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Weather System Processor (WSP) Test and Evaluation Master Plan (TEMP)

Radame Martinez
Tai Lee
Baxter Stretcher
Cindy Adamskyj

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Federal Aviation Administration

William J. Hughes Technical Center
Atlantic City International Airport, NJ 08405

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16. Abstract

This Test and Evaluation Master Plan (TEMP) describes technical and operational testing requirements, general methodology, and responsibilities for the comprehensive system testing of the Weather System Processor (WSP) National Airspace System (NAS) subsystem.

This TEMP further establishes an agreement between the developing organization, the user, and the tester to support acquisition decisions, (1) by identifying areas of technical and operational risk, (2) by defining a comprehensive plan to address and resolve the risk, and (3) by providing a structure for reporting the results.

The WSP Test and Evaluation Program will ensure that the WSP fulfills the Mission Needs Statement (MNS), meets the requirements in the WSP Requirements Document (RD), applicable NAS requirements, the WSP Specification, applicable Interface Requirements Documents (IRDs), and relevant contractor-generated documents that have been approved by the Government.

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EXECUTIVE SUMMARY

This Test and Evaluation Master Plan (TEMP) addresses the Test and Evaluation (T&E) requirements associated with the acquisition and deployment of the Weather Systems Processor (WSP). This document will be referenced by the Integrated Program Plan (IPP) for the WSP. The WSP Integrated Product Team (IPT) will seek approval of the IPP from the acquisition executive early in the solution implementation phase and before release of any formal solicitation, transfer of funds, or commitment to any interagency agreement for the WSP program implementation.

The purpose of this WSP TEMP is to describe technical and operational testing requirements, general methodology, and responsibilities for the comprehensive system testing of the WSP National Airspace System (NAS) subsystem. This TEMP establishes an agreement between the developing organization, the user, and the tester to support acquisition decisions by identifying areas of technical and operational risk, by defining a comprehensive plan to address and resolve the risk, and to provide a structure for reporting the results in an objective and unbiased manner.

1. INTRODUCTION.

This Test and Evaluation Master Plan (TEMP) is developed in accordance with the Federal Aviation Administration (FAA) Acquisition Management System (AMS), dated April 1, 1996. As the FAA AMS direction on Test and Evaluation (T&E) policy is still in the evolutionary stage, this document comes under the direction of Acquisition Reform Interim Guidance (ARIG): 96-1, dated July 10, 1996. The contents and format of this TEMP comply with the guidelines and requirements defined in FAA Order 1810.4B, FAA National Airspace System (NAS) Test and Evaluation Policy, dated October 22, 1992 and FAA-STD-024B, Content and Format Requirements for the Preparation of T&E Documentation, dated August 22, 1994. This TEMP is a living document and may be updated to reflect major system changes at the discretion of the Wind Shear Product Team (PT).

This TEMP addresses the T&E requirements associated with the acquisition and deployment for the Weather Systems Processor (WSP). The Product Team has concurred with this document and it will be referenced by the Integrated Program Plan (IPP) for the WSP. The WSP Integrated Product Team (IPT) will seek approval of the IPP from the acquisition executive early in the solution implementation phase and before release of any formal solicitation, transfer of funds, or commitment to any interagency agreement for the WSP program implementation. Draft solicitations may be released for industry review and comment before approval of the IPP.

1.1 BACKGROUND.

Since 1986, the Airport Surveillance Radar (ASR) Program Office has funded the Massachusetts Institute of Technology/Lincoln Laboratory (MIT/LL) to evaluate the low-altitude wind shear detection capabilities (microburst and gust fronts) of the WSP. This capability will be achieved by means of a relatively low cost modification to the ASRs which will allow the detection of low-altitude wind shear without interfering with the primary function of aircraft detection and tracking.

A WSP test bed was established and operated in Huntsville, Alabama, in 1987, and continued through 1988. In order to investigate algorithmic performance under diverse weather conditions, the test bed was moved to Kansas City, Missouri in 1989, and from 1990 to 1992, the test bed was operated in Orlando, Florida. During the Orlando field program, the test bed ASR-8 was replaced by a production ASR-9, and an operational demonstration of the prototype WSP weather products in the Orlando Air Traffic Control (ATC) facilities commenced. Since 1993, the test bed has been located in Albuquerque, New Mexico, in order to support the refinement of algorithms for operation in an environment known for frequent "dry" wind shear activity.

MIT/LL is currently conducting prototype testing Demonstration Validation (DEMVAL) to demonstrate that WSP interfaces to the ASR-9 do not adversely affect surveillance radar performance. MIT/LL, working under a study contract with Northrop Grumman, will design, develop, and demonstrate a new high integrity receiver chain, a hardware/software interface for ASR-9 6-level weather, and a Remote Monitoring Infrastructure and man-machine interface.

The WSP will detect and display hazardous weather phenomena, in particular, low-altitude wind shear created by thunderstorm-generated microbursts and gust fronts. Coverage will be provided to airports not slated for a dedicated Terminal Doppler Weather Radar (TDWR). The WSP will expand and improve the ability to provide warning of terminal area hazardous wind shear, microburst, and wind shift, and improve the display and tracking of thunderstorms.

The WSP procurement is at the Investment Decision. A key WSP acquisition objective is to implement low-cost, high quality, wind shear detection equipment at medium and high air traffic density airports not equipped with TDWR. The WSP provides advanced Doppler weather radar performance, including all the functions of the TDWR, along with several planned improvements to the TDWR from the planned Integrated Terminal Weather System (ITWS).

Because of the specialized functions performed by the WSP there are as of this writing no known complete Commercial-off-the-Shelf (COTS) systems that satisfy the WSP Mission Need Statement (MNS). The WSP prototype was developed using COTS hardware and Non-Developmental Item (NDI) components from the ASR-9 and the TDWR. It is anticipated that the development contractor will utilize as many COTS and NDI hardware items as possible. The meteorological algorithms will be provided to the contractor as government furnished property (GFP).

This project is not designated for Independent Operational Test and Evaluation Oversight (IOT&E).

1.2 PURPOSE.

The purpose of this WSP TEMP is to describe technical and operational testing requirements, general methodology, and responsibilities for the comprehensive system testing of the WSP NAS subsystem. This TEMP establishes an agreement between the developing organization, the user, and the tester to support acquisition decisions by identifying areas of technical and operational risk, by defining a comprehensive plan to address and resolve the risk, and to provide a structure for reporting the results in an objective and unbiased manner.

These T&E activities include:

a. Overall test strategy presentation,
b. Technical and operational risk identification,
c. Test requirements and critical T&E issues identification,
d. Test responsibilities and implementation identification, and
e. Development of T&E schedules

1.3 SCOPE.

This TEMP will detail the T&E strategy as applicable to the development, production, and deployment of the WSP. The T&E program philosophy is to ensure that all of the specified requirements for the WSP, including reliability, availability and maintainability, have been satisfied, and that the WSP is operationally suitable in the ATC environment.

The test and evaluation of the WSP, hereafter referred to as *System Test*, will provide verification that the WSP fulfills the Mission Need Statement, meets the requirements contained in the WSP Requirements Document (RD) and System Specification, and operates effectively when integrated into the NAS. The WSP Verification Requirements Traceability Matrix (VRTM) identifies the verification method and is contained in section appendix A of this document. System Testing will confirm that test and evaluation as required by FAA Order 1810.4B has been completed. System Test will be conducted on developmental systems, COTS and NDI systems, and significant Pre-Planned Product Improvements (P^3I) that change a baselined system. As of this writing, Terminal Weather Information for Pilots (TWIP) is considered a P^3I for the WSP. The implementation and testing of TWIP will be addressed in the WSP OT&E test plan when that requirement is identified. Figure 1.3-1 depicts a high level flow of System Testing .

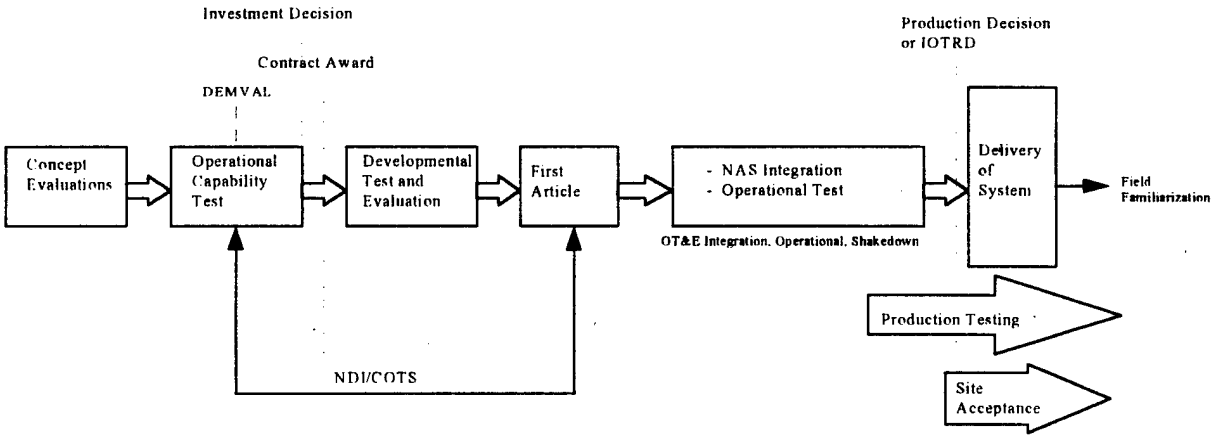

FIGURE 1.3-1. WSP SYSTEM TEST BLOCK DIAGRAM

The WSP Acquisition Strategy Paper (ASP) provides for the procurement of the limited production of seven first article units at the Investment Decision. Provisions will be made for the procurement of the production turnkey units at the Production Decision. Of the seven limited

production units, the first five will be considered "prototype" systems and the remaining two will be considered "first article" systems. The first of these "prototype" systems will remain at the contractor's facility for factory testing. The second "prototype" system will be shipped to the FAA William J. Hughes Technical Center in Atlantic City, New Jersey, for government test and evaluation. Subsequent "prototype" systems will be shipped to selected ASR-9 key sites and will be operated under a test NAS Change Proposal (NCP). The two "first article" systems will be installed at selected sites. At this time, the "prototype" systems will be brought up to "first article" configuration.

Subsequent to successful government testing, the FAA will award a production contract for up to 40 WSP systems including retrofit kits necessary to bring limited production systems up to final production configuration.

2. REFERENCE DOCUMENTS.

The following specifications, standards, publications, orders, and other miscellaneous documents were used in preparation of this document and may be utilized in the preparation of subsequent lower level test documents and test reports.

FAA DOCUMENTS

FAA Specifications

NAS-SS-1000	NAS System Specification Volume I, Functional and Performance Requirements for the National Airspace System General.
FAA-E-2917	Specification for the Weather Systems Processor.
FAA-E-2911	Federal Aviation Administration Functional Specification for National Airspace Systems (NAS) Infrastructure Management System (NIMS) Managed Subsystems.
FAA-G-2100	FAA Electronic Equipment Specification.
NAS-IR-TBD	WSP to ASR-9 Interface Requirements.
NAS-IR-TBD	WSP to External Users Interface Requirements.
NAS-IR-TBD	WSP to Wind Speed and Direction Sensor Interface Requirements.
NAS-IR-51070000	NAS Infrastructure Management System (NIMS) Manager/Managed Subsystem using the Simple Network Management Protocol, version 1 (SNMPv1) Draft, dated November 15, 1996.

FAA Standards

FAA-STD-024B	Preparation of Test and Evaluation Plans and Test Procedures, August 22, 1994.

Other FAA Publications

FAA AMS	FAA Acquisition Management System (AMS), dated April 1, 1996.
ARIG: 96-1	Acquisition Reform Interim Guidance (ARIG):96-1, dated July 12, 1996.

NCP 18718	ASR-9 Weather Systems Processor (WSP) Demonstration at Albuquerque International Airport (1996 DEMVAL).
FAA Order 1600.54	FAA Automated Information Systems Security Handbook.
FAA Order 1800.58	National Airspace Integrated Logistics Support (NAILS) Policy.
FAA Order 1810.4B	FAA NAS Test and Evaluation Policy, October 22, 1992.
FAA Order 1810.6.	Policy for Use of Non-developmental Items (NDI) in FAA Acquisitions, November 13, 1992.
FAA Order 3900-19A	Occupational Safety and Health.
FAA Order 6310.19	Maintenance of the Airport Surveillance Radar-9 (ASR-9).
WSP ASP	Acquisition Strategy Paper for the Weather System Processor, January 30, 1997.
WSP RD	Requirements Document for the Weather Systems Processor.
WSP MNS	Mission Need Statement for the Weather Systems Processor.
WSP SOW	Statement of Work for the Weather Systems Processor.

MILITARY STANDARDS

MIL-STD-973	Configuration Management.
MIL-STD-498	Software Development and Documentation, December 1994.

MISCELLANEOUS REPORTS

DOT/FAA/CT-TN92/48	Final Report for the ATC Evaluation of the Prototype ASR-WSP at Orlando International Airport, FAA Technical Note, March 1993.
DOT/FAA/CT-TN94/4	Final Report for the Operational OT&E of the Prototype ASR-WSP at Albuquerque International Airport, FAA Technical Note, March 1994.

Phase I/II DEMVAL Plan (dated 10/96)	WSP Phase I/II Demonstration/Validation (DEMVAL) Plan, ACT-320, Weather Systems Branch.
Phase I DEMVAL Monitoring Report (dated 2/12/96)	Phase I Demonstration/Validation (DEMVAL) Monitoring Report of Albuquerque, NM Terminal Radar Development Facility (TRDF) Activities Conducted January 16 - 22, 1996.
MIT/LL Wx Project Memorandum No. 43PM-Wx-0045	Evaluation of the Effects of the Weather Systems Processor (WSP) Hardware on ASR-9 Performance, dated August 30, 1996.
ATC-247	MIT/LL: ASR-9 Weather Systems Processor (WSP) Wind Shear Algorithms Performance Assessment, May 7, 1996.
ATC-249	MIT/LL: Assessment of the Delay Aversion Benefits of the Airport Surveillance Radar (ASR) Weather Systems Processor (WSP), July 2, 1996.
ATC-255	MIT/LL: ASR-9 Weather Systems Processor Signal Processing Algorithms, July 24, 1996.

3. WSP SYSTEM DESCRIPTION.

3.1 WSP SYSTEM IMPLEMENTATION.

The prototype WSP was developed using COTS hardware and NDI components from the ASR-9 and the TDWR. The prototype WSP hardware and software will be used by the contractor for their engineering design model.

Procurement of the WSP will be in compliance with AMS, dated April 1, 1996. The FAA-managed contract requires the contractor to provide all services, materials, and data necessary to design, develop, fabricate, test, deliver, install, and check out the WSP equipment as a turnkey system.

The prototype hardware consists of NDI components. The contractor has the discretion of using the same hardware architecture, or replacing the components with newer technology. The meteorological algorithms will be GFP. MIT/LL will provide the coding for these algorithms.

3.2 WSP FUNCTIONAL DESCRIPTION.

Refer to figure 3.2-1 WSP Functional Block Diagram.

The WSP functions as a safety enhancement at those airports using ASR-9 radars through the timely detection and reporting of hazardous wind shear in and near the terminal approach and departure zones. The WSP will detect and process these low-level wind shears due to microbursts and gust fronts using ASR-9 data and meteorological product algorithms. These hazardous conditions will then be communicated to air traffic controllers using an alphanumeric Ribbon Display Terminal (RDT) and Geographic Situation Display (GSD). Six level weather without anomalous propagation will also be detected and tracked. Specifically, the WSP will provide the following products/functions:

a. Detect, locate, quantify, and display low-altitude terminal area wind shear and microburst events,

b. Detect, locate, quantify, predict and display the current and future location of gust fronts,

c. Detect, locate, quantify, extrapolate and display the future position of storm cells,

d. Generate runway specific alerts in the event of hazardous wind shear and microburst events,

e. Generate National Weather Service (NWS), anomalous propagation (AP) corrected 6-level, precipitation intensity maps.

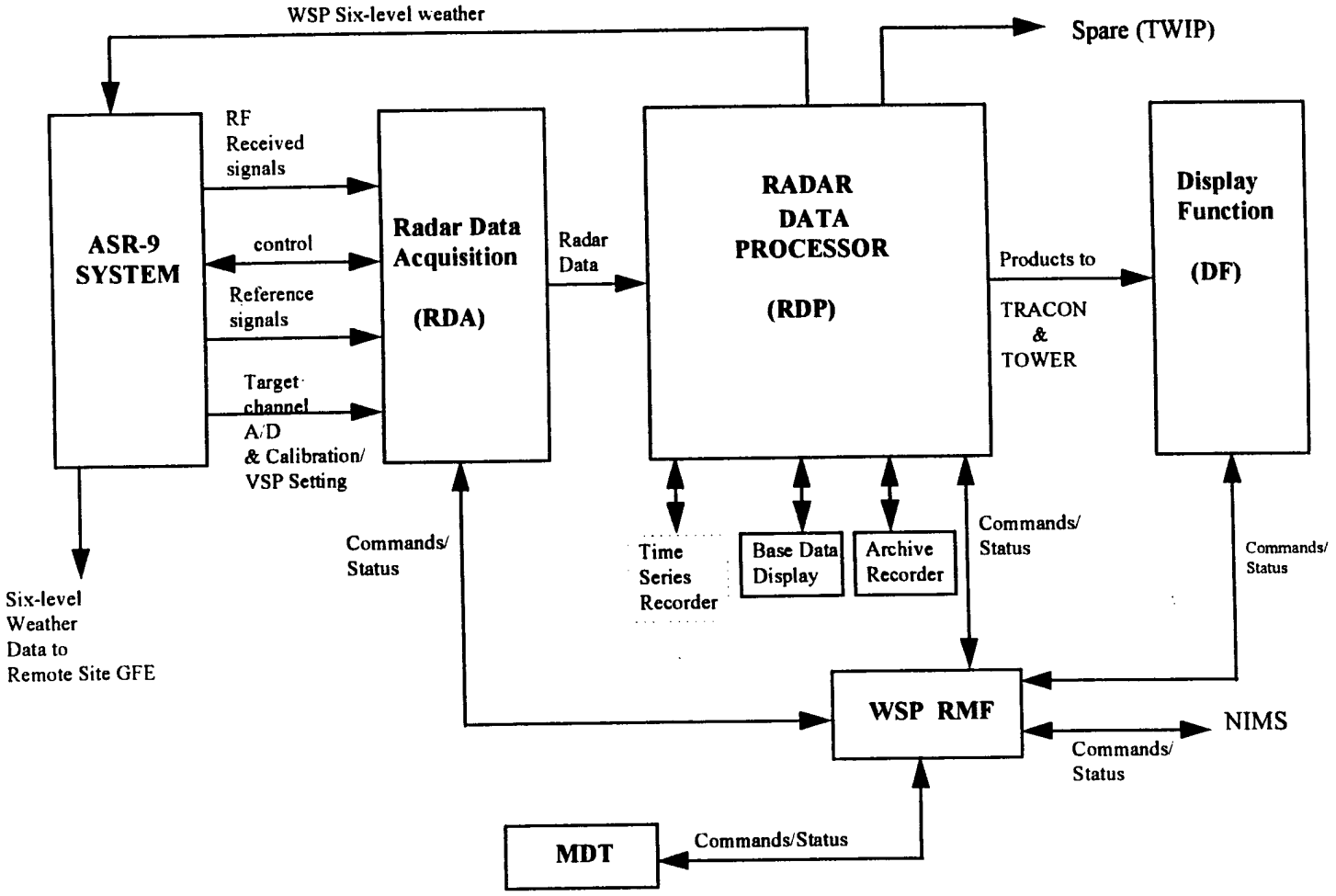

FIGURE 3.2-1. WSP FUNCTIONAL BLOCK DIAGRAM

3.2.1 Major Functional Areas.

The WSP is comprised of four major functional areas:

a. Radar Data Acquisition (RDA);
b. Radar Data Processor (RDP);
c. Display Function (DF); and
d. WSP Remote Monitoring Function (RMF).

3.2.1.1 RDA.

The RDA consists of microwave and digital interfaces to the ASR-9, including a high-dynamic range receive chain that provides inphase and quadrature samples to the WSP data processor. The RDA acquires microwave signals from the ASR-9, as well as associated timing, reference, and radar state data. The RDA performs certain control functions for Instantaneous Automatic Gain Control (IAGC) within the WSP and Sensitivity Time Control (STC) within the weather portion of the ASR-9. The RDA will format data for use by the RDP.

3.2.1.2 RDP.

The RDP is a COTS data processor that receives data from the RDA and performs time series recording, base data generation, and data archiving. The RDP supplies the generated products to the Terminal Radar Approach Control (TRACON) and Air Traffic Control Tower (ATCT) for use on the RDTs and GSDs. In addition, the RDP will feed back WSP-generated six level weather less anomalous propagation to the ASR-9 for display on air traffic controllers' displays and Digital Bright Radar Indicator Tower Equipment (DBRITE).

3.2.1.3 DF.

The DF will communicate with the RDP through communication lines to provide display and control for alphanumeric and graphical wind shear information, and to provide audible and visual alarms in the TRACON and ATCT. Each Display Functional Unit (DFU) will be composed of one GSD and one to eight RDTs per GSD. The DFU displays the weather information using the supervisor's GSD and the controllers' alphanumeric RDT; the GSDs and RDTs are collectively known as the DF. The configuration layout of the screens is similar to that of the TDWR and ITWS. The RDT will be an alphanumeric display with audible and visual alarms for use in the ATCT and at the supervisor or traffic management unit (TMU) position in the TRACON. The RDT will present hazardous warnings to controllers who then relay this information to affected pilots. Weather information on the GSD will be used to assist the ATCT and TRACON supervisors for runway management. The DF enables operators to issue commands, display weather products, and archive data.

3.2.1.4 WSP RMF.

The WSP RMF will monitor critical system performance data and perform system performance status monitoring, reporting, maintenance alert and alarm processing, command and control of the WSP system, and automatic fault isolation for the WSP. Additionally, the RMF will obtain and store in the local data file certification test data that include values of all internal operating parameters required for certification. The WSP RMF allows entry of site adaptable data and provides maintenance related data to FAA maintenance specialists. Upon NAS Infrastructure Management System (NIMS) or Maintenance Data Terminal (MDT) command, the RMF will execute performance tests to verify that the WSP is operating within operational specifications.

3.2.2 Unique Operational and Performance Characteristics.

There are two unique characteristics identifiable for the WSP:

a. The WSP must interface directly with the ASR-9 without degrading the ASR-9 system performance,

b. The WSP must provide independent processing of the ASR-9 data to generate new weather radar products similar in quality and appearance to the TDWR.

3.3 INTERFACES.

WSP external and internal interfaces are shown in figure 3.3-1.

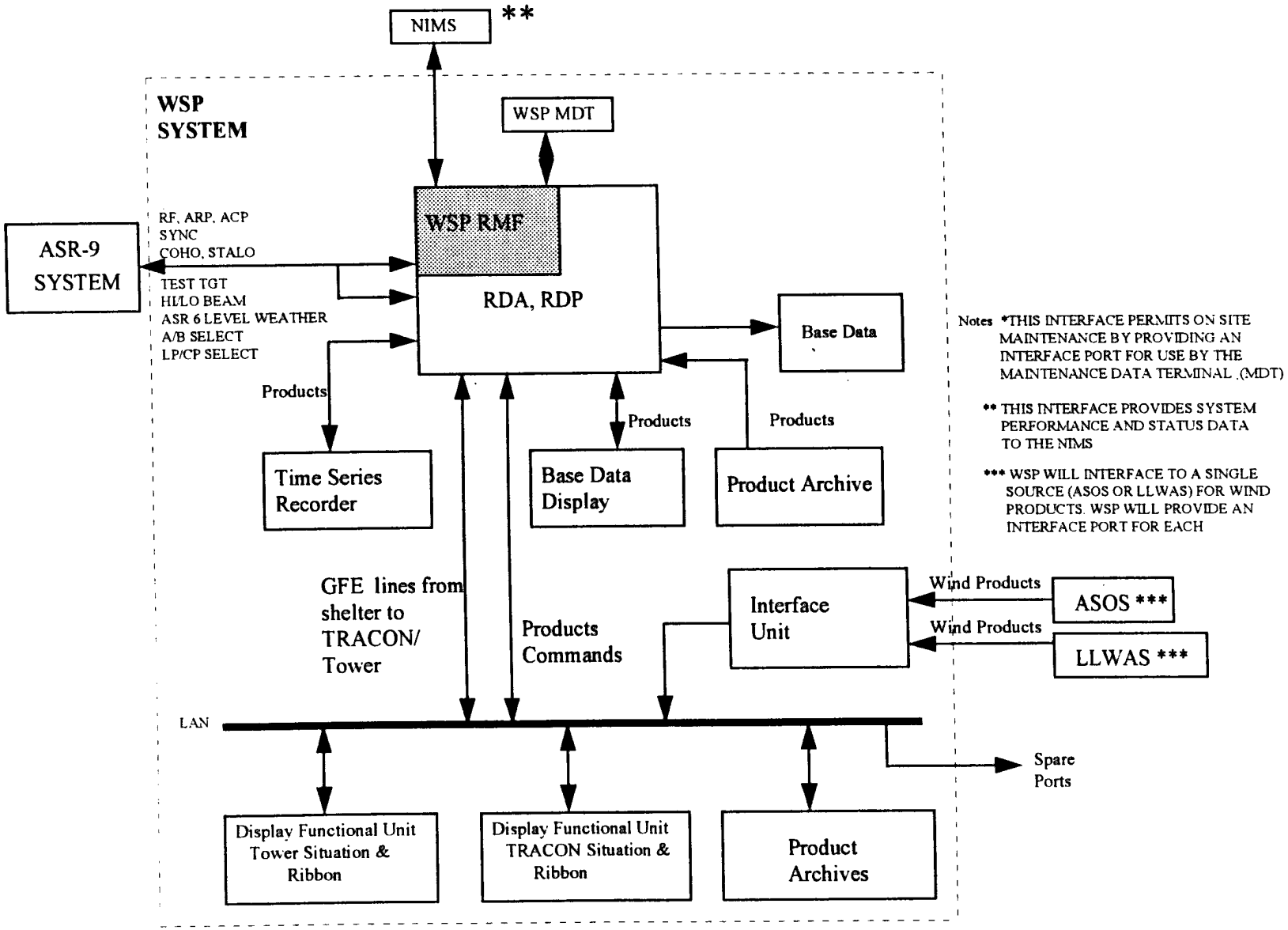

FIGURE 3.3-1. WSP INTERNAL/EXTERNAL INTERFACE BLOCK DIAGRAM

3.3.1 External Interfaces.

The WSP will interface with the following external systems.

a. ASR-9. The WSP will directly interface with the ASR-9 system to receive primary radio frequency (RF), timing, reference, and control signals. The WSP reconstituted six levels of reflectivity minus AP will be routed through the ASR-9 Surveillance Communications Interface Processor (SCIP) to an interim NAS configuration of external interfaces consisting of the Automated Radar Tracking System (ARTS) Data Entry and Display System (DEDS) and DBRITE.

b. WIND SPEED AND DIRECTION SENSOR. The WSP will be capable of accepting centerfield wind speed and direction data from either the Automated Surface Observing System (ASOS) or the Low Level Wind Shear Alert System (LLWAS). This data will be utilized by the WSP in the GFP processing and display software. WSP will accept input of this government furnished data (GFD) at a government approved location in the equipment room.

c. NIMS. The WSP RMF is capable of adjustment, command, and control of the WSP system. The WSP RMF provides system performance and status information to the NIMS, the interface between the WSP and the end user by providing functions needed to perform local and remote monitoring, automatic fault isolation to the Line Replaceable Unit (LRU) level, variable parameter adjustment, and control of the WSP system. The WSP RMF will allow equivalent control from either the MDT or NIMS.

d. SPARE DFU PORTS. The WSP will provide a broadcast protocol supporting up to nine external DFUs.

3.3.2 Internal Interfaces.

The WSP will interface with the following internal subsystems. Refer to figure 3.3-1.

a. DFU. The DF will reside in the ATCT and the TRACON within the DFUs. Each DFU will include COTS computers capable of compiling and subsequently executing in real-time the Government-supplied DF software. A DFU is composed of one or more GSDs and one to eight RDTs per DFU.

The DFU has the following capabilities:

1. The WSP will continuously store, without user intervention, the last 15 days of all generated weather products and the weather products which were displayed on each of the DFUs. Upon MDT command, the archived data will be transferred to a removable physical storage medium. Archiving functions will be provided as part of the WSP GFP software package. The contractor will provide a suitable interface and physical storage media to meet the requirements of the GFP software. Archive data will be tagged with synchronized time values.

2. The GSD computer will support a UNIX/X-Windows graphical applications package. It will have a 100-megahertz (MHz) or greater Central Processing Unit (CPU), 32 megabytes (MB) or greater Random Access Memory (RAM) and a 1 gigabyte or greater hard disk. Communication between the RDP and DFU will be accomplished via Transport Control Protocol/Internet Protocol (TCP/IP) protocols at bandwidths of 128 kilobaud (kb) or greater. The DFU's ethernet port will support transfer rates of 10 MHz or greater to accommodate higher bandwidth communication requirements within the WSP's ATCT Local Area Network (LAN).

3. The DFU will produce audible and visual alarms when a weather product alarm is generated.

b. MDT. The WSP RMF allows control, monitoring, and troubleshooting capability of the WSP from either the MDT or the NIMS. The WSP MDT will provide on-site maintenance of the WSP.

c. TIME SERIES RECORDER PORT. The WSP will provide a port for real-time recording to, and playback from, a time series recorder. An interface to a high-speed, high density 8 millimeter (mm) tape or disk to support this function will be provided along with the appropriate software to facilitate recording and playback.

d. LOCAL BASE DATA DISPLAY. The WSP will provide an interface and software to drive a local Base Data Display (BDD) capable of displaying WSP base data, intermediate products and end-user products in both real-time and playback modes.

e. BASE DATA RECORDER PORT. The WSP RMF will control recording and playback of base data through the base data recording port.

f. ARCHIVE RECORDER. The WSP will interface with the Archive Recorders as required by the GFP RDP software.

g. MODEMS. The contractor will furnish RDP to DF modems, as required. These modems will conform to FAA-E-2786 and EIA-530 (any standards applicable to communications circuits effective on the date of the contract will also apply and take precedence). The Government will furnish all dedicated communication lines and all dial-up communication lines.

3.4 WSP CRITICAL PERFORMANCE PARAMETERS (CPP).

The WSP Operational Test and Evaluation (OT&E) will demonstrate operational suitability and effectiveness of the WSP according to the critical performance thresholds as defined in the WSP RD. Table 3.4-1 provides a list of CPPs for the WSP as referenced in the RD.

TABLE 3.4-1. WSP CRITICAL PERFORMANCE PARAMETERS (CPP).

CRITICAL PARAMETER	THRESHOLD	REMARKS
System Performance		
Wind Shear		
Intensity - Wind shear with loss - Microburst - Wind shear with gain	 Wind loss $\geq$ 20 knots but < 30 knots Wind loss $\geq$ 30 knots Wind gains $\geq$ 15 knots	WSP shall issue an alert for each detected occurrence
Coverage - Azimuth - Range - Altitude	 Full 360 degrees 6 nmi from airport reference point (ARP) Surface to 1500 ft. above ground level (AGL.)	Applies to Wind Shear and Microburst
Probability of Detection (PD) - PD for wind shear with losses $\geq$ 20 knots - PD for microburst with wind losses $\geq$ 30 knots $\geq$ 40 knots	 PD $\geq$ 0.7 PD $\geq$ 0.8 PD $\geq$ 0.9	
Probability of False Alarm (PFA) - PFA for wind shear with wind loss $\geq$ 20 knots - PFA that a microburst is false wind loss $\geq$ 30 knots wind loss $\geq$ 40 knots	 PFA $\leq$ 0.2 PFA $\leq$ 0.15 PFA $\leq$ 0.1	

CRITICAL PARAMETER	THRESHOLD	REMARKS
Accuracy (GSD Display) - Wind shear hazards (to be met everywhere) - Position of Wind shear - Intensity (5 knot increments)	 Nearest range bin of 1st encounter ≥ 70% of events to an accuracy of 10 knots or 20% of wind speed change, whichever is greater	
Product Update Rate	≤ 30 seconds	Wind Shear and Microburst Alerts
Gust Front and Wind Shift Prediction		
Coverage - Azimuth - Range - Altitude	 Full 360 degrees 15 nmi from the ARP Surface to 1500 feet AGL	
Probability of Detection (to be met everywhere) ≥ 20 knots but < 30 knots ≥ 30 knots	 PD ≥ 0.6 PD ≥ 0.75	
Probability of False Alarms (to be met everywhere) ≥ 20 knots but < 30 knots ≥ 30 knots	 PFA ≤ 0.15 PFA ≤ 0.1	
Product Update Rate	≤ 1 minute	
Storm Motion Depiction		
Coverage - Azimuth - Range - Altitude	 Full 360 degrees 0 to 60 nmi. To the altitude limits of the (host) ASR	

CRITICAL PARAMETER	THRESHOLD	REMARKS
Accuracy Speed Direction Estimates - Speed Estimate RMF Error - Direction Estimate RMF Error Storm Extrapolated Positions - 10 Minute Forecasts - 20 Minute Forecasts	 ≤ 5 knots ≤ 30 degrees provided that speed > 5 knots Leading Edge Position Accurate 50% of time Leading Edge Position Accurate 30% of time	
Product Update Rate	≤ 1 minute	
Precipitation Display (AP Censored 6-Level Reflectivity)		
Coverage - Azimuth - Range - Altitude	 Full 360 degrees 0 to 60 nmi. To the altitude limits of the host ASR	
Inadvertent Edit	The WSP shall not edit more than 5% of actual weather reflectivity regions with reflectivity of level 3 or greater.	
Edit Performance	The WSP shall edit 90% or more of AP when the corresponding level of AP is 3 or greater.	
Product Update Rate	≤ 30 seconds	

3.5 CRITICAL OPERATIONAL ISSUES (COI).

1. Will the integration of WSP with the host ASR prevent recertification of the ASR?

The ASR-9 is essentially a terminal radar; its primary function is target detection. It is most important that the ASR-9 system is not degraded when the WSP is interfaced to it. The ASR-9 is the first radar system to receive the WSP.

In an effort to address this COI, MIT/LL is conducting DEMVAL testing at the Terminal Radar Development Facility (TRDF) in Albuquerque, NM, and ACT-320 is conducting some integration testing at the Technical Center. Of this testing completed to date, there appears to be no significant degradation to the ASR-9. However, these tests are limited and do not include the majority of the WSP interfaces (e.g., no WSP RMF, no WSP processor, no WSP switches, etc.). In addition, production hardware was not used.

This COI will be fully resolved during System Test conducted on the production WSP at the Technical Center and key site(s). At the Technical Center, baseline readings will be taken and will include all ASR-9 critical parameters (from both channels before and after WSP installation) to measure the amount of degradation to coverage, to discern induced faults and to verify calibrations and alignments. Live weather data will be collected both before and after the WSP is installed. A flight check will also be conducted after the WSP is installed. The above procedure will also be followed at the first key site (except for the flight check which will be conducted at the discretion of the Test Planning Working Group (TPWG)). Any degradation issues found as a result of testing will be satisfactorily addressed by the TPWG.

2. Does the WSP system provide weather products that are sufficient for Air Traffic (AT) use ?

WSP weather products are listed in table 3.4-1 and in table 1 of the WSP RD. This listing includes minimum operational thresholds that must be met for weather products to be sufficient for AT use. The WSP weather products will be verified during OT&E testing at key sites. A combination of live weather events and government furnished test tapes will be used to verify that the WSP weather products are sufficient for AT use.

3. Will WSP products enhance the effectiveness of traffic planning/management (delays, airport acceptance rate, traffic flow, etc.) during adverse weather conditions in the terminal area ? Are terminal airspace and runway used more effectively ?

This COI has been satisfactorily addressed by MIT/LL Project Report ATC-249, "Assessment of the Delay Aversion Benefits of the Airport Surveillance Radar (ASR) Weather Systems Processor (WSP)," dated July 1996.

This report assesses the magnitude of the delay aversion benefits that will be realized through national deployment of the WSP. These benefits are quantified both in terms of aircraft delay-hour reductions and corresponding dollar benefits. The analysis indicates that these benefits will

total approximately $18M per year given year 2000 expected traffic counts at the planned WSP airports. This exceeds, in equivalent dollar value, the safety benefits realized through WSP deployment by a factor of approximately five.

3.6 MINIMUM OPERATIONAL PERFORMANCE (MOP).

The WSP in the terminal area must provide data to enable determination of the position and intensity of hazardous low altitude wind shear in the terminal area and especially along an aircraft's projected approach or departure path. Gust front coverage is required to 15 nautical miles (nmi) from the airport. A high probability of detection with a low false alarm rate is required (see section 3.4, table 3.4-1). Precipitation as measured by reflectivity is required to discern thunderstorm cells to the instrumental range of the host radar. The WSP must provide an improved ASR-9 six-level weather map without AP error.

4. TEST AND EVALUATION MANAGEMENT.

4.1 MANAGEMENT (ORGANIZATIONAL AND FUNCTIONAL RESPONSIBILITIES).

The management process and the participating organizational roles and responsibilities relative to the support of WSP T&E activities are presented in the following paragraphs.

4.1.1 Integrated Product Team for Surveillance and Weather (AND-400).

a. Develops and reviews the WSP IPP,
b. Provides Product Lead for WSP,
c. Endorses policy waiver requests initiated by the Product Lead,
d. Reviews and provides approval on all NCPs.

4.1.2 Wind Shear PT Lead (AND-420).

The WSP program is under the authority of the FAA Wind Shear Products Team, AND-420. The Product Lead and designated staff are responsible for the procurement and implementation of the WSP, from mission analysis through contract award, development, installation, checkout, integration into the NAS, and system commissioning. The Product Lead directs and manages all FAA activities for the development and implementation of the WSP. With regard to the WSP T&E program, the Product Lead:

a. Facilitates Product Team review and approval of WSP TEMP,
b. Arranges with the Team Lead for Test for T&E support, planning, conduct and implementation through an annual program directive (PD),
c. Presents test deployment issues to the In-Service Review Committee,
d. Prepares test NCPs for designated test locations,
e. Approves Development Test and Evaluation (DT&E) plans, procedures, and reports,
f. Monitors DT&E contractor conducted testing,
g. Approves OT&E test requirements, plans, procedures, and reports,
h. Monitors OT&E testing,
i. Reviews Field Familiarization requirements with the Airway Facilities (AF) Division organization,
j. Reviews Production and Acceptance Test and Evaluation (PAT&E) test plans, procedures, and reports,
k. Monitors Field Familiarization testing,
l. Maintains system configuration management (CM),
m. Member of TPWG.

4.1.3 Communication, Navigation & Surveillance Engineering and Test Division (ACT-300).

a. Provides Team Lead for Test,
b. Endorses project TEMP,

c. Provides for Technical Center facility readiness.

4.1.4 Technical Center Weather Branch (ACT-320).

The Team Lead for Test is provided by the Weather Branch (ACT-320) organization located at the Technical Center. The Team Lead for Test acts as the agent of the Product Lead to manage the WSP T&E program. The Team Lead for Test is responsible for the conduct of overall system test activities, specifically OT&E testing. Responsibilities of the Team Lead for Test include:

a. With the Product Lead, develops WSP TEMP for approval by the Wind Shear and Weather Radar Product Team,
b. Prepares OT&E test requirements for inclusion in the TEMP,
c. Reviews WSP acquisition documents and provides input for T&E,
d. Prepares OT&E test plans and procedures in accordance with ARIG 96-1, FAA-STD-024B, FAA Order 1810.4B or any other applicable document,
e. Establishes and chairs a TPWG with cognizant FAA organizations to fund and/or arrange for organizations' participation and/or support in test and evaluation activities,
f. Prepares OT&E test reports and provides recommendations based on test results to AND-420 in support of In-Service Review (ISR),
g. Reviews DT&E test plans, procedures, and reports,
h. Monitors DT&E tests performed by the contractor at the contractor's facility, as well as at any government designated test sites,
i. Monitors PAT&E and site acceptance of the limited production first article systems,
j. Conducts Test Schedule Status Review (TSSR) meetings as necessary in order to plan, direct, status, and report on T&E activities,
k. Reviews and provides concurrence on all WSP NCPs,
l. Directs and conducts OT&E tests,
m. Reviews Field Familiarization requirements, plans, procedures, and reports,
n. Coordinates required system downtime with Airway Facility (AF) personnel,
o. Assures Technical Center test site preparation.

4.1.5 Air Traffic Plans and Requirements Service (ATR).

a. Provides requirements for and reviews the FAA TEMP,
b. Supports and reviews OT&E test plan development, and when necessary coordinates approval with union,
c. Provides operational expertise and planning for conducting and analyzing tests,
d. Provides personnel to support monitoring and conduct of OT&E,
e. Reviews OT&E test reports,
f. Member of TPWG,
g. Reviews and provides concurrence on all WSP NCPs,
h. Reviews field familiarization requirements, plans, procedures, and reports,
i. Coordinates required system downtime with field AT personnel.

4.1.6 Communications/Infrastructure (ACT-330).

The Communications/Infrastructure Branch will provide the following test support functions as required in support of the ACT-320 Team Lead for Test:

a. Reviews OT&E test requirements, plans, and reports,
b. Supports the development of the TEMP,
c. Reviews WSP acquisition documents and provides input for T&E,
d. Witnesses and/or participates in NIMS Confidence testing, as required,
e. Provides personnel in support of the performance and/or monitoring of the NIMS DT&E effort,
f. Review all forms of test documentation (DT&E, OT&E, and/or PAT&E) as requested in support of the acquisition process.

4.1.7 Product Team Lead for NIMS (AND-130).

a. Conduct NIMS Pre-Confidence/Confidence testing,
b. Review all forms of test documentation (DT&E, OT&E, and/or PAT&E) as requested in support of the acquisition process,
c. Member of TPWG.

4.1.8 Operational Support Service (AOS).

The Weather Systems Engineering Branch (AOS-250), of the Operational Support Service, will support T&E under the direction of the Team Lead for Test . AOS-270, the Radar Branch located at the Technical Center, will provide assistance and technical support to aid in the resolution of technical issues related to ASR/WSP integration. Additional AOS organizational responsibilities include:

a. Supports the development of the TEMP,
b. Reviews OT&E test requirements, plans, and reports,
c. Provides personnel in support of the performance and/or monitoring of T&E,
d. Reviews technical instruction books for completeness and technical accuracy,
e. Develop OT&E Test Plans and Procedures for (live/tape) Weather Testing,
f. Member of TPWG,
g. Provide data on results of Weather Testing for inclusion in the WSP OT&E Final Report,
h. Provides support during Field Familiarization Testing.

4.1.9 Regional AT Division.

a. Supports the Product Lead via ATR in the development of test requirements for inclusion in the FAA TEMP,
b. Supports the Product Lead in the implementation of the FAA TEMP at test and operational facilities as required by ATR,

c. Supports the AF Division in the development of Field Familiarization requirements, plans, procedures, and reports with the inclusion of Regional AT Division objectives and interests,
d. Participates in the conduct of NAS Integration and Operational Test as coordinated with the ATR organization,
e. Supports Field Familiarization that is in satisfaction of Regional AT Division test requirements or objectives, as coordinated with AF Division,
f. Conducts Field Familiarization in coordination with AF Division,
g. Monitors Field Familiarization,
h. With the AF Division, co-approves Field Familiarization requirements with the Product Lead,
i. Reviews Program Directives established in support of the Product Lead and Team Lead for Test.

4.1.10 Regional Airway Facilities (AF) Division.

a. Supports the Product Lead in the development of test requirements for inclusion in the FAA TEMP,
b. Reviews Program Directives established in support of the Product Lead and Team Lead for Test,
c. Supports the Product Lead in the implementation of the FAA TEMP at test and operational facilities,
d. With the AT Division, co-approves Field Familiarization requirements with the Product Lead,
e. Approves Field Familiarization plans, procedures, and reports,
f. Participates in the conduct of NAS Integration and Operational Test as coordinated with ACT and AOS,
g. Directs Field Familiarization that is in satisfaction of AF Division test requirements or objectives and as coordinated with AT Division,
h. Conducts Field Familiarization in coordination with AT Division.

4.1.11 AF Sectors.

a. Participates in FAA TEMP activities as required by AF Division,
b. Develops Field Familiarization requirements, plans and procedures in coordination with the facility AT organization,
c. Conducts Field Familiarization, including Joint Acceptance Inspection (JAI) and reports results in coordination with facility AT organization,
Participates in the conduct of OT&E Testing as coordinated with ACT and AOS.

4.1.12 AT Facilities.

a. Participates in FAA TEMP activities as required by ATR through Regional AT Division,

b. Supports development of Field Familiarization requirements, plans, procedures, and reports, in coordination with AF organizations,
c. Conducts and monitors Field Familiarization and reports results in coordination with AF organizations and Regional AT Division.

4.1.13 Logistics (AFR-300).

a. Provides Associate Program Manager for Logistics (APML),
b. Responsible for ensuring that the eight elements of NAILS have been addressed and established, as applicable, prior to initiation of OT&E in accordance with FAA Order 1800.58,
c. Supports the Product Lead in the development of test requirements for inclusion in the FAA TEMP,
d. Participates in FAA TEMP activities as required.
e. Reviews T&E plans and reports.
f. Reviews and provides concurrence on NCPs.
g. Member of TPWG.

4.1.14 TPWG.

The TPWG manages test activities under the direction of the Team Lead for Test. This group consists of, but is not limited to, members appointed from responsible test organizations as shown in table 4.1.14-1. Temporary members may be appointed as required for specific tasks. The TPWG will:

a. Develop and implement the T&E management process for the WSP,
b. Meet as deemed necessary by the Team Lead for Test to discuss test related issues concerning the TEMP, the coordination of T&E funding, T&E schedules, and other related issues,
c. Provide input for test requirements and represent respective organizations regarding acceptance of test responsibilities and input for test requirements.

TABLE 4.1.14-1. RESPONSIBLE TEST ORGANIZATIONS.

ORGANIZATION	NAME	ROLES/RESPONSIBILITIES	TPWG
ACT-320	Weather Branch, William J. Hughes Technical Center	Team Lead for Test , Overall responsibility for System Test. Conduct OT&E, monitor DT&E and PAT&E	X
AND-130	Product Team Lead for NIMS	AND-130 will conduct Pre-Confidence/Confidence testing	X
ACT-330	Communications/ Infrastructure Branch, William J. Hughes Technical Center	Conduct NIMS interface testing during OT&E Integration.	X
AND-420	Weather Products Team Program Office	Product Lead, Overall Program Management Responsibility	X
AOS-250	Weather Systems Engineering Branch, OK City, OK.	Operational Test Support, Algorithm Implementation Verification. Implement mods to incorporate the WSP with the ASOS/LLWAS. Assists in Field Familiarization	X
AOS-270	Radar Branch, William J. Hughes Technical Center	Support for resolution of technical issues related to WSP/ASR-9 Integration. Implement mods to the ASR-9 to incorporate the WSP	X
ATR-200 and ATO-100	Weather Division	AT Controllers, Operational Requirements	X
AFR-304	Communications/ Navigation/Surveillance Systems Division	APML, Logistics Support	X
MIT/LL	Weather Sensing Group	Provide Technical Expertise	X
Key Site Regional Support		Test Site Coordination/Support	X

4.1.15 MIT/LL.

a. Conduct prototype testing during DEMVAL,
b. Provide status reports, lessons learned information and meteorological data analysis on the prototype test activities,
c. Provide technical support/meteorological algorithms,
d. Support overall test effort on the technical and scientific environment of the WSP.

4.1.16 Prime Contractor.

Program Management Reviews (PMR) will be conducted in accordance with the WSP Statement of Work (SOW) in order to monitor the contractor's performance. The PMR will cover the status of hardware and software development, system integration and test, schedule, cost, staffing, and significant technical issues and risks that have surfaced in the reporting period.

The contractor will conduct the Critical Design Reviews, DT&E, Test Readiness Review (TRR), Contract Acceptance Inspection (CAI), and first Operational Readiness Demonstration (ORD) in accordance with the SOW.

Design reviews will be held in accordance with the SOW, in order for the product team to have detailed insight into the technical effort. Contract Data Requirements List (CDRL) items will be developed in accordance with accepted FAA standards and these standards will be the criteria for evaluating the deliverables. Software documentation will be developed using MIL-STD-498 as guidance.

The WSP contractor will be responsible for the planning, conduct, and analysis of all contractually required testing during the verification phases. The FAA will approve and monitor the contractor's test program to verify that the system meets specification requirements.

4.2 INTEGRATED SCHEDULE.

The chart presented in appendix B depicts the WSP TEMP Integrated Schedule. This schedule details the key elements of the test program as well as relative durations for acquisition events. The limited production test phase will commence upon contract award. As of this writing DT&E is scheduled to begin after contract award. While the contractor is conducting DT&E on the first article systems, government test personnel will be involved as DT&E test witnesses and in the review and approval of contractor test documentation. Installation of the first limited production system at the Technical Center is scheduled for 8 months after contract award. OT&E testing of the first system is scheduled to begin following site acceptance and installation at the first key site.

4.3 TEST AND EVALUATION FUNDING.

The FAA funding profile chart in table 4.3-1 contains an estimate by fiscal year, up to and including fiscal year 2002, the funding required for the overall WSP test program.

TABLE 4.3-1. WSP FAA T&E FUNDING ESTIMATION

WSP T&E FUNDING								
FY	96	97	98	99	00	01	02	TOTAL
Testing Phase								
Development T&E	250K	700K	-0-	-0-	-0-	-0-	-0-	950K
OT&E	-0-	-0-	*850K	700K	400K	100K	-0-	**2050K
PAT&E	-0-	-0-	-0-	-0-	600K	700K	700K	2000K
Total T&E Program $/FY	250K	700K	850K	700K	1000K	800K	700K	5000K
* Includes 150K for site preparation at William J. Hughes Technical Center in 1998								
** Includes funding for Material Resources (test equipment, computers, communications lines, etc.)								

4.4 TEST PLANS AND PROCEDURES.

Table 4.4-1 lists the WSP System Test Plans and Procedures, expected completion dates, responsible and approving organizations.

TABLE 4.4-1 WSP SYSTEM TEST PLANS AND PROCEDURES.

SYSTEM TEST PLANS AND PROCEDURES			
Document Title	**Expected Completion Date**	**Responsible Organization**	**Approving Organization**
FAA Test and Evaluation Master Plan (TEMP)	June 1997	ACT-320	PT
FAA OT&E Test Plan • OT&E Integration, OT&E Operational and OT&E Shakedown (ACT-320) • WSP/NIMS Integration Testing (ACT-330) • Weather Testing (AOS-250)	Sept. 1998	ACT-320	PT
FAA OT&E Test Procedures • OT&E Integration, OT&E Operational and OT&E Shakedown (ACT-320) • WSP/NIMS Integration Testing (ACT-330) • Weather Testing (AOS-250)	Oct. 1998	ACT-320	PT
Field Familiarization Test Plan	TBD	AF/AT Organizations	PT
Field Familiarization Test Procedures	TBD	AF/AT Organizations	PT
Contractors Master Test Plan (CMTP) (CDRL C01 IAW SOW)	Upon Contract Award	Development Contractor	AND-420
Software Test Plan (STP) (includes DQT/FQT) (CDRL D01 IAW SOW)	60 days after (DA) Critical Design Review (CDR) & 15 days after receipt of comments (DARC)	Development Contractor	AND-420
DT&E Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT) Plan (CDRL D05 IAW SOW)	CDR & 15 DARC	Development Contractor	AND-420

SYSTEM TEST PLANS AND PROCEDURES			
Document Title	**Expected Completion Date**	**Responsible Organization**	**Approving Organization**
DT&E FAT/SAT Procedures (CDRL D06 IAW SOW)	FAT -60 & 15 DARC SAT -60 & 15 DARC	Development Contractor	AND-420
PAT&E FAT/SAT Plan (CDRL D08 IAW SOW)	FAT -90 & 15 DARC SAT -90 & 15 DARC	Development Contractor	AND-420
PAT&E FAT Test Procedures (CDRL D09 IAW SOW) PAT&E SAT Test Procedures (CDRL D09 IAW SOW)	PAT&E FAT -90 & 15 DARC PAT&E SAT -90 & 15 DARC	Development Contractor	AND-420
Reliability Program Demonstration Plan (CDRL B12 IAW SOW)	30 DACA & 15 DARC	Development Contractor	AND-420
Maintainability Program/Demonstration Plan (CDRL B14 IAW SOW)	30 DACA & 15 DARC	Development Contractor	AND-420
Maintainability Demonstration Procedures (CDRL B16 IAW SOW)	60 DACA & 15 DARC	Development Contractor	AND-420
Management and Installation Plan (CDRL IAW SOW)	CDR & 15 DARC	Development Contractor	AND-420

4.4.1 Government Test Plans and Procedures.

All system test plans and procedures will be developed in accordance with FAA Order 1810.4B and FAA-STD-024B. The OT&E Test Plans and Test Procedures will address NAS integration requirements and will verify that the subsystem interfaces correctly to the existing elements of the NAS and that the NAS can operate with the new subsystem. Operational suitability/effectiveness of the WSP will be addressed as well as reliability and maintainability of the subsystem as installed in the field. Listed below are the specific government test plans to be developed for system test .

a. Test and Evaluation Master Plan (TEMP). The WSP TEMP is developed jointly by the Product Lead, AND-420 and Team Lead for Test, ACT-320 . The TEMP is prepared in accordance with FAA-STD-024B and is consistent with FAA Order 1810.4B. The purpose of the TEMP is to provide the overall test philosophy and test strategy for the WSP test program.

b. OT&E Test Plan. This plan identifies and describes the tests required to ensure that the WSP interfaces with the existing and future NAS equipment. It outlines testing of the NAS end-to-end performance with the fully integrated WSP in an operational configuration. This plan identifies and describes the tests required to ensure that the WSP is operationally suitable and effective. Additionally, this plan discusses outstanding COIs and will include a list of specific evaluation criteria or measures of effectiveness (MOE)/measures of performance (MOP)/measures of suitability (MOS). The following issues will also be addressed:

a. Reliability, Maintainability, and Availability (RMA),
b. Degraded Operations,
c. NAS loading, capacity, and delay evaluation,
d. Site Adaptation and Optimization,
e. Human Factors,
f. Safety,
g. Security,
h. Transition and Switch Over.

This plan identifies and describes the tests (formerly known as OT&E Shakedown) conducted by the user organizations to verify that the WSP is operationally suitable and effective. It specifically addresses the following issues:

a. Supportability and Maintenance Concept,
b. Maintainability in the NAS,
c. Continuing Optimization and Field Support,
d. Technical Manual Suitability,
e. WSP Baseline Evaluation.

c. OT&E Test Procedures. These procedures identify and describe the detailed procedures to accomplish the OT&E objectives stated in the OT&E Plan. Step-by-step procedures will be defined for each subtest.

4.4.2 Contractor Test Plans and Procedures.

The contractor will develop test schedules, test plans, test procedures, conduct tests, and generate test reports utilizing FAA-STD-024 as guidance and as required by the SOW for the WSP. The contractor test program will involve developmental and production testing of all specification requirements. The DT&E for the first system test unit is intended to ensure that each subsystem developed meets all of the specification requirements and that these subsystems can be integrated successfully into the production WSP baseline. The following is a description of each type of test plan that will be developed by the contractor and is subject to approval by the government.

a. Contractor's Master Test Plan (CMTP). This plan contains a description of all tests performed by the contractor on the WSP and will serve as the overall control document for

contractor conducted testing. The Contractor's Master Test Plan will be developed using FAA-STD-024B as a guiding document.

b. Software Test Plan (STP). The Software Test Plan describes Design Qualification Test (DQT) and Formal Qualification Test (FQT) plans for all of the Computer Software Configuration Items (CSCIs) including Algorithm Verification and "Worst Case" testing. The STP will identify software test environment resources required for testing, and will provide schedules for test activities. In addition, the STP will identify the individual tests that will be performed during qualification testing.

c. Development Test and Evaluation Factory Acceptance Test and Site Acceptance Test (DT&E FAT/SAT) Plan. This plan identifies and contains a description of the tests that will be conducted to ensure that each delivered item conforms to applicable specifications, is free from manufacturing defects, and is substantially identical to the qualified hardware. This plan will be presented to the government for approval.

The contractor will develop DT&E FAT/SAT Procedures to accomplish the above.

d. Production Acceptance Test and Evaluation Factory Acceptance Test and Site Acceptance Test (PAT&E FAT/SAT) Plan. This plan identifies and contains a description of Factory and Site Production and Type Testing and System Integration. This document also provides the plan for completing the Installation, Checkout and Acceptance tests. Upon government approval, the contractor will accomplish the site acceptance test program in accordance with this plan.

The contractor will develop PAT&E FAT/SAT Procedures to accomplish the above.

e. Reliability Program/Demonstration Plan. This plan documents the contractor's overall methodology for conducting a reliability program and provides assurance that the reliability requirements of the WSP specification will be satisfied.

f. Maintainability Program/Demonstration Test Plan. This plan contains a description of the corrective and preventive maintenance demonstrations. It includes compatibility tests to perform on-line and off-line diagnostics and LRU diagnostics, and is fully compatible with the NIMS.

g. Management and Installation Plan This plan will describe how the contractor will accomplish the facilities site preparation, installation, integration, test, implementation, and other services as described in the WSP SOW.

4.5 TEST PROGRAM RESOURCES.

The WSP Test Program Resources are shown in table 4.5-1.

TABLE 4.5-1. WSP TEST PROGRAM RESOURCES

WSP T&E PERSONNEL REQUIREMENTS								
FY	96	97	98	99	00	01	02	Total EY/Org
Organization								
ACT	6	6	7	7	4	2	2	34
AOS	2	3	3	4	4	4	4	24
AT	1	1	2	2	1	1	1	9
AF	0	0	1	3	3	3	3	13
AND								
*Prime Contractor Support								
*Total EY/FY & Test Phase								80
* Program office to determine estimates EY = employee years								

4.5.1 Manpower and Training.

The WSP test team consists of personnel from AT, AF, AND-420, ACT-320, ACT-330, AOS-250, AOS-270 and support contractors. Training for these personnel is described in the following paragraph.

4.5.1.1 Test Team Training.

The Contractor will conduct two OT&E test team training courses, one at the Technical Center and the other at the FAA Academy in Oklahoma City. Each course will familiarize the test team with the WSP equipment and displays to enable them to perform and support OT&E activities and to maintain the WSP system. Each course will be conducted prior to OT&E commencement and will utilize commercial item training materials to the maximum extent possible. Students will be instructed on how WSP test tools can support testing, i.e., hardware and software problem solving, trouble replication, alternative configuration tryouts, product improvements, and their

validation, etc. The Contractor will also provide supplemental training to address future system upgrades. Each class size shall not exceed 40 students.

4.5.2 Test Article.

Limited production systems and production turnkey systems will be procured under the overall WSP acquisition. Upon completion of contractor conducted factory testing, the first limited production unit will be shipped to the Technical Center for government test and evaluation. Subsequent first article limited production units will be shipped to selected sites as depicted in the Master Test Schedule (appendix B). These limited production first article WSP systems will be installed and operated at each site under a test NCP.

4.5.3 Test Sites.

The WSP DT&E testing will be conducted at the contractor's facility and test sites as designated by the government. OT&E testing will be conducted at the Technical Center and the first key operational site.

4.5.4 Test Support Equipment.

The contractor will be responsible for assuring that all necessary test equipment is available on time, properly calibrated, and fully operational to support all tests. Government test equipment may be utilized where Government test equipment is available on site and meets all specified test equipment requirements. All test equipment used by the contractor during Factory or Site Tests will be standard commercial equipment and will not be modified. All test equipment will operate in the manner specified by the test equipment manufacturer. Use of custom test equipment or modified commercial test equipment by the contractor requires approval in writing by the Contracting Officer. All ancillary equipment required by the contractor for test purposes will be furnished by the contractor for the duration of the tests. The Government Team Lead for Test may require the contractor to recalibrate any test equipment provided by the contractor to be used in the test program due to the following:

a. The test equipment is removed from the test setup for unrelated purposes.

b. The test equipment fails, is damaged, or appears to be operating in a faulty manner based on Government evaluation of test results.

In addition to the standard contractor supplied equipment, test equipment required for OT&E consists of, but is not limited to, the following:

a. Simple Network Management Protocol (SNMP) NIMS Simulator,
b. Anemometer Simulator,
c. Weather Scenario Test Tapes (AOS-250),
d. Power Monitor,
e. Protocol Analyzer,

f. Oscilloscope,
g. Spectrum Analyzer,
h. Signal Generators,
i. Toshiba Tecra Computer.

4.6 TEST CONFIGURATION MANAGEMENT (CM).

The WSP contractor will maintain a CM program using MIL-STD-973 as guidance on all project configuration items. The contractor will provide a CM Plan that documents the program procedures and responsibilities including baseline identification, control, audit, and configuration status accounting of hardware, software, firmware, documentation, and support equipment. The CM program described in the plan will ensure positive control of the configuration of the WSP equipment and documentation throughout the life of the contract.

5. TEST AND EVALUATION PROGRAM DESCRIPTION.

The WSP System Test program will ensure that the WSP fulfills the MNS, the RD, NAS requirements, and the FAA System Specification, and operates effectively when integrated into the NAS. The WSP System Test program will address the following general objectives:

a. Verify that contractor testing is adequately planned and successfully implemented,
b. Verify that contractor deliverables meet required functional and performance requirements,
c. Resolve COIs through test and evaluation,
d. Resolve the NAS, RD, and FAA requirements identified in the VRTM,
e. Support acquisition and life cycle planning and decision-making.

The WSP System Test program is comprised of the following components which are discussed in further detail in the following sections:

a. DEMVAL,
b. DT&E,
c. OT&E,
d. PAT&E,
e. Field Familiarization.

DEMVAL testing is designed to reduce and quantify risk associated with the WSP program. DEMVAL testing, conducted by MIT/LL on the TRDF in Albuquerque, New Mexico, will continue through the deployment of the first production system.

DT&E testing is designed to verify system compliance with all applicable requirements, and consists of informal DQT, FQT, and First Article Testing. The contractor will conduct and the Government will witness DT&E tests.

OT&E, conducted by the ACT-320 test team using FAA Order 1810.4B as guidance, will be comprised of NAS Integration, Operational, and Shakedown tests. NAS Integration will address the NAS system-level testing requirements in accordance with NAS-SS-1000 to ensure that the system will operate and be compatible with the NAS environment. Operational testing will provide feedback concerning the overall operational effectiveness and suitability of the WSP in the total NAS environment, and will focus on the actual operation and maintenance of the system. Shakedown testing will determine the overall readiness of the WSP as part of the NAS by exercising the system in an operational environment.

PAT&E testing is designed to ensure the system's functional operation and verify that it conforms to applicable specifications, is free from manufacturing defects, and is substantially identical to the qualified hardware. The contractor will conduct and the Government will witness PAT&E tests on each production system. PAT&E testing consists of FAT and SAT.

Field Familiarization is conducted at each WSP site by regional Airways Facility and AT personnel. It is conducted in an operational environment to support determination that the WSP is ready for full operation as part of the NAS. Field Familiarization occurs after contractor-conducted site acceptance testing.

5.1 COMPLETED DEMVAL TESTING.

DEMVAL testing of the engineering prototype WSP has been conducted at Huntsville, Alabama; Kansas City, Missouri; Orlando, Florida; and Albuquerque, New Mexico.

The 1990 DEMVAL of the engineering prototype WSP was performed by MIT/LL in Orlando, Florida. The WSP test bed used during this evaluation was an ASR-8 modified to emulate the essential features of an ASR-9. This 1990 evaluation was the first evaluation of ASR derived wind shear products in an operational setting. Five distinct products were provided: microburst detection, gust front detection, gust front movement prediction, precipitation reflectivity, and storm motion. The objectives of the evaluation were to provide a quantitative assessment of the performance of the signal processing and wind shear detection algorithms in the wet, convectively unstable environment of the Florida peninsula, and to obtain feedback from users (air traffic controllers and supervisors). The first objective was achieved by recording wind shear products generated by the WSP during the operational test, and then correlating them with observations from other meteorological sensing systems (two Doppler C-band weather radars). The detection probabilities for moderate to strong microbursts (greater than 15 meters per second (m/s) measured loss) were consistent with previous analyses of WSP performance in the southeastern United States, indicating that the high-reflectivity outflows characteristic of this environment could be reliably detected. Microburst false-alarm probabilities were acceptable, although higher than expected from earlier measurements. Comments noted by TRACON and tower observers indicated an overall satisfaction with the WSP gust front detection capability. Supervisors found the product to be a valuable aid in coordinating air and ground traffic in anticipation of airport runway reconfigurations. Algorithm parameter and code modifications were necessary during the operational period to alleviate unanticipated false declaration problems; as a result, algorithm performance improved. The second objective was achieved by having MIT/LL observers

stationed in the tower cab and TRACON during the test period and by means of questionnaires distributed to controllers and supervisors at the conclusion of the test period. Air traffic controllers and their supervisors provided a generally favorable assessment of the system. During periods when weather impacted airport operations, the MIT/LL observers in the tower noted intense interest by controllers and supervisors in the information being presented on the GSD. Overall, the 1990 DEMVAL established that the WSP could enhance the safety and efficiency of AT operations.

During the summer of 1991, testing of the prototype WSP continued, but due to the lack of weather no report was generated concerning the data collected.

The 1992 DEMVAL of the engineering prototype WSP was also performed by MIT/LL in Orlando. The objective of the evaluation was to obtain air traffic controller reaction to the engineering prototype WSP weather data and display equipment. Questionnaire forms were used to obtain responses from supervisors and controllers relative to the operational suitability of the displays and data. The 1992 DEMVAL provided significant input on the operational suitability of the RDT and GSD, and usefulness of the weather products provided by the system in an operational environment. The system was very useful; the completeness, timeliness, and usefulness of the displayed information for gust fronts and microbursts and the clarity of the displayed RDT information was good. In addition, supervisors found the GSD very helpful in making runway configuration changes prior to weather events. There was, however, a feeling that the system produced a high amount of false alarms, especially gust front false alarms. ACT-320 recommended, in their published report, that microburst and gust front algorithm refinement and additional testing be performed to better meet the needs of the users. This report, titled "Final Report for ATC Evaluation of the Prototype ASR-WSP at Orlando International Airport," dated March 1993, is available from ACT-320 at the Technical Center.

The 1993 DEMVAL of the prototype WSP was performed at the Albuquerque International Airport. Unlike Orlando, Albuquerque provided a dry environment in which to test the algorithms. The objective of the evaluation was to obtain air traffic controller reaction to the engineering prototype WSP weather data and display equipment. Again, questionnaire forms were used to obtain responses from supervisors and controllers relative to the operational suitability and effectiveness of the displays and data. The 1993 DEMVAL provided significant input on the operational suitability of the GSD and RDT, and usefulness of the weather products provided by the system in an operational environment. Generally, the controllers felt that the WSP system was a significant improvement over the LLWAS and ASR-9 weather channel for ease of analyzing and broadcasting severe weather products to pilots. Supervisors found the GSD very helpful in making runway configuration changes prior to weather events. The displayed information for both microburst alerts (MBA) and wind shear alerts (WSA) and the clarity of the displayed GSD and RDT information were rated very good. The evaluation of the RDT display information was inconclusive, possibly due to the limited opportunities for the user participants to observe wind shear alerts during the evaluation. ACT-320 recommended, in their published report, that evaluations of the WSP continue at Albuquerque in order to obtain more data on dry microbursts and wind shear information. This report, titled "OT&E ATC Evaluation for the

Prototype WSP at Albuquerque International Airport," dated March 1994, is available from ACT-320 at the Technical Center.

Less formal evaluations of operational effectiveness were conducted by MIT/LL following 1994 and 1995 Albuquerque summer demonstrations. Each of these evaluations solicited feedback from air traffic controllers and supervisors on the operational suitability of the WSP and benefits realized through utilization of its products. Controllers valued the advanced warning of possible impact of weather on terminal flight routes and the ability to plan accordingly.

The 1996 DEMVAL of the prototype WSP was conducted in Albuquerque to demonstrate that the required WSP hardware interfaces would not adversely affect the operation of the ASR-9 target channels or the ability to certify the system. In addition, the 1996 DEMVAL was conducted to determine the differences, if any, in performance between the WSP-equipped ASR-9 channel and a normally configured ASR-9 channel; this was accomplished via a preliminary flight inspection. It was concluded that the introduction of WSP hardware into the RF path of the ASR-9 did not significantly affect target detection performance of the radar. Target detection performance comparisons of a normally configured ASR-9 channel versus a WSP-modified ASR-9 channel were nearly identical in that the inner and outer fringe coverage ranges appeared the same for both channels. MIT/LL published their findings in a memorandum titled "Evaluation of the Effects of the Weather Systems Processor (WSP) Hardware on ASR-9 Performance," dated August 1996.

DEMVAL will continue in Albuquerque through the deployment of the first production system. MIT/LL, working under a study contract with Northrop Grumman, will design, develop, and demonstrate a new high integrity receiver chain, a hardware/software interface for ASR-9 6-level weather, and a Remote Monitoring Infrastructure and man-machine interface.

5.2 COMPLETED DT&E/PAT&E.

No DT&E or PAT&E has been performed on the WSP to date.

5.3 COMPLETED OT&E.

Operational Evaluations were conducted during DEMVAL testing in Orlando in 1990 and 1992, and in Albuquerque in 1993. The 1990 DEMVAL established that the WSP could enhance the safety and efficiency of air traffic operations. Air traffic controllers and their supervisors provided a generally favorable assessment of the system. The 1992 and 1993 DEMVALs provided significant input on the operational suitability of the RDT and GSD, and usefulness of the weather products provided by the system in an operational environment. During 1992, the users found the system to be very useful; the completeness, timeliness, and usefulness of the displayed information for gust fronts and microbursts and the clarity of the displayed RDT information was good. In addition, supervisors found the GSD very helpful in making runway configuration changes prior to weather events. There was, however, a feeling that the system produced a high amount of false alarms, especially gust front false alarms. During 1993, the controllers felt the WSP system was a significant improvement over the LLWAS and ASR-9 weather channel for ease of analyzing and

broadcasting severe weather products to pilots. Supervisors found the GSD very helpful in making runway configuration changes prior to weather events. However, the evaluation of the RDT display information was inconclusive, possibly due to the limited opportunities for the user participants to observe wind shear alerts during the evaluation.

ACT-320 conducted some WSP/ASR-9 integration testing in late 1996 at the Technical Center. Testing was conducted to measure the effects to the ASR-9 coverage, calibration, alignments, and induced faults when WSP RF waveguide was added to the ASR-9. Before and after the addition of the WSP hardware to channel A of the ASR-9, baseline measurements from the ASR-9 system were taken. Analysis indicated a 0.5 decibel (dB) loss in the low beam target path and a 3 dB loss in the high beam target path as shown by the low and high beam Minimum Discernible Signal (MDS) and noise figure degradation in channel A. These losses were compensated for by making firmware (Erasable Programmable Read-Only Memory (EPROM)) changes to the ASR-9. In a study done by Northrop Grumman, low and high beam coverage patterns also changed. This high beam coverage was returned to normal by making high beam STC Variable Site Parameter (VSP) changes and moving the high/low beam switching point VSPs. A comprehensive report was generated and submitted to the WSP PT. Future ACT-320 integration testing at the Technical Center will be coordinated with the AND-410 ASR-9 Technical Officer.

5.4 DT&E TESTING.

DT&E will be conducted at the contractor's facility and encompasses hardware, software, system testing, test reports, and Functional Configuration Audit/Physical Configuration Audit (FCA/PCA). DT&E will be conducted by the contractor using FAA-approved test procedures, and will be monitored by the WSP PT. The contractor is responsible for timely and satisfactory completion of testing in accordance with the approved schedule.

The contractor will develop and provide test procedures for each test and evaluation activity identified in the CMTP and the DT&E Plan. Procedures will be written for all test, demonstration, analysis, and inspection requirements. Requirements verified through analysis, such as reliability, will include detailed information regarding vendor's data. Procedures will include required personnel, test support equipment, test configuration, schedule, location, success criteria, and expected results. A VRTM which maps contract requirements will be developed. No formal testing will commence until the procedures have been reviewed and approved by the WSP PT.

The contractor will provide test reports for all completed tests as directed by the SOW. The test report will describe evaluation criteria, results, and all relative supporting material. The reports will be approved by the WSP PT prior to the commencement of OT&E.

DT&E consists of DQT, FQT, and First Article Testing. DQT will incrementally demonstrate that the engineering design and development are complete, that design risks have been minimized, and that the system meets WSP design and performance specifications. FQT is formal qualification testing conducted by the contractor to verify that the implemented hardware and

software design meets the functional and performance requirements of the WSP System Specification.

First Article Testing is testing conducted on the first system(s) built by the contractor, and consists of FAT, SAT, and Delta DT&E Tests. FAT is conducted by the contractor 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. SAT is conducted by the contractor at each field site before acceptance by the FAA.

Delta DT&E tests those requirements that require a NAS operational environment (e.g., stress, loading, or weather conditions) or NAS equipment (interfacing subsystems) not available at the contractor's facility, and will be conducted at the Technical Center and/or the key site(s). Delta DT&E consists of system reliability, maintainability, algorithm implementation, weather, 72-hour continuous operation, alignment, and interface demonstrations. Results for all tests/demonstrations will be contained in the FAA-approved DT&E Report.

5.4.1 Reliability Program.

The contractor will maintain and demonstrate a reliability program in accordance with contract requirements. The contractor's overall methodology for conducting a reliability program and reliability predictions will be documented in a Reliability Program/Demonstration Plan. These reliability predictions will be based on data collected from the First Article systems.

5.4.2 Maintainability Program.

The contractor will maintain and demonstrate a maintainability program in accordance with contract requirements. The contractor's overall methodology for conducting a maintainability program will be documented in a Maintainability Program/Demonstration Plan.

5.4.3 Algorithm Implementation Demonstration.

The contractor will demonstrate that the software used to implement the GFP meteorological algorithms is correct. GFP base data will be used as test data and the resulting algorithm outputs will be compared with corresponding Government supplied correct outputs. The results of this comparison will be analyzed to determine the performance of the software system on the test data cases.

5.4.4 Weather Demonstration.

The contractor will conduct an end-to-end system demonstration using Government Furnished Information (GFI) time-series weather data sets. All weather processing, weather reporting functions, and associated specification performance parameters and tolerances will be met and demonstrated.

5.4.5 72-Hour Continuous Operation Demonstration.

The contractor will conduct a 72-hour continuous operation field demonstration on all First Article systems to demonstrate compliance with requirements. During this test, the WSP system will meet all specification requirements without failure of hardware or software. Any failure will require a rerun of the demonstration once the failure is remedied. Any failure of the ASR-9 system not attributable to the WSP will not be scored against the WSP.

5.4.6 Alignment Demonstration.

The WSP will be completely aligned utilizing only the procedures and test equipment cited in the instruction manuals. Verification and validation testing will be performed to determine the adequacy of techniques, technical manuals, and test equipment.

5.4.7 Interface Demonstration.

The contractor will demonstrate that the WSP system can interface and operate compatibly with all external and internal interfaces defined in the system specification.

5.5 OT&E TESTING.

The following provides an overview of the OT&E test strategy to satisfy NAS operational requirements. OT&E will identify deficiencies in hardware, software, human performance factors, and operational concepts, and will encompass an interactive process of risk reduction demonstrations and analyses to ensure NAS functionality (as it existed prior to installation of the new subsystem) is not degraded. OT&E will consist of three phases -- Integration, Operational, and Shakedown.

Successful completion of OT&E will resolve the COIs identified in section 3 and satisfy the requirements identified in the VRTM in section appendix A. Various FAA organizations, regions, and sectors will support OT&E test activities as specified in section 4 of this document.

5.5.1 Integration Testing.

Integration testing will ensure the successful integration of the WSP into the FAA NAS. The WSP must be operationally integrated with other operational systems used by the AT community. Testing will include subsystem integration (Base Data Display, Maintenance Display Terminal, etc.), system integration (ASR-9, NIMS, etc.), and end-to-end performance to ensure all system interfaces are compatible and that WSP product information and system maintenance information are properly displayed.

Integration requirements are derived from the WSP System Specification, the WSP RD, and NAS-SS-1000, and are included in the VRTM. ACT-320 has determined the methodology for testing these requirements.

5.5.1.1 Subsystem Integration.

ACT-320 will conduct subsystem integration tests to verify that the internal interfaces of the WSP function according to specifications. WSP internal interfaces include the Base Data Recorder, the BDD, the Times Series Recorder, the MDT, and the DFU as described and shown in figure 3.3-2.

5.5.1.2 System Integration.

ACT-320 and ACT-330 will conduct system integration tests to verify that the external interfaces of the WSP meet link level requirements as specified in the WSP System Specification, NAS-SS-1000, and the associated Interface Requirements Document (IRD) and Interface Control Document (ICD). WSP external interfaces include the ASR-9, the LLWAS or ASOS, and the NIMS as described and shown in figure 3.3-2.

ACT-330 will accomplish WSP/NIMS interface testing to ensure all commands, status messages, and alarms function in accordance with approved directives, test plans, and procedures. Prior to this interface testing, ACT-330 may also conduct NIMS confidence testing -- dry run testing to evaluate a NIMS module designed to decode the WSP RMF information. If deficiencies are discovered, this confidence testing will be followed by confidence regression testing of contractor's fixes. This regression testing will occur prior to formal WSP/NIMS interface testing.

5.5.1.3 End-to-End Performance.

ACT-320 will conduct end-to-end performance tests to establish a system baseline, to ensure all system interfaces are compatible, and to ensure that WSP product information and system maintenance information are properly displayed.

Included as part of these performance tests, ACT-320 and AOS-250 will verify that the GFP weather algorithms have been satisfactorily implemented by the contractor. Base data will be collected at operational sites (beginning at the key sites) and analyzed to determine the algorithm's performance.

5.5.2 Operational Testing.

ACT-320 will develop and perform operational tests on the WSP. Operational testing will identify deficiencies in hardware, software, human performance factors, or operational concepts, including supportability. Testing will be accomplished at the Technical Center and the key site(s) using the approved FAA OT&E test plans and procedures.

Operational testing will involve field maintenance and field AT personnel as an integral part of the test effort. The test team will include a WSP (and/or ASR-9) maintenance specialist who will actively participate as a member of the test team with specific test responsibilities. Air traffic controllers will be actively involved in the hands-on evaluation of the WSP equipment.

This testing, with user participation, is to ensure operational requirements are met. Aspects of this testing include the following:

a. Reliability, maintainability, and availability,
b. Degraded operations,
c. Site adaptation and optimization,
d. Human factors,
e. Safety,
f. Transition switchover,
g. Security,
h. Stress and NAS loading,

Results of operational testing will be presented in the WSP OT&E Final Report.

5.5.2.1 Reliability.

ACT-320 will review reliability (failure) data collected during DT&E to perform a trend analysis. A failure will be scored as a relevant or nonrelevant failure (not inherent to the equipment). The trend analysis will be used to predict system reliability to the configuration item level. Failure rate analysis will be based on actual operational experience, test data, experience with similar systems, and manufacturer specifications. After reviewing data, ACT-320 will determine if additional reliability testing is required during OT&E.

5.5.2.2 Maintainability.

A maintainability test will be conducted by ACT-320 at the Technical Center. This test will use procedures taken from the maintenance manuals developed by the contractor. Field maintenance personnel trained on the WSP and ASR-9 will assist with this test.

5.5.2.3 Availability.

Failure data and maintenance test results will be used in computing WSP system availability.

5.5.2.4 Degraded Operations.

ACT-320 will determine the acceptability of the WSP responses and resulting operational impacts when failures are induced into the system. Failures may include communication link disruptions, processor malfunctions, host radar problems, etc.

5.5.2.5 Site Adaptation and Optimization.

OT&E will verify that the WSP is adaptable to function successfully in various site configurations. System performance should not be adversely impacted by the altering of system parameters to meet various site configurations. ACT-320 and AOS-250 will verify these adaptable parameters and perform system optimization at all test sites.

5.5.2.6 Human Factors.

ACT-320 and human factors personnel will assess the usability and impact of new products (AP-corrected six-level weather) only. These products will be displayed on the users' DBRITE and DEDS displays. (Human factors evaluations were conducted during DEMVAL testing and are discussed in sections 5.1 and 5.3. Specifically, users were asked to evaluate the usability of existing DFUs (GSDs and RDTs) and products (microbursts, gust fronts, etc.).)

5.5.2.7 Safety.

A safety inspection will be conducted by qualified personnel to ensure that the WSP subsystem is in conformance with FAA Order 3900.19A, Occupational Safety and Health.

5.5.2.8 Transition Switchover.

ACT-320 will assess the ease of transition from the standard ASR-9 6-level weather receiver to the ASR-9 with the WSP receiver, the transition from the existing wind shear detection system to the WSP system, etc. This assessment will be conducted at the key site(s) and will benefit later site installations.

5.5.2.9 Security.

A Security inspection or analysis will be conducted by qualified personnel to ensure that the WSP is in conformance with FAA Order 1600.54, FAA Automated Information Systems Security Handbook.

5.5.2.10 Stress and NAS Loading.

ACT-320 will estimate and determine the acceptable WSP capabilities and reactions to the levels of stress and NAS loading provided by the operational environment.

5.5.3 Shakedown Testing.

Shakedown testing will determine the overall readiness of the WSP as part of the NAS through exercising the system in an operational environment. This will include testing to confirm that when the WSP is operated and maintained by operational personnel, all requirements are met. Shakedown testing will verify the effectiveness, suitability, maintainability, supportability, and integration requirements of the system.

Shakedown testing will be conducted at the Technical Center, key site(s), and First Article sites by hardware and software engineers, meteorologists, and technicians from ACT-320, AOS-250, AOS-270, and various FAA Regions.

5.5.3.1 Effectiveness.

The WSP will be assessed regarding potential system effectiveness in providing reliable service.

5.5.3.2 Suitability.

This assessment will determine the suitability of the display information and system response.

5.5.3.3 Maintainability.

In addition to the operational maintainability testing, this assessment will evaluate Technical Instruction Books for completeness and clarity and will evaluate the WSP's capability to accurately present system status to the user.

5.5.3.4 Supportability.

This assessment will determine if WSP documentation is readily available and current. In addition, this assessment will establish the FAA's capability to support field activities from a total system perspective and will include hardware and software maintenance and configuration management.

5.5.3.5 System Integration.

Shakedown system integration testing will assess the WSP operation and determine any negative impact on the existing ATC system. Testing will encompass all internal and external interfaces.

5.6 PAT&E TESTING.

The contractor will conduct PAT&E on each production unit to verify that the product conforms to applicable specifications, is free from manufacturing defects, and is substantially identical to the qualified hardware. These tests will be conducted in accordance with the FAA-approved PAT&E test plans and procedures.

PAT&E will consist of FAT and SAT. PAT&E FAT will be conducted on each production item by the contractor at their factory to verify that it conforms to applicable specifications and requirements. A limited subset of Delta DT&E First Article Tests will be performed on each PAT&E FAT article. Successful completion of PAT&E FAT represents a partial FAA acceptance of the production article. PAT&E SAT will be conducted on each delivered item to verify the effective installation of the WSP into each facility and to verify the suitability of the system for FAA OT&E. Again, a limited subset of Delta DT&E First Article Tests will be performed on each PAT&E SAT article.

5.7 FIELD FAMILIARIZATION.

Field familiarization testing, formerly referred to as Field Shakedown testing, will be conducted by AF and AT field personnel following site acceptance testing at each field site. During field familiarization, site personnel will become familiar with the WSP and confirm, via site specific testing, that the WSP is properly configured and integrated to allow the transition into the NAS. Support for field familiarization will be provided by the Integrated Product Team (IPT) as required. Once field familiarization has been completed to the satisfaction of field personnel, the WSP will be ready for commissioning.

6. ACRONYMS.

A	Analysis
ACP	Azimuth Change Pulse
A/D	Analog to Digital
ADP	Automatic Data Processing
AF	Airway Facilities
AGL	Above Ground Level
AMS	Acquisition Management System
AP	Anomalous Propagation
APML	Associate Program Manager for Logistics
ARIG	Acquisition Reform Interim Guidance
ARP	Airport Reference Point
ARTS	Automated Radar Terminal System
ASOS	Automated Surface Observing System
ASP	Acquisition Strategy Paper
ASR	Airport Surveillance Radar
AT	Air Traffic
ATC	Air Traffic Control
ATCT	Air Traffic Control Tower
BDD	Base Data Display
BIT	Built-In Test
CAI	Contractor Acceptance Inspection
CDRL	Contract Data Requirements List
CFR	Code of Federal Regulations
CM	Configuration Management
CMTP	Contractor's Master Test Plan
COHO	Coherent Oscillator
COI	Critical Operational Issue
COTS	Commercial-off-the-Shelf

CP	Circular Polarization
CPP	Critical Performance Parameters
CPU	Central Processing Unit
CSCI	Computer Software Configuration Items
D	Demonstration
dB	Decibel
DBRITE	Digital Bright Radar Indicator Tower Equipment
DEDS	Data Entry and Display System
DEMVAL	Demonstration Validation
DF	Display Function
DFU	Display Functional Unit
DQT	Design Qualification Testing
DT&E	Development Test and Evaluation
EXCOM	Executive Committee
EY	Employee Year
FAA	Federal Aviation Administration
FAT	Factory Acceptance Test
FCA	Functional Configuration Audit
FIT	Fault Isolation Test
FQT	Formal Qualification Test
ft	Feet
FY	Fiscal Year
GFD	Government Furnished Data
GFP	Government Furnished Property
GMT	Greenwich Mean Time
GSD	Geographic Situation Display
I	Inspection
I & Q	In-Phase and Quadrature
IAGC	Instantaneous Automatic Gain Control
ICD	Interface Control Document

IOT&E	Operational Test and Evaluation Oversight
IPP	Integrated Program Plan
IPT	Integrated Product Team
IRD	Interface Requirements Document
ISR	In-Service Review
ITWS	Integrated Terminal Weather System
JAI	Joint Acceptance Inspection
LAN	Local Area Network
LLWAS	Low Level Wind Shear Alert System
LP	Limited Production
LP	Linear Polarization
m/s	Meters per Second
MBA	Microburst Alert
MDT	Maintenance Data Terminal
MB	Megabyte
MHz	Megahertz
MIT/LL	Massachusetts Institute of Technology/Lincoln Laboratory
MNS	Mission Need Statement
MOE	Measures of Effectiveness
MOP	Measure of Performance
MOP	Minimum Operational Performance
MOS	Measure of Suitability
MTBF	Mean Time Between Failures
MTBPMA	Mean Time Between Preventive Maintenance Actions
MTR	Mean Time To Repair
MTTR	Mean Time To Restore
NAILS	National Airspace Integrated Logistics Support
NAS	National Airspace System
NCP	NAS Change Proposal
NDI	Non-Developmental Item

NIMS	NAS Infrastructure Management System
NLT	No Less Than
nmi	Nautical Mile
NWS	National Weather Service
ORD	Operational Readiness Demonstration
OT&E	Operational Test and Evaluation
P^3I	Pre-Planned Product Improvement
PAT&E	Production Acceptance Test and Evaluation
PCA	Physical Configuration Audit
PD	Probability of Detection
PD	Program Directive
PFA	Probability of False Alarm
PMR	Program Management Review
PT	Product Team
RAM	Random Access Memory
RD	Requirements Document
RDA	Radar Data Acquisition
RDP	Radar Data Processor
RDT	Ribbon Display Terminal
RF	Radio Frequency
RMA	Reliability, Maintainability, Availability
RMF	Remote Monitoring Function
RMS	Root Mean Square
SAT	Site Acceptance Testing
SCIP	Surveillance Communication Interface Processor
SNMPv1	Simple Network Management Protocol Version 1
SOW	Statement of Work
STALO	Stable Local Oscillator
STC	Sensitivity Time Control
STD	Standard

STP	Software Test Plan
T	Test
T&E	Test and Evaluation
TBD	To Be Determined
TCP/IP	Transport Control Protocol/Internet Protocol
TDWR	Terminal Doppler Weather Radar
TEMP	Test and Evaluation Master Plan
TMU	Traffic Management Unit
TPWG	Test Planning Working Group
TRACON	Terminal Radar Approach Control
TRDF	Terminal Radar Development Facility
TRR	Test Readiness Review
TSSR	Test Schedule Status Review
UTC	Universal Coordinated Time
VRTM	Verification Requirements Traceability Matrix
VSP	Variable Site Parameters
WSA	Wind Shear Alert
WSP	Weather System Processor

Appendix A
Verification Requirements Traceability Matrix (VRTM)

VERIFICATION REQUIREMENTS TRACEABILITY MATRIX (VRTM).

The TEMP VRTM presents high level test requirements that are to be verified as part of the OT&E test program. The WSP requirements are based on NAS-SS-1000 Volume 1, the RD for the WSP, and the WSP System Specification, FAA-E-2917. The VRTM also includes a summary of NIMS functional and performance requirements from the NIMS draft specification, FAA-E-XXXX (to become FAA-E-2911 after baselined).

COLUMN DEFINITIONS.

The following is an explanation of terms used in the VRTM table header:

Test Descrtn ID# - (Test Description Identification Number) - Unique test identifier assigned for ease and consistency of reference throughout the OT&E test program

Reqs. Para. - (Requirements Paragraph) - Paragraph number from a particular FAA Document.

Description - Describes the appropriate test requirement.

DT&E - Development Test and Evaluation

PAT&E - FAT - Production Acceptance Test and Evaluation - Factory Acceptance Test

PAT&E - SAT - Production Acceptance Test and Evaluation - Site Acceptance Test

OT&E - Operational Test and Evaluation Integration, Operational, and Shakedown

SITE LEVEL - This level of verification is usually performed at the designated site. The verification portion of the subsystem installation and checkouts will emphasize the demonstration of the overall system performance requirements. It includes the demonstration of an end-item, subsystem and or system, the final acceptance demonstrations, and commissioning activities. All verification levels for subsystem to facility interfaces would normally occur at installation site.

MAOR - Minimum Acceptable Operational Requirements

COI - MOE - MOS - MOP Critical Operational Issue - Measure of Effectiveness - Measure of Suitability - Measure of Performance

VERIFICATION METHODS AND DEFINITIONS.

Verification methods are defined as follows:

TEST - Method of verification that will measure equipment's performance under specific configuration-load conditions and after the controlled application of known stimuli. Quantitative

values are measured, compared against previous predicted success criteria and then evaluated to determine degree of compliance.

DEMONSTRATION - Method of verification where qualitative versus quantitative validation of a requirement is made during a dynamic test of the equipment. Additional definitions state that if a requirement is validated by test during first article testing and the requirement has enough significance that it is "retested" during acceptance test, then this acceptance testing can be indicated in the VRTM as a demonstration. The final definition states that, in general, software functional requirements are validated by demonstration since the functionality must be observed through some secondary media.

ANALYSIS - Method of verification comparing hardware or software design with known scientific and technical principles, technical data, or procedures and practices to validate that the proposed design will meet the specified functional or performance requirements.

INSPECTION - Method of verification to determine compliance with specification requirements and consists primarily of visual observations, or mechanical measurements of the equipment, physical locations, or technical examination of engineering-support documentation.

WSP VERIFICATION REQUIREMENTS TRACEABILITY MATRIX (VRTM).

Test Descrtn ID#	Reqs. Para. Ref.	Description	DT&E Tests	PAT&E FAT	PAT&E SAT	OT&E	SITE LEVEL	MAOR Thshld	COIs MOE, MOS, MOP	Remarks
	NAS-SS-1000									
SS-001	3.2.1.1.7.1d	The NAS shall provide weather data from designated radars.	X	X	D	D	X			
SS-002	3.2.1.2.4a.2b	The NAS shall detect the current weather conditions aloft, at least once every 5 minutes, for all airspace within the terminal area, from ground level to 10,000 feet AGL within 45 nmi of designated airports.	X	X	T	D T	X	NLT 1 X per 5 min; Gd. to 10,000'; 45 nmi of airport.		
SS-003	3.2.1.2.4b.3	Current weather conditions aloft information shall be available to local area specialists and users and updated at least once every five minutes.	X	X	T	D T	X	NLT 1 X per 5 mins.		
SS-004	3.2.1.2.8.4b	The standard time signal in a system dealing with non-ATC functions (e.g., maintenance, weather, traffic management, flight planning) shall be synchronized to within 6 seconds of universal coordinated time (UTC).	X	X	T	D	X	+ or - 6 secs. UTC		
SS-005	3.2.7.1	Automatic Data Processing (ADP) security. NAS subsystems and information shall be protected in accordance with FAA Order 1600.54.	A	X	X	D	X			
SS-006	3.3.6.2	NAS facilities and facility subsystems shall comply with Code of Federal Regulations (CFR), Title 29 per FAA Order 3900.19A, Occupational Safety and Health.	I	X	X	I	X			
	WSP Requirements Document (RD)									
RD-001	Table 1 Block 2-1	Wind Intensity " Wind Shear with loss" Wind loss ≥ 20 knots but < 30 knots	T*	D	D	T	X	WSP shall issue an alert for each occurrence	MOP	
RD-002	Table 1 Block 2-2	Wind Intensity " Microburst" Wind losses ≥ 30 knots	T*	D	D	T	X	WSP shall issue an alert for each occurrence	MOP	
RD-003	Table 1 Block 2-3	Wind Intensity " Wind Shear with gain" Wind gains ≥ 15 knots	T*	D	D	T	X	WSP shall issue an alert for each occurrence	MOE, MOP	
RD-004	Table 1 Block 3-1	Wind Shear detection coverage - Azimuth	T*	D	D	T	X	Full 360°	MOP	Applies to Wind Shear & Microburst

Verification Methods: T = Test, D = Demonstration, A = Analysis, I = Inspection, X = Not Applicable, * = Test using Canned Data, ** = The Reliability Demonstration shall use reliability data collected during testing and shall include a 72-hour "hands-off" demonstration test, # OT&E includes Integration, Operational, and Shakedown testing

Test Descrtn ID#	Reqs. Para. Ref.	Description	DT&E Tests	PAT&E FAT	PAT&E SAT	OT&E	SITE LEVEL	MAOR Thshld	COIs MOE, MOS, MOP	Remarks
RD-005	Table 1 Block 3-2	Wind Shear detection coverage - Range	T*	D	D	T	X	6 nmi from ARP	MOP	Applies to Wind Shear & Microburst
RD-006	Table 1 Block 3-3	Wind Shear detection coverage - Altitude	T*	D	D	T	X	Surface to 1500' AGL	MOP	Applies to Wind Shear & Microburst
RD-007	Table 1 Block 4-1	Probability of Detection - PD for Wind Shear with losses $\geq$ 20 knots	T*	D	D	T	X	PD $\geq$ 0.7	MOP	
RD-008	Table 1 Block 4-2	Probability of Detection - PD for microburst with wind losses $\geq$ 30 knots	T*	D	D	T	X	PD $\geq$ 0.8	MOP	
RD-009	Table 1 Block 4-3	Probability of Detection - PD for microburst with wind losses $\geq$ 40 knots	T*	D	D	T	X	PD $\geq$ 0.9	MOP	
RD-010	Table 1 Block 5-1	Probability of False Alarms - PFA for Wind Shear with wind loss $\geq$ 20 knots	T*	D	D	T	X	PFA $\leq$ 0.2	MOP	
RD-011	Table 1 Block 5-2	Probability of False Alarms - PFA that a microburst is false for wind loss $\geq$ 30 knots	T*	D	D	T	X	PFA $\leq$ 0.15	MOP	
RD-012	Table 1 Block 5-3	Probability of False Alarms - PFA that a microburst is false for wind loss $\geq$ 40 knots	T*	D	D	T	X	PFA $\leq$ 0.1	MOP	
RD-013	Table 1 Block 6-1	Accuracy Wind Shear hazards (to be met everywhere) Position of Wind Shear	X	X	X	T	X	Nearest operational range bin of 1st encounter	MOP	
RD-014	Table 1 Block 6-2	Accuracy Wind Shear hazards (to be met everywhere) Intensity (5 knot increments)	X	X	X	T	X	$\geq$ 70% of events to an accuracy of 10 knots or 20% of wind speed change, whichever is greater	MOP	
RD-015	Table 1 Block 7-1	Wind Shear Product Update Rate	T*	D	D	T	X	$\leq$ 30 seconds	MOP	Wind Shear and Microburst Alerts.
RD-016	Table 1 Block 9-1	Gust Front & Wind Shift Prediction - Gust Front Coverage - Azimuth	T*	D	D	T	X	Full 360°	MOP	
RD-017	Table 1 Block 9-2	Gust Front & Wind Shift Prediction - Gust Front Coverage - Range	T*	D	D	T	X	15 nmi from the ARP	MOP	
RD-018	Table 1 Block 9-3	Gust Front & Wind Shift Prediction - Gust Front Coverage - Altitude	T*	D	D	T	X	Surface to 1500' AGL	MOP	
RD-019	Table 1 Block 10-1	Gust Front & Wind Shift Prediction - Probability of Detection (to be met everywhere) $\geq$ 20 knots but < 30 knots	X	X	X	T	X	PD $\geq$ 0.6	MOP	

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Test Descrtn ID#	Reqs. Para. Ref.	Description	DT&E Tests	PAT&E FAT	PAT&E SAT	OT&E	SITE LEVEL	MAOR Thshld	COIs MOE, MOS, MOP	Remarks
RD-020	Table 1 Block 10-2	Gust Front & Wind Shift Prediction - Probability of Detection (to be met everywhere) ≥ 30 knots	X	X	X	T	X	PD ≥ 0.75	MOP	
RD-021	Table 1 Block 11-1	Gust Front & Wind Shift Prediction - Probability of False Alarms (to be met everywhere) ≥ 20 knots but < 30 knots	X	X	X	T	X	PFA ≤ 0.15	MOP	
RD-022	Table 1 Block 11-2	Gust Front & Wind Shift Prediction - Gust Front & Wind Shift Prediction - Probability of False Alarms (to be met everywhere) ≥ 30 knots	X	X	X	T	X	PFA ≤ 0.1	MOP	
RD-023	Table 1 Block 12	Gust Front & Wind Shift Prediction - Gust Front Product Update Rate	T*	D	D	T	X	≤ 1 minute	MOP	
RD-024	Table 1 Block 14-1	Storm Motion Depiction - Storm Motion Coverage - Azimuth	T*	D	D	T	X	Full 360°	MOP	
RD-025	Table 1 Block 14-2	Storm Motion Depiction - Storm Motion Coverage - Range	T*	D	D	T	X	0 to 60 nmi	MOP	
RD-026	Table 1 Block 14-3	Storm Motion Depiction - Storm Motion Coverage - Altitude	T*	D	D	T	X	To the altitude limits of the ASR-9 or host ASR	MOP	
RD-027	Table 1 Block 15-1	Storm Motion Depiction - Storm Motion Accuracy - Speed Direction Estimates - Speed Estimate RMS Error	T*	D	D	T	X	≤ 5 knots	MOP	
RD-028	Table 1 Block 15-2	Storm Motion Depiction - Storm Motion Accuracy - Speed Direction Estimates - Direction Estimate RMS error	T*	D	D	T	X	≤ 30 degrees provided speed > 5 knots	MOP	
RD-029	Table 1 Block 16-1	Storm Motion Depiction - Storm Extrapolated Positions (Level 3) - 10 Minute Forecasts	T*	D	D	T	X	Leading edge position accurate 50% of time	MOP	
RD-030	Table 1 Block 16-2	Storm Motion Depiction - Storm Extrapolated Positions (Level 3) - 20 Minute Forecasts	T*	D	D	T	X	Leading edge position accurate 30% of time	MOP	
RD-031	Table 1 Block 17-1	Storm Motion Depiction - Storm Motion Product Update Rate	T*	D	D	T	X	≤ 1 minute	MOP	
RD-032	Table 1 Block 19-1	Precipitation Display (AP Filtered 6-Level Reflectivity) - Precipitation Coverage - Azimuth	T*	D	D	T	X	Full 360°	MOP	
RD-033	Table 1 Block 19-2	Precipitation Display (AP Filtered 6-Level Reflectivity) - Precipitation Coverage - Range	T*	D	D	T	X	0 to 60 nmi	MOP	
RD-034	Table 1 Block 19-3	Precipitation Display (AP Filtered 6-Level Reflectivity) - Precipitation Coverage - Altitude	T*	D	D	T	X	To the altitude limits of the host ASR	MOP	

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RD-035	Table 1 Block 20-1	Precipitation Display (AP Filtered 6-Level Reflectivity) - Inadvertent Edit	T*	D	D	T	X	The WSP shall not edit more than 5% of actual weather reflectivity regions with reflectivity ≥ level 3	MOP	
RD-036	Table 1 Block 21-1	Precipitation Display (AP Filtered 6-Level Reflectivity) - Edit Performance	T*	D	D	T	X	The WSP shall edit 90% or more of AP when the corresponding level of AP is ≥ level 3	MOP	
RD-037	Table 1 Block 22-1	Precipitation Display (AP Filtered 6-Level Reflectivity) - Precipitation Product Update Rate	T*	D	D	T	X	≤ 30 seconds	MOP	
RD-038	Table 1 Block 23-1	Supportability Requirements - Availability	A			A	X	0.999 host ASR up time 0.99967 or greater for each major component		
RD-039	Table 1 Block 24-1	Supportability Requirements - Maintainability	T	X	X	T	X	MTTR = 1.0 hours; MTR = 0.5 hours		
RD-040	Table 1 Block 25-1	Supportability Requirements - Frequency of Preventative Maintenance	A	X	X	A	X	MTBPMA = 2190 hours		
	WSP System Specification FAA-E-2917									
ID-001	3.1.2.4.2	Accuracy (Precipitation Display)	T*	D	X	T	X	Resolution = .5 nmi by 1.4 degree res., accurate to ± 2 dBs, exclusive of biases caused by beamfilling effects and ground clutter processing		
ID-002	3.1.2.5	WSP Integration With Host ASR	I	X	X	T	X		MOP	
ID-003	3.1.2.7	Supportability Requirements - Reliability	AD**	AD**	X	AD	X	The WSP Mean time Between Failures (MTBF) shall be sufficient to meet availability requirements stated above		
ID-004	3.1.4.5	Time Source	D	D	D	D	X			

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ID-005	3.1.4.6.1	Time Series Recording	D	D	D	D	X			
ID-006	3.1.4.6.2	Base Data Archiving	D	D	D	D	X			
ID-007	3.1.4.6.3	Product Archiving	D	D	D	D	X			
ID-008	3.1.4.6.4	Playback of Archived Data	D	D	D	D	X			
ID-009	3.1.7.1.1.2	ASOS and LLWAS Center Field Wind Speed and Direction Interface	D	X	D	D	X			
ID-010	3.1.7.1.1.4	Spare Ports	D	X	X	D	X			
ID-011	3.1.7.2.2	Time Series Recorder	D	D	D	D	X			
ID-012	3.1.7.2.3	Local Base Data Display	D	D	D	D	X			
ID-013	3.1.7.2.4	Archive Recorder	D	D	D	D	X			
ID-014	3.1.7.2.5	Display Functional Unit	T	X	D	T	X			
	NAS NIMS Functional Specification 8/21/96 Draft									
	3.1	GENERAL								Title
	3.2	FUNCTIONAL REQUIREMENTS								Title
	3.2.1	Subsystem monitoring								Title
	3.2.1.1	Maintenance Data Acquisition								Title
NIMS-001	3.2.1.1.a	Monitor attributes to determine the operating status of each hardware component	D	X	X	D	D			
NIMS-002	3.2.1.1.b	Monitor attributes to determine the operating status of each software component	D	X	X	D	D			
NIMS-003	3.2.1.1.c	Monitor attributes to determine the operating status of each external interface	D	X	X	D	D			
NIMS-004	3.2.1.1.d	Monitor attributes to determine the operating status of each function	D	X	X	D	D			

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Test Descrtn ID#	Reqs. Para. Ref.	Description	DT&E Tests	PAT&E FAT	PAT&E SAT	OT&E	SITE LEVEL	MAOR Thshld	COIs MOE, MOS, MOP	Remarks
NIMS-005	3.2.1.1.e	Monitor attributes to determine the operating status of the agent process	D	X	X	D	X			
NIMS-006	3.2.1.1.f	Monitor attributes to certify managed subsystem	D	X	X	D	X			
NIMS-007	3.2.1.1.g	Monitor attributes to determine the physical configuration of subsystem resources	D	X	X	D	X			
NIMS-008	3.2.1.1.h	Monitor attributes to determine the logical configuration of subsystem resources	D	X	X	D	X			
NIMS-009	3.2.1.1.i	Monitor attributes to determine the operating mode of select subsystem resources	D	X	X	D	D			
NIMS-010	3.2.1.1.j	Monitor attributes to determine the workload of select subsystem resources	D	X	X	D	X			
NIMS-011	3.2.1.1.k	Monitor attributes to determine throughput and response time of select subsystem functions	D	X	X	D	X			
NIMS-012	3.2.1.1.l	Monitor attributes of protected subsystem resources	D	X	X	D	X			
NIMS-013	3.2.1.1.m	Monitor environmental attributes	D	X	X	D	X			
NIMS-014	3.2.1.1.n	Monitor attributes of redundant equipment	D	X	X	D	X			
	3.2.1.2	Maintenance Status Determination								Title
NIMS-015	3.2.1.2.a	Report event for operating status change of hardware component	D	X	X	D	D			
NIMS-016	3.2.1.2.b	Report event for operating status change of software component	D	X	X	D	D			
NIMS-017	3.2.1.2.c	Report event for operating status change of external interface	D	X	X	D	D			
NIMS-018	3.2.1.2.d	Report event for operating status change of subsystem function	D	X	X	D	D			
NIMS-019	3.2.1.2.e	Report event for subsystem operating status change	D	X	X	D	D			
NIMS-020	3.2.1.2.f	Report event for configuration change	D	X	X	D	X			
NIMS-021	3.2.1.2.g	Report event operating mode change	D	X	X	D	X			

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Test Descrip ID#	Reqs. Para. Ref.	Description	DT&E Tests	PAT&E FAT	PAT&E SAT	OT&E	SITE LEVEL	MAOR Thshld	COIs MOE, MOS, MOP	Remarks
NIMS-022	3.2.1.2.h	Report event for workload change	D	X	X	D	X			
NIMS-023	3.2.1.2.i	Report event for throughput/response time change	D	X	X	D	X			
NIMS-024	3.2.1.2.j	Report event for access control rule violation	D	X	X	D	X			
NIMS-025	3.2.1.2.k	Log access control rule violation	D	X	X	D	X			
	3.2.1.3	Maintenance Data Reporting								Title
	3.2.1.3.1	Event Reporting								Title
NIMS-026	3.2.1.3.1.a	Report event only once	D	X	X	D	X			
NIMS-027	3.2.1.3.1.b	Apply event forwarding discriminators	D	X	X	D	X			
NIMS-028	3.2.1.3.1.c	Include attribute value in event notification	D	X	X	D	X			
	3.2.1.3.2	Solicited Data Reporting								Title
NIMS-029	3.2.1.3.2.a	Report monitored attributes	D	X	X	D	X			
NIMS-030	3.2.1.3.2.b	Report control attributes	D	X	X	D	X			
NIMS-031	3.2.1.3.2.c	Report most recently obtained attributes	D	X	X	D	X			
NIMS-032	3.2.1.3.2.d	Report security logs	D	X	X	D	X			
	3.2.1.4	General monitoring Requirements								Title
NIMS-033	3.2.1.4.a	Monitor on continuing basis	D	X	X	D	X			
NIMS-034	3.2.1.4.b	Monitor without interfering with subsystem operational mission	D	X	X	D	X			
NIMS-035	3.2.1.4.c	Monitor without operator intervention	D	X	X	D	X			
NIMS-036	3.2.1.4.d	Perform automatic self-tests	D	X	X	D	X			
	3.2.2	Subsystem Control								Title
	3.2.2.1	Manual Control								Title
NIMS-037	3.2.2.1.a	Provide response to maintenance control command	D	X	X	D				
NIMS-038	3.2.1.1.b	Process Reset maintenance control command	D	X	X	D	D			

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Test Descrtn ID#	Reqs. Para. Ref.	Description	DT&E Tests	PAT&E FAT	PAT&E SAT	OT&E	SITE LEVEL	MAOR Thrshld	COIs MOE, MOS, MOP	Remarks
NIMS-039	3.2.1.1.c	Provide Diagnostics control	D	X	X	D	X			
NIMS-040	3.2.1.1.d	Provide fault management threshold adjustment control	D	X	X	D	X			
NIMS-041	3.2.1.1.e	Provide control of automatic fault isolation and fault recovery processing	D	X	X	D	X			
NIMS-042	3.2.1.1.f	Process Operating Mode change maintenance control command	D	X	X	D	D			
NIMS-043	3.2.1.1.g	Provide configuration change control	D	X	X	D	X			
NIMS-044	3.2.1.1.h	Provide event forwarding discriminator adjustment control	D	X	X	D	X			
NIMS-045	3.2.1.1.i	Provide performance attribute control	D	X	X	D	X			
NIMS-046	3.2.1.1.j	Provide performance threshold adjustment control	D	X	X	D	X			
NIMS-047	3.2.1.1.k	Provide control for modification of access control rules	D	X	X	D	X			
NIMS-048	3.2.1.1.l	Enforce access control rules	D	X	X	D	X			
	3.2.2.2	Automatic Control								Title
NIMS-049	3.2.2.2.a	Automatically initiate fault isolation processing	D	X	X	D	X			
NIMS-050	3.2.2.2.b	Automatically initiate fault recovery processing	D	X	X	D	X			
	3.2.3	Subsystem Management Information Base (MIB)								Title
NIMS-051	3.2.3.a	Organize attributes in MIB to correspond to subsystem resources	I	X	X	X	X			
NIMS-052	3.2.3.b	Create MIB in medium and using syntax that can be used by managing subsystem	I	X	X	X	X			
	3.3	INTERFACE REQUIREMENTS								Title
NIMS-053	3.3.a	Use non-proprietary management protocols	I	X	X	X	X			
NIMS-054	3.3.b	Provide dial-up capability when dedicated communication services not available	D	X	X	D	X			

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Test Descrtn ID#	Reqs. Para. Ref.	Description	DT&E Tests	PAT&E FAT	PAT&E SAT	OT&E	SITE LEVEL	MAOR Thshld	COIs MOE, MOS, MOP	Remarks
NIMS-055	3.3.c	Apply data-origin authentication procedures to dial-up connections	D	X	X	D	X			
	3.4	PERFORMANCE CHARACTERISTICS								Title
NIMS-056	3.4.a	Report events within average of 2 seconds and maximum of 4 seconds	T	X	X	T	X			
NIMS-057	3.4.b	Respond to requests within average of 2 seconds and maximum of 4 seconds	T	X	X	T	X			
NIMS-058	3.4.c	Acknowledge or respond to commands within average of 2 seconds and maximum of 3 seconds	T	X	X	T	X			

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Appendix B

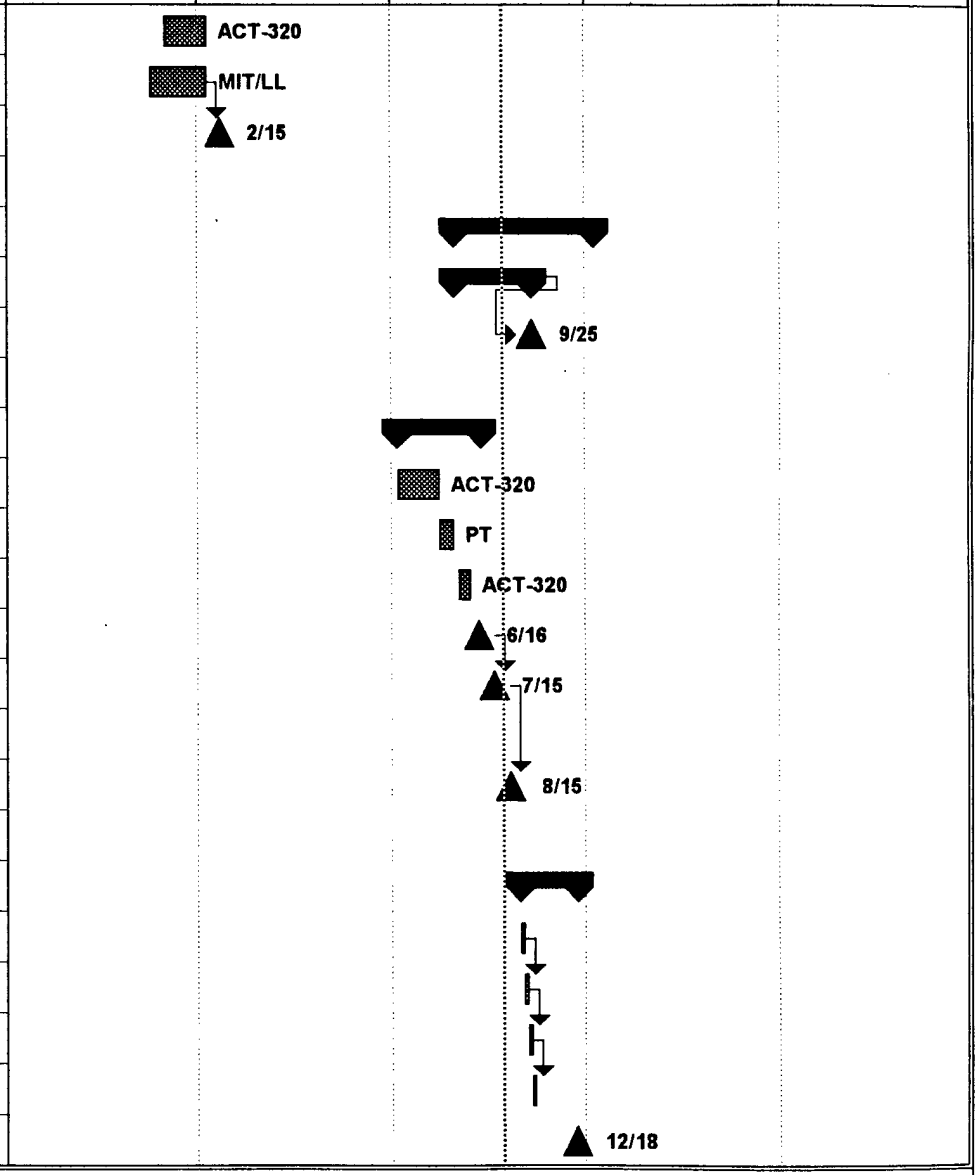
Integrated Schedule

(WSP Test Schedule in separate Microsoft Project file)

WEATHER SYSTEMS PROCESSOR (WSP) MASTER TEST SCHEDULE - 6/12/97

This is a projected test schedule and is subject to change in accordance with the WSP Acquisition Schedule

ID	Task Name	Duration	Start	Finish
1	ACT-320 DEMVAL Test Plan (Phase I/II)	60d	10/30/95	1/19/96
2	- DEMVAL Phase I - MIT/LL ABQ (subsystems testing)	80d	10/2/95	1/19/96
3	DEMVAL Report Phase I (ACT-320)	1d	2/15/96	2/15/96
4				
5	**DEMVAL MIT/LL Phase II**	**181d**	**5/1/97**	**1/20/98**
36	**DEMVAL MIT/LL Study Contract (to Northrop)**	**103d**	**5/1/97**	**9/24/97**
57	DEMVAL Report Phase II Monitoring Report (ACT-320)	15d	9/25/97	10/16/97
58				
59	**TEMP DEVELOPMENT**	**113d**	**1/13/97**	**6/20/97**
60	Prepare 1st Draft	54d	1/13/97	3/31/97
61	TEMP PT Formal Review/Clearance	20d	4/1/97	4/28/97
62	Adjudicate comments/revise TEMP	15d	5/9/97	5/29/97
63	PT TEMP Approval	5d	6/16/97	6/20/97
64	Integrated Program Plan (IPP) Approved	1d	7/15/97	7/15/97
65				
66	Contract Award	1d	8/15/97	8/15/97
67				
68	**Contractor Site Surveys**	**75d**	**9/2/97**	**12/18/97**
69	Site Survey - Tech Center (Atlantic City)	5d	9/2/97	9/8/97
70	Site Survey - Test Site (ABQ)	5d	9/9/97	9/15/97
71	Site Survey - First Site (New Austin)	5d	9/16/97	9/22/97
72	Site Survey - Aeronautical Center (OKC)	5d	9/23/97	9/29/97
73	Contractor Site Engineering Reports Complete	1d	12/18/97	12/18/97



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WEATHER SYSTEMS PROCESSOR (WSP) MASTER TEST SCHEDULE - 6/12/97

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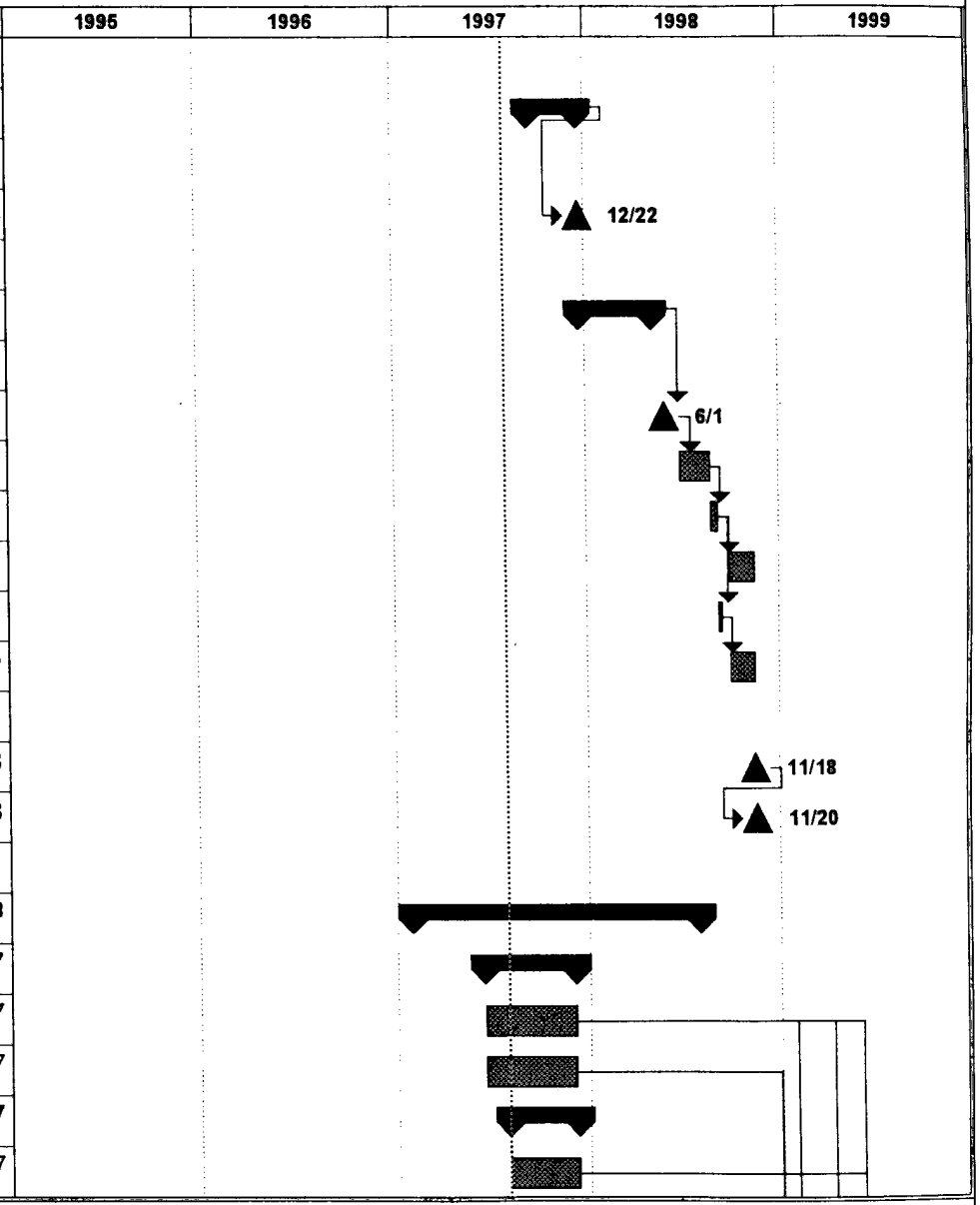
ID	Task Name	Duration	Start	Finish
74				
75	**Development Contractor CDRLs for CDR**	**65d**	**9/17/97**	**12/19/97**
86				
87	Critical Design Review (CDR)	1d	12/22/97	12/22/97
88				
89	**Development Contractor CDRLs for TRR**	**96d**	**12/22/97**	**5/8/98**
101				
102	Test Readiness Review (TRR)	2d	6/1/98	6/2/98
103	FQT	40d	6/29/98	8/24/98
104	DT&E FAT	10d	8/25/98	9/8/98
105	DT&E FAT Report (FAT+15 & 15DARC) D07	32d	9/30/98	11/16/98
106	DT&E SAT (dry run)	5d	9/9/98	9/15/98
107	DT&E SAT Report (SAT+15 & 15DARC) D07	32d	10/1/98	11/17/98
108				
109	FCA (1st unit)	2d	11/18/98	11/19/98
110	PCA (1st Unit)	2d	11/20/98	11/23/98
111				
112	**TECH CENTER SYSTEM ACTIVITIES**	**380d**	**1/30/97**	**7/31/98**
113	**- Develop FAA OT&E Test Plan**	**120d**	**6/16/97**	**12/5/97**
114	ACT-320 OT&E Test Plan	120d	6/16/97	12/5/97
115	ACT-330 NIMS Integration Test Plan	120d	6/16/97	12/5/97
116	**- Develop FAA OT&E Test Procedures**	**90d**	**8/1/97**	**12/10/97**
117	ACT-320 OT&E Test Procedures	90d	8/1/97	12/10/97



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WEATHER SYSTEMS PROCESSOR (WSP) MASTER TEST SCHEDULE - 6/12/97

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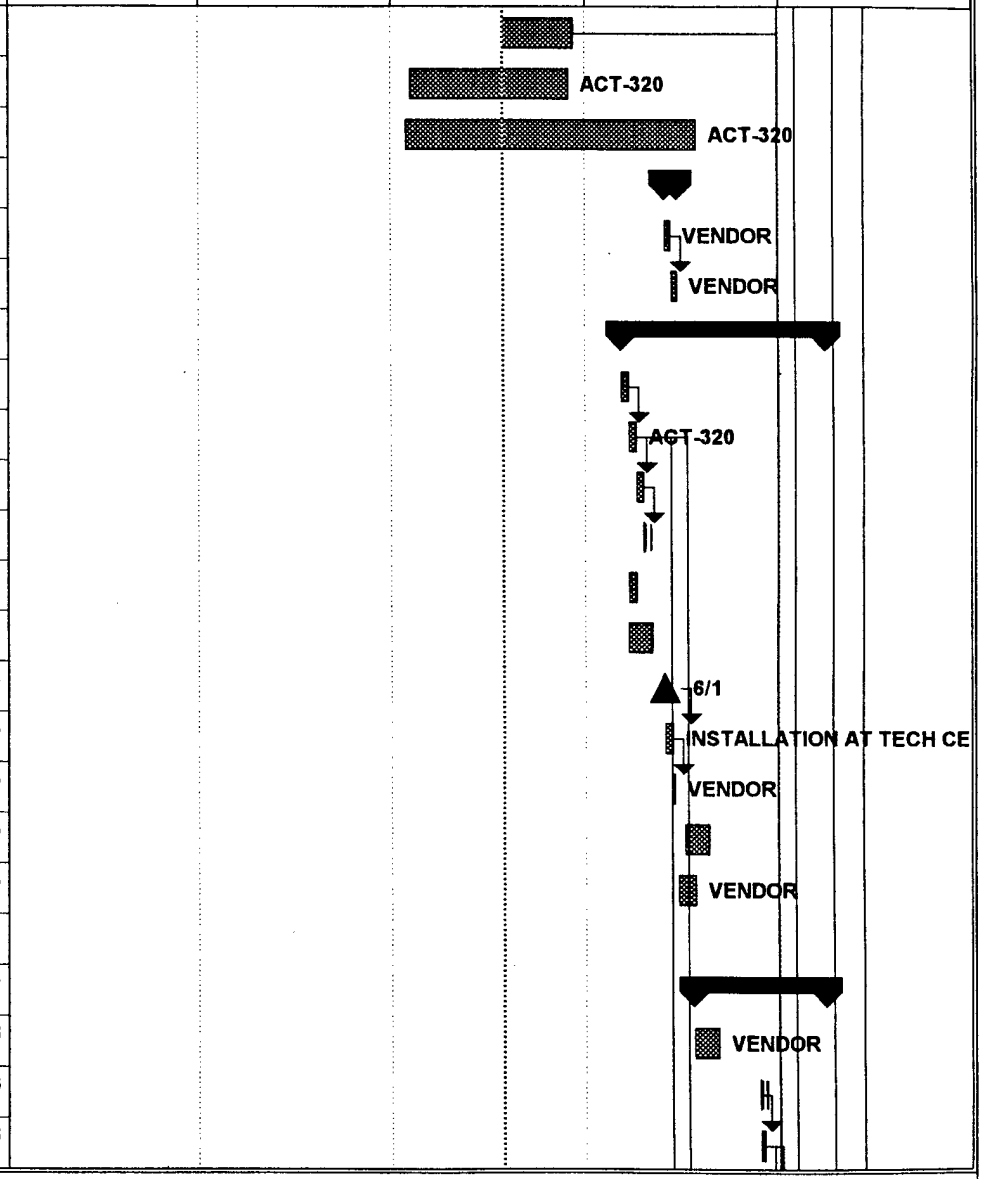
ID	Task Name	Duration	Start	Finish
118	ACT-330 NIMS Integration Test Procedures	90d	8/1/97	12/10/97
119	- WJHTC Lab Preparation/Coordination	206d	2/7/97	12/1/97
120	- Tech Center Site Preparation/Coordination	380d	1/30/97	7/31/98
121	**OT&E Training - Test Team**	**16d**	**6/3/98**	**6/24/98**
122	H/W and S/W Training	8d	6/3/98	6/12/98
123	ASR-9/WSP Training	8d	6/15/98	6/24/98
124	**Install Tech Center System**	**262d**	**3/13/98**	**3/29/99**
125	Establish ASR-9 Baseline	10d	3/13/98	3/26/98
126	Deliver and Install Pre-Installation Kit	10d	3/27/98	4/9/98
127	Establish Modified ASR-9 Baseline	10d	4/10/98	4/23/98
128	Re-certify ASR-9/Flight Check	1d	4/24/98	4/24/98
129	Site Prep	10d	3/27/98	4/9/98
130	DT&E FAT Report (FAT+15 & 15DARC) D07	32d	3/26/98	5/8/98
131	Prototype System Delivery (WJHTC)	1d	6/1/98	6/1/98
132	Install Tech Center Unit	10d	6/2/98	6/15/98
133	Contractor Site Acceptance Test (SAT)	4d	6/16/98	6/19/98
134	DT&E SAT Report (SAT+15 & 15DARC) D07	33d	7/8/98	8/21/98
135	Prototype Testing	22d	6/25/98	7/27/98
136				
137	**OT&E Testing at Tech Center**	**169d**	**7/24/98**	**3/29/99**
138	PAT&E FAT Report (PAT&E FAT+15 & 15DARC	32d	7/24/98	9/8/98
139	Production Configuration Retrofit	1d	11/24/98	11/24/98
140	Production SAT - WJHTC	4d	11/25/98	12/1/98



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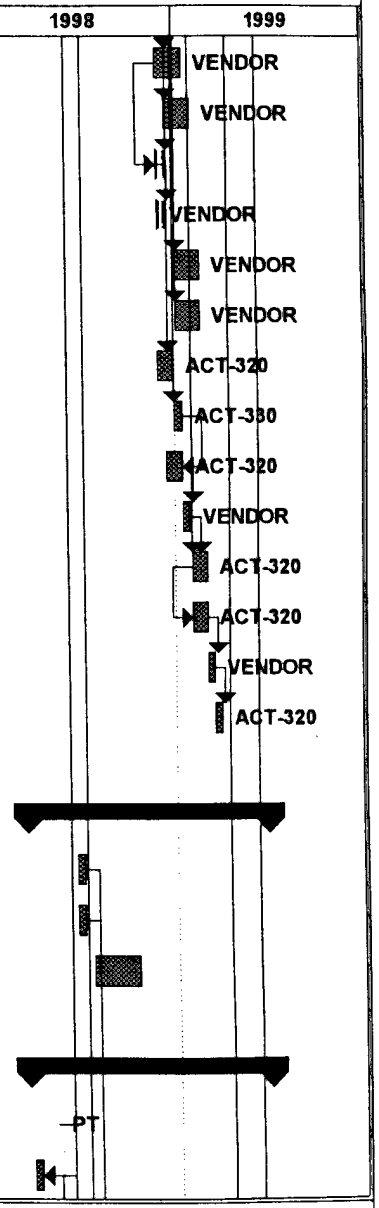
WEATHER SYSTEMS PROCESSOR (WSP) MASTER TEST SCHEDULE - 6/12/97

This is a projected test schedule and is subject to change in accordance with the WSP Acquisition Schedule

ID	Task Name	Duration	Start	Finish
141	"Red Lined" Installation Drawings (PSAT & 15DA	32d	12/2/98	1/19/99
142	PAT&E SAT Report (PAT&E SAT+15 & 15DARC	32d	12/17/98	2/3/99
143	Contractor Acceptance Inspection (CAI)	1d	12/2/98	12/2/98
144	LRU Bar Code Identification Report (NLT 24hrs. a	1d	12/3/98	12/3/98
145	Final As-Built Drawings (30DA SAT & 15DARC)	32d	1/5/99	2/19/99
146	CAI Inspection Documentation Package (30DA S.	32d	1/5/99	2/19/99
147	Integration Testing	20d	12/2/98	12/30/98
148	NIMS Testing	10d	12/31/98	1/14/99
149	PTRs Submitted	20d	12/16/98	1/14/99
150	Vendor Corrects PTRs	10d	1/15/99	1/29/99
151	Operational Testing	20d	2/1/99	3/1/99
152	PTRs Submitted	20d	2/1/99	3/1/99
153	PTRs Corrected	10d	3/2/99	3/15/99
154	OT&E Regression Testing of Corrected PTRs	10d	3/16/99	3/29/99
155				
156	**KEY SITE SYSTEM ACTIVITIES (ABQ)**	**317d**	**3/26/98**	**6/28/99**
157	Training Key Site AF Personnel	10d	6/25/98	7/9/98
158	Training Key Site AT Personnel	10d	6/25/98	7/9/98
159	Weather Testing	60d	7/24/98	10/19/98
160				
161	**KEY SITE (ABQ) SYSTEM INSTALLATION**	**317d**	**3/26/98**	**6/28/99**
162	Key Site NCP Approved	1d	5/15/98	5/15/98
163	Establish ASR-9 Baseline	10d	3/31/98	4/14/98



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WEATHER SYSTEMS PROCESSOR (WSP) MASTER TEST SCHEDULE - 6/12/97

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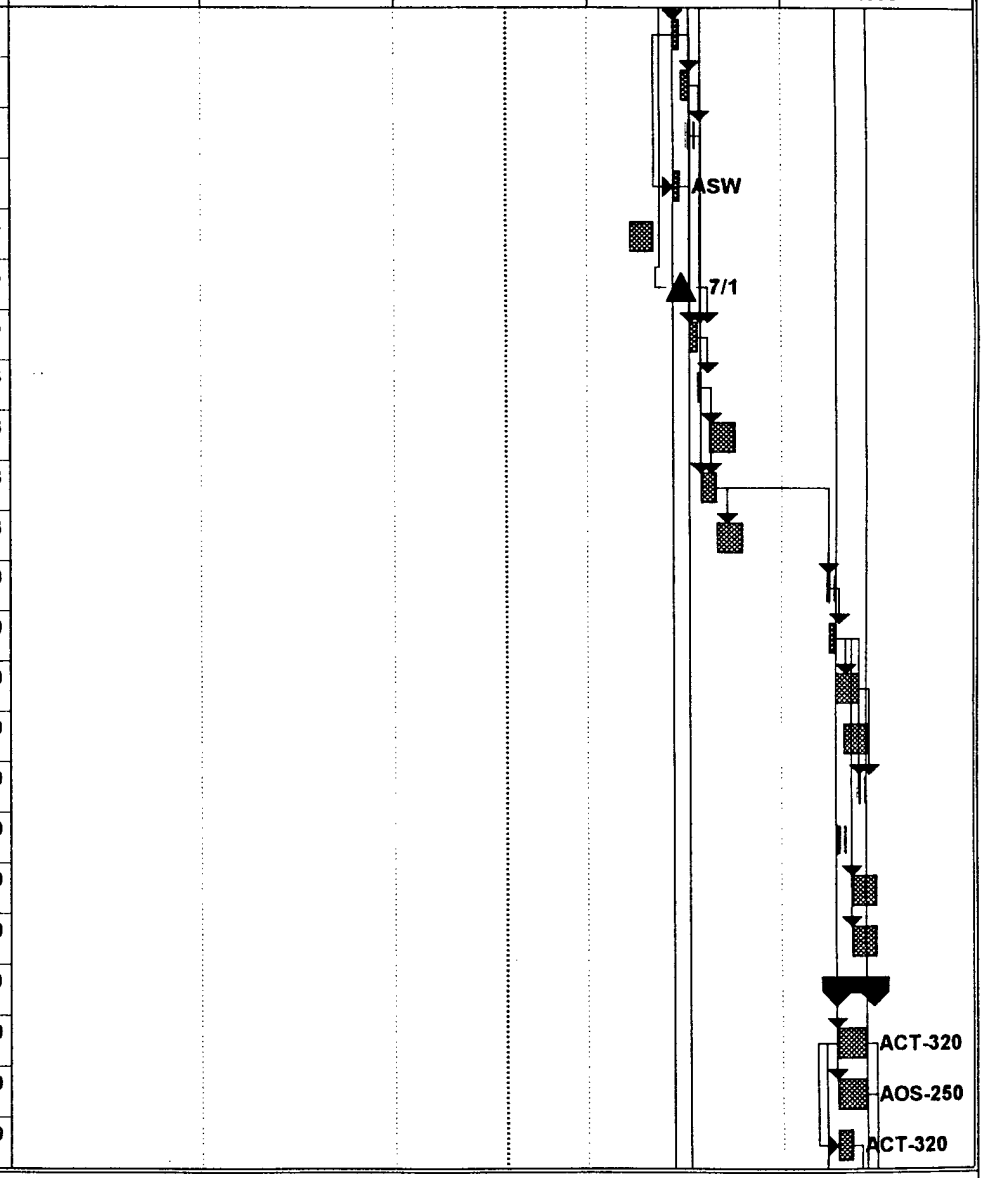
ID	Task Name	Duration	Start	Finish
164	Deliver and Install Pre-Installation Kit	10d	6/15/98	6/26/98
165	Establish Modified ASR-9 Baseline	10d	6/29/98	7/13/98
166	Re-certify ASR-9/Flight Check	1d	7/14/98	7/14/98
167	Site Prep	10d	6/15/98	6/26/98
168	DT&E FAT Report (FAT+15 & 15DARC) D07	32d	3/26/98	5/8/98
169	ABQ (Key Site) System Delivery (6DA OKC SAT)	1d	7/1/98	7/1/98
170	Installation at Key Site	10d	7/15/98	7/28/98
171	Contractor SAT	5d	7/29/98	8/4/98
172	DT&E SAT Report (SAT+15 & 15DARC) D07	32d	8/20/98	10/5/98
173	Prototype Testing	20d	8/5/98	9/1/98
174	PAT&E FAT Report (PAT&E FAT+15 & 15DARC	32d	9/2/98	10/19/98
175	Production Configuration Retrofit	2d	3/30/99	3/31/99
176	Production SAT at ABQ	8d	4/1/99	4/12/99
177	"Red Lined" Installation Drawings (PSAT & 15DA	32d	4/13/99	5/26/99
178	PAT&E SAT Report (PAT&E SAT+15 & 15DARC	32d	4/28/99	6/11/99
179	Contractor Acceptance Inspection (CAI)	1d	5/27/99	5/27/99
180	LRU Bar Code Identification Report (NLT 24hrs. a	1d	4/14/99	4/14/99
181	Final As-Built Drawings (30DA SAT & 15DARC)	32d	5/13/99	6/28/99
182	CAI Inspection Documentation Package (30DA S.	32d	5/13/99	6/28/99
183	**DELTA OT&E TESTING (Key Site)**	**50d**	**4/14/99**	**6/24/99**
184	Delta OT&E Testing (ACT-320)	40d	4/14/99	6/9/99
185	Weather Testing (AOS-250)	40d	4/14/99	6/9/99
186	PTRs Submitted	20d	4/14/99	5/11/99



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WEATHER SYSTEMS PROCESSOR (WSP) MASTER TEST SCHEDULE - 6/12/97

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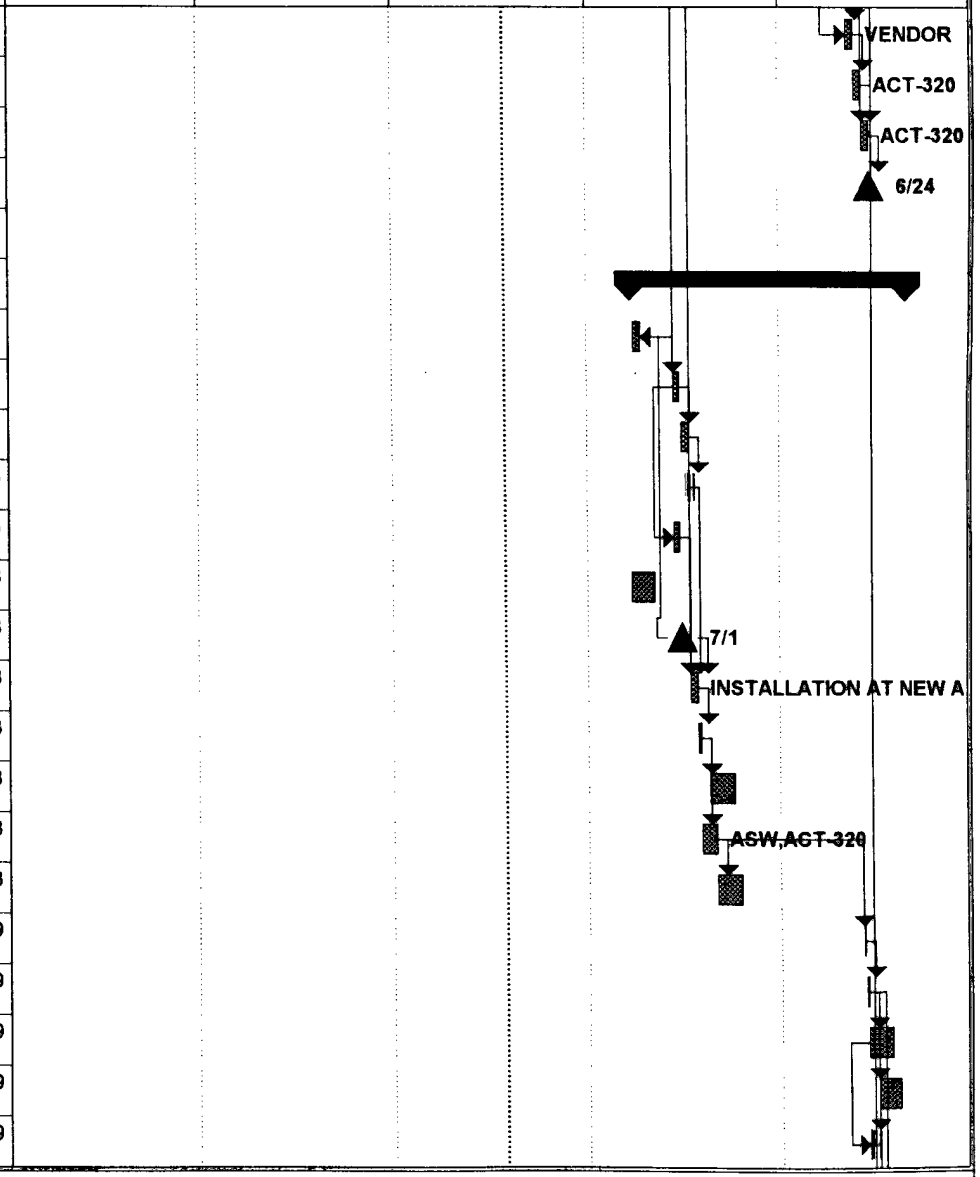
ID	Task Name	Duration	Start	Finish
187	Vendor Corrects PTRs	10d	5/12/99	5/25/99
188	Regression Testing of Mods/Corrected PTRs	10d	5/26/99	6/9/99
189	Operational Evaluation/Site Familiarization @ ABC	10d	6/10/99	6/23/99
190	Operational Readiness Date (ORD) at ABQ	0d	6/24/99	6/24/99
191				
192	**NEW AUSTIN WSP SYSTEM**	**364d**	**3/26/98**	**9/2/99**
193	Establish ASR-9 Baseline	10d	3/31/98	4/14/98
194	Deliver and Install Pre-Installation Kit	10d	6/15/98	6/26/98
195	Establish Modified ASR-9 Baseline	10d	6/29/98	7/13/98
196	Re-certify ASR-9/Flight Check	1d	7/14/98	7/14/98
197	Site Prep	10d	6/15/98	6/26/98
198	DT&E FAT Report (FAT+15 & 15DARC) D07	32d	3/26/98	5/8/98
199	New Austin System Delivery (Same as ABQ)	1d	7/1/98	7/1/98
200	Installation at New Austin	10d	7/15/98	7/28/98
201	Contractor SAT	5d	7/29/98	8/4/98
202	DT&E SAT Report (SAT+15 & 15DARC) D07	32d	8/20/98	10/5/98
203	Prototype Testing	20d	8/5/98	9/1/98
204	PAT&E FAT Report (PAT&E FAT+15 & 15DARC) D1	32d	9/2/98	10/19/98
205	Production Configuration Retrofit	2d	6/10/99	6/11/99
206	Production SAT	4d	6/14/99	6/17/99
207	"Red Lined" Installation Drawings (PSAT & 15DARC)	32d	6/18/99	8/3/99
208	PAT&E SAT Report (PAT&E SAT+15 & 15DARC) D1	32d	7/6/99	8/18/99
209	Contractor Acceptance Inspection (CAI)	1d	6/18/99	6/18/99



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WEATHER SYSTEMS PROCESSOR (WSP) MASTER TEST SCHEDULE - 6/12/97

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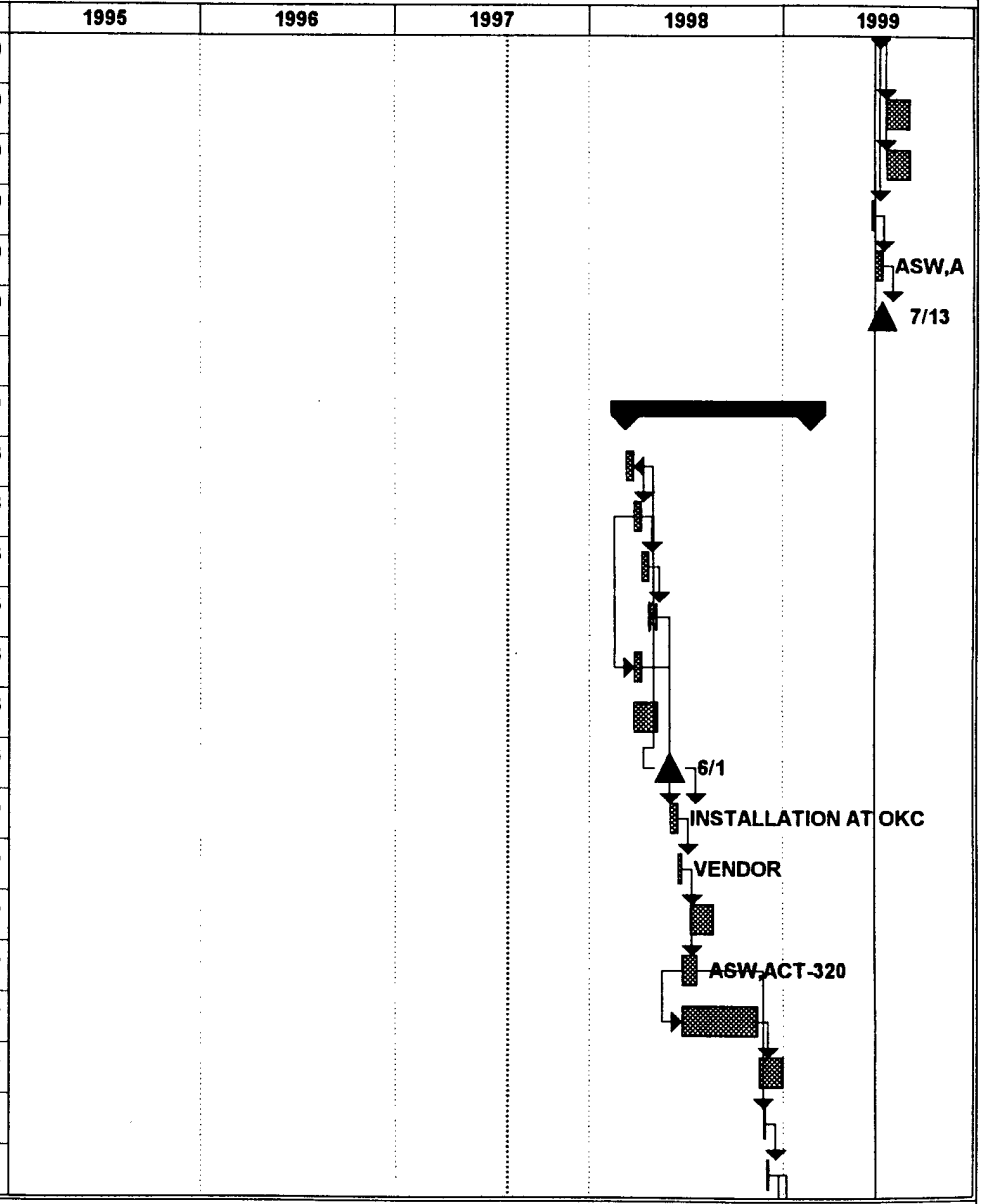
ID	Task Name	Duration	Start	Finish
210	LRU Bar Code Identification Report (NLT 24hrs. after (	1d	6/21/99	6/21/99
211	Final As-Built Drawings (30DA SAT & 15DARC) E04 (	32d	7/21/99	9/2/99
212	CAI Inspection Documentation Package (30DA SAT &	32d	7/21/99	9/2/99
213	Retrofit Testing	5d	6/21/99	6/25/99
214	Regional Operational Evaluation/Site Familiarization	10d	6/28/99	7/12/99
215	ORD at New Austin	1d	7/13/99	7/13/99
216				
217	**ACADEMY (OKC) WSP SYSTEM**	**238d**	**3/13/98**	**2/23/99**
218	Establish ASR-9 Baseline	10d	3/13/98	3/26/98
219	Deliver and Install Pre-Installation Kit	10d	3/27/98	4/9/98
220	Establish Modified ASR-9 Baseline	10d	4/10/98	4/23/98
221	Re-certify ASR-9/Flight Check	1d	4/24/98	4/24/98
222	Site Prep	10d	3/27/98	4/9/98
223	DT&E FAT Report (FAT+15 & 15DARC) D07	32d	3/26/98	5/8/98
224	OKC System Delivery (Same as WJHTC)	1d	6/1/98	6/1/98
225	Installation at OKC	10d	6/2/98	6/15/98
226	Contractor SAT	5d	6/16/98	6/22/98
227	DT&E SAT Report (SAT+15 & 15DARC) D07	32d	7/9/98	8/21/98
228	Prototype Testing	20d	6/23/98	7/21/98
229	Meteorological Verification Testing	100d	6/23/98	11/13/98
230	PAT&E FAT Report (PAT&E FAT+15 & 15DARC) D1	32d	11/16/98	12/31/98
231	Production Configuration Retrofit	2d	11/25/98	11/27/98
232	Production SAT	4d	11/30/98	12/3/98



WEATHER SYSTEMS PROCESSOR (WSP) MASTER TEST SCHEDULE - 6/12/97

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ID	Task Name	Duration	Start	Finish
233	"Red Lined" Installation Drawings (PSAT & 15DARC)	32d	12/4/98	1/21/99
234	PAT&E SAT Report (PAT&E SAT+15 & 15DARC) D1	32d	12/21/98	2/5/99
235	Contractor Acceptance Inspection (CAI)	1d	12/4/98	12/4/98
236	LRU Bar Code Identification Report (NLT 24hrs. after (	1d	12/7/98	12/7/98
237	Final As-Built Drawings (30DA SAT & 15DARC) E04 (	32d	1/7/99	2/23/99
238	CAI Inspection Documentation Package (30DA SAT &	32d	1/7/99	2/23/99
239	Retrofit Testing	5d	12/7/98	12/11/98
240				
241	FAA OT&E Integ/Op Quick Look Report	15d	6/25/99	7/16/99
242	Prepare FAA OT&E Integ/Op Final Report	60d	6/25/99	9/20/99
243	Submit Final Report	0d	9/20/99	9/20/99