**STATEMENT OF WORK**

Developmental HW & SW (Template #2)

**Warning:**

The Statement of Work (SOW) paragraphs, Contract Data Requirements List (CDRL) items, and Data Item Descriptions (DIDs) identified for your type of acquisition are recommendations only. You are expected to modify or add SOW paragraphs, CDRLs, or DIDs to address the specific requirements of your program.

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# 1 **Introduction**

## 1.1 Background

## 1.2 Purpose

This Statement of Work (SOW) delineates the Contractor's work tasks required to bring the [*insert system name*] to a production configuration, and to produce, implement, and provide support for a limited number of [*insert system name*] systems to be used for operational testing; and operational support. The work performed under this contract will lead to and be in support of the commissioning of the [*insert system name*] into the FAA's National Airspace System (NAS).

## 1.3 Scope

This SOW defines the requirement to bring the [*insert system name*] design to a producible configuration, to produce, implement and maintain the [*insert system name*], and to provide additional engineering support.

# 2 Applicable Documents

The following specifications, handbooks, orders, standards, and drawings form a part of this SOW and are applicable to the extent specified herein. The latest version of these documents as of the contract date must apply. In the event of conflict between this SOW and any of the applicable documents cited below, the provisions of this SOW must apply.

## FAA Specifications

FAA-D-2494 Technical Instruction Book Manuscripts: Electronic, Electrical and Mechanical Equipment, Requirements for Preparation of Manuscript and Production of Books.

## 2.2 FAA Standards

FAA-G-2100F FAA Electronic Equipment Specification

FAA-STD-025D Preparation of Interface Control Documentation

FAA-STD-028B Contract Training Programs [*This standard has been canceled without replacement*]

## 2.3 Military Standards

MIL-STD-129N Marking for Shipment and Storage

MIL-HDBK-470A Designing and Developing Maintainable Products and Systems

MIL-HDBK-781A Reliability Testing for Engineering Development, Qualification, and Production

MIL-HDBK-881 Work Breakdown Structures for Defense Material Items

MIL-STD-973 Configuration Management

MIL-STD-1390D Level of Repair Analysis

MIL-STD-1472E Human Engineering Design Criteria for Military Systems, Equipment, and Facilities

MIL-PRF-28000A Digital Representation for Communication of Product Definition Data Initial Graphic Exchange Specification (IGES) Application and IGES Application Protocols

MIL-HDBK-46855 Human Engineering Requirements for Military Systems, Equipment, and Facilities

MIL-DTL-31000 Technical Data Packages, General Specification for

MIL-PRF-49506 Logistics Management Information

## 2.4 Federal Standards

DOD-STD-1686 Electrostatic Discharge Control Program for Protection of Electrical and electronic Parts, Assemblies and Equipment

DOD-STD-1700 Data Management Program

## 2.5 Other FAA Documents

FAA Order 1600.54 FAA Automated Information Systems Security Handbook

FAA Order 1800.58 National Airspace Integrated Logistics Support Policy

FAA Order 3900.19 Occupational Safety and Health

FAA Order 6000.30 Policy for Maintenance of the NAAMS T&E Acquisition Management System Test and Guidelines Evaluation Process Guidelines

## 2.6 Non-Government Documents

Q9001-1994 ANSI/ASQC American National Standard, Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation, and Servicing

ISO 9000-3 Quality management and quality assurance standards - Part 3: Guidelines for the application of ISO 9001 to the development, supply and maintenance of software

UCC/EAN-128 Bar Code Symbol

IEEE/EIA 12207.0 Standard for Information Technology-Software Life Cycle Processes

IEEE/EIA 12207.1 Guide for IAO/IEC 12207, Standard for Information Technology-Software Life Cycle Processes-Life Cycle Data

IEEE/EIA 12207.2 Guide for ISO/IEC 12207, Standard for information Technology-

-Software Life Cycle Processes-Implementation Consideration.

## 2.7 Obtaining Copies of Documents

* Copies of FAA specifications and interface documents may be obtained from the Federal Aviation Administration, Headquarters Public Inquiry Center APA-230, 800 Independence Avenue SW, Washington, DC 20591, 202-267-3484. Requests should fully identify material desired and cite the solicitation or contract number.
* Requests for copies of documents not covered in the preceding paragraph should be addressed to the Contracting Officer. Requests should fully identify material desired and cite the solicitation or contract number.
* Military Standards and Specifications can be ordered from the Department of Defense Single Stock Point (DODSSP), Building 4/Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5098. Information is available at their website, http://www.dodssp.daps.mil.
* Copies of ANSI/ASQC-Q-9001-1994 and ISO 9000-3 can be obtained from the following source: American Society for Quality Control 611 East Wisconsin Avenue P.O. Box 3005; Milwaukee, Wisconsin 53201-3005. Phones: (414) 272-8575 or (800) 248-1946. The Fax is: (414) 272-1734.
* Copies of the Acquisition Management System Test and Evaluation Process Guidelines are available in the FAA Acquisition System Toolset (FAST). The on-line internet address of FAST is: <http://FAST.faa.gov>.

# 3 Limited Production and Deployment Requirements

To the extent specified in this SOW, the Contractor must design, develop, produce, test, deliver, install, support, and maintain the [*insert system name*] IAW the [*insert system name*] Specification. The term Limited Production (LP) applies to all prototype and first article systems.

Data items referenced throughout by their Contract Data Requirements List (CDRL) titles must be performed in accordance with (IAW) the CDRL of the same name, even when the CDRL number is not specified, and all data deliverables must be prepared and delivered IAW the corresponding CDRL items specified under the SOW requirement.

The contractor must perform this contract IAW all Government approved plans developed in response to this SOW. All reference to the "Government" in this SOW must mean by authority of the Contracting Officer or designee. Throughout this SOW, the requirement to "record" information or data must be interpreted to mean, "Set down in a manner that can be retrieved and viewed." The result may take many forms, including, but not limited to, hand-written notes, hard copy or electronic documents, and data recorded in computer - aided software engineering (CASE) and project management tools. All CDRL items identified in this SOW must be delivered to the Government in digital media (Compact Disc Read Only Memory (CDROM) for more than 1.4 MB) compatible with the Microsoft Office suite of products, (unless otherwise specified), as well as hard copy.

## 3.1 Program Management

The Contractor must submit a Program Management Plan (PMP) for Government approval. The Contractor must revise the PMP plan as necessary. Upon approval of the PMP, the Contractor must use this plan. The PMP must identify the Contractor's management, organization, authority, responsibility, controls, and the extent to which these apply to this contract. The PMP must detail the Contractor's methodology to ensure that the requirements set forth in this SOW are met. At a minimum, the Contractor must perform the following tasks in managing the [*insert system name*] Contract:

* Produce the schedules of work that reflect and track the delivery of products as specified by this SOW.
* Use methods and metrics for assessing the schedule, technical performance of the work, and risks of this program.
* Use procedures for relating costs and risks to schedule and technical performance to assess the impact of risks and costs on successful completion of the [*insert system name*] work efforts; and
* Designate a Program Manager (PM) who is responsible for integrating and maintaining the total Contractor effort as described in this SOW. The PM must be prepared at all times, given reasonable notice, to present and discuss with the FAA the status of contract activities.

An integral factor in the success of the [*insert system name*] Contract is the Contractor's plans for interaction with the Government and their support contractors. The PMP must include the Contractor's plan for ensuring that all interaction is managed and conducted to provide maximum benefit toward successful completion of the [*insert system name*] Contract. The Contractor must also conduct ongoing risk management activities during the period of the contract. The risk management activities must be an integral part of the Contractor's management process, as described in the PMP.

CDRL A001 Program Management Plan

### 3.1.1 Project Control

The Contractor must continuously monitor the technical performance of this contract, and of all subcontracts, to provide the Government with a timely assessment of program progress or problems, and to control the contract activities as well as subcontractor and vendor activities. The Contractor must establish a schedule based on a logical and efficient sequence of events designed to accomplish the tasks described in this contract. The schedule must be maintained in the form of an integrated program schedule, and must include both planned dates and actual completion dates.

The Contractor must use a schedule performance measurement and reporting system and related management procedures. The Contractor must maintain the system and related procedures throughout the program. The Contractor's management methods and procedures must ensure that they provide visibility into, and timely progress reporting on, all contracted efforts for internal management and Government oversight purposes.

CDRL A002 Program Status Report

CDRL A003 Master Integrated Project Schedule

#### 3.1.1.1 Program Metrics

The Contractor must use a Software Lifecycle Management (SLIM) software application to prepare and report [*insert system name*] project metrics. These metrics must include Project Software Cost and Schedule (Contract Performance Measurement), Project Staffing (Software Effort), Project Requirements (Stability Measure), Project Quality (Software Errors), Project Size (Source Lines of Code), and CMM (Maturity Level -- Contractor's SCE Rating). For the Project Size (Source Lines of Code) metric, the Contractor must prepare two sub-metrics (including charts) one tracking Contractor-developed code only, and one tracking total non-Commercial Off the Shelf (COTS) software in [*insert system name*]. The Contractor must deliver the SLIM software application to the Government at the conclusion of the Contract.

CDRL A004 Program Metrics Report

#### 3.1.1.2 Contract Work Breakdown Structure

The Contractor must maintain a Contract Work Breakdown Structure (CWBS), using MIL-HDBK-881 as guidance, based on a logical and efficient sequence of tasks designed to accomplish the effort described in this contract.

CDRL A005 Contractor Work Breakdown Structure

### 3.1.2 Meetings, Reviews, and Conferences

The Contractor must conduct meetings and reviews IAW the Government approved PMP and this SOW. At each management review or audit, the Contractor must provide backup data regarding assumptions made and methodologies used in arriving at specific recommendations or conclusions. For the Program Management Reviews (PMRs), the Government may identify entry and exit criteria for evaluating the content and quality of those reviews. The Contractor must provide evidence that all identified criteria are satisfied before the Government will approve the PMR. The Contractor must host technical reviews and audits. In addition to the agenda for each management review, the Contractor must include current efforts to maintain requirements traceability and architectural integrity. Management and formal reviews and audits must not be considered complete until approval by the Government is granted in writing. The Contractor must propose an overall strategy for conducting each set of reviews.

Support provided by the Contractor must include, but is not limited to, facilities, materials, office equipment, clerical personnel, mockups, technical data, and subcontractor participation (when requested by the Government). The Contractor must provide an agenda for each management and formal meeting. The Contractor must provide the minutes, accompanied by a summary of action items and all presentation materials used, for Government approval.

CDRL A006 Conference Agenda

CDRL A007 Conference and Meeting Minutes

#### 3.1.2.1 Post Award Conference

The Contractor must plan for, host, support, and participate in a Post Award Conference to be held at the Contractor's site within one month after contract award. The FAA will determine the actual date within 2 weeks after contract award. At this conference, the Contractor must address the plans and schedules for the [*insert system name*] work efforts.

#### 3.1.2.2 System Engineering Reviews and Working Groups

The Contractor must support the following specifically planned meetings, as a minimum, in order to manage the evolving [*insert system name*] design and program control activities.

##### 3.1.2.2.1 Critical Design Review

The Contractor must discuss the system design in the context of how it implements the system architecture and system requirements. The Contractor must provide evidence that the [*insert system name*] system design supports the system architecture and requirements at a Critical Design Review (CDR). Successful completion of the CDR must include, but not be limited to, Government approval of the Contractor's final submission of the associated CDRL items ([list required CDRL items]).

##### 3.1.2.2.2 Test Readiness Reviews

The Contractor must schedule and conduct Test Readiness Reviews (TRRs) to ensure readiness to begin formal testing to include, but not be limited to, all Formal Qualification Tests (FQTs), Factory Acceptance Tests (FATs), Site Development Test and Evaluation (DT&E) Tests, and Algorithm Verification Checkpoint Tests during Design Qualification Test (DQT). The Contractor must provide test plans and test procedures for Government review prior to each TRR. The Contractor must provide a schedule for the testing of the critical capabilities and applicable requirements. Successful completion of the TRR prior to formal testing must include, but not be limited to, Government approval of the Contractor's final submission of the associated CDRL items [list required CDRL items].

##### 3.1.2.2.3 Post-Test Reviews

The Contractor must hold post-test reviews following the completion of each formal test to review test data and preliminary results.

#### 3.1.2.3 Other Reviews

The Contractor must support the following, as a minimum, in order to exchange technical information, to obtain Government guidance, and to execute proactive management.

##### 3.1.2.3.1 Program Management Reviews

The Contractor must conduct Program Management Reviews (PMRs) as specified in the Government approved PMP. PMRs must be held every other month, alternating between the Contractor's facility and sites selected by the Government. During the PMRs, the Contractor must present plans for accomplishing project milestones. The PMR must include, but not be limited to, the presentation of cost, schedule, and technical performance status of the contract, including specific coverage of problem areas and any known or anticipated differences between contract milestones, schedules, or technical performance parameters; accomplishments since the last PMR; expected accomplishments prior to the next PMR; schedule critical paths; definition and implementation of contingency or work-around plans; program risks and status of risk-alleviation measures; manufacturing status; software design, code, and test status, including the status of Software Problem Reports, which are included in the Program Status Reports; logistics support implementation status; status of action items, CDRL deliveries, Engineering Change Proposals (ECPs), Government Furnished Property (GFP)/Government Furnished Equipment (GFE), and Government/Contractor correspondence; planned vs. actual staffing by functional discipline; organizational changes; and cost/schedule performance.

##### 3.1.2.3.2 Technical Interchange Meetings

The Contractor must plan and participate in [insert frequency, monthly, quarterly] Technical Interchange Meetings (TIMs) between the Government and the Contractor at the Contractor's facility and sites selected by the Government. The TIMs will be conducted to discuss the status of specific technical activities, including studies, test plans, test results, design issues, cost, schedule, technical performance, implementation, and technical guidance to ensure continued Government visibility into the technical progress of the contract.

##### 3.1.2.3.3 Logistics Guidance Conference

A Logistics Guidance Conference (LGC) must be conducted at the Contractor's facility in conjunction with the Post Award Conference. The meeting will be co-chaired by the FAA Assistant Program Manager for Logistics (APML) and the Contractor's Logistics Support Manager. Contractor logistics personnel must present the Contractor's approach to accomplish the required logistics tasks. The Contractor must support the conference with the required resources (e.g. briefings, vu-graphs, personnel, and facilities) necessary to discuss in detail all support considerations. The Contractor must provide an agenda for each formal meeting. The Contractor must provide the minutes, accompanied by a summary of action items and all presentation materials used, for Government approval. The LGC must also clarify provisioning requirements and issues (e.g., provisioning deliverables, Data Requirements, technical documentation, and Engineering Data for Provisioning). The following subjects, as a minimum, must be included:

* Maintenance Planning
* Manpower and Personnel
* Supply Support
* Support Equipment
* Technical Data
* Training and Training Support
* Computer Resources Support
* Packaging, Handling, Storage, and Transportation
* Facilities
* Integrated Logistics Support (ILS) Management

CDRL A006 Conference Agenda

CDRL A007 Conference and Meeting Minutes

##### 3.1.2.3.4 Provisioning Conference

The Contractor must host and support a Provisioning Conference to be conducted at the Contractor's facility NLT 30 days after the Physical Configuration Audit (PCA). Subsequent Provisioning Conferences (not to exceed three) must be conducted when requested by the Government. The Contractor and subcontractor/vendors, as determined by the Government, must attend, participate, and contribute expertise to the Government in resolution of provisioning and supply support problems or issues. The Contractor support to the conference must also include facilities, materials, office equipment, clerical personnel, mockups, and technical data. The Contractor must provide an agenda for each meeting. The Contractor must provide the minutes, accompanied by a summary of action items and all presentation materials used, for Government approval.

CDRL A006 Conference Agenda

CDRL A007 Conference and Meeting Minutes

### 3.1.3 Cost Management

The Contractor must establish, maintain and use internal cost management control systems and provide the Government with timely and auditable data on a monthly basis which reports product-oriented contract status. The Contractor must submit Cost Performance Reports (CPR) to advise the Government of Cost/Schedule Control Systems Criteria (C/SCSC). The CPR must report the data and provide narrative to measure cost and schedule performance variances and other contract problems. Cost and schedule variances must provide specific information from the C/SCSC regarding the disposition, overall impact, and plans of action (with projected dates of implementation). The Contractor must also provide a Contract Funds Status Report (CFSR) and a separate Cost/Schedule Status Report (C/SSR), which supports the CPR.

CDRL A008 Cost Performance Report

CDRL A009 Contract Funds Status Report

CDRL A010 Cost/Schedule Status Report

### 3.1.4 Configuration Management Program

The Contractor must use an internal Configuration Management (CM) system for the control of all configuration documentation, software, physical media, and physical parts representing or comprising the [*insert system name*]. The detailed requirements are included in these subparagraphs.

#### 3.1.4.1 Contractor's Configuration Management Plan

The Contractor must submit a Configuration Management Plan (CMP). Upon approval by the Government of the CMP, the Contractor must use this plan.

CDRL A011 Configuration Management Plan

#### 3.1.4.2 Configuration Identification

The Contractor must use and maintain a definitive basis for control and status accounting for a Configuration Item (CI) throughout the [*insert system name*] life cycle. Any item subject to replacement in the site, used without modification from a subordinate vendor, or as a serialized end item for tracking or Government acceptance purposes must be designated a CI.

##### 3.1.4.2.1 Developmental Configuration

The Contractor must use an internal developmental CM system. The documentation and repositories for this developmental configuration must remain the Contractor's responsibility until the [*insert system name*] system is accepted by the Government.

##### 3.1.4.2.2 Configuration Baselines

The Contractor must use and maintain configuration baselines and their documentation. Incremental product baselines must be permitted if proposed and approved via the CMP.

#### 3.1.4.3 Configuration Identifiers

The Contractor must assign unique configuration identifiers.

##### 3.1.4.3.1 Part/Item Identification Numbers

The Contractor must assign a discrete part/item identification number until such time as either an interim or final product baseline is established. At that point, parts must be re-identified only upon Government approval whenever a non-interchangeable condition is created.

##### 3.1.4.3.2 Software Identification Numbers

The Contractor must assign a discrete part/item identification number to each software medium (e.g., magnetic tape, disk) containing [*insert system name*] release- or build-type software executables. The medium thus identified must be inclusive and contain all software segments, thereby providing easy identification of software releases after the product baseline is established.

##### 3.1.4.3.3 FAA Type Designations

The Contractor must request unique FAA equipment type designations based upon an engineering and logistical review of structural or hardware items that could be advantageously identified by means of an FAA type number, as soon as practical but no later than (NLT) nine months after contract award. FAA designations normally consist of two alpha characters in combination with five numeric (e.g., FA-85000), which must be affixed to the unit on the nameplate in a location where it is readable, if practical, when the unit is in service IAW FAA-G-2100 paragraph 3.3.3 and subparagraphs. FAA type designations must not be assigned nor affixed to equipment that has been procured to specifications of other Government agencies or previous FAA procurements and that have already been assigned their own type designations or model numbers, unless a "major modification" is applied to the equipment based upon the [*insert system name*] design. FAA type designations are applicable to developmental and COTS items. The FAA type designation nameplate must not invalidate any warranty or equipment operation. Consideration must be given to adhesive attachment of the FAA type number nameplate for COTS items.

#### 3.1.4.4 Configuration Control

The Contractor must maintain change control of the engineering design and production after Functional Configuration Audit/Physical Configuration Audit (FCA/PCA) as follows.

##### 3.1.4.4.1Engineering Change Proposal

The Contractor must use an Engineering Change Proposal (ECP) program.

CDRL A012 Engineering Change Proposal

##### 3.1.4.4.2 Requests for Deviation

The Contractor must submit deviation requests prior to the manufacture of a hardware item that would incorporate a known departure from requirements. Deviations must be submitted only for temporary departures from requirements, must be for less than the production quantity of the item, and must not involve changes to any [*insert system name*] baseline documentation.

CDRL A013 Request for Deviation

##### 3.1.4.4.3 Requests for Waiver

The Contractor must submit waiver requests after the manufacture of a hardware item that contains a departure from known requirements and the Contractor proposes that the Government accept the item "as is". Waivers must be submitted only for specifically identified items of less than the production quantity of that item, and must not involve changes to any [*insert system name*] baseline documentation.

CDRL A014 Request for Waiver

##### 3.1.4.4.4 Parts Substitution

The Contractor must maintain parts substitution control.

##### 3.1.4.4.5 Change Description

The Contractor must submit, attached to each ECP, a Change Description for each document that would be changed if that ECP were approved. Each Change Description must include the exact proposed changes by citing the words/information to be changed in "From/To" format. Each proposed Change Description cover page must be uniquely identified by color, border, or other means to easily distinguish proposed and approved change documentation.

CDRL A015 Change Description

##### 3.1.4.4.6 Notice of Revision

The Contractor must submit, attached to each ECP, a Notice of Revision (NOR) to drawings that are not controlled by the ECP originator.

CDRL A016 Notice of Revision

#### 3.1.4.5 Configuration Status Accounting

The Contractor must use, record, and present, at the PMRs, Configuration Status Accounting (CSA) information.

#### 3.1.4.6 Discrepancy Reporting System

The Contractor must use a system level discrepancy reporting system as part of the Contractor's CM program. Throughout that system, the Contractor must identify all system level discrepancies identified during development or testing and must submit corrective action plans. During each PMR, the Contractor must report on any outstanding discrepancies and the planned resolution. The Government will have the right to witness or review the documentation regarding the closure of any discrepancy item.

CDRL A017 Discrepancy Report

#### 3.1.4.7 Configuration Audits

The Contractor must support configuration audits using MIL-STD-973, as guidance. The Contractor must be responsible for ensuring that subcontractors, vendors, and suppliers participate in Government configuration audits.

##### 3.1.4.7.1 Functional Configuration Audit

The Contractor must support a Functional Configuration Audit (FCA) of a first production article [*insert system name*] system prior to the start of Operational Test and Evaluation (OT&E). Each individual requirement (i.e. MUST Statement), irrespective of the test guidance provided from any requirements or verification test matrix, must be audited. The intent must be to audit the attainment of all functional requirements and to validate their attainment during the FCA.

CDRL A018 Configuration Audit Summary Report

##### 3.1.4.7.2 Physical Configuration Audit

The Contractor must support a Physical Configuration Audit (PCA) of a first production article [*insert system name*] system prior to the start of OT&E. Subcontractor, vendor, and supplier PCAs must be performed for CIs developed for the [*insert system name*] procurement or modified for use by other than the [*insert system name*] prime Contractor. Successful completion of the PCA must include, but not be limited to, successful conclusion of FCA and Government approval of the Contractor's final submission of the associated CDRL items [*insert applicable CDRL numbers*].

CDRL A018 Configuration Audit Summary Report

#### 3.1.4.8 Bar Code Marking

Each package, replaceable item, and its container must be marked and bar coded, IAW MIL-STD-129. The Contractor must mark all LRUs and LRU spares with bar code symbology IAW UCC/EAN-128 Code.

CDRL A019 LRU Bar Code Identification Report

### 3.1.5 Data Management Program

The Contractor must establish a data management program to maintain contractually-required documentation and correspondence; design, test, and production documentation, and other supporting documentation; in one logical and inclusive system using the requirements of DOD-STD-1700 as guidance. This effort must include documentation involved with, but not be limited to, the development, production, implementation, testing, schedule, and management of the [*insert system name*] equipment. This specifically must include a process for monitoring, reporting, status accounting, and cross-matrix of changes to, additions of, or deletions of data item deliverable contents.

All test-related CDRL items will be reviewed by the Government to verify Contractor compliance with the system design as defined in the [*insert system name*] specification, and to ensure that all requirements have been incorporated into the test documentation. The Contractor must identify and use an orderly review and comment process in order to preclude schedule delays. Revised documents incorporating Government submitted comments must be submitted with revision marks showing all changes to the previous submission. Revision marks must be removed in the final delivery of documents unless otherwise stated.

#### 3.1.5.1 Integration of Contractor's Data Management Effort

The Contractor must identify a single focal point for integrating and maintaining the total Contractor data management effort. The Contractor must submit a Data Management Plan (DMP). Upon approval by the Government of the DMP, the Contractor must use this plan. The Contractor must develop and record a Data Accession List (DAL). Internal data generated in compliance with contractual tasks and subcontractor-generated data must be listed on the DAL. When requested by the Government, the Contractor must make available for Government review, these internal documents used to design and manage the [*insert system name*] program.

CDRL A020 Data Management Plan

CDRL A021 Data Accession List/Internal Data

#### 3.1.5.2 Data Control and Status Accounting

The Contractor must use an automated status accounting system to provide for data logging, recording, status reports, tracking, follow-ups, record keeping, and audit trails for contract data items. Additionally, the Contractor must provide Contract Data Status and Schedule Reports. The reports must be presented as an agenda item at PMRs.

CDRL A022 Contract Data Status and Schedule Report

##### 3.1.5.2.1 Controls over Subcontractor Data

The Contractor must control the generation, receipt, approval, storage, and delivery of subcontractor data. The Contractor must assume responsibility for subcontractor data and must ensure that the subcontractor data meets requirements of the contract. Integration of subcontractor data into contract deliverables must be the responsibility of the Contractor. Deliverables must be the sole responsibility of the Contractor.

### 3.1.6 Quality Assurance

The Contractor must provide and maintain a documented quality system as a means of assuring compliance with the hardware and software requirements of the contract. A Quality System Plan must be prepared and submitted (Ref. DID/CDRL Quality System Plan and ISO 9001/ISO 9000-3 required) as a separate bound volume and submitted with the technical proposal. All portions must be considered of equal importance. The Contractor must require of sub tier suppliers a quality system achieving control of quality of the services and supplies provided. All spare parts must be inspected and tested in plant, using the same procedures as the primary equipment components.

Note: The Government intends to use these Quality Standards as it would any other quality standards. Third party registration of ISO standards is not required nor does such registration relieve the offeror of the requirement of submitting a Quality System Plan (QSP).

CDRL A023 Quality System Plan

#### 3.1.6.1 Higher-Level Interface Data Quality Requirement for NAS Procurements

The contractor must establish and maintain a Data Quality system, and prepare and submit a Data Quality Plan (DQP). The DQP must describe the Contractor's provisions for data quality assurance, including assessment, remediation and monitoring the data quality to insure compliance with business requirements; also, inspection and test of all technical data to be provided under this contract, in accordance with the terms of this contract, including sub-contractors. The DQP must describe the Contractor's provisions for review of and alignment with DOT/FAA data management initiatives, specifically to include review of the FAA Data Registry (FDR) for standardized and certified technical data elements IAW FAA-STD-060. If the contractor's systems engineering program includes the use of commonly shared interface data, the contractor's DQP must include development and delivery of a Technical Data Report (TDR).

CDRL A080 Data Quality Plan

## 3.2 Systems Engineering and Design Development

The Contractor must execute a systems engineering program for the definition, development, verification, integration, and testing of the [*insert system name*] System requirements as allocated to [*insert system name*] Computer Software Configuration Items (CSCIs) and Hardware Configuration Items (HWCIs). System engineering efforts must consider all aspects of performance, quality, life cycle cost, maintainability, reliability, schedule, data processing reserves, and future growth requirements. Under this SOW, the Contractor must perform hardware prototyping as necessary to support system design development, and must designate and purchase, prior to CDR, long lead-time hardware items necessary to implement the system design.

The Contractor must provide a system design for all the requirements in the [*insert system name*] specification. Where applicable, the Contractor must follow MIL-H-46855 and MIL-STD-1472 as guidance, particularly for Contractor-designed Graphical User Interfaces (GUIs) (Sec. 5.2 of MIL-STD-1472) and user-computer interfaces (Sec. 5.15 of MIL-STD-1472).

The Contractor must maintain effective control over the system engineering and design development process, including subcontract items and services, to ensure that cost, performance, and schedule are met, to provide early detection and resolution of problems, and to reduce risk. The Contractor must specify a single authority who will serve as a Point of Contact (POC) for systems engineering issues.

### 3.2.1 Systems Engineering Documentation

The Contractor must provide the following engineering documents.

#### 3.2.1.1 System Design Description

The Contractor must provide a System Design Description (SDD) for the entire system. The SDD must further describe the decomposition of the [*insert system name*] specification requirements into HWCIs and CSCIs, as appropriate. The SDD must describe the system architectural design, the system design concept of execution, the system interface design, and decisions about the selection and design of system components. The SDD must contain an explicit trace of each system requirement in the entire [*insert system name*] specification to the CI to which it is allocated by the Contractor.

CDRL A024 System Design Description

#### 3.2.1.2 Interface Control Documentation

The Contractor must develop interface control documentation, as listed in [insert attachment number] based on an analysis and decomposition of the requirements contained in the entire [*insert system name*] specification. The Contractor must participate in TIMs with FAA and Contractor personnel who support or develop the systems to which the [*insert system name*] interfaces. The Contractor must submit Interface Control Documents (ICDs) to the Government for review and approval. The Contractor must analyze Government-provided Interface Requirements Documents (IRDs) and ICDs for discrepancies. The Contractor must inform the FAA of any inconsistencies among the ICDs, IRDs, or design documentation. The results of the inconsistency analysis must be presented at the PMRs and in the ICD Discrepancy Report. The Contractor must use and document external and internal engineering interfaces IAW the interface requirements of [*insert system name*] functional baseline documentation. Interface controls must be established, coordinated, and maintained for interface requirements and documents, and include applicable Contractor, subcontractor, and vendor contract items, and GFP/GFE computer programs, facilities, and data. The Contractor must designate one Interface Manager to be responsible for interface related issues and communications. The Contractor must define [*insert system name*] interface requirements as a part of the systems engineering process. The Contractor must use physical and functional interfaces of the system, equipment, software, communications, and facilities using FAA-STD-025 as guidance.

CDRL A025 Interface Control Document

CDRL A026 Interface Control Document Discrepancy Report

#### 3.2.1.3 Human Engineering Design

#### 3.2.1.3.1 Approach

An adequately staffed Human Factors Engineering (HFE) effort must be dedicated to and be an integral part of the analysis, design, and test process. The Human Engineering approach must be structured such that the program has a direct, measurable effect on system design. In the sections below a number of efforts are specified. These efforts are not to be conducted in a "stand-alone" mode, but rather must be an integral part of the design and development process. HFE must be a contributing member of the design team. Execution of the HFE process must be documented in such a way that the value of HFE can be demonstrated.

##### 3.2.1.3.2 Planning and Execution

An HFE program must be planned and implemented in accordance with MIL-HDBK-46855 as applicable. The HFE program plan should specify, at a minimum: the steps that will be taken during system development to determine user needs and functional requirements that have an impact on human performance. The plan and management approach should enable the HFE staff to have direct input to system design, specify the method or procedures that will be used to translate the analytical results into system design, and specify the testing process that will assure the user that human-in-the-loop (HITL) system performance will meet expectations. The HFE program plan must contain a schedule showing the major HFE activities such that interim or final products of the analysis are used during system design. The plan must specify the tasks the HFE staff will perform to support and be an integral part of system design. The plan must specify points in the program design cycle where HFE risks are identified. The plan must specify the major elements of the HFE test and evaluation program that will contribute to system design. The HFE program schedule must show how the results of the HFE test program will be used to influence system design.

CDRL A075 Human Engineering Program Plan

##### 3.2.1.3.3 Objective

The objective of the HFE effort must be to assure that the system design is consistent with the capabilities and limitations of the air traffic service provider and/or maintainer in the operational environment.

##### 3.2.1.3.4 Scope

To attain the above objective, the scope of the HFE analytical, design, and test activities must include accountability for the variations in site operational conditions and workload variations. The impact of equipment, software, and procedures on personnel availability, skill levels, proficiency, and operation and maintenance under various levels of stress must be assessed to assure that the demands on personnel resources are consistent with requirements.

##### 3.2.1.3.5 Human Factors Engineering Program Emphasis Areas

Within the context of the above considerations, the human factors engineering program must include as a minimum, the following emphasis areas:

* Studies and Analyses - Human Factors Engineering studies and analyses of the system must be performed as applicable to the objectives of the contract in the areas outlined by MIL-HDBK-46855 (as tailored) in general and the following system functions and issues in particular:
* Operations. Effectiveness of user control/ display/ communication/ environment integration for accomplishment of operator tasks including display legibility, decision-making, fault isolation using system BITE, capability of handling high workload levels, compatibility with required communication links, control-display dynamics for information acquisition and insertion, etc. Operations under degraded and emergency conditions must be analyzed and tracked throughout the life cycle of the system to assure that safe operation under these conditions is maintained.
* Maintainer Interface. Suitability of maintainer/hardware/procedures to facilitate the meeting of system performance requirements including accomplishing maintenance involving fault isolation, manipulation, access, removal, replacement, and repair; manual operations involving pulling, pushing, lifting, or carrying; and compatibility of tools with tasks, hand wear, and environment.
* Critical Tasks. Analysis of critical tasks must include consideration of methods and procedures, communications, and system queries that may be used to perform operator and maintainer tasks. Analyses of the capability of integrated hardware/software/personnel/procedures to perform the specified air traffic services consistent with system performance requirements must be conducted in conjunction with the critical task analysis.
* Design and Application - Human engineering applications to design must be governed by that human performance necessary to meet or exceed system requirements as stated by the system specification and conformance to applicable provisions of MIL-HDBK-46855. Analytical findings must be applied to system design.
* Mock-ups and Models - At the earliest practical point in the development program (preferably before Preliminary Design Review and in no case later than Critical Design Review) and well before completion of system prototypes, full-scale three-dimensional mock-ups of equipment involving critical human performance must be constructed. The Human Engineering Program Plan must specify mock-ups requiring procuring activity approval. These mockups and models must provide a basis for resolving access, workspace and related human engineering issues, and incorporating these solutions into systems design. In those design areas where systems/equipment involve critical human performance and where human performance measurements are necessary, functional mockups must be provided.
* Computer Human Interface (CHI) and Software Rapid Prototypes - For systems that have a reliance on software for the human interface, the Human Engineering Program Plan must specify the process by which the CHI will be designed. CHI must include the workstation, computer hardware, and software aspects of the system. The program plan must specify the conventions, style guides, and design constraints that will be applied to system design. The impact of legacy systems, other software in the workstation, and transfer of training from predecessor systems must be addressed. Rapid prototypes (i.e.: software mockups) must be used as design aids and as tools in the design process. Rapid prototypes must be used in the test and evaluation process during the design phase as a means to assess the impact of design decisions on human performance and user acceptance.
* Test and Evaluation - Human factors engineering requirements must be integrated into system test and evaluation to demonstrate the capability of the human-system interface to attain required system performance characteristics. Testing and evaluation must include: reaction times, ability to perform visual search tasks, performance of tracking and monitoring tasks, maintenance of situational awareness, ability to perceive the development of potential problems in the tactical situation, data insertion, adequacy of operating and maintenance procedures, and other tasks that the requirements documents and human engineering analyses have determined are critical. Testing must thoroughly assess human performance and human engineering design of each personnel position. HFE tests may be integrated into other system tests. However, dedicated HFE tests must be performed when validation of critical task accomplishments is necessary. Examples of such tasks are those where reaction time and accuracy requirements are primary determinants of mission accomplishment.

* HFE Reviews - Conduct of the following reviews does not obviate the requirements for HFE participation in other reviews such as program reviews, technical review, PDRs, CDRs, etc.
* HFE Program Planning Reviews. An HFE program planning review scheduled by the contractor must be scheduled as soon as practicable after contract go-ahead. The purposes of this program planning meeting are to:
* Insure mutual understanding of the proposed HFE Program Plan to be submitted in accordance with the requirements of this SOW.
* Insure consistency of HFE program planning with the objectives of the contract and applicable provisions of MIL-HDBK-46855.
* Discuss any tailoring of applicable human engineering design criteria which the contractor anticipates proposing in the HFE program plan.
* Review general approach, assumptions, guidelines, schedule, and level of effort.
* Surface problems and/or needs for contractor access to technical information for requirements clarification.
* HFE Design Reviews. Two HFE design reviews must be scheduled and conducted by the contractor. The first HFE Review must be conducted not later than 30 days prior to the PDR; the second HFE review must be conducted not later than 30 days prior to the CDR. Each HFE review must cover at least the following:
* Program Accomplishments. The human factors engineering program must be described in sufficient detail to provide a clear understanding of progress, status, and plans pursuant to implementing the approved HFE program.
* System Integration and Interactions. Evidence must be presented to insure that the system will work effectively with other systems with which it interfaces and that human performance requirements for such integrated operations and maintenance are consistent with planned human resources.
* Principal Human Performance Requirements. System operation and maintenance requirements (e.g., reaction times, accuracy, and time to repair/replace) which depend on human performance must be summarized. Critical tasks upon which satisfactory performance and/or the system's effectiveness depend must be identified. Review of such critical tasks must therefore include: a) system performance requirements, b) critical tasks driving such performance, c) human performance requirements of these critical tasks, d) equipment/software involved with the critical tasks, and e) the range of operational and environmental conditions anticipated during performance of the critical tasks.
* Human Engineering Design. Compliance of items having an operator, controller, or maintainer interface must be presented in terms of compliance with human performance and human engineering design requirements.
* Manpower, Personnel, and Training (MPT), Health Hazard or Safety Implications. MPT, health hazard or safety implications for design and, conversely, design implications for MPT, health hazards or safety, must be described. Risks and planned corrective action must be identified. Absence of risk, if applicable and supporting rationale must be stated.

CDRL A076 Human Engineering Design Approach Doc-Operator

CDRL A077 Human Engineering Design Approach Doc-Maintainer

CDRL A078 Critical Task Analysis Report

CDRL A079 Human Engineering Simulation Concept

### 3.2.2 Software Development

The Contractor must design, code and unit test, integrate, test, and deliver the [*insert system name*] software using the Government-Furnished Information (GFI) software as guidance. The Contractor must document software developed under this contract as required in the following sub-paragraphs. The Government will provide the GFI software on a GFE bench. Although the software is GFI, the algorithms themselves must be considered GFE, and must not be modified by the Contractor without the Government's consent. The Contractor must integrate the software into the hardware designed and procured under this contract, to produce the [*insert system name*] systems. The correctness of algorithm implementation in Contractor-developed weather software must be subject to testing and verification by the Contractor as part of DT&E. Also, all operational functionality present in the interface seen by air traffic control personnel in the software provided as GFI must be also be present in Contractor-developed software.

#### 3.2.2.1 System Software Design

Where [*insert system name*] requirements cannot be met by using commercially offered software packages, the Contractor must develop the required computer software. Firmware (software that resides on programmable memory) must be treated as software. Commercially available operating systems used in the [*insert system name*] must be POSIX compliant and be the most recent release or update. [*insert system name*] software must be IAW the operating system and COTS application manufacturer recommendations and applicable industry standards to assure compatibility with future releases of the operating system and related COTS software applications. The Contractor must implement updates and revisions as they occur until the TRR. If the Contractor has a desire to modify commercial software, he must supply the justification for the change to the Government. The justification must state the method of documentation. All changes must require Government approval.

For standard commercial product software employed to satisfy [*insert system name*] requirements, corresponding commercial documentation, licensing agreements, and usage limitations must be submitted to the Government for approval. The Contractor must ensure that the Government has the unrestricted access to additional copies of commercial software documentation.

#### 3.2.2.2 Software Documentation

The Contractor must provide the documentation for requirements, design, test, quality assurance, delivery, installation, operation, maintenance, and support of each computer resource CI and CSCI. The Contractor must submit software documentation to the Government for review and approval. The following paragraphs are the tailored list of software documentation.

##### 3.2.2.2.1 Software Development Plan

The Contractor must prepare, use, maintain, and update the Software Development Plan (SDP) throughout the contract life cycle. The SDP must describe the Contractor's plans for conducting the [*insert system name*] software development effort. The SDP must be consistent with system-level planning. The plan must identify a single focal point of management responsibility for accomplishment of the software development activities. Government approval of the SDP must obligate the Contractor to accomplish software development in compliance with the SDP. The FAA will use the SDP as a tool for monitoring the processes to be followed for software development, the methods to be used, and the approach to be followed for each activity, and project schedules, organization, and resources. However, the SDP must not relieve the Contractor from complying with all other requirements of the [*insert system name*] specification and this SOW. The Contractor must ensure that software products developed by subcontractors are IAW all prime contract requirements. The Contractor must specify the means by which this is to be accomplished in the SDP.

CDRL A027 Software Development Plan

###### 3.2.2.2.1.1 Interface with the FAA

The Contractor must develop specific plans and procedures for interfacing with the FAA as required by this SOW. These plans and procedures must be documented in the SDP. The Contractor may propose the establishment of informal data delivery and access mechanisms to.

##### 3.2.2.2.2 Software Requirements Description

The Contractor must provide a Software Requirements Description (SRD) for each CSCI. The SRD must document and allocate each requirement applicable to the software. The SRD must provide a complete allocation matrix of all software requirements (explicit and derived) from the entire [*insert system name*] specification and System Design Description. The SRD must also contain a cross-matrix tracing each SRD requirement to its [*insert system name*] system (or subsystem) requirement. The SRD must identify external and internal interfaces (i.e., outward and downward links). It must contain estimates of timing and sizing requirements. The SRD must reference and not duplicate GFI software documentation; however, any modifications to GFI made by the Contractor must be documented by the Contractor. Following delivery to the Government, the SRD must be subject to configuration control.

CDRL A028 Software Requirements Description

##### 3.2.2.2.3 Software Design Description

To the extent of software developed under the contract associated with this SOW, the Contractor must provide a Software Design Description (SDD) for each CSCI. The SDD must describe the architectural design of the CSCI (identify software units, interfaces, and the concept of execution (among them)) plus the allocation of requirements from a CSCI to its Computer Software Units (CSU). The SDD must reference and not duplicate GFI software design documentation; however, any modifications to GFI made by the Contractor must be documented by the Contractor. Upon completion of the PCA, the SDD, as part of the Software Product Specification (SPS), must be entered into the product baseline for the CSCI. Subsequent to approval, the SDD must be subject to formal configuration control and must not be changed without prior Government approval.

CDRL A029 Software Design Description

##### 3.2.2.2.4 Software Test Plan

The Contractor must provide a Software Test Plan (STP) for each CSCI. The STPs must describe the DQT and FQT plans for all CSCIs, including Algorithm Verification and "Worst Case" testing. The STP must identify software test environment resources required for testing, and must provide schedules for test activities. In addition, the STP must identify the individual tests that must be performed during qualification testing. The Contractor may submit a single STP for multiple CSCIs when approved by the Government. The Contractor must incorporate and use Government comments in subsequent test activities. The final version of the STP must not be changed without prior Government approval.

CDRL A030 Software Test Plan

##### 3.2.2.2.5 Software Test Description

The Contractor must provide a Software Test Description (STD) for each CSCI. The STD must be developed and delivered in two increments and in the following order:

* The test case descriptions and related information
* The test procedures and the formal test preparations

The final version of the STD must not be changed without prior Government approval.

CDRL A031 Software Test Description

##### 3.2.2.2.6 Software Test Report

The Contractor must provide a Software Test Report (STR) on completion of the formal tests. The STR may be used by the Contractor as a basis for retesting. The STR must summarize test discrepancies and must reference their corresponding problem/change reports.

CDRL A032 Software Test Report

##### 3.2.2.2.7 Software Version Description

The Contractor must provide a Software Version Description (SVD) for each CSCI. The SVD must be used by the Contractor to release CSCI versions to the Government. The SVD must accompany the shipment of each CSCI to the Government. The Contractor must use and maintain a system that ensures that each CSCI change is accounted for, following approval by the Government. The SVD must describe all changes to any CSCI version delivered subsequent to the initial CSCI delivery.

CDRL A033 Software Version Description

##### 3.2.2.2.8 Software User Manual

The Contractor must provide one Software User Manual (SUM) for the [*insert system name*] program. The SUM must provide user personnel with instructions sufficient to utilize the [*insert system name*] for its intended purpose. Functions described must include, but are not limited to, operations, log in, weather product examination, and operator switch settings/changes.

CDRL A034 Software User Manual

##### 3.2.2.2.9 Software Product Specifications

The Contractor must provide a Software Product Specification (SPS) for each CSCI that consists of the design documents, software listings, and source code. Upon Government approval, the SPS must establish the Product Baseline for the delivered CSCI. The SPS must be delivered electronically in a Government-specified format and on hard copy.

CDRL A035 Software Product Specification

##### 3.2.2.2.10 Interface Design Document

The Contractor must provide a detailed design of the HWCI to CSCI interfaces and the CSCI to CSCI interfaces, not provided by the Government. The Interface Design Document (IDD) must be used to specify the design for those interfaces. Following delivery to the Government, the IDD must be subject to configuration control.

CDRL A036 Interface Design Description

##### 3.2.2.2.11Technical Data Report Document

The contractor must provide a Technical Data Report (TDR) for all commonly shared interface data specified in the Interface Control Document (ICD). The contractor is required to collect and compile the metadata for each technical data element that meets the commonly shared interface definition. The metadata descriptions are found on the FAA Data Registry (FDR) at http:/fdr.faa.gov/ and in FAA-STD-060, Data Standard for the National Airspace System. Delivery to the government must be by creating the Technical Data Report Document and submitting it to the government.

CDRL A081 Technical Data Report

#### 3.2.2.3 Development of Non-Operational Software

The Contractor must provide any non-operational software such as simulation software, test software, and development/maintenance tools with documentation (in Contractor format).

### 3.2.3 Hardware Identification and Selection

The Contractor must provide a detailed design of the [*insert system name*] hardware and provide requirements traceability to the entire [*insert system name*] specification. This design and development must be IAW, and meet the requirements of, the entire [*insert system name*] specification. The Contractor must make maximum use of readily available COTS hardware systems which satisfy the functional and performance requirements of the entire [*insert system name*] specification. Hardware subsystems, assemblies, or components which meet the requirements of the entire [*insert system name*] specification must be procured according to applicable FAA regulations and orders. COTS hardware must remain consistent across all sites (same manufacturer, type, and hardware family) and upon completion of any hardware upgrade of [*insert system name*] equipment/design. During the engineering design process, the Contractor may propose a new configuration item, developmental LRU, or modified COTS/Non-Developmental Item (NDI) if it is justified as best value on a cost/benefit basis. The Contractor must document the interrelationships between the system/subsystem/equipment drawings in an Engineering Drawing Tree. The documentation of the selected COTS equipment design must be as Commercial Item Descriptions (CIDs).

CDRL A037 Engineering Drawing Tree

CDRL A038 Commercial Item Descriptions

### 3.2.4 Access to System Development Environment

The Contractor must fully cooperate and provide the FAA full and timely access to the [*insert system name*] system development environment. Such access must include, but not be limited to, data, documentation, draft CDRLs, source code, and the physical plant. FAA access must include access for FAA employees and FAA Contractor support personnel. FAA access must also include FAA Training Academy personnel in support of their development of Airway Facilities (AF) training. To facilitate such access, the Contractor must:

* Provide the FAA with weekly physical access of not less than forty (40) hours
* Provide access to contract deliverables prior to delivery
* Provide the FAA with electronic access to data, documentation, and [*insert system name*] development environment elements, other than physical plant facilities
* Propose an alternative method to providing access, where remote electronic access is not feasible, subject to acceptance and approval by the Government
* Provide timely notification to the Government of any adverse impact to the development effort arising from the cooperation and access afforded to the FAA as specified herein
* Provide password protected Internet access to documents selected by the Government.

### 3.2.5 Reliability Program

The Contractor must maintain a reliability program to ensure that the reliability requirements of the [*insert system name*] specification and this SOW are satisfied. For the Limited Production systems, the Contractor must act as a focal point for tracking failed hardware (including receiving failed equipment from the fielded sites and returning them to the equipment manufacturers for repair/replacement) and software. Part of this effort must include using the associated failure data as part of the Contractor's reliability program. The Contractor must analyze failures and present failure data and discuss engineering remedies/actions at TIMs and PMRs. The Contractor's overall methodology for conducting a reliability program, including the process for tracking failed hardware and using the failure data for reliability purposes, must be documented in a Reliability Program/Demonstration Plan. The Contractor must submit reliability documentation IAW the CDRLs.

CDRL A039 Reliability Program/Demonstration Plan

CDRL A040 Reliability Predictions/Demonstration Report

### 3.2.6 Maintainability Program

The Contractor must maintain and demonstrate a maintainability program to ensure that the maintainability requirements of the [*insert system name*] Specification and this SOW are satisfied. The Contractor's overall methodology for conducting a maintainability program must be documented in a Maintainability Program Plan. The Contractor must submit maintainability documentation IAW the CDRLs.

CDRL A041 Maintainability Program/Demonstration Plan

CDRL A042 Maintainability Demonstration Procedures

CDRL A043 Maintainability Predictions/Demonstration Report

### 3.2.7 Electromagnetic Interference and Susceptibility

The Contractor must design and construct the system to meet the interference and susceptibility requirements of the [*insert system name*] Specification. If a deficiency exists between the system and the requirements, the Contractor must correct these deficiencies.

### 3.2.8 Facilities

The Contractor must be responsible for cableways, power installation, and phone line interconnection within the [*insert facilities*].

### 3.2.9 Security

The Contractor must use the applicable security requirements contained in FAA Order 1600.54 as a guide. Implemented security must be subject to Government approval.

## 3.3 System Test and Evaluation

The Contractor must plan, conduct, and document an integrated test and evaluation program, in accordance with this SOW and the Government approved Contractor's Master Test Plan (CMTP) using the Acquisition Management System Test & Evaluation Process Guidelines (AMST&EPG) and MIL-STD-498 as guidance. The test program must verify that the [*insert system name*] system and its support elements meet the physical, functional, interface, and performance requirements, as stated in the [*insert system name*] specification, in the intended environment, and with the intended users. The Contractor must develop test schedules, test plans, and test procedures to meet the CDRL requirements of this SOW. The Contractor must conduct tests and generate test reports, as required by this SOW. The Contractor must integrate test schedules into the overall [*insert system name*] program schedule. The Government reserves the right to witness, on a non-interference basis, Contractor testing during any test phase or level. The Contractor must furnish equipment, space, and personnel required to perform Contractor-conducted factory tests. The Contractor must coordinate testing to be performed, and ensure that there is minimal redundancy of effort or data. The Contractor must have the responsibility for integration, control, and coordination of Contractor and subcontractor testing and support of Government testing. The Contractor must designate in the Contractor's PMP a single test manager who must be responsible for testing and testing support items. The Contractor must maintain the CMTP, which must serve as the overall test control document for the Contractor's [*insert system name*] Test Program. The Contractor must notify the Government of testing schedules at least five (5) working days prior to the start of each test. Contractor-proposed test tools, documentation, and test-support hardware and software must be approved by the FAA prior to the start of testing. The Contractor must provide facilities and equipment required for successful completion of required tests. The Contractor's test program must include the tests identified in attachment [*insert attachment number*].

### 3.3.1 Development Test and Evaluation

The Contractor must perform Development Test and Evaluation (DT&E). The purpose of DT&E must be primarily to assist in the engineering design and development and implementation process by determining incrementally the degree to which functional engineering specifications are attained. In general, DT&E must consist of DQTs, FQTs and First Article Tests as defined below. The Contractor must develop DT&E FAT/Site Acceptance Test (SAT) Plans, DT&E FAT/SAT Procedures, and DT&E FAT/SAT Reports.

CDRL A044 DT&E FAT/SAT Plan

CDRL A045 DT&E FAT/SAT Procedures

CDRL A046 DT&E FAT/SAT Reports

#### 3.3.1.1 Design Qualification Tests

The Contractor must perform Design Qualification Tests (DQT) to verify that the implemented design meets functional and performance requirements of the [*insert system name*] specification and this SOW. The Contractor must provide the Government five (5) days advance notice of all major DQT activities as defined in the CMTP. DQT may be witnessed by an authorized Government representative. DQT test planning must be documented in the STP, which includes planned testing for both DT&E DQT and FQT.

#### 3.3.1.2 Formal Qualification Tests

The Contractor must perform Formal Qualification Tests (FQT) to verify that the implemented design meets functional and performance requirements of the [*insert system name*] specification and this SOW. FQT will be witnessed by the Government.

#### 3.3.1.3 First Article Tests

The Contractor must perform First production article testing on a limited production system that has been modified to a first production article configuration.

##### 3.3.1.3.1 Factory Acceptance Tests

The Contractor must perform Factory Acceptance Tests (FAT) at the factory for each delivered item to verify that it conforms to applicable specifications, is free from manufacturing defects, and is substantially identical to the qualified hardware. The FAT procedure is validated after DT&E at the factory on the First Article.

##### 3.3.1.3.2 Site Acceptance Tests

The Contractor must perform Site Acceptance Tests (SAT) at each field site before acceptance of the system by the FAA. SAT procedures are validated during DT&E and constitute part of PAT&E when being conducted at field deployment sites.

##### 3.3.1.3.3 Delta DT&E Tests

The Contractor must perform Delta DT&E testing at the FAA William J. Hughes Technical Center (WJHTC) and/or key sites to satisfy those test requirements that require an operational environment not available at the Contractor's facility. Delta DT&E tests must be conducted on First Article system(s). Several First Article systems may be necessary to complete testing to show compliance with this SOW's requirements and the [*insert system name*] specification. Delta DT&E Tests must include but not be limited to the following:

###### 3.3.1.3.3.1 System Maintainability

A maintainability demonstration must be performed using MIL-STD-471 as guidance, to demonstrate that the equipment satisfies the mean and maximum repair time requirements, the Mean Time Between Preventative Maintenance Action (MTBPMA) requirements, and the Fault Detection/Isolation requirements.

###### 3.3.1.3.3.2 System Reliability

The reliability demonstration must be conducted through analysis, using data from the limited production systems, with MIL-STD-781 being used as guidance, to predict that the equipment satisfies the reliability/availability requirements. The Contractor must document failures found during DT&E and First Article testing and conduct a Hands-Off 72-Hour Reliability Demonstration.

###### 3.3.1.3.3.3 System Alignment

The Contractor must completely align the [*insert system name*] utilizing only the procedures and test equipment cited in the instruction manuals. The Contractor must perform verification and validation testing to determine the adequacy of techniques, technical manuals, and test equipment.

###### 3.3.1.3.3.4 Algorithm Implementation

The Contractor must utilize GFP base data as test data and must compare the resulting algorithm outputs with corresponding Government-supplied correct outputs. The Contractor must analyze the results of this comparison test to determine the performance of the system on the test data cases.

###### 3.3.1.3.3.5 Interface Tests

The Contractor must perform the following interface tests:

* The Contractor must demonstrate that the [*insert system name*] can interface and operate compatibly with the external interfaces defined in the [*insert system name*] specification.
* The Contractor must demonstrate that the [*insert system name*] can interface and operate compatibly with the following interfaces: [*list interfaces*]. These tests must utilize the maximum number of interfaces and functions as facility operational requirements permit.

###### 3.3.1.3.3.6 72-Hour Continuous Operation

The Contractor must perform a 72-hour continuous operation field test on systems during SAT to demonstrate compliance with requirements. During this test, the [*insert system name*] system must meet specification requirements without failure of hardware or software. Any failure must require a rerun of the 72-hour test once the failure is remedied. At the end of this period, the equipment must meet applicable specification requirements. During the 72-hour test, the Contractor must demonstrate the following, as a minimum:

* [*Insert system name*] switching and [*insert system name*] modes
* Display Functional Unit (DFU) functionality
* [*Insert system name*] maintenance functionality
* Clutter map capabilities (collecting, installing, etc.)
* [*Insert system name*] power capabilities
* [*Insert system name*] diagnostic and certification tests
* [*Insert system name*] backup switch capability
* Degraded operations (link failure, etc.)

### 3.3.2 Production Acceptance Test and Evaluation

The Contractor must perform Production Acceptance Test and Evaluation (PAT&E) on each delivered system to verify that end-items conform to applicable specifications, are free from manufacturing defects, and are substantially identical to the qualified hardware. These tests must ensure compliance to system-level hardware and software requirements of the [*insert system name*] specification. PAT&E must consist of FAT and SAT. A subset of the Delta DT&E tests identified under section 3.3.1.3.3 must be conducted as part of FAT and SAT.

CDRL A047 PAT&E FAT/SAT Plan

CDRL A048 PAT&E FAT/SAT Procedures

CDRL A049 PAT&E FAT/SAT Reports

### 3.3.3 Operational Test and Evaluation

The Contractor must provide the following services to support the Government conduct of OT&E testing:

* + Systems engineering
  + Hardware engineering
  + Software engineering
  + Communications hardware and software
  + Hardware maintenance personnel at the WJHTC, (if needed)
  + Training.

Additionally, the Contractor must continue to provide the factory software development facility and support services. The Contractor must make corrections to first production article [*insert system name*] that may be necessary as the result of operational testing conducted by the FAA. The Contractor must prepare a problem/change report to describe each problem detected in software or documentation which has been placed under configuration control. The problem/change report must describe the corrective action needed to resolve the problem. These reports must serve as input to the corrective action process. The Contractor must use a corrective action process for handling all problems detected in the products under configuration control. The corrective action process must ensure that all detected problems are promptly reported, action is initiated on them, resolution is achieved, status is tracked and reported, and records of the problems are maintained for the period of the contract.

### 3.3.4 Test Equipment

The Contractor must be responsible for assuring that necessary test equipment is available, on time, properly calibrated, and fully operational to support tests. Use of Government test equipment may be permitted where Government test equipment is on site, is available, and meets specified test equipment requirements. Test equipment used by the Contractor during Factory or Site Tests must be standard commercial equipment and must not be modified without prior written approval of the FAA. Test equipment must operate in the manner specified by the test equipment manufacturer. Ancillary equipment required by the Contractor for test purposes must be furnished by the Contractor for the duration of the tests. The Government Test Director may require the Contractor to re-calibrate any test equipment provided by the Contractor to be used in the test program due to the following:

* The test equipment is removed from the test set-up for unrelated purposes
* The test equipment fails, is damaged, or appears to be operating in a faulty manner based on government evaluation of test results

### 3.3.5 Re-testing

The Contractor must be responsible for corrective action necessary to assure full specification compliance. Failure of the [*insert system name*] equipment to meet specified requirements as identified in the Discrepancy Report must cause the Contractor to determine the reason for the non-compliance. The Contractor must complete repair or rework prior to submission for re-testing. The Government Test Director will determine the extent of re-testing required. No formal re-testing must be commenced until the Contractor has submitted in writing all information concerning the non-compliance and the corrective action taken, and the Government Test Director agrees to start the re-testing. If a review of the reasons for failure to comply with [*insert system name*] specification requirements indicates that the cause may exist as latent defects in items previously accepted, the Contractor must be responsible to correct the defects in a timely manner, even those previously accepted by the Government. The Contractor must re-verify, by the verification method identified in the [*insert system name*] Specification Verification Requirements Traceability Matrix (VRTM), that the defect(s) have been corrected. The Contractor must utilize the Discrepancy Reporting System for reporting the re-testing plans, procedures, and results.

### 3.3.6 Test and Evaluation Training Program Development

The Contractor must develop and implement a training program to support all T&E activities. The Contractor may make use of commercial item training materials, developed draft training materials, draft technical manuals, and other draft documentation as required and approved by the Government. Conduct of DT&E training must make use of seminar/familiarization type training. OT&E training must provide the hands-on experience and theory training required to support all test activities, site support activities, and second-level maintenance activities. Personnel receiving this training will be experienced engineers, and journeymen technicians. Training for each T&E activity must not exceed [insert number of hours] hours per class.

CDRL A050 Test and Evaluation Training Program

#### 3.3.6.1 Developmental Test and Evaluation Briefing

The Contractor must conduct a DT&E Training and Familiarization Briefing, at the WJHTC, to enable Government personnel to assess DT&E test activities. DT&E Briefings must be conducted in time to permit Government personnel to witness and understand Contractor DT&E activities. Briefing attendance will not exceed 50 students.

#### 3.3.6.2 Operational Testing and Evaluation Training

The Contractor must conduct two OT&E Training Courses, one at the WJHTC and the other at the FAA Academy at Oklahoma City. The course must use commercial item training materials, to the maximum extent possible, to train Government personnel, before commencement of OT&E, to perform OT&E test activities. The Contractor must provide supplemental training to address future system upgrades. The OT&E training must be conducted in time to permit Government personnel to operate, maintain, and support the [*insert system name*] during all operational test and evaluation activities. Each class size will not exceed 40 students.

## 3.4 Limited Production Installations

The Contractor must provide personnel, equipment and materials required for the establishment of each limited production sites. The Contractor must provide installation, integration, test, implementation, and other services required. The Contractor must modify limited production [*insert system name*] systems to first article production configuration at the completion of first article testing conducted at the Contractor's facility. The Contractor must maintain first article production systems in a single configuration. The breadth and depth of services required must be determined at each site and must be based upon site surveys plus coordination with site personnel. The Contractor must consider a typical [*insert system name*] installation to include [*list components*]. The Contractor must identify and provide a recommended listing of expendable/consumable products or materials required to support each site. The Contractor must provide full-time supervision and direction of its personnel and subcontractors during LP site activities. The Contractor must assign a single manager with responsibility for integration, control, and coordination of installation activities IAW this SOW. The Contractor must prepare a Management and Installation Plan for the LP sites. Activities must be conducted IAW the approved plans. The Government will designate the Technical On Site Representative (TOR), to represent the Contracting Officer during the equipment installation process at each site. The TOR is the POC for all on-site activities.

CDRL A051 Management and Installation Plan

### 3.4.1 Limited Production Installation Management

The Contractor must manage LP installation activities and must perform:

* Site engineering
* Any subcontract design specification preparation, award, administration, inspection, and acceptance
* Coordination between subcontractors
* Integration and management of facility site preparations and physical facility modifications

### 3.4.2 Site Survey

The Government will provide site information to the Contractor to show geographic locations with each preliminary equipment destination, physical interfaces, available Government resources, facility drawings, POCs, and other available information to assist the Contractor in planning each site installation. This information will be provided no later than 3 months prior to the scheduled equipment delivery for that site. The information will, as a minimum, identify to the Contractor the specific locations that define the intended site.

The Contractor must complete a survey of each [*insert system name*] location to include the [insert facilities], according to a Government-approved survey schedule, in order to acquire site-specific information required for performance of the system installation activities. The Contractor must coordinate the survey with the TOR. The Contractor must provide a Contractor Site Engineering Report (CSER) to the Government for each site. The Contractor must not commence any site installation activity until final approval of the CSER is received from the Government. The Contractor must include precise information in the CSER for routing of primary power within the facility, microwave components, telephone lines (or any other line of information transfer) within the facility, cabling, or ducting needed to prepare, construct, modify, or otherwise provide for the installation, operation, maintenance, and support of the [*insert system name*] equipment. Storage and security of on-site materials must be the responsibility of the Contractor and must be addressed in the CSER.

CDRL A052 Contractor Site Engineering Report

### 3.4.3 Contractor Site Engineering Reports

As part of each CSER, the Contractor must deliver site-specific drawings. Cutting, pasting, and microfilm drafting techniques may be used to generate these new drawings. The product must be in an integrated drawing with information from several sources superimposed with new [*insert system name*] site installation data. These drawings must contain the appropriate regional title block and site-adapted notes referencing the [*insert system name*] site or other drawing numbers used to produce them.

#### 3.4.3.1 Red-lined Installation and Government Facility Drawings

The Contractor must redline site specific and FAA facility drawings to show any changes resulting from the installation and actual placement of [*insert system name*] equipment. Redline markings must include, but not be limited to, wiring diagrams (including color-coding), identification, and terminations. All markings must be legible and depicted in a manner that will enable the Government to verify corrections to the original drawings. The following drawings must be made current to reflect the particulars of a given site:

* Installation Drawings. These drawings must be modified to indicate actual dimensions, cable runs, and concretion specifics
* Government Facility Drawings. These drawings must include Government drawings of the [list facilities] that show details of cable trays, equipment rooms, and console layouts. These drawings must also include the Facilities General Layout Plan.

CDRL A053 "Red Lined" Installation Drawings

#### 3.4.3.2 Final as Built Drawings

The Contractor must accurately and promptly amend (on all original drawings) the changes, revisions, or additions resulting from the [*insert system name*] installation. This amending process must reflect the current "As Built" status. The amendment process must apply to all site-specific Contractor-generated drawings and Government facility drawings that were "red-lined" during installation, and also to any [*insert system name*] standard drawing. The drawings must be amended with the appropriate regional title block, facility title, and completed revision block.

CDRL A054 Final As Built Drawings

### 3.4.4 Facility Site Preparation and Physical Facility Modification

After Government approval of the CSER, the Contractor must accomplish site preparation and site modifications for installation of each [*insert system name*] system. The facility site preparation and physical site modification must be accomplished IAW the [*insert system name*] specification and the approved CSER. The Contractor must determine, select, provide, and install cables and connectors necessary to connect the [*insert system name*] equipment to the Government-designated power sources. Power installation must be to the power bus. The services required for the movement of Contractor personnel, mail, and materials at each location must be the Contractor's responsibility. Construction and installation at [*insert system name*] sites includes, but is not limited to, the following typical items:

* Electrical wiring and lighting
* Mechanical mounting and grounding of all [*insert system name*] components
* Connection with distribution, demark, and terminal panels, boxes, and cabinets

#### 3.4.4.1 Test Equipment

The Contractor must furnish test jigs and special test equipment for maintenance, testing, and installation activities on the [*insert system name*] system during installation and acceptance. Required installation procedures, tuning adjustments, maintenance procedures, and testing must be performed using only the test equipment, special and common, identified by the Contractor to the Government for this purpose IAW the [*insert system name*] specification and this SOW. The use of any other test equipment by Contractor is prohibited unless approved by the Government.

#### 3.4.4.2 Priority and Coordination of Activities

Air Traffic Control (ATC) activities and services must have priority over all Contractor installation activities. There must be no compromise for the safe and timely control of aircraft during the installation period. The Contractor must provide services in such a manner which avoids disruptions to ATC facilities and conforms to the procedures considered essential by the FAA for assuring safety for air traffic control. Site preparation, physical facilities construction, installation, inspection, and acceptance testing; and the movement (on/off airport or on/off other FAA sites) of equipment must be coordinated through the TOR. The TOR will coordinate such activities with local and regional air traffic, and airways facilities personnel for final scheduling. Any required shutdowns of facilities to accommodate the [*insert system name*] installation or testing must be coordinated through the TOR.

#### 3.4.4.3 Site Security

A security program to minimize risk to personnel, equipment, and other [*insert system name*] assets on-site must be incorporated in the CSER. The Contractor must use the applicable security requirements contained in FAA Order 1600.54 as a guide. Implemented security must be subject to Government approval.

### 3.4.5 Site Acceptance Test

The Contractor must produce and accomplish facility site modifications and equipment test acceptance procedures IAW the Management and Installation Plan. Acceptability of site modification and installation must be determined IAW the plan. Acceptance testing for each site must be IAW the [*insert system name*] specification, as limited by this SOW, the Management and Installation Plan, and the PAT&E FAT/SAT Plans and Procedures.

#### 3.4.5.1 Clean Up

The Contractor must be responsible for removing from the site all surplus material such as tools, equipment, etc., belonging to the Contractor and to clean up rubbish and debris resulting from the modification/installation work. The Contractor must leave the site in a neat and workmanlike appearance. Upon completion of "clean-up" operations, the Contractor must obtain a written release from the TOR that the site has been restored to a satisfactory condition.

# 4 National Airspace Integrated Logistics Support

The National Airspace Integrated Logistics Support (NAILS) effort begins on this contract and evolves throughout the development, test, installation and Interim Contractor Support (ICS). During this contract, OT&E training will be presented to the FAA test personnel, the finalized documentation will be delivered, Program Support Facility (PSF) and Depot requirements must be established, and the Product Baseline will be maintained by the CM process. The following paragraphs provide the groundwork to build a complete life-cycle support plan. The NAILS is an interrelated, unified, and iterative approach to the managerial and technical activities that support the NAS. The analyses associated with NAILS influence system configuration to minimize the life cycle cost. Through the NAILS process, support requirements are identified and acquired. The following paragraphs describe the intended minimum NAILS activities associated with the development of the [*insert system name*] Pre-Installation Kit and [*insert system name*] system design and implementation activities.

## 4.1 NAILS Program Management

The Contractor must plan, manage, and execute a NAILS program that addresses applicable elements of logistics identified in FAA Order 1800.58. The Contractor must designate a NAILS Manager to serve as a single POC between the Contractor and the FAA in logistics matters.

### 4.1.1 NAILS Management Team

A joint Government/Contractor sponsored NAILS Management Team (NAILSMT) for the [*insert system name*] must be established and must serve as the primary management vehicle for monitoring the status of the NAILS program. The chairperson of the NAILSMT is the FAA APML. The NAILSMT provides a means for coordinating and monitoring logistics-related schedules and contract performance, and reviews the adequacy, timeliness, and compliance with related contract requirements. The NAILSMT must meet semi-annually or when requested by the APML, not to exceed four meetings per year. NAILSMTs must be conducted at locations mutually convenient, but usually at the Contractor's facility. The Contractor must provide an agenda for each meeting. The Contractor must attend NAILSMTs and assure that subcontractors and engineering personnel are available when requested. The Contractor must brief the status of the logistics elements and address support issues identified on the agenda. The agenda must also provide for status reporting and analysis of problem areas. The Contractor must prepare minutes for each meeting. The Contractor must provide the minutes, accompanied by a summary of action items and all presentation materials used, for Government approval.

CDRL A006 Conference Agenda

CDRL A007 Conference and Meeting Minutes

### 4.1.2 NAILS Program Planning

The Integrated Support Plan (ISP) must be the detailed document presenting the Contractor's NAILS effort. The ISP must identify the Contractor's organizational support that will be implemented during the limited production system development as their approach to satisfying each FAA ILS requirement. The ISP must reflect program requirements during this contract. The ISP must also provide details of hosting the Post Award and Logistics Guidance Conference at the Contractor's facilities.

The ISP must be periodically revised to incorporate Government comments and to reflect changes emanating from program changes, reviews, and other actions affecting the logistics aspects of the [*insert system name*] program as directed in the CDRL. The plan must also include a brief explanation of the Contractor's activities and milestones in support of the FAA logistic elements for the total [*insert system name*] implementation.

CDRL A055 Integrated Support Plan

### 4.1.3 Maintenance Concept

The [*insert system name*] Maintenance concept is two-level, site and depot, with maintenance to be performed at both levels. Site maintenance is intended to be centered on removal and replacement of Line Replaceable Units (LRUs). Depot repair will consist of component-level repair of LRUs and must be the Contractor's responsibility until the FAA assumes that responsibility. Maintenance of [*insert system name*] software must be the Contractor's responsibility until the FAA assumes that responsibility. Maintenance for the [*insert system name*] must be based on FAA Order 6000.30. The Contractor must furnish labor, tools, test equipment, LRUs, parts, software, and any other technical data necessary to maintain the operational status of the identified sites.

## 4.2 Logistics Management Information (LMI)

### 4.2.1 LMI Requirements

The Contractor must develop and deliver to the Government in accordance with MIL-PRF-49506 the data products contained on the attached Logistics Management Information Data Products Worksheet (LMI Data Product) in the format attached to CDRL F05. The data products must represent the system design configuration to the component level including systems, subsystems, components, assemblies, subassemblies, support and test equipment, and training equipment required for the [*insert system name*]. Temporary items are not required. The contractor must adhere to the data definitions, edits, and data formats as described in MIL-PRF-49506, Appendix B, the attached LMI Data Product worksheet, and the [*insert system name*] Data Product Format attachment to CDRL F05. Modified data product requirements shown on the LMI Data Product Worksheet and the [*insert system name*] Data Product Format must take precedence over MIL-PRF-49506.

### 4.2.2 LMI Data Reviews

Contractor efforts and progress must be reviewed at design, program, and/or logistics reviews and meetings. The Contractor must host a LMI data review 90 days following the Logistics Guidance Conference. Topics must include the Contractor's progress in LMI development and plans for future efforts. Additional data reviews, not to exceed four each year, must be held at the discretion of the Government.

### 4.2.3 LMI Acceptance Criteria

Upon receipt of data submittals the Government will verify that the data is documented as specified in 4.2.1 and that it meets the data definition, edit, and data format requirements of MIL-PRF-49506 and the attached worksheet. Data will not be accepted unless:

* The submitted data reflects a level of detail to the component level as specified above
* The data is verified to accurately reflect the current design configuration
* The data conforms to the delivery requirements stated in the Data Item Description DI-ALSS-81530
* The required data elements are provided as specified on the attached LMI Data Products Worksheet, DID DI-ALSS-81530

CDRL A056 LMI Data Product

### 4.2.4 Level of Repair Analysis

The Contractor must conduct a Level of Repair Analysis (LORA) commensurate with the level of design, operation, and support data available using data resulting from the Reliability program. The Contractor must optimize the maintenance plan for the [*insert system name*] considering cost, operational readiness, and operational requirements. The SMR characteristics developed from the LORA process must be used in the development of the LMI. The Contractor must use the FAA NASLORA model provided by the FAA.

CDRL A057 Eval Of Repair Alternatives and Tradeoff Analysis

## 4.3 Supply Support

### 4.3.1 Site Spares

The Contractor must develop and submit for Government approval a site spares list. A list of site spares must consist of LRUs, removable modules, common and bulk items, and any other parts necessary to perform site maintenance. Upon Government approval of the site spares list, the Contractor will be required to deliver the approved range and quantity of site spares to each site.

CDRL A058 Recommended List of Site Spares

#### 4.3.1.1 Tools and Test Equipment

Tools and test equipment lists must be developed to support FAA planning and training.

CDRL A059 Tools and Test Equipment List

## 4.4 Technical Data

The Contractor must be responsible for obtaining, integrating and providing the necessary operations and maintenance technical data required to maintain the [*insert system name*] as identified below. The Contractor must be responsible for ensuring that [*insert system name*] technical data is updated to reflect Government-approved engineering changes prior to establishment of the Product Baseline.

### 4.4.1 Technical Drawings and Associated Lists

The Contractor must develop technical drawings and data for the implementation and support of the [*insert system name*]. The Contractor must develop an engineering drawing tree that will identify all items to be delivered as part of the drawing package. For each non-COTS printed circuit board the Contractor must provide a master pattern and plan view of the parts layout. The Contractor must provide the program data for Read Only Memory (ROM) and Programmable ROM (PROM) to reflect the digital information content of non-COTS firmware designed into the system.

CDRL A060 Engineering Drawing Tree

CDRL A061 Master Pattern and Plan View of Parts Layout

CDRL A062 ROM and PROM Data

#### 4.4.1.1 Product Drawings

For developed items, the Contractor must provide product drawings IAW MIL-D-28000A, Initial Graphic Exchange Specification (IGES) Class 2 & 3 and associated lists must be IAW MIL-T-31000 paragraph 3.6.3.

Basic elements required for Product Drawings and Associated Lists are:

* Drawing index by part number and drawing tree of LRUs
* The drawing package to include the following:
  + Detail drawing of part and/or assembly
  + Performance data of part and/or assembly
  + Dimensions and tolerance data
  + Manufacturing process
  + Schematics (detail not just block diagram)
  + Mechanical and electrical connections
  + Reference to next higher assembly used on detail parts list for part and/or assembly (the parts list may be attached to the drawing and need not be integral to it)
  + Details of materials used, form and finish
  + Test setup and equipment used to do testing
  + Test data sheet, calibration information, and quality control information
  + Camera-ready artwork for silk screen printed wiring boards, nameplates and etc.
  + Drilling schedule for printed wiring boards or sheet metal layout and drilling tapes
  + Detail parts list for part and/or assembly identifying each part of the assembly
  + Original Equipment Manufacturer (OEM) Information, name of manufacturer, his part number, address, phone number, etc.
* If applicable FPLA, EPROM, PROM, data, including blank chip information, source code, and a master programmed device
* Cable drawings with a complete parts breakdown and wiring run list (the parts list may be attached to the drawing and need not be integral to it)
* Wiring list for wire-wrapped printed circuit boards (to-from list) and media for generating programs

CDRL A063 Production Drawings

#### 4.4.1.2 COTS Manuals and Documentation

The Contractor must provide a set of available vendor-produced COTS Manuals for each type of hardware/software supplied. The Government must be provided with reproduction rights on all deliverable COTS documentation. The following are examples of COTS documents to be provided:

* Operator/User's Manuals
* Hardware/Repair Manuals
* Installation Requirements (Space and Power) Manuals
* Software/Software Development Tool Manuals
* Diagnostics/Diagnostic Interpretations Manuals
* Installation/Removal/Maintenance Instruction Manuals
* Schematics/Wiring Diagrams
* Parts Lists/Catalog

In addition to the manuals delivered to the Contracting Officer, the Contractor must deliver two (2) sets to each of the limited production sites concurrent with equipment delivery.

CDRL A064 COTS Manuals

#### 4.4.1.3 COTS Hardware Description Document

The Contractor must develop a COTS hardware description document for use in provisioning and base lining the system.

CDRL A065 COTS Hardware Description

### 4.4.2 In Process Review

In-process reviews of all technical instruction manuals must be hosted by the Contractor per FAA-D-2494, paragraph 3.3.1.1. The reviews must be conducted at 30%, 60%, and 90% draft manual completion or as deemed necessary by the Government. The reviews must be held at the Contractor's facility. The Contractor must provide drawings, illustrations and support materials to assist in manual review. Comments from the reviews must be incorporated into the draft manuscripts prior to their submission as deliverables. The Contractor must prepare meeting minutes and action items resulting from the meetings.

CDRL A007 Conference Minutes

4.4.3 Operator and Maintenance Technical Instruction **Books**

The Contractor must provide technical manuals necessary to support operations, maintenance, and repair for equipment and software. The Contractor must ensure that technical manuals provided to support the [*insert system name*] System and the Pre-Installation Kit reflect the systems' most current hardware/software configuration and that required technical data incorporated into the technical manuals is updated to reflect Government-approved hardware and software engineering changes. The Contractor must be responsible for coordinating the identification and assignment of Government technical manual identification numbers for any newly developed and/or existing technical manuals provided in support of the [*insert system name*].

#### 4.4.3.1 Technical Instruction Books

The Contractor must prepare and submit for Government approval draft [*insert system name*] operator and maintenance Technical Instruction Books (TIBs) IAW the latest version of specification FAA-D-2494. The TIBs must provide a thorough understanding of all system functions.

#### 4.4.3.2 Formal Draft Operator's Manual Manuscript

The Contractor must prepare and deliver a draft operator's manual. The draft manual must be submitted after the comments from the 30% in-process review have been incorporated. The draft must be provided for review and approval by the Government. The manual must provide a thorough description of the uses of the equipment. The manual must clearly indicate the relationship to other program documentation, describe the function of all operator controls, describe the use of all peripheral equipment (including immediate interface equipment), and provide detailed operating procedures. Copies of the [*insert system name*] manual must be provided for each site.

#### 4.4.3.3 Formal Draft Operator's Manual Manuscript

The Contractor must prepare and deliver a draft operator's manual. The draft must be submitted after the comments from the 30% in-process review have been incorporated. The draft must be provided for review and approval by the Government. The manual must provide a thorough description of the uses of the equipment. The manual must clearly indicate the relationship to other program documentation, describe the function of all operator controls, describe the use of all peripheral equipment (including immediate interface equipment), and provide detailed operating procedures. Copies of the [*insert system name*] manual must be provided for each site.

CDRL A066 Technical Instruction Books

#### 4.4.3.4 Formal Draft Site-Level Maintenance Manual Manuscript

The Contractor must develop a separate draft maintenance technical instruction book (TIB) for site maintenance IAW FAA-D-2494. The TIB must be consistent with the maintenance concept identified above.

CDRL A066 Technical Instruction Books

#### 4.4.3.5 Second-Level Engineering Maintenance Manual Manuscript

The maintenance manual must consist of hardware, firmware, and software engineering and maintenance descriptions necessary to support the second-level engineering function.

CDRL A066 Technical Instruction Books

#### 4.4.3.6 Final Manuscript for FAA Review

The Contractor must develop final draft manuscripts for an operator and maintenance technical instruction book IAW FAA-D-2494. Final draft manuscripts must be provided after comments from the 70% in-process review have been incorporated. The drafts must be provided for review and approval by the Government. Government comments must be incorporated into the manuscripts. The instruction book also must be delivered in digital media in the Government's standard format.

CDRL A066 Technical Instruction Books

#### 4.4.3.7 Final Reproducible Manuscript for Technical Instruction Book

The Contractor, after the final in-progress review, must develop a final reproducible manuscript for the operator and technical instruction book addendum IAW FAA-D-2494 for review and approval by the Government. Submission must be as reproducible hard copy and digital media.

CDRL A066 Technical Instruction Books

#### 4.4.3.8 Support/Test Equipment Manuals

Separate, stand-alone instruction books must be provided for the operation, description, maintenance, and repair of the Contractor-furnished peculiar support/test equipment. The instruction books may be in the original equipment manufacturer's format. The final instruction books reproducible manuscript must be delivered IAW the CDRL.

CDRL A066 Technical Instruction Books

#### 4.4.3.9 Technical Instruction Books Validation

The Government will validate each TIB submission prior to Government approval. The Contractor must provide labor, tools, software, equipment, facilities, and any other engineering, technical, or administrative support necessary to the Government, as may be required, during the validation of the Technical Data Reports. Existing factory or fielded equipment must be used for validation.

## 4.5 Status Reporting

The contractor must provide a monthly repair status report. These status reports must contain the part number, serial number, description, site, date of request for repair, date of shipment from site to repair facility, date of repair, date of shipment, contractor's shipping number, on failed LRUs. Failed components replaced in the repair process, must be identified by part number, quantity, probable cause of failure (including identification of failures that cannot be duplicated), and be tracked back to the failed LRU. The monthly failure report must also include cumulative failure information for each contract year, mathematical calculations of observed availability by LRU type, and statistical data that show repair trends, common failures, and site comparisons.

CDRL A067 Contractor Repair Service Status Reports

# 5 Maintenance

The Contractor must be responsible for on-site maintenance under a separate delivery order under this contract. The Contractor must provide inclusive maintenance support prior to site commissioning and maintenance as directed after the sites are commissioned, as described below.

## 5.1 Contractor Depot Logistics Support Requirements

* The Contractor must provide Interim Contractor Depot Logistics Support (ICDLS) for the [*insert system name*] limited production systems throughout the duration of this contract. This must include stocking, storing, issuing, and shipping expendable, consumable and repairable Items
* Those items covered by warranty must be replaced at no cost to the Government
* The Contractor must repair, as required, all repairable Expendable and Replaceable (E&R) LRUs returned from FAA field sites. This repair cost must not exceed 65% of the cost of a new item, unless approved by the Contracting Officer
* The Contractor must furnish all labor, tools, test equipment, parts, software, and any other technical or administrative support necessary to provide the required ICDLS

## 5.2 E&R LRU Repair Procedure

* E&R items must be repaired to the extent necessary to restore them to a condition in which the items are capable of meeting all operational and functional requirements for which they were designed
* Any modification to items required by the contract and not previously accomplished must be made by the Contractor at the time of repair

## 5.3 Lay-In Spares

The Contractor must lay-in and maintain a quantity of spares to support the availability rate defined in the [*insert system name*] specification.

## 5.4 Post-Commissioning Technical Site Support

The FAA will be responsible for site-level maintenance for each site after it is separately commissioned. When notified by the Government, the Contractor must provide assistance to resolve any [*insert system name*] site maintenance or logistics problem. These services may vary from phone consultation to Contractor on-site activities. If a Contractor on-site presence is required, the Contractor must arrive at the site no later than 24 hours after notification that Contractor on-site assistance is necessary. The Contractor must provide the number of skilled personnel, support equipment, and [*insert system name*] LRUs/components necessary to return the [*insert system name*] to its operational performance level as specified in the [*insert system name*] specification.

## 5.5 Second Level Engineering Support

The Contractor must provide on-call maintenance support to the Government. On-call hardware support must be to assist in resolving problems or provide additional expertise should unexpected problems develop. Software on-call maintenance must be directed towards resolution of software problems until the establishment and operations of the PSF. It is anticipated that after the establishment of the product baseline, the accumulation and the simultaneous implementation of routine software changes will be minimized with a corresponding limit of interim software versions and related documentation changes. The Contractor must be responsible for maintaining the production [*insert system name*] software, investigating software problems, and incorporating approved software changes until such time as control of changes is passed to the PSF. The Contractor must provide the necessary materials required for this effort. This must include all software and procedural documentation required for the development, generation, modification, CM, maintenance, testing, analysis, and debugging of all [*insert system name*] software, as specified in the contract.

## 5.6 Contractor Transition Plan

The Contractor must prepare for Government review and approval a Contractor Transition Plan (CTP). The CTP establishes the procedures and means for the orderly transfer of the system support and maintenance management activities from the Contractor to the FAA. The CTP must detail the activities that the Contractor must undertake to ensure a smooth transition from Contractor to Government operations, and the preparations, facilities, and personnel that the Government will require to assume responsibility for the conduct of all or some maintenance and logistics services provided by the Contractor. The CTP must include an itemized list of Government-owned hardware/software used during development that will be transferred to the FAA.

CDRL A068 Contractor Transition Plan

# 6 System Support Equipment/Facilities Services

## 6.1 Special Test Equipment

The Contractor must provide special test equipment and items required for operation, use and maintenance including cables, and operation, maintenance and vendor data manuals. Documentation must be delivered concurrently with special test equipment.

### 6.1.1 Time-Series Data Recorder

The Contractor must provide a portable Time-Series Data Recorder IAW the [*insert system name*] specification.

## 6.2 Computer Resources Support

### 6.2.1 Program Support Facility

The [*insert system name*] PSF must include those portions of the [*insert system name*] system, equipment, supporting software, firmware, and documentation (including revisions and upgrades) required for the generation, maintenance, testing, analysis, and debugging of all the [*insert system name*] functional software IAW the [*insert system name*] specification. Operation, maintenance and vendor data manuals for PSF equipment must also be provided IAW FAA-D-2494 concurrent with the PSF delivery. The PSF must execute the [*insert system name*] operational programs (and associated tests) for test and debugging purposes. The physical facility will be provided by the Government. The PSF must provide the capability to modify the [*insert system name*] non-COTS software, hardware, firmware, and documentation, and to validate the resulting changes. Non-COTS software must include Contractor-developed software and GFP software. PSF personnel will be provided the training to read, manipulate, evaluate, and display field-recorded time series and data. For COTS CASE development tools (such as Cadre's Teamwork or IDE's Software through Pictures) the Contractor must deliver the CASE tool database for each CSCI in a format suitable for import into the same CASE tool at the PSF. The Contractor must ensure that all appropriate CASE tools are in place and operational at the PSF, prior to transition of the Software Maintenance effort from the Contractor to the PSF.

CDRL A069 Program Support Facility Instruction Manuals

#### 6.2.1.1 Software Transition Plan

The Contractor must plan for transition of life-cycle support of the [*insert system name*] software to the Government using MIL-STD-498 as guidance. The Contractor must identify the hardware, software, and other resources needed for life cycle support of deliverable software and describe the Contractor's plan for transitioning deliverable items to the support agency. Resources must include the programming environment, peripherals, memory, compilers, assemblers, and linkers for all non-COTS software. The Contractor must use existing documentation when it is available and meets the data content intent of MIL-STD-498.

CDRL A070 Software Transition Plan

## 6.3 Contractor Support Services

This section further defines the scope of the Time and Materials provisions in Section H of this Contract. The Government will use Contractor Support Services for second-level support of the [*insert system name*] system, excluding Contractor Depot Level Maintenance.

Pre-Planned Product Improvements are under consideration for incorporation into the end product after implementation of the basic [*insert system name*] system.

At the request of the Government, the Contractor must provide support at Government sites, the Contractor's plant, or elsewhere, in specific areas including, but not limited to:

* Telecommunications network applications, planning, design, engineering, hardware installation, and operation
* [*Insert system name*] problem investigation (e.g. communications, hardware, software, firmware)
* Planning, implementation, maintenance, and/or update of [*insert system name*] equipment
* Non-envisioned or catastrophic repair of [*insert system name*] or other equipment
* Field Modifications or retrofit activities
* Porting of GSD and RDT functionality to different COTS hardware platforms
* Graphical User Interface (GUI) modifications
* Development of a remote [*insert system name*] Maintenance Data Terminal (MDT)
* Additional Interface Development and modifications
* Additional hardware, as required, not covered elsewhere needed to support the [*insert system name*] program
* Minor software development
* Review of [*insert system name*] operational modes and procedures
* On-site maintenance

The Contractor must provide qualified engineering and technical personnel for these services as necessary to complete assigned tasks. These services must be provided on a time and material basis with the Contractor indicating any incidental hardware required to perform services not otherwise covered in the [*insert system name*] contract.

Tasks must be preceded by an estimate of the time, material, and corresponding cost from the Contractor at the request of the Government. Tasks must begin after written Government authorization has been received.

# 7 Full Production and Deployment Requirements

The Contractor must produce, update, test, deliver, install, and optionally support the Full Production [*insert system name*] IAW the [*insert system name*] Specification, associated interface documentation, and the requirements cited in this SOW.

## 7.1 Program Management

### 7.1.1 Meetings, Resources, and Conferences

The Contractor must schedule and conduct meetings, reviews, and conferences as identified in Section 3.1.2.

CDRL A006 Conference Agenda

CDRL A007 Conference and Meeting Minutes

### 7.1.2 Configuration Management Program

The Contractor must use an internal configuration management system relating to the full production [*insert system name*], as identified in Section 3.1.4. The detailed requirements are included in these subsections.

#### 7.1.2.1 Configuration Identification

The requirements under this section are the same as the requirements detailed under Section 3.1.4.2, and must apply to the full production [*insert system name*].

##### 7.1.2.1.1 Development Configuration

The requirements under this section are the same as the requirements detailed under Section 3.1.4.2.1, and must apply to the full production [*insert system name*].

##### 7.1.2.1.2 Configuration Baselines

The requirements under this section are the same as the requirements detailed under Section 3.1.4.2.2, and must apply to the full production [*insert system name*].

#### 7.1.2.2 Configuration Identifiers

The Contractor must assign unique configuration identifiers.

##### 7.1.2.2.1 Part/Item Identification Numbers

The Contractor must assign a discrete part/item identification number until such time as either an interim or final product baseline is established. At that point, parts must be re-identified only upon Government approval whenever a non-interchangeable condition is created.

##### 7.1.2.2.2 Software Identification Numbers

The Contractor must assign a discrete part/item identification number to each software medium (e.g., magnetic tape, disk) containing [*insert system name*] release or build type software executables. The medium thus identified must be inclusive and contain all software segments, thereby providing easy identification of software releases after the product baseline is established.

##### 7.1.2.2.3 FAA Type Designations

The requirements under this section are the same as the requirements detailed under Section 3.1.4.3.3, and must apply to the full production [*insert system name*].

### 7.1.3 Data Management Program

The requirements under this section are the same as the requirements detailed under Section 3.1.5, and must apply to the full production [*insert system name*].

#### 7.1.3.1 Integration of Contractor's Data Management Effort

The requirements under this section are the same as the requirements detailed under Section 3.1.5.1, and must apply to the full production [*insert system name*].

CDRL A020 Data Management Plan

CDRL A021 Data Accession List/Internal Data

#### 7.1.3.2 Data Control and Status Accounting

The requirements under this section are the same as the requirements detailed under Section 3.1.5.2, and must apply to the full production [*insert system name*].

CDRL A022 Contract Data Status and Schedule Report

## 7.2 Systems Engineering

During full production of the [*insert system name*], the Contractor must maintain effective control over the system engineering and production process, including subcontract items and services, to ensure that cost, performance, and schedule are met, to provide early detection of problems and their resolution and to reduce risk. The Contractor must specify a single authority who will serve as a point of contact for all systems engineering issues.

### 7.2.1 Electromagnetic Interference and Susceptibility

The Contractor must construct full production [*insert system name*] systems to meet the interference and susceptibility requirements of the [*insert system name*] Specification. If a deficiency exists between the system and the requirements, the Contractor must correct these deficiencies prior to government acceptance.

## 7.3 Full Production Installations

Requirements under this section are the same as the requirements detailed under Section 3.4, Limited Production Installations, and must apply to all [*insert system name*] Production sites.

## 7.4 Training

### 7.4.1 Personnel Qualifications Report

The Contractor must submit for Government review and acceptance a report of experience and training for each person assigned to develop courseware and conduct classes under these contracts. The content of the Personal Qualifications Report must be similar to the style presented in FAA-STD-028.

CDRL A071 Personnel Qualifications Report

### 7.4.2 Depot Level Repair Training Development

This course structure must provide information and skills that allow Government engineers and technicians to perform component level repair procedures on the [*insert system name*] LRUs and equipment.

CDRL A072 Depot Level Repair Training Course

### 7.4.3 Certificate of Training

The Contractor must provide a certificate of training to each course graduate and a class roster to the Contracting Officer's Technical Representative at the end of each class of instruction. The certificate must contain, as a minimum:

* Course title and FAA course number, if applicable
* Hours of training completed
* Location of training
* Class start and end dates
* Student name and SSN
* Course grade (numerical or pass/fail)

CDRL A073 Certificate of Training

## 7.5 Status Reporting

The requirements under this section are the same as the requirements detailed under Section 4.7, and must apply to the full production [*insert system name*].

CDRL A074 Contractor Repair Service Status Reports

## 7.6 Testing

### 7.6.1 Production Acceptance Test and Evaluation

The Contractor must perform PAT&E on each delivered system to verify that end-items conform to applicable specifications, are free from manufacturing defects, and are substantially identical to the qualified hardware. These tests must ensure compliance to system-level hardware and software requirements of the [*insert system name*] specification. PAT&E must consist of FAT and SAT.

CDRL A047 PAT&E FAT/SAT Plan

CDRL A048 PAT&E FAT/SAT Procedures

CDRL A049 PAT&E FAT/SAT Reports

# 8 Acronyms

|  |  |
| --- | --- |
| AF | Airway Facilities |
| APML | Assistant Program Manager for Logistics |
| ATC | Air Traffic Control |
| ATC | Air Traffic Control |
| CASE | Computer Aided System Engineering |
| CDR | Critical Design Review |
| CDRL | Contract Data Requirements List |
| CDROM | Compact Disc Read Only Memory |
| CFSR | Contract Funds Status Report |
| CI | Configuration Item |
| CID | Commercial Item Description |
| CM | Configuration Management |
| CMP | Configuration Management Plan |
| CMTP | Contractor's Master Test Plan |
| COR | Contracting Officer's Representative |
| COTS | Commercial Off-the-Shelf |
| CPR | Cost Performance Reports |
| CSA | Configuration Status Accounting |
| CSCI | Computer Software Configuration Item |
| C/SCSC | Cost/Schedule Control Systems Criteria |
| CSER | Contractor Site Engineering Report |
| CSU | Computer Software Unit |
| CTP | Contractor Transition Plan |
| CWBS | Contract Work Breakdown Structure |
| DFU | Display Functional Unit |
| DOD | Department of Defense |
| DQT | Design Qualification Test |
| DT&E | Developmental Test & Evaluation |
| E&R | Expendable and Replaceable |
| ECP | Engineering Change Proposal |
| FAA | Federal Aviation Administration |
| FAT | Factory Acceptance Test |
| FCA | Functional Configuration Audit |
| FQT | Formal Qualification Testing |
| GFE | Government Furnished Equipment |
| GFI | Government Furnished Information |
| GFP | Government Furnished Property |
| GSD | Geographic Situation Display |
| GUI | Graphical User Interface |
| HWCI | Hardware Configuration Item |
| IAW | In Accordance With |
| ICDLS | Contractor Depot Logistics Support |
| ICS | Interim Contractor Support |
| IDD | Interface Design Document |
| IGES | Initial Graphical Exchange Specification |
| ILS | Integrated Logistics Support |
| IRD | Interface Requirement Document |
| ISO | International Standards Organization |
| ISP | Integrated Support Plan |
| LCN | Control Number |
| LGC | Logistics Guidance Conference |
| LLWAS | Low-Level Wind Shear Alert System |
| LOGSA | Logistics Support Activity |
| LORA | Level of Repair Analysis |
| LP | Limited Production |
| LRU | Line Replaceable Unit |
| LSA | Logistics Support Analysis |
| LSAP | Logistics Support Analysis Plan |
| LSAR | Logistics Support Analysis Record |
| MDT | Maintenance Data Terminal |
| MTBPMA | Mean Time between Preventative Maintenance Actions |
| NAILS | National Airspace Integrated Logistics Support |
| NAILSMT | NAILS Management Team |
| NAS | National Airspace System |
| NDI | Non-Developmental Item |
| NLT | No Later Than |
| NOR | Notice of Revision |
| OEM | Original Equipment Manufacturer |
| OT&E | Operational Test and Evaluation |
| PAT&E | Production Acceptance Test & Evaluation |
| PCA | Physical Configuration Audit |
| PM | Program Manager |
| PMP | Program Management Plan |
| PMR | Program Management Review |
| POC | Point of Contact |
| PROM | Programmable Read Only Memory |
| PSF | Program Support Facility |
| QSP | Quality System Plan |
| RDT | Ribbon Display Terminal |
| RF | Radio Frequency |
| RFO | Request for Offer |
| ROM | Read Only Memory |
| SAT | Site Acceptance Test |
| SDD | Software Design Description |
| SDP | Software Development Plan |
| SMR | Source, Maintenance and Recoverability |
| SOW | Statement of Work |
| SPS | Software Product Specification |
| SRD | Software Requirements Description |
| STD | Software Test Description |
| STP | Software Test Plan |
| STR | Software Test Report |
| SVD | Software Version Description |
| TIB | Technical Instruction Book |
| TIM | Technical Interchange Meeting |
| TOR | Technical On Site Representative |
| TRACON | Terminal Radar Approach Control |
| TRR | Test Readiness Review |
| UM | User Manual |
| UPS | Uninterruptible Power Supply |
| VRTM | Verification Requirements Traceability Matrix |