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AIR FORCE SPACE COMMAND**

**AIR FORCE SPACE COMMAND
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Operations

**SATELLITE FUNCTIONAL
AVAILABILITY PLANNING**

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(Mr. Joseph M. Gambrell)

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This instruction implements AFI 10-1201, *Space Operations*. The publication outlines tasks and responsibilities pertaining to satellite constellation mission requirements, functional success criteria, functional availability, reliability parameter lists, Functional Availability Reports (FAR), planning, acquisitions, and operations. This instruction applies to Headquarters, Air Force Space Command (HQ AFSPC), Space and Missile Systems Center (SMC), 14th Air Force (Air Forces Strategic-Space) [14 AF (AFSTRAT)], subordinate units, and supporting agencies. This instruction applies to Air Force Reserve Command (AFRC) and Air National Guard (ANG). This instruction does not apply to efforts that are strictly research and development oriented, such as demonstrations or prototypes, or programs conducted for experimental or scientific research purposes, unless designated by the Service Lead. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Form 847s from the field through the appropriate functional's chain of command. Organizations at any level may supplement this instruction. Supplements will not lessen the requirements nor change the basic content or intent of this instruction. Process supplements as required in AFI 33-360. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with (IAW) AFMAN 33-363, *Management of Records*, and disposed of IAW the Air Force Records Disposition Schedule (RDS) located at <https://www.my.af.mil/afirms/afirms/afirms/rims.cfm>.

SUMMARY OF CHANGES

This interim change aligns Functional Availability Report (FAR) development with the Planning, Programming, Budgeting and Execution (PPBE) process to include changing parameter and FAR production requirements. A margin bar (|) indicates newly revised material.

1. General. This instruction implements standards for assessing and reporting AFSPC mission areas. Reference [Attachment 1](#) for a list of abbreviations, acronyms, and definitions.

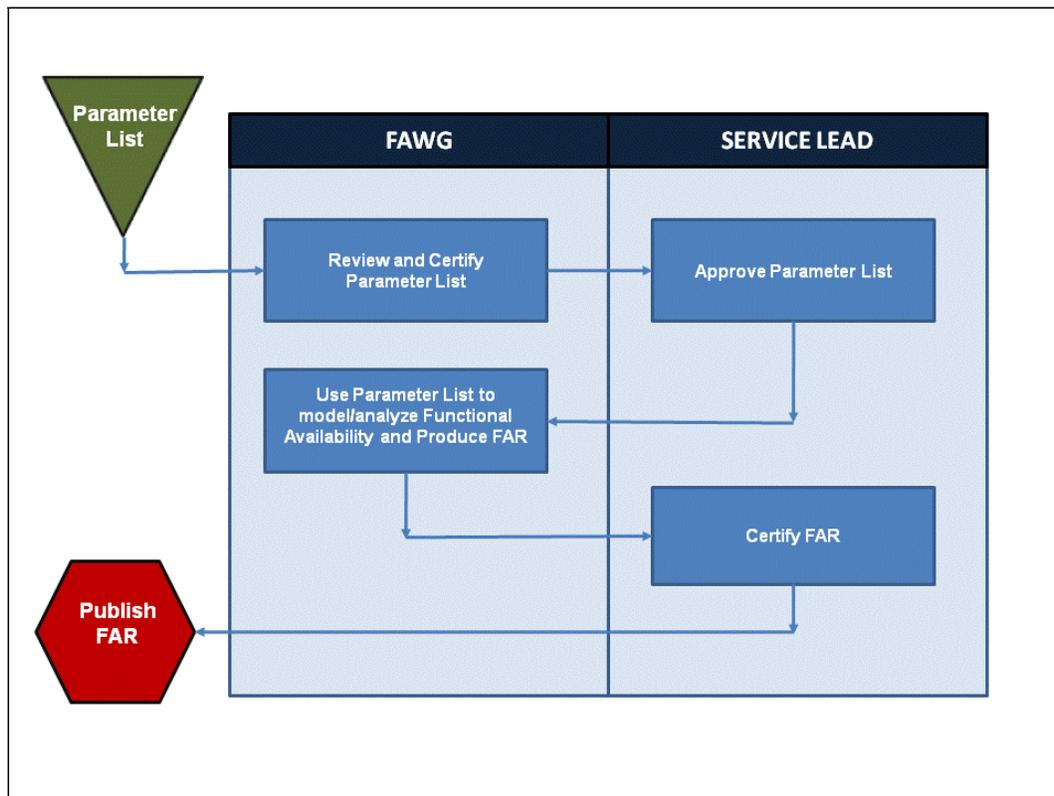
1.1. **Purpose.** Operational assessments and reports provide valid and consistent information to aid decision makers at all levels in determining satellite replenishment strategy, launch schedule planning and future system acquisition.

1.2. **Mission Areas.** For the purpose of this instruction, a mission area is the existing or future capability provided by one or more satellite constellations. These mission areas can be composed of existing or future satellite constellations and may include satellite assets owned by agencies outside AFSPC that share responsibility for fulfilling mission area requirements. The current AFSPC mission areas are: Positioning Navigation and Timing (PNT), Missile Warning (strategic and theater), Missile Defense (strategic and theater), Technical Intelligence, Battlespace Awareness, Environmental Monitoring, Nuclear Detonation (NUDET) Detection, Protected Communications, and Wideband Communications. A complete functional availability assessment of a mission area includes an assessment of the space, launch, control and appropriate user segments pertaining to functional availability. HQ AFSPC will model mission area capabilities based on warfighter and/or user requirements.

2. Responsibilities:

2.1. Director of Air, Space and Cyberspace Operations (HQ AFSPC/A3) will:

2.1.1. Function as the Service Lead for designated mission areas within the satellite functional availability process. [Figure 2.1](#) illustrates the satellite functional availability process.

Figure 2.1. Satellite Functional Availability Process

2.1.2. Ensure unassigned/future missions are identified in this instruction and appropriate notifications are made to external agencies, as required. New missions are normally identified at Milestone C.

2.1.3. Ensure mission areas not identified in this instruction, utilizing HQ AFSPC-funded launch services, provide functional availability analysis.

2.1.4. Certify and authorize release of all official FARs and the reliability parameter lists used as inputs to computing functional availability.

2.1.5. Approve and accredit modeling and simulation (M&S) applications for use in FAR process.

2.1.6. Ensure FAR is published annually NLT 31 March to align with PPBE process. Specific FAR requirements are located in [paragraph 2.7.7](#)

2.2. Spacelift and Range Operations Branch (HQ AFSPC/A3SR) will:

2.2.1. Serve as functional availability single Point of Contact (POC) between HQ AFSPC and domestic external agencies/organizations.

2.2.2. Serve as the HQ AFSPC Office of Primary Responsibility (OPR) for satellite functional availability planning.

2.2.3. Produce reports for MAJCOM and HHQ customers for release by Service Lead or appropriate AFSPC mission area lead/division chief, as required.

2.2.4. Maintain a list of Functional Availability Working Group (FAWG) Leads, FAWG meeting dates, and FAR report status for each mission area.

2.2.5. Ensure only HQ AFSPC/A3 approved reliability parameter lists are used to generate all HQ AFSPC reports used in FARs.

2.2.6. Provide FAWGs with launch profile for use in annual FARs.

2.2.7. Ensure all FARs meet standardized format as provided on the Launch Information Support Network (LISN) website.

2.2.8. Post final unclassified reports on the LISN website at <https://lisn.afspc.af.mil> and all reports on the classified LISN website (up to SECRET) at <http://lisn.afspc.af.smil.mil>

2.2.9. Post the National Reconnaissance Office (NRO)-produced launch vehicle (LV) reliabilities on all levels of the LISN website.

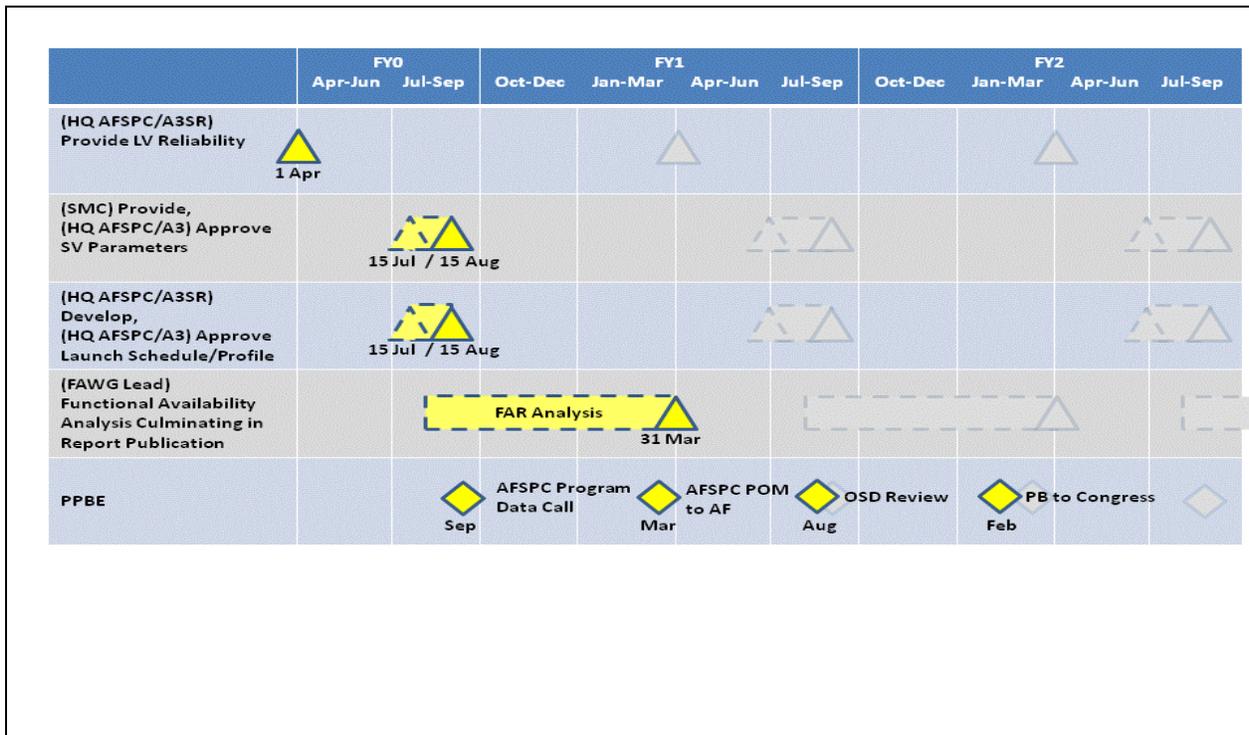
2.3. Mission Area Leads/Divisions: Space Superiority (HQ AFSPC/A3SC/A5C); Space Protection and Information Operations (HQ AFSPC/A3SC); Missile Warning/Missile Defense (HQ AFSPC/A3SF/A5F); Space Based Environmental Monitoring (HQ AFSPC/A3SF/A5FW); Space Support- MILSATCOM (HQ AFSPC/A3SM/A5MS/A5MT); Space Support- Positioning, Navigation and Timing (HQ AFSPC/A3SM/A5MP), will:

2.3.1. Provide the MAJCOM mission area expertise and appoint primary and alternate FAWG Leads. There is normally one FAWG Lead per mission area.

2.3.2. Convene FAWGs, as required, to produce all FARs. FAWGs will follow guidance as specified in **paragraph 2.6**. See **Figure 2.2** for required FAR reporting cycle.

2.3.2.1. Produce updates to FARs following significant events, as needed, within 60 days of event. The extent of the FAR update should reflect the extent of the significant event.

Figure 2.2. Satellite Functional Availability Reporting Cycle



2.3.3. Coordinate FARs with HQ AF/A3/A5, HQ AFSPC/A3SR/A5/A8/9, SMC (appropriate systems program office), and appropriate NAF/warfighting HQ (A3 or equivalent), prior to requesting A3 approval.

2.3.4. Assist FAWGs with classification determination, as required.

2.3.5. Identify unassigned/future missions to the appropriate Service/Agency Lead.

2.4. Director of Plans, Programs and Analyses (HQ AFSPC/A8/9) will:

2.4.1. Ensure FARs are reviewed and integrated into long range planning and programming efforts.

2.4.2. Collect user requirements for mission modeling.

2.4.3. Serve as subject matter experts to evaluate modeling tools used by HQ AFSPC.

2.4.4. Provide mission modeling tools.

2.4.5. Ensure models support commonality of FARs.

2.4.6. Review accreditation plans and reports and provide recommendations concerning AF owned or managed M&S tools.

2.4.7. Assist in developing a verification and validation (V&V) program that will support accreditation decisions.

2.4.8. Attend FAWGs and provide subject matter expertise in evaluating/certifying reliability parameters.

2.5. Space and Missile Systems Center (SMC) will:

2.5.1. Provide SMC Directorate-approved reliability parameter lists to appropriate HQ AFSPC mission area lead/division and HQ AFSPC/A3SR NLT 15 July of each year, and when there has been a substantive change impacting constellation status (such as a satellite anomaly impacting the vehicle life expectancy). This will ensure the most current data is used for HQ AFSPC POM and FAR submissions. Reference **Figure 2.2**

2.5.1.1. When multiple satellite systems are used to satisfy a given mission area, ensure coordination with appropriate Service/Agency Lead(s) representative.

2.5.2. Provide expertise and support to FAWGs, as required by FAWG Lead.

2.5.2.1. Provide sufficient lower-level reliability model details to the FAWG so the FAWG understands the key factors driving the overall reliability model and its sensitivity to lower-level model perturbations.

2.5.3. Ensure all reports are properly marked with appropriate launch schedule, time origin, parameter dates, releasing authority and indicate variations from approved launch schedules and parameters. See also **paragraph 3.2.3**.

2.5.3.1. Program Directors may release reports for specific teams, assessments, studies, exercises, etc., if the situation requires near real time analysis. These special analyses will show Program Director as the release authority, and will include the purpose, timeframe, releasing authority, and parameters used in the reports. A copy of all analyses will be provided to HQ AFSPC/A3 for situational awareness and for incorporation into formal A3-approved OPGAP reports, as applicable.

2.5.4. Develop and present accreditation plans and reports to support the FAR for approval by HQ AFSPC/A3 prior to release of the FAR to external organizations.

2.6. Functional Availability Working Group (FAWG) Lead will:

2.6.1. Convene FAWGs as required for respective mission area. Each FAWG will determine if a face-to-face meeting is necessary.

2.6.2. Determine required FAWG membership and ensure acquisition organization representatives, pertinent payload & platform operational managers, appropriate ground system and operations experts, M&S analysts, and other stakeholders and user community representatives are included, as appropriate.

2.6.3. Forward FAWG-certified parameter lists to HQ AFSPC/A3 for MAJCOM approval.

2.6.4. Ensure FARs adhere to standardized format provided on LISN website at <https://lisn.afspc.af.mil> in the downloads section.

2.6.5. Advise HQ AFSPC/A3SR of FAWG progress and FAR production when delays occur or support is required.

2.6.6. Ensure FAR is marked IAW appropriate classification guidance.

2.6.7. Ensure FAR production IAW **Figure 2.2** and **Paragraph 2.7.7**

2.7. Functional Availability Working Group (FAWG) will:

2.7.1. Review, understand, and certify SMC Directorate-approved reliability parameter lists within 30 days of receipt.

2.7.2. Ensure M&S applications are accredited in accordance with AFI 16-1001, *Verification, Validation, and Accreditation (VV&A)*. Ensure V&V documentation is submitted to HQ AFSPC/A9 for approval of M&S applications.

2.7.3. Ensure all M&S tools/reliability parameters used in FAR development are listed in the report and clearly identify all additional inputs and assumptions.

2.7.4. Define functional success criteria.

2.7.5. Determine and obtain user agreement on functional availability thresholds. Thresholds must be documented in the FAR. Two functional availability thresholds shall be used to depict three regions of functional availability success.

2.7.5.1. The “planned” (green) region corresponds to the probability that a constellation will satisfy the functional success criteria. This region represents the level of probability of success the system should strive to achieve. The “planned” threshold is the lower level of this region and should be used to time replacement of assets.

2.7.5.2. The “below planned” (yellow) region indicates that the probability of the constellation meeting all mission goals is less than specified by functional success criteria. The “below planned” (yellow) region is between the “planned” threshold and the “below planned threshold”. Nominally, the goal will be to avoid the “below planned” region.

2.7.5.3. The “below minimum” (red) region is below the “below planned” threshold and indicates the probability of the constellation meeting functional success criteria is at an unacceptable level. This level of risk should be avoided.

2.7.6. Ensure FARs utilize the latest NRO-produced launch vehicle success probabilities posted on the LISN website at <https://lisn.afspc.af.mil>.

2.7.7. Ensure FARs provide an adequate assessment of the mission.

2.7.7.1. Include all segments: space, launch, control (ground and operations), and user (as applicable to functional availability).

2.7.7.2. Add classified supplements, as needed.

2.7.7.3. Scenarios may be used to illustrate and communicate the capabilities provided and/or needed.

2.7.7.4. FARs may be produced in two parts (see templates located on LISN website at <https://lisn.afspc.af.mil>). Part I will contain static information and will be reviewed/updated biennially or when significant changes occur. Part II will contain dynamic information, including the M&S charts, and requires an annual up date NLT 31 March to align with PPBE cycle.

2.7.7.5. Coordinate, certify, approve, and distribute FAR IAW [paragraph 3.3](#)

3. Satellite Functional Availability Process.

3.1. Reliability Parameter Lists (Input).

3.1.1. Proposal. SMC Directorates will generate annual reliability parameter lists and internally approve reliability parameters prior to forwarding them to the FAWG Lead.

3.1.2. Certification. Upon receipt of SMC Directorate-approved reliability parameter lists the respective FAWG Lead will forward them to the FAWG members. Each FAWG will meet, as required, to review, understand and certify their reliability parameter lists within 30 days. Understanding the reliability parameter lists includes knowing the limited life components affecting the reliability parameters and variations between previous and current data sets. Each FAWG will ensure maximum utilization of empirical data when available. Following FAWG certification, the FAWG Lead will forward certified reliability parameter lists to the Service Lead.

3.1.3. MAJCOM Approval. The Service Lead will approve reliability parameter lists.

3.2. Modeling (Analysis).

3.2.1. Modeling Tools. AF- and AFSPC-approved tools will be used to perform system/mission modeling. To gain HQ AFSPC approval for other modeling tools, the FAWG should present a summary of the modeling tool, its capabilities, and output examples to the Service/Agency Lead for approval. M&S tools must also be accredited by the Service/Agency Lead.

3.2.2. Skilled Interpretation. The model alone is not the complete answer. The FAWG is responsible for validating model results and accurately depicting system/mission area capabilities, shortfalls, and future needs.

3.2.3. Modeling Reports. HQ AFSPC/A3SR and any other agency capable of producing modeling reports will ensure reports are properly marked with appropriate launch schedule, time origin, parameter dates, purpose for release, releasing authority and indicate variations from approved launch schedules and parameters.

3.2.4. Report Releasability. At the request of the service lead or AFSPC mission area lead/division chief, HQ AFSPC/A3SR will produce reports for organizations outside the MAJCOM. An accreditation report is required prior to release of modeling results outside of HQ AFSPC. Releasing agency will determine if the modeling results are covered by an existing accreditation report or if the modeling represents a new application and requires an updated accreditation report. The release processes outlined here are for intra-governmental users. Freedom of Information Act requests and discovery requests in civil litigation are separate and distinct. Those will be processed in accordance with AFMAN 33-302, *Freedom of Information Act Program*, and AFI 51-301, Civil Litigation.

3.2.4.1. Reports and supporting reliability parameters/Excel file/data from accredited M&S tools may be released by the appropriate AFSPC mission area lead/division chief (or SMC personnel with prior approval per paragraph 2.5.3.1) following coordination with A3 or A5 counterpart, HQ AFSPC/A3SR/A8/9, NAF and SMC directorate personnel, as appropriate. HQ AFSPC/A3 approval is required for release

3.3.2. Certification. After the draft report is complete, the FAWG Lead will forward it to the FAWG for review. The FAWG will meet, as required, to review, understand and certify the FAR. Due to the vested authority of the FAWG, the FAWG fulfills the equivalent of 3-letter coordination of the FAR. Following FAWG certification, the FAWG Lead will forward the FAR via 2-letter coordination. Following 2-letter coordination and appropriate comment resolution, the FAWG Lead will forward the FAR to the Service Lead for approval.

3.3.3. Service Lead Approval. The Service Lead is final approval for FAR release. The Service Lead will provide informational copies to Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD/AT&L), HQ AF/A3/A5, AFSPC/CC/CV, SMC/CC (AFPEO Space), AFPEO Space Launch, and 14 AF (AFSTRAT)/CC. A final report will be sent to the Department of Defense (DoD) Executive Agent for Space NLT 31 March. Interested parties may find FARs on the LISN website at <https://lisn.afspc.af.mil> for unclassified reports and the classified website at <http://lisn.afspc.af.smil.mil>

JACK WEINSTEIN, Major General, USAF
Director of Air, Space and Cyberspace Operations

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

DoD Executive Agent for Space Interim Guide for Satellite Functional Availability Planning, 22 Mar 2004

DoDI 5000.61, *DoD Modeling and Simulation (M&S) Verification, Validation, and Accreditation (VV&A)*, 9 December 2009

AFI 16-1001, *Verification, Validation and Accreditation (VV&A)*, 1 Jun 1996

Abbreviations and Acronyms

AF—Air Force

AFB—Air Force Base

AFI—Air Force Instruction

AFMAN—Air Force Manual

AF PEO—Program Executive Office

AFRC—Air Force Reserve Command

AFSPC—Air Force Space Command

AFSPCI—Air Force Space Command Instruction

AFSTRAT—Air Forces Strategic-Space

ANG—Air National Guard

AT&L—Acquisition, Technology and Logistics

CBO—Congressional Budget Office

DoD—Department of Defense

FAA—Federal Aviation Administration

FAR—Functional Availability Report

FAWG—Functional Availability Working Group

GAO—Government Accountability Office **HAF** —Headquarters Air Force

HQ—Headquarters

IMT—Information Management Tool

LISN—Launch Information Support Network

LSO—Launch Services Office

M&S—Modeling and Simulation

NAF—Numbered Air Force

NRO—National Reconnaissance Office NUDET —Nuclear Detonation

OSD—Office of the Secretary of Defense

POC—Point of Contact

POM—Program Objective Memorandum

PNT—Positioning, Navigation and Timing

SAF—Secretary of the Air Force

SMC—Space and Missile Systems Center

USSTRATCOM—United States Strategic Command

V&V—Verification and Validation

VV&A—Verification, Validation, and Accreditation

VV&C—Verification, Validation, and Certification

WG—Wing

Terms

Accreditation— Accreditation is the official determination by the accreditation authority that the

M&S is acceptable for a specific purpose. This determination considers the V&V status of a specific model version, its data support (source, quality, and verification, validation and certification— VV&C) and the analysts/users that operate the model and interpret its results. The accreditation authority is the individual who is responsible and accountable for decisions or actions based upon the specific M&S usage. The decision to accredit a model or simulator rests solely with the accreditation authority. Likewise, determining the level of effort supporting a particular accreditation, whether conducting additional V&V activities or simply reviewing the existing M&S documentation and past VV&A history, rests solely with the accreditation authority. The validation documentation of M&S application results correlating M&S results with test or other data describing behavior of the subject being modeled will be reviewed during the M&S accreditation assessment.

Control Segment— The resources needed to perform command and control of spacecraft, usually consists of ground equipment/network and personnel performing operations and operational support activities.

Functional Availability— The probability of satisfying the functional success criteria for a given mission as a function of time. This value can be graphically depicted as probability of mission success.

Functional Availability Analysis— Provides a forecast to the operational community, assists in making launch decisions, and aids program managers when formulating procurement budgets. Serves as an analytical basis for satellite procurement budgets, and accordingly represents a key aspect for major satellite system budget decisions.

Functional Availability Report (FAR)— A document depicting the results of the functional availability analysis. This report requires formal FAWG certification and Service Lead approval.

Functional Availability Working Group (FAWG)— This advisory group is convened by the FAWG Lead, appointed by the appropriate mission area lead/division chief, and is responsible for reviewing and certifying the reliability parameter list and submitting the parameters to the Service Lead for approval. The FAWG develops and coordinates the Functional Availability Report (FAR) and submits it to the Service Lead for certification. This group consists of, at a minimum, the FAWG Lead, Aerospace, acquisition organization representatives, pertinent payload and platform operational managers, USSTRATCOM and other stakeholders, launch schedulers, M&S analysts/specialists, and user community representatives, as appropriate.

Functional Success Criteria— A minimum level of performance a satellite constellation must achieve for a specific satellite constellation mission.

Launch Segment— The resources needed to perform pre-launch testing and place spacecraft on orbit, including the launch vehicle, upper stage, facilities, equipment, networks, range resources and associated personnel.

Launch Services Office (LSO)— An office within HQ AFSPC/A3S stood up by PMD 7123(19)/35171F dated 22 Mar 91 to perform launch scheduling, satellite modeling, and other launch related modeling.

Launch Vehicle Success Probability— The probability of a specific booster or upper stage achieving successful satellite deployment in an acceptable orbit.

Minimum Functional Availability— The minimum acceptable functional availability for a given satellite constellation mission, as determined by the customer community.

Mission Area— A space mission area is the capability provided by one or more satellite constellations. These mission areas can be composed of existing or future satellite constellations. Current HQ AFSPC mission areas are: Positioning Navigation and Timing (PNT), Missile Warning (strategic and theater), Missile Defense (strategic and theater), Technical Intelligence, Battlespace Awareness, Environmental Monitoring, Nuclear Detonation (NUDET) Detection, Protected Communications, and Wideband Communications. HQ AFSPC should model mission area capabilities based on war fighter and/or user requirements.

Mission Modeling— Modeling capabilities of a mission area (such as PNT) to include all appropriate space, launch and ground segments. All user requirements should be considered.

Reliability Parameter List— A report and file depicting an explicit and summary level listing of key input reliability parameters, values, and assumptions for use in the functional availability analysis.

Satellite Constellation— A satellite constellation is comprised of those on-orbit satellites capable and intended to support a unique satellite constellation mission. A given satellite may be considered part of more than one constellation and support more than one mission.

Satellite Constellation Mission— A unique performance requirement of a satellite constellation that is traceable to a specific customer need. A satellite constellation satisfies one or more functional success criteria.

Service Lead— The single Point of Contact within the Air Force to the DoD Executive Agent for Space. The Service Lead for AF will be the HQ AFSPC Director of Air, Space and Cyberspace Operations (A3).

Space Segment— Space segment is the payload and the spacecraft bus together. Examples of space segments include Global Positioning System (GPS), Defense Support Program (DSP), Milstar, Defense Satellite Communications System (DSCS), and Defense Meteorological Satellite Program (DMSP) constellations.

Space System— All of the devices and organizations forming the space network. These consist of: spacecraft; mission packages(s); ground stations; data links among spacecraft, mission or user terminals, which may include initial reception, processing, and exploitation; launch systems; and directly related supporting infrastructure, including space surveillance and battle management and/or command, control, communications and computers. HQ AFSPC divides space systems into four segments: space, launch, control, and user.

System Modeling— For the purposes of this instruction, system modeling has historically been accomplished by modeling satellite constellations such as Global Positioning System (GPS), Defense Support Program (DSP), Milstar, Defense Satellite Communications System (DSCS), and Defense Meteorological Satellite Program (DMSP) constellations.

User Segment— The equipment/networks and personnel accessing mission capabilities. As related to functional availability, the FAR should provide a brief description of the user segment, including an overview of the systems, data/capabilities provided or needed. Of particular interest are differences between acquisition profiles of space segment and user community.

Validation— The process of determining the degree to which a model is an accurate representation of the real-world from the perspective of the intended uses of the model. Validation process can be used to identify model improvements, where necessary. It has two main components: structural validation, which includes an internal examination of M&S assumptions, architecture, and algorithms in the context of the intended use; and output validation, which determines how well the M&S results compare with the perceived "real world."

Verification— Verification is the process of determining that M&S accurately represent the developer's conceptual description and specifications. This is accomplished by identifying and eliminating mistakes in logic, mathematics, or programming. This process establishes that the M&S code and logic correctly perform the intended functions, and to what extent M&S development activities conform to state-of-the-practice software engineering techniques.