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ENCLOSURE I

PHOTO RECONNAISSANCE SYSTEM

PROPOSAL AND SPECIFICATIONS

[redacted]

31 OCTOBER 1958

SECRET

WORK STATEMENT

DEVELOPMENT OF A PHOTOGRAPHIC SUBSYSTEM FOR A SATELLITE RECOVERY RECONNAISSANCE VEHICLE

31 OCTOBER 1958

ENCLOSURE I

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ENCLOSURE I

WORK STATEMENT

Development of a Photographic Subsystem
For a Satellite Recovery Reconnaissance Vehicle

1.0 SCOPE

In its broadest definition, the work shall consist of the design, development, production, and test of a complete photographic reconnaissance camera system for use in an orbiting satellite. The system shall be capable of photographing a given area of the earth's surface from the basic WS117L orbiting vehicle and shall be capable of traversing the exposed film into a recoverable capsule for eventual return to the surface of the earth. Neither the recovery system nor the final processing of the film are included within the requirements of this work statement. Within this broad framework, ITEK Corporation shall assume responsibility for the solution of a variety of technical problems. Because of the complex nature of these problems, a major effort will be devoted to their solution in order to insure a maximum probability of operational success.

1.1 Design

Although the detailed design engineering and fabrication of the operational cameras shall be undertaken by ITEK Corporation's principal subcontractor, the basic research leading to the choice of parameters of the high-acuity panoramic camera for this purpose is being performed by ITEK Corporation. Accordingly, it shall be ITEK Corporation's responsibility to maintain strict supervision and technical direction over the design efforts of its principal subcontractor. The lens system shall be designed by ITEK Corporation.

1.2 Research and Development

Because in fact nothing is known about the actual operation of a panoramic camera in an orbiting satellite, every effort shall be made to insure operational reliability under extremely rigorous conditions.

Although operational experience may later define the optimum approach to various problems, in the development phase multiple approaches to the solution of critical problems will be considered.

1.3 Production

The operational and prototype cameras shall be fabricated by ITEK Corporation's principal subcontractor. Lens cells for use in these cameras shall be fabricated by ITEK Corporation which shall also maintain close control over the fabrication effort of its principal subcontractor.

1.4 Tests

Completed cameras shall be subjected to an extensive test program as the most effective non-operational method for proving operational reliability. In addition to using in this program various equipments designed to reproduce the anticipated operational environment, ITEK Corporation shall design and fabricate a test fixture suitable for checking the resolution of the camera at simulated operational velocity and altitude as well as the dynamic effect of camera operation on the vehicle.

1.5 Field Operations

ITEK Corporation shall have the responsibility for providing engineering services for the installation and checkout of cameras in the operation vehicles and their final testing prior to flight.

All of the above activities are discussed at greater length in Exhibit I. The successful performance of each, whether at ITEK Corporation, at the facilit of its principal subcontractor, or at the facility of the prime contractor, are dependent on proper liaison and control.

Also, it is further recognized that security considerations of the stricte sort govern all phases of the work.

All specifications, documents, and/or drawings which are referenced in this proposal, but are not attached hereto, are hereby incorporated herin by reference.

2.0 DESIGN OBJECTIVE

2.1 Photo Quality - The photographs as finally produced on the ground shall be of such quality as to permit a ground resolution of 25 feet or better. This corresponds to resolution of the standard Air Force medium contrast test pattern as defined in MIL STD 150 with dimension W equal to 12.5 feet at the design altitude of 140 s. miles.

2.2 Location Accuracy - The design objective for locational accuracy of any point on photograph shall be $\pm$ 1 mile. Specifically, a port and starboard horizon will be recorded in each alternate frame to permit subsequent determination of pitch and roll angles to 0.1°. Yaw measurement will be accomplished by object matching in the overlap region between successive frames to 0.1°. A Digitote will be used to record vehicle time (5 digits) at center of scan to 0.1 sec precision. The Digitote output will be telemetered to ground on a minimum of 5 channels. A 160 cycle timing pip will be placed on one edge of the format during scan. Both the Digitote input and the 160 cycle signals will be externally provided.

2.3 Ground Coverage - During periods of proper light level, reconnaissance photography shall be obtained by ground command in a continuous strip for all vehicle time over the target area. Film capacity will be sufficient to provide for two nominal days operation.

Specifically, a nominal day's operation is defined as sufficient film capacity for 10% overlap at the design altitude of 140 s. miles on 2.1 inches of a 70 mm format for approximately 25,000 miles linear coverage by ground command. A supply spool will be provided for spooling thin base (3-1/2 mil)

70 mm film on a 4" diameter core to a diameter of 20". The film thus spooled will weigh not more than 40 lbs.

2.4 Image Motion Compensation - Provision will be incorporated for correcting the image motion due to orbital motion. For a design value of V/H = 0.0345 Rad/sec, capability will be provided for variation of ± 40%. A most probable value of V/H may be inserted prior to launch. Subsequently, a correction, based on tracking data, can be sent to the vehicle via a telemetry link.

2.5 Momentum Balance - The oscillating panoramic sweep assembly will incorporate momentum balancing. This is required to take out the major portion of the torque reaction effect on the vehicle which would cause a significant roll rate.

3.0 GENERAL

3.1 ITEK-Furnished Materials - ITEK shall, within the period of time specified in Part II hereof, furnish and deliver to the Prime the supplies, data and reports as set forth in Exhibit I attached hereto and hereby made a part thereof.

EXHIBIT I

	Quantity	Date
ITEM 1		
Systems Management Services:		
Provide Systems Management of the Photographic Sub-System as defined in Appendix A		1 May 1958 - 31 Oct.19
ITEM 2		
Design and fabricate camera and cassette space utilization mock-up in accordance with Appendix B, "High Acuity Panoramic Camera (HYAC II)" and Appendix C,"Cassette, Take-Up."		
Camera Mock-Up Space:	1	21 June 1958
	1	7 July 1958
Cassette Mock-Up Space:	1	21 June 1958
	2	7 July 1958

ENCLOSURE I

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	Quantity	Date
ITEM 3. Design and fabricate camera and cassette weight and balance mock-up in accordance with Appendix B, "High Acuity Panoramic Camera,(HYAC II)", and Appendix C, "Cassette, Take-Up."		
Camera Mock-Up, Weight and Balance:	1	12 July 1958
	1	19 July 1958
Cassette Mock-Up, Weight and Balance:	1	12 July 1958
	2	19 July 1958
ITEM 4. Design and fabricate a thermal mock-up of the camera and cassette to simulate the heat transfer conditions of the equipment:		
Camera and Cassette Mock-Up, Thermal	1	15 August 1958
ITEM 5. (a) Design and fabricate a lens weight and balance mock-up in accordance with Appendix D, "Lens, 24" , f/5 HYAC II", and (b) Provide lens cells for test.		
a. Lens Weight & Balance Mock-Up	1	15 July 1958
b. (1) Lens Cell for Test		
(a) Two for II A (Aluminum)	2	15 August 1958
(b) Two for II B (Aluminum)	2	15 January 1959
(2) Lens cells for environmental test		
(a) Two for shock, acceleration, vibration (Aluminum)	2	1 September 195[illegible]
(b) Two for temperature, altitude, humidity (Steel)	2	1 September 195[illegible]
(3) One preliminary cell for kinematic analysis (Magnesium)	1	15 August 1958
ITEM 6. Design and fabricate camera flight units and cassette flight units non-deliverable for use in test program less supply spool, in accordance with Appendix B, "High Acuity Panoramic Camera (HYAC II)" and Appendix C, "Cassette, Take-Up."	1	13 December 1958
	1	7 February 1959
ITEM 7. Design and fabricate camera flight units, less supply spool in accordance with Appendix B, "High Acuity Panoramic Camera (HYAC)."	1	31 January 1959
	1	14 February 1959
	1	14 March 1959
	1	11 April 1959
	1	18 April 1959
	1	16 May 1959
	1	30 May 1959
	1	4 July 1959
	1	18 July 1959
	1	15 August 1959
	1	5 September 195[illegible]
	1	12 September 195[illegible]

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	Quantity	Date
ITEM 8. Design and fabricate cassette flight units in accordance with Appendix C, "Cassette, Take-Up."	1**	13 September 1958
	2**	20 September 1958
	2**	27 September 1958
	1**	11 October 1958
	2	23 October 1958
	2	30 November 1958
	2	7 December 1958
	1	27 December 1958
	1	3 January 1959
	1	31 January 1959
	1	14 February 1959
	2	28 February 1959
	1	28 March 1959
ITEM 9. Design and fabricate supply spools compatible with the applicable paragraphs of Appendix B.	15	27 August 1958
	25	5 September 1958
	40	12 September 1958
	40	19 September 1958
ITEM 10. Fabricate a HYAC II A Lens, non-deliverable for use in the environmental test program in accordance with Appendix D.	1	11 October 1958
ITEM 11. Design a lens and filter based upon the design objectives stated in Appendix D, and fabricate a sufficient quantity of flight units to meet the over-all delivery schedule. This lens shall be designated HYAC II A.	1	26 October 1958
	1	23 November 1958
	1	30 November 1958
	1	21 December 1958
	1	4 January 1959
	2	8 February 1959
	2	15 March 1959
	1	19 April 1959
ITEM 12. Design a lens and filter giving improved lens-film performance over the II A, and fabricate a sufficient number of flight units for the remaining flight cameras. This lens shall be in accordance with Appendix D, and shall be designated HYAC II B.	1	19 April 1959
	1	17 May 1959
	2	22 June 1959
ITEM 13. Provide engineering services for the specification and design of instrumentation for the HYAC II camera in accordance with Appendix E, "Specification for Camera and Cassette Instrumentation and V/H Transducer."		1 May '58-1 Dec '

** These units are essentially the same as deliverable units but will not have been qualified and will not include transit cases.

	Quantity	Date
ITEM 14. Design, develop and fabricate a static simulator in accordance with Appendix F, "Simulators for HYAC II", to be used for camera testing.	1	17 November 1958
ITEM 15. Design, develop and fabricate portable simulators in accordance with Appendix F, "Simulators for HYAC II."	2	31 January 1959
ITEM 16. Design, develop and fabricate a dynamic simulator in accordance with Appendix F, "Simulators for HYAC II."	1	7 February 1959
ITEM 17. Design and fabricate test and check-out console in accordance with Appendix G, "Test and Check-Out Console for HYAC II."	1 1 1	6 December 1958 13 December 1958 7 February 1959
ITEM 18. Design and fabricate full supply spool handling and loading fixtures compatible with deliverable equipment.	1 1 1 1	31 January 1959 28 February 1959 14 March 1959 11 April 1959
ITEM 19. Design and fabricate film retrieval magazines in accordance with Appendix H, "Film Retrieval Magazines for HYAC II."	2 2 2 2	16 December 1958 23 December 1958 30 December 1958 6 January 1959
ITEM 20. Design and fabricate a go-no-go console in accordance with Appendix I, "Go-No-Go Console for HYAC II."	1	31 January 1959
ITEM 21. Supply and modify darkroom supplies and equipment in accordance with Appendix J.	2	15 December 1958
ITEM 22. Provide engineering-type operational and maintenance manual for equipment supplied under Items 7, 8, 15, and 17.		
Items 7, 8	6 6	Concurrent with first flight units Within 2-1/2 months after initial flight deliveries.
Items 15, 17		Concurrent with equipment deliveries

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ENCLOSURE 1

	Quantity	Date
ITEM 23. Provide spare parts in accordance with lists contained in Appendix K.		Within 30 days of delivery of flight units
ITEM 24. Design and fabricate transit cases for HYAC II camera in accordance with Appendix L, except that transit cases shall not be qualified environmentally.	1 for each fabricated camera	Concurrent with equipment deliveri
ITEM 25. Design and fabricate transit cases for film take-up cassette of HYAC II in accordance with Appendix M, except that transit cases shall not be qualified environmentally.	1 for each fabricated cassette	Concurrent with equipment deliveri
ITEM 26. Design and fabricate shipping cases for test console in accordance with Appendix N, except that shipping cases shall not be qualified environmentally.	1 for each fabricated Test Console less console for ITEK	Concurrent with equipment deliveries.
ITEM 27. Provide liaison and technical support in accordance with Appendix O.		
a. Training, Orientation, Test Support		1 Sept.'58-31 Dec.'58
b. Field Support		1 Jan. '59-31 Oct. '5
ITEM 28. Provide engineering services to support the test program described in Appendix P, "HYAC II Test Program."		1 Sept. '58-31 May '5
ITEM 29. Equipment and facilities to support the test program described in Appendix P, "HYAC II Test Program, Appendix P.		1 December 1958
ITEM 30. Provide engineering services to conduct the study tasks outlined in Appendix R, "Supporting Study Tasks, HYAC II," except that these services will terminate on 1 September 1959.		15 May '58-1 Sept.'5
ITEM 31. Reports and drawings as defined in Appendix S.		
a. Monthly Program Progress Reports	20 each	15th of each month
b. Briefing Aids for each Monthly Progress meeting.	1 set each	15th of each month
c. Sub-assembly Test Reports	-	In Monthly Report

		Quantity	Date
ITEM 31 (continued)			
d.	Reliability and Life Test Reports	-	In Monthly Report
e.	Environmental Acceptance Test Reports	3 each	As completed
f.	Final Report, Environmental Testing of Camera	20	45 days after completion of this phase.
g.	Final Engineering Report	20	45 days after completion of program.
h.	Special Reports	-	As required.
i.	Interim drawings	1 each	As completed.
j.	Final drawings.	1 set	45 days after completion of program.

ITEM 32.
Breadboards and mock-ups as described in Appendix T.

3.2 Prime-Furnished Material - The Prime shall furnish or cause to be furnished the items of Prime or Government Furnished Equipment listed below by the dates indicated:

ITEM 1.
Cassette installed in air frame to be assembled with a camera for use in the Dynamic Simulator — By 1 February 1959

ITEM 2.
Velocity sensing fixtures FCIC Part No. 789TE025 (to be transferred from Air Force Contract No. [redacted] — By 4 October 1958

ITEM 3.
Rolls of film as described in Exhibit II.

ITEM 4.
All equipment located at ITEK and originally supplied to Boston University, to be transferred from Air Force Contract No. [redacted] — By 1 September 19[redacted]

ENCLOSURE I

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EXHIBIT II

FILM REQUIREMENTS

The Prime contractor shall cause to be supplied without charge 70 mm film with sufficient lead time to meet the following schedule:

Operational Needs

Type	Amount	Date
S.O. 1188	6 spools at 3500'	28 Feb 1959
S.O. 1188	7 spools at 7000'	28 Feb 1959
S.O. 1188	12 spools at 7000'	27 June 195
S.O. 1221	6 spools at 3500'	28 Feb 1959
S.O. 1221	7 spools at 7000'	28 Feb 1959
S.O. 1221	12 spools at 7000'	27 June 195

Testing Needs

Type	Amount	Date	Remarks
S.O. 1188	1 spool at 1000'	20 Sept. 1958	For use at FCIC
S.O. 1188	3 spools at 7000'	20 Sept. 1958	For use at FCIC
S.O. 1188	4 spools at 7000'	11 Oct. 1958	For use at FCIC
S.O. 1188	4 spools at 7000'	29 Nov. 1958	For use at FCIC
S.O. 1188	4 spools at 7000'	7 Feb. 1959	For use at FCIC
S.O. 1221	1 spool at 1000'	20 Sept. 1958	For use at FCIC
S.O. 1221	3 spools at 7000'	20 Sept. 1958	For use at FCIC
S.O. 1221	4 spools at 7000'	11 Oct. 1958	For use at FCIC
S.O. 1221	4 spools at 7000'	29 Nov. 1958	For use at FCIC
S.O. 1221	4 spools at 7000'	7 Feb. 1959	For use at FCIC
Dummy	4 spools at 7000'	27 Sept. 1958	For use at FCIC
Dummy	5 spools at 7000'	4 Oct. 1958	For use at FCIC
Dummy	6 spools at 7000'	29 Nov. 1958	For use at FCIC
Dummy	6 spools at 7000'	20 Dec. 1958	For use at FCIC
Dummy	3 spools at 7000'	7 Feb. 1959	For use at FCIC
S.O. 1188	1 spool at 7000'	4 Oct. 1958	For use at ITEK
S.O. 1188	3 spools at 7000'	8 Nov. 1958	For use at ITEK
S.O. 1188	2 spools at 7000'	6 Dec. 1958	For use at ITEK
S.O. 1188	3 spools at 7000'	10 Jan. 1959	For use at ITEK
S.O. 1221	1 spool at 7000'	4 Oct. 1958	For use at ITEK
S.O. 1221	2 spools at 7000'	8 Nov. 1958	For use at ITEK
S.O. 1221	3 spools at 7000'	6 Dec. 1958	For use at ITEK
S.O. 1221	2 spools at 7000'	10 Jan. 1959	For use at ITEK
Dummy	2 spools at 7000'	20 Sept. 1958	For use at ITEK
Dummy	3 spools at 7000'	4 Oct. 1958	For use at ITEK
Dummy	3 spools at 7000'	29 Nov. 1958	For use at ITEK
Dummy	3 spools at 7000'	20 Dec. 1958	For use at ITEK
Dummy	3 spools at 7000'	7 Feb. 1959	For use at ITEK

Testing Needs, cont.

S.O. 1188	5 spools at 7000'	13 Dec. 1958	For use at Prime
S.O. 1188	5 spools at 7000'	14 March 1959	For use at Prime
S.O. 1221	5 spools at 7000'	13 Dec. 1958	For use at Prime
S.O. 1221	5 spools at 7000'	14 March 1959	For use at Prime
Dummy	6 spools at 7000'	28 Nov. 1958	For use at Prime
S.O. 1188	1 spool at 7000'	4 Oct. 1958	For drop test
S.O. 1188	1 spool at 7000'	8 Nov. 1958	For drop test
S.O. 1188	1 spool at 7000'	22 Nov. 1958	For drop test
S.O. 1188	1 spool at 7000'	6 Dec. 1958	For drop test
S.O. 1221	1 spool at 7000'	4 Oct. 1958	For drop test
	1 spool at 7000'	8 Nov. 1958	For drop test
	1 spool at 7000'	22 Nov. 1958	For drop test
	1 spool at 7000'	6 Dec. 1958	For drop test

APPENDIX A

SPECIFICATION

SYSTEMS MANAGEMENT

31 October 1958

SYSTEM MANAGEMENT

1.0 SCOPE

1.1 This effort consists of planning, directing, supervision and control, appraisal, liaison, administration and security of the work performed by ITEK and its principal sub-contractor, Fairchild Camera and Instrument Corporation. It includes the technical direction and monitoring of Fairchild as well as such system analysis as is required to support the project. It includes liaison with the Prime, his customer and his other sub-contractors, as requested by the Prime. Project control and general project reporting are included under this task.

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APPENDIX B

SPECIFICATION

SME-DB-1(B)

HIGH ACUITY PANORAMIC CAMERA

HYAC II

31 OCTOBER 1958

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HIGH ACUITY PANORAMIC CAMERA

HYAC II

1.0 SCOPE

1.1 This specification covers one type of photographic high acuity panoramic camera for aerial reconnaissance. The basic design of this panoramic camera utilizes a curved focal plane arc with panoramic scanning by rotation of the lens about its nodal point.

2.0 APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on the date of this specification form a part of this specification to the extent specified herein.

SME-EB-5A Environmental Test Specification dated 31 October 1958

3.0 REQUIREMENTS

3.1 Component Parts - The camera shall consist of the complete photographic system including lens, camera structure, film advance mechanism image motion compensation, horizon recording optics, and time recording as described in the following paragraphs.

3.1.1 Horizon Recording - These units shall record both horizons. Recording shall occur on alternate frames only and shall be initiated by the closure of a switch at the nadir position.

3.1.2 Elapsed Time Recording - Elapsed time will be recorded on an area of the film outside the picture format and to be determined by convenience of camera design. The component selected for the recording shall be mutually accepted by the contractor and the customer and shall be provided with suitable inputs from the system in order to operate. Minimum size and weight shall be a major consideration in the choice of components.

3.1.3 Frequency Recording - During the scanning operation of the camera, a lamp pulsed by a fixed frequency shall record a series of equally spaced marks along the edge of the format. The Prime shall be informed of the input requirements necessary to the camera design.

3.1.4 Thermal Instrumentation - Thirteen modified Ruge BM-5 2400 ohm resistance thermometers will be installed in the camera.

3.2 Basic Camera Design

3.2.1 Configuration - The design of the camera shall conform to the basic configuration and space limitations as shown in Figure No. 1.

3.2.2 Camera Weight - The weight of the complete camera system shall be held to an absolute minimum; and shall not exceed 75 pounds. This 75 pound limit, however, shall not include the weight of the Digitote and its associated components and an additional 2 pound allowance for camera mounting structure as mutually agreed upon by the contractor and customer. Any weight associated with instrumentation shall also not be included within this 75 pound limit.

3.2.3 Lens Assembly - The main camera lens shall be a 24" focal length f5.0 high acuity optical system suitable for covering a 70 mm slit format as described in Appendix D. The lenses shall be calibrated so that the nodal points will be nearly coincident with the axis of rotation and the focal length will be held to 24.000" ± .005" at operational altitude and temperature of 70° ± 10° F.

3.2.4 Camera Scan Angle - The active format scan angle shall be 70° utilizing approximately 15° each of mechanical travel of the lens scanning system for acceleration and deceleration. This requires a total angle of scanning of approximately 100°.

3.2.5 Film Requirements - Unperforated thin base film of a nominal 3-1/2 mil (0.0035") thickness and 70 mm width shall be used. The emulsions that will be used with this camera shall be Eastman Kodak type SO-1221 and SO-1188.

3.2.6 Film Capacity - The camera shall be designed to use film properly wound on a 4" diameter core. The film spool of special design shall have a minimum of 1/8" spool flange projection above the full roll of film.

3.2.7 Space Between Picture Formats - The space between adjacent formats shall be utilized for data recording and shall be held to a minimum. The maximum space permitted between picture formats shall not exceed 2-1/2".

3.2.8 Allowable Film Wastage During Camera Start - The total allowance for film wastage during any starting of the film transport mechanism shall be a maximum of two (2) frames. This maximum wastage shall be the total average of starts over a full roll of film at maximum film speed. From the time the start sequence command is received, the camera system shall be up to speed in less than 15 seconds.

3.2.9 Format Width - The effective picture width of each frame shall be 2.1" + .03". Format dimensions and data recording details are shown in Figure 2.

3.2.10 Exposure Time - Exposure time shall be preset with one of three fixed slits to provide exposure times of 1/500 sec., 1/1000 sec., and 1/2000 sec. at the nominal scanning rate. These three (3) fixed slits shall be readily interchangeable.

3.2.11 Camera Cycling Rate Range - The camera shall be capable of providing a cycling rate range from .263 cycles per second to .613 cycles per second. This range shall be governed by a systems command driving the camera drive motor at the appropriate speed. Camera operation is initiated and terminated by the receipt or deletion of vehicle power derived from the basic vehicle programmer, with scanner positioned at end of scan cycle. The scanning drive of the camera shall be determined in flight by a V/H signal supplied by the vehicle and compatible with the camera servo system.

3.2.12 Reaction and Momentum Balance - The design of the camera shall provide a minimum of residual reaction and momentum to the basic vehicle.

3.2.13 Optical Scanning Rate - The optical scanning rate shall be a function of the camera cycling rate and shall vary proportionately with the camera cycling rate.

3.2.14 Forward Motion Compensation Rate - The required forward motion compensation rate at the nadir shall be .828 inches/second for the nominal cycling rate of .438 cycles per second. The camera drive mechanism shall be such that there is a fixed mechanical relationship between the forward motion compensation rate and the scanning rate. Therefore, the forward motion compensation rate ranges from .497 inches/second to 1.159 inches/second. The relationship of the forward motion compensation and the cycling rate has been established for a 10% overlap condition at the nadir.

3.3 Performance Requirements

3.3.1 Camera General Performance - Every effort shall be made to produce a high acuity photographic camera which, when operated, will produce a minimum degradation of static lens-film resolution. The design objective shall be such that photography taken under simulated operating conditions utilizing the simulator described in Appendix F shall not be degraded by more than 10% of the static lens-film resolution.

3.3.1.1 Forward Motion Compensation Accuracies - The forward motion compensation mechanism and the servo system shall have performance compatible with the design objective of paragraph 3.3.1.

3.3.1.2 Lens Drive Smoothness - The lens drive system, which is used for focal plane scanning in addition to forward motion compensation shall be smooth such that no appreciable visual banding can be detected with the unaided eye on the resulting photograph.

3.3.2 Data Recording Performance

3.3.2.1 Horizon Recording - The design objective for the horizon recording shall be such that roll and pitch information can be extracted to an accuracy of $\pm 0.1^{\circ}$. Yaw measurements shall be extracted by overlap measurements of adjacent photographs and it shall be a design objective that these measurements will yield yaw accuracies of $\pm 0.1^{\circ}$. For calibration purposes, four fiducial marks of sufficient quality, spaced 90° apart, shall be recorded on each horizon exposure.

3.3.2.2 Time Recording - Time shall be recorded on each frame from the appropriate command system to produce time information to within 0.1 second. A digital recording head shall be utilized in the camera for this purpose and the time recording accuracy shall be in accordance with the accuracy of the command.

3.3.2.3 Center of Format Recording - A single fiducial mark locating the center of the format along the scan axis of the frame shall be recorded outside of the picture format area and on each exposure. In conjunction with this mark, a second fiducial shall be accurately placed 3.000" $\pm$ .001 from the center of format fidicual to permit shrinkage measurements.

3.3.2.4 Serial Number Recording - A camera serial number shall be recorded outside of the picture format area.

3.3.3 Focal Plane Accuracy - The curved focal plane shall be a fixed arc of 24" nominal radius. The accuracy of the focal plane shall be compatible with the lens system and the general camera performance requirements of paragraph 3.3.1.

3.3.4 Power Consumption of Camera System - The total power consumption of the camera system shall be held to an absolute minimum and shall be compatible with the following sources. The maximum total average power permitted from all these sources shall not exceed 165 watts. The power required by the Digitote and its associated components shall not be included in this 165 watt total.

(a) 28 volt battery supply varying from 22 to 29.5 volts
(b) 28 volt DC supply, regulated to $\pm$ 0.5%
(c) 115 volts AC, 2000 cycles, single phase, regulated to $\pm$ 1.0% in frequency and $\pm$ 5.0% in voltage.
(d) 115 volts AC, 400 cycles, three phase, regulated to $\pm$ .02% in frequency and $\pm$ 1.0% in voltage.
(e) 115 volts AC, 400 cycles, single phase, regulated to $\pm$ 1.0% in frequency and $\pm$ 5.0% in voltage.

3.4 Camera Design Details

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3.4.1 Allowance for Film Splices - The camera film handling systems and guides shall be designed to allow for smooth passage of the required number of proper film splices expected in each roll of operational film. The camera shall be capable of passing film that has been properly butt spliced [illegible] tape.

3.4.2 Film Loading - The camera shall be capable of being loaded in subdued light using live film for leader without excessive light striking of the supply of live film.

3.4.3 Main Lens Light Shield - The main lens light shield design shall be mutually agreed upon between contractor and the customer. For convenience of installation, this light shield may be attached to the lens assembly after the camera has been installed in the vehicle.

3.4.4 Film Transport Rollers - A minimum diameter of 1" shall be used for all rollers in the film transport system.

3.4.5 Instrumentation Requirements - For the purposes of telemetering, the following functions shall be brought to the camera main connector:

(a) Thirteen Temperature Signals - The temperature sensors shall be located in the camera as mutually agreed upon between the contractor and the customer.

(b) Four (4) V/H Signals

(c) One (1) Light Leak Signal - (The light leak transducer shall be supplied by the contractor.)

(d) One (1) Center of format signal.

(e) One (1) Film transport signal.

(f) Five (5) Elapsed time signals (Representing 5 digits)

NOTE: The increase in weight due to above instrumentation requirements is considered Customer-sponsored and therefore for the purposes of contractual weight agreements, shall not be charged to the final camera weight.

3.4.6 Operational Temperature - For the purposes of design, the operational temperature shall be $70^{\circ} \pm 10^{\circ}$ F.

3.4.7 Thermal Considerations - To assure stable operational temperatures, the following design features shall be incorporated.

(a) Structural Plate No. 1 - Shall have black finish on side facing supply spool. Opposite side shall have a highly polished reflective surface finish. Plate No. 1 shall be thermally insulated from Plate No. 2 wherever practical.

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3.4.7 (cont.)

(b) Structural Plate No. 2 - Shall have highly polished evaporated gold finish of 10 to 12 microinch thickness on side facing Plate No. 1. Opposite side shall have a black finish.

(c) Structural Plate No. 3 - Shall have a black finish on side facing Plate No. 1. Opposite side shall have highly polished evaporated gold finish of 10 to 12 microinch thickness.

(d) Supply Spool Thermal Shield - Shall be of light weight construction, polished on the inside and polished gold finish of 10 to 12 microinch thickness on the outside.

(e) Camera Double Thermal Shield - Shall extend from Plate No. 1 to Plate No. 3, but insulated from Plate No. 1. The double thermal shield shall be comprised of two gold plated skins sandwiching on insulating spacer with a thermal conductivity k equal to..028 BTU/hr./sq.ft./°F/ft. or less.

(f) Component Thermal Insulation - All heat generating components mounted on Plate No. 2 shall be insulated from Plate No. 2 wherever practical.

(g) Sub-Plates, Spacer Posts and Gussets - Sub-plates, spacer posts and gussets between Plate No. 1 and Plate No. 2 shall be prepared with suitable thermal radiating qualities compatible with over-all camera thermal requirements wherever practical.

(h) Boot, Lens to Camera - The boot from lens to camera shall have a highly polished gold surface on both sides.

(i) Boot, Camera to Vehicle - The boot from camera to vehicle shall be black on side facing lens and have a highly polished gold surface on opposite side.

(j) Boot Clamps - Boot clamps shall have appropriate thermal finishes compatible with the requirements of (h) and (i).

NOTE: The increase in weight due to above thermal requirements is considered Customer sponsored and therefore for the purposes of contractual weight agreements, shall not be charged to the final camera weight.

The above designs shall be incorporated commencing with the second non-deliverable camera.

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3.5 Mock-ups - Appropriate space and weight and balance mock-ups shall be provided in accordance with the Work Statement. A simple mock-up shall be fabricated to be used in space utilization application. An accurate simulator of the final camera configuration shall be fabricated to permit the ready mock-up of total system weight and balance. A mock-up designated to be retained at the contractors facilities for the duration of the program shall reflect the current external configuration whenever changes occur.

3.6 Engineering Manual - An engineering manual shall be furnished which shall contain test and service procedures necessary to assure the satisfactory operation of the system. This manual shall be furnished in the form of standard ozalid reproduction and need not be prepared to any Military Specification.

3.7 Design and Selection of Components - The design and selection of components for this camera shall be compatible with the performance and environmental requirements of the system. The best available items shall be used and the components need not be in accordance with specific military specifications.

3.8 Environmental Conditions - The components and over-all camera shall be designed in accordance with specification SME-EB-5A, entitled "Environmental Test Specification - dated 9 September 1958". The components to be evaluated shall be tested in accordance with Schedule I attached. The environmental tests performed are detailed under the Qualification Test Section, paragraph 4.

3.9 Spare Parts - A complete list of spare parts required for the camera shall be submitted.

4.0 QUALIFICATION TESTING

4.1 Acceptance Tests - Acceptance tests shall be performance tests to be accomplished on each deliverable camera system to assure proper functioning of the equipment. The tests shall be in conformance with the requirements of Acceptance Test Specification, SME-EB-3A attached hereto as Enclosure 1.

4.2 Environmental Tests - The environmental testing shall be performed on selected components and the first non-deliverable flight units for the purposes of qualifying the deliverable equipments. The components to be tested and the tests they are to undergo are included in Schedule I attached and hereby form a part of this specification. The environmental tests shall be as indicated in the following paragraphs which reference the appropriate paragraph of the Environmental Test Specification, SME-EB-5A, dated 9 September 1958, attached hereto as Enclosure 2 The tests selected represent the most critical in accordance with the requirements and therefore shall constitute the qualification test specification for the camera system.

APPENDIX B

4.2.1 Temperature, Altitude, and Humidity Tests - The temperature, altitude and humidity tests shall be conducted in accordance with the requirements of paragraph 4.2.1 of the Environmental Test Specification, Enclosure 2 attached hereto.

4.2.2 Drop Tests - Drop tests shall be conducted in accordance with the requirements of paragraph 4.2.4.2 of the Environmental Test Specification, Enclosure 2 attached hereto.

4.2.3 Vibration Tests - Vibration tests shall be conducted in accordance with the requirements of paragraph 4.2.2 of the Environmental Test Specification, Enclosure 2 attached hereto.

4.2.4 Shock Tests - Shock tests shall be conducted in accordance with the requirements of paragraph 4.2.4 of the Environmental Test Specification, Enclosure 2 attached hereto.

4.2.5 Acceleration Tests - Acceleration tests shall be conducted in accordance with the requirements of paragraph 4.2.3 of the Environmental Test Specification, Enclosure 2 attached hereto.

4.2.6 Explosion Proof Tests - Explosion proof tests shall be conducted in accordance with requirements of paragraph 4.2.6 of Environmental Test Specification, Enclosure 2 attached hereto.

APPENDIX B

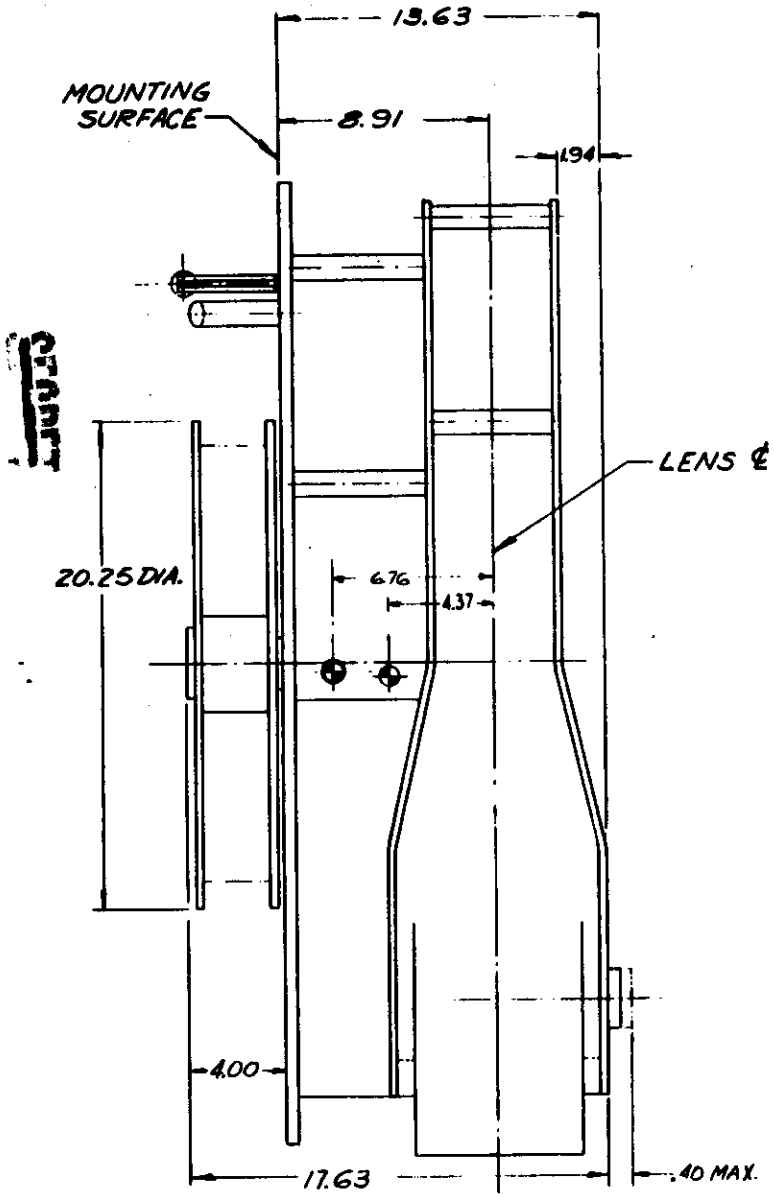
SCHEDULE I

COMPONENT ENVIRONMENTAL TEST SCHEDULE

Part No.	Name	Temperature Alt., & Hum. TS 956-2001	Vibration TS 956-2003	Shock TS 956-2002	Accel. TS 956-2004
956-174	Transistor	X			
956-427	Solenoid, F.	X	X	X	X
956-428	Solenoid	X	X	X	X
956-508	Tach. Generator	X			
956B30	Preamplifier Assy.	X	X	X	
956B139	Accelerating Control Assembly	X	X	X	
956B72	Clutch and Brake Assembly	X			
956B74	Clutch Assembly	X			
956B76	Clutch Assembly	X			
956B77	Brake Assembly	X			
956B127	Recording Assy, Digitote	X	X	X	X
956B79	Fiducial Assembly	X	X		
956B82	Recording Assembly	X	X	X	X
956B87	Drive Motor Gear Assy	X			
956B144	Supply Assembly, Synch, Pulsing	X	X		
956C10	Lamp Assy, Freq.		X		
956B4	Spool Assembly		X	X	X
956B122	Platen Assembly	X			
956B63	Main Mtg Plate Assy		X		

APPENDIX B

4 CAMERA CG, NO FILM
5 CAMERA CG, SUPPLY 400' FULL



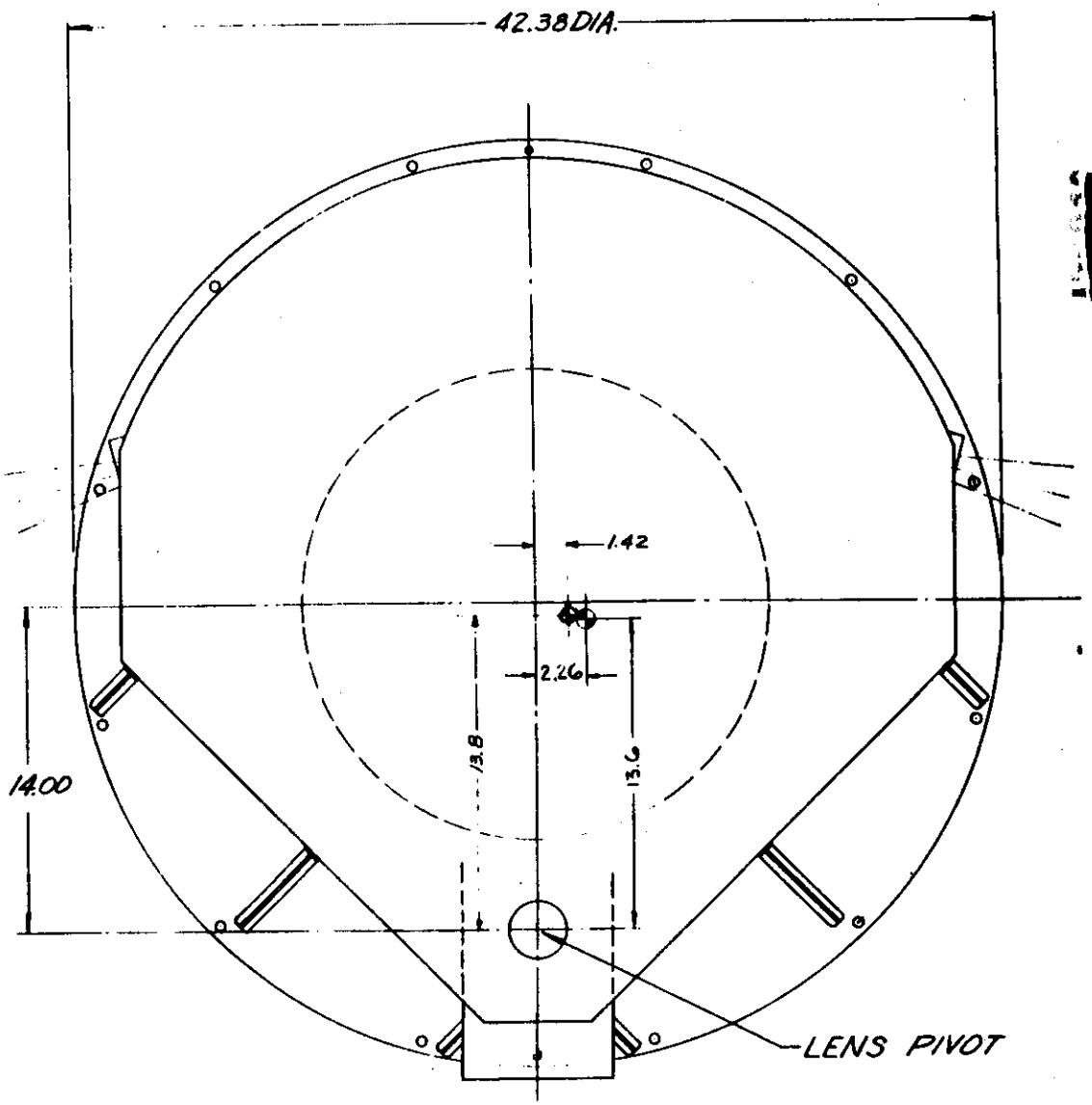
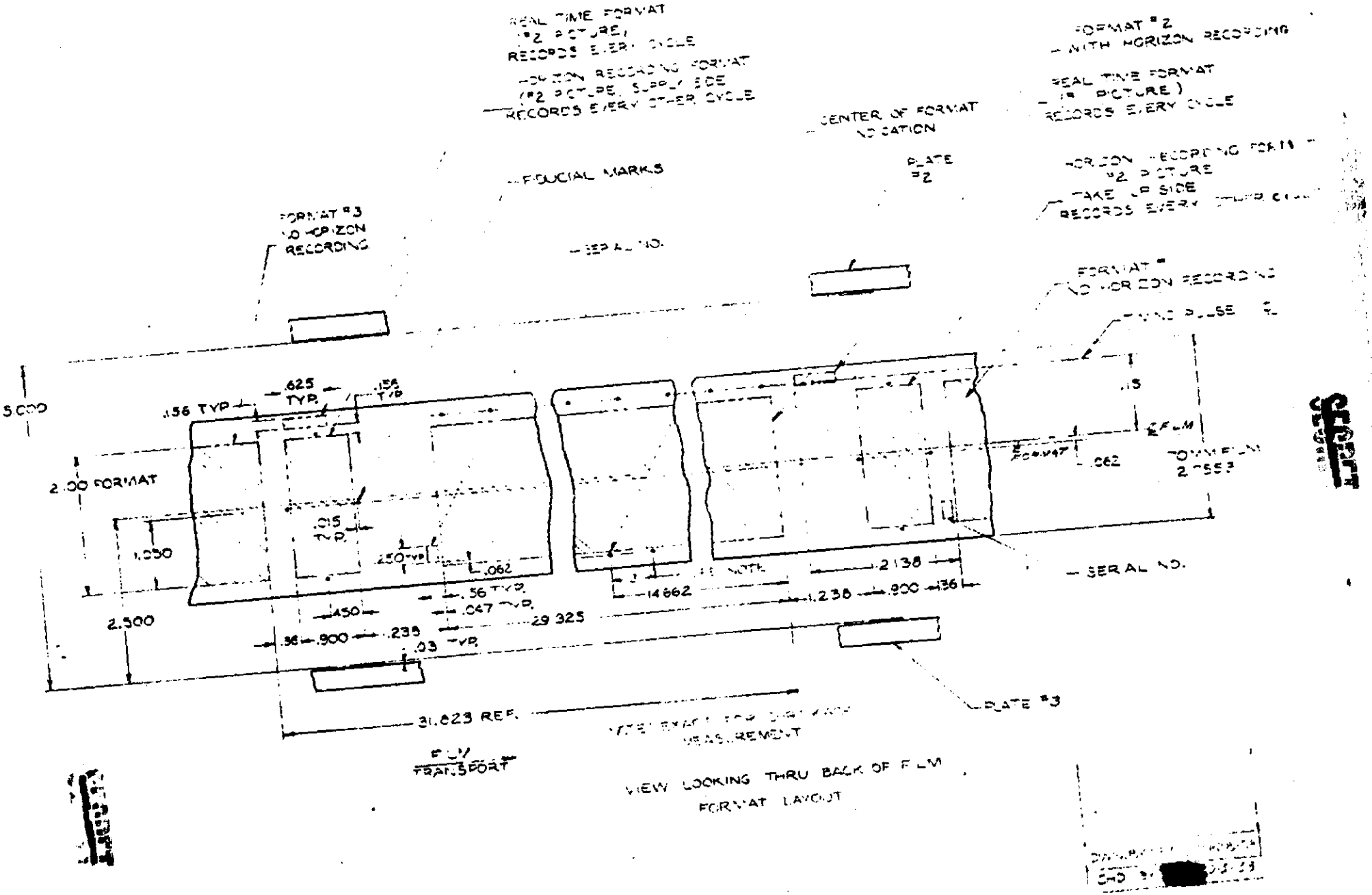


FIG 1


REAL TIME FORMAT
(#2 PICTURE)
RECORDS EVERY CYCLE
HORIZON RECORDING FORMAT
(#2 PICTURE, SUPPLY SIDE
RECORDS EVERY OTHER CYCLE
FIDUCIAL MARKS
SERIAL NO.
CENTER OF FORMAT
INDICATION
PLATE
#2
FORMAT #2
WITH HORIZON RECORDING
REAL TIME FORMAT
(#1 PICTURE)
RECORDS EVERY CYCLE
HORIZON RECORDING FORMAT
#2 PICTURE
TAKE UP SIDE
FORMAT #3
NO HORIZON
RECORDING
FORMAT #
NO HORIZON RECORDING
SERIAL NO.
PLATE #3
5.000
2.00 FORMAT
2.500
1.050
.156 TYP.
.625
TYP.
.156
TYP.
.015
TYP.
.250 TYP.
.062
.56 TYP.
.047 TYP.
.450
.36
.900
.235
.03 TYP.
29.325
14.662
1.238
.900
.136
2.138
.062
2.555
31.623 REF.
FILM
TRANSPORT
VIEW LOOKING THRU BACK OF FILM
FORMAT LAYOUT

Acceptance Test Specification

SME-[redacted]-3(A)

High Acuity Panoramic Camera

Part No. 956A1

31 October 1958

Enclosure 1

APPENDIX B

[redacted]

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Enclosure 1
APPENDIX B

DRAFT

1 SCOPE

1.1 It is the purpose of this specification to outline and describe the acceptance tests which must be performed on the subject equipment in order to assure the proper functioning of this equipment.

2. APPLICABLE DOCUMENTS AND DRAWINGS

2 1 The following documents and drawings form a part of this specification.

ITEK Specification "High Acuity Camera, HYAC II"
FCIC Drawing No. 956-A1 Final Assembly
FCIC Drawing No. 956-SD10 Electrical Schematic - Camera
FCIC Drawing No. 956-WD2 Wiring Diagram - Camera

3. ACCEPTANCE TESTS

These tests are divided into two groups, namely, Mechanism Tests and Photographic Tests.

3.1 Mechanism Tests: - The following tests will be made on each camera in order to check mechanical and electrical operation.

3.1.1 Film Transport: - Load camera with dummy film and operate over the limits of the camera cycling rate. Start and stop camera several times. Look for erratic operation and formation of slack in film. No slack or loops should appear. Observe film transport indicator pulse being transmitted to telemetering system. This pulse will have a magnitude of 4.0 ± 5% D.C. volts and a repetition rate of 6.37 ± 5% pps at maximum film speed (20 in/sec.). The pulse duration at this speed will be approximately 108 milliseconds.

3.1.2 Center of Format: - Observe the "Center of Format" pulse being transmitted to the telemetering system. This pulse will occur once every camera cycle and will be 4.0 ± 5% D.C. volts in magnitude. The pulse duration will not be less than 100 milliseconds at the maximum camera cycling rate.

3.1.3 Time Indicator Light Source: - Place the emulsion speed switch in the "ASA" position and observe the pulse which appears across the time indicator lamps. This pulse will have a peak amplitude of approximately 8.0 volts and will occur once every camera cycle. Check the synchronization of the lamp pulse and the movement of the digitote dials. The lamp pulse will occur when the digitote dials are motionless.

3.1.4 Digitote: - In order to check the operation of the "Digitote" unit measur the time required for the one (1) second telemetering transducer of the "Digitote" to make one complete revolution. The time will be 10.0 ± 1.0% seconds. The output of this transducer will be a step function consistin of 10 equally spaced steps per revolution. The maxim um voltage output of the transducer will be 4.0 ± 5% D.C. volts. Check for the presence of a telemetering signal from each dial of the "Digitote".

3.1.5 Horizon Camera Fiducial Lamps: -In order to obtain an indication of the operation of the fiducial lamps for each horizon camera, observe the voltage which appears at fiducial lamp test point for each camera. A voltage will appear at these test points every other camera cycle. When the "center of format" switch closes, the voltage will rise from zero to approximately 28 volts instantaneously and remain at this value until the "center of format" switch opens. The voltage then returns to approximately zero over a long period of time. If the return to zero voltage is instantaneous, all lamp circuits are open.

3.1.6 Frequency Recording Lamp: - Place the emulsion speed switch on the "ASA 10" position and observe the pulse which actuates the recording lamp. This pulse will be approximately 4.5 volts in magnitude and 1 + 10% milliseconds in duration. The frequency of the pulse will be 160 ± 0.05%. This pulse occurs only in the forward scan portion of the camera cycle.

3.1.7 Temperature Indicators: - Check the output of each temperature indicator to the telemetering system. Make these tests at room temperature and compare with the calibration data supplied with indicators.

3.1.8 Cycling Rate: -Operate the camera at various V/H command voltages and determine the cycling rates. These rates will be as follows:

V/H Command DC Volts	Cycling Rate Cycles/Sec.
5.250	0.269 ± 4%
8.250	0.421 ± 4%
12.000	0.613 ± 4%

3.1.9 Operational Test - Camera and Cassette: - Operate camera and cassette as a system and observe film handling performance. The camera system will be up to speed in 6 to 10 seconds.

3.1.10 Light Sensor: - Check the output of the light sensor to the telemetering system. Compare with calibration data supplied with the sensor.

3.1.11 V/H Transducer: - Determine the proper operation of the V/H transducer by checking the operation of the stepping switch and the generation of V/H and telemetering signals for each switch position. The signals generated by the transducer will be as follows:

Switch Position	Telemetering Signals DC Volts* Read Out Nos.				V/H Signal D.C. Volts
	4	3	2	1	
1	1	1	1	4	0
2	1	1	4	4	3.00 ± 3%
3	1	1	4	1	3.75 ± 3%
4	1	4	4	1	4.50 ± 3%
5	1	4	4	4	5.25 ± 3%

*NOTE: Voltage Tolerance ± 5%

3.1.11 (cont)

Switch Position	Telemetering Signals DC Volts* Read Out Nos.				V/H Signal D.C. Volts
6	1	4	1	4	6.00 ± 3%
7	1	4	1	1	6.75 ± 3%
8	4	4	1	1	7.50 ± 3%
9	4	4	1	4	8.25 ± 3%
10	4	4	4	4	9.00 ± 3%
11	4	4	4	1	12.00 ± 3%

* NOTE: Voltage Tolerance + 5%

3.2 Photographic Tests:

3.2.1 Actual Photography: - Locate Camera on roof of building, or suitable tower and take actual photographs over the range of camera cycling rates. Develop film and examine to determine the following items:

3.2.1.1 Lens Drive Smoothness: - Examine each photograph for visual banding. The lens drive will be considered smooth if no appreciable banding can be detected with the unaided eye.

3.2.1.2 Film Scratch and Pressure Marks: Examine photographs for excessive marking.

3.2.1.3 Time Recording: - A picture of the "Digitote" face will appear between the main picture formats. It will be possible to read the elapsed time with the unaided eye.

3.2.1.4 Horizon Recording: - Photographs from the Port and Starboard Cameras will appear between the main picture formats. These pictures will be of good quality. Each side of the format will be bisected by a fidicual mark. These marks will be well defined and visible to the unaided eye.

3.2.1.5 Center of Format: - Examine photographs for the appearance of a "Center of format" mark. This mark will indicate the center of the main picture format and will be located between the edge of the film and the format. This mark will be visible to the unaided eye.

3.2.1.6 Frequency Recording: - Examine film for laydown of timing marks. These marks will be visible to the unaided eye and will appear as a series of dots extending from one end of the format to the other.

3.2.1.7 Scan Rate: - In order to determine scan rate, measure the distance between timing marks. These marks will be equally spaced when the camera is scanning at constant speed. The distance between marks for various scan rates follows:

Scan Rate Degrees/Sec.	Distance between Marks Inches
110.25	0.2876 ± 2%
173.25	0.4535 ± 2%
252.00	0.6596 ± 2%

3.2.2 Tests Using Collimator: - Mount camera in Collimator and determine the following:

3.2.2.1 Resolution: - The degree of resolution should be determined for both static and operating conditions. Examination of the resolution charts on the film will indicate that the photography has not been degraded by more than 10% of the static lens-film resolution.

3.2.2.2 Horizon Camera Location: - Determine the relationship of the port and starboard horizon camera optical axes with the camera "center of format" axis. The angle between each horizon camera optical axis and the "center of format" axis will be 75 ± 0.1 degrees.

Environmental Test Specification

SME-EB-5(A)

High Acuity Panoramic Camera, Part No. 956A1
Cassette, Take-Up, Part No. 956E2

31 October 1958

Enclosure 2

APPENDIX E

SECRET

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Enclosure 2

APPENDIX B

1.0 SCOPE

1.1 It is the purpose of this specification to outline and describe the environmental tests which must be made on the High Acuity Panoramic Camera, Part No. 956A1, and the Cassette, Take-Up, Part No. 956A2, in order to demonstrate that the airborne system is capable of meeting the General Environmental Specification L-2916 dated 29 March 1958 Rev. 30 April 1958, and NCS 1411 and 1412 dated 6 May 1958. These tests will be made on the first non-deliverable flight units for the purpose of qualifying the deliverable equipment.

2.0 APPLICABLE SPECIFICATIONS AND OTHER PUBLICATIONS

2.1 The following documents form a part of this specification to the extent specified herein.

A. Specifications

SME-DB-1A High Acuity Panoramic Camera
SME-DC-3B Cassette, Take-Up
SME-EB-3A Acceptance Tests - High Acuity Panoramic Camera
SME-EB-4A Acceptance Tests - Cassette, Take-Up
MIL-C-9435 Chamber, Explosion Proof Testing

3.0 REQUIREMENTS

The equipment shall be capable of tolerating the following environments.

3.1 Non-Operating Conditions

3.1.1 Temperature, Humidity and Atmospheric Pressure

3.1.1.1 Temperature

(a) Lower Limit - Plus 20°F for periods of at least one hour duration.

(b) Upper Limit - Plus 160°F for periods of two hours.

3.1.1.2 Humidity: - Relative humidities up to 100 per cent, including condensation during temperature change.

3.1.1.3 Atmospheric Pressure

(a) Upper Limit - 30.5 inches of mercury

(b) Lower Limit - 5×10^{-5} inches of mercury

3.1.2 Vibration: - Equipment shall be capable of withstanding along each of three major mutually perpendicular axes sinusoidal vibration as follows

(a) 5 - 24.5 cps at 1⅛ inch zero to peak
(b) 25 - 2000 cps at 7.5 g.

3.1.3 Acceleration: - Equipment shall be capable of withstanding accelerations as follows:

(a) Longitudinal Axis - 12 g's for 5 minutes
(b) 2 Lateral Axes at Right Angles - 3 g's for 5 minutes

3.1.4 Shock - Equipment shall be capable of withstanding the following shock conditions:

(a) When the equipment is not packaged for shipment, it shall be capable of withstanding a shock of 20 g's at least three times along each of three mutually perpendicular axes.

3.1.5 Additional Non-Operating Tests which apply to Cassette

(a) Acceleration - Roll Axis of Vehicle - 25 g's for 3 minutes. The cassette need not be operable after this test.
(b) Shock - Roll Axis of Vehicle - Three 75 g shocks. The cassette need not be operable after this test.

3.2 Operating Conditions

3.2.1 Temperature, Humidity and Atmospheric Pressure

3.2.1.1 Temperature - Plus $70^{\circ} \pm 10^{\circ}F$

3.2.1.2 Humidity - Zero to 70 per cent

3.2.1.3 Atmospheric Pressure - 30.5 to 5×10^{-5} inches of mercury

3.2.2 Vibration: - None

3.2.3 Acceleration: - None

3.2.4 Shock: - None

3.2.5 Explosion: - Equipment shall operate in an ambient explosive atmosphere without causing ignition of such atmosphere.

4.0 TESTING

4.1 Test Conditions

4.1.1 Atmospheric Conditions - Unless otherwise specified, herein, all tests required by this specification shall be performed at an atmospheric pressure of between 28 and 32 inches of mercury, a temperature of between plus $60^{\circ}F$ and plus $95^{\circ}F$, and a relative humidity of not more than 90 per cent.

Enclosure 2
APPENDIX B

4.1.2 Tolerances - The maximum allowable tolerances on test conditions during environmental testing shall be as follows:

(a) Temperature - plus or minus 5°F
(b) Barometric Pressure - plus or minus 5 percent
(c) Relative Humidity - plus or minus 5 percent
(d) Vibration Amplitude - plus or minus 10 percent
(e) Vibration Frequency - plus or minus 2 percent
(f) Shock - plus or minus 10 percent
(g) Acceleration - plus or minus 10 percent

4.1.3 Measurements - All measurements shall be made with instruments of laboratory precision type, whose accuracy has been certified.

4.1.4 Temperature Stabilization - Temperature stabilization has been reached when the temperature of the largest centrally located internal mass of the equipment does not vary more than 5°F from the temperature ambient to the equipment.

4.2 Test Procedures

4.2.1 Temperature-Altitude-Humidity Tests

4.2.1.1 Rate of Change of Temperature - During change of chamber temperature, the temperature rate of change shall be 0.75 to 1.25°F per minute.

4.2.1.2 Tests - The following test sequence shall be conducted:

(a) Prior to placing Camera and Cassette in test chamber, performance record tests must be performed in accordance with paragraph No. 3 of FCIC Specification No. SME-EB-3 and paragraph No. 3 of FCIC Specification No. SME-EB-4. These tests must be performed in the atmospheric conditions outlined in paragraph 4.1.1 of this specification with the following exceptions:

(1) Temperature Range - plus 60°F to plus 80°F.
(2) Relative humidity of not more than 70 percent.

(b) Place the equipment in the test chamber at the conditions specified in paragraph 4.1.1 (load camera with a full spool of film). The chamber temperature and relative humidity shall be stabilized and maintained at plus 160°F and greater than 95 percent, respectively, for a period of three hours.

(c) Reduce the chamber temperature to plus 20°F and maintain at this temperature and a relative humidity of greater than 95 percent for one hour.

(d) Return chamber to conditions specified in paragraph 4.1.1.

(e) Repeat the above temperature humidity cycle two (2) times.

(f) After the three (3) temperature humidity cycles have been completed, stabilize the camera and cassette at 70°F and operate. Reduce the chamber internal pressure to one millimeter of mercury, within a period of ten (10) minutes, and maintain at one millimeter of mercury for a minimum of ten minutes. While the chamber pressure is at one millimeter of mercury, conduct tests on the camera and cassette in accordance with paragraphs 3.1.1, 3.1.2, 3.1.7, and 3.1.8 of FCIC specification SME-EB-3 and paragraph 3.1 of FCIC specification SME-EB-4. Compare with test results obtained in paragraph 4.2.1.2 (a) above. Test results must fall within the tolerances given in specification Nos. SME-EB-3 and SME-EB-4.

(g) Return chamber to conditions specified in paragraph 4.1.1 and remove camera and cassette. Subject camera and cassette to complete acceptance tests as described in paragraph No. 3 of FCIC Specification No. SME-EB-3 and paragraph No. 3 of FCIC Specification No. SME-EB-4. Test results must fall within the tolerances given in these specifications.

4.2.2 Vibration Tests

4.2.2.1 Test Conditions - The camera shall be tested with a spool of film attached. The cassette shall be tested without film on spool. Vibration shall be applied through the mounting points of the equipment to major air frame structure. All tests must be performed in the atmospheric conditions outlined in paragraph 4.1.1 of this specification. Test shall be conducted with the equipment inoperative.

4.2.2.2 Sweep Tests and Determination of Resonant Frequencies - The vibrations given in paragraph 3.1.2 shall be applied along each of three major mutually perpendicular axes. At the specified vibration values, a sinusoidal sweep shall be performed starting at the lower frequency limit and continuing at a constant octave sweep rate to the upper frequency limit in one-half hour. The resonant frequencies for each axis shall be determined by the following methods:

(a) Increased accelerations measured on the equipment with constant input accelerations, measured at the equipment mounting points.

(b) Excessive noise emitted from equipment.

At the conclusion of the sweep test on each axis, the equipment under test shall be examined for mechanical failure.

4.2.2.3 Resonant Frequency Tests - If resonant frequencies are found, the equipment shall be vibrated for a period of five (5) minutes at each resonant frequency and at the amplitude specified in paragraph 3.1.2. After resonant frequency tests on each axis, examine equipment under test for mechanical failures.

4.2.2.4 Performance Record - After the completion of all vibration tests, subject the camera and cassette to the acceptance tests described in paragraph No. 3 of FCIC Specification No. SME-KB-3 and paragraph No. 3 of FCIC specification No. SME-KB-4. The test results must fall within the tolerances given in these specifications.

4.2.3 Acceleration Tests - The camera and cassette shall be subjected to the accelerations specified in paragraph 3.1.3. During tests, the camera shall be equipped with a spool of film and the cassette shall be equipped with an empty film spool. The acceleration test on the longitudinal axis shall be in one direction only and the acceleration test on each lateral axis shall be made in both directions. Tests shall be conducted with equipment inoperative.

Note: The longitudinal axis shall be considered as the roll axis of the vehicle

4.2.3.1 Performance Record - After the completion of all acceleration tests, subject the camera and cassette to the tests given in paragraph 4.2.2.

4.2.4 Shock Tests

4.2.4.1 Equipment Not Packaged for Shipment - The camera and cassette shall be subjected to the shock tests as specified in paragraph 3.1.4 (a). The shocks shall be applied through the normal mounting points of the camera and cassette to the vehicle primary structures. The shocks shall be applied to the camera and cassette successively along three mutually perpendicular axes. The reference axis shall be the roll axis of the vehicle. This cycle shall be repeated three times. These tests shall be conducted with the camera and cassette inoperative. After completion of these tests, examine camera and cassette for mechanical failure. If no failures occur, subject the camera and cassette to the tests specified in paragraph 4.2.2.4.

Note: During the shock tests, the camera shall be equipped with a spool of film and the cassette shall be equipped with an empty film spool.

4.2.5 Acceleration and Shock Tests, Cassette -The cassette shall be subjected to the following tests which are in addition to those outlined in paragraphs 4.2.3 and 4.2.4:

4.2.5.1 Acceleration - Load the cassette with film and subject to an acceleration of 25 g's for 3 minutes along the axis corresponding to the roll axis of the vehicle. At the end of this test, the cassette need not be operable but the film shall be undamaged.

4.2.5.2 Shock - Load the cassette with film and subject to a series of three (3) shocks of 75 g's each along the axis corresponding to the roll axis of the vehicle. At the end of this test, the cassette need not be operable but the film shall be undamaged.

Enclosure 2

APPENDIX B

4.2.6 Explosion Tests - The explosion test shall be conducted in an explosion chamber equal to the chamber specified in MIL-C-9435. Conduct the explosion test in the following manner:

(a) Operate the camera and cassette in order to determine that it is functioning properly and to observe the location of any sparking which shall be considered a potential hazard.

(b) Install the camera and cassette in the chamber in such a manner that normal electrical operation is possible.

(c) The temperature within the chamber during the test procedure is not critical but should be maintained between 68°F and 122°F.

(d) A single test shall be conducted as follows:

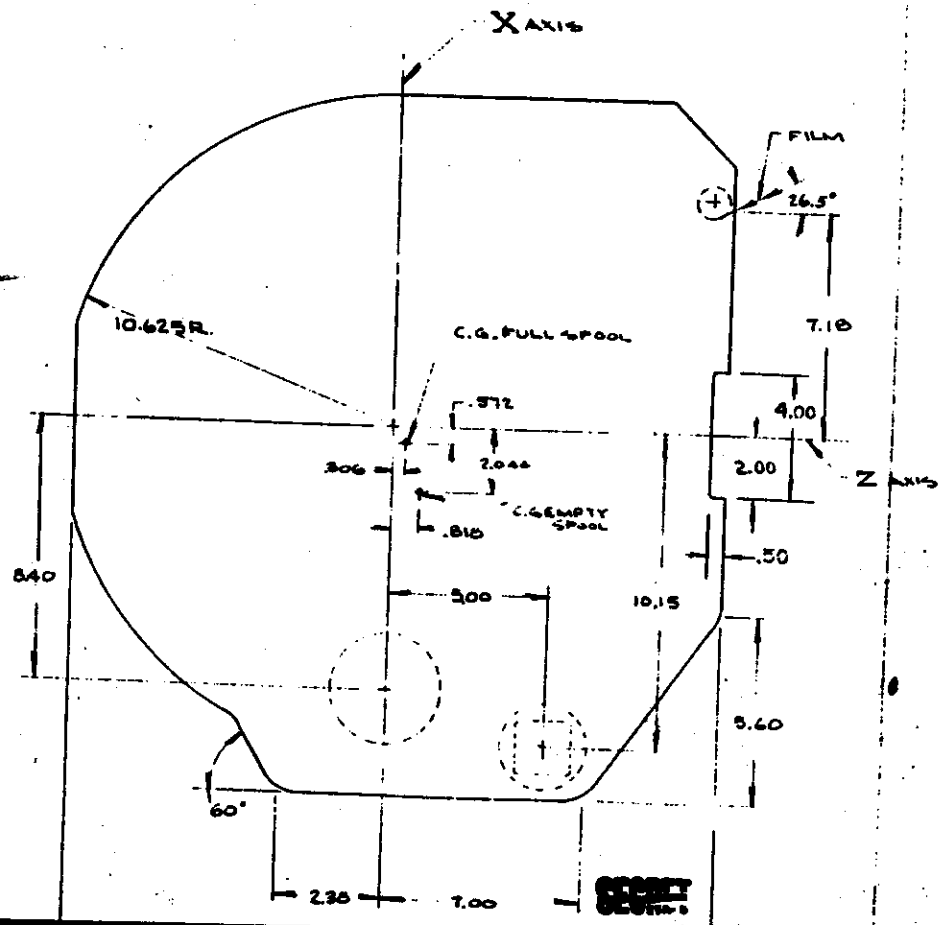
(1) The chamber shall be sealed and the internal pressure reduced to approximately 10,000 feet above sea level to compensate for leakage or increase in pressure when fuel vapor is introduced. The predetermined quantity of fuel shall be introduced into the chamber. The amount of fuel used shall depend upon the size of the chamber, test altitude and atmospheric conditions existing at the time of the test. The explosive mixture shall be capable of producing an instantaneous explosion when ignited by the chamber spark plug. If necessary, an additional quantity of air shall be bled into the chamber until the desired test pressure is obtained. Fuel used shall conform to MIL-G-5572B grade 100/130 or commercial butane.

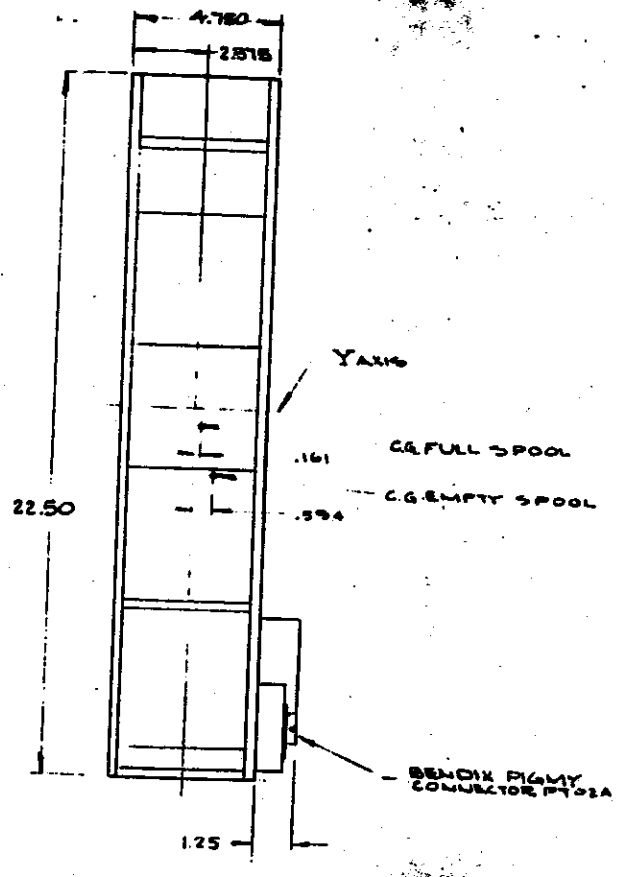
(2) Operate camera and cassette through 20 cycles at the maximum camera cycling rate.

(3) If an explosion does not occur as a result of the operation of the equipment under test, ignite the explosive mixture by the chamber spark plug.

(e) If the equipment under test causes an explosion, it shall be considered as failing this test.

Specification No. [illegible]
Page No. 7





APPENDIX C

SPECIFICATION

SME-DC-3B

CASSETTE, TAKE-UP

FOR

HIGH ACUITY PANORAMIC CAMERA, HYAC II

31 October 1958

DRAFT

1. SCOPE

1.1 This specification covers one type of film cassette for use with the HYAC II panoramic camera. The basic design of the cassette shall be to take-up the exposed film from the camera in accordance with the details of this specification.

2. APPLICABLE DOCUMENTS

2.1 The following document of the issue in effect on the date of this specification form a part of this specification to the extent specified herein:

"SME-EB-5A, dated 31 October 1958 -
Environmental Test Specification."

3. REQUIREMENTS

3.1 Component Parts - The cassette shall consist of the take-up spool, film drive system and telemetering potentiometer.

3.2 Basic Cassette Design

3.2.1 Configuration - The design of the cassette shall conform to the basic configuration and space limitation as shown in Figure 1.

3.2.2 Cassette Weight - The weight of the complete cassette without film shall be held to an absolute minimum and shall not exceed 20 pounds.

3.2.3 Film Spool Drive System - The cassette drive shall be intregral to the cassette and shall be designed for minimum power consumption. The drive motor shall be a 28 volt DC motor.

3.2.4 Mounting Provisions - Provision shall be made for mounting the cassette within the vehicle in accordance with the mounting provisions as shown in Figure 1.

3.2.5 Thermal Instrumentation - Three modified RUGE BN-5 2400 ohm resistance thermometers will be installed in the cassette.

3.3 Performance Requirements

3.3.1 Film Take-up Performance - The cassette shall be capable of taking up the required amount of film as specified in the cassette detail section (paragraph 3.4) under simulated operating conditions.

3.3.1.1 The cassette shall be able to be started and stopped at least twenty times over the range of taking up a complete roll of film. The rate of film take-up shall be 20 inches per second.

3.3.1.2 The maximum acceleration time permitted under the worst conditions of the take-up spool starting shall not exceed 15 seconds.

3.3.2 Power Consumption - The total power consumption of the cassette shall be held to an absolute minimum. The maximum total power consumed shall not exceed 35 watts of 28 volt DC supply regulated to $\pm$ 0.5%.

3.4 Cassette Design Details

3.4.1 Allowance for Film Splices - The cassette film handling system and guides shall be designed to allow for smooth passage of the required number of proper film splices expected in each roll of operational film. The assembly shall be capable of passing film that has been properly butt spliced with 1" wide polyester film tape (Minnesota Mining and Manufacturing Co. type #850 or equivalent).

3.4.2 Film Loading - The cassette shall be assembled with leader attached to the spool and threaded through the film handling system with six feet of leader external to the cassette film entrance slot. This leader shall be spliced to the camera film for final assembly and testing purposes.

3.4.3 Remote Indication Requirement - The cassette shall be provided with a trar ducer and the necessary electrical connections to permit remote indication the amount of film that is on the take-up spool at any time during the opera

3.4.4 Anti-Back-Up Device - The cassette shall be designed to incorporate an an back-up mechanism in the spool drive system to prevent the take-up spool from unwinding. This anti-back-up device shall be capable of being releas for test and check-out purposes by applying 28 volts DC on an appropriate connection. The anti-back-up device shall be mechanically engaged when t voltage is removed.

3.4.5 Film Capacity - The cassette shall contain a film spool of special design w a 4" diameter core and a 20-1/4" diameter flange capable of handling a filr capacity of 20" diameter.

3.4.6 Film Requirements - The film to be handled by the cassette and spool shall thin based unperforated film of a nominal 3-1/2 mil, (0.0035") thickness a 70 mm width. The cassette shall be capable of properly winding this film the spool tightly without excessive pressure marking or scratching.

3.5 Design and Selection of Components - The design and selection of components for this cassette shall be compatible with the performance and environmental requirements of the system. The best available items shall be used and the components need not be in accordance with specific Military Specifications.

3.6 The components and overall cassette shall be designed to satisfy the requirements of Specification SME-EB-5A, entitled "Environmental Test Specification," dated 31 October 1958. The environmental tests performed are detail under the qualification test section, paragraph 4.

3.7 Spare Parts - A complete list of spare parts required for the cassette shall be submitted by separate document.

4. QUALIFICATION TESTING

4.1 Acceptance Tests - Acceptance tests shall be performance tests to be accomplished on each deliverable cassette to assure proper functioning of the equipment. The details of the tests shall be as mutually agreed upon by the contractor and the customer.

Acceptance Tests

1. Mechanical and electrical inspection.
2. Film Spool Acceleration Test.
3. Film Take-up Test.
4. Checking the Anti-Back-Up Device.
5. Checking the Remote Indication Transducer Output.

The order in which these acceptance tests have been listed shall not necessarily indicate the order in which the acceptance tests shall be run. The acceptance shall be run in the most expeditious order by which to accomplish the requirements, and shall be in accordance with Acceptance Test Specification SME-EB-4A attached hereto as Enclosure I.

4.2 Environmental Tests - The environmental testing shall be performed on the first non-deliverable flight unit for the purposes of qualifying the deliverable cassettes. The environmental tests shall be as indicated in the following paragraphs, which reference the appropriate paragraph of the Environmental Test Specification SME-EB-5A, dated 31 October 1958.

4.2.1 Temperature, Altitude, and Humidity Tests - The temperature, altitude and humidity tests shall be conducted in accordance with the requirements of paragraph 4.2.1 of the Environmental Test Specification referenced herein.

4.2.2 Explosion Proof Tests - Explosion proof tests shall be conducted in accordance with the requirements of paragraph 4.2.6 of the Environmental Test Specification referenced herein.

4.2.3 Drop Tests - Drop tests shall be conducted in accordance with the requirement of paragraph 4.2.4.2 of the Environmental Test Specification referenced herein

4.2.4 Vibration Tests - Vibration tests shall be conducted in accordance with the requitements of paragraph 4.2.2 of the Environmental Test Specification referened herein.

4.2.5 Shock Tests - The cassette shall be subjected to three 20 g shocks in both directions along each of its three mutually perpendicular axes for a total of eighteen shocks. Time to peak of each shock shall be approximately 5-1/2 milliseconds. Duration of each shock shall be 11 $\pm$ 1 millisecond. The cassette shall not be operated during this test. The cassette shall then be subjected to three 75 g shocks along the roll axis as determined by the orientation of the cassette when mounted in the vehicle. The cassette shall be operable after the 20 g shock tests but need not be operable after the 75 g shock test along the longitudinal axes.

4.2.6 Acceleration Tests - Shall be conducted in accordance with the requirements of paragraph 4.2.3 of the Environmental Test Specification referenced herein. In addition to this test, an acceleration test shall be applied along the longitudinal axis of the cassette when properly oriented in the vehicle at 25 g's for a period not less than three minutes. The cassette need not be operable after this additional test.

SCHEDULE I

Part No.	Name	TS 956-2201	TS 956-2003	TS 956-2002	TS 956-2004	TS956-20
956 E4	Motor Assy	X	X	X	X	X
956 E25	Miniclutch Assembly		X	X	X	
956-265	Potentiometer,	X	X	X	X	

ACCEPTANCE TEST SPECIFICATION

SME-EB-4A

Cassette, Take-Up, Part No. 956E2 for

High Acuity Panoramic Camera Part No. 956A1

31 October 1958

Enclosure 1
Appendix C

SECRET

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SECRET

1. SCOPE

1.1 It is the purpose of this specification to outline and describe the acceptance tests which must be performed on the subject equipment in order to assure the proper functioning of this equipment.

2. APPLICABLE DOCUMENTS

2.1 The following documents and drawings form a part of this specification:

Specification No. SME-DC-3B, Cassette, Take-Up
FCIC Drawing 956E2 Assembly
FCIC Drawing 9568D2 Electrical Schematic

3. ACCEPTANCE TESTS:

3.1 Film Handling: Connect the cassette with a simulated camera loaded with dummy film. The simulated camera must be capable of feeding film to the cassette at a rate of 20 inches per second and accelerating from standstill to maximum speed in 5.0 ± 10% seconds. Start cassette and simulated camera. Operate until the cassette has taken up a complete roll of film. Start and stop system at least twenty times during this period. The film handling capabilities of the cassette are satisfactory if the complete roll of film is taken up without formation of loops, excessive slack, or breakage

3.2 Power Consumption: Measure the operating 28 volt DC power at the maximum film take-up rate. This power shall not exceed 35 watts average.

3.3 Film Indication - Quantity: Measure the DC voltage output from the transducer which indicates the amount of film on the take-up spool. This voltage will vary from 0 to approximately 4.5 volts. Zero voltage represents an empty film spool and 4.5 volts represents a full film spool. In order to check correct operation of the device, measure the output voltage for various radii of film on the spool. Typical values are as follows:

Radius of Film on Spool Inches	Transducer Output D.C. Volts
2.0	0.00 ± 0.01
4.0	1.08 ± 0.05
6.0	2.17 ± 0.10
8.0	3.31 ± 0.20
10.0	4.50 ± 0.30

Enclosure 1
Appendix C

3.4 Anti-Back-Up Device: The anti-back-up device will be engaged with the film spool in such a manner as to prevent the take-up spool from unwinding during normal operation of the camera and cassette. Check by attempting to unwind spool by hand. Apply 28.0 ± 0.5% DC volts to the operating coil of the anti-back-up device. Spool will be free to rotate in both directions.

3.5 Resistance Thermometers: Resistance of each resistance thermometers shall be 2400 ohms ± 10%.

Enclosure 1
Appendix C

APPENDIX D

SPECIFICATION

LENS, 24" f/5 (HYAC II)

31 October 1958

SECRET

LENS, 24" f/5 (HYAC II)

1. Scope

This specification covers one type of high acuity photographic lens suitable for aerial reconnaissance.

2. Applicable Documents

Those issues of the following documents which are in effect on the date of this specification form a part of this specification, where applicable.

MIL-STD-150 Military Standard Photographic Lenses

9103-L2916

General

Environmental Specification, ITEK Corporation

3. Requirements

a. General

The design of the lens shall conform to the basic configuration and space limitations shown in Figure No. 1.

b. Details

(1) Lens

The lens shall be a 24" focal length at altitude and associated operating temperature of 70 ± 10°F, f/5, covering a 70mm slit forma The design goal resolution of the lens-film combination shall be such to provide the ground detail goal of the work statement. For purpose

of design a goal of 100 l/mm across the slit shall be set. For the Hyac II A design, the following minimum tangential or radial lens film resolution values will be met across the slit (using SO-1213 or equivalent emulsion).

Left				Right		
2 1/2°	2°	1°	0°	1°	2°	2 1/2°
60	75	90	110	90	75	60

For the Hyac II B design, all values should read 100 lines/mm or greater. The lenses shall be manufactured so that the nodal point will be sufficiently close to the axis of rotation of the lens so as not to produce more than 0.0001" image motion within the slit. The focal length will be calibrated to ± 0.001".

(2) Lens Barrel

The lens barrel shall be constructed of extremely light weight materials capable of withstanding the general environmental specification referenced.

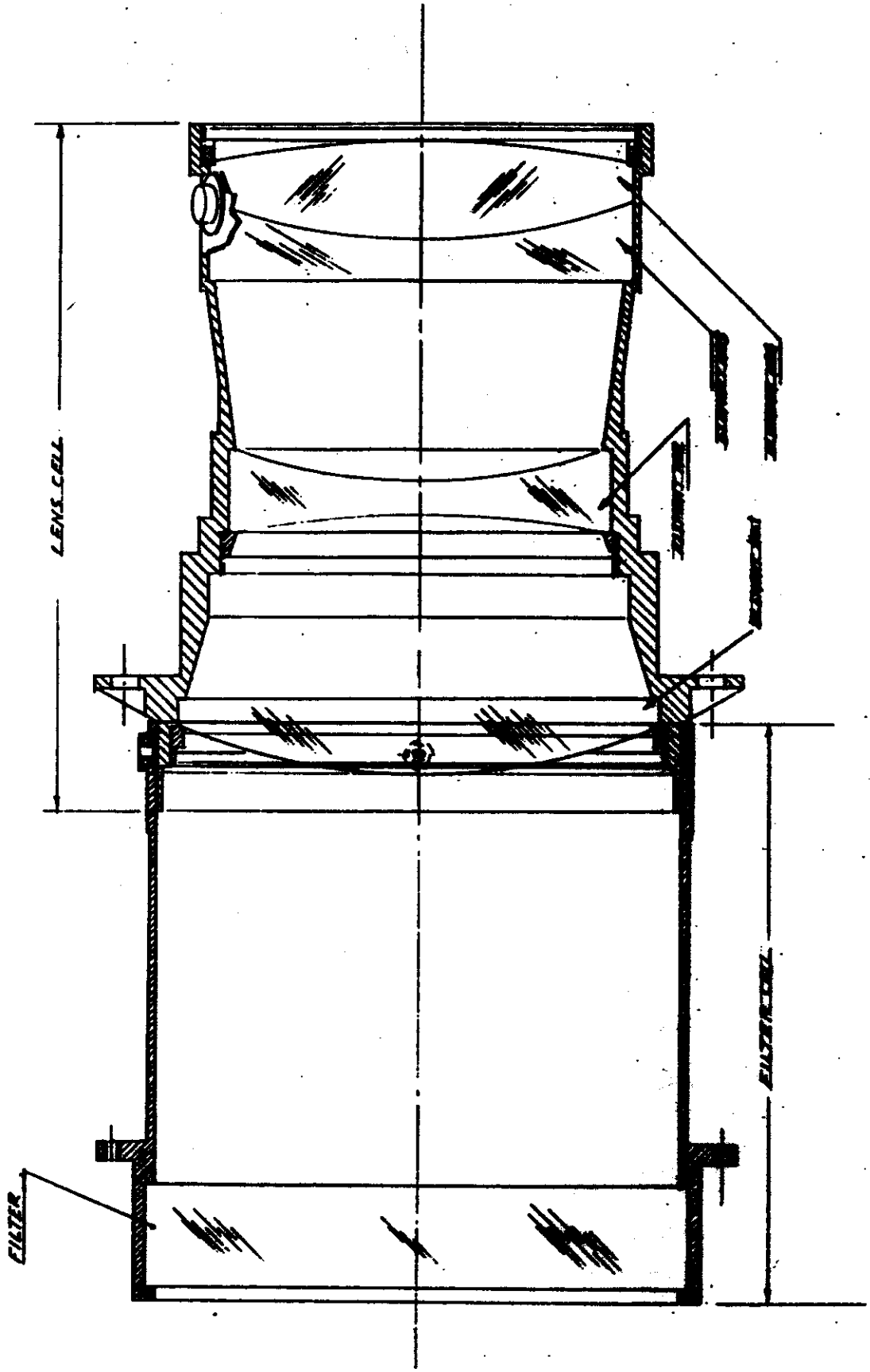

FIGURE 1

APPENDIX E

SPECIFICATION

CAMERA AND CASSETTE INSTRUMENTATION

AND

V/H TRANSDUCER

31 October 1958

SECRET

1. SCOPE

1.1 This specification covers engineering services for the purpose of instrumenting the HYAC II panoramic camera. These services shall include design of instrumentation; recommendations to the prime; monitoring of the instrumentation activities of the sub-contractor; and experimentation to verify the desi

2. STATEMENT OF WORK

2.1 V/H Command Transducer

2.1.1 ITEK Corporation shall design and construct a transducer for converting digital V/H command signals into analogue V/H signals suitable as an input to the camera servo accelerating control. The input to the V/H transducer shall consist of a series of ground closure pulses. The maximum repetition rate of the pulses shall be 30 pps. The pulse duration shall be .01 sec. or longer but in any case the spacing between pulses shall be not less than .01 sec. The minimum input impedance of the V/H transducer shall be 28 ohms The output of the V/H transducer shall consist of a voltage staircase of 11 steps from 5.15 to 12 volts. The V/H transducer shall provide V/H positior indication for each of its 11 positions to be telemetered to ground on 4 prime provided channels. This indication shall be in the form of a 4-digit binary unit-distance code such as the Gray code.

2.2 Light Leak Detection

2.2.1 ITEK Corporation shall design a circuit for detecting light levels in the pano ramic camera. This circuit shall provide a qualitative indication that the illuminance within the camera exceeds 0.01 ft. - candles.

2.3 Temperature Measurement

2.3.1 ITEK Corporation shall provide instrumentation for the measurement of loca temperature at thirteen points in the camera and three points in the cassette The temperature range covered and the precision of measurement depend upon the characteristics of the telemetry link, but a design goal of 1°F precision over the range 32°F to 150°F shall be pursued. The temperature transducers employed shall be Ruge resistance thermometers as specified by the Contractor.

2.4 Film Footage Indication

2.4.1 ITEK Corporation shall provide instrumentation for measuring the radius of film on the take-up spool. The precision of this measurement shall be ± 0.1 inch.

2.5 Film Transport Indication

2.5.1 ITEK Corporation shall provide instrumentation for indicating the rotation of the take-up film metering rollers. The output of the film transport indicator shall be a voltage pulse whose repetition rate is 6.5 pps at a film speed of 20 inches per second.

3. COMPATIBILITY WITH VEHICLE TELEMETER

3.1 Output of all transducers shall be compatible with the following telemeter input characteristics:

a. Input range 0.5 - 4.5 volts.

b. Input impedance 500,000 ohms.

c. Signal resolution 5 millivolts

d. Commutation rate 10 cps.

APPENDIX F

SPECIFICATION

SIMULATORS FOR HYAC II

31 October 1958

1. SCOPE

1.1 This specification covers three types of test instruments to provide for overall photographic performance testing of the HYAC II camera and cassette.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on the date of this specification form a part of this specification to the extent specified herein:

Appendix B, "High Acuity Panoramic Camera (HYAC II)"

Appendix C, "Cassette, Take-Up"

Appendix D, "Lens, 24" f/5 (HYAC II)"

Appendix E, "Specification for Camera and Cassette Instrumentation and V/H Transducer."

3. REQUIREMENTS

3.1 Types - Three types of simulators as defined below will be designed. These are designated as Static, Dynamic and Portable.

3.2 Static Simulator

[redacted] 11/18/58

3.2.1 Configuration - The design of the static simulator shall conform to the basic configuration and space limitations, [redacted].

3.2.2 Detail requirements - The static simulator shall be a self contained assembl which will be used to determine the photographic performance characteristic of the HYAC II camera. It shall be a light tight unit with a motorized cover which when opened will enable the camera to be mounted in its natural operating position for test. Directly under the lens centerline three suitable collimators of 48" focal length shall be placed as follows: one unit 18° to the le of the nadir, one unit at the nadir and one unit 30° to the right of the nadir. (The angles are determined from the nodal point of the camera lens.) The collimators shall be designed to present resolution targets shall be on endles belts and driven at constant velocities by three velocity servo systems, so designed as to give a wide range of velocity-altitude ratios, compatible with the system. A means for testing the effect of yaw error shall be provided.

3.3 Dynamic simulator

[redacted] 11/18/58

3.3.1 Configuration - The design of the dynamic simulator shall conform to the basic configuration and space limitations, [redacted].

3.3.2 Detail requirements - The Dynamic Simulator shall be similar to the Static Unit with the following modifications. The inner gimbal shall contain not only the camera and cassette, but also a pair of integrating gyros, which will be used as measurement and control devices for drift rates in pitch and roll. The inner gimbal shall be mounted on low torque bearings with a torquer mounted on each end of the pitch shaft to enable two modes of possible operation. For one mode, the torquers will be used to stabilize the inner gimbal by use of the signal received from the pitch gyro. The other proposed mode is to introduce known rates by supplying the torque generator of the gyro microsyn back to the gimbal torquers which in turn will cause the inner gimbal to precess at a known rate.

The inner gimbal-camera assembly will be mounted in the outer gimbal which in turn is to be supported by low friction bearings, and these pivot points will form the roll axis. The operation about the roll axis shall be similar to that about the pitch axis.

Provision shall be made to lock both gimbals for operation in a mode similar to that of the static unit.

The optical and V/H portions of the Dynamic Unit shall be identical to those used in the Static Unit.

3.4 Portable Simulator

3.4.1 Configuration - The design of the portable simulator shall conform to the basic configuration and space limitations [redacted].

3.4.2 Detail requirements - The portable simulator shall consist of a basic framework on which are mounted three of the simulator collimators as described above and three V/H drive servos. Accompanying this shall be a control console which contains the electronics necessary for operation of the simulator.

The design of the velocity servos shall be identical with those used in the Static and Dynamic Simulators. The main objective of this smaller unit is to permit a final operational check of a camera which has been installed in the vehicle. The complete unit shall be capable of being mounted on a dolly furnished by the customer.

3.5 Engineering Manual - An engineering manual shall be furnished which shall contain tests and procedures necessary to assure the satisfactory operation of the simulators. This shall be furnished in the form of standard ozalid reproduction and need not be prepared to any Military Specification.

3.6 Design and Selection of Components - The design and selection of components for the simulators shall be compatible with the performance requirements of the system. The best available items shall be used and the components need not be in accordance with specific Military Specifications.

4. QUALIFICATION TESTING

4.1 Acceptance tests - Acceptance tests shall be performance tests to assure prope functioning of the equipment.

4.2 Environmental Tests - The simulators will operate in a controlled environment It is not necessary, therefore, to environmentally test this equipment.

APPENDIX G

SPECIFICATION

SME-DN-24B

TEST AND CHECK-OUT CONSOLE

FOR

HIGH ACUITY PANORAMIC CAMERA

31 October 1958

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1. SCOPE

1.1 This specification covers one type of test and check-out console to provide for a complete functional operating test of a panoramic camera and cassette including indication of correct operation of all mechanical and electrical functions.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on the date of this specification form a part of this specification to the extent specified herein.

SME-DB-1B High Acuity Panoramic Camera

SME-DC-3B Cassette, Take-up, for High Acuity Panoramic Camera

3. REQUIREMENTS

3.1 Component Parts: The test and check-out console shall consist of a chassis on wheels containing the necessary instrumentation and circuitry to record or present for rapid interpretation the information provided by the camera system transducers and/or camera system circuits.

3.2 Basic Console Design:

3.2.1 Configuration: The design of the console shall conform to the basic configuration and space limitations as shown in Figure 1. The console weight shall be kept at a minimum with a design goal of 750 lbs.

3.2.2 Console Functions: The console shall be capable of making functional operating checks of the camera system which shall include the following:

(a) Constancy of Scan Velocity.
(b) Relative change of Scan Velocity due to change of V/H Commands.
(c) Camera Cycling Rate.
(d) Film Transport Indication.
(e) Cassette anti-back-up operation and film remaining indicator operat
(f) Data Recording Functions.
(g) Temperature Sensors
(h) Light Leak Detector

3.2.3 Instrumentation: The console shall contain standard commercial instruments wherever practicable. These instruments shall be installed integral to the console and furnished as part of the console. Modification of these standard instruments and the proper interconnections between them shall be included i the console design. A 400 cps power supply shall provide power for the Programmer and Camera-Cassette. A power supply converting 60 cps line pow

to supply the 28V D.C. requirements of the Test Console and Camera-Cassette shall be provided. No batteries for prime power shall be used. All power supplies shall be over-rated to allow for system change and growth potential.

3.2.4 General: Connecting means (wire) shall be provided for inter-connection between the console and the camera system. Remote telemetering receiver, if required, is not a part of the console. The console shall supply power and operating control command signals to the camera system. The console shall be capable of testing the camera and cassette on test fixtures as well as when installed in the vehicle. The latter capability will be accomplished by interconnecting patch cables.

3.3 Performance Requirements

3.3.1 Console Performance: The selection of all components for the tests and check-out console shall have accuracies consistent with the accuracy of the camera and cassette performance requirements as reflected in Specification No. SME-DB-1B entitled, "High Acuity Panoramic Camera," and Specification No. SME-DC-3B entitled, "Cassette, Take-up, for High Acuity Panoramic Camera."

3.3.2 Power Requirements: The console shall provide the necessary power requirements consistent with the camera and cassette specifications referenced herein for pre-flight check-out. The power required for the console shal utilize standard 110 volts, 60 cycles, three phase, "Y", 4 wire (208V Phase to Phase) supply.

3.4 Engineering Manual: An engineering manual shall be furnished which shall contain tests and service procedures necessary to assure the satisfactory operation of the console. This manual shall be furnished in the form of standard ozalid reproduction and need not be prepared to any Military Specification.

3.5 Reports: All reports called for in the contract shall be of an engineering type and need not be prepared in accordance with any special format or Military Specification. These reports however, shall be complete and include all necessary data to properly permit engineering evaluation.

3.6 Drawings: All drawings to be prepared for this project shall be working drawings of sufficient detail to permit fabrication of additional equipment at a future time by an experimental or model shop facility. These drawings need not conform to any military Specification and shall include sketches wherever possible.

3.7 Design and Selection of Components: The design and selection of components for this console shall be compatible with the performance and environmental requirements of the system. The best available items shall be used and the components need not be in accordance with specific Military Specifications.

3.8 Spare Parts: A complete list of spare parts requested for the console shall be furnished and delivered, as mutually agreed between ITEK/FCIC and the customer.

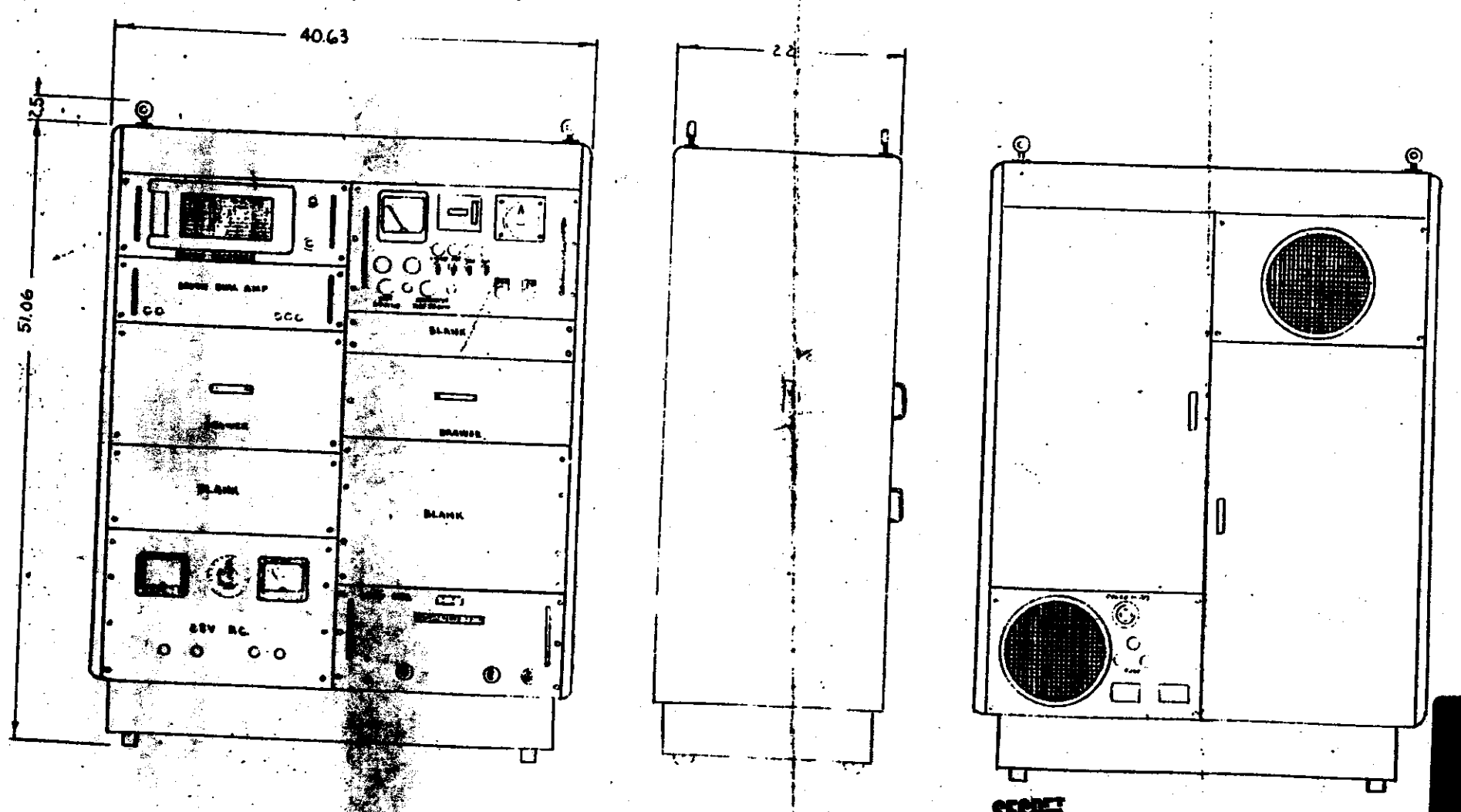
4. QUALIFICATION TESTING

4.1 Acceptance Tests: Acceptance tests shall be performance tests to be accomplished on the first deliverable console to assure proper functioning of the equipment. The details of the tests shall be as mutually agreed upon by ITEK/FCIC and the customer. The acceptance tests performed on articles subsequent to the first deliverable will be of reduced detail as mutually agreed upon by ITEK/FCIC and the customer.

ACCEPTANCE TESTS

(a) Mechanical and electrical inspection.
(b) Calibration check of all standard instruments in accordance with normal procedure.
(c) Check of each functions the console is designed to handle, utilizing standard type of commands.

4.2 Environmental Tests: The test console shall operate in a controlled environment which will basically be that of normal room conditions. It is not necessary, therefore, to environmentally test the console.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2.5
51.06
2.4
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ACCEPTANCE TEST SPECIFICATION

SME-EN-2B

TEST CONSOLE, 956-T60

AND SHIPPING CASE, 956-T64

31 October 1958

Enclosure 1
Appendix G

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1. SCOPE

1.1 This specification covers the tests and procedures to be used in performing the Acceptance Test of the Test Assembly, Console, FCIC Part Number 956 T60 and Shipping Case, FCIC Part Number 956-T64.

2. APPLICABLE SPECIFICATIONS, DOCUMENTS AND DRAWINGS

2.1 The following specifications, documents and drawings of the issue in effect the date of this specification, form a part of this specification to the extent specified herein:

Specifications and Documents

SME-DN-24B	Test and Check-out Console for High Acuity Panoramic Camera
SME-DY-3A	Shipping Case for Test Console
	Engineering Instruction Manual, Test Console

Drawings

FCIC	956-T60
FCIC	956-T64

3. REQUIREMENTS

3.1 Inspection: Inspections will be performed, as described in detail in Section 4, assuring that the Test Console satisfies the design requirements as specified in Specification No. SME-DN-24B.

3.2 Calibration: Calibration tests will be performed, as described in detail in detail in Section 4, assuring that the Test Console will interpret and record accurate operations of the Camera-Cassette as specified in Specification No. SME-DN-24B.

3.3 Functional: The Camera-Cassette and Console shall be tested together, as described in Section 4, to insure that the Console meets the performance requirements as specified in Specification No. SME-DN-24B. There shall be no malfunction in the Camera-Cassette caused by connection to or operation of the Test Console.

4. PROCEDURE

4.1 Inspections: Inspections shall be performed, under ITEK/FCIC Quality Control and customer selected witnesses, if desired.

4.1.1 Mechanical Inspection: Perform the following mechanical inspections to the referenced drawings.

4.1.1.1 Determine that Test Console and Shipping Case do not exceed the outline dimensions shown. Inspect for correct markings on Shipping Case.

4.1.1.2 Inspect for workmanship including cleanliness, neatness, and general physical appearance.

4.1.1.3 Inspect for tightness of screws and securing devices; check that test cables mate properly with console connectors.

4.1.2 Electrical Inspection: Perform the following electrical inspections to the referenced drawings.

4.1.2.1 Inspect for positive and secure solder connections on components and cable assemblies.

4.1.2.2 Inspect for proper size and types of fuses, vacuum tubes and plug-in devices, such as relays, etc.

4.2 Calibration: Perform the following calibration tests of the various components of the Console described herein, using calibrated standard test equipment. Console to be turned on for 30 minutes prior to recording calibration measurements.

4.2.1 28 Volt Power Supply: Measure output voltage and record in data sheet; voltage to be 22 to 29.5 volts D. C.

4.2.2 400 CPS Power Supply: Measure output voltage and record in data sheet; voltage to be 114.85 to 116.15 (115V ± 1%). Measure output frequency a record in data sheets; frequency to be 399 to 401 CPS (400 CPSm ± 0.25

4.2.3 Recorder and Amplifier: Check calibration of the recorder and amplifie (dual channel) as described herein.

4.2.3.1 Recorder Test

4.2.3.1.1 Turn the SELECTOR switch to "standby".

4.2.3.1.2 Turn the CHART SPEED switch to "25". Twenty-five millimeters per second is fast enough to align chart paper and slow enough to conserve chart paper.

4.2.3.1.3 Turn the POWER switch "on".

4.2.3.1.4 Turn the SELECTOR switch to "mm/sec". This is the operational switch which starts the oscillograph.

4.2.3.1.5 Test all eight standard speeds momentarily by means of the CHART SPEE switch.

4.2.3.1.6 Turn the SELECTOR switch to "standby". This stops the oscillograph.

4.2.3.2. Amplifier Test

4.2.3.2.1 Balancing - To balance either channel of the amplifier, proceed as follow

4.2.3.2.1.1 Center the pen on the chart by means of the mechanical pen centering adjustment on the penmotor.

4.2.3.2.1.2 Turn both VOLTS/CHART LINE switches to "off". Turn the amplifier POWER switch to "on" and allow 10 to 15 minutes for the amplifier to warm up.

4.2.3.2.1.3 Turn the oscillograph "on".

4.2.3.2.1.4 Set the INPUT switch in the "balanced" position.

4.2.3.2.1.5 Turn the CALIBRATION control full clockwise and bring the oscillograph pen approximately to chart center by means of the "B" (BALANCE) contr

4.2.3.2.1.6 Turn the CALIBRATION control full counterclockwise, then full clockwis noting the direction of pen deflection as the CALIBRATION control is turn in a clockwise direction. If the pen is deflected to the right, turn the "A" (BALANCE) control in a clockwise direction until no pen deflection is not as the CALIBRATION control is operated. If the pen is deflected to the left, turn the "A" (BALANCE) control in a counterclockwise direction until no deflection is noted as the CALIBRATION Control is operated.

4.2.3.2.1.7 Center the pen on the chart by means of the "B" (BALANCE) control.

4.2.3.2.2 Calibration - Calibrate the amplifier as follows:

4.2.3.2.2.1 Turn the VOLTS/CHART LINE switch "off" and set the INPUT switch in the "balanced" position. If the oscillograph pen is not on the center line of the chart, repeat the "balancing" procedure described above.

4.2.3.2.2.2 Turn the VOLTS/CHART LINE Switch to the "Calibrate" position and adjust the CALIBRATION control as necessary to obtain a pen deflection of 20 chart lines below center. (Pen deflection below center indicates positive signal.) Turn the VOLTS/CHART LINE switch to "off".

4.2.3.2.2.3 Check 20 line deflection by again turning the VOLTS/CHART LINE switch to the "calibrate" position. If necessary, readjust the CALIBRATION control to obtain a pen deflection of 20 chart lines.

4.2.4 Control Panel

4.2.4.1 Timer: Measure the elapsed time versus that indicated on the Timer during a scan cycle and record on the data sheet. Time to be accurate to ± 1 second.

4.3 Functional Tests: Functional tests described herein shall be performed to assure that the Test Console and Camera-Cassette operate compatibly together. The Test Console shall cause no operational malfunction of the Camera-Cassette. Refer to Instruction Manual for Operation of the Test Console in all tests described herein.

4.3.1 Constant Scan Velocity: Operate Camera-Cassette at nominal cycling ra Read the Scan velocity variation over the scan portion of the sweep. Vel ocity to be within ± 2% of nominal over the scan portion. Prior to this te record transport indicator reading in space provided on data sheet for Fi Transport Tests.

4.3.2 Film Transport and Cassette Operation: After the test of 4.3.1 above, o serve the reading of the Transport Indicator Counter and compare this count to that before the Test of 4.3.1. This is a Go-No-Go test indicating proper film handling.

4.3.3 Camera Cycling Rate: With control panel operate switch "off" and conso telemetering switch "on", operate the V/H "Step" switch to cause the V/ Computer in the camera to operate over the eleven (11) positions. Obse that the V/H Computer is sequencing according to the binary readout on t Control Panel. Operate the camera- cassette at three speeds selected b the Control Panel command simulator "Step" switch. Cycling rate to be within ± 2% of the nominal for the selected command input. The presenc of the nadir pulse should be recorded on the data sheet.

4.3.4 Film Footage Indicator: Perform pre-operating test for this item per instruction in Console Operating Manual. This is a Go-No-Go Test.

Enclosure1
Appendix G

4.3.5 Data Recording: The following data signals are tested for operation during a part of the pre-operating test. Time, Fiducial Lamps, Frequency Recording, Digitote Illumination, Horizon Camera #1, Horizon Camera #2, Temperature Sensors, and Light Leak Detector. Record the check-offs on the data sheet for these tests, which are Go-No-Go type tests.

4.4 Overall Acceptance: Successful completion of the tests described in Paragraph 4 above constitute an acceptance of the Console and Shipping Case.

Enclosure 1
Appendix G

APPENDIX H

SPECIFICATION

FILM RETRIEVAL MAGAZINE

31 October 1958

SECRET

FILM RETRIEVAL MAGAZINE

1. SCOPE

This specification describes a magazine for retrieval of film from the take up cassette. This device can be used to remove test quantities of film from the cassette in a daylight condition (subdued light) for subsequent transport to a darkroom where the spool may be removed for processing. The unit will be compatible with available access holes in the camera/cassette enclosure, see Figure 1.

2. APPLICABLE DOCUMENTS

SME-DB-1(B) High Acuity Panoramic Camera

SME-DC-3(B) Cassette, Take-up, for High Acuity Camera

3. REQUIREMENTS

a. The projected area in one plane shall not exceed 5" x 5".
b. The capacity shall be not less than 250' of thin base (.0035") 70 mm.
c. The unit will be light-tight with an access cover to remove the spool.
d. Take-up will be motorized utilizing a miniature DC motor.
e. Variable quantities of film from 1' to 250' in 1' increments will be metered, using a small predetermining ratchet counter.

4. QUALIFICATION TESTING

a. Acceptance Tests

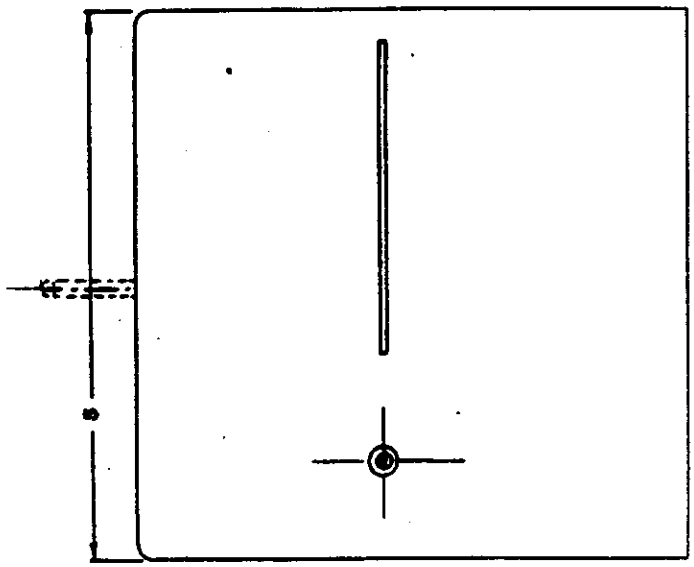
Acceptance tests shall be performed on each deliverable unit to assure proper functioning. These tests shall insure that the unit will meet performance requirements.

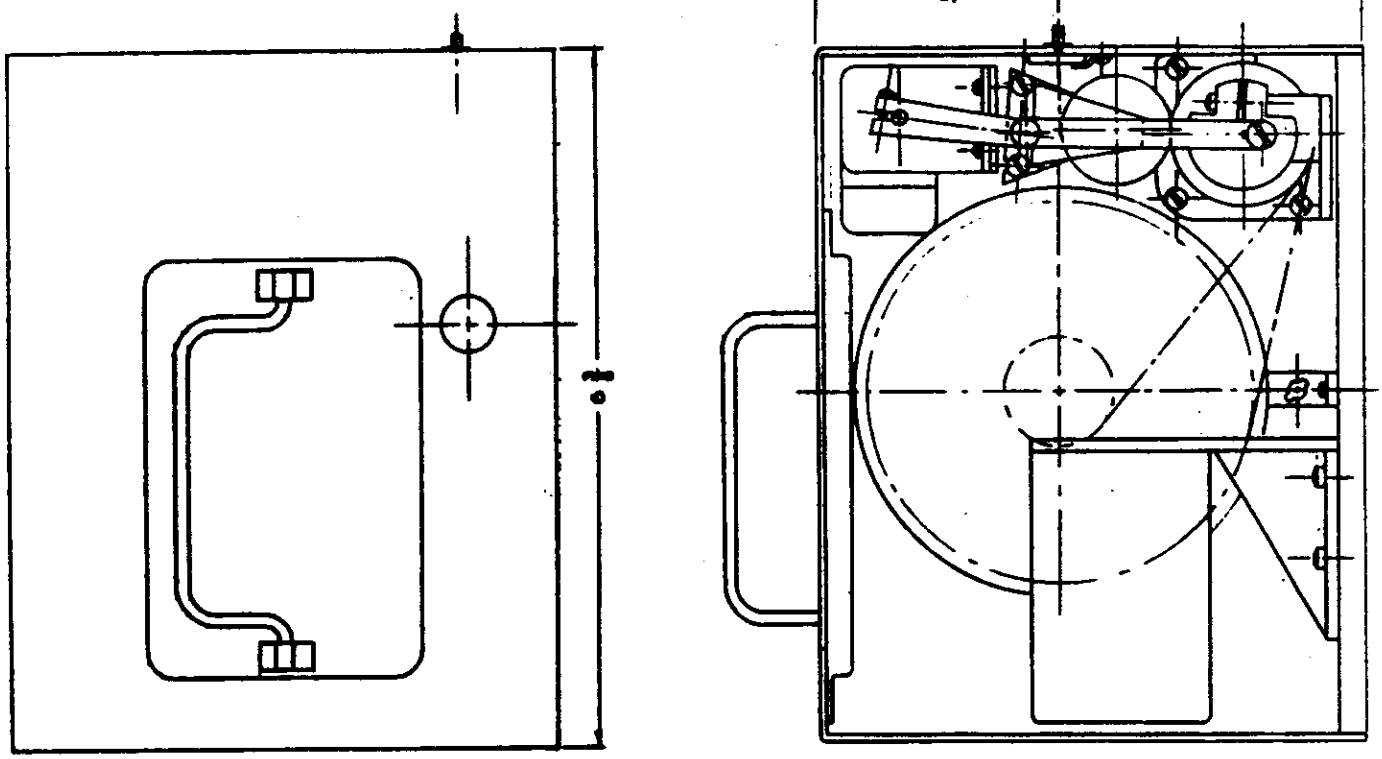
b. Environmental Tests

It will be used in normal laboratory environment and testing is not required.

Appendix H

OUTLINE DRAWING FOR FILM RETRIEVAL MAGAZINE





APPENDIX I

SPECIFICATION

GO-NO GO CONSOLE FOR HYAC II

31 October 1958

Go-No Go Console for Hvac II

1. SCOPE

1.1 This specification covers one type of rack mounted console to provide an indication of flight readiness for a panoramic camera in the blockhouse at the launch site.

2. REQUIREMENTS

2.1 Component parts - The rack-mounted console shall consist of a chassis for mounting on a standard rack using a prime-provided wire lin to the camera. The chassis shall contain the necessary circuitry tc monitor certain events in the camera and deliver to an operator a single indication that the camera and associated system are ready.

2.2 Basic Console Design

2.2.1 Console Functions - The console shall be capable of ascertaining th each of the following is true:

a. Film has not broken
b. There is no gross light leak in the camera. A gross lig leak is defined as a rupture in the camera housing such that th illumination level exceeds 0.001 footcandles.
c. The camera mechanism has operated through three con secutive cycles upon receipt of a command signal from the cc sole to cycle.

These three determinations shall be made automatically by th console and there shall be no visual indication to the operator that s of the individual checks are positive. The successful completion of three requirements shall be announced to the operator by means of single "ready" light. An output jack on the front panel shall provid a circuit closure for remote indication and/or remote actuation; th cuit closure shall be electrically independent of the console circuitr The camera shall be automatically turned off at the completion of th readiness check.

2.3 Performance Requirements

2.3.1 Time for Indication - The console shall require a minimum of 6 se and a maximum of 10 seconds to accomplish a readiness check.

2.3.2 Fail Safe - On the premise that an unnecessary flight postponement is economically preferable to an unwarranted go-ahead, the console shall be designed fail-safe, i.e., the logical addition of the three determinations shall be made in a positive way.

2.3.3 Reliability - To avoid expensive flight postponements, every effort shall be made to ensure reliability in the console; i.e., emphasis shall be on simplicity rather than sophistication in circuit design.

2.3.4 Power Requirements - The console shall not supply operation power to the camera. The power required for the console shall utilize standard 110 volt, 60 cycle, single phase supply.

3. QUALIFICATION TESTING

3.1 Acceptance Tests - Acceptance tests shall be performance tests to assure proper functioning of the equipment.

3.2 Environmental Tests - The go-no go console will operate in a controlled environment. It is not necessary, therefore, to test this equipment environmentally.

Appendix I

APPENDIX J

LIST OF DARKROOM EQUIPMENT AND SUPPLIES

31 October 1958

LIST OF DARKROOM EQUIPMENT AND SUPPLIES

HYAC II PROGRAM

EQUIPMENT OR SUPPLIES		PRIME	BASE	ITE E.T.
Fisher Processor, as modified in Enclosure 1, hereto		X		X
Kodak Safe Lights	2 each	X	X	
Weston Thermometer		X	X	
Trays, stainless steel	3 each	X	X	
Beaker, stainless steel	2 each	X	X	
Funnel, stainless steel		X	X	
Mixer		X		
70mm processor Micco			X	
Microscope and case		X		
Densitometer Weston		X		
Sensitometer Kodak 101 Model		X		
Timer Gralab		X		
Step Wedges	3 each	X		
Static Master Brush		X		
Magnifier	2 each	X		
Chemicals, Initial Supply		X		
Paper Cutter		X		
Misc. Photographic Supplies, initial supply		X		
Light Table (with minimum of 9" x 18" viewing surface)		X		

ENCLOSURE 1

PROPOSED MODIFICATION TO FISHER PROCESSOR

1. Provide air pre-heating chamber to increase drying rate.

2. Replace squeegee wiper blades with sponges or other suitable materia to eliminate scratches.

Enclosure 1

Appendix J

TEST CONSOLE SPARE PARTS LIST

Part No.	Item	Vendor	Qty.
Model 1500	2000 cps Power Oscillator	[redacted]	2
RD-2622-00	Oscillograph Recorder		2
RD-5621-00	Dual Channel Amplifier		2
RA-2921-30	Ink, Roll Chart Paper		4 doz. rolls
RA-2821-30	Ink, Pen		4
RA-2760-16	Ink, Red, Pint		2
Model SS-32-30	28 Volt Power Supply		1
5AR-SS-1	Amplifier		2
PFM-50-3000	Capacitor		4
Am-1020	Rectifier, Metallic		8
PT-530	Rectifier, Metallic		8
6S6DC	Lamp		12
FNM-15	Fuse, 15A, 125V		12
MDX-7	Fuse, 7a, 125V		12
2N176	Transistor		4
2N441	Transistor		24
	3AG,6.25A,125V Slo-Blo Fuse		12
	3AG,1.5A, 250V Fuse		12
	3AG,2A, Slo-Blo Fuse		12
	3AG,3A,125V Fuse		12
	3AG,3/4A, 125V, Slo-Blo Fuse		12
5Y3GT	Vacuum Tube		4
5U4GA/GB	Vacuum Tube		4
6x4	Vacuum Tube		4
12AT7	Vacuum Tube		20
12AX7	Vacuum Tube		12
0A2	Vacuum Tube	[redacted]	8
12BW4	Vacuum Tube		8
5687	Vacuum Tube		16
5881	Vacuum Tube		8
6550	Vacuum Tube		16
S6	3 Watt Lamp		16
47	Lamp		10
126621	Neon Lamp Assembly	[redacted]	4
TR132-R	Mercury Battery		4

APPENDIX K

APPENDIX K

SPARE PARTS LIST

31 October 1958

CAMERA SPARE PARTS LIST

Part No.	Name	Quantity
956-80	Commutator	2
956-429	Boot, Lens to Camera	2
956-518	Boot, Camera to Vehicle	2
956-519	Boot, Horizon	4
956-520	Cap, Lens	2
956B19	Brush Assembly	2
956B30	Preamplifier Assembly	2
956B78	Lamp Assembly, Digitote	2
956B79	Fiducial Assembly	14
956B80	Fiducial Assembly	2
956B87	Drive Motor Gear Assembly	2
956B112	Lens Assembly, Digitote	2
956B139	Accelerating Control Assembly	2
956B144	Supply Assembly, Synch Pulsing	2
956C10	Lamp Assembly, Frequency	2
956C11-1	Aperture	2
956C11-2	Aperture	2
956C11-3	Aperture	2

APPENDIX L

SPECIFICATION

SME-DY-1A

TRANSIT CASE

FOR

HIGH ACUITY PANORAMIC CAMERA

31 October 1958

1. SCOPE

1.1 This specification covers the design and manufacture of a transit case for the High Acuity Panoramic Camera, FCIC Part No. 956-A1.

2. APPLICABLE DOCUMENTS

2.1 The following specifications and drawings in affect on the date of this specification, form a part of this specification to the extent specified herein.

A. Specifications

SME-EB-5A - Environmental Test Specification dated 31 Oct.
MIL-E-005272B - Environmental Testing
MIL-F-14072 (Sig C) - Finishes for Ground Signal Equipment.

B. Drawings

FCIC Drawing No. 956L73

3. DESIGN REQUIREMENTS

3.1 Physical Description

3.1.1 General - The transit case shall be constructed from Balsa panels with 0.016' aluminum faces and the necessary aluminum extrusions. Suitable gasket material shall be installed between the case and its cover. Case shall be equipp with an Atwood Morrill Duplex Automatic Relief Valve Model No. 5462 or equivalent.

3.1.2 Details

3.1.2.1 Cover - The cover of this case shall not be hinged and shall be completely removable. The cover shall be fastened to the case on all four (4) sides by recessed spring loaded clamps of a type which will enable the case to meet the test requirements herein specified. Provisions shall be made for locking the cover in its closed position by means of key operated locks.

3.1.2.2 Handles - The transit case shall be equipped with four (4) spring loaded rece handles.

3.1.2.3 Interior of Case - The interior of the case shall be fitted with molded hair ins or equal to protect the camera against the test requirements herein specified. In order to protect camera gearing, etc. from pieces of the molded hair whic

may become dislodged a smooth protective vinyl coating or equivalent shall be sprayed, dipped or applied in some other manner, to all exposed surfaces of the molded hair. Fairchild Drawing No. 956L73 gives the outline dimensions of the camera which shall be transported and stowed in this case. Provision shall be made inside the case for the following:

a. Space for stowing a box 4" x 1-1/2" x 1-1/2".

b. Sufficient spade around the open sides of the camera for a dessicant packaged in bags of a type approved by FCIC.

3.1.2.4 Dimensions - The approximate inside dimensions of the case shall be 50" x 50" x 24". The thickness of the molded hari inserts between the walls of the transit case and the parts of the camera which are supported by the inserts shall not be less than 4.5 inches.

3.1.2.5 Weight - The weight of the transit case shall not exceed 75 pounds. The case shall be designed to hold a camera which does not exceed 85 pounds in weight

3.1.2.6 Materials - Materials which are flammable, toxic, fungus nutrient, corrosiv etc., shall not be used without suitable protective treatment.

3.1.2.7 Finishes - Material used in the transit case shall be finished in accordance w finish Specification MIL-F-14072 (Sig C).

3.1.2.8 Color - The exterior of the case shall be painted light blue color No. 501 Fe eral STD No. 595 Color No. 15102.

3.1.2.9 Marking and Identification - All four (4) sides and top shall have stenciled th warning "Fragile-Delicate Equipment" and "This Side Up". The sides shall have arrows indicating the up direction. The stenciling shall be in orange-yellow, Color No. 506 Federal STD No. 595 Color No. 13538.

3.1.2.10 Workmanship - The transit case shall be manufactured and finished in a thoroughly workmanlike manner.

4. SERVICE ENVIRONMENT

The transit case with camera installed shall be designed so that no fixed par or assembly will become loose, and no movable part or assembly will becon undesirably free or sluggish in operation when subjected to the service envir ments listed below. The transit case shall also protect the camera from an damage under these service environments.

4.1 Temperature - The transit case with camera shall be capable of safe storag and transportation under the following conditions:

a. Lower Limit - minus 65°F for periods of at least 8 hours duration.

b. Upper Limit - plus 125°F plus the full impact of solar radiation of 360 BTU/sq.ft./hr., for periods of 4 hours per day, or 160°F with no solar radiation for periods of 4 hours per day, which ever is greater.

4.2 Atmospheric Pressure - Transit case shall be designed to withstand atmospheric pressure ranging between 3.44 inches of mercury and 30.5 inches of mercury.

4.3 Fungus - The transit case shall be capable of withstanding Fungus Resistance Tests in accordance with MIL-E-005272B.

4.4 Humidity - Transit case shall be designed to withstand relative humidities up to 100 per cent, including condensation due to temperature change. Test in accordance with MIL-E-005272B except that 5 cycles shall be run instead of 10 cycles.

4.5 Watertight - The transit case shall be made watertight in accordance with MIL-STD-108C Table II.

4.6 Other Atmospheric Elements - The transit case shall be designed to withstand and to protect the camera from any of the probable combinations of the following atmospheric elements: rain, snow, sleet, hail, i.e., fog, smoke, wind, ozone, sand and dust, sunshine, salt and corrosive atmosphere

4.7 Shock - The transit case with camera shall be capable of withstanding a shock of 40g with a 2 millisecond rise and 6 millisecond dwell, at least once along each of three mutually perpendicular axis. The decay time shall be such that the area under the decay portion of the acceleration time curve is less than 50% of the total area.

4.8 Drops - The transit case with camera shall be capable of withstanding drops to a flat concrete surface in both directions along each of the three major mutually perpendicular axis. Height of drop shall be 18 inches.

4.9 Vibration - The transit case and camera shall withstand vibration tests conducted under both resonant and cycling conditions as follows:

4.9.1 Resonance - Resonant frequencies shall be determined by varying the frequency of applied vibration slowly through the 5 to 500 cps frequency at double amplitudes or acceleration not exceeding those given below:

Frequency	Double Amplitude or Vibration Acceleration
5 cps to 27.5 cps	± 1.3g
27.5 cps to 52 cps	0.036 inch
52 xps to 500 cps	± 5g

This procedure shall be followed successively for vibration applied along each of three mutually perpendicular axis of the case. The case shall be vibrated for thirty minutes at each resonant node encountered. When resonant frequencies within the specified frequency range are not apparent, the specimen shall be vibrated for one hour along each axis under the cycling conditions given below:

4.9.2 Cycling - The test frequency shall vary linearly from 10 cps to 500 cps an return to 10 cps in a 15 minute interval. Between 10 cps and 52 cps, the double amplitude applied shall be 0.036 inch and from 52 cps to 500 cps th vibratory acceleration shall be ± 5g.

APPENDIX M

SPECIFICATION

SME-DY-2A

TRANSIT CASE FOR
FILM TAKE-UP CASSETTE OF
THE HIGH-ACUITY PANORAMIC CAMERA

31 October 1958

SECRET

1. SCOPE

1.1 This specification covers the design and manufacture of a transit case for the Film Take-up Cassette of the High Acuity Panoramic Camera, FCIC Part No. 956E2.

2. APPLICABLE DOCUMENTS

2.1 The following specifications and drawings in effect on the date of this specification, form a part of this specification to the extent specified herein.

A. Specifications

SME-EB-5A -Environmental Test Specification dated 31 October 1
MIL-E-005272B -Environmental Testing.
MIL-F-14072(Sig C)-Finishes for Ground Signal Equipment.

B. Drawings

FCIC Drawing No. 956L21

3. DESIGN REQUIREMENTS

3.1 Physical Description

3.1.1 General - The transit case shall be constructed from Balsa panels with 0.016 aluminum faces and the necessary aluminum extrusions. Suitable gasket material shall be installed between the case and its cover. Case shall be equipp with an Atwood - Morrill Duplex Automatic Relief Valve Model No. 5462 or equivalent.

3.1.2 Details

3.1.2.1 Cover- The cover of this case shall not be hinged and shall be completely removable. The cover shall be fastened to the case on all four (4) sides by recessed spring loaded clamps of a type which will enable the case to meet the test requirements herein specified. Provisions shall be made for locking the cover in its closed position by means of key operated locks.

3.1.2.2 Handles - The transit case shall be equipped with two (2) spring loaded reces handles.

3.1.2.3 Interior of Case - The interior of the case shall be fitted with a molded polyurethane insert of proper density to protect the cassette against the test requirements herein specified. The cavity in this molded insert shall have a smooth surface so as not to mar or in any way deface the cassette surfaces and in addition shall fit the unit snugly when installed. Fairchild Drawing No. 956L21 gives the outline dimensions of the cassette which shall be transported and stowed in this case. Provision shall be made inside the case for sufficient space around the open sides of the cassette for a dessicant packaged in bags of a type approved by FCIC.

3.1.2.4 Dimensions - The approximate inside dimensions of the case shall be 32" x 32" x 11". The thickness of the molded hair inserts between the walls of the transit case and the parts of the cassette which are supported by the inserts shall not be less than 3.0 inches.

3.1.2.5 Weight - The weight of the transit case shall not exceed 25 pounds. The case shall be designed to hold a cassette which does not exceed 20 pounds in weight

3.1.2.6 Materials - Materials which are flammable, toxic, fungus nutrient, corrosive etc., shall not be used without suitable protective treatment.

3.1.2.7 Finishes - Material used in the transit case shall be finished in accordance w finish Specification MIL-F-14072(Sig C).

3.1.2.8 Color - The exterior of the case shall be painted light blue color No. 501 Federal STD No. 595 Color No. 15102.

3.1.2.9 Marking and Identification - The top of the transit case shall have stenciled th warning "Fragile-Delicate Equipment," and "This Side Up." The stenciling shall be in orange-yellow, color No. 506 Federal STD No. 595 Color No. 135

3.1.2.10 Workmanship - The transit case shall be manufactured and finished in a thoroughly workmanlike manner.

3.1.2.11 Humidity Indicator - A humidity indicator shall be installed approximately in the center of the one side panel of the case. It shall be vented to the interior the case where the cassette is located. The indicator shall be a type similar to the Culligan Co. type No. 6942 and meet Specification No. MIL-I-26860.

3.1.2.12 Stacking - The corners of the cover and case shall use the proper hardware t permit stacking cases one on top of the other.

4. SERVICE ENVIRONMENT

The transit case with cassette installed shall be designed so that no fixed part or assembly will become loose, and no movable part or assembly will become undesirably free or sluggish in operation when subjected to the service environments listed below. The transit case shall also protect the cassette from any damage under these service environments.

4.1 Temperature - The transit case with cassette shall be capable of safe storag and transportation under the following conditions:

a. Lower Limit - minus 65°F for periods of at least 8 hours duration.

b. Upper Limit - plus 125°F plus the full impact of solar radiation of 360 BTU/sq.ft./hr., for periods of 4 hours per day, or 160°F with no solar radiation for periods of 4 hours per day, which ever is greater.

4.2 Atmospheric Pressure - Transit case shall be designed to withstand atmospheric pressure ranging between 3.44 inches of mercury and 30.5 inches of mercury.

4.3 Fungus - The transit case shall be capable of withstanding Fungus Resistanc Tests in accordance with MIL-E-005272B.

4.4 Humidity - Transit case shall be designed to withstand relative humidities u to 100 per cent, including condensation due to temperature change. Test in accordance with MIL-E-005272B except that 5 cycles shall be run instead of 10 cycles.

4.5 Watertight - The transit case shall be made watertight in accordance with MIL-STD-108C Table II.

4.6 Other Atmospheric Elements - The transit case shall be designed to withstand and to protect the cassette from any of the probable combinations of the following atmospheric elements: rain, snow, sleet, hail, i.e., fog, smoke, wind, ozone, sand and dust, sunshine, salt and corrosive atmosphe

4.7 Shock - The transit case with cassette shall be capable of withstanding a sho of 40g with a 2 millisecond rise and a 6 millisecond dwell, at least one shock each of three mutually perpendicular axis. The decay time shall be such tha the area under the decay portion of the acceleration time curve is less than 50% of the total area.

4.8 Drops - The transit case with cassette shall be capable of withstanding drop to a flat concrete surface in both directions along each of the three major mutually perpendicular axis. Height of drop shall be 18 inches.

4.9 Vibration - The transit case and cassette shall withstand vibration tests conducted under both resonant and cycling conditions as follows:

4.9.1 Resonance - Resonant frequencies shall be determined by varying the frequency of applied vibration slowly through the 5 to 500 cps frequency at double amplitudes or accelerations not exceeding those given below:

Frequency	Double Amplitude or Vibration Acceleration
5 cps to 27.5 cps	± 1.3g
27.5 cps to 52 cps	0.036 inch
52 cps to 500 cps	± 5g

This procedure shall be followed successively for vibration applied along each of three mutually perpendicular axis of the case. The case shall be vibrated for thirty minutes at each resonant mode encountered. When resonant frequencies within the specified frequency range are not apparent, the specimen shall be vibrated for one hour along each axis under the cycling conditions given below:

4.9.2 Cycling - The test frequency shall vary linearly from 10 cps to 500 cps and return to 10 cps in a 15 minute interval. Between 10 cps and 52 cps, the double amplitude applied shall be 0.036 inch and from 52 cps to 500 cps the vibratory acceleration shall be ± 5g.

APPENDIX N

SPECIFICATION

SME-DY-3A

SHIPPING CASE

FOR

TEST CONSOLE

PART NO. 956-T64

31 October 1958

ITEK Corporation
Boston and Waltham, Mass.

31 October 1958

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APPENDIX B

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1. SCOPE

1.1 This specification covers one type of Shipping Case used to store and protect the Test Console, Part No. 956-T60, during transportation.

2. APPLICABLE DOCUMENTS

2.1 Federal Standard 595 Colors

ANA Bulletin 166 Colors, List of Standard Aircraft, Glossy

3. DESIGN REQUIREMENTS

3.1 Construction: The shipping case shall be constructed of the most suitable material to provide the minimum size and weight consistent with insuring protection to the Test Console as set forth herein. Provisions shall be incorporated to handle the shipping case together with the Test Console packed within by both fork lift truck and by lifting rings (Eyebolts). The configuration shall be clam-shell construction, not hinged. The cover shall be secured on four (4) sides to meet the requirements stated herein. "Locking of cover shall be provided by four (4) key operated latches (Excelsior or equal), two (2) each to be located on the front and rear sides of the case; all latches to be painted per Paragraph 4. "Consideration shall be given to provide empty stacking capability by selection of suitable corner configurations on the top and bottom of the case.

3.2 Console Configuration: The Test Console consists of a Steel Frame with enclosed sides, top and bottom, containing various test instruments mounted on 19" rack panels. The Test Console weighs 750 lbs. complete. The overall dimensions of the Test Console including front panel protrusions are shown in Figure 1.

3.3 Test Console Protection: The shipping case shall protect the Test Console against all non-operating environments during storage or transportation as described herein.

3.3.1 Drop Test: The Test Console, housed within the shipping case, shall not be damaged when dropped on a flat concrete surface once in both directions in each of the three mutually perpendicular axes. Height of drop shall be 12 inches. Maximum shock imparted to the Test Console shall be 12g. Design of shipping case shall provide a minimum shock on the console as determined by best trade-off between size and cost. A design goal of 6g is desired.

3.3.2 Temperature: Insulation shall be provided, if necessary to limit the temperature in any part of the Test Console to 40°F when subjecte

to a storage temperature of -65°F for 8 hours and to 100°F when subjected to a storage temperature of 160°F for 4 hours.

3.3.3 Fungus: The Test Console shall be protected against fungus in environments encountered in the United States.

3.3.4 Humidity

3.3.4.1 The Test Console, while stored in the Transit Case, shall be protected against humidity of up to 100%. A 16 unit Lamtuck Bag, Protek-Sorb, 121 Silica Gel, Davidson Chemical Co., Code No. 36-10-3X-1951 or equivalent, meeting the requirements of Specification MIL-D-3464A, Class 2 shall be installed in a suitable place in the Transit Case.

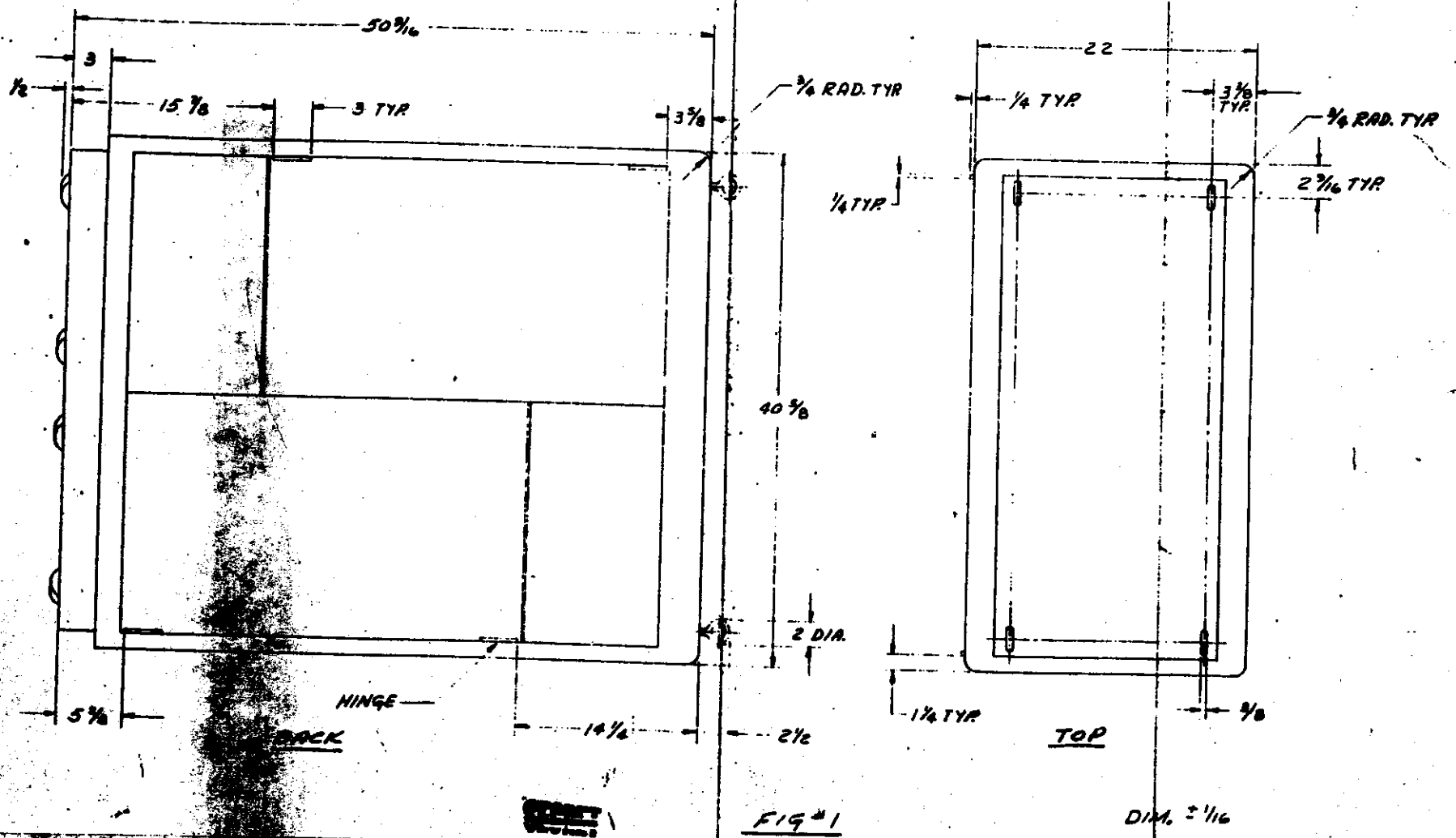
3.3.4.2 A humidity indicator shall be installed on one of the sides or the front of the Transit Case, and vented to the interior of the case. The humidity indicator shall be Type No. 6942, Culligan Co., or the equivalent thereof, meeting the requirements of Specification MIL-I-26860. Markings shall be provided containing instructions to interpret the humidity indicator.

4. FINISHES

All aluminum shall be protected by anodizing prior to painting. The shipping case shall be painted with Aircraft Gray Color No. 16473 of Federal Standard 595 or to USAF Color 512 of ANA Bulletin 166.

5. MARKING AND IDENTIFICATION

"The four (4) ends and top shall have two (2) inch high markings, 'FRAGILE - DELICATE EQUIPMENT' and 'THIS END UP'. The ends shall have arrows indicating the 'up' direction. The markings shall be in gloss black, color 1770 of Federal Standard 595".

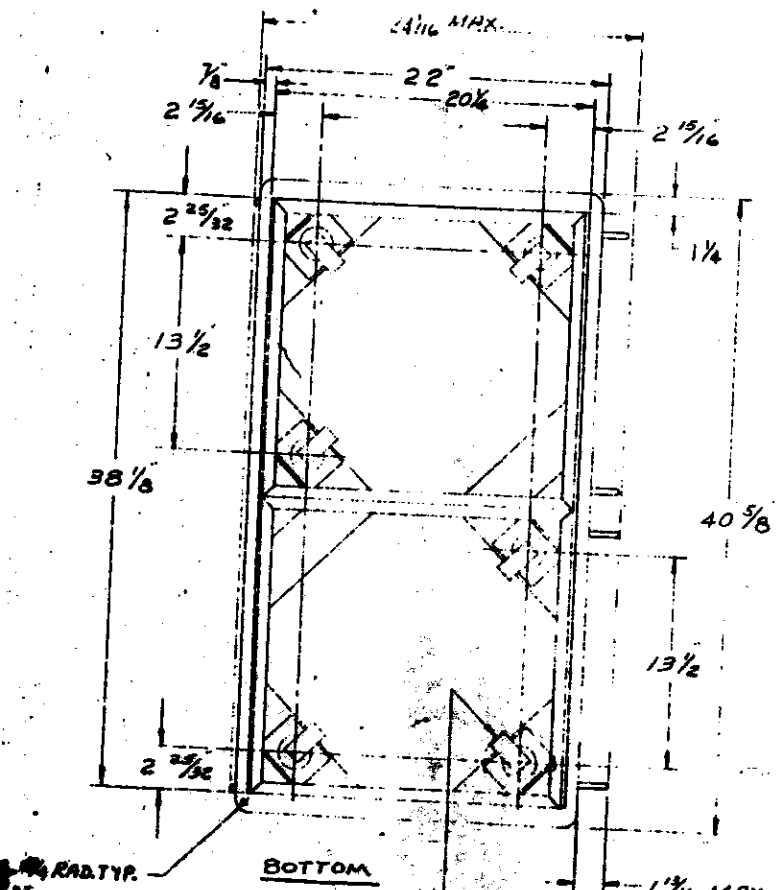


SECRET

FIG #1

DIM. ± 1/16

DEFENSE PRODUCTS DIVISION
Fairchild Camera and Instrument Corporation



SERIES "61 BASSICK CASTERS
SWIVEL RAD. 2 1/8.
2 1/2 DIA WHEEL

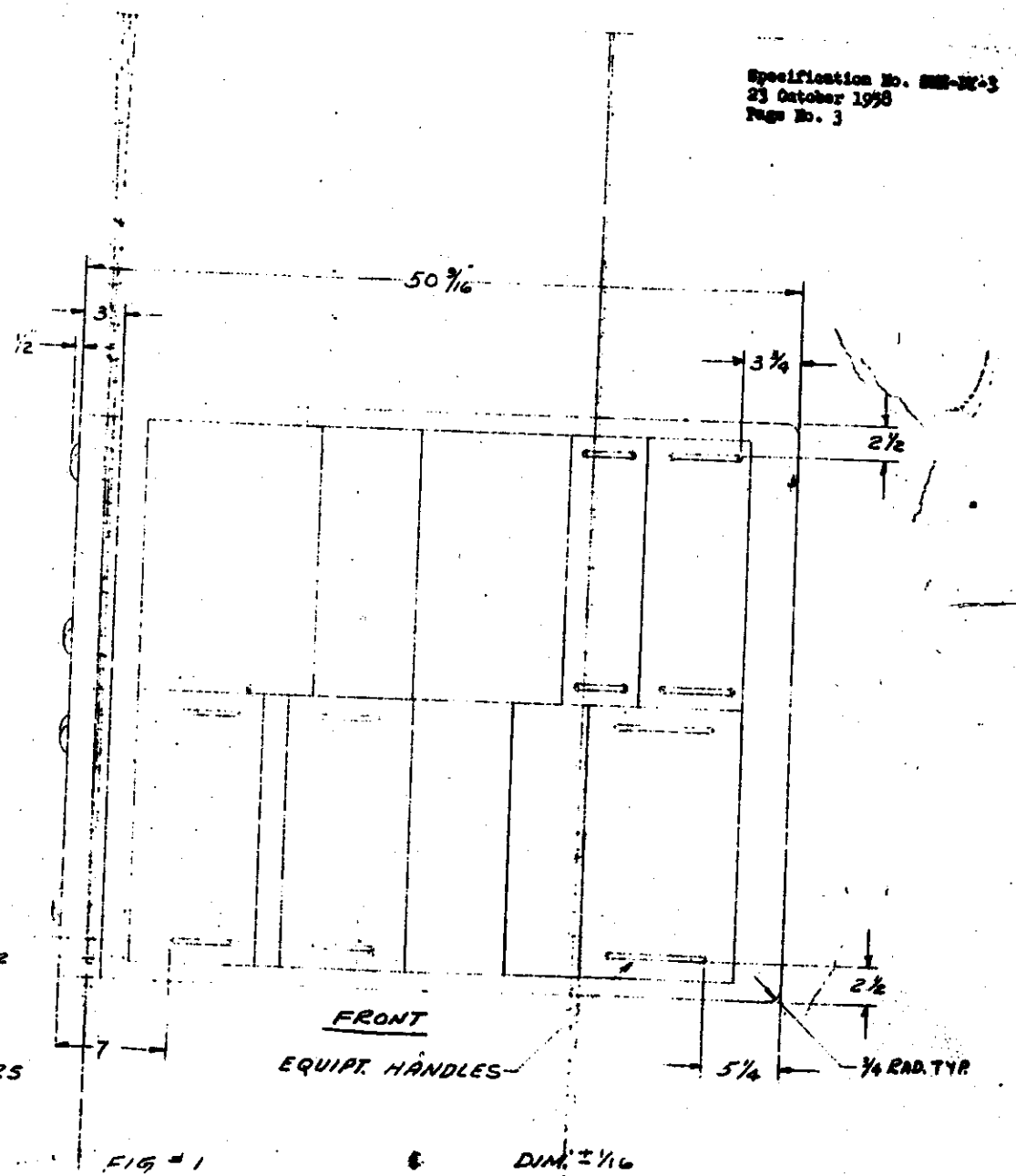


FIG = 1 DIM. ± 1/16

APPENDIX O

FIELD OPERATIONS

31 October 1958

FIELD OPERATIONS

Field Operations for the project are divided into two separate phases:

Phase I - to include approximately the period through November 1958

Phase II - from December through the end of the program

Phase I

This phase will include training and orientation at ITEK and FCIC. This training of Field Service Personnel will be supplemented by their participation in test programs conducted at both ITEK and FCIC. The training program will not be formal, but will completely familiarize these individuals with the mechanical, electrical, and optical functions, adjustments, tests and field repair procedures of the photo sub-system, as well as the special processing and evaluation to be followed.

Phase II

This phase will be performed at the prime's facilities and will be divided into two general categories: Indoctrination and Testing; and Operations.

a. Indoctrination

This phase will include complete indoctrination and familiarization of the prime's personnel in all the equipment supplied under this contract.

b. Testing

This phase will include testing of each camera and cassette at the prime's and his customer's facilities to:

(1) Demonstrate satisfactory operation and quality.

(2) Verify camera and cassette compatibility with other operation subsystems.

Film processing and analysis of results from these tests will also be required to evaluate system performance. The special test equipment including check-out console and simulator will be utilized. Repairs and component replacement, as required, will be accomplished.

Phase II Operational Period

This phase will include complete pre-flight check-out in accordance with established procedures including processing and evaluation of results and the preparation and installation of camera and cassette in the vehicle.

Personnel

a. Two field engineers each from ITEK and Fairchild will be supplied to perform the work called for under this task for a period of nine months. As a team, they will be under the direct supervision of the ITEK Team Supervisor who will report directly to the Prime's Field Operations Supervisor. This team will be available for work at all times as required but as a minimum, their normal work week will be 48 hours.

b. In direct support of the Field operation, services of specialists from both ITEK and FCIC will be supplied, as required through 31 October 1969.

c. Evaluation of results at the Processing Center will be accomplished in order that rapid and proper feedback to the design team and field service team takes place to insure continual improvement in the performance of the system.

APPENDIX P

HYAC II TEST PROGRAM

31 October 1958

HYAC II TEST PROGRAM

FOREWORD

This task shall include effort utilizing the special test equipment provided by the customer for complete performance environmental testing of the camera to prove the performance of the unit under laboratory-simulated flight conditions. This includes the Environmental Test Facility (ETF) operations, the design and fabrication of jigs, fixtures, and provision for instrumentation during testing. It includes the effort required for component and subassembly testing as well as complete camera subsystem environmental qualification tests and camera subsystem reliability and life tests. This effort is described in the HYAC II camera test program in both extent and scope.

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APPENDIX P

HYAC II

CAMERA TEST PROGRAM

1.0 INTRODUCTION

Because of the nature of the program, the tight time scale between conception and first article, and the additional development complication of the unusual reliability required of the camera subsystem, a thorough ground test program will be instituted. The philosophy of the program will be to achieve the highest possible degree of reliability and thus assure a maximum probability of success of the photo mission. The program will include both performance and environmental testing and combinations of both where possible. The culmination of the ground test program will result in articles for the flight program which should operate with a high degree of success.

It is expected that as a result of this Test Program, recommended engineering changes will be instituted rapidly. This will insure that operational dates will be met.

1.1 Scope: This report provides a compilation of the significant aspects of this program and defines the procedures to be followed during various phases. It covers the test plan by contractor areas, test procedures, facilities, support equipment, methods of data recording, analysis, and other requisite factors. It also covers performance and environmental tests both for components and the total photographic subsystem including the efforts of the ITEK Corporation and its subcontractor Fairchild Camera and Instrument Corporation.

1.2 Purpose: To set forth the formal ground and flight test program which will functionally qualify the photographic subsystem and its components and to ascertain operational readiness.

2.0 TYPE TESTS

The type test will be applied to a non-deliverable camera and cassette. This test is primarily intended to prove the design. Two camera and cassette units will be retained by ITEK and Fairchild for the type test program. The tests will be devised to determine as accurately as feasible within contractual limitations that the camera and cassette are capable of meeting the performance set forth in the Performance Specification. Articles submitted to type test will not be used in operational flights. However, in the event of an emergency if reworked to operational level and subjected to careful inspection and acceptance tests, these articles subjected to type test may be approved for flights.

Use of the camera test and check-out console will indicate the proper mechanical and electrical functioning of the unit. Use of the simulator will indicate the performance achieved by indicating the resolution in lines per millimeter of the camera with image motion.

3.0 ACCEPTANCE TESTS

Each delivered photographic subsystem (camera and cassette) will be acceptance tested at Fairchild using the Test and Check-out Console and Static Simulator per Acceptance Tests Specifications (ATS) and in accordance with Acceptance Tests Procedures. Delivery of the article will occur at completion of the acceptance tests at Fairchild with both ITEK and its prime signing off on delivery at that time.

Nearly all tests will be performed with the camera and cassette installed in the airframe and will in no case be subjected to temperature, humidity, vibration, and acceleration environments greater than those expected during the flight phase.

4.0 PERFORMANCE TESTS

During development, performance testing will be conducted both at ITEK and at its subcontractor Fairchild Camera and Instrument Corporation to determine performance of the photographic subsystem, its sub-assemblies components and parts if necessary. These tests are part of the type test program being conducted at ITEK and F.C.I.C.

4.1 Components: Parts, components and sub-assemblies will be evaluated for suitable application. This evaluation will include: quality-of-image testing of the lens system; testing of film to determine exposure levels and processing techniques if special; tests of motor drive assemblies for the required dynamic precision; manufacturing tolerances on critical elements such as the curved focal plane, the lens nodal point, and other parameters affecting the focal length; film transport and scanning operations; momentum balancing of rotating parts; cutting and sealing assemblies; telemetry transducers; wiring harnesses; sensitivity of electrical components to airborne power variations per specification from prime, etc.

4.2 Photographic Subsystem

4.2.1 Test and Check-out Console: The test and check-out console will be capable of making functional operating checks of the camera and cassette which will include the following:

1. The constancy of scan velocity.
2. The relative change of scan velocity due to V/H inputs.

3. The camera cycling rate.
4. Film transport rate indication.
5. Anti-back-up operation, film remaining indicator operation.
6. Data recording lamp functions.
7. Temperature transducers.

4.2.2 Simulator: The simulator will be capable of measuring overall photographic performance of the camera system by indicating the resolution obtainable und simulated operating conditions. In the static version, the simulator will be capable of checking the image motion compensation in the following manner: First, a static test can be conducted with the film transport system inoperative and performing the scanning operation of the lens by simply aligning the lens with the appropriate collimator. A static resolution target will be actua photographed. This will be performed at each of the three collimator points. Second, the camera will be started, i.e., film transported with image motio compensation in operation. The resolution targets will be moving to simulat ground motion. The roll axis of the camera will be precisely aligned with th velocity direction of the resolution target motion and a test will be run with the identical ground speed as the V/H command of the camera. As a third phase, the same test can be run with intentional incorrect IMC put into the camera. This test will be conducted at various simulated ground speeds wit various percentage errors commanded to the camera as a V/H signal. Four with various values of correct V/H corresponding to the simulator ground speed, the camera roll axis can be tilted to various angles with respect to th ground motion direction. This simulates steady state yaw attitude errors. A series of data points can be taken in this fashion. Fifth, a combination of th previous two conditions can be run simultaneously, i.e., both yaw attitude errors and incorrect IMC errors can be inserted simultaneously. The simulator is being designed in such a way that it will accept a camera and cassett unit either as components tied together in the simulator mounting by a speci rigid jig or installed in the appropriate airframe structure. Tests in this latter mode of operation should exhibit the appropriate vibration characteristics of the flight articles.

The dynamic simulator unit planned for use at ITEK incorporates all of the above features. In addition, however, the simulator at ITEK will be gim balled on at least two axes to permit relative motion between the camera an the collimated targets. This will simulate platform rotation. It is anticipat that the capability of introducing known command rates about two axes will b contained in the unit as well as the capability of merely suspending the came with the gimballed axes passing through its center of gravity permitting rota tion in response to torques which are generated within the camera during th film transport and scanning operation. To accomplish this latter phase, extremely low friction bearings are required.

5.0 ENVIRONMENTAL TESTS

Environmental tests will be conducted on the photographic subsystem, its sub-assemblies components, and parts where required to determine the capability of performing to the required degree when subjected to simulated

flight environmental conditions.

5.1 Components: Tests on the film to determine its mechanical and photographic qualities will be conducted under simulated altitude, temperature and humidity conditions. Both standard film tests (tension, bending, and compliance) and breadboard tests of mock-ups of film handling sequences as well as the actual camera sub-assemblies will be conducted. Tests to determine the affect of pressure marks from film under tension over rollers will be conducted. Image quality tests will be conducted under the appropriate environmental conditions including the effect of temperature and humidity on exposure time, gamma, fog level, etc. The lens assembly will be tested under simulated and ground level conditions. In particular, effect of temperature and pressure on focal length will be experimentally determined. The effect of shock and vibration on the lens cell assembly will be measured. The first phase will be conducted using pyrex blanks in a lens cell assembly and the second phase using glass of identical mechanical properties but not ground to optical quality. Environmental tests of critical camera-cassette components will be conducted at both ITEK and F.C.I.C.

5.2 Photographic Subsystem: Tests of the photographic subsystem under environmental conditions will be conducted wherever possible with the camera and cassette as an integral unit including the airframe or equivalent structural tie. ITEK and F.C.I.C. will qualify the camera design by testing one unit in accordance with the General Environmental Specification for acceleration and explosion proof testing, and will perform the altitude, temperature, humidity, vibration, and shock tests at ITEK, Waltham. One camera will be retained at ITEK for extensive performance and environmental testing. Further environmental testing on these units will be conducted at the ITEK environmental test facility (ETF).

6.0 LIFE

As an approach to achieving maximum reliability, life tests will be conducted on components and the photographic subsystem to determine critical links in the subsystem chain. Critical items will be tested to failure on a component level and the system under certain conditions will be tested to failure of a component. After repair and/or replacement, the unit will be continued in the test program.

7.0 TESTS AT PRIME'S FACILITY - (Part of ITEK/FCIC Field Operations)

The test procedures will follow in logical sequence. Following visual inspection, a detailed functional bench check of components will be performe

Component tests will be limited to those replaceable as units. All components below a readily replaceable level will be returned to ITEK and/or F.C.I.C. for rework. Spare parts for accomplishing this function will be available at ITEK and F.C.I.C. The test and check-out console will be used to perform a functional, mechanical, and electrical check of the camera and cassette as described elsewhere in this report. Resolution tests using the simulator will be performed after light leak tests have been completed on the camera within its light-tight enclosure. A means shall be provided for testing of the auxiliary optics. After test quantities have been run through the camera into the cassette, the magazine provided by ITEK will be used to remove the film from the cassette in a daylight condition to be returne to the processing room for developing and subsequent evaluation.

During transport of the photographic subsystem from one location to another during this part of the test program, all film will be removed from the camera to prevent damage from handling due to film loads on the structure.

In the final phase, a fresh roll of the desired emulsion (after such preconditioning as may be necessary) will be installed in the camera, threaded under daylight conditions (subdued) and if test quantities of film are to be used, the supply spool shall be overwrapped to the diameter of the spool. This will provide several hundred feet which can be cut from the operational film and separately processed. From this point on, the camera enclosure will be appropriately sealed for no further access. The only test being planned during preflight is an indication through telemetry transducers via hard wire links to check camera operation during a start-run-stop of the unit. This will complete the preflight of the camera and cassette. After the flight, a review of telemetry data will yield a quick-look report on camera operation coupled with a cursory review of the film after processing to indicate possible remedies and changes prior to the next flight. This is considered an absolute necessity for proper conduction of a flight test program.

8.0 SUMMARY

8.1 Limitations: The nature and schedule of this program allow minimum time for R & D support effort; therefore, maximum utilization will be made of all items and/or services developed or used on other programs which can properly support this reconnaissance program.

8.2 Ground and Flight Test Plan: The primary purpose of all ground tests is to provide a level of confidence in the ability of the flight article to perform its designated mission satisfactorily. This confidence can be achieved by carryi

out systematic tests of reliability and compatibility as well as demonstrating with complete tests the photographic subsystem's ability to operate as expected. Ground and flight testing will pin point areas which may fail during flight, thereby generating requisite modifications or redesign in these areas. These modifications will be incorporated in recommended engineering change orders. The photographic subsystem tests will verify proper operation before assembly with other subsystems for a complete system test.

8.3 Reliability: A systematic study and test program will be set up to achieve and insure the highest practical degree of reliability in the operational camera system. The work will be oriented to insure that the component, sub-assembly and subsystem levels performance requirements are met and that operation characteristics, reliability, and service life are consistent with the overall program requirements. The test program will integrate all components and sub-assemblies into a functioning system and demonstrate that the subsystem is capable of the performance required to satisfy flight test objectives.

8.4 Reports:

a. Sub-assembly Test Reports to be included in monthly progress reports.

b. Environmental Acceptance Test Report.

c. Reliability and Life Test Reports. Monthly in monthly program progre reports and Final Report.

APPENDIX Q

SPECIAL FACILITIES AND EQUIPMENT

31 Octbber 1958

SPECIAL FACILITIES AND EQUIPMENT

This appendix itemizes the special facilities and equipment required for the Proje Approval for purchase was obtained in mid-August 1958 after submitting a letter requesting same, subject: Special Equipment and Facility Requirements for HYAC II.

In addition, other requirements for equipment and facilities whose purchase was separately authorized is included. In this category is the altitude, temperature and humidity chamber whose purchase was authorized in June 1958 as well as the modification to the FCIC chamber and tower.

Accurate detailed actual costs for these items will be submitted through normal billing procedure.

REFERENCE: SPECIAL EQUIPMENT AND FACILITY REQUIREMENTS FOR PROJECT HYAC II

ENCLOSURE B - CAMERA SUBSYSTEM ENVIRONMENTAL TEST AND FACILITIES REQUIREMENTS

1. VIBRATION SYSTEM

Reference Appendix No. 1

A calidyne vibration system has been ordered including the following:

Sinusoidal Components

Qty. Reqd.		Prices (FOB Factory)	TOTA
1	Model 177A, Wide Band, 5000 lb. Force, Shaker	[redacted]	
1	Model 226 Power Amplifier (with Clamper and Switchgear and Duct Housing)		
1	Model 218 Rectifier Field Supply	[redacted]	
1	Model 220 Control Console, Section A		
1	Model 242 Sweep Oscillator (with Calibrated Potentiometer)	[redacted]	
1	Model A205 Degaussing Coil		
1	Model C98 Servo Control	[redacted]	
2	Model 54D Signal Monitor (including C 135 Crossover Control)		
1	Model D208 Frequency Cycler	[redacted]	

Low Frequency Components (1-5 cps)

1	Model D159 Power Supply	[redacted]
1	Model 202CR Oscillator	
1	Model A130 Power Amplifier	[redacted]
1	Console (Including Transfer Gear)	

Recording Components

1	3 X-Y Recorder	[redacted]
1	221 Recorder Control	
1	220 Console Section B	[redacted]

Other

1	7' x 7' x 4' Seismic Block including reinforcing stell and channels, and one set Isolation Mounts for Shaker	[redacted]
		Total [redacted]

SECRET

2. SHOCK SYSTEM

Reference Appendix No. 2

Qty Reqd.		Prices (FOB Factory)	TOTALS
1	Barry Model 15000 Shock Machine including the following:	[redacted]	[redacted]

Magnitudes and durations -

CASE	MAGNITUDE	RISE-TIME	DWELL
I	20	2	4
II	20	2	1
III	40	2	3
IV	30	3	1

Note - The decay time shall be such that the area under this decay portion of the acceleration - time curve is less than 10% of the total area.

V — 75g ± 15% — Time to peak - 5 1/2 milliseconds. Duration of each shock shall be 11 ± 1 millisecond.

VI — 30 g ± 15% — Time to peak - 5 1/2 milliseconds. Duration of each shock shall be 11 ± 1 millisecond.

The required accuracy is ± 10% on magnitude and duration

1	6' x 6' x 6' Seismic block	[redacted]	
1	Reinforcing and mounting structure in block including anvil	[redacted]	[redacted]
		Total	[redacted]

3. ALTITUDE, TEMPERATURE, HUMIDITY CHAMBER

Qty. Reqd.		Prices (FOB Factory)	TOTA
	Delivered, Installed and In use on 5 Sept.		
	FOB Cost	[redacted]	
	Estimated Frieght Cost		
	*Temporary Housing Cost Estimate		

* Note - This expenditure was necessary to provide temporary inclosure for operation of the chamber before and during construction of the environmental test facility. The larger building is being constructed over and around this structure.

4. MISCELLANEOUS EQUIPMENT
Not listed specifically in previous requirements

4	Chain Hoists	[redacted]	
1	Dark Room Sink	[redacted]	

5. FREIGHT COSTS

Reference Appendix 4

Freight and Handling Approved at Cost
Our estimates remain nearly the same, as follows:

Vibration System	[redacted]	
Shock Machine	[redacted]	
	Total	[redacted]

6. CONSTRUCTION AND INSTALLATION ESTIMATE

Qty. Reqd.		Prices (FOB Factory)	TOTALS

Reference Appendix No. 5

The original estimate was [redacted] Discussions between ITEK management and the prime resulted in the following agreement:

ITEK agreed to assume the cost of a general purpose building, and all other costs peculiar to its use for housing the HYAC II test equipment would be assumed by the sponsor. A rough cost estimate of approximately [redacted] would be assumed by each party. A tolerance of 20% was quoted on these estimates. Our current estimate for the total construction and installation cost is [redacted] This figure, although somewhat higher, considers the addition of several new factors.

Special security measures are planned as a result of customer discussions. These include: a guard room, a conference room and a dark room in the secure area, a secure storage area, special doors, a curtain near the shipping door, etc. As the firm bids are received, a more accurate and detailed figure will be furnished. The facility is scheduled for use on 1 December 1958.

[redacted]
Maximum

SUMMARY ITEMS 1-6 ESTIMATES

1. Vibration System [redacted]
2. Shock System [redacted]
3. Altitude, Temperature, Humidity Chamber (not costed in Enc. B Total) [redacted]
4. Miscellaneous Equipment [redacted]
5. Freight Costs [redacted]
6. Construction and Installation [redacted]

Appendix Q

SECRET

	Prices (FOB Factory)	TOTALS

7. ANALOGUE COMPUTER AND RECORDER

Reference Enc. C, Item 1

Mfg. Electronic Associates Computer [redacted] [redacted]
Mfg. *Sanborn Recorder
*The cost of the recorder was omitted in the original estimate.

8. FOLDING ENDURANCE TESTING MACHINE

Reference Enc. C, Item 2

Mfg. Tinius Olsen [redacted]

9. TENSILE STRENGTH TESTER

Reference Enc. C, Item 3

Mfg. Scott Tester, Inc. [redacted]

10. SMALL ENVIRONMENTAL CHAMBER (Temperature and Humidity only)

Reference Enc. C, Item 4

Mfg. International Radiant Corporation [redacted]
Note: The original chamber could not approach desired humidity conditions.

11. SMALL VACUUM CHAMBER

Reference Enc. C, Item 5

Mfg. International Radium Corporation [redacted]

12. INSTRUMENTATION FOR SIMULATOR

Reference Enc. C, Item 6

Mfg. Visicorder including accessories
Honeywell [redacted]

13. STATIC CHARGE VTVM

Reference Enc. C, Item 7

Equipment eliminated [redacted]

SECRET

14. MISCELLANEOUS INSTRUMENTATION FOR TESTS

Reference Enc. C, Item 8

This item was not approved as these costs should be assumed under normal project billing procedure. This will include such items as pressure gauges, accelerometers, etc.

15. ESTIMATED FREIGHT AND INSTALLATION RE ITEMS 7-13

This is allowable at cost.

Total [redacted]

Total, Items 1 - 6 [redacted]
Total, Items 7 - 15

TOTAL [redacted]

APPENDIX R

SUPPORTING STUDY TASKS

FOR

HYAC II

31 October 1958

Supporting Study Tasks, (HYAC II)

1.0 SCOPE

Engineering Services shall be provided to support the HYAC II Photo Reconnaissance program to provide information of value in the design, production and operational aspects of the program.

1.1 ITEK

This program will include the following:

1.1.1 Illumination, exposure and processing data for the various films to be used at altitudes, times of the year, exposures, etc.

1.1.2 An investigation of the problem of static discharge in a vacuum as it affects the photographic properties of the emulsion to be used.

1.1.3 Tests to determine the physical and sensitometric characteristics of thin base films in the environment.

1.1.4 Tests to determine the pressure sensitivity of various types of rollers on the film and other related effort with regard to the films to be used.

1.1.5 Studies, investigations and tests in the thermal area to define optimu thermal insulation and controls to achieve the ground resolution required by the Work Statement.

1.1.6 Engineering studies and investigations to insure maximum reliability of the system.

1.1.7 Engineering studies to determine weight and balance, moments of inertia, and products of inertia of the system.

1.1.8 Design and fabrication of mock-ups required to confirm the design approach or to provide an alternate approach for insuring a timely solution.

1.1.9 Investigation and tests to select suitable lubricants.

1.1.10 Tests to determine the optimum performance of the system with recommendations for improvement within the project time scale.

1.2 FCIC

1.2.1 Feasibility Study, Thermal Investigation

1.2.2 Film Creep Investigation

1.2.3 Thermal Insulation - Feasibility between Mech. Plates No. 1, 2, and 3.

APPENDIX S

REPORTS AND DRAWINGS

31 October 1958

1. Reports

The following reports will be delivered on the schedule and quantities shown:

a. Monthly Program Progress Reports (20 copies) by the 15th of each month.

The reports will cover:

(1) Accomplishment during the month

Problems solved during the month and general progress of the entire project will be summarized.

(2) Major Technical Problems

Technical problems which adversely affect performance and/or delivery, and action necessary to eliminate these problems. New problems will be included, as well as old problems not yet solved.

(3) Major Scheduling Problems

A list of any definite and/or probable changes in schedule will be included with causes and effects, and action required to revert to s chedule.

(4) Studies

A report of all studies, both research and engineering, will be included as required.

(5) Percentage Completion of Task

The percentage completion of task will include:

(a) Time span

(b) Man-hours

(c) Dollars

(d) Physical completion of equipment

b. Briefing Aids for Each Monthly Progress Meeting

Briefing aids summarizing the monthly progress report will be presented.

c. Test Reports

(1) Sub-assembly Test Reports

These reports will be included in monthly program progress reports.

(2) Environmental Acceptance Test Report, three of each, completed

(3) Reliability and Life Test Reports

These reports will be included in Monthly Program Progress Reports.

(4) Final Report, Environmental Testing of Camera (20 copies)

(Forty-five days after completion of this phase.)

d. Final Engineering Report (20 copies)

(Forty-five days after completion of program.)

e. Special Reports as Required

2. Drawings

a. Interim drawings covering the following categories (one each, as completed): major assemblies and sub-assemblies, layouts (functional), outlines and installation drawings (weight and C.G. data), schematics

including power requirements.

b. Final drawings, 1 set - forty-five days after completion of program.

SECRET

APPENDIX T

BREADBOARDS AND MOCK-UPS

31 October 1958

SECRET

BREAD BOARDS - MOCK-UPS

ITEK and FCIC will fabricate the following bread boards and mock-ups.

1.0 ITEK

1.1 Focal Surface Model - a model of HYAC type film holder for 70 mm thin base film having a 24-inch focal length and a 90° arc. A film advance capability of 6 feet per second is incorporated.

1.2 Film Transport Models - experimental film transports for 70 mm thin base film. To transport film through two 90° changes for film rates of two feet per second.

Twist Turn Model	1 each
"Z" Path Model	1 each
Elliptical Model	1 each

1.3 Lens Mock-Up - a model for weight, balance and space configuration.

1.4 Film Set Breadboard - a breadboard for checking film set in atltitude environment.

1.5 Lens Check Breadboard - a breadboard for checking altitude-temperature characteristics of HYAC II A Lens. Basic element determining lens film separation to be Titanium plate.

1.6 Tri-Filar Pendulum - a pendulum for checking kinetics of camera cassette element.

1.7 Film Spooling Breadboard - a breadboard for determining film path and spool alignment tolerances.

2.0 FCIC

2.1 Minimum Power Film Spool Drive breadboard.

2.2 Reaction and momentum-face breadboard.

2.3 Light Sealing Boot breadboard

2.4 Film Drive breadboard

2.5 Light Weight Focal Plane breadboard.

2.6 Cassette Sealing breadboard.

2.7 Lens Drive breadboard.

APPENDIX T