AFOTEC PROJECT

DET1/TP--92-007

SOLAR ELECTRO-OPTICAL NETWORK (SEON) UPGRADE/REPLACEMENT PROGRAM PHASE I QUALIFICATION OPERATIONAL TEST AND EVALUATION PLAN

June 1993

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SOLAR ELECTRO-OPTICAL NETWORK (SEON) UPGRADE/REPLACEMENT PROGRAM PHASE I QUALIFICATION OPERATIONAL TEST AND EVALUATION PLAN

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13. ABSTRACT *(Maximum 200 words)*

Detachment 1, Air Force Operational Test and Evaluation Center will conduct a Qualification Operational Test and Evaluation (QOT&E) on the SEON Upgrade/Replacement Program during the fourth quarter of FY 1993 and the first quarter of FY 1994 at the Palehua Solar Observatory in Hawaii. The purpose of this QOT&E is to determine the operational suitability and effectiveness of the upgraded SEON so decision makers can decide what changes, if any, need to be made prior to upgrading the other sites. SEON measures solar events to predict their impact on manned space activities and satellite communication, and validates ionospheric disturbances. SEON interfaces with the Air Force Space Forecast Center and the Air Force Global Weather Central. It is comprised of five Solar Observing Optical Networks (SOONs) and four Radio Solar Telescope Networks (RSTNs) longitudinally separated to ensure the sun is constantly monitored. Each SOON is composed of a solar optical telescope (AN/FMQ-7) with automatic solar tracking. Each RSTN is composed of a solar radio telescope (AN/FRR-95) with automatic solar tracking. This equipment also measures the magnitude of solar flares and prepares the necessary solar event messages for release by the operator into the Automated Weather Network.

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b. **COI-2:** Do the SEON computers provide sufficient capabilities to support the mission?

c. **COI-3:** Does the upgraded RSTN allow detection of solar events?

d. **COI-4:** Does the upgraded SOON allow detection of solar events?

e. **COI-5:** Is the SEON software supportable?

f. **COI-6:** Does the SEON adequately report solar events?

g. **COI-7:** Is the SEON logistically supportable?

h. **COI-8:** Does the SEON facility provide adequate power and environmental support?

i. **COI-9:** Is the human factors engineering of the SEON adequate?

5. This QOT&E will be managed by Det 1, AFOTEC and supported by Detachment 5, Air Force Space Forecast Center, Palehua, Hawaii, and the 15th Communications Squadron, Hickam AFB, Hawaii. The test will be representative of the operational scenarios users are expected to employ during actual operations. All key user operational issues will be addressed during this QOT&E. The test will be conducted over a 90-day period, and will test the upgraded equipment and software and their effect on the mission capability of the SEON. Testing will be conducted during normal SEON operational duty hours, which are sunup to sundown (15 hours) each day for a total 1350 hours . The 90 days will be broken down into three 30-day phases: Simulations, Normal Operations, and Software. Phase 1, Simulations, conducted during the first 30 days, will consist of initial system start-up, solar event simulations, software and hardware maintainability, and a safety evaluation. Phase 2, Normal Operations, conducted during the middle 30 days, will evaluate the ability to perform the mission using real-time solar data. This phase also includes normal maintenance and the evaluation of the uninterruptable power source. Phase 3, Software, will evaluate the on-site programmers ability to perform depot maintenance on the system application software. This phase also includes human factors engineering, and software usability. There are no known test limitations identifiable before test start. The user, Air Weather Service, expects a representative sample of solar events to occur during the test.

6. The test directors will submit a report that addresses the using commands' critical operational issues. Briefings in support of the final report will be provided, as required. Status reports will be sent bi-weekly during the QOT&E. Activity and Significant Event reports will be prepared, as required.

EXECUTIVE SUMMARY

1. Detachment 1, Air Force Operational Test and Evaluation Center (Det 1, AFOTEC) will conduct a Qualification Operational Test and Evaluation (QOT&E) on the Solar Electro-Optical Network (SEON) Upgrade/Replacement Program during the fourth quarter of FY 1993 and the first quarter of FY 1994 at the Palehua Solar Observatory in Hawaii. The purpose of this QOT&E is to determine the operational suitability and effectiveness of the upgraded SEON prior to considering upgrading the other sites.

2. The SEON is the only current or planned network that can provide optical and radio solar observations support to the Department of Defense (DOD). It measures solar events to predict their impact on manned space activities and satellite communications, and validates ionospheric disturbances. The SEON interfaces with the Air Force Space Forecast Center and the Air Force Global Weather Central, and is required to alert these facilities of all significant solar events within 2 minutes of their occurrence. The SEON is comprised of five Solar Observing Optical Networks (SOONs) and four Radio Solar Telescope Networks (RSTNs) longitudinally separated to ensure the sun is constantly monitored. Each SOON is composed of a solar optical telescope (AN/FMQ-7) with automatic solar tracking. Each RSTN is composed of a solar radio telescope (AN/FRR-95) with automatic solar tracking. The data from each solar observatory is collected and analyzed using automated computer processing equipment. This equipment also measures the magnitude of solar flares and prepares the necessary solar event messages for release by the operator into the Automated Weather Network. The sites at Palehua, Hawaii, Learmonth, Australia, and San Vito Air Station, Italy, have both the SOON and RSTN and are referred to as combined sites. The sites at Holloman AFB, New Mexico and Ramey, Puerto Rico, only have a SOON. The site at Sagamore Hill, Massachusetts, only has a RSTN. The upgraded system will consist of new charge-coupled device (CCD) cameras in the SOON, replacement of analog-to-digital and digital-to-analog converters, relay drivers, and logic cards in the SOON with an Intelligent Data Acquisition System (IDAS), replacement of the sweep frequency interferometric radiometer (SFIR) in the RSTN, and replacement of the computer hardware and software to operate the SOON and RSTN.

3. This program was initiated due to the decreasing maintenance supportability and limited operational effectiveness of the current system's hardware and software. It will replace the current obsolete and logistically unsupportable equipment with commercial-off-the-shelf equipment and automate many of the current manual procedures. The upgrade will increase operational effectiveness in several critical areas by taking advantage of proven and emerging technology. There has been no known operational test and evaluation previously performed on the SEON. No follow-on test is planned.

4. The following Critical Operational Issues (COIs) were developed by the using commands and will be addressed during this QOT&E:

a. **COI-1:** Is the upgraded SEON safe to operate and maintain?

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LIST OF ABBREVIATIONS/ACRONYMS/SYMBOLS

%	percent
°F	degrees Fahrenheit
A	angstroms
A/D	analog-to-digital
ACC	Air Combat Command
AFETS	Air Force Engineering and Technical Services
AFGWC	Air Force Global Weather Central
AFMC	Air Force Materiel Command
AFOTEC	Air Force Operational Test and Evaluation Center
AFR	Air Force Regulation
AFSC	Air Force Specialty Code
AFSCR	Air Force Space Command Regulation
AFSFC	Air Force Space Forecast Center
AFSFCP	Air Force Space Forecast Center Pamphlet
AFSFCR	Air Force Space Forecast Center Regulation
AFSPACECOM	Air Force Space Command
AFTO	Air Force Technical Order
ASCII	American National Standard Code for Information Interchange
AWN	Automated Weather Network
AWS	Air Weather Service
AWSR	Air Weather Service Regulation
BIT	built-in tests
CAT	category
CCD	charge-coupled device
CDR	critical design review
CFAT	Contractor First Article Test
CG	Communications Group
COI	critical operational issue
COMSEC	communications security
COTS	commercial-off-the-shelf
CPU	central processing unit
CRA	centralized repair activity
D/A	digital-to-analog
DCL	digital command language
Det	detachment
DIPS	Digital Imagery Processing Subsystem
DOD	Department of Defense
DPI	digital port interface

DSRD	Depot Support Requirements Document
EMI	Electro-magnetic interference
ESI	Electrospace Systems, Incorporated
FAD	force activity designator
FAT	first article test
FRD	Functional Requirements Descriptions
FY	fiscal year
HFE	human factors engineering
HQ AWS	Headquarters Air Weather Service
IAW	in accordance with
IDAS	Intelligent Data Acquisition System
ILS	integrated logistics support
ISSL	initial supply support listing
kms	kilometers per second
LAN	local area network
LIA	lock in amplifiers
LRU	line replaceable unit
Max TTR	maximum time to repair
MDT	mean down time
MHz	megahertz
MILDEP	military department
MIP	material improvement project
MOE	measure of effectiveness
MOP	measure of performance
MRT	mean repair time
MTBCF	mean time between critical failures
MTBMc	mean time between maintenance corrective
MTTR	mean time to repair
NGDC	National Geophysical Data Center
NDS	non-developmental software
OJT	on-the-job training
OPSEC	Operations Security
OT&E	operational test and evaluation
OTA	Operational Test Agency

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PACAF	Pacific Air Forces
PMI	preventative maintenance inspection
PMP	Program Management Plan
POC	point of contact
PQDR	product quality deficiency reports
QOT&E	qualification operational test and evaluation
RCN	report control number
RFI	radio frequency interference
RSTN	Radio Solar Telescope Network
SEON	Solar Electro-Optical Network
SASS	Space Environmental Support System
SFIR	Sweep Frequency Interferometric Radiometer
SFZ	solar flux unit
SM-ALC	Sacramento Air Logistics Center
SOON	Solar Observing Optical Network
SPO	System Program Office
STM	Software Test Manager
TDSB	test data scoring board
T.O.	technical order
TEMP	test and evaluation master plan
TEMPEST	control of compromising emissions
TRP	test resource plan
TSG	test support group
TTR	time to repair
UPS	uninterruptable power source
USAFE	United States Air Forces Europe
UTR	uptime ratio

SECTION 1 - INTRODUCTION

1.0. GENERAL. Detachment 1, Air Force Operational Test and Evaluation Center (Det 1, AFOTEC) will conduct a Qualification Operational Test and Evaluation (QOT&E) of the Solar Electro-Optical Network (SEON) Upgrade/Replacement Program during the fourth quarter of fiscal year (FY) 93 and the first quarter of FY 94 at the Palehua Solar Observatory in Hawaii. The purpose of this QOT&E is to provide information to decision makers on the suitability and effectiveness of the upgraded SEON for milestone III decision maker consideration prior to upgrading the other sites. The Test Director will coordinate with the System Program Office (SPO) and Headquarters Air Weather Service (HQ AWS) on all proposed changes to this plan. The Commander, Det 1, AFOTEC has approval authority for all changes to this QOT&E plan. If a change is approved prior to the start of the test, either write-in changes or page changes will be issued, as appropriate. Once the test has started, all changes will be annotated in the report.

1.1. SYSTEM INFORMATION:

1.1.1. Background. This program was initiated due to the decreasing maintenance supportability and limited operational effectiveness of the current system hardware. This program will replace the current obsolete and logistically unsupportable equipment with commercial-off-the-shelf (COTS) equipment, and automate many of the current manual procedures at the six SEON sites. The upgrade will increase suitability and operational effectiveness in several critical areas by taking advantage of proven and emerging technology. There has been no known operational test and evaluation previously performed on the SEON. Program Management Directive 8205(3)/PE35111F, 19 March 1992, directs Air Force Materiel Command (AFMC) with implementation of this program. The Program Management Plan, 30 March 1989, delegates SPO responsibility to Sacramento Air Logistics Center (SM-ALC). This program has a United States Air Force precedence rating of 3-06 and a Force Activity Designator (FAD) of III for acquisition. SEON has an operational precedence rating of 1-1 and a FAD of I. Other relevant program documents include the System Operating Requirements Document (SORD) dated 10 August 1989, and the Test and Evaluation Master Plan (TEMP) dated 1 April 1993.

1.1.2. Description:

1.1.2.1. The present SEON was installed in the mid-1970s, utilizing proven technology of solar observing systems developed in the 1960s. The optical and electronic equipment were designed, manufactured, and individually installed by a small group of scientists. The SEON is the only current or planned network that can provide optical and radio solar observations support to the Department of Defense (DOD). It measures solar events to predict their impact on manned space activities and satellite communications, and validates ionospheric disturbances. The SEON interfaces with the Air Force Space Forecast Center (AFSFC) and the Air Force Global Weather Central (AFGWC), and is required to alert these facilities of all significant solar events within 2 minutes of their occurrence. The

SEON wasn't designed nor intended to operate in a high-threat environment. Air Force weather forecasters and observers operate the SEON under the control of the AFSFC. Air Force weather officers stationed at Palehua are trained in computer programming and identify software problems, recommend software changes, and perform software maintenance for the SEON. The SEON hardware is maintained by Air Force weather equipment technicians (Air Force specialty code 304X2) from the local supporting major command; e.g., United States Air Forces Europe (USAFE), Pacific Air Forces (PACAF), or Air Combat Command (ACC). Air Force Engineering and Technical Services (AFETS) personnel from Palehua, Hawaii, and Holloman Air Force Base (AFB), New Mexico, provide maintenance training. Each site has developed local training to supplement the AFETS training. Detachment 4, AFSFC will provide operations training to all sites.

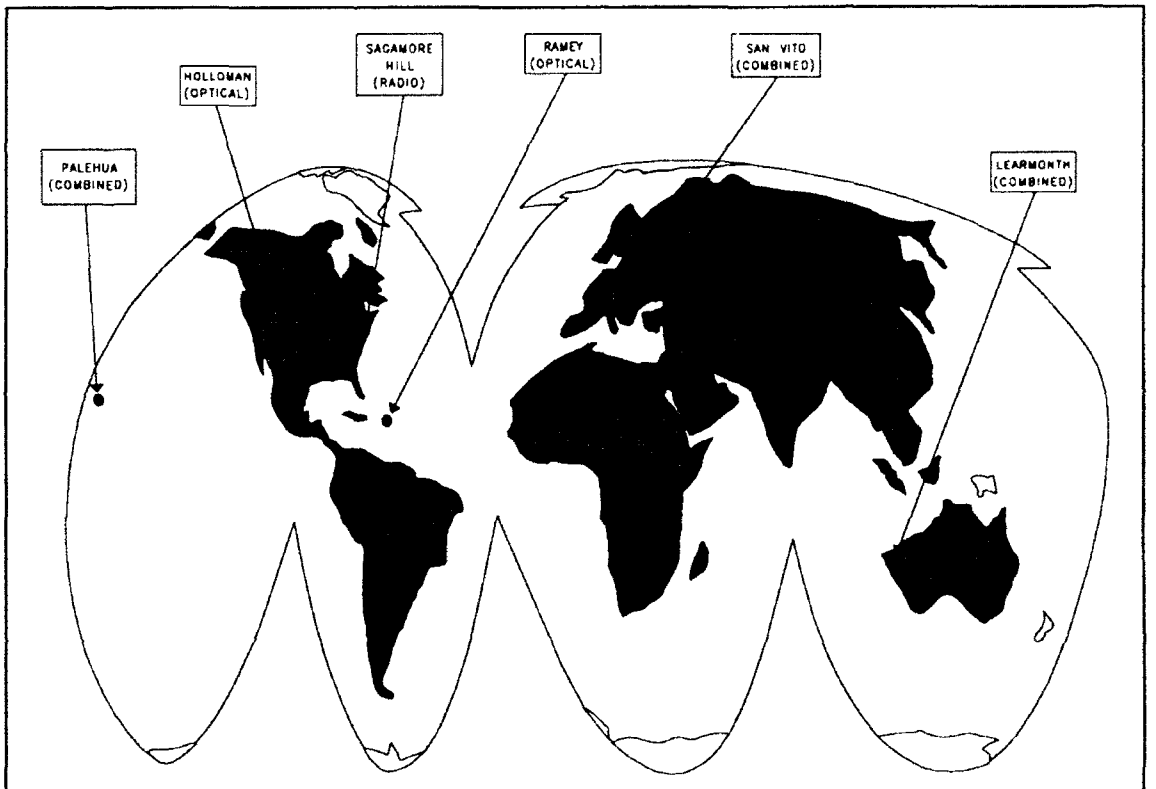

FIGURE 1-1. LOCATION OF SEON SITES

1.1.2.2. The SEON is comprised of five Solar Observing Optical Networks (SOONs) and four Radio Solar Telescope Networks (RSTNs) longitudinally separated to ensure the sun is constantly monitored (refer to Figure 1-1). The SOON is a solar optical telescope (AN/FMQ-7) with automatic solar tracking. The RSTN is a solar radio telescope (AN/FRR-95) with automatic solar tracking. The sites at Holloman AFB, New Mexico, and Ramey, Puerto Rico, only have a SOON. The site at Sagamore Hill, Massachusetts,

only has a RSTN. The sites at Palehua, Hawaii; Learmonth, Australia; and San Vito Air Station, Italy, have both the SOON and RSTN and are referred to as combined sites. A single computer is currently employed at each solar observatory to collect and analyze the solar data. This computer also measures the magnitude of solar flares and prepares the necessary event messages for release by the operator. The proposed upgrade consists of the following (refer to Figure 1—2 for system diagram):

1.1.2.2.1. Replacement of the two video cameras in the SOON with charge-coupled device (CCD) cameras. The CCDs will interface with the new SOON computer through the existing Digital Imagery Processing Subsystem (DIPS). The CCDs will also interface with the VAX 4000 computer, DIPS, video system, television monitors, switches, and distribution amplifiers.

1.1.2.2.2. Replacement of the analog-to-digital and digital-to-analog converters, relay drivers, and logic cards in the SOON with an Intelligent Data Acquisition System. This will allow the operation of the SOON to continue to be fully automated.

1.1.2.2.3. Replacement of the sweep frequency interferometric radiometer (SFIR) in the RSTN. The current SFIR collects data between 25—75 megahertz (MHz) while the new SFIR will collect data between 30—250 MHz. The new SFIR will provide better real-time information to the operator.

1.1.2.2.4. Replacement of the computer hardware. Each SOON and RSTN will have its own computer system as shown in Figure 1-2. A thin-wire Ethernet will interconnect the individual computers and the terminal server. At combined sites, the computer systems will use fiber optics to interconnect the two Ethernet terminal servers. At these combined sites, the work stations must be able to provide mutual backup.

1.1.2.2.5. An uninterruptable power source will be provided to ensure stable operation of the computer systems. It must provide power long enough for backup power to be established or the system safely shutdown without the loss of any data.

1.1.2.2.6. Upgrade software shall improve code documentation and efficiency while retaining the present SEON functions as described in the SEON and RSTN Functional Requirements Descriptions (FRDs).

1.1.2.3. SEON is a part of the Space Environmental Support System (SESS). The SESS observes and forecasts environmental conditions and system effects on DOD systems operating more than 50 kilometers above the earth's surface. The SESS Forecast Center is currently located at the AFGWC at Offutt AFB, Nebraska (refer to Figure 1—3).

1.1.2.4. The Palehua Solar Observatory was selected for the QOT&E because it is a combined SOON and RSTN site and acts as the depot maintenance and software development site for all SEON software programs. The on-site programmers are experts on

the system and fully understand its operational requirements. Additionally, the required manpower to conduct the test is already in place, saving substantial TDY cost over the length of the test.

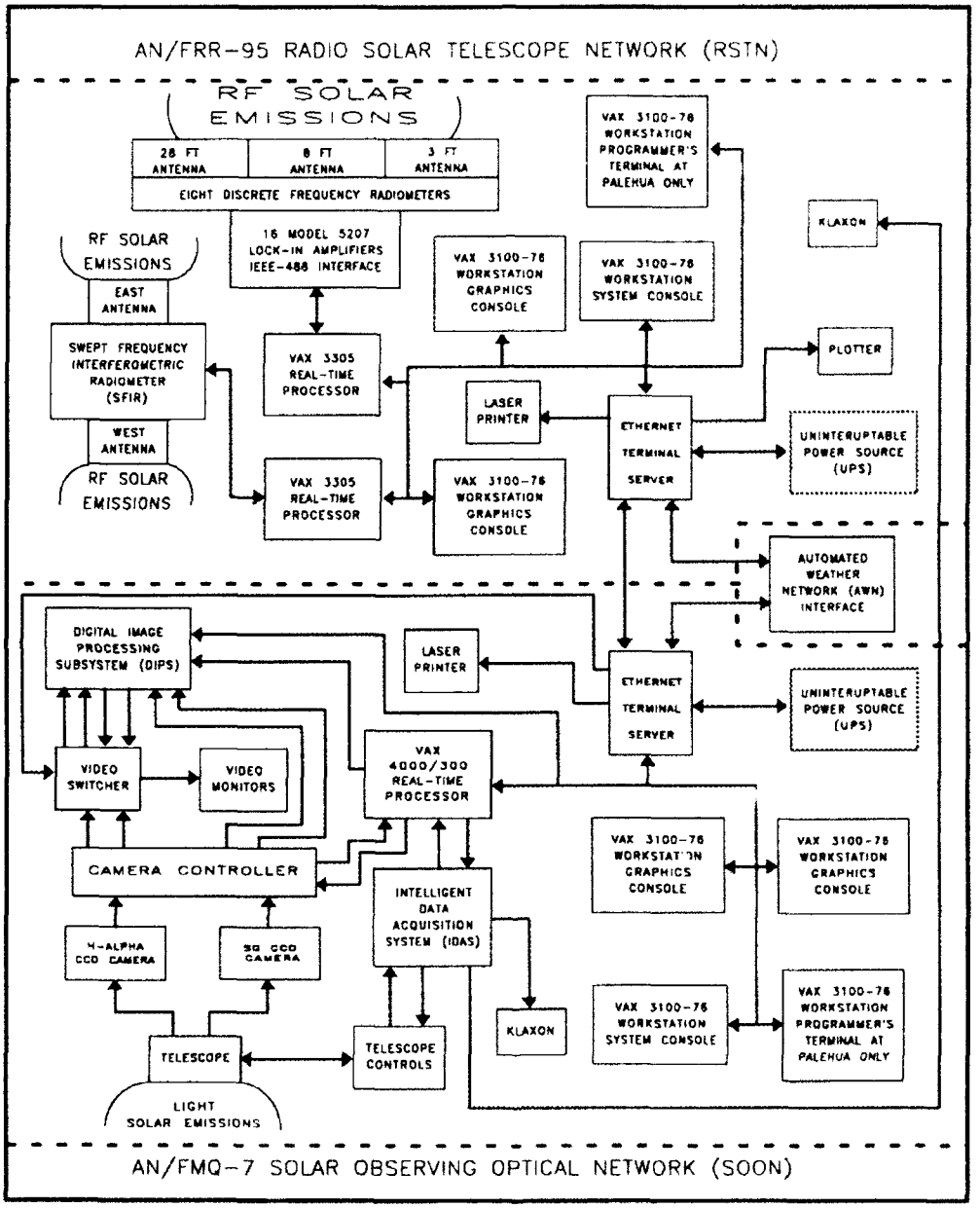

FIGURE 1-2. SEON BLOCK DIAGRAM

1.2. OPERATIONAL ENVIRONMENT. The SEON is operated under the direction of HQ AWS. Currently, all three levels of maintenance are used (organizational, intermediate, and depot); however, only organizational-level and depot-level maintenance will be used to support all new equipment resulting from this program. AFMC will provide software configuration management and control, and maintain system software. Personnel at Palehua, Hawaii, will maintain the operational software.

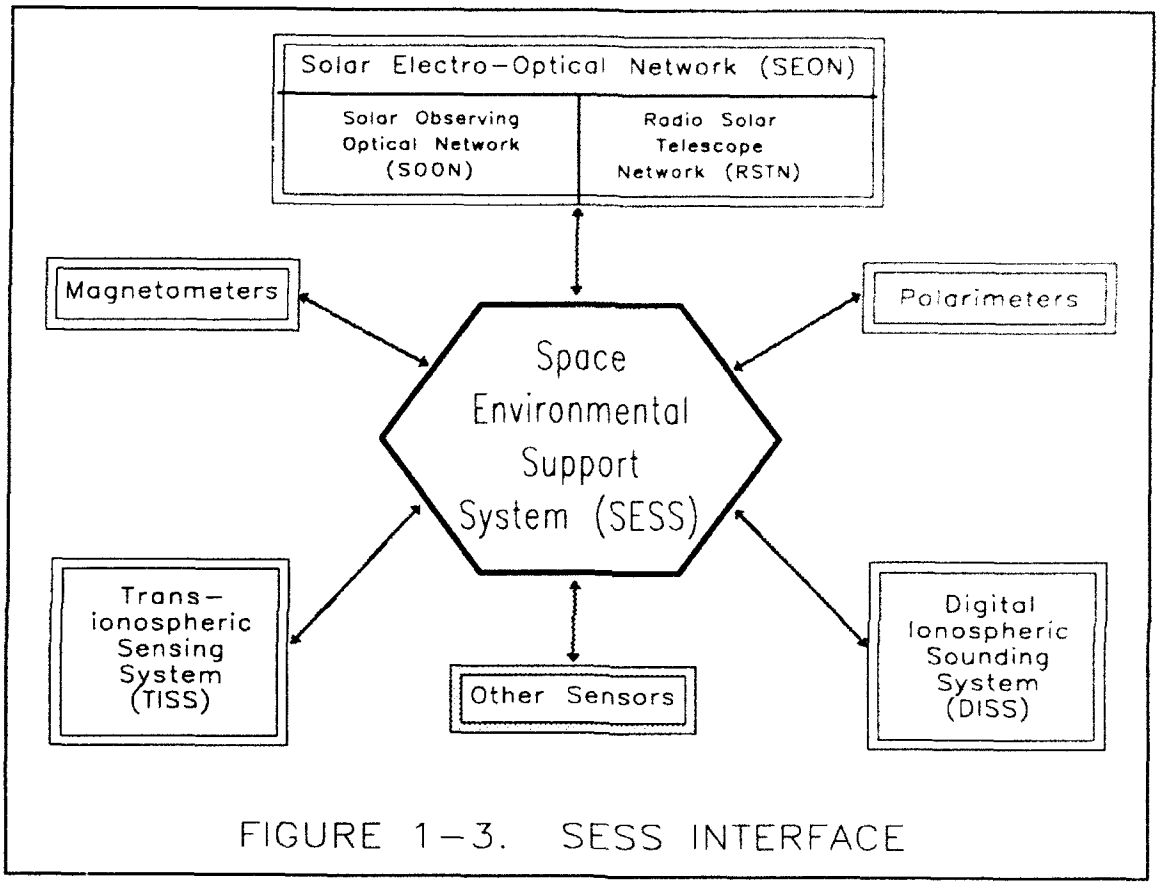

FIGURE 1-3. SESS INTERFACE

1.2.1. Threat Summary. The SEON is not expected nor designed to operate in a hostile environment. It isn't hardened to operate in a chemical, biological, or radiological environment. Since none of the SEON is classified, security guides are not required for the equipment, details of equipment performance, or design specifications. Communications security has been considered and is not required.

1.2.2. Operational Concept. Each site is required to operate from sunup to sundown. Their location allows two sites to concurrently monitor solar activity, increasing the network's overall effectiveness. The effectiveness of the SOON is degraded by any object that obscures the optical path between the telescope and the sun; e.g., clouds. The effectiveness of the RSTN is degraded by radio frequency interference that causes false signals. Each SEON site reports within 2 minutes after detection of all significant solar

events using message traffic routed over the Automated Weather Network (AWN). AFSFC and AFGWC use the information to forecast the effects of solar activity on manned space activities and satellite communications.

1.2.3. Maintenance Concept:

1.2.3.1. Air Force personnel in the 304X2 career field will maintain the SEON. Air Force Regulation 39—11 classifies SEON maintenance as a special duty. The Consolidated Repair Activities, which currently perform the intermediate-level maintenance, will provide technical guidance and maintenance as needed on the new equipment. The SOON Centralized Repair Activity (CRA) is located at Holloman AFB, New Mexico, and the RSTN CRA is located at Palehua, Hawaii. Except for some optics conditioning done at Hill AFB, Utah, all depot support will be provided by the CRAs.

1.2.3.2. The upgraded SEON will not require peculiar test equipment or tools. All failures will be detected using test points and existing test equipment. Self-diagnostics will detect a minimum of 90 percent (%) of all faults. Replacing a single line replaceable unit (LRU) must correct a minimum of 90% of all detected faults, replacing no more than two LRUs must correct a minimum of 95% of all detected faults, and replacing no more than three LRUs must correct a minimum of 99% of all detected faults.

1.2.3.3. AFMC will do software configuration management and control, and maintain system software. Personnel at Palehua, Hawaii, will maintain the operational software.

1.2.3.4. The supply support system provides for sufficient spares to allow a "remove and replace" maintenance concept. Spares data will be prepared by the systems contractor. This data will identify all parts used in the fabrication of the mechanical and electronic components. From this data, spares to support the QOT&E will be procured. For the first year after installation of the system upgrade, a warranty will be in effect that will cover all upgrade components.

1.2.4. Training Concept. The contractor; Electrospace Systems, Incorporated (ESI); will provide initial operator training during equipment installation and checkout at each site. The new operations will then be incorporated into the existing operators training currently taught at Holloman AFB, New Mexico. The sites will conduct refresher training using technical orders or manuals. The Air Force Engineering and Technical Services personnel (AFETS) will continue to provide ongoing training to all SEON maintenance personnel. ESI will provide organizational-level maintenance training to technicians and AFETS. They will also provide depot-level maintenance training to the CRAs and AFETS.

1.3. ACQUISITION PROGRAM STRUCTURE:

1.3.1. This program is nondevelopmental. The program will incorporate new COTS hardware with nondevelopmental software (NDS) and operational software. The

operational software will allow the operators to interface with the different NDS, and control the SEON. The operational software will be written in the Ada programming language. ESI was selected by competitive bid as the contractor who will integrate the new hardware, existing hardware, and new software into the SEON.

1.3.2. The contractor's first article testing must be completed prior to the start of QOT&E. QOT&E is scheduled to begin during the second quarter of FY 1993. Table 1−1 is the current schedule for QOT&E.

Table 1-1. QOT&E Program Schedule and Milestones

ACTIVITY	DATES
QOT&E Plan	June 93
Installation Completed	June 93
Conducting Dedicated QOT&E	Aug to Nov 93
QOT&E Final Report	Jan 94
Material Improvement Project Review Board	Jan 94
Milestone III Decision	Jan 94

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SECTION 2 - OPERATIONAL TEST AND EVALUATION (OT&E) OUTLINE

2.0. Critical Operational Issues (COIs). The COIs were taken directly from the Solar Electro-Optical Network (SEON) Test and Evaluation Master Plan (TEMP), 1 Apr 93. These nine COIs were broken into specific quantitative or qualitative Measures of Performances (MOPs) reflecting key parameters. The Test Data Scoring Board (TDSB) will evaluate results before assigning ratings to the MOPs. The TDSB will then aggregate the results to rate the COI based on mission impact. All MOPs rated "did not meet user criteria" will be evaluated for impact upon mission accomplishment before assigning an overall rating to the affected COI. All critical MOPs must meet user requirements in order to rate the associated COI as "resolved satisfactory." In addition, MOPs marked as "significant" were determined to have a significant impact on mission accomplishment. To cause the COI to be rated "resolved unsatisfactory," the results of these MOPs must fail to meet user criteria and prevent mission accomplishment. The Qualification Operational Test and Evaluation (QOT&E) will test the MOPs against documented user requirements and will result in one of the following two ratings: "**Met User Requirements**" or "**Did Not Meet User Requirements**." The final report will use the MOP findings to answer each COI as "resolved satisfactory" or "resolved unsatisfactory." Finally, the QOT&E test report will use the answers to the COIs to provide the Milestone Decision Authority the following statement: "Based upon demonstrated performance during QOT&E, the system is/is not operationally effective/suitable."

2.0.1. The COIs are as follows:

2.0.1.1. COI-1: Is the upgraded SEON safe to operate and maintain?

2.0.1.2. COI-2: Do the SEON computers provide sufficient capabilities to support the mission?

2.0.1.3. COI-3: Does the upgraded Radio Solar Telescope Network (RSTN) allow detection of solar events?

2.0.1.4. COI-4: Does the upgraded SOON allow detection of solar events?

2.0.1.5. COI-5: Is the SEON software supportable?

2.0.1.6. COI-6: Does the SEON adequately report solar events?

2.0.1.7. COI-7: Is the SEON logistically supportable?

2.0.1.8. COI-8: Does the SEON facility provide adequate power and environmental support?

2.0.1.9. COI-9: Is the human factors engineering of the SEON adequate?

2.0.2. Objectives: Objectives are listed in order of precedence. The "E" or "S" preceding the number indicates the objective relates to either the system's effectiveness or suitability, respectively.

2.0.2.1. S-1. The safety of the upgraded Solar Electro-Optical Network (SEON).

2.0.2.2. S-2. The capabilities of the SEON computers (includes analysis of mutual backup, restoral, archival, and operational capabilities).

2.0.2.3. E-3. The capability of the Radio Solar Telescope Network's (RSTNs) swept frequency interferometric radiometer (SFIR) subsystem.

2.0.2.4. E-4. The capability of the RSTN's discrete frequency radiometer.

2.0.2.5. E-5. The capability of the computer to interface with the lock-in amplifiers (LIAs).

2.0.2.6. E-6. The capability of the Solar Observing Optical Network's (SOON) charged coupled devices (cameras) and their interfaces.

2.0.2.7. E-7. The capabilities of the digital imagery processing subsystem (DIPS) to perform its mission.

2.0.2.8. E-8. The capability of the SOON's analog to digital (A/D) converters.

2.0.2.9. E-9. The capability of the SOON's digital to analog (D/A) converters.

2.0.2.10. E-10. The capability of the interface between the SOON's computer and the DIPS.

2.0.2.11. S-11. The usability of the SEON software.

2.0.2.12. S-12. The maturity of the SEON software.

2.0.2.13. S-13. The logistics supportability, readiness, and maintainability of the SEON.

2.0.2.14. E-14. The capability of the network to transmit and receive messages over the Automated Weather Network (AWN).

2.0.2.15. S-15. The adequacy of the technical data provided with the upgraded SEON.

2.0.2.16. E-16. The capability of the system's built-in tests (BIT) to support mission needs.

2.0.2.17. S-17. The training provided to support the upgraded SEON.

2.0.2.18. E-18. The capability of the programmers to perform their mission.

2.0.2.19. E-19. The capability of the uninterruptable power source (UPS).

2.0.2.20. S-20. The maintainability of the SFIR software.

2.0.2.21. S-21. The maintainability of the SEON.

2.0.2.22. S-22. The environmental control of the Palehua Solar Observatory.

2.0.2.23. S-23. The maintainability of the discreet frequency radiometer software.

2.0.2.24. S-24. The maintainability of the SOON software.

2.0.2.25. S-25. The support resources of the SEON software.

2.0.2.26. S-26. The life-cycle process of the SEON software.

2.0.2.27. S-27. The human factors engineering (HFE) aspects of the upgraded SEON.

2.0.2.28. S-28. The impact of electro-magnetic interference (EMI)/radio frequency interference (RFI) on SEON operations.

2.0.3. COI/Objective Matrix.

CRITICAL OPERATIONAL ISSUES

		1	2	3	4	5	6	7	8	9
	S-1	X								
O	S-2		X							
B	E-3			X						
J	E-4			X						
E	E-5		X							
C	E-6				X					
T	E-7				X					
I	E-8				X					
V	E-9				X					
E	E-10		X							
S	S-11					X				
	S-12					X				
	S-13							X		

(Continued next page)

COI/Objective Matrix (Continued)

CRITICAL OPERATIONAL ISSUES

		1	2	3	4	5	6	7	8	9
	E-14						X			
O	S-15							X		
B	E-16		X							
J	S-17							X		
E	E-18					X				
C	E-19								X	
T	S-20					X				
I	S-21							X		
V	S-22								X	
E	S-23					X				
S	S-24					X				
	S-25					X				
	S-26					X				
	S-27									X
	S-28								X	

2.1. SCOPE AND TEST CONCEPT.

2.1.1. This QOT&E will encompass both operational effectiveness and suitability issues by performing an operational evaluation of an upgraded SEON site comprised of both SOON and RSTN subsystems. The test will be representative of the operational scenarios users are expected to employ during actual operations. Solar event simulators will be used during Phase 1 to provide a means to verify proper initial operation of the system. These simulators require the operators and the system to perform the same functions they will perform during normal events. During Phase 2 and 3 of the test, and during all times when specific test scenarios are not being performed, the test team will observe and evaluate SEON as it performs its primary mission of solar patrol. There are no differences in the mission SEON will perform during test, and that which it is expected to perform during normal operations. All key user operational issues will be addressed during this QOT&E. The test will be conducted over a 90-day period, and will test the upgraded equipment and software and their effect on the mission capability of the SEON. Testing will be conducted during normal SEON operational duty hours which are sunup to sundown (15 hours) each day for a total 1350 hours. The 90 days will be broken down into three 30-day phases: Simulations, Normal Operations, and Software. Phase 1, Simulations, conducted during the first 30 days, will consist of initial system start-up, solar event simulations, software and hardware maintainability, and a safety evaluation. Phase 2, Normal Operations, conducted during the middle 30 days, will evaluate their ability to

perform the mission using real-time solar data. This operational solar data will be compared to the solar data simultaneously obtained by other SEON locations to determine the operational effectiveness of the upgraded system. This phase also includes normal maintenance and the evaluation of the uninterruptable power source. Phase 3, Software, will evaluate the on-site programmers ability to perform depot maintenance on the system application software. This phase also includes human factors engineering, and software usability. Reliability, Maintainability, and Availability (RMA) data will be collected during the entire test period and will be used to determine the operational suitability of the SEON. No specific test limitation has been identified. Data reduction and data analysis will occur daily during the test. The daily test schedule has 2 hours per day dedicated to these activities. The user, Air Weather Service, expects a representative sample of solar events to occur during the test. The following schedule outlines our plan:

PHASE ONE - SIMULATIONS:

NOTE: Test start day = TS+0

Test Objective	Start	Number Days Scheduled
Initial Support Supply Listing (ISSL)	TS+0	1 day
Safety Evaluation	TS+0	1 day
System Start-up	TS+0	4 days
Software Maintainability	TS+0	10 days
Computer Operations	TS+5	18 days
RSTN Simulations	TS+7	6 days
SOON Flare Simulations	TS+7	7 days
Resolution Target	TS+17	2 days
DIPS Interface	TS+25	3 days
Faults	TS+28	3 days

PHASE TWO - NORMAL OPERATIONS:

Test Objective	Start	Number Days Scheduled
Normal Patrol Duties	TS+31	30 days
Preventative Maintenance Inspections	TS+33	7 days
Uninterruptable Power Source (UPS)	TS+40	7 days

PHASE THREE - SOFTWARE:

Test Objective	Start	Number Days Scheduled
Usability	TS+61	7 days
HFE Survey	TS+62	1 day

PHASE THREE - SOFTWARE (CONTINUED):

Test Objective	Start	Number Days Scheduled
Support Resources	TS+69	4 days
Programming Scenarios	TS+75	15 days

NOTE: Testing will usually occur during the normal operating hours of the site which is open from sunup to sundown. This equates to a 15-hour duty day for the site during the test period.

2.2. PLANNING CONSIDERATIONS AND LIMITATIONS:

2.2.1. Planning Considerations:

2.2.1.1. The limited length of the QOT&E may restrict high-confidence level, statistical verification of logistics supportability, readiness, and maintainability results. Because of this, the user agreed to rate the results of the reliability and maintainability evaluations from the performance data gathered, disregarding a lack of statistical confidence.

2.2.1.2. If actual solar events do not occur, the charge-coupled devices (CCDs) and solar telescope will be tested using stored and artificial event images to simulate solar activity. These images will be introduced into the SOON and will allow conclusions to be made about their capabilities from data collected.

2.2.1.3. Because of the limited length of the QOT&E, all possible solar events are not expected to occur. This may prevent a high confidence that the upgraded system can detect all types of solar activity. Because of this, the users have agreed that the system effectiveness should be rated based on the data gathered operationally, and on data gathered through the various simulations.

2.2.1.4. If operational commitments conflict with the scheduled test events, delays in the QOT&E may occur.

2.2.1.5. In the case of a SEON system failure, the Test Director will determine if the contractor will be allowed to make any modifications or adjustments. If a modification or adjustment is made, its effect on the previously collected data must be carefully considered. Modifications that invalidate enough data to prevent conclusive results will not be allowed.

2.2.2. Limitations. The sun is currently in a time of decreased activity and all solar events may not occur during the time of the QOT&E. The user, AWS, expects a representative sample of solar events to occur during the test period and cannot identify, before hand, a specific event that will not occur. Therefore, there are no known test

identifiable before test start. All COIs will be resolved as a result of this QOT&E.

2.3. SYSTEM CONTRACTOR INVOLVEMENT IN DEDICATED OT&E. There will be no system contractor involvement during this QOT&E except as indicated in paragraph 2.2.1.5. above.

2.4. OT&E SCHEDULE AND READINESS REQUIREMENTS:

2.4.1. The following is the schedule for QOT&E events:

2.4.1.1. Planning the QOT&E will be ongoing. The following activities are scheduled or have taken place:

2.4.1.1.1. Nov 91: the test support group (TSG) met at the Palehua Solar Observatory in Hawaii. During the meeting, COIs, objectives, and user criteria were developed for submission to the System Program Office (SPO) for development of the TEMP.

2.4.1.1.2. Mar 92: the TSG met at the Air Force Space Forecast Center (AFSFC) at Falcon Air Force Base (AFB), Colorado. The draft QOT&E plan was reviewed by the users and SPO focusing on testing methodology and acceptable criteria. Action items were assigned to the appropriate agency for resolution.

2.4.1.1.3. Mar 92: the TSG met at McClellan AFB, California, to determine procedures for aggregation of the test results for rating the applicable critical operational issues. The draft QOT&E plan was reviewed by the using command and SPO. Action items were assigned to the appropriate agency for resolution.

2.4.1.1.4. Aug 92: TSG meeting was held at Sacramento Air Logistics Center to develop a method for aggregating the MOP results to rate the COIs.

2.4.1.1.5. Nov 92: the contractor first article test (CFAT) was performed at Electrospace Systems, Incorporated (ESI) in Richardson, Texas. This test will be considered the qualification test and evaluation, and will validate that the technical specifications were met.

2.4.1.1.6. Nov 92: QOT&E test plan was submitted for approval.

2.4.1.1.7. Dec 92: the TSG will meet at the Palehua Solar Observatory in Hawaii to finalize the detailed test procedures.

2.4.1.1.8. May 93: the installation of the upgrade at the Palehua Solar Observatory in Hawaii completed.

2.4.1.2. Jan - Nov 93: QOT&E will occur. The following activities are scheduled or

have taken place:

2.4.1.2.1. Feb to Jun 93: the software life-cycle evaluation data collection at Sacramento Air Logistics Center (SM-ALC) at McClellan AFB, California; the Palehua Solar Observatory, Hawaii; and ESI in Richardson, Texas. Results of the evaluation will be published in the final QOT&E report.

2.4.1.2.2. Jul 93: contractor maintainability demonstration at the Palehua Solar Observatory, Hawaii.

2.4.1.2.3. Jul 93: certification that the Palehua Solar Observatory SEON is ready for dedicated QOT&E by the SPO. This formally releases control of the system to the operational test agency (OTA).

2.4.1.2.4. Jul 93: software maintainability evaluation data collection at the Palehua Solar Observatory, Hawaii. Results of the evaluations will be published in the final QOT&E report.

2.4.1.2.5. Aug-Nov 93: dedicated QOT&E at the Palehua Solar Observatory, Hawaii. Data required to support the COIs for the SEON will be gathered. Product quality deficiency reports will be submitted in accordance with (IAW) Technical Order (T.O.) 00-35D-54 on all verified discrepancies. The following QOT&E events will also take place during this time:

2.4.1.2.5.1. Aug-Nov 93: software usability and support resources evaluations data collection. Results of the evaluations will be published in the final QOT&E report.

2.4.1.2.5.2. Nov 93: test data scoring board (TDSB) will convene at the test site to validate the reliability and maintainability data.

2.4.1.2.5.3. Aug-Dec 93: data reduction at Palehua Solar Observatory on a daily basis and at Scott AFB, Illinois, during phase 2 of the test and after the last test event at Palehua. All data collected will be reduced and validated. Results will be published in the QOT&E report.

2.4.1.3. Dec 93-Jan 94: QOT&E reporting will occur. During this period, the following activities are scheduled:

2.4.1.3.1. Jan 94: material improvement project review board hosted by SM-ALC at McClellan AFB, California. This board will take action IAW T.O. 00-35D-54.

2.4.1.3.2. Jan 94: QOT&E report board at Scott AFB, Illinois. The report board will review the document for proper format and philosophy. All conclusions and recommendations will be reviewed to ensure they are supported by the findings. After the

recommendations will be reviewed to ensure they are supported by the findings. After the required corrections are made, the QOT&E report will be forwarded for final approval.

2.4.1.3.3. Jan 94: QOT&E report printing and distribution at Scott AFB, Illinois. The final report will be printed and distribution made.

2.4.2. The following actions must be completed before the QOT&E can take place:

2.4.2.1. The SPO must develop and publish an approved TEMP.

2.4.2.2. The OTA must approve the QOT&E plan.

2.4.2.3. The SPO must ensure the SEON at the Palehua Solar Observatory is upgraded.

2.4.2.4. The SPO must ensure the CFAT is completed with satisfactory results.

2.4.2.5. The Commander of the Palehua Solar Observatory must have the upgraded SEON system safety inspected.

2.4.2.6. The SPO must provide the OTA with a written certification that the upgraded SEON at the Palehua Solar Observatory is ready for dedicated QOT&E.

2.4.3. RESOURCE SUMMARY. The upgraded SEON at the Palehua Solar Observatory, with the following personnel and material, are required to support this QOT&E:

Personnel

1 Test Director from the OTA
1 Associate Test Director from the OTA
1 Software Test Manager (STM) from the OTA
5 Associate STMs from the OTA (as required)
1 Data Analyst from the OTA (as required)
2 SEON programmers from Air Weather Service (AWS)
4 Weather forecasters from AWS
1 Information manager from AWS (as required)
1 Air Force Engineering and Technical Services (AFETS) from Air Combat Command (ACC)
4 Equipment technicians from the Pacific Air Forces (PACAF)
1 AFETS from PACAF
1 Systems expert from IPS radio space services
1 Software consultant from Phillips Labs

Required material not part of the SEON-1 upgrade.

2 SOON Flare Simulators
3 Hydrothermographs
1 Current SFIR with chart recorder
1 Notebook personal computer (PC)
1 Facsimile Machine
1 Desktop PC

Test Articles

SOON:

4 VAX 3100-76 Workstations
1 VAX 4000/300 Real Time Processor
1 LNO5R Laser Printer
1 H-Alpha CCD Camera
1 Spectrographic CCD Camera
1 Digital Imagery Processing Subsystem (DIPS)
1 AN/FMQ-7 Solar Optical Telescope
1 Camera Controller
1 Intelligent data acquisition
1 Uninterruptable Power Source
1 Ethernet terminal server

RSTN:

4 VAX 3100-76 Workstations
2 VAX 3305 Real Time Processors
1 LNO5R Laser Printer
16 Model 5207 Lock-in amplifiers
1 Swept Frequency Interferometric Radiometer
1 AN/FRR-95 Solar Radio Telescope
8 Discrete Frequency Radiometers
1 Plotter
1 Uninterruptable Power Source
1 Ethernet terminal server

Communications:

1 AWN interface
1 SELSIS interface

SECTION 3 - METHODOLOGY

3.0. GENERAL. This section describes the Qualification Operational Test and Evaluation (QOT&E) operational effectiveness and suitability test activities that will be accomplished by the test team during the Solar Electro-Optical Network (SEON) QOT&E. The Measures of Performance (MOPs), which are a quantitative or qualitative measure of a system's capabilities or characteristics, were derived from and support the Critical Operational Issues (COIs). The COIs are questions about critical operational issues concerning a system's essential capabilities, risks, or uncertainties which must be answered before the overall worth of the new or modified system can be estimated. The user, Air Weather Service, has identified 18 key parameters that will be fully tested during this QOT&E.

3.0.1. COI Summary:

3.0.1.1. The following matrix correlates the various test and evaluation events to the COIs they support.

Test Phase	Test Event	COI Supported
Simulations (day 1 - 30)	Safety	1
	Initial Support Supply Listing	7
	System Start-up	2
	Software Maintainability	5
	Computer Operations	2
	RSTN Simulations	3,6
	SOON Flare Simulations	4,6
	Resolution Target	4
	DIPS Interface	2,3,4,5
	Faults	2,7

Normal Operations (day 31 - 60)	Normal Patrol Duties	1,2,3,4,5,6,7,8,9
	Preventative Maintenance Inspections	7
	Uninterruptable Power Source (UPS)	8
Software (day 61 - 90)	Usability	5,9
	HFE Survey	9
	Support Resources	5
	Programming Scenarios	2,5

NOTE: See Section 2, paragraph 2.1.1. for a schedule of the above test events.

3.0.1.2. The COIs are listed below:

3.0.1.2.1. COI-1. Is the upgraded SEON safe to operate and maintain?

3.0.1.2.2. COI-2. Do the SEON computers provide sufficient capabilities to support the mission?

3.0.1.2.3. COI-3. Does the upgraded Radio Solar Telescope Network (RSTN) allow detection of solar events?

3.0.1.2.4. COI-4. Does the upgraded Solar Observing Optical Network (SOON) allow detection of solar events?

3.0.1.2.5. COI-5. Is the SEON software supportable?

3.0.1.2.6. COI-6. Does the SEON adequately report solar events?

3.0.1.2.7. COI-7. Is the SEON logistically supportable?

3.0.1.2.8. COI-8. Does the SEON facility provide adequate power and environmental support?

3.0.1.2.9. COI-9. Is the human factors engineering of the SEON adequate?

3.0.2. The following COI/MOP Matrix correlates each COI to the MOP(s) that support it.

COI-1	MOP 1-1: number of SEON safety hazards that meet category (CAT) I deficiency PQDR criteria. MOP 1-2: number of SEON safety hazards that meet CAT II deficiency PQDR criteria.
COI-2	MOP 2-1: number of real-time computer processors that cannot be restored using the Ethernet. MOP 2-2: number of workstations that cannot be restored to full mission capability from other nodes over the ethernet. MOP 2-3: number of computers that cannot be restored to full mission capability using the tape back-ups. MOP 2-4: number of interfaces not achieved between the computers and equipment. MOP 2-5: number of menu items that cannot be selected by a single keystroke or a single combination of two keystrokes (as in alt/F10). MOP 2-6: number of mission data segment changes not executable via operator menu selection. MOP 2-7: number of equipment checks and alignments not executable via keyboard entry. MOP 2-8: percent of selected text files adequately printed to the LN05R printers. MOP 2-9: percent of selected graphics files adequately printed to the LN05R printers. MOP 2-10: percent of screen images adequately printed to the LN05R printers. MOP 2-11: number of inadequate plots from the Sweep Frequency Interferometric Radiometer (SFIR). MOP 2-12: number of Digital Command Language (DCL) level functions that cannot be performed by the operators. MOP 2-13: number of nodes that cannot be assigned or reassigned without bringing the system down. MOP 2-14: uptime ratio (UTR) of the RSTN computer system. MOP 2-15: UTR of the SOON computer system.

COI-2 (Continued)	MOP 2-16: time required for operators to load and run new version software. MOP 2-17: performs required functions where the computer individually reads, writes, interacts and controls for each LIA. MOP 2-18: percent of faults detected by the automatic monitoring system. MOP 2-19: false alarm rate of faults by the automatic monitoring system. MOP 2-20: number of incorrect status indications. MOP 2-21: number of work stations assigned as system console, that cannot perform calibration of the DIPS. MOP 2-22: number of work stations assigned as system console, that cannot control the data image collection function of the DIPS. MOP 2-23: number of work stations assigned as system console, that cannot control the scheduling of movie replay function of the DIPS. MOP 2-24: number of workstations assigned as system console, that cannot control the remote shutdown of the DIPS. MOP 2-25: number of inadequate magnetic contour and Stoneyhurst plots performed by the system using data provisioned from the telescopes under control of the workstations.

COI-3	MOP 3-1: percent of solar bursts detected by the current SFIR between 30-75 megahertz (MHz) that are also detected by the new SFIR between 30-75 MHz while both SFIRs are operational. MOP 3-2: percent of solar bursts detected by other SFIRs (at other SEON sites) between 30-75 MHz that are also detected by the new SFIR. MOP 3-3: subjective rating by qualified analysts of solar sweep signatures detected between 30-75 MHz. MOP 3-4: subjective rating by qualified analysts of solar sweep intensities between 30-75 MHz. MOP 3-5: speed of Type 2 shocks. MOP 3-6: minimum sensitivity of the new SFIR at 30 MHz. MOP 3-7: minimum sensitivity of the new SFIR at 250 MHz. MOP 3-8: number of solar events, types of solar burst signatures, and bursts intensities between 75-250 MHz detected by the SFIR. MOP 3-9: percent of solar intensity difference between that indicated by the discrete frequency radiometer computer and the charted intensity. MOP 3-10: the computer reported burst characteristics (start time, maximum time, stop time, mean flux, integrated flux, and peak flux) compared to the charted characteristics. MOP 3-11: number of solar bursts the discrete frequency radiometer incorrect identifies (excluding Radio Frequency Interference (RFI)). MOP 3-12: subjective rating by experienced RSTN analysts and programmers of discrete frequency bursts.

COI-4	MOP 4-1: subjective rating by qualified analysts of H-Alpha images. MOP 4-2: minimum resolution of large scale H-Alpha images. MOP 4-3: minimum resolution of full disk H-Alpha images. MOP 4-4: subjective rating by qualified analysts of spectrographic images. MOP 4-5: minimum resolution of large scale spectrographic images. MOP 4-6: minimum resolution of full disk spectrographic images. MOP 4-7: subjective rating by qualified analysts of H-Alpha images transferred to the DIPS from the RS170 output of the charge-coupled device (CCD). MOP 4-8: subjective rating by qualified analysts of spectrographic magnetic data transferred to the DIPS. MOP 4-9: number of frames transferred to the DIPS from the SOON. MOP 4-10: DIPS playback speed. MOP 4-11: number of frames that can be stored by the DIPS. MOP 4-12: resolution of each frame (stored in the DIPS). MOP 4-13: sufficiency of shades of gray (of stored DIPS images). MOP 4-14: speed of overlaying pictures on stored grids (in the DIPS). MOP 4-15: subjective rating by trained SOON analysts and programmers of the histogram capability. MOP 4-16: minimum resolution of H-Alpha and visible light including magnesium ($Mg\ B_2$). MOP 4-17: resolution of the detected solar magnetic field. MOP 4-18: subjective rating by trained SOON analysts and programmers of the image enhancement of gray scale and pseudo color. MOP 4-19: rate of optical scan conversion. MOP 4-20: subjective rating by trained SOON analysts and programmers of the adequacy

COI-4 (Continued)	MOP 4-21: subjective rating by trained National Geophysical Data Center (NGDC) analysts of the adequacy of archived solar data. MOP 4-22: subjective rating by trained SOON analysts and programmers of the spectrographic output data. MOP 4-23: subjective rating by trained SOON analysts and programmers of the digital images (scaled, standardized, and superimposed). MOP 4-24: amount of degradation in current provided operability. MOP 4-25: performs required Analog to Digital (A/D) converter functions. MOP 4-26: number of SOON significant outages caused by an A/D converter. MOP 4-27: number of A/D converters failures. MOP 4-28: performs required Digital to Analog (D/A) converter functions. MOP 4-29: number of SOON significant outages caused by a D/A converter. MOP 4-30: number of D/A converter failures. MOP 4-31: subjective rating by experienced SOON analysts and programmers of solar flare analysis function.

COI-5	MOP 5-1: usability of the SEON software. MOP 5-2: maturity of the SEON software. MOP 5-3: maintainability of the SEON software. MOP 5-4: support resources of the SEON software. MOP 5-5: life-cycle process of the SEON software. MOP 5-6: time required to update and install completely new source software distribution into the system. MOP 5-7: number of approved software changes the programmers cannot introduce into the application software. MOP 5-8: system impact of testing software changes. MOP 5-9: number of tested software changes that cannot be introduced into the system without rebooting the computer. MOP 5-10: number of software development tools the programmers cannot effectively use. MOP 5-11: number of program documentation items the programmers cannot update. MOP 5-12: number of programming tasks that cannot be performed due to inadequate training.
COI-6	MOP 6-1: percent of message formats transmitted IAW Air Force Space Forecast Center Pamphlet (AFSFCP) 105-5. MOP 6-2: time between solar activity and transmission of the required message. MOP 6-3: number of errors between transmitted and received messages. MOP 6-4: number of solar events the analysts are unable to respond to within time constraints listed in Air Force Space Command Regulation.

COI-7	MOP 7-1: mean time between critical failure (MTBCF) of the RSTN. MOP 7-2: MTBCF of the SOON. MOP 7-3: mean time between maintenance corrective (MTBMc). MOP 7-4: mean repair time (MRT) of the SEON. MOP 7-5: MRT of the embedded computer resources. MOP 7-6: MRT of the SFIR. MOP 7-7: Max time to repair (Max TTR) for the SFIR. MOP 7-8: Max TTR for the CCD. MOP 7-9: Max TTR for the UPS. MOP 7-10: Max TTR for the SEON. MOP 7-11: number of failures not detected through test points using full resources. MOP 7-12: percent of detected faults corrected by replacing one line replaceable unit (LRU). MOP 7-13: percent of detected faults corrected by replacing a maximum of two LRUs. MOP 7-14: percent of detected faults corrected by replacing a maximum of three LRUs. MOP 7-15: number of special tools required to maintain the SEON. MOP 7-16: number of peculiar test equipment required to maintain the SEON. MOP 7-17: weekly preventive maintenance inspection (PMI) times for maintaining the upgraded portions of the SEON. MOP 7-18: weekly PMI times for maintaining the upgraded portions of the RSTN. MOP 7-19: amount of increased time required to perform weekly PMI for maintaining the non-upgraded portions of the RSTN. MOP 7-20: amount of increased time required to perform weekly PMI for maintaining the non-upgraded portions of the SOON.

COI-7 (Continued)	MOP 7-21: number and skill level of personnel required to perform any SEON maintenance routine. MOP 7-22: number of failures requiring more than removal and replacement of defective LRUs on the new SFIR, CCDs, IDAS, or computer resources. MOP 7-23: depot-level task completion time. MOP 7-24: MTBCF of the SFIR and discrete frequency radiometer. MOP 7-25: percent of initial spares support listing (ISSL) items filled at site prior to QOT&E. MOP 7-26: percent of critical ISSL items filled at site prior to QOT&E. MOP 7-27: number of significant outages caused by erroneous technical data. MOP 7-28: subjective assessment by qualified programmers, technicians, and analysts of the technical data. MOP 7-29: number of significant outages caused by inadequate training. MOP 7-30: subjective assessment by qualified SEON operators, maintainers, and analysts of the training. MOP 7-31: number of discrepancies between maintenance AFSC job descriptions and the tasks performed. MOP 7-32: adequacy of the course chart for maintenance. MOP 7-33: adequacy of plan of instruction for maintenance. MOP 7-34: adequacy of the provided student maintenance training material. MOP 7-35: adequacy of the maintenance training program and training equipment plan. MOP 7-36: number of discrepancies between operations AFSC job descriptions and the tasks performed. MOP 7-37: adequacy of the course chart for operations.

COI-7 (Continued)	MOP 7-38: adequacy of plan of instruction for operations. MOP 7-39: adequacy of the provided student operations training material. MOP 7-40: adequacy of the operations training program and training equipment plan. MOP 7-41: UTR of the SOON system. MOP 7-42: UTR of the RSTN system. MOP 7-43: UTR of the SEON system.
COI-8	MOP 8-1: time the UPS provides power to the equipment connected to it in a generator backed-up configuration. MOP 8-2: time the UPS provides power to the equipment connected to it in a non-generator backed-up configuration. MOP 8-3: range of temperature in the SOON equipment room. MOP 8-4: range of temperature in the RSTN equipment room. MOP 8-5: range of relative humidity in the SOON equipment room. MOP 8-6: range of relative humidity in the RSTN equipment room. MOP 8-7: amount of operational impact caused by Electro Magnetic Interference (EMI) encountered by the SEON. MOP 8-8: amount of operational impact caused by RFI encountered by the SEON.
COI-9	MOP 9-1: number of significant outages caused by improper HFE considerations. MOP 9-2: subjective assessment by qualified operators, maintainers, and analysts of the HFE characteristics.

3.1. COI-1. Is the upgraded SEON safe to operate and maintain?

3.1.1. Scope. The safety of operations and maintenance of the SEON will be evaluated during the entire 90-day Qualification Operational Test and Evaluation (QOT&E). MOP 1-1 is the critical MOP supporting this COI. The site safety officer will perform a safety evaluation prior to operation of the SEON equipment.

3.1.2. Measures of performance (MOPs) and Performance Criterion.

3.1.2.1. MOP 1-1: number of SEON safety hazards that meet category (CAT) I deficiency PQDR criteria. (CRITICAL)
Performance Criterion: zero detected.

3.1.2.2. MOP 1-2: number of SEON safety hazards that meet CAT II deficiency PQDR criteria. (SIGNIFICANT)
Performance Criterion: zero detected.

3.1.3. Mission Scenarios. During normal operations and maintenance, any safety deficiency will be immediately reported to the Site Safety Officer for full investigation. The Site Safety Officer will fully document the deficiency and provide this documentation to the Test Director. The Test Director will ensure the required PQDR is released in accordance with (IAW) Technical Order (T.O.) 00-35D-54.

3.1.4. Method of Evaluation. The number of CAT I and CAT II safety PQDRs generated will be compared to the performance criterion. MOP 1-1 was determined to be critical to mission accomplishment and must meet user criteria to rate the COI as "resolved satisfactory". MOP 1-2 was marked as "significant" and was determined to have a significant impact on mission accomplishment. To cause the COI to be rated "resolved unsatisfactory", the results of MOP 1-2 must fail to meet user criteria and prevent mission accomplishment.

3.2. **COI-2:** Do the SEON computers provide sufficient capabilities to support the mission?

3.2.1. Scope. The capabilities of the SEON computers, the computer's built-in tests (BIT), the interface to the RSTN's lock in amplifiers (LIAs), and the interface to the digital imagery processing subsystem (DIPS) will be evaluated during normal operation and maintenance of the SEON system. MOPs 2-1, 2-2, 2-3, 2-4, 2-13, and 2-16, are the critical MOPs supporting this COI.

3.2.2. MOPs and Performance Criteria:

3.2.2.1. MOP 2-1: number of real-time computer processors that cannot be restored using the ethernet. (CRITICAL)
Performance Criterion: zero detected.

3.2.2.2. MOP 2-2: number of workstations that cannot be restored to full mission capability from other nodes over the ethernet. (CRITICAL)
Performance Criterion: zero detected.

3.2.2.3. MOP 2-3: number of computers that cannot be restored to full mission capability using the tape back-ups. (CRITICAL)
Performance Criterion: zero detected.

3.2.2.4. MOP 2-4: number of interfaces not achieved between the computers and equipment. (CRITICAL)
Performance Criterion: zero detected.

3.2.2.5. MOP 2-5: number of menu items that cannot be selected by a single keystroke or a single combination of two keystrokes (as in alt/F10). (SIGNIFICANT)
Performance Criterion: zero detected.

3.2.2.6. MOP 2-6: number of mission data segment changes not executable via operator menu selection.
Performance Criterion: zero detected.

3.2.2.7. MOP 2-7: number of equipment checks and alignments not executable via keyboard entry.
Performance Criterion: zero detected.

3.2.2.8. MOP 2-8: percent of selected text files adequately printed to the LNO5R printers. (SIGNIFICANT)
Performance Criterion: 97%.

3.2.2.9. MOP 2-9: percent of selected graphics files adequately printed to the LNO5R printers. (SIGNIFICANT)
Performance Criterion: 97%.

3.2.2.10. MOP 2-10: percent of screen images adequately printed to the LNO5R printers. (SIGNIFICANT)
Performance Criterion: 97%.

3.2.2.11. MOP 2-11: number of inadequate plots from the SFIR. (SIGNIFICANT)
Performance Criterion: zero detected.

3.2.2.12. MOP 2-12: number of Digital Command Language (DCL) level functions that cannot be performed by the operators.
Performance Criterion: zero detected.

3.2.2.13. MOP 2-13: number of nodes that cannot be assigned or reassigned without bringing the system down. (CRITICAL)
Performance Criterion: zero detected.

3.2.2.14. MOP 2-14: uptime ratio (UTR) of the RSTN computer system. (SIGNIFICANT)
Performance Criterion: a minimum of 98%. This is based on the requirement for no degradation to the documented UTR of the existing computer system.

3.2.2.15. MOP 2-15: UTR of the SOON computer system. (SIGNIFICANT)
Performance Criterion: a minimum of 98%. This is based on the requirement for no degradation to the documented UTR of the existing computer system.

3.2.2.16. MOP 2-16: time required for operators to load and run new version software. (CRITICAL)
Performance Criterion: less than 8 hours.

3.2.2.17. MOP 2-17: performs required functions where the computer individually reads, writes, interacts, and controls for each lock in amplifier (LIA). (SIGNIFICANT)
Performance Criterion: adequate.

3.2.2.18. MOP 2-18: percent of faults detected by the automatic monitoring system. (SIGNIFICANT)
Performance Criterion: a minimum of 99%.

3.2.2.19. MOP 2-19: false alarm rate of faults by the automatic monitoring system. (SIGNIFICANT)
Performance Criterion: a maximum of 1%.

3.2.2.20. MOP 2-20: number of incorrect status indications. (SIGNIFICANT)
Performance Criterion: zero detected.

3.2.2.21. MOP 2-21: number of work stations assigned as system console that cannot perform calibration of the DIPS.
Performance Criterion: zero detected.

3.2.2.22. MOP 2-22: number of work stations assigned as system console that cannot control the data image collection function of the DIPS.
Performance Criterion: zero detected.

3.2.2.23. MOP 2-23: number of work stations assigned as system console that cannot control the scheduling of movie replay function of the DIPS.
Performance Criterion: zero detected.

3.2.2.24. MOP 2-24: number of work stations assigned as system console that cannot control the remote shutdown of the DIPS.
Performance Criterion: zero detected.

3.2.2.26. MOP 2-25: number of inadequate magnetic contour and Stoneyhurst plots performed by the system using data provisioned from the telescopes under control of the workstations. (SIGNIFICANT)
Performance Criterion: zero detected.

3.2.3. Mission Scenarios. Technicians and analysts will document any computer-related anomalies that occur during normal operations and maintenance of the SEON computers. SEON analysts will attempt to change mission data segments using keyboard entries. Technicians will perform equipment checks and alignments using workstation keyboard entries. To evaluate restoring computer information, all data on the computer under test will first be saved to the restoring device and then erased. Technicians will then attempt to restore the data to the computers. Restored data will be verified to ensure no errors or lost data occurs. The interface between the new computer and the LIAs will be tested by technicians during normal preventive maintenance inspections. To test the BIT, status indications will be monitored. Status indications that do not occur spontaneously will be induced using locally developed checklists. Solar data gathered by the SOON will be sent to the DIPS and manipulated to evaluate the effect of the upgrade on DIPS operations.

3.2.4. Method of Evaluation. All data pertaining to the new computers will be compared to the performance criteria. The UTR of the RSTN and SOON computer systems will be calculated separately using the formula below. A computer system will be considered "down," if it causes a significant outage as defined in Air Force Space Forecast Center Regulation (AFSFCR) 105-1, Attachment 4 (refer to Figure 3-1). Qualified analysts and programmers will use their professional judgement to rate the computer enhanced data as either "adequate" or "not adequate." All critical MOPs must meet user requirements in order to rate this COI as "resolved satisfactory." In addition, MOPs marked as "significant" were not deemed "critical," but were determined to have a significant impact on mission accomplishment. To cause the COI to be rated "resolved unsatisfactory," the results of these MOPs must fail to meet user criteria and prevent mission accomplishment.

$$\text{UTR} = \frac{\text{TOTAL OPERATING HOURS MINUS TOTAL DOWNTIME HOURS}}{\text{TOTAL OPERATING HOURS}}$$

3.3. **COI-3:** Does the upgraded RSTN allow detection of solar events?

3.3.1. Scope. The Swept Frequency Interferometric Radiometer (SFIR) and discrete frequency radiometer will be evaluated during normal operation and maintenance each day during the 90-day QOT&E. MOP 3-12 is the critical MOP supporting this COI.

3.3.2. MOPs and Performance Criteria:

3.3.2.1. MOP 3-1: percent of solar bursts detected by the current SFIR between 30-75 megahertz (MHz) that are also detected by the new SFIR between 30-75 MHz while both SFIRs are operational. (SIGNIFICANT)
Performance Criterion: 97%.

3.3.2.2. MOP 3-2: percent of solar bursts detected by other SFIRs (at other SEON sites) between 30-75 MHz that are also detected by the new SFIR. (SIGNIFICANT)
Performance Criterion: 95 % of bursts detected by other sites during concurrent patrol periods.

3.3.2.3. MOP 3-3: subjective rating by qualified analysts of solar sweep signatures detected between 30-75 MHz. (SIGNIFICANT)
Performance Criterion: adequate.

3.3.2.4. MOP 3-4: subjective rating by qualified analysts of solar sweep intensities between 30-75 MHz. (SIGNIFICANT)
Performance Criterion: adequate.

3.3.2.5. MOP 3-5: speed of Type 2 shocks. (SIGNIFICANT)
Performance Criterion: within 500 kilometers per second of the speed indicated by the current system.

3.3.2.6. MOP 3-6: minimum sensitivity of the new SFIR at 30 MHz. (SIGNIFICANT)
Performance Criterion: 10 Solar Flux Units (SFUs).

3.3.2.7. MOP 3-7: minimum sensitivity of the new SFIR at 250 MHz. (SIGNIFICANT)
Performance Criterion: 40 SFUs.

3.3.2.8. MOP 3-8: number of solar events, types of solar burst signatures, and burst intensities between 75-250 MHz detected by the SFIR. There is no performance criterion for this MOP.

3.3.2.9. MOP 3-9: percent of solar intensity difference between that indicated by the discrete frequency radiometer computer and the charted intensity. (SIGNIFICANT)
Performance Criterion: 10% or less.

3.3.2.10. MOP 3-10: the computer reported burst characteristics (start time, maximum time, stop time, mean flux, integrated flux, and peak flux) compared to the charted characteristics. (SIGNIFICANT)
Performance Criteria: plus or minus 5 seconds for times and within 10% for mean flux, integrated flux, and peak flux.

3.3.2.11. MOP 3-11: number of solar bursts the discrete frequency radiometer incorrectly identifies (excluding RFI). (SIGNIFICANT)
Performance Criterion: zero detected.

3.3.2.12. MOP 3-12: subjective rating by experienced RSTN analysts and programmers of discrete frequency bursts. (CRITICAL)
Performance Criterion: adequate.

3.3.3. Mission Scenarios. Data will consist of the solar information collected by the discrete frequency radiometer, the new SFIR, the existing SFIR, other SFIRs in the SEON, and Culgoora Solar Observatory in Australia. Simulated data will be used if spontaneous solar events do not occur. Technicians will test the SFIR and automated discrete frequency radiometer a minimum of 30 times for proper performance as a part of their normal preventative maintenance. Technicians will test the SFIR's sensitivity during preventative maintenance inspections.

3.3.4. Method of Evaluation. The solar data between 30-75 MHz from the new SFIR will be compared to the solar data between 30-75 MHz from the existing SFIR and other SFIRs in the SEON. The solar data gathered from the new SFIR and discrete frequency radiometer will also be compared to the solar data from Culgoora Solar Observatory in Australia. Qualified analysts will use their professional judgement to make subjective ratings on nonquantifiable data. Quantified RSTN data will be compared to the performance criteria. MOP 3-12 was determined to be critical to mission accomplishment and must meet user criteria to rate the COI as "resolved satisfactory." In addition, MOPs marked as "significant" were determined to have a significant impact on mission accomplishment. To cause the COI to be rated "resolved unsatisfactory," the results of these MOPs must fail to meet user criteria and prevent mission accomplishment.

3.4. **COI-4:** Does the upgraded SOON allow detection of solar events?

3.4.1. Scope. The test team will evaluate CCD images, the Intelligent Data Acquisition System (IDAS), and the DIPS capabilities during normal operation and maintenance each day of the QOT&E. MOPs 4-16, and 4-32 are the critical MOPs supporting this COI.

3.4.2. MOPs and Performance Criteria:

3.4.2.1. MOP 4-1: subjective rating by qualified analysts of H-Alpha images. (SIGNIFICANT)
Performance Criterion: adequate.

3.4.2.2. MOP 4-2: minimum resolution of large scale H-Alpha images. (SIGNIFICANT)
Performance Criterion: 2.2 arc seconds.

3.4.2.3. MOP 4-3: minimum resolution of full disk H-Alpha images. (SIGNIFICANT)
Performance Criterion: 12.5 arc seconds.

3.4.2.4. MOP 4-4: subjective rating by qualified analysts of spectrographic images. (SIGNIFICANT)
Performance Criterion: adequate.

3.4.2.5. MOP 4-5: minimum resolution of large scale spectrographic images. (SIGNIFICANT)
Performance Criterion: 2.2 arc seconds.

3.4.2.6. MOP 4-6: minimum resolution of full disk spectrographic images. (SIGNIFICANT)
Performance Criterion: 12.5 arc seconds.

3.4.2.7. MOP 4-7: subjective rating by qualified analysts of H-Alpha images transferred to the DIPS from the RS170 output of the CCD. (SIGNIFICANT)
Performance Criterion: adequate.

3.4.2.8. MOP 4-8: subjective rating by qualified analysts of spectrographic magnetic data transferred to the DIPS.
Performance Criterion: adequate.

3.4.2.9. MOP 4-9: number of frames transferred to the DIPS from the SOON. (SIGNIFICANT)
Performance Criterion: a minimum of 12 frames per minute.

3.4.2.10. MOP 4-10: DIPS playback speed.
Performance Criteria: up to 30 frames per second.

3.4.2.11. MOP 4-11: number of frames that can be stored by the DIPS.
Performance Criterion: a minimum of 800 frames.

3.4.2.12. MOP 4-12: resolution of each frame (stored in the DIPS).
Performance Criterion: a minimum of 512 X 512 X 8 bits per frame.

3.4.2.13. MOP 4-13: sufficiency of shades of gray (of stored DIPS images).
Performance Criterion: 256 gray shades to allow the capability for coronal hole detection at 10830 angstroms.

3.4.2.14. MOP 4-14: speed of overlaying pictures on stored grids (in the DIPS).
Performance Criterion: a minimum of one frame per second.

3.4.2.15. MOP 4-15: subjective rating by trained SOON analysts and programmers of the histogram capability. (CRITICAL)
Performance Criterion: adequate.

3.4.2.16. MOP 4-16: minimum resolution of H-Alpha and visible light (including Mg B_2). (SIGNIFICANT)
Performance Criteria: 2.2. arc seconds for large scale, 12.5 for full disk.

3.4.2.17. MOP 4-17: resolution of the detected solar magnetic field. (SIGNIFICANT)
Performance Criterion: a minimum of 5 arc seconds at large scale.

3.4.2.18. MOP 4-18: subjective rating by trained SOON analysts and programmers of the image enhancement of gray scale and pseudo color. (SIGNIFICANT)
Performance Criterion: adequate.

3.4.2.19. MOP 4-19: rate of optical scan conversion. (SIGNIFICANT)
Performance Criterion: adequate.

3.4.2.20. MOP 4-20: subjective rating by trained SOON analysts and programmers of the adequacy of stored images compared to the live images. (SIGNIFICANT)
Performance Criterion: adequate.

3.4.2.21. MOP 4-21: subjective rating by trained NGDC analysts of the adequacy of archived solar data.
Performance Criterion: adequate.

3.4.2.22. MOP 4-22: subjective rating by trained SOON analysts and programmers of the spectrographic output data. (SIGNIFICANT)
Performance Criterion: adequate.

3.4.2.23. MOP 4-23: subjective rating by trained SOON analysts and programmers of the digital images. (scaled, standardized, and superimposed). (SIGNIFICANT)
Performance Criterion: adequate.

3.4.2.24. MOP 4-24: amount of degradation in current provided operability. (SIGNIFICANT)
Performance Criterion: no degradation.

3.4.2.25. MOP 4-25: performs required analog to digital (A/D) converter functions. (SIGNIFICANT)
Performance Criterion: adequate.

3.4.2.26. MOP 4-26: number of SOON significant outages caused by an A/D converter. (SIGNIFICANT)
Performance Criterion: zero detected. A significant outage is defined in AFSFCR 105-1, Attachment 4 (refer to Figure 3-1).

3.4.2.27. MOP 4-27: number of A/D converter failures. (SIGNIFICANT)
Performance Criterion: zero detected. This is based on the requirement for 18 months of operation without a failure.

3.4.2.28. MOP 4-28: performs required digital to analog (D/A) converter functions. (SIGNIFICANT)
Performance Criterion: adequate.

3.4.2.29. MOP 4-29: number of SOON significant outages caused by a D/A converter. (SIGNIFICANT)
Performance Criterion: zero detected. A significant outage is defined in AFSFCR 105-1, Attachment 4 (refer to Figure 3-1).

3.4.2.30. MOP 4-30: number of D/A converter failures. (SIGNIFICANT)
Performance Criterion: zero detected.

3.4.2.31. MOP 4-31: subjective rating by experienced SOON analysts and programmers of solar flare analysis function. (CRITICAL)
Performance Criterion: adequate.

3.4.3. Mission Scenarios. All system failures will be documented using established procedures and the QOT&E Operations Record. Technicians will test the digital to analog (D/A) and analog to digital (A/D) converters and report their findings using Air Force Technical Order (AFTO) Forms 349 or equivalent and the QOT&E Maintenance Record. Qualified analysts and programmers will collect a minimum of 30 solar images from the various SEON interfaces. Technicians will test each CCD and IDAS A/D and D/A converter a minimum of 30 times. To test the CCDs, live solar images and simulated solar images will be used. To simulate solar images, a calibrated test target will be placed in the light path of the telescope to project images to the CCDs. To test the adequacy of images transferred to the DIPS, prerecorded, test, and live solar images will be transferred from the computers and CCDs.

3.4.4. Method of Evaluation. Qualified analysts will use their professional judgement to make subjective ratings on nonquantifiable data. They will rate this data as either "adequate" or "not adequate." Quantifiable data will be compared to the performance criteria. All critical MOPs must meet user requirements in order to rate this COI as "resolved satisfactory." In addition, MOPs marked as "significant" were determined to have a significant impact on mission accomplishment. To cause the COI to be rated "resolved unsatisfactory," the results of these MOPs must fail to meet user criteria and prevent mission accomplishment.

3.5. **COI-5:** Is the SEON software supportable?

3.5.1. Scope. Testing for this COI is divided into two sections. The first section, the capability of the programmers to perform their mission, will be evaluated during normal operation and maintenance of the SEON software. The second section, software testing, will be evaluated by the Software Test Manager (STM). Software testing will focus on four areas: software maintainability, usability, support resources, and maturity. Software

four areas: software maintainability, usability, support resources, and maturity. Software maintainability examines characteristics of the software source code and documentation which affect the ability of programmers and analysts to modify and update the software. Software usability examines attributes which define the "ease-of-use" of a system. Software support resources evaluation examines personnel, training, support systems, and facilities. Software maturity measures the software's progress in its evolution toward satisfaction of all documented user requirements. MOP 5-1 is the critical MOP supporting this COI.

3.5.2. MOPs and Performance Criteria:

3.5.2.1. MOP 5-1: usability of the SEON software. (CRITICAL)
Performance Criterion: Subjective.

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ATTACHMENT 4

SEON EQUIPMENT OUTAGE IMPACTS

EQUIPMENT	IMPACT
Radio (RIMS):	An outage is SIGNIFICANT if data cannot be gathered or analyzed on: - 245 MHz - 2695 MHz - 8800 MHz - Two or more adjacent frequencies - Three or more frequencies
Radio (SFIR):	An outage is SIGNIFICANT if sweep time or type cannot be determined.
Optical (SOON):	An outage is SIGNIFICANT if the SOON system (which includes DIPS) cannot: - Be calibrated - Detect or analyze flares in automatic mode - Analyze real-time H-alpha or White light images - Produce magnetograms - Track the sun automatically
SEON Computer System:	An outage is SIGNIFICANT if any of the above listed SOON or RSTN operations cannot be done in automatic mode.
Communications:	A teletype outage is SIGNIFICANT if either send or receive capability is completely lost at the site. A DSN (previously known as autovon) or commercial phone outage is SIGNIFICANT if the teletype circuit is also down, leaving no functioning means of communications.

NOTES:

1. All SEON equipment, computer, or communications outages not specified above as SIGNIFICANT are MINIMAL, unless declared SIGNIFICANT by the detachment commander, AFSFC/DCM, or AFSFC/DOO.

2. An outage is normally MINIMAL if data is degraded due to minor equipment problems, but can still be collected and analyzed.

Figure 3-1. SEON Equipment Outage Impacts

3.5.2.2. MOP 5-2: maturity of the SEON software. (SIGNIFICANT)
Performance Criterion: Subjective.

3.5.2.3. MOP 5-3: maintainability of the SEON software. (SIGNIFICANT)
Performance Criterion: subjective.

3.5.2.4. MOP 5-4: support resources of the SEON software. (SIGNIFICANT)
Performance Criterion: subjective.

3.5.2.5. MOP 5-5: life-cycle process of the SEON software. (SIGNIFICANT)
Performance Criterion: subjective.

3.5.2.6. MOP 5-6: time required to update and install completely new source software distribution into the system. (SIGNIFICANT)
Performance Criterion: less than 8 hours.

3.5.2.7. MOP 5-7: number of approved software changes the programmers cannot introduce into the application software. (SIGNIFICANT)
Performance Criterion: zero detected.

3.5.2.8. MOP 5-8: system impact of testing approved software changes.
Performance Criterion: subjective.

3.5.2.9. MOP 5-9: number of tested software changes that cannot be introduced into the system without rebooting the computer.
Performance Criterion: zero detected.

3.5.2.10. MOP 5-10: number of software development tools the programmers cannot effectively use. (SIGNIFICANT)
Performance Criterion: zero detected.

3.5.2.11. MOP 5-11: number of program documentation items the programmers cannot update. (SIGNIFICANT)
Performance Criterion: zero detected.

3.5.2.12. MOP 5-12: number of programming tasks that cannot be performed due to inadequate training. (SIGNIFICANT)
Performance Criterion: zero detected.

3.5.3. Mission Scenarios. The SEON programmers will document all actions they take during the 90-day QOT&E in their QOT&E Operations Record. They will pay particular attention to the time required to update and install the completely new source software distribution into the system. This time will include loading the software into the system, compiling and linking, distributing the software to other nodes over the Local Area

ATTACHMENT 4

TIMELINESS CRITERIA

1. **AUTOMATIC OPERATIONS:** (transmit as soon as possible, but not to exceed these limits.)

CODE TYPE	EVENT LEVEL	NON-EVENT LEVEL
EVENT	2 min after event start (5 min for a SITEC)	Not Applicable
FLARE: preliminary	5 min after max	Not Required
final	10 min after end	15 min after end
DALAS: preliminary	10 min after event start	30 min after start
final	20 min after end	15 min after end
BURST: preliminary	5 min after max (or 1st NSM event peak)	Not Required (30 min after start for NSM)
final	10 min after end (45 min for a NSM)	30 min after end (45 min for NSM)
SWEEP: preliminary	10 min after type identification	Not Required (30 min after start data availability for a Code 6, 7, or 8)
final	30 min after data availability	45 min after end data availability

2. **SEMIAUTOMATIC OR MANUAL OPERATIONS:** (transmit as soon as possible, but not to exceed these limits.)

CODE TYPE	EVENT LEVEL	NON-EVENT LEVEL
EVENT	5 min after event start	Not Applicable
FLARE: preliminary	15 min after max	Not Required
final	20 min after end	30 min after end
DALAS: preliminary	---------- (same as for automatic operations) ----------	
final	---------- (same as for automatic operations) ----------	
BURST: preliminary	20 min after max (or 1st NSM event peak)	Not Required (30 min after start for NSM)
final	30 min after end (45 min for a NSM)	45 min after end
SWEEP: preliminary	---------- (same as for automatic operations) ----------	
final	---------- (same as for automatic operations) ----------	

NOTE: NSM = Noise Storm.

Figure 3-2. Timeliness Criteria.

Network (LAN), and initiating (running) the software. The STM is responsible for conducting the AFOTEC-designed software evaluation in accordance with the AFOTEC

800-Series pamphlets. The STM will conduct software evaluations throughout our involvement of the system's development and test. These evaluations may take place at several locations: software facilities of the contractor, agency responsible for maintaining the software (SM-ALC), AFSFC, and at Det 1, AFOTEC. The STM will ensure the guides and questionnaires from the AFOTEC 800-Series pamphlets are completed in compliance with current guidance.

3.5.4. Method of Evaluation. To evaluate the ability of the programmers to perform their mission, all data relating to programming functions will be summarized and compared to the performance criteria. For the software evaluations, the STM will collect and process data from the four software areas. Each of the guides and questionnaires will result in qualitative and quantitative information on an attribute of the software. MOP 5-1 was determined to be critical to mission accomplishment and must meet user criteria to rate the COI as "resolved satisfactory." In addition, MOPs marked as "significant" were determined to have a significant impact on mission accomplishment. To cause the COI to be rated "resolved unsatisfactory," the results of these MOPs must fail to meet user criteria and prevent mission accomplishment.

3.6. COI-6: Does the SEON adequately report solar events?

3.6.1. Scope. The test team will test the ability of the SEON to transmit all required messages over the AWN. MOPs 6-2, and 6-4 are the critical MOPs supporting this COI.

3.6.2. MOPs and Performance Criteria.

3.6.2.1. MOP 6-1: percent of message formats transmitted IAW Air Force Space Forecast Center Pamphlet (AFSFCP) 105-5. (SIGNIFICANT)
Performance Criterion: 97% (refer to Table 3-1).

3.6.2.2. MOP 6-2: time between solar activity and transmission of the required message. (CRITICAL)
Performance Criterion: IAW AFSFCR 105-1, Attachment 4 (refer to Figure 3-2).

3.6.2.3. MOP 6-3: number of errors between transmitted and received messages. (SIGNIFICANT)
Performance Criterion: zero detected.

3.6.2.4. MOP 6-4: number of solar events the analysts are unable to respond to within time constraints listed in Air Force Space Command Regulation (AFSCR) 105-1. (CRITICAL)
Performance Criterion: zero detected.

3.6.3. Mission Scenarios. A copy of all messages transmitted by the Palehua Solar Observatory during the QOT&E will be given to the Test Director. A copy of all messages

received by the Air Force Space Forecast Center (AFSFC) from the Palehua Solar Observatory will be sent to the Test Director. If additional messages are required to statistically support the findings, messages clearly marked "PALEHUA SEON TEST MESSAGE" will be transmitted.

3.6.4. Method of Evaluation. All data gathered during this event will be summarized and compared to the performance criteria. All critical MOPs must meet user requirements in order to rate this COI as "resolved satisfactory." In addition, MOPs 6-1 and 6-3 marked as "significant" were not deemed "critical," but were determined to have a significant impact on mission accomplishment. To cause the COI to be rated "resolved unsatisfactory," the results of these MOPs must fail to meet user criteria and prevent mission accomplishment.

3.7. **COI-7:** Is the SEON supportable?

3.7.1. Scope. The data supporting logistics supportability, readiness, maintainability, training, and sufficiency of T.O.s will be collected during normal operations and maintenance of the SEON. MOP 7-27 is the critical MOP supporting this COI.

3.7.2. MOPs and Performance Criteria:

3.7.2.1. MOP 7-1: mean time between critical failure (MTBCF) of the RSTN. (SIGNIFICANT)
Performance Criterion: a minimum of 750 hours.

3.7.2.2. MOP 7-2: MTBCF of the SOON. (SIGNIFICANT)
Performance Criterion: a minimum of 750 hours.

3.7.2.3. MOP 7-3: mean time between maintenance corrective (MTBMc). (SIGNIFICANT)
Performance Criterion: a minimum of 200 hours.

3.7.2.4. MOP 7-4: mean repair time (MRT) of the SEON. (SIGNIFICANT)
Performance Criterion: a maximum of 4 hours.

3.7.2.5. MOP 7-5: MRT of the embedded computer resources. (SIGNIFICANT)
Performance Criterion: a maximum of 1 hour.

3.7.2.6. MOP 7-6: MRT of the SFIR. (SICNIFICANT)
Performance Criterion: a maximum of 1.5 hours.

3.7.2.7. MOP 7-7: Max time to repair (Max TTR) for the SFIR. (SIGNIFICANT)
Performance Criterion: a maximum of 8 hours.

3.7.2.8. MOP 7-8: Max TTR for the CCD. (SIGNIFICANT)
Performance Criterion: a maximum of 1 hour.

3.7.2.9. MOP 7-9: Max TTR for the UPS. (SIGNIFICANT)
Performance Criterion: a maximum of 1 hour.

3.7.2.10. MOP 7-10: Max TTR for the SEON. (SIGNIFICANT)
Performance Criterion: a maximum of 3 hours for 95% of all failures.

3.7.2.11. MOP 7-11: number of failures not detected through test points using full resources. (SIGNIFICANT)
Performance Criterion: zero detected.

3.7.2.12. MOP 7-12: percent of detected faults corrected by replacing one Line Replaceable Unit (LRU). (SIGNIFICANT)
Performance Criterion: a minimum of 90%.

3.7.2.13. MOP 7-13: percent of detected faults corrected by replacing a maximum of 2 LRUs. (SIGNIFICANT)
Performance Criterion: a minimum of 95%.

3.7.2.14. MOP 7-14: percent of detected faults corrected by replacing a maximum of 3 LRUs. (SIGNIFICANT)
Performance Criterion: a minimum of 99%.

3.7.2.15. MOP 7-15: number of special tools required to maintain the SEON. (SIGNIFICANT)
Performance Criterion: zero detected.

3.7.2.16. MOP 7-16: number of peculiar test equipment required to maintain the SEON. (SIGNIFICANT)
Performance Criterion: zero detected.

3.7.2.17. MOP 7-17: weekly preventative maintenance inspection (PMI) times for maintaining the upgraded portions of the SEON. (SIGNIFICANT)
Performance Criterion: a maximum of 30 minutes.

3.7.2.18. MOP 7-18: weekly PMI times for maintaining the upgraded portions of the RSTN. (SIGNIFICANT)
Performance Criterion: a maximum of 30 minutes.

3.7.2.19. MOP 7-19: amount of increased time required to perform weekly PMI for maintaining the non-upgraded portions of the RSTN. (SIGNIFICANT)
Performance Criterion: zero detected.

3.7.2.20. MOP 7-20: amount of increased time required to perform weekly PMI for maintaining the non-upgraded portions of the SOON. (SIGNIFICANT)
Performance Criterion: zero detected.

3.7.2.21. MOP 7-21: number and skill level of personnel required to perform any SEON maintenance routine. (SIGNIFICANT)
Performance Criterion: one 30452 technician.

3.7.2.22. MOP 7-22: number of failures requiring more than removal and replacement of defective LRUs on the new SFIR, CCDs, IDAS, or computer resource. (SIGNIFICANT)
Performance Criterion: zero detected.

3.7.2.23. MOP 7-23: depot-level task completion time. (SIGNIFICANT)
Performance Criterion: Less than 6 hours.

3.7.2.24. MOP 7-24: MTBCF of the SFIR and discrete frequency radiometer. There is no performance criteria for this MOP.

3.7.2.25. MOP 7-25: percent of initial spares support listing (ISSL) items filled at site prior to QOT&E.
Performance Criterion: a minimum of 80%.

3.7.2.26. MOP 7-26: percent of critical ISSL items filled at site prior to QOT&E. (SIGNIFICANT)
Performance Criterion: 100%.

3.7.2.27. MOP 7-27: number of significant outages caused by erroneous technical data. (CRITICAL)
Performance Criterion: zero detected.

3.7.2.28. MOP 7-28: subjective assessment by qualified programmers, technicians, and analysts of the technical data. (SIGNIFICANT)
Performance Criterion: adequate.

3.7.2.29. MOP 7-29: number of significant outages caused by inadequate training. (SIGNIFICANT)
Performance Criterion: zero detected.

3.7.2.30. MOP 7-30: subjective assessment by qualified SEON operators, maintainers, and analysts of the training. (SIGNIFICANT)
Performance Criterion: adequate.

3.7.2.31. MOP 7-31: number of discrepancies between maintenance AFSC job descriptions and the tasks performed.
Performance Criterion: zero detected.

3.7.2.32. MOP 7-32: adequacy of the course chart for maintenance. (SIGNIFICANT)
Performance Criterion: adequate.

3.7.2.33. MOP 7-33: adequacy of plan of instruction for maintenance. (SIGNIFICANT)
Performance Criterion: adequate.

3.7.2.34. MOP 7-34: adequacy of the provided student maintenance training material. (SIGNIFICANT)
Performance Criterion: adequate.

3.7.2.35. MOP 7-35: adequacy of the maintenance training program and training equipment plan. (SIGNIFICANT)
Performance Criterion: adequate.

3.7.2.36. MOP 7-36: number of discrepancies between operations AFSC job descriptions and the tasks performed.
Performance Criterion: zero detected.

3.7.2.37. MOP 7-37: adequacy of the course chart for operations. (SIGNIFICANT)
Performance Criterion: adequate.

3.7.2.38. MOP 7-38: adequacy of plan of instruction for operations. (SIGNIFICANT)
Performance Criterion: adequate.

3.7.2.39. MOP 7-39: adequacy of the provided student operations training material. (SIGNIFICANT)
Performance Criterion: adequate.

3.7.2.40. MOP 7-40: adequacy of the operations training program and training equipment plan. (SIGNIFICANT)
Performance Criterion: adequate.

3.7.2.41. MOP 7-41: UTR of the SOON system.
Performance Criterion: a minimum of 97%.

3.7.2.42. MOP 7-42: UTR of the RSTN system.
Performance Criterion: a minimum of 97%.

3.7.2.43. MOP 7-43: UTR of the SEON system.
Performance Criterion: a minimum of 97%.

3.7.3. Mission Scenarios. During normal operations, all system problems will be documented using established procedures and the QOT&E Operations Records and QOT&E Maintenance Records. Copies of all documentation (Master Station Logs, Equipment Outage Reports, AFTO Forms 349 or equivalent, etc.) will be given to the Test Director. Induced failures will be used by the test team to ensure that all system areas are tested for maintainability. The Test Director will ensure documents are marked if the data was gathered during normal operations or during a QOT&E induced scenario. An inventory of the ISSL will be conducted at the beginning and end of the QOT&E. During normal operations and maintenance, any inadequacy in training or T.O.s will be reported. Qualified test team members will verify the deficiency, determine its impact, and document the findings in the QOT&E Records. Test team members will justify any discrepancy between AFSC job description and tasks performed. Data collected during the maintainability demonstration may be used to supplement test results.

3.7.4. Method of Evaluation. All logistics supportability, readiness, maintainability, training, and technical data will be extracted, summarized, and compared to the performance criteria. Course instructors will assess the adequacy of the course chart, plan of instruction, provided student training material, and training program and training equipment plan. Near the end of the QOT&E, all analysts, programmers, and technicians will rate the training and T.O.s as either "adequate" or "not adequate." Any "not adequate" rating will be fully justified. MOP 7-27 was determined to be critical to mission accomplishment and must meet user criteria to rate the COI as "resolved satisfactory." In addition, MOPs marked as "significant" were determined to have a significant impact on mission accomplishment. To cause the COI to be rated "resolved unsatisfactory," the results of these MOPs must fail to meet user criteria and prevent mission accomplishment. Any purposely induced failures will not be included when figuring MTBCF, MTBMc, and MDT. The following formulas will be used:

$$\text{MTBCF} = \frac{\text{NUMBER OF OPERATING HOURS}}{\text{NUMBER OF CRITICAL FAILURES}}$$

NOTE: a critical failure is any significant outage as defined in AFSFCR 105-1, Attachment 4 (refer to Figure 3-1).

$$\text{MTBMc} = \frac{\text{NUMBER OF OPERATING HOURS}}{\text{NUMBER OF CORRECTIVE MAINTENANCE ACTIONS}}$$

NOTE: corrective maintenance is only unscheduled maintenance events.

$$\text{MRT} = \frac{\text{TOTAL TIME TO REPAIR ALL CORRECTIVE MAINTENANCE EVENTS}}{\text{NUMBER OF CORRECTIVE MAINTENANCE EVENTS}}$$

NOTE: Repair time starts when the technician arrives and continues until the repair is completed, or a part is determined to be required. It does not include maintenance

delays (ordering parts, technician travel time, etc.) or supply delays.

Maximum TTR = MAXIMUM REPAIR TIME AS DEFINED IN MRT ABOVE

TABLE 3-1. REQUIRED MESSAGES AND HEADERS

1. SOON MANOP HEADERS	
HEADER	TYPE MESSAGE
HOHW PHFF DDGGgg	Scheduled PLAIN message (file time)
HOHW1 PHFF DDGGgg	Preliminary message for FLARE, DALAS, PLAIN, HSTRY, and STATS code types.
HOHW2 PHFF DDGGgg	End of day summary and final STATS message.
HOHW3 PHFF DDGGgg	SPOTS message
HOHW5 PHFF DDGGgg	Equipment status summary message (PLAIN)
HOHW6 PHFF DDGGgg	BXOUT message
2. RSTN MANOP HEADERS	
HEADER	TYPE MESSAGE
HRHW1 PHFF DDGGgg	Preliminary messages for BURST, SWEEP, STATS, and PLAINS.
HRHW2 PHFF DDGGgg	End of day summary and final STATS message.
HRHW3 PHFF DDGGgg	IFLUX message
3. EVENT MESSAGE MANOP HEADERS	
HEADER	TYPE MESSAGE
HEHW PHFF DDGGgg (5 bells)	All-sensor message
HEHW1 PHFF DDGGgg (5 bells)	Preliminary EVENT message for FLARE, DALAS, BURST, SWEEP, and SITEC

TABLE 3-1. REQUIRED MESSAGES AND HEADERS (CONTINUED)

4. IONOSONDE MESSAGES	
HEADER	TYPE MESSAGE
HIHW3 PHFF DDGGgg	TELCO messages
HIHW4 PHFF DDGGgg	IONSS messages
5. SERVICE MESSAGES	
HEADER	TYPE MESSAGE
Not Specific	Not Specific

3.8. **COI-8:** Does the SEON facility provide adequate power and environmental support?

3.8.1. Scope. The uninterruptable power supply (UPS), environmental control system, effects of electro-magnetic interference, and effects of radio frequency interference will be evaluated during normal operation and maintenance each day during the 90-day QOT&E. MOPs 8-1 and 8-2 are the critical MOPs supporting this COI.

3.8.2. MOPs and Performance Criteria:

3.8.2.1. MOP 8-1: time the UPS provides power to the equipment connected to it in a generator backed-up configuration. (CRITICAL)
Performance Criteria: long enough for the backup generator to come on-line with no loss of SEON data.

3.8.2.2. MOP 8-2: time the UPS provides power to the equipment connected to it in a non-generator backup configuration. (CRITICAL)
Performance Criterion: long enough for the equipment to be orderly and safely powered-down with no loss of SEON data.

3.8.2.3. MOP 8-3: range of temperature in the SOON equipment room. (SIGNIFICANT)
Performance Criterion: 60° F to 80° F.

3.8.2.4. MOP 8-4: range of temperature in the RSTN equipment room. (SIGNIFICANT)
Performance Criterion: 50° F to 90° F.

3.8.2.5. MOP 8-5: range of relative humidity in the SOON equipment room. (SIGNIFICANT)
Performance Criterion: 30% to 60%.

3.8.2.6. MOP 8-6: range of relative humidity in the RSTN equipment room. (SIGNIFICANT)
Performance Criterion: 25% to 75%.

3.8.2.7. MOP 8-7: The amount of operational impact caused by EMI encountered by the SEON. (SIGNIFICANT)
Performance Criterion: No operational impact.

3.8.2.8. MOP 8-8: The amount of operational impact caused by RFI encountered by the SEON. (SIGNIFICANT)
Performance Criterion: No operational impact.

3.8.3. Mission Scenarios. The Test Director will coordinate all power outages with the Palehua Site Commander. To test the UPS capability, power outages will be induced with the systems configured with and without generator backup. Once power outages occur, the Test Director will time how long it takes for site personnel to properly shutdown the system, or the standby generator to come on-line. Existing hydrothermographs in the RSTN and SOON equipment rooms will be used to document the temperature and relative humidity. The recorded readings on the hydrothermographs will be examined daily. If an out-of-tolerance condition is found, it will be clearly marked on the chart. All relative information will be documented in the Test Director's QOT&E Record.

3.8.4. Method of Evaluation. All environmental, power, EMI, and RFI data will be extracted, summarized, and compared to the performance criteria. All critical MOPs must meet user requirements in order to rate this COI as "resolved satisfactory." In addition, MOPs marked as "significant" were determined to have a significant impact on mission accomplishment. To cause the COI to be rated "resolved unsatisfactory," the results of these MOPs must fail to meet user criteria and prevent mission accomplishment.

3.9. **COI-9:** Is the human factors engineering of the SEON adequate?

3.9.1. Scope. The Human Factors Engineering (HFE) will be evaluated during the entire 90-day QOT&E. All SEON aspects applicable to the Military Standard 1472D, Human Engineering Design Criteria for Military Systems, Equipment, and Facilities will be evaluated. MOP 9-1 is the critical MOP for this COI.

3.9.2. MOPs and Performance Criteria:

3.9.2.1. MOP 9-1: number of significant outages caused by improper HFE considerations. (CRITICAL)
Performance Criterion: zero detected.

3.9.2.3. MOP 9-2: subjective assessment by qualified operators, maintainers, and analysts of the HFE characteristics. (SIGNIFICANT)
Performance Criterion: adequate.

3.9.3. Mission Scenarios. All significant outages as defined in Air Force Space Forecast Center Regulation (AFSFCR) 105-1, Attachment 4 (refer to Figure 3-1) system will be documented using established procedures and in the QOT&E Operations and Maintenance Records. Near the end of the QOT&E, the analysts, programmers, and technicians will complete an HFE Questionnaire.

3.9.4. Method of Evaluation. At the end of each section of the HFE Questionnaire, the test team will rate the area as either "adequate" or "not adequate" based on their professional judgement. All data relating to HFE will be summarized and compared to the performance criteria. MOP 9-1 must meet user requirements in order to rate this COI as "resolved satisfactory." In addition, MOP 9-2, marked as "significant" was not deemed "critical," but was determined to have a significant impact on mission accomplishment. To cause the COI to be rated "resolved unsatisfactory," the results of this MOP must fail to meet user criteria and prevent mission accomplishment.

3.10 Survivability Assessment. The users have determined that survivability of the system isn't an issue. The SEON isn't expected nor designed to operate in a hostile environment. It isn't hardened to operate in a chemical, biological, or radiological environment.

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SECTION 4 - ADMINISTRATION

4.0. TEST MANAGEMENT. Headquarters (HQ) Air Force Materiel Command (AFMC) is the implementing command. AFMC has tasked Sacramento Air Logistics Center (SM-ALC) with System Program Office (SPO), and supporting command responsibilities. The participating commands directly involved in the Qualification Operational Test and Evaluation (QOT&E) are: HQ Air Weather Service (AWS), Air Force Operational Test and Evaluation Center (AFOTEC), and HQ Air Force Space Command (AFSPACECOM). The operating commands directly supporting the QOT&E are: HQ AWS, HQ AFSPACECOM, HQ Pacific Air Forces (PACAF), HQ Air Combat Command (ACC), and HQ United States Air Forces Europe (USAFE).

4.1. TASKING.

4.1.1. Detachment (Det) 1, AFOTEC has assigned a Test Director. The Test Director has overall responsibility for planning, conducting, and reporting the QOT&E. He will schedule required resources through the test resource plan (TRP). He will have operational control over the test team during the QOT&E. He will convene the test data scoring board (TDSB) at the test site to validate the reliability and maintainability data collected during the QOT&E. Assisting him from Det 1, AFOTEC is the Associate Test Director(s), Software Test Manager (STM), Associate STM, and Statistician.

4.1.1.1. The Associate Test Director will assist the Test Director. In the absence of the Test Director, he will assume responsibility for planning, conducting, and reporting the QOT&E.

4.1.1.2. The STM will plan and conduct the software evaluations consisting of Maintainability, Usability, Support Resources, Maturity, and Life Cycle Process. He will ensure an adequate number of software evaluators are used for the Software Maintainability Evaluation. The STM will provide all plans and reports to the Test Director as soon as possible, but no later than 30 days after last test event.

4.1.1.3. The Associate STM will assist the STM in conducting the various software evaluations. In the absence of the STM, he will assume responsibility for the software evaluations.

4.1.1.4. The Statistician will ensure the accuracy and meaningfulness of all statistical data.

4.1.2. SM-ALC/LHFBB is the SPO. The SPO will prepare and coordinate the Test and Evaluation Master Plan (TEMP). The program manager certifies the upgraded Solar Electro-Optical Network (SEON) at the Palehua Solar Observatory as ready for dedicated QOT&E prior to test start. The program manager will ensure all actions required in paragraph 4-7 of Technical Order 00-35D-54 are taken. Assisting with the QOT&E from SM-ALC will be a system engineer and software consultant.

4.1.2.1. The System Engineer will assist the Test Director in assuring the QOT&E plan uses acceptable system parameters and addresses all operational effectiveness and suitability issues. He will also assist the SPO in determining actions required to correct deficiencies noted during the QOT&E.

4.1.2.2. The Software Consultant will work with the STM to determine that all software issues are adequately addressed in the QOT&E plan. He will also participate in the Software Maintainability Evaluation.

4.1.3. HQ AWS/PMT has assigned an acquisition manager. The acquisition manager will be the focal point for all operational issues regarding the SEON. He will ensure the QOT&E plan adequately addresses all operational effectiveness and suitability issues. He will ensure the required TRP identified test team members are provided to support the QOT&E. Subordinate to HQ AWS is the Air Force Space Forecast Center (AFSFC); Det 5, AFSFC at the Palehua Solar Observatory; and the operating units assigned to the other SEON sites.

4.1.3.1. The AFSFC will help HQ AWS ensure the QOT&E plan adequately addresses all operational effectiveness and suitability issues. They will ensure sufficient, validated data from other SEON sites and Culgoora Solar Observatory in Australia is provided to the Palehua Solar Observatory to verify the data collected by the upgraded SEON. They will provide a representative to sit on the TDSB.

4.1.3.2. Det 5, AFSFC at the Palehua Solar Observatory will assist the AFSFC in ensuring the QOT&E plan adequately addresses all operational effectiveness and suitability issues. They will provide qualified programmers and analysts as indicated in the TRP to support the QOT&E. They will also provide all resources agreed to in the letter of agreement. They will ensure the upgraded SEON has a comprehensive safety inspection after installation and prior to the start of QOT&E. They will provide a representative to sit on the TDSB.

4.1.4. HQ AFSPACECOM/LKLMK is the SEON maintenance focal point. They will ensure the QOT&E plan adequately addresses all operational effectiveness and suitability issues. They will provide the test team members as indicated in the TRP, including all technicians required for the maintainability demonstration. They will also ensure training slots are allocated for all test team members, including the Test Director, Associate Test Director, STM, and Associate STM. They will provide a representative to sit on the TDSB.

4.1.5. The 49th Communications Squadron (49 CS/LGR) is the SOON centralized repair activity (CRA). The 1957th Communications Group (15 CS/LGR) is the Radio Solar Telescope Network (RSTN) CRA. They will ensure the QOT&E plan adequately addresses all operational effectiveness and suitability issues. They will provide a representative to sit on the TDSB.

4.2. TRAINING REQUIREMENTS. Test team members performing programming, operations, and maintenance will be qualified on the current SEON. The contractor will provide training on operations, programming, and maintenance of the upgraded SEON prior to QOT&E. HQ AFSPACECOM/LKLMK is the point of contact (POC) for the training. The Test Director will provide a 1-day QOT&E training class immediately prior to the QOT&E to teach the test team members data collection processes and the goals of the QOT&E.

4.3. SAFETY.

4.3.1. Safety will not be compromised to accomplish test objectives. The Test Director is responsible for the overall QOT&E safety program. All personnel will receive a comprehensive safety briefing before the start of the QOT&E. The Hickam Air Force Base, Hawaii Safety Office will be consulted for support in evaluating and correcting any unsafe condition. They will also be consulted for any required incident report. If an unsafe or potentially hazardous condition arises during the QOT&E, all testing will be suspended until the unsafe condition is corrected or controlled.

4.3.2. Before commencing the QOT&E, Palehua Solar Observatory Safety Officer will ensure the Hickam AFB, Hawaii Safety Office conducts a comprehensive safety review. The Test Director will ensure all reviews become part of the project file. If the test objectives or methods are added or altered, a safety review will be conducted. All test team members must comply with applicable military department (MILDEP), major command, and test location safety directives and procedures.

4.3.3. If a safety-related incident occurs, the Test Director, test team members, and Palehua Solar Observatory Safety Officer will ensure the reports required by Air Force Regulation (AFR) 127-4 are completed. The Test Director will verify the hazard severity category with the Palehua Solar Observatory Safety Officer prior to releasing any service report. The QOT&E report will contain the results, conclusions, and recommendations of the safety objective. This evaluation will be based upon observation of safety procedures, hazard identification forms, and incident/accident reports.

4.4. SECURITY. Paragraph 1.6 of the Program Management Plan (PMP), dated 30 Mar 89 states: "All efforts currently directed under this program are unclassified for official use only. This includes equipment, details of equipment performance, and specifications. The Program Office has determined that a Security Classification Guide for SEON is not required." Communications Security (COMSEC) support and control of compromising emissions (TEMPEST) protection aren't required. The physical security requirements already in place at the Palehua Solar Observatory are adequate for this QOT&E. Personnel desiring to visit the test location during the QOT&E for purposes directly related to the test effort must coordinate the visit through the Test Director. Personnel visiting the test site must not impede the progress of the QOT&E. This program has been determined to be insusceptible to hostile intelligence exploitation; however, the

test director will ensure sound security practices are implemented during the QOT&E and will continue to monitor the program for changes that could reveal system capabilities or vulnerabilities to hostile intelligence sources.

4.5. ENVIRONMENTAL IMPACT. The operational test and evaluation will be conducted in conjunction with the SEON upgrade at Palehua Solar Observatory. The environmental impact is covered by the 1842d Engineering Installation Group Revised Project Support Agreement, Attachment 1, paragraph 4.d., dated 10 Feb 92. It states "environmental impact considerations, none."

4.6. RELEASE OF INFORMATION. Prior to publishing the results of the QOT&E, all information will be treated as "FOR OFFICIAL USE ONLY." The Test Director will brief all test team members not to discuss any preliminary QOT&E results prior to the release of the QOT&E report. The QOT&E report will have unlimited distribution.

4.7. FOREIGN DISCLOSURE. Any release of test and evaluation information to foreign nationals, governments, or agencies must be approved by HQ USAF/CVAII through HQ AFOTEC/SP.

SECTION 5 - REPORTING

5.0. ACTIVITY REPORTS. The Test Director will send activity reports as required.

5.1. STATUS REPORTS. The Test Director will send a status report as required. These reports will be sent bi-weekly as a minimum during the Qualification Operational Test and Evaluation (QOT&E). Status reports will be addressed as follows:

```
FROM: DET 1 AFOTEC SCOTT AFB IL//TA//***
  TO: SM ALC MCCLELLAN AFB CA//LHFBB//
INFO: HQ AFOTEC KIRTLAND AFB NM//TK//
      HQ AFSPACECOM PETERSON AFB CO//LKLMK//
      AFSFC FALCON AFB CO//DOO//
      HQ AWS SCOTT AFB IL//PMT//
      DET 1 AFOTEC SCOTT AFB IL//TAA//
      49CS HOLLOMAN AFB NM//SCO//
      DET 5 AFSFC HICKAM AFB HI//CC/DO//
      15CS HICKAM AFB HI//SCL/SCLR//
```

5.2. SIGNIFICANT EVENT REPORT. The Test Director will send a significant event report as required.

5.3. FINAL QUALIFICATION OPERATIONAL TEST AND EVALUATION (QOT&E) REPORT. The Test Director will prepare this report with the assistance of the test team. All data collected will be analyzed before presenting the results, conclusions, and recommendations. The QOT&E report will be approved no later than 60 calendar days following the last test event.

5.4. BRIEFINGS. If requested, briefings will be conducted at the conclusion of the QOT&E. Briefing locations will be coordinated through the Test Director.

5.5. PRODUCT QUALITY DEFICIENCY REPORTS (PQDRs).

5.5.1. PQDRs will be submitted in accordance with Technical Order 00-35D-54. They will be sent to the appropriate agency and included in the final test report. PQDRs will be addressed as follows:

```
FROM: DET 1 AFOTEC SCOTT AFB IL//TA//***
  TO: SM ALC MCCLELLAN AFB CA//SE/LHFBB//
INFO: HQ AFOTEC KIRTLAND AFB NM//SE/TK//*
      AFISC NORTON AFB CA//DR//**
      HQ USAF WASHINGTON DC//SE//*
      HQ AFSPACECOM PETERSON AFB CO//LKLMK/SE//*
      AFSFC FALCON AFB CO//DOO//
      HQ AWS SCOTT AFB IL//PMT/SE//*
      49CS HOLLOMAN AFB NM//SCO//
```

DET 1 AFOTEC SCOTT AFB IL//TAA//
ZEN 15CS HICKAM AFB HI//SCLR/SE//*

NOTES:

* Safety offices (SE) identified with an asterisk (*) will receive only Category I and Category II Hazard PQDRs.

** AFISC will only receive Category I and Category II Hazard PQDRs.

*** Since the test team will be deployed to the Palehua Solar Observatory during the test, the "FROM" address may be changed.

5.5.2. Report Control Number (RCN). The PQDR screening point (test team) will validate and assign a unique RCN to each PQDR generated during the QOT&E. Each RCN will be structured as follows: FA3103 YY XXXX A SEON, where:

FA3103	=	Unique six character alphanumeric DOD Activity Address Code for Detachment 1, Air Force Operational Test and Evaluation Center (Det 1, AFOTEC).
XX	=	Last two digits of the calendar year.
YYYY	=	Chronological order of occurrence (0001 through 9999).
A	=	Identifies the test agency branch (Det 1, AFOTEC/TAA).
SEON	=	Program identifier.

5.5.3. PQDR Prioritization. PQDR prioritization will start at the beginning of the QOT&E. Deficiency and Enhancement Analysis Ranking Technique (DART) will be used to prioritize the PQDRs. Before the start of the QOT&E, a DART board will be established consisting of the following members:

5.5.3.1. The SEON QOT&E Test Director.

5.5.3.2. The SEON QOT&E Associate Test Director(s).

5.5.3.3. A representative from the Centralized Repair Activity (CRA).

5.5.3.4. A representative from Det 5, Air Force Space Forecast Center.

5.5.3.5. A representative from Air Force Space Command/LKLMK, SEON maintenance focal point.

5.5.3.6. A representative from Air Weather Service program office (AWS/PMT).

5.5.4. Material Improvement Projects (MIP) Tracking. In accordance with TO 00-35D-54, paragraph 4-11.1, the test team will track all MIPs generated due to PQDRs. The Test Director will assign a MIP focal point who will track the status of open MIPs using the MIP data base developed by the test team.

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COI and MOE/MOP Matrix

1. Measures of Effectiveness (MOEs) have been created for the SEON 1 QOT&E based on changes to AFOTECR 55-9, by Policy Letter 93-01.

2. The following is the new COI and MOE/MOP matrix:

COI-1: Is the upgraded SEON safe to operate and maintain?

MOE 1-1: Adequacy of the system design to allow safe operations and maintenance.

MOP 1-1-1: number of SEON safety hazards that meet Category (CAT) I deficiency PQDR criteria. (CRITICAL)
Performance Criterion: zero detected.

MOP 1-1-2: number of SEON safety hazards that meet CAT II deficiency PQDR criteria. (SIGNIFICANT)
Performance Criterion: zero detected.

COI-2: Do the SEON computers provide sufficient capabilities to support the mission?

MOE 2-1: Capability of the SEON computers.

MOP 2-1-1: number of real-time computer processors that cannot be restored using the Ethernet. (CRITICAL)
Performance Criterion: zero detected.

MOP 2-1-2: number of workstations that cannot be restored to full mission capability from other nodes over the ethernet. (CRITICAL)
Performance Criterion: zero detected.

MOP 2-1-3: number of computers that cannot be restored to full mission capability using the tape backups. (CRITICAL)
Performance Criterion: zero detected.

MOP 2-1-4: number of interfaces not achieved between the computers and equipment. (CRITICAL)
Performance Criterion: zero detected.

MOP 2-1-5: number of menu items that cannot be selected by a single keystroke or a single combination of two keystrokes (as in alt/F10). (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 2-1-6: number of mission data segment changes not executable via operator menu selection.
Performance Criterion: zero detected.

MOP 2-1-7: number of equipment checks and alignments not executable via keyboard entry.
Performance Criterion: zero detected.

MOP 2-1-8: percent of selected text files adequately printed to the LNO5R printers. (SIGNIFICANT)
Performance Criterion: 97%.

MOP 2-1-9: percent of selected graphics files adequately printed to the LNO5R printers. (SIGNIFICANT)
Performance Criterion: 97%.

MOP 2-1-10: percent of screen images adequately printed to the LNO5R printers. (SIGNIFICANT)
Performance Criterion: 97%.

MOP 2-1-11: number of inadequate plots from the SFIR. (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 2-1-12: number of Digital Command Language (DCL) level functions that cannot be performed by the operators.
Performance Criterion: zero detected.

MOP 2-1-13: number of nodes that cannot be assigned or reassigned without bringing the system down. (CRITICAL)
Performance Criterion: zero detected.

MOP 2-1-14: time required for operators to load and run new version software. (CRITICAL)
Performance Criterion: less than 8 hours.

MOE 2-2: Capability of the computer to interface with LIAs.

MOP 2-2-1: performs required functions where the computer individually reads, writes, interacts, and controls for each lock in amplifier (LIA). (SIGNIFICANT)
Performance Criterion: adequate.

MOE 2-3: Capability of the system's built-in tests.

MOP 2-3-1: percent of faults detected by the automatic monitoring system. (SIGNIFICANT) Performance Criterion: a minimum of 99%.

MOP 2-3-2: false alarm rate of faults by the automatic monitoring system. (SIGNIFICANT)
Performance Criterion: a maximum of 1%.

MOP 2-3-3: number of incorrect status indications. (SIGNIFICANT)
Performance Criterion: zero detected.

MOE 2-4: Capability of the interface between the SOON and DIPS.

MOP 2-4-1: number of workstations assigned as system console that cannot perform calibration of the DIPS.
Performance Criterion: zero detected.

MOP 2-4-2: number of workstations assigned as system console that cannot control the data image collection function of the DIPS.
Performance Criterion: zero detected.

MOP 2-4-3: number of workstations assigned as system console that cannot control the scheduling of movie replay function of the DIPS.
Performance Criterion: zero detected.

MOP 2-4-4: number of workstations assigned as system console that cannot control the remote shutdown of the DIPS.
Performance Criterion: zero detected.

MOP 2-4-5: number of inadequate magnetic contour and Stoneyhurst plots performed by the system using data provisioned from the telescopes under control of the workstations. (SIGNIFICANT)
Performance Criterion: zero detected.

COI-3: Does the upgraded RSTN allow detection of solar events?

MOE 3-1: Capability of the RSTN swept frequency interferometric radiometer (SFIR) subsystem.

MOP 3-1-1: percent of solar bursts detected by the current SFIR between 30-75 megahertz (MHz) that are also detected by the new SFIR between 30-75 MHz, while both SFIRs are operational. (SIGNIFICANT)
Performance Criterion: 97%.

MOP 3-1-2: percent of solar bursts detected by other SFIRs (at other SEON sites) between 30-75 MHz that are also detected by the new SFIR. (SIGNIFICANT)
Performance Criterion: 95% of bursts detected by other sites during concurrent patrol periods.

MOP 3-1-3: subjective rating by qualified analysts of solar sweep signatures detected between 30-75 MHz. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 3-1-4: subjective rating by qualified analysts of solar sweep intensities between 30-75 MHz. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 3-1-5: speed of Type 2 shocks. (SIGNIFICANT)
Performance Criterion: within 500 kilometers per second of the speed indicated by the current system.

MOP 3-1-6: minimum sensitivity of the new SFIR at 30 MHz. (SIGNIFICANT)
Performance Criterion: 10 Solar Flux Units (SFUs).

MOP 3-1-7: minimum sensitivity of the new SFIR at 250 MHz. (SIGNIFICANT)
Performance Criterion: 40 SFUs.

MOP 3-1-8: number of solar events, types of solar burst signatures, and burst intensities between 75-250 MHz detected by the SFIR. There is no performance criterion for this MOP.

MOE 3-2: Capability of the RSTN's discrete frequency radiometer.

MOP 3-2-1: percent of solar intensity difference between that indicated by the discrete frequency radiometer computer and the charted intensity. (SIGNIFICANT)
Performance Criterion: 10% or less.

MOP 3-2-2: the computer reported burst characteristics (start time, maximum time, stop time, mean flux, integrated flux, and peak flux) compared to the charted characteristics. (SIGNIFICANT)
Performance Criteria: plus or minus 5 seconds for times and within 10% for mean flux, integrated flux, and peak flux.

MOP 3-2-3: number of solar bursts the discrete frequency radiometer incorrectly identifies (excluding RFI). (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 3-2-4: subjective rating by experienced RSTN analysts and programmers of discrete frequency bursts. (CRITICAL)
Performance Criterion: adequate.

COI-4: Does the upgraded SOON allow detection of solar events?

MOE 4-1: Capability of the SOON charged couple devices (cameras) and their interfaces.

MOP 4-1-1: subjective rating by qualified analysts of H-Alpha images. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 4-1-2: minimum resolution of large-scale H-Alpha images.
(SIGNIFICANT)
Performance Criterion: 2.2 arc seconds.

MOP 4-1-3: minimum resolution of full disk H-Alpha images.
(SIGNIFICANT)
Performance Criterion: 12.5 arc seconds.

MOP 4-1-4: subjective rating by qualified analysts of spectrographic images. (CRITICAL)
Performance Criterion: adequate.

MOP 4-1-5: minimum resolution of large-scale spectrographic images. (SIGNIFICANT)
Performance Criterion: 2.2 arc seconds.

MOP 4-1-6: minimum resolution of full disk spectrographic images. (SIGNIFICANT)
Performance Criterion: 12.5 arc seconds.

MOP 4-1-7: subjective rating by qualified analysts of H-Alpha images transferred to the DIPS from the RS170 output of the CCD. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 4-1-8: subjective rating by experienced SOON analysts and programmers of solar flare analysis function. (CRITICAL)
Performance Criterion: adequate.

MOE 4-2: Capabilities of the digital imagery processing subsystem (DIPS).

MOP 4-2-1: subjective rating by qualified analysts of spectrographic magnetic data transferred to the DIPS.
Performance Criterion: adequate.

MOP 4-2-2: number of frames transferred to the DIPS from the SOON. (SIGNIFICANT)
Performance Criterion: a minimum of 12 frames per minute.

MOP 4-2-3: DIPS playback speed.
Performance Criteria: up to 30 frames per second.

MOP 4-2-4: number of frames that can be stored by the DIPS.
Performance Criterion: a minimum of 800 frames.

MOP 4-2-5: resolution of each frame (stored in the DIPS).
Performance Criterion: a minimum of 512 X 512 X 8 bits per frame.

MOP 4-2-6: sufficiency of shades of gray (of stored DIPS images).
Performance Criterion: 256 gray shades to allow the capability for coronal hole detection at 10830 angstroms.

MOP 4-2-7: speed of overlaying pictures on stored grids (in the DIPS).
Performance Criterion: a minimum of one frame per second.

MOP 4-2-8: subjective rating by trained SOON analysts and programmers of the histogram capability. (CRITICAL)
Performance Criterion: adequate.

MOP 4-2-9: minimum resolution of H-Alpha and visible light (including Mg B_2). (SIGNIFICANT)
Performance Criteria: 2.2. arc seconds for large scale, 12.5 for full disk.

MOP 4-2-10: resolution of the detected solar magnetic field. (SIGNIFICANT)
Performance Criterion: a minimum of 5 arc seconds at large scale.

MOP 4-2-11: subjective rating by trained SOON analysts and programmers of the image enhancement of gray scale and pseudo color. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 4-2-12: rate of optical scan conversion. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 4-2-13: subjective rating by trained SOON analysts and programmers of the adequacy of stored images compared to the live images. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 4-2-14: subjective rating by trained NGDC analysts of the adequacy of archived solar data.
Performance Criterion: adequate.

MOP 4-2-15: subjective rating by trained SOON analysts and programmers of the spectrographic output data. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 4-2-16: subjective rating by trained SOON analysts and programmers of the digital images (scaled, standardized, and superimposed). (SIGNIFICANT)
Performance Criterion: adequate.

MOP 4-2-17: amount of degradation in current provided operability. (SIGNIFICANT)
Performance Criterion: no degradation.

MOE 4-3: Capability of the SOON's analog to digital (A/D) converters.

MOP 4-3-1: performs required A/D converter functions performed. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 4-3-2: number of SOON significant outages caused by an A/D converter. (SIGNIFICANT)
Performance Criterion: zero detected. A significant outage is defined in AFSFCR 105-1, Attachment 4 (refer to Figure 3-1).

MOP 4-3-3: number of A/D converters failures. (SIGNIFICANT)
Performance Criterion: zero detected. This is based on the requirement for 18 months of operation without a failure.

MOE 4-4: Capability of the SOON's digital to analog (D/A) converters.

MOP 4-4-1: performs required D/A converter functions. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 4-4-2: number of SOON significant outages caused by a D/A converter. (SIGNIFICANT)
Performance Criterion: zero detected. A significant outage is defined in AFSFCR 105-1, Attachment 4 (refer to Figure 3-1).

MOP 4-4-3: number of D/A converter failures. (SIGNIFICANT)
Performance Criterion: zero detected.

COI-5: Is the SEON software supportable?

MOE 5-1: Usability of the SEON software.

MOP 5-1-1: The usability of the SEON software. (CRITICAL)
Performance Criterion: Subjective.

MOP 5-1-2: number of tested software changes that cannot be introduced into the system without rebooting the computer.
Performance Criterion: zero detected.

MOE 5-2: Maturity of the SEON software.

MOP 5-2-1: The maturity of the SEON software. (SIGNIFICANT)

Performance Criterion: Subjective.

MOE 5-3: Maintainability of the SEON software.

MOP 5-3-1: The maintainability of the SEON software.
Performance Criterion: Subjective.

MOE 5-4: Support resources of the SEON software.

MOP 5-4-1: The support resources of the SEON software. (SIGNIFICANT)
Performance Criterion: Subjective.

MOP 5-4-2: system impact of testing approved software changes.
Performance Criterion: subjective.

MOE 5-5: Life-cycle process of the SEON software.

MOP 5-5-1: The life-cycle process of the SEON software. (SIGNIFICANT)
Performance Criterion: Subjective.

MOE 5-6: Capability of the programmers to perform their mission.

MOP 5-6-1: time required to update and install completely new source software distribution into the system. (SIGNIFICANT)
Performance Criterion: less than 8 hours.

MOP 5-6-2: number of approved software changes the programmers cannot introduce into the application software. (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 5-6-3: number of software development tools the programmers cannot effectively use. (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 5-6-4: number of program documentation items the programmers cannot update. (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 5-6-5: number of programming tasks that cannot be performed due to inadequate training. (SIGNIFICANT)
Performance Criterion: zero detected.

COI-6: Does the SEON adequately report solar events?

MOE 6-1: Capability of the network to transmit and receive messages over the Automated Weather Network (AWN)

MOP 6-1-1: percent of message formats transmitted IAW Air Force Space Forecast Center Pamphlet (AFSFCP) 105-5. (SIGNIFICANT)
Performance Criterion: 97% (refer to Table 3-1).

MOP 6-1-2: time between solar activity and transmission of the required message. (CRITICAL)
Performance Criterion: IAW AFSFCR 105-1, Attachment 4 (refer to Figure 3-2).

MOP 6-1-3: number of errors between transmitted and received messages. (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 6-1-4: number of solar events the analysts are unable to respond to within time constraints listed in Air Force Space Command Regulation (AFSCR) 105-1. (CRITICAL)
Performance Criterion: zero detected.

COI-7: Is the SEON supportable?

MOE 7-1: Logistics supportability, readiness, and maintainability of the SEON.

MOP 7-1-1: mean time between critical failure (MTBCF) of the RSTN. (SIGNIFICANT)
Performance Criterion: a minimum of 750 hours.

MOP 7-1-2: MTBCF of the SOON. (SIGNIFICANT)
Performance Criterion: a minimum of 750 hours.

MOP 7-1-3: mean time between maintenance corrective (MTBMc). (SIGNIFICANT)
Performance Criterion: a minimum of 200 hours.

MOP 7-1-4: mean repair time (MRT) of the SEON. (SIGNIFICANT)
Performance Criterion: a maximum of 4 hours.

MOP 7-1-5: MRT of the embedded computer resources. (SIGNIFICANT)
Performance Criterion: a maximum of 1 hour.

MOP 7-1-6: MRT of the SFIR. (SIGNIFICANT)
Performance Criterion: a maximum of 1.5 hours.

MOP 7-1-7: Max time to repair (Max TTR) for the SFIR. (SIGNIFICANT)
Performance Criterion: a maximum of 8 hours.

MOP 7-1-8: Max TTR for the CCD. (SIGNIFICANT)
Performance Criterion: a maximum of 1 hour.

MOP 7-1-9: Max TTR for the UPS. (SIGNIFICANT)
Performance Criterion: a maximum of 1 hour.

MOP 7-1-10: Max TTR for the SEON. (SIGNIFICANT)
Performance Criterion: a maximum of 3 hours for 95% of all failures.

MOP 7-1-11: number of special tools required to maintain the SEON. (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 7-1-12: number of peculiar test equipment required to maintain the SEON. (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 7-1-13: percent of initial spares support listing (ISSL) items filled at site prior to QOT&E.
Performance Criterion: a minimum of 80%.

MOP 7-1-14: percent of critical ISSL items filled at site prior to QOT&E. (SIGNIFICANT)
Performance Criterion: 100%.

MOP 7-1-15: UTR of the SEON system.
Performance Criterion: 97%.

MOE 7-2: Maintainability of the SEON.

MOP 7-2-1: Max TTR for the SEON. (SIGNIFICANT)
Performance Criterion: a maximum of 3 hours for 95% of all failures.

MOP 7-2-2: number of failures not detected through test points using full resources. (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 7-2-3: percent of detected faults corrected by replacing one Line Replaceable Unit (LRU). (SIGNIFICANT)
Performance Criterion: a minimum of 90%.

MOP 7-2-4: percent of detected faults corrected by replacing a maximum of two LRU's. (SIGNIFICANT)
Performance Criterion: a minimum of 95%.

MOP 7-2-5: percent of detected faults corrected by replacing a maximum of three LRUs. (SIGNIFICANT)
Performance Criterion: a minimum of 99%.

MOP 7-2-6: weekly preventive maintenance inspection (PMI) times for maintaining the upgraded portions of the SEON. (SIGNIFICANT)
Performance Criterion: a maximum of 30 minutes.

MOP 7-2-7: weekly PMI times for maintaining the upgraded portions of the RSTN. (SIGNIFICANT)
Performance Criterion: a maximum of 30 minutes.

MOP 7-2-8: amount of increased time required to perform weekly PMI for maintaining the non-upgraded portions of the RSTN. (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 7-2-9: amount of increased time required to perform weekly PMI for maintaining the non-upgraded portions of the SOON. (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 7-2-10: number of failures requiring more than removal and replacement of defective LRUs on the new SFIR, CCDs, IDAS, or computer resources. (SIGNIFICANT)
Performance Criterion: zero detected.

MOP 7-2-11: depot-level task completion time. (SIGNIFICANT)
Performance Criterion: Less than 6 hours.

MOP 7-2-12: MTBCF of the SFIR and discrete frequency radiometer. There is no performance criteria for this MOP.

MOP 7-2-13: up time ratio (UTR) of the RSTN system.
Performance Criterion: a minimum of 97%.

MOP 7-2-14: UTR of the SOON system.
Performance Criterion: a minimum of 97%.

MOE 7-3: Adequacy of the technical data provided with the upgraded SEON.

MOP 7-3-1: number of significant outages caused by erroneous technical data. (CRITICAL)
Performance Criterion: zero detected.

MOP 7-3-2: subjective assessment by qualified programmers, technicians, and analysts of the technical data. (SIGNIFICANT)
Performance Criterion: adequate.

MOE 7-4: Training provided to support the upgraded SEON.

MOP 7-4-1: subjective assessment by qualified SEON operators, maintainers, and analysts of the training. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 7-4-2: number of discrepancies between maintenance AFSC job descriptions and the tasks performed.
Performance Criterion: zero detected.

MOP 7-4-3: number and skill level of personnel required to perform any SEON maintenance routine. (SIGNIFICANT)
Performance Criterion: one 30452 technician.

MOP 7-4-4: adequacy of the course chart for maintenance. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 7-4-5: adequacy of plan of instruction for maintenance. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 7-4-6: adequacy of the provided student maintenance training material. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 7-4-7: adequacy of the maintenance training program and training equipment plan. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 7-4-8: number of discrepancies between operations AFSC job descriptions and the tasks performed.
Performance Criterion: zero detected.

MOP 7-4-9: adequacy of the course chart for operations. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 7-4-10: adequacy of the plan of instruction for operations. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 7-4-11: adequacy of the provided student operations training material. (SIGNIFICANT)
Performance Criterion: adequate.

MOP 7-4-12: adequacy of the operations training program and training equipment plan. (SIGNIFICANT)
Performance Criterion: adequate.

COI-8: Does the SEON facility provide adequate power and environmental support?

MOE 8-1: Capability of the uninterruptable power source (UPS).

MOP 8-1-1: time the UPS provides power to the equipment connected to it in a generator backed-up configuration. (CRITICAL)
Performance Criteria: long enough for the backup generator to come on-line with no loss of SEON data.

MOP 8-1-2: time the UPS provides power to the equipment connected to it in a non-generator backup configuration. (CRITICAL)
Performance Criterion: long enough for the equipment to be orderly and safely powered-down with no loss of SEON data.

MOE 8-2: Environmental control of the Palehua Observatory.

MOP 8-2-1: range of temperature in the SOON equipment room. (SIGNIFICANT)
Performance Criterion: 60° F to 80° F.

MOP 8-2-2: range of temperature in the RSTN equipment room. (SIGNIFICANT)
Performance Criterion: 50° F to 90° F.

MOP 8-2-3: range of relative humidity in the SOON equipment room. (SIGNIFICANT)
Performance Criterion: 30% to 60%.

MOP 8-2-4: range of relative humidity in the RSTN equipment room. (SIGNIFICANT)
Performance Criterion: 25% to 75%.

MOP 8-2-5: the amount of operational impact caused by EMI encountered by the SEON. (SIGNIFICANT)
Performance Criterion: No operational impact.

MOP 8-2-6: the amount of operational impact caused by RFI encountered by the SEON. (SIGNIFICANT)
Performance Criterion: No operational impact.

COI-9: Is the human factors engineering of the SEON adequate?

MOE 9-1: Human factors engineering (HFE) aspects of the upgraded SEON.

MOP 9-1-1: number of significant outages caused by improper HFE considerations. (CRITICAL)
Performance Criterion: zero detected.

MOP 9-1-2: subjective assessment by qualified operators, maintainers, and analysts of the HFE characteristics. (SIGNIFICANT)
Performance Criterion: adequate.

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