MISSION DEVELOPMENT SIMULATOR

PHASE 0

SYSTEM TEST PLAN

REVISION B

12/5/68

INTERNAL SIGN-OFF SHEET

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CONTENTS

1.0 SCOPE

This Document is the Test Plan for demonstration of the Phase 0 capability of the MDS.

1.1 Phase 0 Description

Phase 0 hardware will consist of:

a) SLM - The active panels will be 2C, 2D, 3B, and 7B. All other panels will be blank. Sound attenuation will not be provided.

b) SCC - The active panels will be 1A, 1B, 2A, 2B, 5A and 5B. All other panels will be blank.

c) DIU and System Junction Box - The DIU and system junction box will be complete.

d) Stimulus Subsystem - The stimulus subsystem will consist of:

1) A dual SVS ATS system with supplemental eyepiece.

2) A2 Power Conditioning Racks

3) A2 Special Effects

The dual SVS ATS system will contain all driven elements in both legs for all modes of operation.

1.2 Allocation of Test Level

Allocation of Tests between Subsystem Level, System Level and Demonstration Orbital Passes are indicated in this Document.

1.3 Index of Tests and Requirements

Section 4 is a cross reference of Phase 0 demonstration requirements to paragraphs of this Plan which satisfy those requirements.

1.4 List of Subsystems

These Subsystems will be functionally tested as part of the Demonstration Orbital Passes and no special test data will be recorded for these Subsystems.

1) Interface Subsystem
   a) DIU
   b) System Junction Box
   c) Adapter
2) SLM
3) SCC
4) Stimulus Subsystem
   a) Dual SVS ATS System with supplemental eyepiece
   b) A2 Power Conditioning Racks
   c) A2 Special Effects
5) Computer Subsystem
   a) SDS 930
   b) Beckman 2200
   c) IBM 360/44

2.0 APPLICABLE DOCUMENTS

Mission Development Simulator Performance

Design Requirements

SAFSL Exhibit 34003, 15 August 1968

Phase Zero Configuration Presentation

Made 6/26/68, BIN 50372-96-3

Phase 0 - Simulation Software Requirement Rev 2

Oct. 15, 1968 BIN: BIF-055-1318-20-3-68

Mission Development Simulator Phase 0

Demonstration Requirements

BIF 055-50372-244-268

3.0 SYSTEM DEMONSTRATION TESTS

The overall functional characteristics of the Phase 0 will be demonstrated during a series of System Level Demonstration, Review and Analysis of Subsystem Test Data and Visual Inspection of Hardware. The System Level Demonstrations are catagorized as follows:

1) Demonstration of the Pre-Test Checkout Program and Procedure.
2) Demonstration of Simulator operation in the ATS Mode on a Demonstration Orbital Passes.
3) Demonstration of Simulator operation in the MO Mode on Demonstration Orbital Passes.
4) Demonstration of Simulator operation in the ATS/MO Mode on Demonstration Orbital Passes.
5) Demonstration of Simulator operation in the Pre-Pass Mode.
6) Individual measurements made at the System Level but not included in the script of the Demonstration Orbital Passes.
7) Visual Inspection of the Hardware at the System Level.

3.1 Simulator Pre-Test Checkout Program

3.1.1 Simulation Checkout

The function of the Simulation Check Computer Programing Component (CPC) is to check the Simulator Hardware by use of the appropriate Software. The Test will perform error detection on the Hardware to insure its integrity prior to the execution of a Real Time Simulation Run.

The test will also serve as a routine confidence Test for the System. Prior to this Test, Manufacturers Diagnostics will have been performed on the SDS 930, Beckman 2200 and IBM 360/44 to assure their operational status.

The Simulation Check CPC will operate in the SDS 930 Computer in a non-real time mode and will be written in SDS 930 machine language.

The major functional input to the Simulation Check CPC will be all DIU input register signals. The major outputs will be all DIU output register signals.

3.1.2 Description

The program will detect the following type of errors:

1) Failure of a console generated input to reach the proper SDS 930 data base location

3.1.2 Continued

2) Change in a data base input value without a corresponding change in the input device associated with the signal.

3) Failure of a hardware device to respond to a software generated signal.

4) Recording of a hardware change where no software signal has been generated.

3.1.3 Simulation Checkout Plan

The Simulation Check CPC will consist of two major sections; the input check and the output check.

3.1.3.1 Output Check

The output check will be controlled by a predetermined numbered list of device checks and an external interrupt button which will allow the operator to step through the check routines one by one. This procedure will be used to check all software generated outputs to the SVS, SLM, and SCC. In general, the external interrupt will trigger a single response (e.g., a blanking shutter closing.)

3.1.3.1 Continued

In some cases, such as the slide change checks, a sequence of events will occur to check the operation of all possible commands to the device. The last device test routine in the output section will call for the start of the input checkout section of the Simulation Check CPC.

The operator will be provided with a script which indicates what action should occur for each interrupt and what method the operator will use to verify the action. In most cases, the successful completion of the action will be indicated on the alpha-numeric display on Panel 2D. In other cases, such as dero rotation, the operator will verify the action through the eyepiece.

3.1.3.2 Input Check

The input check will allow for random checking of any device. The status of the SLM and SCC Panels will be read continuously and any change of state in the input section of the core will indicate that a devices status has been changed.

3.1.3.2 Continued

When the change is recognized, the device (name and position) will be listed on the SDS 930 console teletype. The same information, in an abbreviated form, will be displayed on the alpha-numerics display on panel 2D. This process of sending the console status and displaying changes will continue until the operator terminates the program.

3.2 Demonstration Orbital Passess (DOP)

The System demonstrations to be performed for acceptance of the Phase 0 configuration of the MDS will consist of several simulated missions passes utilizing four modes of operation.

These modes are:

1. ATS only
2. MO only
3. ATS/MO
4. Pre-pass Operation

In order to implement operation of these modes, the following scripts will be generated:

1. High target density pass (60 tgts)
2. Medium target density pass (40 tgts)
3. Low target density pass (20 tgts)
4. Prepass briefing

Modifications to these basic "scripts" will allow any of the first three to be tailored for ATS only, MO only, or ATS/MO operation. These same "scripts" will be utilized during Phase 0 operation of MDS with minimum modification required.

3.2 Demonstration Orbital Passes (DOP) CONTINUED

The modifications will be implemented by changing control statements in the SCRIPT DECK (Training language), and the data base initialization. These changes will permit mode changes by revising the simulator initialization logic.

This method of modification of basic "scripts" will permit pre-programming of stops during operation, requesting data recording, modifying on-line readout on CRT, simulator operating mode selection, slide sequencing, etc.

The prepass briefing script will provide the system initialization required to operate the cue subsystem in the prepass mode and the two manual modes. The Auto During Pass cue subsystem mode will be implemented in scripts 1, 2, and 3. The manual modes will also be available in scripts 1, 2, and 3.

The following list of definitions describe the types of verification to be performned for the DOP's.

Demonstration

Test performned in a specified hardware/software environment where pre-designated inputs should produce known and readily observable outputs.

Review of Test Data

Detailed auditing of test data to determine that outputs are present in exact configuration and format expected. This includes core dump or other intermediate data not readily observable during the test.

3.2 Demonstration Orbital Passes (DOP) CONTINUED

Review of Analytical Data

Computer Programs which perform mathematical computations frequently generate output data which are not precisely predictable. These outputs must then be analyzed in terms of basic functions and/or compared with data derived by independent computation or in some cases by actual experience.

3.2.1 ATS Mode DOP's

The ATS only DOP's will exercise all functions on console 2 associated with the operation of the ATS. This will be accomplished by generating a mission profile utilizing the MDS Pre-Simulation Data Generation Program and providing mission passes as required to exercise the LP and HP operations, as well as the Auto during pass and manual modes of cue operation.

Since the scripting of these missions profiles require the use of the Pre-Simulation Data Generation program, the detailed content and sequence of events for these demonstrations will be derived from the outputs generated by these programs. The task to be performed and the capabilities to be demonstrated can be discussed independent of the exact mission profile.

3.2.1 ATS Mode DOP's (CONTINUED)

These DOP's will be used to demonstrate operational characteristics for the ATS functions available in the MDS Phase 0 configuration. Table I lists the controls and Displays associated with one-man operation of the ATS. Table 2 shows the list of requirements to be demonstrated during these DOP's. Each control and display will be exercised several times during the DOP's to demonstrate operation of these controls and displays. Where required, measurements shall be made at the hardware side of the hardware/software interface, Stops will be programmed for each DOP to allow measurements to be made during the run to verify requirements. The functions be demonstrated will consist of the following:

1. LP/HP stimulus presentation using the dual arm SVS. The dual arm SVS will contain the slides for HP in one arm and slides for LP in the other arm. The capability to view targets in Trackpath 1, 2 or Primary will be implemented by inter leaving slides in each arm. During the DOP, slide selection and presentation will be based on Trackpath selected, magnification range selected, voting, decision time, and ATS hold.

3.2.1 ATS Mode DOP's (Continued)

2. Target sequencing based on real world mission profiles as generated by the Pre-Simulation Data Generation Programs and selected by AVE POSC. (This will include target sequencing and timing, group allocation and voting priorities, peripheral display drive, Time to next Target, Target Number, Alpha-Numeric Coding and cue display requirements).

3. Magnification zoom control and LP/HP and HP/LP switching. Demonstrate 2:1 magnification change in both LP and HP and switching from LP to HP or HP to LP within the time constraints.

4. Control stick performance, GE determine STF. GE will determine the specific stick transfer function to be used with the ATS tasks and will calibrate the stick output to the accuracy and limits as required. Calibration data will be available at time of DOP.

5. Trackpath selection. In this DOP, the script will allow the crewman to select Trackpath 1, Trackpath 2, or Primary Trackpath as desired.

6. Voting will be performed as per directions.

3.2.1 ATS Mode DOP's (Continued)

7. Position Update will be exercised as per directions.

8. The peripheral displays will be driven to demonstrate wipeout display, recommended dwell per target.

9. The cues will contain information for crew voting of targets and positions update centering information.

10. Cue hold will be exercised at crewman discretion.

11. ATS hold will be exercised as per directions contained on cues.

12. Special FREEZE mode will be demonstrated during the run. Special "FREEZE" stops the simulation but permits use of mag stick and control stick with proportional characteristics. Upon resuming the simulation, the eyepiece scene will revert to the position existing at the start of FREEZE.

The stimulus material for this demonstration will consist of sequentially numbered 9 x 9 diapositives marked at one inch intervals with crosshairs and identifying coordinates assigned to each set of crosshairs.

The cues will also be sequentially numbered and will contain the information required for voting, position update, position mark and ATS hold.

3.2.1 ATS Mode DOP's (Continued)

The ATS only DOP's will be prepared to permit usage of any of the three "Payload Mode" scripts. These scripts will allow ATS Trackpath selection at the crewman's discretion but will blank the eyepiece if mag stick is placed in MO position by the crewman. Trackpath 1 will contain the Primary and up to three alternates and Trackpath 2 will contain up to four alternates. Vehicle and mission constraints will be applied to the groups and targets to insure that the mission profile represents a valid simulation. In addition, the peripheral displays, target number, alpha-numeric, and cues associated with each target will be driven. The wipeout display with recommended target dwell times will be displayed for each group. The crewman will have the capability to select the trackpath to be used and the displays and controls will be driven accordingly.

Data recording and reduction (Magnetic tape) will be demonstrated at the completion of this run and the parameters selected for recording by prescripting will be those required to verify operation of this demonstration. In addition, analog recorders (strip charts up to 16 channels) will be available for recording specified variables during the DOP.

3.2.1 ATS Mode DOP's (Continued)

Real time monitoring of the run at the SCC will be demonstrated, including the prescripting of parameters on the CRT.

The ATS only DOP's will be scripted to provide several programmed stops during each run for measurements required to demonstrate validity of the simulation. These DOP's will also be scripted to display data at the SCC during each run and to record various parameters for analysis after the run. The on-line data display will include:

1. No. of tgt selected based on ATS voting.
2. Current status of SLM controls and displays.

The recorded data will include:

1. Voting on each target
2. Time
3. LOS and Gimbal data
4. Status and values for SLM C & D Panels

3.2.2 MO only DOP's

The MO only DOP's will exercise all functions on console 2 associated with operation of the MO. This will be accomplished by generating a mission profile utilizing the 106 Pre - Simulation Data Generation program and providing mission passes as required to exercise the MO operations.

3.2.2 MO Only DOP's CONTINUED

Since the scripting of these missions profiles require the use of the Pre-Simulation Data Generation program, the detailed content and sequence of events for these demonstrations, will be derived from the outputs generated by these programs. The tasks to be performed and the capabilities to be demonstrated can be discussed independent of the exact mission profile.

These DOP's will be used to demonstrate operational characteristics for the MO functions available in the MDS Phase 0 configuration. Table 1 lists the controls and displays associated with one-man operation of the MO. Table 2 shows the list of requirements to be demonstrated during these DOP's. Each control and display will be exercised several times during the DOP's to demonstrate operation of these controls and displays. Stops will be programmed for each DOP to allow measurements to be made during the run to verify requirements.

The functions to be demonstrated during these DOP's will consist of the following:

1. MO stimulus presentation using one arm of the dual arm SVS with a mask inserted to decrease the apparent FOV to 40^{o}.

3.2.2 MO Only DOP's (Continued)

2. Target sequencing based on mission profiles as generated by the Pre-Simulation Data Generation Programs and selected by AVE POSC. (This will include target sequencing and timing, voting assigned, and peripheral display driven.)

3. Step Magnification Control demonstrate that the four steps occur within time constraints.

4. Control Stick. GE will determine the specific stick transfer function to be used with the MO tasks and will calibrate the output to the accuracy and limits as required. Calibration data will be available at the time of the DOP's.

5. Manual controls for Exposure Adjust, Shutter Mode, Camera Mode, Manual Shutter, and X Format IMC. The operation of these controls will be recorded on mag. tape and will be displayed at the SCC.

6. The reticles pattern used for these DOP's will be the MO design.

7. The peripheral displays for these DOP's will utilize the ATS hardware but will be driven in the MO mode and sequence.

3.2.2 MO Only DOP's (Continued)

8. The rate nulling time for each target will be based on the photo sequence scripted for that target. At the completion of each sequence, the eyepiece will be blanked until start of track for the next target.

9. Special FREEZE mode will be demonstrated during these DOP's. Special FREEZE stops the simulation but permits use of mag. stick and control stick. Upon resuming the simulation, the eyepiece scene will revert to the position existing at start of FREEZE.

The Stimulus material for these DOP's will be the same as for the ATS only DOP's.

The MO only DOP's will be prepared to permit usage of any of the three basic Payload Mode scripts. These scripts will permit tracking of MO targets but will blank the eyepiece if the mag stick is not placed in the MO position by the crewman.

Data recording during these DOP's will be limited to functions associated with or required for verification of system requirements. In addition, analog recorders (up to 16 channels of strip charts) will be available for recording specified variables during the DOP's.

3.2.2 MO Only DOP's CONTINUED

Real time monitoring of the DOP's at the SCC will be demonstrated, including the presceipting of parameters on the CRT.

3.2.3 ATS/MO DOP's

The ATS/MO DOP's will exercise all functions available on Panels 2C and 2D. These DOP's will be performed to verify the functions and interactions associated with the combined manual operation of the ATS and MO.

1. These DOP's will utilize mission profiles generated in the same manner as for the ATS only and MO only DOP's.

2. One arm of the SVS will be utilized for MO stimulus with the mask inserted to decrease the apparent FOV to 40°. The other arm will contain the stimulus for LP and HP ATS operation. In these DOP's stimulus for only one ATS Trackpath will be provided.

3.2.3 ATS/MO DOP's (CONTINUED)

3. During the ATS/MO DOP's, the targets selected for MO tracking will be based on the voting performed by the crewman in the ATS. At Decision Time for each group of targets, the target with the highest priority will be available for viewing by the crewman.

4. The reticle pattern for these DOP's will be the ATS pattern.

5. Special FREEZE mode will be demonstrated during these DOP's.

6. The stimulus for these DOP's will be the same as for the ATS only DOP's.

7. The Auto during pass and manual modes of Cue operation will be utilized.

The ATS/MO DOP's will be prepared to permit usage of any of the three basic Payload Mode scripts.

Data recording during these DOP's will be limited to functions associated with or required for verification of system requirements. In addition, analog recorders (up to 16 channels of strip chart) will be available for recording specified variables during the DOP's.

Real time monitoring of the DOP's at the SCC will be demonstrated, including the prescripting of parameters on the CRT.

3.2.4 Pre-Pass Briefing DOP's

These DOP's will be limited to verifying the operation of the Cue Sub-system in the non-payload modes of operation. They will require usage of the Visual Display Projetor and associated controls and the Reject Vote button on the magnification controller only.

The stimulus for these DOP's will consist of numbered cue slides.

The script will be prepared to permit operation of the Cue subsystem in the three non-payload modes as defined below.

1. Manual Mode - Single Step: Crewman advances cues sequentially by using single Step switch on VDP.

2. Manual Mode - Random Access: Crewman selects cue number on Manual Thumbwheels and presses Execute button on VDP to obtain desired cue for display.

3. Auto-Prepass Mode - Computer sequences cues automatically each time crewman presses Reject button on magnification Controller.

TABLE I - PHASE "O" C&D

	Anal Data	Test Data	Demonstration		
			ATS	MO	ATS/MO
ATS Track Lite			X		X
Trackpath Select			X		X
ATS Peripherals			X		X
Target Number			X		X
Time To Next Group			X		X
Position Mark			X		
Position Update			X		X
Voting (R, I, A, O)		X	X		X
LP-HP Mag.	X	X	X		X
ATS Hold		X	X		
Control Stick	X		X	X	X
Control Stick Reset			X	X	X
Alpha-Numerics			X		X
Cue Display		X	X		X
Cue Hold		X	X		
Cue Manual Call Up			X		
Cue Single Step	Special Prepass Briefing Mode Demo				
Cue Execute					
ATS Reticle			X		X
ATS FOV			X		X
Event Timer		X	X	X	
MO Track Lite				X	X
MO Peripherals				X	X
MO Reticle				X	
MO Mag.	X	X		X	X
Camera Select				X	X
Camera Mode				X	X
Manual Shutter				X	X
Exposure Adjust				X	X
X Format IMC				X	X
Control Stick	X			X	X
MO FOV				X	X

MISSION PROFILE

MODE	High Density 60 Targets	Medium Density 40 Targets	Low Density 20 Targets
ATS ONLY	2 Trackpaths LP & HP Tgts	2 Trackpaths LP & HP Tgts	2 Trackpaths LP & HP Tgts
MO ONLY	1 Arm of SVS 40 AFOV Mask	1 Arm of SVS 40 AFOV Mask	1 Arm of SVS 40 AFOV Mask
ATS/ MO	1 ATS Trackpath LP & HP Tgts MO - 1 arm of SVS 40° AFOV Mask	1 ATS Trackpath LP & HP Tgts MO - 1 arm of SVS 40° AFOV Mask	1 ATS Trackpath LP & HP Tgts MO - 1 arm of SVS 40° AFOV Mask

3.3 Subsystem Level Tests

Subsystem Level Tests are considered to be Final Acceptance Tests performed on the slide viewing subsystem which will verify compliance with certain requirements. These Tests will be performed at the Vendor's location and the Acceptance Test Data which will be an integral part of the System Demonstration shall be presented for review at the time of System Demonstration Tests.

The portions of the Vendor's Acceptance Test Procedure that are used to verify requirement will be approved by the Air Force System Office. Air Force System Office personnel shall participate in those portions of the Slide Viewing Subsystem Acceptance Test that satisfy System Requirements.

Since the Final Acceptance Test will be performed at the Vendor's location, verification tests will be conducated at VFSTC to re-verify SVS performance.

3.4 Inspection Tests

Inspection Tests are tests that are performed by visually inspecting Hardware to verify compliance with requirements. In some cases, a review of the design drawings and inspection records will be sufficient for verification.

3.5 System Level Verification Tests

System Level Verification Tests are tests performed with the system in the final Phase 0 configuration, and will include running of DOP's during Hardware/Software Integration Tests. All Subsystems shall be active, however, it is not required for all Subsystems to provide their operational functions. For example, it is not required that the Computer Subsystem provide the drive signals for Reticle Brightness Tests.

3.6 System Demonstrations

The plan is divided into two parts, verification of requirements and system demonstrations. Verification of requirements will be accomplished during hardware/software integration tests. Data will be taken during this period and available at or before the time of system demonstration to verify timing and numerical values of system requirements so that no physical measurements are required during system demonstration to interrupt the DOP's. System demonstrations will consist of:

1. Simulator Checkout

2. DOP's

3. Crew demonstrations which will consist of running one of each DOP (ATS only, ATS/MO, MO only) for each crew member that is part of the demonstration team.

3.6 System Demonstrations CONTINUED

No physical measurements are required during system demonstration except for resolution measurements during freeze mode.

Where differences exist between the verification method and demonstration method the two testing approaches are described under the individual requirement.

4.0 The following Section describes the System Requirements, Verification Method and Demonstration Method, and is arranged in the same order as the Phase 0 System Test Requirements Deocument.

4.1 Requirement Title: Performance Demonstrations

4.1.1 Requirement Paragraph in the Test Requirements Document:

3.0 (a)

4.1.2 Requirement: The overall functional characteristics of the Phase 0 MDS, its operability characteristics, and certain of the specific performance and hardware/software design requirements will be demonstrated. General capabilities to be demonstrated are:

a) Pre-test checkout program and procedure.

4.1.3 Verification and Demonstration

a) Verification Method - The Simulation Checkout Program shall be exercised with all controls and displays defined in Appendix A of the Phase 0 Simulation Software Requirements. All system servos will be exercised through their operational ranges. Pre-defined malfunctions will be simulated to insure that the Program will detect failures.

b) Demonstration Method - The Simulation Checkout Program will be exercised in the same manner as the verification method except for malfunction detection.

4.2 Requirement Title: Performance Demonstrations

4.2.1 Requirement Paragraph in the Test Requirements Document:

3.0 (b)

4.2.2 Requirement:

All controls and displays on panels 2C, 2D, 3B and 7B of the SLM.

4.2.3 Verification and Demonstration

a) Verification Method - All Phase 0 active controls and displays on Panels 2C and 2D shall be functionally exercised during the ATS, ATS/MO and MO DOP's. The desired operation

is defined in Appendix A and will be verified during the DOP's. Panels 3B and 7B will be verified by inspection.

b) Demonstration Method - The DOP's shall be scripted to exercise all Phase 0 active controls and displays on Panels 2C and 2D.

4.3 Requirement Title: Performance Demonstrations (Continued)

4.3.1 Requirement Paragraph in the Test Requirements Document:

3.0 (c)

4.3.2 Requirement:

All controls and displays on panels 1A, 1B, 2A, 2B, 5A and 5B of the SCC.

4.3.3 Verification and Demonstration

a) Verification Method - All SLM Repeater Operations will be verified as part of the Simulator Checkout Program (4.1). Stimulus Subsystem status and malfunctions will be verified during final hardware test.

b) Demonstration Method - Simulator Mode Selection Capability shall be demonstrated during DOP's. The SCC operator shall manually request each mode during one or more of the DOP runs.

4.4 Requirement Title: Performance Demonstrations (Continued)

4.4.1 Requirement Paragraph in the Test Requirements Document:

3.0 (e)

4.4.2 Requirement:

The single ATS mode and the single MO mode (peripheral display at 60°)

4.4.3 Verification and Demonstration

a) Verification Method: See Demonstration

b) Demonstration Method:

During the ATS/MO DOP run the peripheral display configuration shall be observed and correlated with the ATS track light, Mag. Contr. setting and the input target list to verify the displays are properly driven.

4.5 Requirement Title: Performance Demonstrations (Continued)

4.5.1 Requirement Paragraph in the Test Requirements Document:

3.0 (k)

4.5.2 Requirement:

Test and operations, data collection and reduction capability

(TBD 1)

4.5.3 Verification and Demonstration

a) Verification Method: The Data Collection and Reduction capability shall be verified by providing a printed data list, a printed stripped and merged data list and plots taken from a rehearsel of one of the DOP runs.

b) Demonstration Method: None

4.6 Requirement Title: Performance Demonstrations (Continued)

4.6.1 Requirement Paragraph in the Test Requirements Document:

1) 3.0 (i) 2) 3.3.2.1.2

4.6.2 Requirement:

1) Turn around capability. (10 & 30 minutes)

2) An automatic Restacking Capability is provided.

4.6.3 Verification and Demonstration

a) Verification Method - At the conclusion of one of the DOP's, the computer shall restack the slides in both the HPA and LPA legs in the original order. This operation shall be timed and the elapsed time shall be 10 minutes or less.

At the conclusion of one of the DOP's, the supply and takeup elevator magazines shall be removed from both the HPA and LPA legs. New magazines shall be installed and the entire operation shall be timed and the elapsed time shall be 30 minutes or less.

b) Demonstration Method - Same as Verification Method.

4.7 Requirement Title: Performance Demonstrations

4.7.1 Requirement Paragraph in the Test Requirements Document: 3.0 (j)

4.7.2 Requirement:

Operational scripting capability.

4.7.3 Verification and Demonstration

a) Verification Method - The running of operational mission oriented scripts shall verify GE's ability to script the Phase 0 System.

b) Demonstration Method - The input data used to generate the DOP scripts and Pre-Simulation Program Printouts shall be presented.

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4.8 Requirement Title: Primary Performance Characteristic

4.8.1 Requirement Paragraph in the Test Requirements Document:

1) 3.1.1.1

2) 3.3.3

4.8.2 Requirement:

1) Validate the adherence of the MDS to a mutually agreed AVE baseline established for Phase 0 on May 1, 1968, except the SLM panels 2C and 2D which were established on June 30, 1968. The software for Phase 0 will be frozen to the Phase 0 Simulation Software Requirements Revision 2.

2) Verify Panels 2C and 2D to insure that these two panels reflect the AVE configuration as presented on:

Drawing 711-03063 2 July 1968 for Panel 2C

Drawing 711-03064 2 July 1968 for Panel 2C

Panels 3B and 7B will also be active. Panels 6C and 3C contain simulation peculiar switches. All other panels of the SLM will be blank for Phase 0.

4.8.3 Verification and Demonstration

a) Verification Method - Verify by inspection and review of the Design Drawings that Panel 2C conforms to Dwg. 711-03063 and Panel 2D conforms to Dwg. 711-03064. Review Software Math Modesl for conformance to Phase 0 Simulation Software Requirements, Revision 2.

4.8.3 Verification and Demonstration CONTINUED

b) Demonstration Method - None

4.9 Requirement Title: TIMING SUBSYSTEM

4.9.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.3.2

4.9.2 Requirement:

One event timer shall be driven.

4.9.3 Verification and Demonstration

a) Verification Method - See Demonstration

b) Demonstration Method - Prior to the DOP Pre-pass Briefing, the event timer shall be set to indicate the start and end of the briefing. Verification shall consist of the fact that the briefing starts and stops at the same time the timer times out.

4.10 Requirement Title: IMAGE VELOCITY SENSOR

4.10.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.5.3

4.10.2 Requirement:

IVS errors to be simulated are random errors. Saturation will be simulated in the event of clouds (when pre-scripted) in which case the saturate light will be turned on and the IVS output will limit. Normal IVS rate - nulling will be simulated in the range of 540 [redacted] rad/sec and when IVS is enabled the rate will be reduced to approximately [redacted] rad/sec.

4.10.3 Verification and Demonstration

a) Verification Method - Test data shall be presented which illustrates the decrease of rate errors in the main optics from a given level at the start of track. This data shall include noise and non-noise cases.

b) Demonstration Method - A MO only DOP run shall include a target pass with the IVS inhibited. After tracking for several seconds the IVS shall be enabled. Visual inspection shall be sufficient to see the decrease in tracking rate error.

4.10.3 Verification and Demonstration CONTINUED

b) Continued Saturation shall be demonstrated by inserting large gimbol rate errors into the system. Also the Script shall be used to force the saturation light to illuminate.

4.11 Requirement Title: STICK INPUT

4.11.1 Requirement Paragraph in the Test Requirement Document:

3.1.1.1.5.4

4.11.2 Requirement:

The stick polarity shall be reversable between runs. The stick shall allow low rates to be inserted into the device system. The transfer function shall be provided by the Drive Connection Module of the On-Board Software.

4.11.3 Verification and Demonstration

a) Verification Method - Test data shall be provided which indicates the stick to eyepiece transfer function and the smoothness of the response.

b) Demonstration Method - The functional capability of the stick and its transfer functions shall be demonstrated during the DOP runs.

4.12 Requirement Title: MAGNIFICATION AND REAL FIELD OF VIEW

4.12.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.7.1.1

4.12.2 Requirement:

Demonstrate that the MDS shall follow operator commands and reach any commanded value within 0.5 second and that the step from 31.76X $\pm$ 5% to 63.5X $\pm$ 5% shall occur in 1.0 second or less. (See paragraph 3.1.1.1.7.1.5) for a discussion of presentation rates) Verify that the simulated real field-of-view is 3.78 degrees at 15.88X, and 0.945 degree at 63.5X with the field varying inversely with zoom to the higher powers in each range.

4.12.3 Verification and Demonstration

a) Verification Method - Using a Graduated Test Slide, measure the FOV at the object plane in the apparent FOV for maximum and minimum magnification with the High Power Arm. Repeat with the Low Power Arm. Measure the apparent FOV. Perform an analysis to relate stimulus material scale factors to FOV and verify that the magnification and FOV requirements are met.

4.12.3 Verification and Demonstration CONTINUED

a) Continued Apply drive signals at the Beckman 2200 to simulate steps from

1) 15.88X ± 5% to 31.76X ± 5%

2) 63.5X ± 5% to 127X ± 5%

Record both the drive signal and feedback signal from the Feedback Potentiometer. The elapsed time shall not exceed 0.5 seconds.

Changes in magnification from 31.76X ± 5% to 63.5X ± 5% require a slide change and SVS Acceptance Test Data demonstrates that slide changes are accomplished in 1.0 second or less. During the ATS only DOP, Record the magnification stick output at the SLM and the blanking shutter feedback. The elapsed time from initiation of Command to shutter unblank shall be 1.0 seconds or less.

b) Demonstration Method - During the ATS only DOP, verify through the eyepiece that magnification changes occur between 15.88X and 31.76X and between 63.5X and 127X and that a slide change occurs between 31.76X and 63.5X.

4.13 Requirement Title: OTHER CHARACTERISTICS

4.13.1 Requirement Paragraph in the Test Requirements Document

3.1.1.1.7.1.2.3

4.13.2 Requirement:

Demonstrate that the headrest is of the same configuration as the June 30, 1968 AVE baseline with dimensional changes to adapt it for use with the supplemental eyepiece.

4.13.3 Verification and Demonstration

a) Verification Method - Inspect the Headrest to verify conformance with SK56179-833.

b) Demonstration Method - None

4.14 Requirement Title: TARGET LOADING AND COORDINATION

4.14.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.7.1.5

4.14.2 Requirement:

Demonstrate target selection logic.

4.14.3 Verification and Demonstration

a) Verification Method - See Demonstration

b) Demonstration Method - During the ATS/MO DOP run voting sequence shall be observed and correlated with the input target list to determine which target shall appear in the main optics. Numbered slides shall be used.

4.15 Requirement Title: SCENE DYNAMICS

4.15.1 Requirement Paragraph in the Test Requirement Document:

3.1.1.1.7.1.6 and 3.1.1.1.8.1.6

4.15.2 Requirement:

The requirement for this paragraph shall be defined when TBD 3 of SAFSL Exhibit 34003 is defined.

4.15.3 Verification and Demonstration

The verification and demonstration methods will be defined when TBD 3 of the SAFSL Exhibit 34003 is defined.

4.16 Requirement Title: LIGHTING

4.16.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.7.2.1

4.16.2 Requirement:

Demonstrate that scene illumination can be varied from target to target.

4.16.3 Verification and Demonstration

a) Verification Method - See Demonstration

b) Demonstration Method - During a DOP run illumination shall be varied full range from one target to the next.

4.17 Requirement Title: INITIAL TARGET LOCATION

4.17.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.7.2.3

4.17.2 Requirement:

It must be demonstrated that the simulator will accept stimulus material from the psecified ranges

	LPA	HPA
Scale Range A	128,000:1 to 160,000:1	32,000:1 to 40,000:1
Scale Range B	286,000:1 to 364,000:1	71,500:1 to 91,000:1

taken at obliquities of $\pm$ 15° in stereo angle and $\pm$ 45° in roll angle. The simulator shall adjust the scale of the scene along the intrack and crosstrack axes to scales representative of 75 to 85 nm altitude and initial target locations of + 45° to -40° intrack with roll angles of $\pm$ 10° of the inherent roll angle in the stimulus slide. It is a further condition that simulated scene roll angles shall be limited to $\pm$ 40°, and also that forward intrack obliquity of up to +60° can be simulated with stimulus material of +15° or less stereo angle when the scale of the stimulus is such that the dimensionally adjusted ground scene is contained in the 9" x 9" stimulus slide.

4.17.3 Verification and Demonstration

a) Verification Method - Verify by analysis that the Math Model limits for derotation, anamorphic, and zoom

4.17.3 Verification and Demonstration CONTINUED

a) Continued rotation satisfy the requirement and that the hardware rotation extremes are not exceeded by the math modeling.

b) Demonstration Method - During the ATS DOP run a target will be tracked from 60° forward to 40° aft for several roll angles which are equal to the obliquity angle of the stimulus. A range of stereo angles of the stimulus available shall be used.

During the MO DOP run a target will be tracked from 30° forward to 40° aft.

In both cases a visual inspection shall be made of the image presented.

4.18 Requirement Title: DYNAMIC TARGET LOCATION

4.18.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.7.2.4

4.18.2 Requirement:

Demonstrate that the stimulus subsystem (Paragraph 3.3.2) can simulate the apparent dynamic perspective, orientation, and slant range of the target, in real time, from the initial intrack position to 40^{o} aft and that the simulator will accomplish the changes in scene appearance for both circular and elliptical orbits within the 75 to 85 nm band.

4.18.3 Verification and Demonstration

a) Verification Method - See Demonstration

b) Demonstration Method - The Demonstration runs used in 4.17 shall be rerun using special test slides which give a more quantitative measure of slant range and perspective changes.

4.19 Requirement Title: SCAN AREA

4.19.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.7.2.5

4.19.2 Requirement:

Demonstrate that line of sight excursions are limited only by the stimulus material format size.

4.19.3 Verification and Demonstration

a) Verification Method - See Demonstration

b) Demonstration Method - During the ATS/MO DOP run the stick shall be moved so as to drive the rhomboid arm into the limits and then move the stick so as to move around limits of the stimulus. This capability shall be verified by observation.

4.20 Requirement Title: SCENE STREAMING

4.20.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.7.2.6

4.20.2 Requirement:

Demonstrate that the ground scene is blocked from view during periods of ATS slew, and that the field of view is illuminated at an intensity comparable to the scene intensity at these times.

4.20.3 Verification and Demonstration

a) Verification Method - See demonstration

b) Demonstration Method - The track light indicates the periods of slew since it is not lighted at that time. When the track light is not illuminated a visual observation of the eyepiece shall ascertain the absence or presence of the scene. In the absence of a scene the eyepiece shall be illuminated. When the scene is presented to the eyepiece, the light level should not change as ascertained by visual observation. This can be observed during any DOP run.

4.21 Requirement Title: CONTROL STICK AND MAGNIFICATION CONTROL DURING FREEZE

4.21.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.7.4

4.21.2 Requirement:

Demonstrate that, at the option of the SCC operator, the pilot can scan the stimulus and change magnification during the freeze mode.

4.21.3 Verification and Demonstration

a) Verification Method - During DOP's the SCC operator shall select the scene freeze mode and verify that the Control Stick and Magnification Stick are active while the remainder of the Simulator is in a Hold State.

b) Demonstration Method - Same as Verification Method.

4.22 Requirement Title: MAGNIFICATION AND REAL FIELD OF VIEW

4.22.1 Requirement Paragraph in the Test Requirement Document:

3.1.1.1.8.1.1

4.22.2 Requirement:

Demonstrate that the simulator will accomplish simulated magnification step changes between the values of 125X, [redacted] plus; and between the values of [redacted] Demonstrate that the real field of view is 0.32 degree ± 5% at 125X and that it varies inversely with magnification.

4.22.3 Verification and Demonstration

a) Verification Method - Using the FOV measurements taken in 4.12, perform an analysis to relate the stimulus material scale factors to FOV and verify that the magnification and FOV requirements are met.

b) Demonstration Method - During the MO Only DOP, verify through the eyepiece that magnification changes occur when commanded from the Magnification Stick.

4.23 Requirement Title: EYEPIECE PROPERTIES

4.23.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.8.1.2

4.23.2 Requirement:

The eyepiece properties will be those for the acquisition subsystem with the exception that the image will be masked down to a $40^{o} \pm 1^{o}$ apparent field of view. The apparent field of view will be demonstrated.

4.23.3 Verification and Demonstration

a) Verification Method

b) Demonstration Method - Before ATS/MO and MO DOP's verify that the $40^{o} \pm 1^{o}$ mask is inserted in the Reticle Plane of one leg of the SVS.

With the mask inserted in the SVS Reticle Plane, measure the apparent FOV to verify that it is $40^{o} \pm 1^{o}$.

4.24 Requirement Title: PERIPHERAL DISPLAY

4.24.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.8.1.2.1

4.24.2 Requirement:

The VO peripheral display will be incorporated in the ATS pattern. The 32 timer lights will appear on the left hand side of the display.

4.24.3 Verification and Demonstration

a) Verification Method - See Demonstration

b) Demonstration Method - The VO display pattern is driven by POSC as a function of the input target list. The output pattern for each target shall be observed and correlated with the input data during the ATS/MO and MO only DOP runs.

4.25 Requirement Title: TARGET COORDINATION AND LOADING

4.25.1 Requirement Paragraph in the Test Requirements Document:

3.1.1.1.8.1.5

4.25.2 Requirement:

It will be shown that targets selected by voting logic during the ATS/MO mode demonstration shall be available for viewing through the eyepiece for MO in the appropriate time sequence. The target will appear at a time corresponding to the end of slew and remain in view until the commencement of slew to the next target.

4.25.3 Verification and Demonstration

a) Verification Method - See Demonstration

b) Demonstration Method - During the ATS/MO DOP run the votes on the targets for each group shall be noted. These notes shall be correlated with the input target list given to PUSC to determine which target should appear in the main optics and when it should appear. Observing the numbered slide and the time it first appears in the MO shall verify target coordination and loading. This voting shall include no vote and ATS hold cases.

4.26 Requirement Title: SCENE LIGHTING

4.26.1 Requirement Paragraph in the Test Requirement Document:

3.1.1.1.8.2.1.2

4.26.2 Requirement:

It will be demonstrated that the scene brightness will be variable over a range of 50:1 $\pm$ 10% up to 20 $\pm$ 2 foot lamberts as seen by the operator with no stimulus slide in the optical path.

4.26.3 Verification and Demonstration

a) Verification Method - With the SVS Open Gated (no slide), insert a fixed neutral density filter into the system to reduce the System Brightness to 20 $\pm$ 10% foot lamberts. Measure the System Brightness, with the filter modulator at maximum, and verify it to be between 18 and 22 foot lamberts. Vary the Filter Modulator from maximum to minimum and verify that the brightness 0.4 foot lamberts $\pm$10%.

b) Demonstration Method - During ATS/MO and MO DOP's, verify through the eyepiece that the scene brightness is variable.

4.27 Requirement Title: TARGET LOCATION RELATIVE TO VEHICLE

4.27.1 Requirement Paragraph in the Test Requirement Document:

3.1.1.1.8.2.3

4.27.2 Requirement:

Show that targets within the envelope of:

30 degrees forward to 40 degrees aft in track,

40 degrees left to 40 degrees right crosstrack,

and 75 to 85 nm altitude

can be simulated. Perspective and slant range associated with the above envelope are considered to be properties of the stimulus material and will not be altered by the MDS.

Show that altitudes beyond the range stated are possible if proper stimulus material is provided with scale factor proportional to the required altitude.

Show that the in-track line on the ground scene is properly oriented for each target and fixed in time. This orientation shall be determined by the script depending on the status of the derotation prism, orbit inclination and target latitude.

4.23.3 Verification and Demonstration

a) Verification Method - See Demonstration

4.27.3 Verification and Demonstration (CONTINUED)

b) Demonstration Method - During the MO DOP run several targets at different roll angles shall be tracked from 30 degrees forward to 40 degrees aft. This shall be visually observed. In addition, the real time strip chart records shall indicate pitch and roll gimbol angles as a function of time.

4.28 Requirement Title: SOURCE HOLDING AND SELECTION SYSTEM

4.28.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.2

4.28.2 Requirement:

1. The adjacent slide position to the one in viewing position may be selected and viewed within one second.

2. The changer may be commanded to any diapositive, forward or reverse of the present position, and to operate the two elevators indepently.

4.28.2 Verification and Demonstration

a) Verification Method - Slide Viewing Subsystem Acceptance Test Data.

b) Demonstration Method - During the ATS only DOP, verify through the eyepiece that slide changes occur when commanded.

4.29 Requirement Title: SOURCE HOLDING AND SELECTION SYSTEM

4.29.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.2

4.29.2 Requirement:

1. It shall be demonstrated that five slide positions can be skipped and a slide from the sixth position can be viewed in 3 seconds or less.

4.29.3 Verification and Demonstration

a) Verification Method - Reject the slide in the viewing station, command the elevator to skip 5 slide positions and insert the slide in the 6th position into the viewing station. Record the reject command, elevator busy, transport busy and blanking shutter feedback. The elapsed time from reject command to shutter unblank shall not exceed 3 seconds. This test shall be performed on the supply and take-up elevators, forward and reverse for both legs of the SVS.

b) Demonstration Method - None

4.30 Requirement Title: IMAGE INTENSITY

4.30.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.3.1

4.30.1 Requirement

It will be demonstrated that the colol balance of the light is between 3000o and 6000^{o} Kelvin.

It will be demonstrated that:

1. The image intensity can be varied through a range of 50:1 with the upper level 500 foot lamberts $\pm$ 10%.

2. The intensity of the image 5 degrees from the edge is no less than 50 percent of the on axis intensity. NOTE: These numbers will be measured at the eyepiece without diapositives in the holder.

3. The color change shall not vary more than $\pm$ 25 mireds over the intensity range.

4.30.3 Verification and Demonstration

a) Verification Method - Slide Viewing Susbystem Acceptance Test Data.

b) Demonstration Method - During the DOP's,Verify through the eyepiece that the scene brightness is variable.

4.31 Requirement Title: MANUAL FILTER WHEEL

4.31.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.3.2

4.31.2 Requirement

It will be demonstrated that the manual filter wheel insertion simulated the optical path transmittances at 100%, 50% and 25%.

Furthermore, it will be demonstrated that it is readily possible to change these transmittances to other values.

4.31.3 Verification and Demonstration

a) Verification Method - Measure the System Brightness, at the eyepiece, with all special effects inputs blanked. Insert the filter wheel to the following positions and measure the brightness at each position.

Wheel Setting	Brightness
1	Same as System Brightness
0.5	50% ±10% of System Brightness
0.25	25% ±10% of System Brightness

b) Demonstration Method - During the ATS only DOP, verify through the eyepiece that wheel settings of 0.5 and 0.25 reduce the scene brightness.

4.32 Requirement Title: IMAGE SIZE

4.32 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.3.4

4.32.2 Requirement

It will be demonstrated that the angular magnification is by continuous zoom techniques.

It will be demonstrated that:

1. The magnification has a range of 7.2:1
2. The fild of view subtends and apparent 60 degrees $\pm$ 1 degree at the eye.
3. Lowest power the exit pupil is 4 mm $\pm$ 0.2 mm
4) Highest power the exit pupil is 2 mm $\pm$ 0.1mm
5) The exit pupil size will vary inversely with magnification within the limits of item 3 and 4 above.
6) Manual focus will have $\pm$ 3 diopter adjustment.

4.32.3 Verification and Demonstration

a) Verification Method - Slide Viewing Subsystem Acceptance Test Data.

b) Demonstration Method - During the ATS only DOP, verify through the eyepiece that the angular magnification is by continuous zoom technique and that manual focus is provided.

4.33 Requirement Title: RESOLUTION REQUIREMENT FROM (3.1.1.1.7.1.3)

4.33.1 Requirement Paragraph in the Test Requirement Document:

3.1.2.1.3.5

4.33.2 Requirement

It will be demonstrated that when using a standard white on black bar chart of 2:1 contrast as an input, the device when simulating [redacted] at nadir from orbit shall provide at least 30 LP/mm for 32K scale stimulus and 67 LP/mm for 72K scale stimulus. This performance shall be provided on axis as viewed through the supplemental eyepiece by the unaided eye, with optical drives operating, the target centered in the FOV and scene drifts nulled by the computer. The resolution variation from the center to the edge of the apparent field shall not vary by more than a factor of 2 from the on axis performance.

The resolution under the above conditions shall not degrade by more than a factor of 2 from the performance at a simulated [redacted] where the device is configured to simulate a magnification of 63.5X.

4.33.3 Verification and Demonstration

a) Verification Method - The ATS only DOP will be scripted with a stop at nadir on a standard AF Tri Bar Chart, per MIL-STD-150, of 2:1 contrast. The SCC operator will put the simulator in scene Freeze. With the high power arm in place and the magnification stick at [redacted] center the on axis resolution target in the FOV. The resolution shall be 67 LP/mm minimum. Center the resolution target at the edge of the FOV. The resolution shall be 34 LP/mm. Repeat the Test for +Y and -Y edge.

Change the magnification to 63.5X, and center the on-axis resolution target in the FOV. The resolution shall be 34 LP/mm minimum. Repeat the center to edge variation resolution test for the extreme of the field. The resolution for this test shall be 17 LP/mm minimum.

Remove the high power arm and insert the low power arm. Repeat all tests.

Target	Magnification	Resolution
On Axis	[redacted]	30 LP/mm (min)
+X		15 LP/mm (min)
-Y		15LP/mm (min)

4.33.3 Verification and Demonstration CONTINUED

a) Continued

Targets	Magnification	Resolution
+Y	[redacted]	15 LP/mm (min)
~~-Y~~ - X		15 LP/mm (min)
On Axis	63.5X	15 LP/mm (min)
+Y X	63.5X	8 LP/mm (min)
-Y -X	63.5X	8 LP/mm (min)
+Y	63.5X	8 LP/mm (min)
-Y	63.5X	8 LP/mm (min)

Repeat all tests in the other leg of the SVS.

All resolution readings shall be the average of the readings of three qualified observers. All Readings

b) Demonstration Method - Same as Verification

4.34 Requirement Title: FIELD CURVATURE REQUIREMENT FROM (3.1.1.1.7.1.3)

4.34.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.3.6

4.34.2 Requirement:

It will be demonstrated that the curvature of the apparent field from center to edge under static conditions at 1:1 anamorph setting using the supplemental eyepiece is no greater than 3.5 diopters.

4.34.3 Verification and Demonstration:

a) Verification Method - slide viewing subsystem acceptance test data.

b) Demonstration Method - none.

4.35 Requirement Title: IMAGE PERSPECTIVE FROM (3.3.2.1.3.3)

4.35.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.3.8

4.35.2 Requirement:

The anamorphic optics, which provide image perspective by distorting an input to simulate various slant angles of view, will be demonstrated.

4.35.3 Verification and Demonstration:

a) Verification Method - slide viewing subsystem acceptance test data.

b) Demonstration Method - none.

4.36 Requirement Title: OPTICAL CENTER SELECTION FROM (3.3.2.1.3.4)

4.36.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.3.9

4.36.2 Requirement:

It will be demonstrated that the center of the optical axis can be continuously varied to at least $\pm$ 4 inches in the two orthogonal directions with respect to the center of the diapositives.

4.36.3 Verification and Demonstration:

a) Verification Method - slide viewing subsystem acceptance test data.

b) Demonstration Method - none.

4.37 Requirement Title: BRIGHTNESS CONTROL

4.37.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.4.1

4.37.2 Requirement:

It will be demonstrated for the filter modulator that:

1. Any position within the brightness range can be set within 1 second.

2. Control accuracy is within $\pm$ 10 percent of a commanded foot lambert setting.

4.37.3 Verification and Demonstration:

a) Verification Method - slide viewing subsystem acceptance test data.

b) Demonstration Method - none.

4.38 Requirement Title: MAGNIFICATION CONTROL

4.38.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.4.2

4.38.2 Requirement:

It will be demonstrated that the spherical zoom control will cause any required 2:1 magnification change within 0.5 seconds and will reset to any position within one second. Furthermore, it will be demonstrated that the control is continuous over the operating range as specified in paragraph (3.3.2.1.3.4).

4.38.3 Verification and Demonstration:

a) Verification Method - this requirement is verified by measurements taken in 4.12.

b) Demonstration Method - none.

4.39 Requirement Title: ANAMORPHIC CONTROL

4.39.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.4.3

4.39.2 Requirement:

It will be demonstrated that:

1. Anamorphic azimuth is continuously variable from 0 to 360 optical degrees.

2. Positional accuracy is $\pm$ 15 arc minutes.

3. Any position can be accomplished within 1 second.

4.39.3 Verification and Demonstration:

a) Verification Method - slide viewing subsystem acceptance test data.

b) Demonstration Method - none.

4.40 Requirement Title: IMAGE ROTATION

4.40.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.4.4

4.40.2 Requirement:

It will be demonstrated that:

1. The image rotation is continuously variable from 0 to 360 degrees.

2. Any position can be accomplished within 1 second.

3. Positional accuracy is $\pm$ 30 arc minutes.

4.40.3 Verification and Demonstration:

a) Verification Method - slide viewing subsystem acceptance test data.

b) Demonstration Method - none.

4.41 Requirement Title: POSITION SELECTION

4.41.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.4.5

4.41.2 Requirement:

1. The center of the optics chain has a position accuracy of $\pm$ 0.0059 inches.

2. Any position, within the operating range, has a repeatable accuracy of $\pm$ 0.0004 inches.

3. The minimum position change is 0.0004 inches.

4. The position change is capable of a change rate between 0 and 4.61 inches per second.

5. During position change, position commands may contain accelerations between 0 and 38 inches per second squared.

4.41.3 Verification and Demonstration:

a) Verification Method - slide viewing subsystem acceptance test data.

b) Demonstration Method - none.

4.42 Requirement Title: ACQUISITION PERIPHERAL DISPLAY

(FROM 3.1.1.1.7.1.2.1)

4.42.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.4.6.1

4.42.2 Requirement:

It will be demonstrated that:

1. All peripheral lights are displayed against a dark background in the outer three degrees in the periphery of a 60 degree field of view.

2. All lights subtend one-half degree in the field of view.

3. All lights have the capability of being switched on singly, in any combination or sequence.

4. There are 35 lights in the wipe out display and the design has a capacity for 45 lights.

5. There are 25 lights equally spaced within a 120 degree arc in the left hand field of view 60 degrees above and 60 degrees below the horizontal centerline.

6. There are 5 lights equally spaced and centered in a 30 degree arc centered in the upper right quadrant.

4.42.2 Requirement: (continued)

7. There are 5 lights equally spaced and centered in a 30 degree arc centered in the lower right quadrant.

8. There is a means provided to color the peripheral lights individually.

9. There is sufficient flexibility to simulate a wide variety of potential AVE configurations.

4.42.3 Verification and Demonstration:

a) Verification Method - visual inspection of the hardware and through the eyepiece and review of design drawings.

b) Demonstration Method - ~~none~~. same

4.43 Requirement Title: ACQUISITION PERIPHERAL DISPLAY

(FROM 3.1.1.1.7.2.1)

4.43.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.4.6.1

4.43.2 Requirement:

1. The brightness is variable over a 50:1 $\pm$ 10% range.

2. The maximum brightness is 500 foot lamberts $\pm$ 10%.

4.43.3 Verification and Demonstration:

a) Verification Method - with all inputs except the peripheral display blanked, all peripheral lights on, and the filter modulator at maximum, measure the brightness at the eyepiece to verify a maximum of 500 foot lamberts $\pm$ 10%. Vary the filter modulator from maximum to minimum and verify that the brightness is 50 foot lamberts $\pm$ 10%.

b) Demonstration Method - during the ATS only DOP, verify through the eyepiece that the peripheral display brightness is variable.

4.44 Requirement Title: HAZE REQUIREMENT (FROM 3.1.1.1.7.2.1.3)

4.44.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.4.6.2

4.44.2 Requirement:

The haze brightness (atmospheric luminance) will be demonstrated to show that:

1. The brightness is variable over a 50:1 $\pm$ 10% range.

2. The upper level is 500 foot lamberts $\pm$ 10%.

4.44.3 Verification and Demonstration:

a) Verification Method - with all inputs except the haze generator blanked and the filter modulator at maximum, measure the brightness at the eyepiece to verify a maximum of 500 foot lamberts $\pm$ 10%. Vary the filter modulator from maximum to minimum and verify that brightness is 50 foot lamberts $\pm$ 10%.

b) Demonstration Method - none.

4.45 Requirement Title: HAZE REQUIREMENT (FROM 3.1.1.1.7.2.1.3)

4.45.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.4.6.2

4.45.2 Requirement:

The scene brightness and haze brightness will give proper appearance of the overall scene as seen from orbit.

4.45.3 Verification and Demonstration:

a) Verification Method - none.

b) Demonstration Method - during the ATS only DOP, verify through the eyepiece that the scene and haze brightness are combined.

4.46 Requirement Title: RETICLE REQUIREMENT FROM (3.1.1.1.7.1.2.2)

4.46.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.4.6.3

4.46.2 Requirement

The reticle display will be demonstrated to show that:

1. The brightness is variable over a 50:1 range within ± 10%.

2. The upper level is 500 foot lamberts, ± 10%

4.46.3 Verification and Demonstration

a) Verification Method - With all inputs except the reticle blanked, and the filter modulator at maximum, measure the Brightness at the eyepiece to verify a maximum of 500 foot lamberts ± 10%. Vary the filter modulator from maximum to minimum and verify that the brightness is 50 foot lamberts ± 10%.

b) Demonstration Method - During the ATS only DOP, verify through the eyepiece that the reticle brightness is variable.

4.47 Requirement Title: RETICLE REQUIREMENT FROM (3.1.1.1.7.1.2.2)

4.47.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.4.6.3

4.47.2 Requirement

It will be demonstrated that:

1. The reticle is illuminated.

2. The reticle will grow and contract with change in magnification.

3. The reticle configuration can be changed.

4.47.3 Verification and Demonstration

a) Verification Method - None

b) Demonstration Method - During the ATS only DOP, verify through the eyepiece that the reticle is illuminated and will grow and contract with changes in magnification. Verify by inspection of the Hardware that the Reticle Configuration can be removed and changed.

4.48 Requirement Title: CUE SUBSYSTEM

4.48.1 Requirement Paragraph in the Test Requirements Document:

3.3.2.1.4.6.4

4.48.2 Requirement

The Cue Subsystem will be presented by rear projection screen display on Panel 2C. Four operating modes shall be simulated in the rear projection display.

1. Manual mode, single step
2. Manual mode, random access
3. Auto-Prepass Mode
4. Auto-During Pass Mode

In the manual mode the ability to advance, backup, or random access shall be demonstrated. It shall be demonstrated that consecutive cues can be accessed in one second. Furthermore, it will be demonstrated that any cue in the cue file shall be accessible within 4 seconds.

In the auto-prepass mode it will be demonstrated that the dwell time can be changed manually.

Demonstrate that the auto-during pass mode will provide a computer controlled dwell time.

4.48.2 Requirement CONTINUED

It will be demonstrated that the cue system can provide the capability to present one cue per acquisition target in the during pass mode, and one cue of different content per acquisition target in the pre-pass mode. It will be further demonstrated that the cue film storage system uses 35 mm full frame slides with a holding capacity of 80 slides.

4.48.3 Verification and Demonstration

a) Verification Method - Data shall be presented to indicate the cue change times.

b) Demonstration Method - During the ATS DOP run the Auto-during pass mode shall be verified by observing the number on the cue slide is coordinated with the number on the target slide and the alphanumeric display. This data shall also be shown to be correlated with the input data given to PUSC. Also during DOP the two manual cue modes shall be exercised and the number on the cue slide is correlated with the input cue-target number input data.

In the Prepass Briefing DOP the cue slides shall be observed and the sequence correlated with the input target list.