14.0-5
SuR-2266	3.2.1.3.2.0-1	SuR-7337	3.7.1.1.3.0-1
		SuR-7338	3.7.1.1.3.0-2
SuR-6355	3.2.1.3.5.1.0-1	SuR-7116	3.7.1.8.2.0-1
SuR-6366	3.2.1.1.2.3.1.0-2	SuR-7111	3.7.1.8.1.0-3
		SuR-7112	3.7.1.8.1.0-4
SuR-6377	3.2.1.1.2.4.1.0-1	SuR-7109	3.7.1.8.1.0-1
		SuR-7110	3.7.1.8.1.0-2
		SuR-7114	3.7.2.6.3.0-1
		SuR-7128	3.7.2.6.4.0-1
		SuR-7130	3.2.1.1.2.2.0-1
		SuR-7365	3.2.1.1.2.1.0-1
		SuR-7367	3.7.1.12.1.0-2
		SuR-7698	3.7.1.12.5.0-1
		SuR-7706	3.7.1.11.1.0-1
SuR-6427	3.2.1.1.2.4.2.0-1	SuR-7109	3.7.1.8.1.0-1
		SuR-7110	3.7.1.8.1.0-2
		SuR-7114	3.7.2.6.3.0-1
		SuR-7128	3.7.2.6.4.0-1
		SuR-7130	3.2.1.1.2.2.0-1
		SuR-7365	3.2.1.1.2.1.0-1
		SuR-7367	3.7.1.12.1.0-2
		SuR-7698	3.7.1.12.5.0-1
		SuR-7706	3.7.1.11.1.0-1
SuR-6445	3.2.5.2.4.2.1.0-2	SuR-7378	3.2.5.2.4.3.0-1
SuR-6973	3.2.3.1.0-2	SuR-6391	3.2.3.3.0-1
SuR-7290	3.2.5.1.11.1.3.0-1	SuR-6306	3.2.5.1.11.1.2.0-1

UNCLASSIFIED			
SuR ID	SuR Section	Lower Lever SuR ID	Lower Lever SuR Section
SuR-7405	3.2.5.2.8.2.2.4.0-1	SuR-1661	3.2.3.4.0-1
SuR-7437	3.2.1.3.3.0-3	SuR-7100 SuR-7358 SuR-7361 SuR-7375	3.2.1.2.1.0-2 3.7.1.12.1.0-1 3.7.1.12.2.0-1 3.7.2.6.2.0-1
SuR-8817	3.2.5.2.4.2.1.0-1	SuR-533	3.2.5.2.4.2.1.0-3
SuR-8831	3.3.5.1.1.4.0-1	SuR-7339	3.3.5.1.1.4.2.0-1
SuR-9708	3.2.2.2.0-1	SuR-9709	3.2.2.1.0-1
UNCLASSIFIED			

6.6 (U) Safety Critical Messages

TABLE XXI-III: (U) Safety Critical Messages

UNCLASSIFIED		
ID	Safety	Safety Critical Messages
SuR-19	N/A	
SuR-71	N/A	
SuR-74	N/A	
SuR-78	Critical	Yes
SuR-82	N/A	
SuR-88	Critical	
SuR-128	Critical	Yes
SuR-346	Related	Yes
SuR-349	N/A	
SuR-352	Critical	Yes
SuR-355	N/A	
SuR-358	N/A	
SuR-367	N/A	
SuR-370	N/A	
SuR-410	N/A	
SuR-423	N/A	
SuR-426	N/A	
SuR-429	N/A	
SuR-436	N/A	
SuR-451	N/A	
SuR-464	N/A	
SuR-472	N/A	
SuR-478	N/A	
SuR-482	N/A	
SuR-486	N/A	
SuR-489	N/A	
SuR-495	Critical	
SuR-498	N/A	
SuR-501	N/A	
SuR-509	N/A	
SuR-519	N/A	

		UNCLASSIFIED
ID	Safety	Safety Critical Messages
SuR-521	N/A	
SuR-523	N/A	
SuR-533	N/A	
SuR-534	N/A	
SuR-538	Related	
SuR-546	N/A	
SuR-552	N/A	
SuR-558	N/A	
SuR-599	N/A	
SuR-601	N/A	
SuR-616	Critical	Yes
SuR-618	Related	
SuR-658	N/A	
SuR-662	N/A	
SuR-669	N/A	
SuR-685	N/A	
SuR-691	N/A	
SuR-709	N/A	
SuR-712	N/A	
SuR-718	N/A	
SuR-719	N/A	
SuR-726	N/A	
SuR-731	N/A	
SuR-734	N/A	
SuR-827	N/A	
SuR-829	N/A	
SuR-831	N/A	
SuR-833	Related	Yes
SuR-835	N/A	
SuR-838	N/A	
SuR-840	N/A	
SuR-842	N/A	
SuR-844	N/A	
SuR-853	N/A	
SuR-858	N/A	
SuR-860	N/A	

UNCLASSIFIED		
ID	Safety	Safety Critical Messages
SuR-862	N/A	
SuR-866	N/A	
SuR-871	N/A	
SuR-873	N/A	
SuR-882	N/A	
SuR-885	N/A	
SuR-887	N/A	
SuR-890	Critical	
SuR-891	Critical	
SuR-898	N/A	
SuR-900	N/A	
SuR-916	N/A	
SuR-922	N/A	
SuR-934	N/A	
SuR-937	N/A	
SuR-941	N/A	
SuR-944	N/A	
SuR-946	N/A	
SuR-948	N/A	
SuR-953	N/A	
SuR-964	N/A	
SuR-970	N/A	
SuR-1578	Critical	
SuR-1584	N/A	
SuR-1585	N/A	
SuR-1608	N/A	
SuR-1657	Related	
SuR-1661	N/A	
SuR-1666	Related	
SuR-1816	Critical	Yes
SuR-1817	Critical	
SuR-1818	Critical	
SuR-1820	Critical	
SuR-1825	Related	
SuR-1837	Critical	
SuR-1839	N/A	

UNCLASSIFIED		
ID	Safety	Safety Critical Messages
SuR-1841	N/A	
SuR-2088	Related	
SuR-2092	Related	
SuR-2126	Related	
SuR-2135	Critical	
SuR-2147	Related	Yes
SuR-2150	Critical	Yes
SuR-2158	Critical	Yes
SuR-2186	N/A	
SuR-2249	Related	
SuR-2253	N/A	
SuR-2261	N/A	
SuR-2265	N/A	
SuR-2266	N/A	
SuR-2311	N/A	
SuR-3864	Critical	
SuR-6301	N/A	
SuR-6305	N/A	
SuR-6306	N/A	
SuR-6342	N/A	
SuR-6351	N/A	
SuR-6355	N/A	
SuR-6358	N/A	
SuR-6360	N/A	
SuR-6362	N/A	
SuR-6366	N/A	
SuR-6377	N/A	
SuR-6391	N/A	
SuR-6393	N/A	
SuR-6394	N/A	
SuR-6396	N/A	
SuR-6427	N/A	
SuR-6431	N/A	
SuR-6433	N/A	
SuR-6436	N/A	
SuR-6439	N/A	

UNCLASSIFIED		
ID	Safety	Safety Critical Messages
SuR-6440	N/A	
SuR-6442	N/A	
SuR-6443	N/A	
SuR-6445	Related	
SuR-6446	N/A	
SuR-6447	N/A	
SuR-6679	N/A	
SuR-6968	N/A	
SuR-6971	N/A	
SuR-6972	N/A	
SuR-6973	N/A	
SuR-6974	N/A	
SuR-6976	N/A	
SuR-7083	N/A	
SuR-7084	Related	
SuR-7099	N/A	
SuR-7100	N/A	
SuR-7109	N/A	
SuR-7110	N/A	
SuR-7111	N/A	
SuR-7112	N/A	
SuR-7114	N/A	
SuR-7116	N/A	
SuR-7122	N/A	
SuR-7123	N/A	
SuR-7125	N/A	
SuR-7128	N/A	
SuR-7130	N/A	
SuR-7137	N/A	
SuR-7140	N/A	
SuR-7254	N/A	
SuR-7290	N/A	
SuR-7329	N/A	
SuR-7330	N/A	
SuR-7337	N/A	
SuR-7338	N/A	

UNCLASSIFIED		
ID	Safety	Safety Critical Messages
SuR-7339	N/A	
SuR-7345	N/A	
SuR-7346	N/A	
SuR-7347	N/A	
SuR-7348	N/A	
SuR-7354	N/A	
SuR-7355	N/A	
SuR-7356	N/A	
SuR-7358	N/A	
SuR-7361	N/A	
SuR-7362	N/A	
SuR-7365	N/A	
SuR-7367	N/A	
SuR-7370	N/A	
SuR-7372	N/A	
SuR-7375	N/A	
SuR-7378	N/A	
SuR-7405	N/A	
SuR-7413	Critical	
SuR-7437	N/A	
SuR-7490	N/A	
SuR-7491	N/A	
SuR-7500	Critical	Yes
SuR-7501	Critical	
SuR-7698	N/A	
SuR-7702	N/A	
SuR-7706	N/A	
SuR-7803	Related	
SuR-7804	Critical	
SuR-7805	Critical	
SuR-7806	Critical	
SuR-7807	Related	
SuR-7810	Critical	
SuR-7811	Critical	
SuR-7812	Critical	
SuR-7813	Critical	

		UNCLASSIFIED
ID	Safety	Safety Critical Messages
SuR-7814	Related	
SuR-7815	Critical	
SuR-7816	Critical	
SuR-7817	Related	
SuR-7818	Related	
SuR-7819	Critical	
SuR-7820	Critical	
SuR-7821	Critical	
SuR-7822	Critical	
SuR-7823	Related	
SuR-7824	Critical	
SuR-7825	Related	
SuR-7826	Related	
SuR-7827	Related	
SuR-7828	Related	
SuR-7830	Related	
SuR-7831	Related	
SuR-7832	Related	
SuR-7833	Related	
SuR-7835	Related	
SuR-7836	Related	
SuR-7837	Related	
SuR-7838	Related	
SuR-7839	Related	
SuR-7840	Related	
SuR-7841	Related	
SuR-7859	N/A	
SuR-7861	N/A	
SuR-7863	Related	
SuR-7864	N/A	
SuR-7882	N/A	
SuR-7884	N/A	
SuR-8411	Critical	
SuR-8421	N/A	
SuR-8422	Related	Yes
SuR-8423	Critical	Yes

UNCLASSIFIED		
ID	Safety	Safety Critical Messages
SuR-8424	Critical	
SuR-8427	N/A	
SuR-8806	N/A	
SuR-8808	N/A	
SuR-8816	N/A	
SuR-8817	N/A	
SuR-8822	N/A	
SuR-8823	N/A	
SuR-8827	N/A	
SuR-8828	N/A	
SuR-8829	N/A	
SuR-8831	N/A	
SuR-8832	N/A	
SuR-8833	N/A	
SuR-8842	N/A	
SuR-8847	N/A	
SuR-8848	N/A	
SuR-8852	N/A	
SuR-8853	N/A	
SuR-8866	N/A	
SuR-8873	Related	
SuR-8874	Related	
SuR-9646	N/A	
SuR-9647	N/A	
SuR-9648	N/A	
SuR-9649	N/A	
SuR-9650	N/A	
SuR-9651	N/A	
SuR-9653	N/A	
SuR-9654	N/A	
SuR-9655	Critical	
SuR-9708	N/A	
SuR-9709	N/A	
SuR-9710	Related	
SuR-9711	Related	
SuR-9712	Related	

UNCLASSIFIED		
ID	Safety	Safety Critical Messages
SuR-9866	Critical	
SuR-9870	Related	
SuR-9871	N/A	
SuR-9872	Related	
SuR-9874	Related	
SuR-9875	N/A	
SuR-9876	N/A	
UNCLASSIFIED		

7 (U) Appendices

7.1 (U) Appendix A: Clutter and Multipath

7.1.1 (U) Clutter

7.1.1.1 (U) Land Clutter

7.1.1.1.1 (U) Distributed Land Clutter

(U) While the radars are expected to operate in all of the various types of clutter, the 95 percentile point of the high relief terrain is the design point for the JLENS system radars.

7.1.1.1.2 (U) Wide Area Mean Scattering

(U) The wide area mean scattering coefficient $\sigma°$, (RCS per unit scattering area), is modeled as being constant with frequency and polarization independent for the region b(3) . The variation of $\sigma°$ with terrain type is as follows:

Urban* $\sigma° = -10.0$dB

High Relief $\sigma° = -20.0$ dB

Low Relief $\sigma° = -30.0$ dB

*And other precipitous terrain

(U) The above coefficients apply for grazing angles between 0° and 10°. For grazing angles above 10°, increase $\sigma°$ by the factor 10 log (0.1 ψ) where ψ is the smooth earth angle (degrees). In the nadir region ($\psi > 40°$) increase $\sigma°$ (addition in power) by the following specular scattering term:

$$\sigma°_{ss}(dB) = 10\log\{0.65\exp[-\tan^2(90° - \psi) / \tan^2(\beta_o)] / \tan^2(\beta_o)\}$$

where tan (βo) is the root mean square (RMS) surface slope which is equal to 0.2, 0.55, and 0.14 for urban, high relief and low relief terrain, respectively.

7.1.1.1.3 (U) Statistical Variation

(U) The statistical variation of scattering coefficient is described here as a compound distribution in which the instantaneous value in a particular cell varies as an exponential distribution whose mean power varies from cell to cell according to the Weibull distribution. This characterization is valid when temporal correlation is not of interest. Alternatively, the mean and instantaneous values vary in accordance with the Weibull and exponential density functions, respectively, as discussed below.

(U) The statistical distribution of scattering coefficient in any given illuminated radar cell is given by the conditional distribution:

$$p(\sigma_i|\sigma_e) = \frac{1}{\sigma_e} \exp\left[-\frac{\sigma_i}{\sigma_e}\right]$$

where σ_i is an "instantaneous" value of the scattering coefficient, the σ_e is the expected value of the scattering coefficient of the cell. σ_e is a statistical variable having a Weibull distribution with the slope parameter for grazing angles below 10° given by:

$a = 6.74 - 0.8 \log A_c$; low relief and urban

$a = 3.05 - 0.28 \log A_c$; high relief

where A_c is the area of the resolution cell (m^2). For grazing angles greater than 10°, a = 1.

(U) The compound distribution described above is itself approximately Weibull with slope parameter as defined in Table A-I. Thus it would be acceptable to model the instantaneous scattering coefficient as a Weibull distribution with this compound slope parameter (Table A-I) and the wide area mean value $\sigma°$ as specified above in 7.1.1.1.2.

TABLE A-I. (U) Slope Parameter of Compound Distribution

UNCLASSIFIED	
Spatial Distribution	**Compound Distribution**
0.125	1.03
0.25	1.09
0.5	1.25
1.0	1.64
2.0	2.51
4.0	4.37
8.0	8.19
16.0	16.08
32.0	32.00
UNCLASSIFIED	

7.1.1.1.4 (U) Discrete Land Clutter

(U) In addition to distributed clutter from terrain surfaces, the radar return from land may contain echoes from large man-made objects including buildings, towers, and bridges. The density of these occurrences will vary with RCS as follows:

40 dBsm @ 1.0 per mi^2 (0.4 per km^2)

50 dBsm @ 0.1 per mi^2 (0.04 per km^2)

60 dBsm @ 0.01 per mi^2 (0.004 per km^2)

(U) These structures are to be modeled as point reflectors with constant RCS, and are assumed present in all terrain types. The return may also include echoes from moving vehicles with Doppler velocities corresponding to vehicular speeds. These range in size from 2 to 200 m^2. The occurrence of vehicle reflections will be highly variable, depending on local terrain and cultural features.

7.1.1.1.5 (U) Velocity Distribution

(U) Each resolution cell is modeled as a many-scatter process with a Gaussian distribution as follows:

$$p(v) = \frac{1}{\sigma_v \sqrt{2\pi}} \exp\left(-0.5\left(\frac{v - v_o}{\sigma_v}\right)^2\right)$$

where u_o is the mean velocity and σ_v is the standard deviation. Land clutter is assumed zero mean. The standard deviation is zero for urban, 0.3 m/s for high-relief, and 0.6 m/s for low relief environments.

7.1.1.2 (U) Sea Clutter

7.1.1.2.1 (U) Distributed Sea Clutter

b(3)

7.1.1.2.2 (U) Wide Area Mean Scattering

(U) The wide area mean scattering coefficients, (σ° (dB m^2/m^2), are defined over the frequency range b(3) as follows:

(U) For Horizontal Polarization: $\sigma^\circ_H = 10 \log [3.9 \times 10^{-6} \lambda \psi^{0.4} G_a G_u G_w]$

(U) For Vertical Polarization: For b(3) $\sigma^\circ_v = \sigma^\circ_H - 1.73 \ln(h_a + 0.015) + 3.76\ln(\lambda) + 2.46 \ln(\psi + 0.0001) + 22.2$

(U) For b(3)

$\sigma^\circ_v = \sigma^\circ_H - 1.05 \ln(h_a + 0.015) + 1.09 \ln(\lambda) + 1.27 \ln(\psi + 0.0001) + 9.70$

where:

$G_a = a^4/(1+a^4)$
$G_u = \exp\{0.2 \cos\phi(1-2.8\psi)(\lambda+0.015)^{-0.4}\}$
$G_w = [1.94V_w/(1+V_w/15.4]^q$
$q = 1.1/(\lambda+0.015)^{0.4}$
$a = (14.4\lambda+5.5)\psi h_a/\lambda$
$h_a = 4.52 \times 10^{-3} V^{2.5}_w$
$V_w = 2.15S^{1.04}$

and where:

λ = Radar wavelength, m
ψ = grazing angle, radians
h_a = average wave height, m
V_w = wind velocity, m/s
ϕ = look direction, radians
S = sea state

(U) The grazing angle ψ may be determined using a standard atmosphere assumption. This is equivalent to a geometric calculation of straight-line propagation over an earth having an equivalent radius $r_e = 1.33\ r_0$, where r_0 is the physical earth radius. A minimum value of $\psi = 0.1°$ will be assumed out to the radar horizon.

(U) In the nadir region ($\psi > 40°$) increase $\sigma°$ by the following specular scattering term:

$$\sigma^\circ_{ss}(dB) = 10\log\left\{\exp\left[-\tan^2(90^\circ - \psi)/\tan^2(\beta_0)\right]\tan^2(\beta_0)\right\}$$

where tan (β_o) is the RMS wave slope which for 10 GHz is equal to 0.12, 0.14, 0.15, 0.16, 0.18 for [redacted] b(3) respectively. At other frequencies tan(β_o) is given by

$$\tan(\beta_o) = \text{sqrt}\left[0.6 + 0.4(f / f_o)\right]\tan(\beta_o)$$ b(3)

where:

f_o = b(3)

7.1.1.2.3 (U) Statistical Variation

(U) The statistical variation of scattering from the sea is described here as a compound distribution in which the instantaneous value in a particular cell varies as an exponential distribution whose mean power varies from cell to cell according to the Weibull distribution. Sea spikes are treated as an additional feature.

(U) The Weibull slope parameter, a, is assumed to be related to the illuminated area and grazing angle by:

$$\log a = 0.86 - 0.33 \log (A_c \psi), \text{ (for P = V)}$$

$$\log a = 1.16 - 0.33 \log (A_c \psi), \text{ (for P = H)}$$

where A_c is in m^2, and ψ is in degrees.

7.1.1.2.4 (U) Discrete Sea Clutter

(U) Discrete sea clutter can result from two phenomena - discrete man-made objects (e.g., oil platforms) and sea spikes. Discrete man-made objects will be modeled in the same manner as land clutter discretes (see 7.1.1.1.2).

(U) Sea spikes are considered to arise from physical processes having dimensions that are smaller than the smallest practical radar resolution cell. At b(3) type B sea spikes are present with an average density of one per 60 km^2. At b(3) the RCS of each spike is

assumed to be 10 dBsm for type A, and 20 dBsm for type B. At other radar frequencies, the sea spike RCS is to be scaled relative to the X-band value, b(3) as follows,

$\sigma_f =$ b(3) $-24.4\log(f) - 23.6$ dBsm, $f \leq$ b(3)

(U) For example, at b(3) the type A sea spike RCS is 4.7 dBsm.

(U) Sea spikes are assumed to exist with a lifetime of 4s with vertical polarization, and 2s with horizontal polarization. During their lifetime, sea spikes fluctuate in power in accordance with the exponential density function and with spectral characteristics consistent with the velocity distribution defined below.

(U) Sea spike amplitudes for Sea States below b(3)

7.1.1.2.5 (U) Velocity Distribution

(U) Each resolution cell is modeled as a many-scatterer process with a Gaussian distribution as described previously in 7.1.1.1.5.

(U) The mean velocity of the clutter attains a maximum value when the radar azimuth is aligned with the wind direction in accordance with:

$$v_o = \begin{cases} 0.85 V_w^{0.5} Cos\phi & \text{(horizontal polarization)} \\ 0.15 V_w Cos\phi & \text{(vertical polarization)} \end{cases}$$

where V_w is the wind velocity and ϕ is the radar azimuth with respect to the wind direction.

(U) The standard deviation of the velocity spectrum is related to wind velocity in accordance with:

$\sigma_v = 0.23\ V_w\ (m/s)$

7.1.1.3 (U) Rain Clutter

(U) Sensor performance is specified in clear weather. The system will continue to operate in the presence of rain with a performance proportional to that specified in the following paragraphs.

7.1.1.3.1 (U) Spatial Extent and Distribution of Rain

(U) Precipitation is assumed to extend to a maximum diameter of 400 km. The altitude of liquid precipitation is assumed to exist to the bright-band layer. This bright-band layer occurs at:

3.7 km	$0° < L < 36°$
3.7-(0.075 * (L-36))	$L > 36°$

where L = Latitude (deg).

(U)The rain rate is assumed to remain constant within a rain cell having length and breadth equal to 2.0 km. Rain rate is assumed to be statistically independent from one rain cell to another. The distribution of rain rate from one rain cell to another is assumed to correspond to a log-normal density function:

$$p(z) = \frac{1}{\sigma_z \sqrt{2\pi}} \exp(-ß^2/2)$$

where:

$$ß = \frac{Z - \mu_z}{\sigma_z}$$

$z = \log_{10} r$

r = rain rate (mm/hr)

μ_Z, σ_Z = mean, standard deviation of z.

7.1.1.3.2 (U) Rain Reflectivity

(U) Below the bright-band layer, mean reflectivity (RCS per unit volume) in a particular resolution cell, σ_r, is related to rain rate in the cell and illumination frequency by:

$$\sigma_r = Kf^4 r^{1.6} (m^2 / m^3)$$

where:

f = radar frequency (Hz)

r = rain rate (mm/hr).

(U) The constant K has the value $7x10^{-48}$ for radar frequencies below 6.0 GHz and the value $13x10^{-48}$ at 35 GHz. Values for K at other frequencies may be determined by linear interpolation and extrapolation of K against log f. See Table A-II.

TABLE A-II. (U) Example of Reflectivity Values for Rain

UNCLASSIFIED			
Frequency (GHz)	Reflectivity (dB m^2/m^3)		
	2 mm/hr	4 mm/hr	8 mm/hr
b(3)	-118.9	-114.0	-109.2
	-102.7	-98.0	-93.2
	-87.6	-82.8	-78.0
	78.8	-72.0	-67.2
	-67.0	-62.2	-57.4
	-55.7	-50.9	-46.1
UNCLASSIFIED			

(U) A bright-band layer is assumed to exist in which the values are 10 dB greater than those calculated above. The bright band thickness is assumed to be 300 m. The reflectivity above the bright-band layer is assumed to diminish at a rate of 6.5 dB/km up to the altitude of the tropopause (17 km for latitudes 0-30°, 9.0 km for latitudes 60°-90°, linear interpolation in between 30°-60°).

7.1.1.3.3 (U) Velocity Distribution

(U) Each resolution cell is modeled as a many-scatterer process with a Gaussian distribution as described previously in 7.1.1.1.3. The mean scatterer velocity in a volume resolution cell may be calculated using a model that includes a wind velocity u_s = 12 m/sec at the surface, 20 m/sec at an altitude of 3 km, 40 m/sec at an altitude of 10 km, and 20 m/sec at an altitude of 20 km. Velocity at intermediate altitudes may be determined by linear interpolation of speed versus altitude. The mean fall velocity is 10 m/sec. The wind direction is assumed constant over the entire elevation extent.

(U) The standard deviation of the velocity distribution is determined by the root-sum-square of turbulence (σ_t), shear (σ_s), beam broadening (σ_b), and fall (σ_f) components:

$$\sigma_v^2 = \sigma_t^2 + \sigma_s^2 + \sigma_b^2 + \sigma_f^2$$

where:

$\sigma_t = 1.0$ m/s

$\sigma_s = 0.42\ k\ \Delta h$

$\sigma_b = 0.42\ \upsilon_o \theta_2\ \text{Sin}\ \beta$

$\sigma_f = F \sin\psi$.

(U) The shear constant, k, is equal to 5.0 m/sec/km, and Δh is the vertical extent of the 3-dB beam within the rain. V_o is the mean wind velocity, defined above, θ_2 is the two-way 3-dB beamwidth, and ß is the angle relative to the mean wind direction. F is the standard deviation of fall velocities (F = 1.0 m/sec) and ψ is the antenna elevation angle.

7.1.1.3.4 (U) Rain Attenuation

(U) Attenuation refers to a loss by absorption of the propagated signal power relative to free space propagation; it occurs in addition to signal power loss (or gain) from refractive effects. The attenuation coefficient for rain may be calculated by:

$$A = kr^{\alpha}$$

where A is the one-way attenuation coefficient (in dB/km), r is rain rate (in mm/hr), k and α are coefficients that depend on frequency as listed in Table A-III. Values of k and α at other specific frequencies may be determined from the data by linear interpolation of log f against log k or log α. Table A-III also lists example values of attenuation for several frequencies and rain rates.

TABLE A-III. (U) Rain Attenuation Coefficients

UNCLASSIFIED			
f (GHz)	k	α	A(r=4mm/hr)
b(3)	3.7×10^{-5}	0.896	1.28×10^{-4}
	1.46×10^{-4}	0.943	5.40×10^{-4}
	6.20×10^{-4}	1.098	2.84×10^{-3}
	1.65×10^{-3}	1.287	0.0098
	4.24×10^{-3}	1.319	0.0264
	9.49×10^{-3}	1.270	0.0552
UNCLASSIFIED			

7.1.1.4 (U) Biological Clutter

(U) The JLENS system will be designed to minimize the effects of biological clutter such as birds and insects, singularly and in groups.

7.1.1.4.1 (U) Bird Clutter

(U) The average RCS of an individual bird is summarized in Table A-IV. RCS at intermediate frequencies is determined by linear interpolation of RCS (dB) against log(f). When more than one bird is in a resolution cell, the average RCS is defined by $n\sigma_B$ where n is the number of individual birds and σ_B is the average RCS (in m^2) of the individual bird. The average density of birds is assumed to be 1000 per km^2 for 25 gm and 120 gm birds, and 1 per km^2 for 1000 gm birds.

TABLE A-IV. (U) Average Radar Cross Section of Individual Birds

UNCLASSIFIED			
Frequency (GHz)	**Bird RCS** (dBsm)		
	25 gm	120 gm	1,000 gm
b(3)	-74	-58	-39
	-58	-45	-27
	-46	-33	-15

UNCLASSIFIED			
Frequency (GHz)	**Bird RCS** (dBsm)		
b(3)	-34	-23	-22
	-29	-26	-23
	-31	-28	-25
	-33	-31	-27
UNCLASSIFIED			

7.1.1.4.1.1 (U) Velocity Distribution

(U) Small birds (25 gm, 120 gm) are assumed to follow the Gaussian distribution with $V_o = V_{max} \cos \phi$ and standard deviation equal to 2.5 m/sec. V_{max} is 15 m/sec greater than the mean wind speed (see 7.1.1.1.5) and ϕ is the radar azimuth with respect to the wind direction. For large birds (1000 gm) V = 10 m/sec with respect to the mean wind velocity and the flight direction is uniformly random with respect to the wind direction.

7.1.1.4.2 (U) Insect Clutter

(U) Insects are assumed to be present over land to a maximum range limited only by propagation visibility. Insects may be present over the sea to a range of 20 km from the coast. Altitude distribution may be of two types: surface layer and elevated layer. The surface layer can exist over land; the elevated layer can exist over land or sea. The altitude extent of the surface layer is assumed to be 1 km; the thickness of the elevated layer is 100 m. The elevated layer may be centered at any altitude from the surface to 3 km. Median reflectivity (σ°_{50}) may be related to radar frequency (f) by:

$$\sigma^\circ_{50} = \begin{cases} K(f/f_0)^4 & f < 3.3\ GHz \\ K(f/f_0)^3 & f \geq 3.3\ GHz \end{cases}$$

where f_0 = 3.3 GHz. When σ°_{50} is expressed in m^2/m^3, the constant K equals 10^{-11} for a surface layer, and equals 10^{-9} for an elevated layer.

7.1.1.4.2.1 (U) Velocity Distribution

(U) Insect velocity will correspond to that of the local winds. Accordingly, the mean and standard deviations should be determined as in 7.1.3.3.

7.1.2 (U) Multipath and Diffraction

7.1.2.1 (U) Multipath

(U) The following multipath model considers specular reflection only for the indirect path to and from the target. At microwave frequencies (e.g., X-band), diffuse scattering can play a significant role.

(U) The one-way propagation factor of the field, F, in the presence of surface reflection can be determined from the expression in Kerr*:

$$F \propto \left| f(\theta_1) + f(\theta_2) \cdot D \cdot \Gamma \cdot \exp(-ik \cdot \Delta r) \right|$$

(U) Here $f(\theta_1)$ is the antenna pattern function for the direct ray at an angle θ_1 to the antenna maximum gain direction, $f(\theta_2)$ is this function for the indirect ray at angle θ_2 to the peak gain direction, and D denotes the divergence factor defined below. Further, Γ represents the complex reflection coefficient (including rough-surface scattering) defined below, Δr is the path difference between the direct and reflected rays, and $k = 2\pi/\lambda$ is the radar wavenumber.

(U) For specular reflection F can be written in the form:

$$F^2 = 1 + R^2 + 2 \cdot R \cdot \cos(\Delta\phi)$$

where the relative amplitude of the specular reflection, R ,is given by:

$$R = D \cdot \Delta G \cdot \rho$$

(U) The phase shift in this case is:

$$\Delta\phi = \left(\frac{2\pi}{\lambda}\right) \cdot \Delta r + \phi_0$$

and the divergence factor is given by:

$$D = \left(1 + \frac{2r_1 r_2}{a_e r \sin(\psi)}\right)^{-1/2}$$

(U) The magnitude of the specular reflection coefficient ρ is the product of the magnitude of the Fresnel reflection coefficient magnitude and the rough surface scattering coefficient:

$$\rho = \rho_0 \cdot \rho_s$$

(U) The other quantities in these equations are defined in the following:

ΔG = antenna gain difference between the specular point direction and the target direction

r_1 = ground range between transmitter and specular point

r_2 = ground range between specular point and target

r = ground range between transmitter and target ($r = r_1 + r_2$)

Δr = path length difference between direct and reflected paths

ρ_0 = magnitude of the complex Fresnel reflection coefficient

ϕ_0 = phase of the complex Fresnel reflection coefficient

ρ_s = rough surface specular reflection coefficient

ψ = grazing angle

α_e = effective radius of the earth (4/3* physical radius)

λ = radar wavelength (m)

(U) The complex Fresnel reflection coefficient for horizontal polarization is given by:

$$\rho_0 \cdot \exp(-i\phi_0) = \frac{\sin\psi - \sqrt{\varepsilon_c - \cos^2\psi}}{\sin\psi + \sqrt{\varepsilon_c - \cos^2\psi}}$$

(U) For vertical polarization the Fresnel reflection coefficient is:

$$\rho_0 \cdot \exp(-i\phi_0) = \frac{\varepsilon_c \sin\psi - \sqrt{\varepsilon_c - \cos^2\psi}}{\varepsilon_c \sin\psi + \sqrt{\varepsilon_c - \cos^2\psi}}$$

(U) Where ε_c is the complex dielectric constant of the earth defined as:

$$\varepsilon_c = \varepsilon_r - i \cdot 60\lambda\sigma$$

(U) Here ε_r is the real part of the dielectric constant, or relative permittivity, and σ is the electrical conductivity in S/m (or mho/m). These quantities for the JLENS multipath model are tabulated in the following:

(U) Sea Water Coefficients. The values for ε_r and σ for sea water are given in Table A-V.

TABLE A-V. (U) Electromagnetic Properties of Sea Water

UNCLASSIFIED		
Frequency	ε_r	σ
b(3)	70	5
	70	5
	70	5.2
	70	7
	65	10
	50	18
UNCLASSIFIED		

(U) Land (Soil) Coefficients. The values for ε_r and σ for soil are given in Table A-VI as a function of frequency and moisture content**.

TABLE A-VI. (U) Electromagnetic Properties of Soil

UNCLASSIFIED								
Frequency (GHz)	**Moisture Content** by Volume							
	0.3%		10%		20%		30%	
	ε_r	$60\lambda\sigma$	ε_r	$60\lambda\sigma$	ε_r	$60\lambda\sigma$	ε_r	$60\lambda\sigma$
b(3)	2.9	0.002	6.4	0.05	10.0	0.1	13.7	0.2
	2.9	0.016	6.6	0.54	10.4	1.1	14.3	1.6
	2.8	0.043	6.5	1.45	10.2	2.9	13.9	4.3
	2.8	0.065	5.9	2.18	9.1	4.3	12.2	6.5
UNCLASSIFIED								

(U) Urban Coefficient. The formula for complex dielectric constant for urban land cover (Asphalt) is given by**:

$$\varepsilon_c = b + mf + iaf^2$$

where:

$a = 1.3125 \times 10^{-9}$

$b = 6.1$

$m = -1.8 \times 10^{-4}$

f = frequency in MHz.

(U) The rough-surface specular reflection coefficient is given by (Miller-Brown-Vegh model):

$$\rho_s = \exp[-2(2\pi g)^2] \cdot I_0[2(2\pi g)^2]$$

(U) Here we have used the following definitions:

$$g = \frac{\sigma_h \sin\psi}{\lambda}$$

$I_0(x) = J_0(ix)$ (modified Bessel function)

σ_h is the RMS height deviation from a smooth, flat surface (meters)

$\sigma_h = 5$ ***For Land***

$\sigma_h = \frac{h_a}{\sqrt{2\pi}}$ ***For Sea, where h_a is given in 7.1.2.1.1***

(U) While the radars are expected to operate in all Sea States, b(3) for the JLENS Orbit radars.

(U) The foregoing multipath interference model is to be used in the calculating propagation gain (loss) in JLENS scenarios for which the following condition holds:

$$\Delta r > \frac{\lambda}{4}$$

(U) When the difference between the direct and indirect paths is less than or equal to a quarter wavelength, the propagation gain is to be determined in accordance with the diffraction model of the next section.

(U) **Propagation of Short Radio Waves, Volume 13,* Radiation Laboratory Series, ed. D.E. Kerr, 1951.

(U) ** Copyright Technology Services Corporation, "Radar Workstation Manual, Volume II", 1988.

7.1.2.2 (U) Diffraction

(U) The following model is used to calculate diffraction for spherical earth, which will describe the propagation gain (loss) when the scenario geometry meets the following criterion:

$$\Delta r \leq \frac{\lambda}{4}$$

(U) Assuming a 4/3 earth model the one-way field propagation factor F for diffraction effects arising from the spherical earth can be expressed in the following form:

$$F(x,y,z) = 2\sqrt{\pi x}\sum_{n=1}^{\infty} f_n(y) f_n(z) \exp[(e^{i\pi/6})a_n x]$$

(U) In this equation the independent variables are respectively the direct range x, transmitter height y and target height z, all defined in normalized quantities as follows:

$$x \equiv \frac{r_d}{r_0}$$

(r_d is the direct range from sensor to target)

$$y \equiv \frac{h_a}{h_0}$$ (h_a is the height of the sensor from the earth's surface)

$$z \equiv \frac{h_t}{h_0}$$ (h_t is the target height relative to the earth's surface)

(U) Here $r_0 \equiv \sqrt[3]{\frac{a_e^{\,2}\lambda}{\pi}}$ and $h_0 \equiv \frac{1}{2}\sqrt[3]{\frac{a_e\lambda^2}{\pi^2}}$

(U) The functions $f_n(u)$ in the sum above are defined as:

$$f_n(u) = \frac{Ai(a_n + ue^{i\pi/3})}{e^{i\pi/3} \cdot Ai'(a_n)}$$

(U) Where $Ai(w)$ is the Airy function given by:

$$Ai(w) = \frac{1}{\pi}\int_0^{\infty} \cos\left(\frac{t^3}{3} + wt\right) dt$$

(U) Furthermore, α_n is the nth root of Airy function, and $Ai'(\alpha_n)$ is the first derivative of the Airy function evaluated at the nth root.

(U) Convergence of the series summation for F has been problematic, particularly when computing it in the case of the target lying in the penumbra, or intermediate region between the interference (multipath) and umbra regions. In addressing this issue, Shatz and Polychronopoulos* developed an algorithm to calculate the sum for F without experiencing overflow problems by introducing a scaled Airy function defined as:

$$\overline{Ai}(w) = Ai(w) \cdot \exp\left(\frac{2}{3} w^{3/2}\right)$$

(U) In terms of scaled Airy functions, the relation for F becomes:

$$F(x,y,z) = 2\sqrt{\pi x}\sum_{n=1}^{\infty} \frac{\overline{Ai}(a_n + ye^{i\pi/3})}{e^{i\pi/3}Ai'(a_n)} \cdot \frac{\overline{Ai}(a_n + ze^{i\pi/3})}{e^{i\pi/3}Ai'(a_n)}$$
$$\times \exp\left[\frac{1}{2}(\sqrt{3}+i)a_n x - \frac{2}{3}(a_n + ye^{i\pi/3})^{3/2} - \frac{2}{3}(a_n + ze^{i\pi/3})^{3/2}\right]$$

(U) This algorithm is the preferred relation for calculating the one-way field propagation factor for JLENS when the direct and indirect path difference is no greater than a quarter wavelength. As in the multipath regime, the two-way signal propagation gain (in power) is then the fourth power of *F*.

(U) *M.P. Shatz and G.H. Polychronopoulos, "An Algorithm for the Evaluation of Radar Propagation in the Spherical Earth Diffraction Region," *IEEE Transactions on Antennas and Propagation*, *Vol. 34*, 1990

7.2 (U) Appendix B: Sea Salt Environments at Sea and for Coastal Regions

(U) The purpose of this appendix is to characterize the marine environment that the JLENS Systems (SuS and FCS) might see during storage, transport and deployment at sea or in coastal regions. Natural and anthropogenic (man-made pollution) aerosols are believed to play an important role in climate through their direct effect of scattering and absorbing radiation and their indirect effect of serving as cloud condensation nuclei [1,2]. The pH of aerosol particles is an important property because the rates of many chemical reactions (e.g. corrosion, oxidation of sulfur, halogen activation) depend on it [3]. Calculations of the pH of sea-salt aerosol particles show that the pH decreases with increasing relative humidity and, therefore, increasing liquid water content of the particles [4,5]. This is an unexpected result as one would expect a dilution with increasing liquid water content. The experimental determination of aerosol pH is difficult because aerosol water contents are usually too small for direct pH measurements [5].

7.2.1 (U) Compendium of Data Sources

(U) This appendix draws upon the referenced sources to characterize several properties of the sea-salt aerosol present at sea and in coastal regions:

a. (U) Effects of varying wind force upon number and weight of large sea-salt particles near cloud base over sea in Hawaii and Florida area for 99% relative humidity.

b. (U) Variation in total amount of airborne sea-salt as wind force varies.

c. (U) The calculated pH in the 3.4 μm sea-salt size bin as a function of relative humidity.

d. (U) The calculated pH of sea-salt particles as a function of relative humidity and ambient HCL concentration.

e. (U) The liquid water content of sea-salt particles with altitude in the marine boundary layer (MBL).

f. (U) The calculated pH of sea-salt particles as a function of altitude in the marine boundary layer (MBL).

(U) The Beaufort wind force scale is referenced in Figures B-1 and B-2 and is defined in Table B-I.

TABLE B-I. (U) Beaufort Wind Force Scale

UNCLASSIFIED	
Beaufort Scale Force	**Wind Speed in Knots**
0	0
1	1-3
2	4-6
3	7-10
4	11-16
5	17-21
6	22-27
7	28-33
8	34-40
9	41-47
10	48-55
11	56-63
12	>63
UNCLASSIFIED	

(U) Data from reference [1] was taken over Hawaii and Florida. Salt particles were taken at cloud level heights on 24 days represented in Figure B-1.

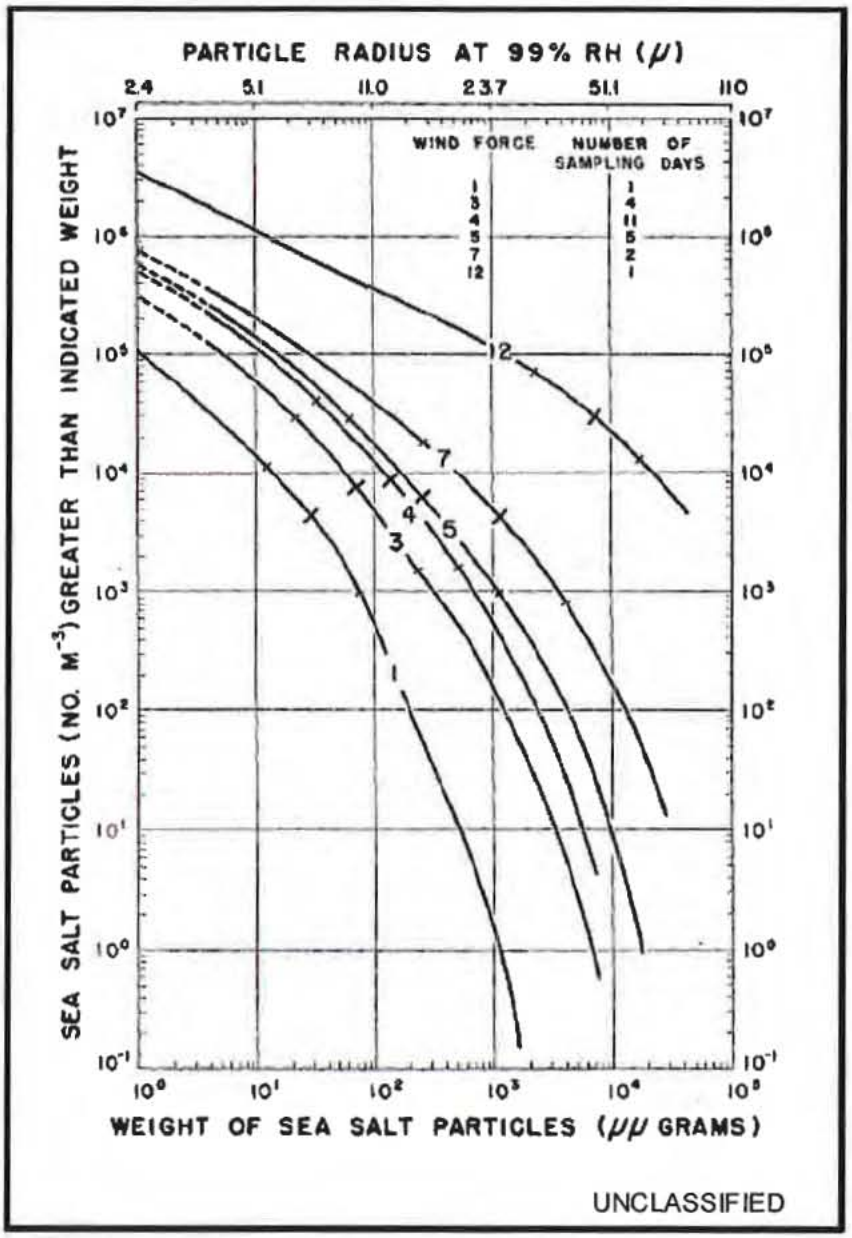

FIGURE B-1. (U) Effects of varying wind force upon number and weight of large sea-salt particles near cloud base over sea in Hawaii and Florida area from reference [1]

(U) The relative humidity is fixed at 99% at heights close to the cloud base. Smoothed distribution curves for forces 3, 4, 5, and 7 based upon averaging of results obtained on days when these forces were

observed (see legend). Curves for force 1 and 12 based upon one day of observation. Three short transverse lines on each curve mark first quartile, median and third quartile weight distribution points, reading from left to right. Distribution curves are read as follows: In force 5 wind, there are about 10,000 particles per m^3 larger than 170 μμg (picograms). Force 12 curve based upon measurements made in Florida within a tropical storm, and included here as indication of probable maximum amount of airborne salt.

(U) The data shown in Figure B-2 was taken along flight paths several kilometers in length. Therefore, the data cannot be considered to be localized. In order to show variability, seven samples were taken on a 65-km horizontal run in the cloud layer at 1,220 meters. Each sample represents 2,700 meters of air with a 7,200 meter interval between them. Surface winds were force 3. The seven samples showed a variation in total weight of sea salt of from 2 to 4 $\mu g\ m^{-3}$.

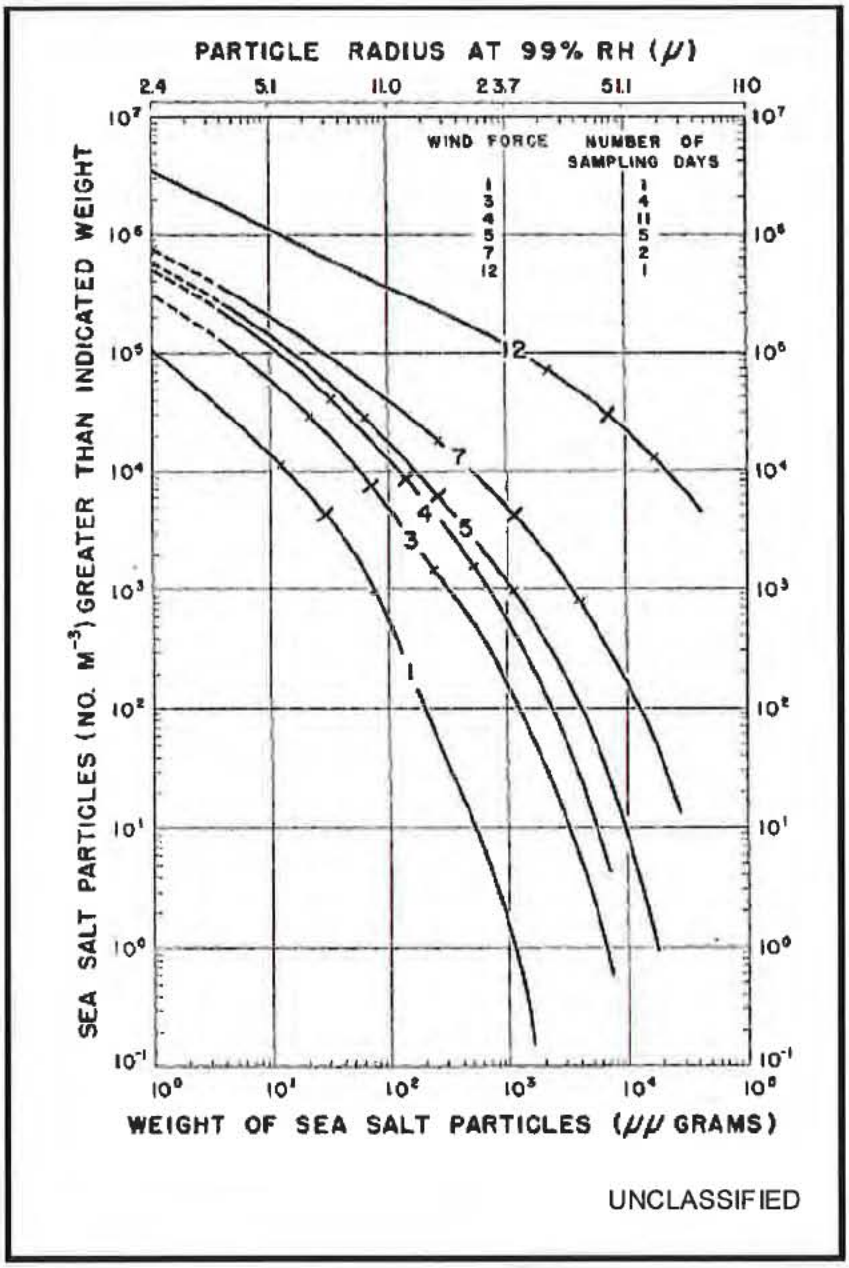

FIGURE B-2. (U) Variation in total amount of airborne sea-salt as wind force varies from reference [1]

JLENS SURVEILLANCE RADAR (SuR) PRIME ITEM DEVELOPMENT SPECIFICATION (PIDS) (U)	4U884	218	G	5219665
TITLE	CAGE CODE	SH NO.	REV LTR	NUMBER

(U) Most of the samples were taken at cloud levels in Hawaii. Upper symbols were taken from Jacobs [2]. His measurements were obtained near seashore at Scripps Institute, La Jolla, CA. Dashed lines are added to denote broad trend of observed values.

(U) The modeled pH of super-micron size bins as shown in Figure B-3 was primarily a function of relative humidity.

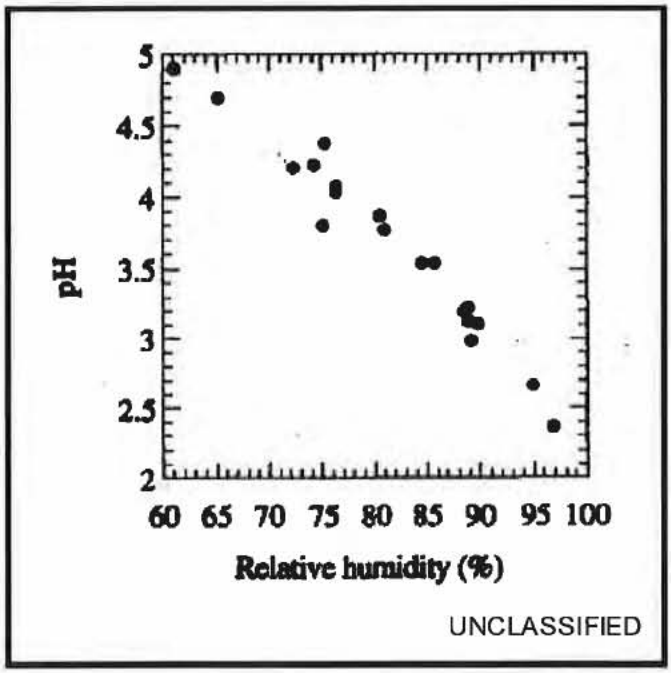

FIGURE B-3. (U) Calculated pH in the 3.4-μm size particle bin as a function of ambient relative humidity from reference [3]

(U) For particles in the 0.1 to 1 μm range, the pH is a strong function of the relative acidity of those particles. For particles in the 1 μm to 10 μm range, the pH is a strong function of the relative humidity, as may be inferred from the graph.

(U) Freshly emitted sea-salt particles are likely to begin with pH of 7-9. Interaction with HCL at a given relative humidity, as shown in Figure B-4, may then lower pH to as little as 2, depending upon relative humidity and ambient HCL. Submicron or micron sized particle probably reach equilibrium pH in their lifetimes, while the largest particles may or may not attain equilibrium in their lifetimes.

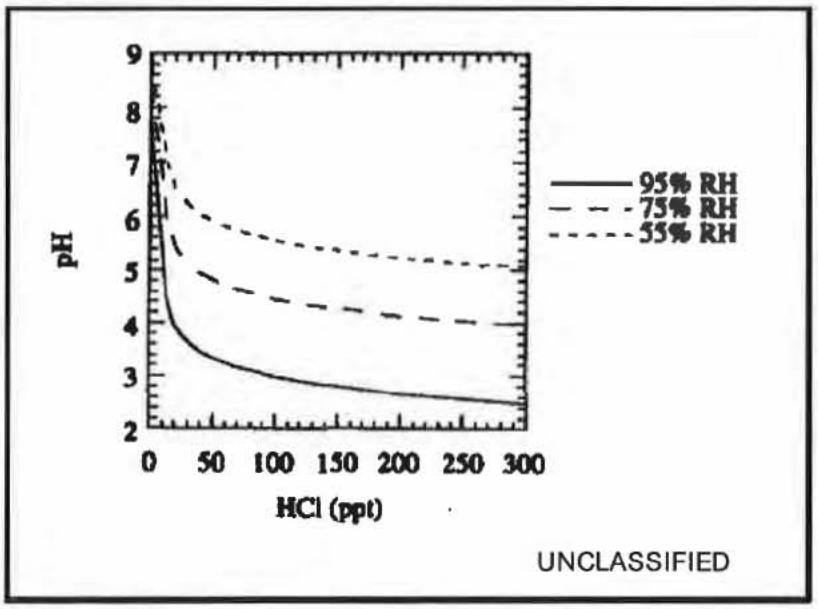

FIGURE B-4. (U) Calculated pH of the sea-salt sample as a function of initial ambient HCL concentration and relative humidity from reference [3]

(U) For reference, the range of 50 - 300 ppt ambient HCL concentration correlates to 0.075 - 0.46 μg m^{-3}. The inference is that at higher relative humidity, lower pH is achieved over time. Smaller particles are more likely to reach an equilibrium condition than are larger particles.

(U) Figure B-5 shows the liquid water content of the salt particles up to the top of the marine boundary layer. The units are dimensionless and relate the aqueous volume in m^3 of water in the particles to 1 m^3 of air.

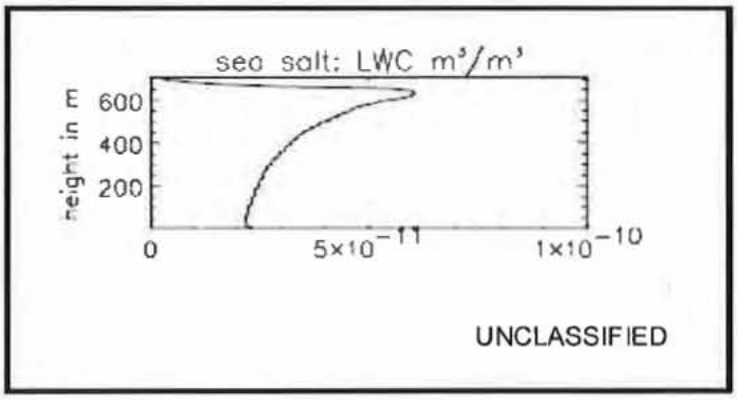

FIGURE B-5. (U) Calculated liquid water content (LWC) in sea-salt particles as a function of height in the marine boundary layer (MBL) from reference [5]

(U) LWC is not a measure of relative humidity, but is a measure of liquid water content in the particles. The units are dimensionless ($m_{aqueous}^3/m_{air}^3$).

(U) The pH for sea-salt particulate is shown to increase with height above the sea. The marine boundary layer (MBL) represented by Figure 6 is at 700 meters. The relative humidity [6] at the sea surface is 65% and increases to 90% below the inversion that caps the MBL.

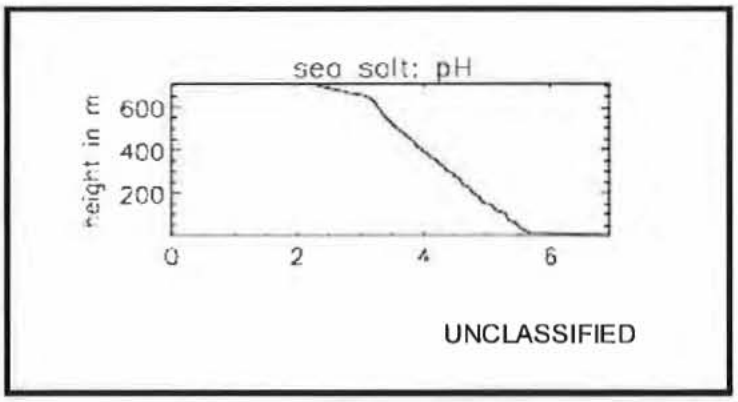

FIGURE B-6. (U) Calculated sea-salt particulate pH as a function of height in the marine boundary layer (MBL) from reference [5]

(U) The pH changes by a factor of 3 times up to top of the MBL. The rapid shift (in slope) to lower pH at greater heights in the MBL is due to atmospheric pollution.

7.2.2 (U) Summary

(U) The humidity of the air above the sea increases with increasing altitude to the top of the marine boundary layer.

(U) The marine boundary layer is defined by the height where temperature inversion occurs.

(U) The pH of particulate salt aerosols decreases (becomes more acidic) with increasing aerosol water content.

(U) Larger sea-salt particles are generated (liberated from the sea) at higher wind forces.

(U) Sub-micron sea-salt particles will reach an equilibrium pH within their lifetimes in the atmosphere, whereas, micron and above sea-salt particles may not.

(U) The pH of sea-salt particles varies by about 3 orders of magnitude within the marine boundary layer, where the pH is lowest at the top of the marine boundary and lowest at the sea surface.

7.2.3 (U) References

[1] (U) A.H. Woodcock, "Salt Nuclei in Marine Air as a Function of Altitude and Wind Force, Journal of Meteorology," Vol. 10, pp 362-371, October 1953.

[2] (U) W.C. Jacobs, Preliminary report of a study of atmospheric chlorides, Monthly Weather Review, Vol. 65, pp 147-151, 1937.

[3] (U) A.M. Fridlind, Jacobson, M.Z., "A study of gas-aerosol equilibrium and aerosol pH in the remote marine boundary layer during the First Aerosol Characterization Experiment (ACE 1)," Journal of Geophysical Research, Vol. 105, No. D13, pp 17325-17340, July 16, 2000.

[3] (U) W.C. Keene, Savoie, D.L., "The pH of deliquesced sea-salt aerosol in polluted marine air, "Geophysical Research Letters, Vol. 25, pp 2181-2184, 1998.

[4] (U) R. von Glasow, Sander, R., "Variation of sea salt aerosol pH with relative humidity," Geophysical Research Letters, Vol. 28, No. 2, pp 247-250, January 15, 2001.

[5] (U) R. von Glasow, doctoral dissertation, "Modeling the gas and aqueous phase chemistry of the marine boundary layer," Department of Physics, Johannes Gutenburg-University, Mainz, Germany, January 25, 2001.

DEPARTMENT OF THE ARMY
PROGRAM EXECUTIVE OFFICE, MISSILES AND SPACE
5250 MARTIN ROAD
REDSTONE ARSENAL, AL 35898-8000

REPLY TO
ATTENTION OF

March 2, 2010

Joint Land Attack Cruise Missile Defense
Elevated Netted Sensor System Product Office

Mr. b(6)
Raytheon IDS
Integrated Air Defense Center
350 Lowell Street
Andover, Massachusetts 01810

Dear b(6)

The following data item submitted for approval, via the noted transmittal letter under contract DASG60-98-C-0001, CLIN 0018, is approved.

JLENS CPG Prime Item Development Specification (PIDS) Revision K
(B009-042a CPG PIDS.zip)
(CDRL Repository folder\SDD\CDRL B009\042a Resubmittal CPG PIDS Rev K)

Transmittal Letter, Date: 10-JLSDD-0721a, 29 January 2010

This letter does not constitute or authorize a change to the contract terms and conditions or to the negotiated contract price.

The JLENS Product Office points of contact for this action are b(6) For Configuration Management issues, contact b(6)

Sincerely,

b(6)

JLENS Technical Monitor
JLENS Product Office

January 26, 2010
CAGE CODE 49956
H377785 – Revision K

Raytheon

JOINT LAND ATTACK CRUISE MISSILE DEFENSE ELEVATED NETTED SENSOR SYSTEM (JLENS)

COMMUNICATION AND PROCESSING GROUP (CPG)

PRIME ITEM DEVELOPMENT SPECIFICATION (PIDS)

Prepared by:
Raytheon Company
Integrated Defense Systems
350 Lowell Street
Andover, Massachusetts 01810

Revision History

Revision	Authorization	Date	Description
Rev –	ED6115819	12/13/06	Initial Release
Rev A	CN7028076	08/24/07	Revision A
Rev B	CN 7029354	10/19/07	Revision B
Rev C	CN 7030455	12/21/07	Revision C
Rev D	CN 7036160	08/25/08	Revision D
Rev E	CN 7037833	10/31/08	Revision E
Rev F	CN 7039301	02/02/09	Revision F
Rev G	CN 7040758	04/06/09	Revision G
Rev H	CN 7043472	09/08/09	Revision H
Rev J	CN 7044881	10/15/09	Revision J
Rev K	CN 7051741	01/26/10	Revision K

1 (U) SCOPE

1.1 (U) SYSTEM OVERVIEW

(U) JLENS is a surveillance, target acquisition, and engagement support system consisting of a Surveillance System (SuS) and a Fire Control System (FCS), and includes elevated sensors for long range target detection and tracking. The scope of operations ranges from single Service applications to a full Joint environment in all phases of warfare. The orbit employs advanced technologies with specific attention given to Land Attack Cruise Missile Defense (LACMD) in order to:

a. b(3) intercepts of Land Attack Cruise Missiles (LACM) b(3)

b. (U) contribute to the Single Integrated Air Picture (SIAP);

c. (U) provide target data on Surface Moving Targets (SMT); and

d. (U) detect and track Theater Ballistic Missiles (TBM) and Large Caliber Rockets (LCR).

(U) The elevated Surveillance Radar (SuR) in the Surveillance System detects hostile targets at long ranges. The Surveillance System target reports can be used to cue the Fire Control System to support weapon systems in the engagement of these hostile targets.

(U) The elevated Fire Control Radar (FCR) enables air defense weapons to engage low-flying cruise missiles at extended ranges and minimizes the likelihood of these threats completing their mission. When tasked, the Fire Control System can perform other missions in support of the warfighter. Either system can be employed as a stand-alone system b(3) Each Fire Control System and Surveillance System includes a platform, sensor and communications payloads, ground-based communications and processing equipment, and ancillary equipment.

(U) The platform is a non-rigid, aerodynamically shaped, helium and air filled air vehicle that is tethered to a ground or sea-based mooring station. The tether is a cable that secures the air vehicle, controls the operating altitude, provides power to airborne components and performs bi-directional data communication. The payloads are either a multi-functional fire control sensor for performing sector surveillance and supporting intercepts or a surveillance sensor performing wide area surveillance and supporting fire control sensor cueing, and the necessary communications equipment for each system. The ground-based Communication and Processing Group (CPG) includes operator station(s) and communications equipment.

FIGURE 1. (U) Notional Diagram of JLENS Orbit

b(3) JLENS provides target data to surface weapon systems for engagement decisions. The FCR also provides radar data to support kill assessment by the surface weapon system and Command and Control (C2) node. JLENS provides target data and surveillance quality tracks on SMTs. TBM/LCR tracking is supported by providing early warning data and corresponding launch point estimates (LPEs) on TBMs and LCRs in b(3)

(U) JLENS supports b(3) by placing data on Link-16. In addition, target data is transmitted on Link-16 to support joint fighter engagements of cruise missiles (CMs) and other airborne threats.

1.1.1 (U) Communication and Processing Group Definition

(U) The Communication and Processing Group (CPG) performs processing and communications functions for JLENS. Commercial fiber-optic components in an environmental enclosure and Government-off-the-shelf (GOTS) radios distributed between the ground-based and airborne equipment of the CPG enables JLENS to be a full participant on the Joint Link-16 and Cooperative Engagement Capability (CEC) networks. JLENS has connectivity to the b(3) component of the Mission Support function, and to the b(3)

(U) The CPG is also responsible for exchanging C2 voice and data with command centers and mobile air defense units on the Combat Net Radio (CNR) VHF network using a Single Channel Ground-to-Air Radio System (SINCGARS) waveform capable radio in the Communication and Control Station (CCS). Geolocation and timing is supported by b(3) Global Positioning System (GPS) receiver in the CCS.

(U) Other JLENS communications capabilities provided by the CPG include:

a. (U) Area Common User Services (ACUS) voice and data services,

b. (U) Wireline connections to collocated Mobile Subscriber Equipment (MSE) units or Joint Network Node (JNN),

c. (U) Switched circuit dialed access to C2 nodes and tactical packet network access,

d. (U) Ethernet access to the Global Command and Control System (GCCS),

e. (U) Secure and non-secure voice calls to other digital non-secure voice telephone (DNVT/ISDN) and digital secure voice telephone (DSVT/DSN) equipped units,

f. (U) Communication over the Public Switched Telephone Network (PSTN),

g. (U) Secure fax capability,

h. (U) Communications via Satellite Communications (SATCOM),

i. (U) Combat Net Radio, and

j. (U) An intercom system.

(U) The CPG enables operators to control the JLENS radars and platform while supporting force and engagement operations. Processing functions of the CPG include mission planning, contributing to the development of the SIAP, providing target data to surface weapon systems for engagement decisions and target updates, and providing radar data to support kill assessment by surface weapon systems and C2 elements. The CPG also provides target data on SMTs, and on TBMs and LCRs b(3)

1.2 (U) DOCUMENT OVERVIEW

(U) This Prime Item Development Specification (PIDS) defines the interface, performance, and functional requirements, as well as the operating environment for the JLENS CPG, as derived from the JLENS System Specification. The CPG interfaces include external systems, platform, and associated radar.

2 (U) APPLICABLE DOCUMENTS

2.1 (U) GOVERNMENT DOCUMENTS

(U) The following Government specifications, standards, and handbooks form a part of this document to the extent specified herein.

UNCLASSIFIED	
[2] MIL-STD-6016C	Tactical Data Link (TDL) 16 Message Standard
[3] MIL-STD-3011	Interoperability Standard for the Joint Range Extension Application Protocol (JREAP)
b(3)	
[5] MIL-STD-209J	Lifting and Tiedown Provisions
[6] MIL-HDBK-1791	Designing for Internal Aerial Delivery in Fixed Wing Aircraft
[7] MIL-STD-130L	Identification Marking of U.S. Military Property
[8]	DoD Internet Protocol Version 6 Transition Plan, March 24, 2005
[9] MIL-HDBK-454A	Central Guidelines for Electronic Equipment
[10] MIL-STD-1472F	Human Engineering
[11] MIL-STD-2525B	Common Warfighting Symbology
[12] MIL-STD-1477C	Symbols for Army System Displays
[13] MIL-STD-6040	United States Message Text Format Program
[15] MIL-STD-810F	Environmental Engineering Considerations and Laboratory Tests
[16] MIL-STD-461E	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
[17] MIL-STD-464A	Electromagnetic Environmental Effects Requirements for Systems
b(3)	
[20] MIL-STD-1366D	Transportability Criteria
[21] MIL-STD-1474D	Noise Limits
[22] MIL-HDBK-759C	Human Engineering Design Guidelines
[24] S-5200.19	DoD Directive
[25] 30393	NAVSEA Operational Directive
[26] MIL-HDBK-419A	Grounding, Bonding, and Shielding for Electronic Equipments and Facilities, dated 29 December 1987
[27] AR 70-38	Research, Development, Test and Evaluation of Material for Extreme Climactic Conditions
[30] NIST FIPS 140-2	National Institute of Standards and Technology (NIST) Federal Information Processing Standard (FIPS) 140-2
[32] MIL-STD-129P	Military Marking for Shipment and Storage
UNCLASSIFIED	

2.2 (U) NON-GOVERNMENT DOCUMENTS

(U) The following non-Government specifications, standards, and handbooks form a part of this document to the extent specified herein.

UNCLASSIFIED	
[100] ANSI Z535.1	Safety Color Code
[101] ANSI Z535.2	Environmental and Facility Safety Signs
[102] ANSI Z535.3	Criteria for Safety Symbols
[103] ANSI Z535.4	Product Safety Signs and Labels
[104] ANSI Z535.5	Accident Prevention Tags (for Temporary Hazards)
[105] ANSI-HFE-100	American National Standard for Human Factors Engineering of Visual Display Terminal Workstations
[106] IEEE C95.1-2005	Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 30 GHz
[107] NFPA-780	Standard for the Installation of Lightning Protection Systems, 2004 Edition
[29] H372287	Requirements for Painting with CARC
b(3)	
[1] H381785	Interface Requirements Specification (IRS) for the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor (JLENS) System Orbit
[14] H387989	Interface Requirements Specification (IRS) for the Communication and Processing Group (CPG)
[19] H381794	Joint Land Attack Cruise Missile Defense Elevated Netted Sensor (JLENS) System Specification (A-Specification)
[28] H350028	JLENS System Safety Program Plan (SSPP)
[31] H409134	Joint Land Attack Cruise Missile Defense Elevated netted Sensor System (JLENS) Cooperative Engagement Capability (CEC) Interface Design Description (IDD)
UNCLASSIFIED	

2.3 (U) ORDER OF PRECEDENCE

(U) In the event of a conflict between the text of this document and the references cited herein, with the exception of Reference [19], the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3 (U) REQUIREMENTS

(U) A CPG that is part of an SuS is referred to as "SuS CPG". A CPG that is part of an FCS is referred to as "FCS CPG". Requirements applicable to either of SuS CPG or the FCS CPG, but not both, explicitly state the type of CPG. Requirements applicable to both types of CPG use the reference "the CPG".

3.1 (U) CPG DEFINITION

(U) The CPG, while supporting air defense tactical operations, has four (4) major functions:

a. (U) Processing of information from the local sensor, CEC, IBS, Link-16, and Joint Range Extension (JRE) to form a local composite air picture.

b. (U) Evaluation by providing Identification Friend or Foe (IFF) and Identification (ID) support on higher priority targets.

c. (U) Engagement support by cueing the FCR to establish and maintain tracks with fire quality measurement data to be sent to surface based weapon system engagements.

d. (U) Transfer of track data between the SuS and FCS within an orbit, and from a JLENS system to external elements over the respective communication networks or links.

(U) The CPG has the following major functions which support the core JLENS operations:

a. (U) Radar operation planning and control in support of the mission

b. (U) Communication operation planning and control in support of the mission

c. (U) Health and status monitoring of the CPG and the overall system

d. (U) Data collection and recording

e. (U) Operator proficiency training including standalone and netted modes.

(U) These functions are achieved through a combination of JLENS communication equipment and interfaces, processing resources and displays, and the software processes of Mission Support (MS), Mission Operations (MO), Embedded Training (ET), Display and Process Manager (DPM), and Health Management System (HMS) functions of the CPG.

3.1.1 (U) JLENS States and Modes

(U) The JLENS System provides operational capabilities to support both wartime and peacetime missions through the use of the system states and modes. The JLENS System may transition between these states and their modes as a system or as individual elements of the systems (Prime Items). The five JLENS System States are Storage, Movement, Deployment, Operations, and Maintenance. Figure 2 shows the CPG transitions through the states and the modes.

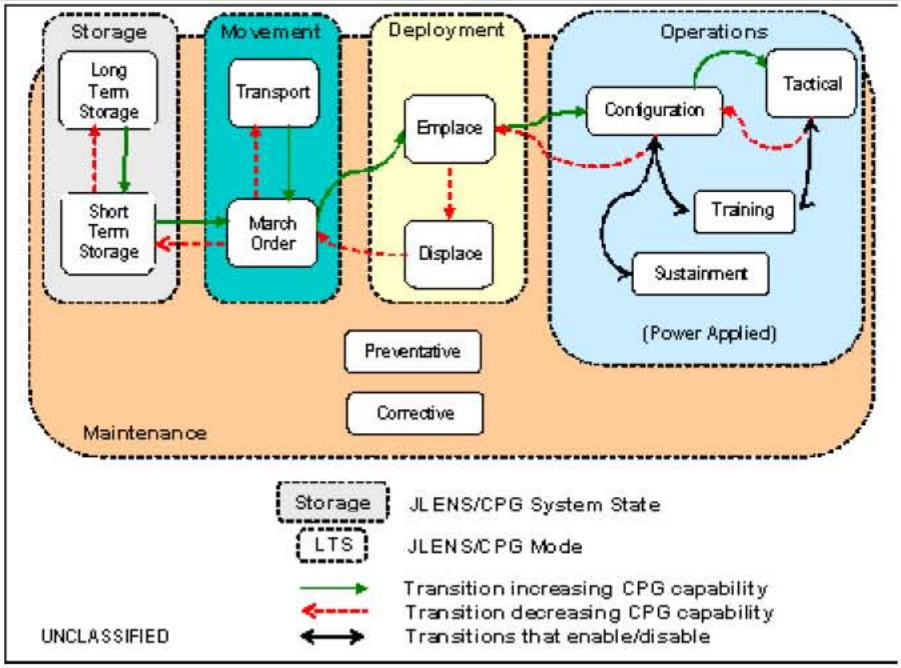

FIGURE 2. (U) CPG States and Modes

3.1.1.1 (U) Storage State

(U) The Storage state ensures the availability of the system after long or short periods of storage. It consists of the short-term and long-term storage modes. The JLENS System normally transitions into and out of the storage state from/to the movement state. This state is a non-operational state. (Each Prime Item has a Storage state.)

3.1.1.1.1 (U) Short-Term Storage (STS) Mode

(U) The system equipment is placed in short-term storage mode with the owning organization when mission requirements require the unit to perform functions other than their normal missions. [redacted] b(3) [redacted] The equipment is placed in the short-term storage without pre-conditioning and is maintained at a reduced maintenance level. [redacted] b(3) [redacted] The equipment is returned to operations in accordance with the appropriate technical manuals. Transition from this mode to the operational state is within the emplacement timeline defined in the requirements. *This mode is a non-operational mode.* (Each Prime Item has a short-term mode.)

3.1.1.1.2 (U) Long-Term Storage (LTS) Mode

(U) CPG equipment is placed in long-term storage when mission requirements do not require the equipment for both peacetime and wartime operations. The equipment may remain stored for the duration of its service life. The system equipment is prepared and pre-conditioned for transition into long-term storage in accordance with the appropriate technical manuals. [redacted] b(3) [redacted] The equipment is returned to operations in accordance with the appropriate technical data and guidance documents. *This mode is a non-operational mode.*

3.1.1.2 (U) Movement State

(U) The Movement state consists of the transport mode for intra-threatre and inter-theatre shipment of the JLENS System using non-organic means. The march-order mode for the movement in-theater is by organic means. This state is a non-operational state. (Each Prime Item has a Movement state.)

3.1.1.2.1 (U) Transport Mode

(U) In the transport mode, the equipment is placed into an air, ground, rail, or water transport configuration. All JLENS equipment is transportable by C-17 and C-5 fixed-wing military aircraft for strategic airlift, sealift, and/or rail. The JLENS system is transportable by C-130 intra-theater with the exception of the Mobile Mooring Station and other specified ground support equipment. Transitions to the transport mode are conducted using organic equipment or the transportation unit's special handling equipment. It remains in the transport configuration until it arrives at its final destination or is prepared for road march. *This mode is a non-operational mode*. (Each Prime Item has a transport mode. For all Prime Items except for the platform, all equipment is packaged for transportation in 8' x 8' x 20' ISO containers, see 6.2. The stations which are a part of the Communications Processing Group (CPG) are modified 8' x 8' x 20' ISO containers and must maintain the storage and transport protection of unmodified ISO containers.)

3.1.1.2.2 (U) March Order Mode

(U) The JLENS system transitions to the march-order mode when required to move by organic means. A JLENS unit is mobile with sufficient vehicles, personnel, supplies, and both system peculiar and common equipment to displace the entire unit in one move. JLENS must be capable of movement on primary and secondary roads, as well as movement off-road. It must be capable of limited off-road movement to reach pre-selected emplacement sites over cross-country terrain and unimproved roads. The system is capable of relocating on public roads and highways, including those having unimproved road surfaces (such as gravel or hard-packed dirt), to support emplacement at prepared sites. *This mode is a non-operational mode*. (Each Prime Item has a march-order mode. In this mode, all the prime items except for the platform, has all of its equipment packaged in 8' x 8' x 20' ISO containers. The platform mobile mooring station is configured so that it can move along paved or unimproved roads or over terrain.)

3.1.1.3 (U) Deployment State

(U) The Deployment state provides the transition from a system in a transport configuration arriving at a prepared site to a system ready to be come operational including aerostat inflation and launching. Conversely, the Deployment state covers the transition from a shut-down operational system to a system that can be transported. This is a non-operational state.

3.1.1.3.1 (U) Emplaced Mode

(U) The emplace mode includes the physical positioning, aerostat inflation, and physical integration of the system. The system equipment transitions to the emplace mode upon arrival at its designated location. After physical positioning and integration, the system can begin initialization of individual Prime Items.

3.1.1.3.2 (U) Displace Mode

(U) The displace mode provides the capabilities to transition system equipment to march order configurations prior to entering the movement state. The assigned crews shut down, disassemble, and stow all deployed equipment in preparation for movement. This mode is a non-operational mode.

(Each Prime Item has a displace mode. It goes from being in an operational mode until the prime item is packaged. The Prime Items do not all have to be at the same mode.)

3.1.1.4 (U) Operations State

(U) The Operations state begins with the system being configured for a mission and continues through all tactical or training operations. Maintenance and sustainment activities can be conducted during the Operations state. The

Operations state also includes a moored configuration where the system can be in any operational mode except tactical. The transition from the Operations state in moored configuration to the Operations state at altitude configuration occurs through the Deployment state. This state is an operational state. (Each Prime Item has an Operations state.)

(U) Note that all Prime Items do not have to be in the same state at the same time. For the system to be operational, each Prime Item must be at least in the configuration mode. Prime Item mode names may differ.

3.1.1.4.1 (U) Configuration Mode

(U) The configuration mode provides the ability for the operators to build and implement a mission profile. The mission profile contains the performance parameters for the radar and communications systems to meet the tasks in the assigned mission. Operator system interfaces are provided for monitoring external stimuli. Voice and data communications, both external and internal to the system, are provided to receive commands, provide status, and exchange data. The configuration mode can be entered as many times as is necessary during operations to change the performance mode. *This mode is an operational mode*. (Each Prime Item has a configuration mode where the PI is physically configured for operations and has power applied. All Prime Items do not have to be in the same mode but if all Prime Items are not at least in the configuration mode, the system cannot be in the configuration mode. Prime Item names for this mode may differ.)

3.1.1.4.2 (U) Tactical Mode

(U) The tactical mode provides the capability to perform all assigned mission operations to include: surveillance, detection, tracking discrimination, classification, threat evaluation, and engagement support. The system operates in the tactical mode concurrent with the configuration mode. In this mode, the radar may or may not be radiating, depending on desired operations. The JLENS System (Surveillance or Fire Control) transitions to the tactical mode, through the configuration mode, when emplacement functions are completed. The JLENS System (Surveillance or Fire Control) transitions out of the tactical mode when ordered to stand down. The JLENS System (Surveillance or Fire Control) can only be in the tactical state during operational environmental conditions. *This mode is an operational mode*. (Each Prime Item has a tactical mode. Each Prime Item in a system must be in the tactical mode for that system, surveillance or fire control, to be in the tactical mode. Prime Item names for this mode may differ.)

3.1.1.4.3 (U) Training Mode

(U) The training mode enables operator training at a number of levels including operator/maintainer, crew, unit and netted in both live and simulated operations, simultaneously. The training mode allows operators to maintain their proficiency in tactical decision making, console operations, and maintenance functions. Training can be enabled while in the Configuration or Tactical mode and provides for a transition to tactical operations. The four levels of training are summarized by the following.

3.1.1.4.3.1 (U) Operator/Maintainer Training

(U) Operator/Maintainer training for the soldier provides hands-on practice in the use of the hardware, software applications, and fault detection and isolation for individual pieces of equipment. Operator task training reinforces skills taught in training institutions, sustains skill previously learned, and is an invaluable tool to teach advanced skills. This mode is an operational mode.

3.1.1.4.3.2 (U) Crew Training

(U) Crew training is a progressive set of individual tasks that integrate the actions of the various system crews. It provides for conduct of crew battle drills for system/prime item emplacement, initialization, and integration. Crew training provides for training on system tactics, techniques, and procedures. This mode is an operational mode.

3.1.1.4.3.3 (U) Unit Training

(U) Unit training is a progressive set of individual and crew battle drills that link the prime items together during system integration and culminates with simulated engagement and force operations. Unit training is performed using tactical software and hardware communications means. This mode is an operational mode.

3.1.1.4.3.4 (U) Netted Training

(U) During Netted training, the JLENS system participates in a common training scenario, coordinated in near real-time, with other JLENS batteries and/or battalion, lower-tier air defense units, higher-echelon headquarters, and other combined arms and joint exercise participants. The JLENS battery participates in netted training exercises through interface with distributed interactive compliant simulations. This mode is an operational mode.

3.1.1.5 (U) Maintenance State

(U) The Maintenance state consists of preventive maintenance and corrective maintenance modes. While in this state, system equipment is maintained to ensure its operational readiness or return failed equipment to a mission capable status. *This state is an operational or a non-operational state dependent on mode*.

3.1.1.5.1 (U) Corrective Maintenance Mode

(U) The corrective maintenance mode is for repair of system failures resulting in unscheduled maintenance actions. Repair is defined as the restoration or replacement of parts to return the end items to an operational condition and maintain efficient operations. *This mode is a non-operational mode*.

3.1.1.5.2 (U) Preventative Maintenance Mode

(U) The preventative maintenance mode allows the JLENS crew to perform scheduled Preventative Maintenance Checks and Services (PMCS) designed to extend and ensure the operational readiness of the system. Preventative maintenance tasks may be conducted on individual Prime Items on a non-interference basis with system operation as long as safety policies and procedures allow. Transition to and from the preventative maintenance mode can occur from the storage, transportation, or operation states. *This can be either an operational or non-operational mode*.

3.1.2 (U) Physical and Functional Diagrams

(U) Figure 3 depicts both the logical and physical view of the CPG Prime Item (PI), as well as its connectivity to external networks and services.

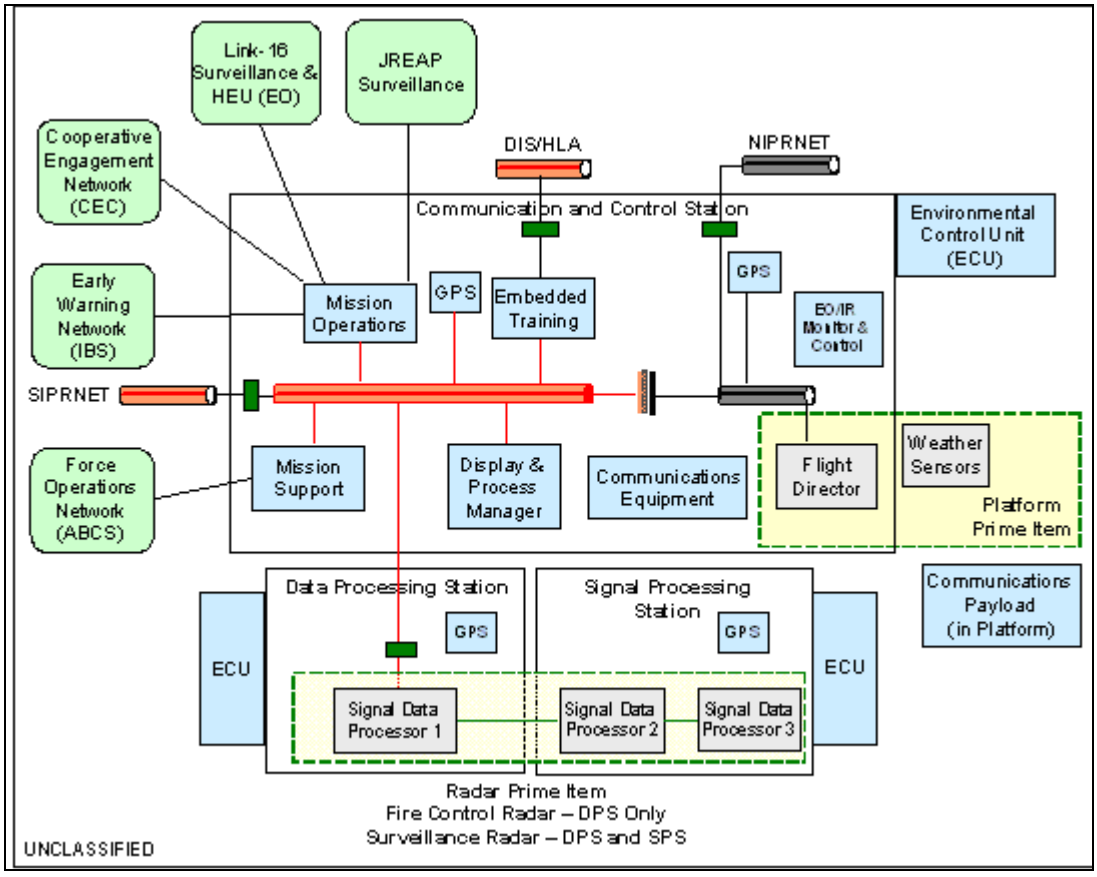

FIGURE 3. (U) CPG Block Diagram

(U) The CPG software subsystems consist of:

a. (U) Mission Support, which primarily handles Force Operations-related functions;

b. (U) Mission Operations, which primarily handles Engagement Operations-related functions;

c. (U) Display and Process Manager, which provides software infrastructure and service-related functions;

d. (U) Embedded Training, which is used to support operator-in-the-loop Distributed Interactive Simulation (DIS) and High Level Architecture (HLA) simulation exercises in a distributed environment; and

e. (U) Health Management System, which provides health, status and prognostics assessment for the JLENS system.

(U) The hardware subsystems of the CPG PI consist of the CP; the CCS, Data Processing Station (DPS), and Signal Processing Station (SPS); the Environmental Control System (ECS) and all hardware in or attached to the CCS except for the Platform weather monitoring equipment.

3.1.3 (U) Components List

(U) The major hardware (HW) and software (SW) components of the CPG are:

a. (U) Mission Support (MS) software,

b. (U) Mission Operations (MO) software,

c. (U) Display and Process Manager (DPM) software,

d. (U) Embedded Training (ET) software,

e. (U) Health Management System (HMS),

f. (U) Communication and Control Station (CCS) Shelter,

g. (U) Data Processing Station/Signal Processing Station (DPS/SPS) Shelter,

h. (U) CPG Environmental Control System (ECS),

i. (U) Communications Payload (CP),

j. (U) Communications, Networks, and Processors (CNP) hardware subsystem,

k. (U) Power subsystem.

3.1.4 (U) Government Furnished Equipment

(U) The JLENS contract contains a complete list of Government Furnished Equipment (GFE). A top level summary is provided below.

a. (U) CEC HW and SW

b. (U) Multi-Band Multi-Mission Radio (MBMMR) Set

c. (U) AN/PRC-150C HF Manpack Radio

d. b(3)

e. (U) MIDS LVT (2) Radio Terminal Set

f. b(3)

g. (U) Tactical/Secure Telephone Equipment (STE)

h. b(3)

3.2 (U) CPG CHARACTERISTICS

3.2.1 (U) Performance Characteristics

3.2.1.1 (U) General Operations

[CPG-268] (U) The CPG **shall** operate as part of a JLENS system (SuS or FCS) on prepared land sites as defined in Reference [19], section titled *Glossary*.

[CPG-269] b(3)

[CPG-270] (U) The CPG **shall** support stand-alone operation for a Surveillance System or a Fire Control System, where stand-alone means that there need not be a complementary FCS or SuS.

[CPG-271] (U) The CPG **shall** execute operations automatically using Mission Planning and Mission Profile parameters in the following areas:

a. (U) maintain track data from multiple sources

b. (U) process category and platform (specific type) data

c. (U) process identification data

d. (U) prioritize and request IFF challenging

e. (U) associate IFF returns to system tracks

f. (U) establish and update track priorities

g. (U) report tracks

h. (U) engagement support for remote weapons

i. (U) assess operational health of the CPG, Platform, and associated radar

j. (U) record tactical data

[CPG-281] (U) The CPG **shall** alert the operator when interventions are required for automatic operations in the following areas:

a. (U) category, platform type or specific type data differences with external systems

b. (U) identification data differences with external systems

c. (U) priority engagement support actions

d. (U) radar and communication [redacted] b(3)

e. (U) data recording space availability

f. (U) operational health failures

[CPG-2343] (U) The CPG **shall** have probability of data transfer from air to ground as defined in Appendix B.

[CPG-2344] (U) The CPG **shall** have probability of transfer of track data within an Orbit as defined in Appendix B.

[CPG-2345] [redacted] b(3)

[CPG-2417] [redacted] b(3)

[CPG-288] [redacted] b(3)

3.2.1.2 (U) System Initialization and Shutdown

[CPG-290] (U) The CPG **shall** initialize (power-up) into a safe state.

[CPG-291] (U) The CPG, upon power application, **shall** automatically initialize components to a point where they can accept configuration commands.

[CPG-292] (U) Upon completed boot up, the CPG **shall** display an indication that boot up is complete along with indications of CPG processing elements faults that occurred during [redacted] b(3)

[CPG-293] (U) The CPG **shall** provide an access control mechanism for operator login.

[CPG-294] (U) The CPG **shall** enable login to support the following roles:

a. (U) operator including planning, system health monitor, and radar management

b. (U) administrator

c. (U) maintainer

[CPG-298] (U) The CPG **shall** enable operator actions based on operator type.

[CPG-299] (U) The CPG **shall** enable operator actions based on the system configuration (SuS or FCS).

[CPG-300] (U) The CPG **shall** configure itself consistent with the selected radar type.

[CPG-301] (U) The CPG **shall** maintain default system configuration parameters.

[CPG-302] (U) The CPG **shall** conduct a controlled shutdown of the system upon operator initiation.

[CPG-303] (U) The CPG **shall** provide for a safe system shutdown, whether operator initiated or automatic.

3.2.1.3 (U) Radar Mission Planning

(U) The operational and mission planning is accomplished in the CPG through the combination of order and data exchanges with the directing C2 node, and on-board tools for data management and coverage analyses. Collaborative planning with the other air defense elements is supported to the extent of the capabilities provided by b(3) and by the serialized interactions with the directing C2 node as defined in the requirements that follow.

[CPG-305] (U) The CPG **shall** collect, prepare, process, and analyze mission and operational planning data; build mission plans; and analyze coverage to conduct its assigned mission using rules defined by the directing C2 node. The results of these activities are used to build the details of mission profiles used to manage the associated radar.

[CPG-2671] (U) The CPG **shall** enable the operator to create, edit, save, and retrieve Mission Planning data to support JLENS operations in the absence of connectivity with HEU(FO) b(3)

[CPG-306] (U) The CPG **shall** enable the operator to create, edit, save, and retrieve b(3) of Mission Planning data to include the following:

a. (U) mission designation/identification
b. (U) airspace control measures (ACMs)
c. (U) weapon control volumes (WCVs)
d. (U) defended assets with priority
e. (U) air defense elements with needed search coverage
f. (U) areas of interest (AOI)
g. (U) IFF mode selections and challenge controls
h. (U) track category priorities in support of the mission
i. (U) known hostile specific types
j. (U) known friendly specific types
k. (U) known neutral specific types

[CPG-318] (U) The CPG **shall** enable the operator to review received messages, generate messages, transmit messages, save messages, and retrieve messages exchanged with the Higher Echelon (Force Operations) (HE(FO)) in formats in accordance with Reference [13]. This exchange supports the transfer of planning data to HE(FO).

[CPG-319] (U) The CPG **shall** display notification upon receipt of new or updated operational orders of the following types:

a. (U) Air Tasking Order (ATO)
b. (U) Airspace Control Order (ACO)
c. (U) Tactical Operations Data (TACOPDAT)
d. (U) Battlefield Geometry
e. (U) Operations Plan and/or Order Change (PLANORDCHG)
f. (U) Order Message (ORDER)

[CPG-326] (U) The CPG **shall** display notification upon receipt of new or updated operational planning data containing the following data elements:

a. (U) Operational Plan
b. (U) Air Defense Plan (ADP)
c. (U) Defended Asset List (DAL)
d. (U) Planning Periods
e. (U) Prioritized DAL (PDAL)
f. (U) Defense Designs
g. (U) Defensive Tasks
h. (U) Resources
i. (U) Assets
j. (U) Threats
k. (U) Units
l. (U) Validations

[CPG-339] (U) The CPG **shall** alert the operator upon receipt of:

a. (U) Enemy Situational Awareness (ENSIT)
b. (U) Operational Tasking Data Links (OPTASKLINK)
c. (U) Commander's Situation Report (SITREP)
d. (U) Request for Information (RI)
e. (U) Response to Request for Information (RRI)
f. (U) Tactical Report (TACREP)

[CPG-346] (U) The CPG **shall** enable the operator to select and load received operational planning data and orders required for the JLENS mission into the Mission Planning database.

[CPG-348] (U) The CPG **shall** provide computer and network equipment to host software for use to perform military administrative, personnel, and logistics functions. This computer equipment can be in addition to processing required for JLENS operations.

[CPG-349] (U) The CPG **shall** perform terrain-based coverage analysis [redacted] b(3)

[CPG-350] (U) The CPG coverage analysis **shall** enable the operator to assess communication visibility based on terrain and relative antenna height above ground level.

[CPG-351] (U) The CPG radar coverage analysis **shall** enable the operator to assess areas of coverage considering the following:

a. (U) Terrain [redacted] b(3)
b. (U) Radar type and planned altitude
c. (U) System is operating standalone or as part of an orbit supporting the same mission (FCS only)
d. [redacted] b(3)
e. (U) Multiple track altitudes
f. (U) Radar field of view adjusted for planned sectors with radiation state and range
g. (U) Overlap with engagement zones of supported weapons

[CPG-2617] (U) The CPG **shall** ensure that the SuR surveillance sectors:

a. (U) Do not overlap

b. (U) Have uniquely assigned priorities

[CPG-359] (U) The CPG **shall** provide the displays and controls necessary to accept and display military weather data.

(U) A Mission Profile includes the following:

a. (U) Mission Profile Designation/Identification

b. (U) Mission(s) Enabled (ABT, TBM, LCR, SMT)

c. (U) Frequency Utilization

d. (U) Radiation Control Sectors

e. (U) b(3) Pre-Planned Procedures

f. (U) IFF transponder settings

g. (U) Surveillance Sectors Definition (Azimuth, Range, Bounds, Priority, FCR Mission)

h. (U) FCR ABT Search Function

i. (U) FCR Mechanical Orientation

(U) Note: Capabilities of associated radar will define interdependency of selections. The FCR can support surveillance functions of Search While Track (SWT) or Track While Scan (TWS).

[CPG-360] (U) The CPG **shall** provide the interface to allow the operator to create mission profiles.

[CPG-2609] (U) The CPG **shall** provide the interface to allow the operator to retrieve stored mission profiles.

[CPG-2608] (U) The CPG **shall** provide the interface to allow the operator to save mission profiles.

[CPG-2607] (U) The CPG **shall** provide the interface to allow the operator to edit mission profiles.

[CPG-2643] (U) The CPG **shall** provide storage and access to b(3) mission profiles.

3.2.1.4 (U) Communications Management

3.2.1.4.1 (U) Communications Setup

[CPG-372] (U) The CPG **shall** enable the operator to create, edit, save, and retrieve communications equipment configuration parameters to include the following:

a. (U) MIDS radio Load File

b. (U) GPS Setup

c. (U) External Systems IP Addressing

d. (U) CEC

e. (U) TOCNET

f. (U) Voice Radio

g. (U) JRE SATCOM

h. b(3)

[CPG-376] (U) The CPG **shall** enable the operator to implement communication controls to include the following:

a. (U) Link 16 Enable/Disable and designate associated load file

b. (U) JRE Enable/Disable

c. (U) CEC Enable/Disable

d. (U) ABCS Enable/Disable

e. (U) ABCS Track Reporting Enable/Disable

f. (U) IBS Enable/Disable and designate associated load file

g. (U) Secure Internet Protocol Router Network (SIPRNET) Enable/Disable

h. (U) Non-Classified Internet Protocol Router Network (NIPRNET) Enable/Disable

[CPG-384] (U) The CPG **shall** enable the operator to command Emission Control (EMCON) for each of the organic GFE radios b(3) Voice communications are shut down by the operator consistent with the scope of the EMCON decision.

[CPG-385] (U) The CPG **shall** provide operator controls to establish track reporting filters for Link-16 to include the following non-mutually exclusive criteria:

a. (U) geographic areas of interest

b. (U) track category

c. (U) track identity

[CPG-2493] (U) The CPG **shall** provide operator controls to establish track reporting filters for JRE to include the following non-mutually exclusive criteria:

a. (U) geographic areas of interest

b. (U) track category

c. (U) track identity

[CPG-2494] (U) The CPG **shall** provide operator controls to establish track reporting filters for IBS to include the following non-mutually exclusive criteria:

a. (U) geographic areas of interest

b. (U) track category

c. (U) track identity

[CPG-2496] (U) The CPG **shall** provide operator controls to establish track reporting filters for HE(FO) (ABCS) to include the following non-mutually exclusive criteria:

a. (U) geographic areas of interest

b. (U) track category

c. (U) track identity

[CPG-391] (U) The CPG **shall** load communications equipment with selected configuration parameters upon operator command.

[CPG-392] (U) The CPG **shall** enable the operator to direct the United States Message Text Format/Extensible Markup Language (USMTF/XML), SIPRNET Application, and Non-Classified Internet Protocol Router Network (NIPRNET) Application messages to the external connections. This is to support multiple-paths of the mission-supplied Military Satellite Communications (MILSATCOM) and/or terrestrial communications. MILSATCOM includes Ultra High Frequency (UHF), Super High Frequency (SHF), and Extreme High Frequency (EHF) Communications. Terrestrial communications include Signal Corps Communications assets (currently known as Warfighter Information Network-Terrestrial (WIN-T) Increment 1) and landlines.

[CPG-393] (U) The CPG **shall** enable the operator to direct JREAP messages to onboard SATCOM and to external connections. External connections support multiple-paths of the mission-supplied MILSATCOM and/or

terrestrial communications. MILSATCOM includes UHF, SHF, and EHF communications. Terrestrial communications include IP-based radios and landlines.

3.2.1.4.2 b(3)

[CPG-395] b(3)

[CPG-396] b(3)

[CPG-397] b(3)

[CPG-2469] b(3)

a. b(3)

b. b(3)

c. b(3)

d. b(3)

b(3)

[CPG-398] b(3)

3.2.1.5 (U) Radar Management

3.2.1.5.1 (U) Common Radar Management

[CPG-2586] (U) The CPG **shall** forward mission profile updates to the radar only when the radar is in an operational state.

[CPG-403] (U) The CPG **shall** send a selected mission profile b(3) to the radar upon operator command.

[CPG-404] (U) The CPG **shall** provide an indication when the associated radar is safe to radiate.

[CPG-405] (U) The CPG **shall** provide an indication when the associated radar has reached the last commanded state.

[CPG-406] (U) The CPG **shall** require two or more unique, sequential operator actions to initiate safety critical functions for the associated radar.

[CPG-407] (U) The CPG **shall** enable the operator to command the radar to transition between radar states.

[CPG-408] (U) The CPG **shall** command selectable EMCON controls to the associated radar b(3)

[CPG-410] (U) The CPG **shall** alert the operator if both the associated radar transponder and the Platform transponder are enabled.

[CPG-2395] (U) The CPG **shall** alert the operator if neither the associated radar transponder nor the Platform transponder is enabled.

[CPG-413] b(3)

[CPG-414] b(3)

3.2.1.5.2 (U) Surveillance Radar Management

[CPG-417] (U) The SuS CPG **shall** enable the operator to command incremental reduction of peak radiated power in azimuth sectors.

[CPG-2684] (U) The SuS CPG **shall** provide controls to enable the operator to prevent radiation in specified azimuth sector.

3.2.1.5.3 (U) Fire Control Radar Management

[CPG-419] (U) The FCS CPG **shall** manage radar tasking to ensure that the operating limits for the reported available radar resources are not exceeded based on the following considerations:

a. (U) nominal percentage usage schedule based on available resources;

b. (U) ability to task for limited periods of time above the nominal; and

c. (U) account for recovery periods after overtasking

[CPG-423] (U) The FCS CPG **shall** rebuild the radar task schedule in response to an operator action. The rebuilt schedule will account for the operator commanded action, previously commanded on-going actions, and current engagement support plans.

[CPG-2587] (U) The FCS CPG **shall** command the radar to provide track update b(3)

[CPG-428] (U) The FCS CPG **shall** enable the operator to view an overlay showing the current FCR azimuth field of view on the situation display.

[CPG-429] (U) The FCS CPG **shall** enable the operator to assess a proposed pointing adjustment by providing indications that include:

a. (U) the projected time to slew

b. (U) projected new area of coverage

[CPG-434] (U) The FCS CPG **shall** recommend to the operator when an FCR pointing adjustment is necessary to address the cases of a) the radar hitting physical rotation limit, and b) aerostat motion prevents the radar from keeping PTL. The CPG operator will take an action that balances current activities with the need to keep the FCR supporting the mission.

[CPG-435] (U) The FCS CPG **shall** enable the operator to command an azimuth slew to the FCR.

[CPG-2646] (U) The FCS CPG **shall** require a separate operator override to perform a slew that conflicts with an engagement support plan.

[CPG-436] (U) The FCS CPG **shall** display the progress of a commanded azimuth slew.

[CPG-437] (U) The FCS CPG **shall** provide the interface to allow the operator to assess the current orientation of the coverage area of the FCR with regard to supporting assigned missions. The orientation assessment should consider the following items:

a. (U) Azimuth offset from planned azimuth primary threat line and sector bounds

b. (U) Elevation offset from planned elevation center line

c. (U) Radar field of view

[CPG-441] (U) The FCS CPG **shall** manage radar tasks in accordance with the CPG assigned priorities.

[CPG-442] (U) The FCS CPG **shall** provide tasking commands to the radar.

3.2.1.6 (U) Track Maintenance

3.2.1.6.1 (U) General Track Maintenance

[CPG-445] b(3) [redacted]

[CPG-2399] (U) The CPG **shall** automatically initiate system tracks on local tracks which do not correlate to existing system tracks.

[CPG-446] (U) The CPG **shall** maintain the following on a per-track basis, if available:

a. (U) position and velocity
b. (U) time associated with track validity
c. (U) covariance data
d. (U) identification
e. (U) correlated IFF responses
f. (U) air space interaction data
g. b(3) [redacted]
h. (U) correlated track numbers
i. (U) track history, including position, identity, category, platform, and specific type information
j. (U) LPEs for TBMs and LCRs
k. (U) simulated track indicator

[CPG-2434] (U) The CPG **shall** maintain the level of precision for track data as provided by the track source.

[CPG-459] (U) The CPG **shall** maintain the position and velocity in system coordinates based on the World Geodetic Survey (WGS)-84 earth model.

[CPG-2552] (U) The CPG **shall** geodetically align the associated radar data using the location of self reporting units.

[CPG-2553] (U) The CPG **shall** align the external system track data from

a. (U) CEC
b. (U) Link-16
c. (U) JRE

to the geodetically aligned radar track data.

[CPG-463] (U) The CPG **shall** purge a source track from the database and reconstitute the platform type, specific type, and identification data of the remaining correlated source tracks when a drop track message is received or a track is no longer updated by the source.

3.2.1.6.2 (U) Air and Space Track Correlation/Decorrelation

[CPG-465] (U) The CPG **shall** correlate and decorrelate the following in order to contribute to the Single Integrated Air Picture (SIAP):

a. (U) local tracks with Link-16/JRE tracks in accordance with Reference [2];
b. b(3) [redacted] and
c. (U) local tracks with CEC tracks

[CPG-469] (U) The CPG, upon correlation events, **shall** assess the platform type, specific type, and identification data of source tracks in a manner consistent with rules of the corresponding external links.

[CPG-470] (U) The CPG, upon decorrelation events, **shall** reconstitute the platform type, specific type, and identification data of the source tracks.

[CPG-471] (U) The CPG **shall** support modification of correlation threshold parameters as defined in Reference [2].

3.2.1.7 (U) Track Category, Platform, and Specific Type Reporting

[CPG-2478] b(3)

a. b(3)

b. b(3)

c. b(3)

d. b(3)

e. b(3)

f. b(3)

g. b(3)

[CPG-2400] b(3)

[CPG-473] (U) The CPG **shall** exchange platform, platform activity, specific type, and identification indicators on Link-16/JRE in accordance with Reference [1]. Reference [2] provides details on Link-16 messaging.

[CPG-2647] b(3)

[CPG-474] (U) The CPG **shall** display an alert indicating a difference in track category between external and local sources that requires operator intervention.

[CPG-475] (U) The CPG **shall** enable the operator to change the category, platform and/or specific type of a track.

[CPG-2615] (U) The CPG **shall** exchange only unambiguous air specific types, as defined in Reference [1], to external links.

[CPG-2614] (U) The CPG **shall** exchange only unambiguous air platform, as defined in Reference [1], to external links.

3.2.1.8 (U) Identification

(U) Identification is the determination of the affiliation of a track. The identification categories are Pending, Unknown, Assumed Friend, Friend, Neutral, Suspect, and Hostile.

3.2.1.8.1 (U) Air Track Identification

[CPG-2652] (U) The CPG **shall** evaluate a local ID against the external data link ID to determine the CPG recommended reportable identification.

[CPG-479] (U) The CPG **shall** utilize the following identifications for local recommendations and exchanges with external systems:

a. (U) Pending

b. (U) Assumed Friend

c. (U) Friend

d. (U) Unknown

e. (U) Suspect

f. (U) Hostile

g. (U) Neutral

[CPG-487] (U) The CPG **shall** recommend an air track as a Friend based on the received Precise Participant Location and Identification (PPLI) correlated with the track.

[CPG-2650] (U) The CPG **shall** recommend an air track as a Friend based on the received Mode 5 IFF correlated with the track in accordance with Reference [2].

[CPG-488] (U) The CPG **shall** enable the operator to set the identification of an air track.

[CPG-489] (U) The CPG **shall** recommend a local identification of a track, excluding Pending, factoring the input from the following identification sources:

a. (U) Change Data Order in effect

b. (U) Operator identification selection

c. (U) PPLI correlation

d. (U) IFF Mode 5

e. (U) Procedural Identification

f. (U) Order of battle correlation

[CPG-2470] (U) The CPG **shall** allow the operator to enable/disable the air space interaction and order of battle methods for determining track identification.

[CPG-495] (U) b(3) the FCS CPG **shall** establish an Order of Battle (OOB) identification.

[CPG-496] (U) The CPG **shall** exchange identification information with Link-16/JRE and set identification in accordance with Reference [1]. This includes the use of the ID Difference Resolution Table and Track Management Messages for ID Differences and Change Data Orders detailed in Reference [2].

[CPG-2649] (U) The CPG **shall** exchange b(3) in accordance with Reference [1] and set identification in accordance with Reference [2].

[CPG-2648] (U) The CPG **shall** exchange b(3) in accordance with Reference [1] and set identification in accordance with Reference [2].

[CPG-497] (U) The CPG **shall** display an identification conflict alert if indicated by the ID Difference Resolution Table described in Reference [1] for tracks exchanged on Link-16/JRE.

[CPG-498] (U) The CPG **shall** display an alert indicating a difference in identification between external sources and a local air track that requires operator intervention. b(3)

3.2.1.8.2 (U) IFF Processing

[CPG-500] (U) The CPG **shall** correlate the system tracks with received valid local IFF responses.

[CPG-501] (U) If an unambiguous correlation has been made between a system track and a local IFF response, the CPG **shall** update the system track data with received valid IFF responses.

[CPG-502] (U) The CPG **shall** provide an indication when an ambiguous correlation has been determined for an IFF response received from the local radar. Ambiguous correlations occur when more than one track can be associated to a single IFF response, when more than one IFF response can be correlated to a single track or when no tracks correlate to the IFF response.

[CPG-503] (U) The CPG **shall** exchange only unambiguous local IFF data with external units.

[CPG-504] (U) The CPG **shall** provide the interface to allow the operator to request an IFF action by mode(s) on a selected track.

[CPG-505] (U) The CPG **shall** automatically provide IFF interrogation requests to the local radar based on the following:

a. (U) Air Tracks that do not have an IFF unambiguous response

b. (U) Air track is within the IFF On Line

c. (U) IFF Modes are enabled and operating for the radar including Modes 1, 2, 3A, 3C, 4, and 5.

d. (U) Age of the current unambiguous IFF response (local or external) is greater than an operator-selectable threshold based on mode

e. (U) Age of the current ambiguous IFF response (local or external) b(3) [redacted]

f. (U) IFF request prioritization

[CPG-512] (U) The CPG **shall** alert the operator when a Mode 4 response of Valid or Mode 5 IFF response is b(3) [redacted]

3.2.1.8.3 (U) Procedural Identification

Air Space Interaction

[CPG-514] (U) The CPG **shall** continuously assess the procedural identification for an air track using the following sources of information:

a. (U) interaction with active ACMs within the ID Authority Area (IDAA) (including volumes, corridors, and safe velocity)

b. (U) interaction with active origins (friendly, hostile)

c. (U) responses to IFF/Selective Identification Feature (SIF)

d. (U) operator-selected weights and identity thresholds

[CPG-519] (U) The CPG **shall** assess an air track's indicators to support a local Procedural Identification using the following:

1. (U) Weight sets for volume membership
   a. (U) Friendly Origin (FO)
   b. (U) Hostile Origin (HO)
   c. (U) Prohibited Volume (PV)
   d. (U) Restricted Volume (RV)
   e. (U) Safe passage Corridor (SPC)
2. (U) Weight set for Velocity test
   a. (U) Safe Velocity (SV)
3. (U) Weight sets for IFF Challenges
   a. (U) Interrogate Friend or Foe Mode 4 (IFF M4)
   b. (U) IFF Selective Identification Features (SIF)

[CPG-2651] (U) The CPG **shall** maintain multiple weight sets and ID thresholds to support Procedural Identification assessment.

[CPG-2641] (U) The CPG **shall** compare the summed weights with the maintained thresholds in order to support a Procedural Identification.

[CPG-520] (U) The CPG **shall** enable the operator to select weight sets and thresholds and define the IDAA to support identification information development on tracks.

3.2.1.9 (U) Track Prioritization

[CPG-2549] b(3)

a. b(3)

b. b(3)

c. b(3)

d. b(3)

[CPG-523] b(3)

[CPG-524] b(3)

a. b(3)

b. b(3)

c. b(3)

d. b(3)

[CPG-529] (U) The CPG **shall** assess and re-order track priority on a per track basis b(3)

[CPG-530] (U) The CPG **shall** enable the operator to override the relative priority of a precision track (air or space).

3.2.1.10 (U) Track Reporting

[CPG-532] (U) The CPG **shall** report only tracks maintained by the associated radar. This prevents the system from forwarding data that may adversely affect the track picture at distant ends.

[CPG-533] b(3)

[CPG-534] (U) The CPG **shall** exchange ABT data with the CEC network in accordance with Reference [1].

[CPG-535] (U) The CPG **shall** broadcast ABT and SMT data to the HE(FO) network (i.e., ABCS) based on enabled track filters.

[CPG-536] (U) The CPG **shall** exchange ABT, TBM, LCR, and SMT data with Link-16/JRE in accordance with Reference [1] and based on enabled track filters. Reference [2] provides details on Link-16 messaging.

[CPG-537] (U) The CPG **shall** enable the operator to cease track reporting on Link-16/JRE for a designated track.

[CPG-2653] b(3)

[CPG-538] (U) The CPG **shall** enable the operator to force Link-16/JRE track reporting, regardless of filters, for a designated track.

[CPG-2654] [redacted b(3)]

[CPG-539] (U) The CPG **shall** send the launch point estimate (LPE) associated with a TBM or LCR track on Link-16, JRE, and IBS in accordance with Reference [1]. For details on message exchanges, see Reference [2] for Link-16, Reference [3] for JRE, and Reference [4] for CMF.

[CPG-540] (U) The CPG **shall** notify external units when a local track is dropped.

[CPG-2402] (U) The CPG **shall** have latency for precision tracks as defined in Appendix B.

[CPG-2403] (U) The CPG **shall** have latency for surveillance tracks as defined in Appendix B.

3.2.1.11 (U) Situational Awareness

[CPG-542] (U) The CPG **shall** provide a situation display of the integrated track picture including tracks and reference points.

[CPG-2497] (U) The CPG **shall** provide a situation display of the integrated track picture to include displays or controls for:

a. (U) track amplification data;
b. (U) track history (i.e., trails, flight path, and point of origin); and
c. (U) situational awareness tools, such as measurement references and pointers.

[CPG-547] (U) The CPG **shall** enable three mission operators to display and simultaneously interact with the CPG tactical software via three operator workstations and a central display.

[CPG-2476] (U) The CPG **shall** provide an indication on the situational display of the current training state during training operations.

[CPG-548] (U) The CPG **shall** provide an indication on the situational display of the radiation state of the associated radar.

[CPG-549] (U) The CPG **shall** display an integrated track picture [redacted b(3)] of the following types:

a. (U) air/space tracks
b. (U) surface/land tracks
c. (U) launch point estimates
d. (U) reference point tracks

[CPG-2475] (U) The CPG **shall** differentiate the display of Embedded Trainer tracks (simulated) from non-simulated tracks in accordance with Reference [11].

[CPG-554] (U) The CPG **shall** display track location information including position, speed, heading and altitude.

[CPG-555] (U) The CPG **shall** enable the operator to filter the display of tracks by criteria to include:

a. (U) geographic areas of interest
b. (U) identity
c. (U) category (surface/land/air/space)
d. (U) platform
e. (U) source
f. (U) simulated track indication

[CPG-562] (U) The CPG **shall** enable the operator to filter the display of the simulated track symbol modifier.

[CPG-563] (U) The CPG **shall** enable the operator to display correlated track numbers with their track symbol.