[redacted]

SECRET

14 000224740

F

J-20

25 February 1965

To: [redacted]

From: [redacted]

Subject: J-20 RETEST

Attached is the proposed AWA on the retest of J-20. Also included is the test history from the first TASC failure to date.

[redacted], Manager
Test, Dept. 60-64

After discussing this with [redacted] on 3-4-65 it was decided that we would not submit an AWA because both A/P and Boston were guilty of causing problems with this P/L.

[redacted]

SECRET

AWA ON J-20 RETEST

Reference: STI J-201 J20 Chamber Failure Study
J-2001-1 J20 Chamber Failure Study
J-2002 Verification of C&W and Light Leak Integrity

The following is the amount of m/h required to complete the work prescribed by the reference STI's.

1st TASC abort & recycle (STI J-2001)

			LAC	L	H
1-26	2L	24		48	-
	2H	12		-	24
	3H	12		-	36
1-27	2L	24		48	-
	2H	8		-	16
1-28	2L	8		16	-
	2H	8		-	16
SV Support			195		
Material LN_2 2 days				[redacted]	

Post 2nd TASC Investigation (STI J-2001-1)

2-8	2L	8		16	-
	2H	8		-	16
2-9	2L	8		16	-
	2H	8		-	16
2-10	2L	8		16	-
	2H	8		-	16
2-11	2L	8		16	-
	2H	8		-	16
2-12 thru 2-15 Contractual (Reso & Theo)				No additional charge	
2-16	2L	8		16	-
	2H	8		-	16
2-17	2L	8		16	-
	2H	8		-	16
2-18	2L	10		20	-
	2H	10		-	20

[redacted]

[redacted]

			LAC	L	H
Verification of C&W and L/L Integrity (STI J-2002)					
2-19	2L	8		16	-
	2H	8		-	16
2-20	2L	8		16	-
	2H	8		-	16
2-22	2L	8		16	-
	2H	8		-	16
2-23	2L	8		16	-
	2H	8		-	16
2-24	2L	8		16	-
	2H	8		-	16
Total to Date			195	308	288
Estimated to Complete					
(L/L) 2-25	2L	8		16	-
	2H	8		-	16
Pre-dry Payload 4 Days	1L			16	16
	1H				
(TASC) 2-26	2L	24		48	-
	2H	24		-	48
SV Support			260		
(TASC) 2-27	2L	24		48	-
	2H	24		-	48
(Dive & Dump) 2-28	2H	8		-	16
	2L	8		16	-
Total Estimated to Complete			260	134	134
Materials LN_2 2 days				[redacted]	
TOTAL AWA COST TEST			455	442	422
Q.C. COSTS				34	282

[redacted]

[redacted]

[redacted]

J-20 HISTORY

During the first TASC Test, Instrument #2 fail-safed on Rev. 4 and could not be reset. The system was returned to AP and trouble-shooting performed.

1. Checked P28 for damaged pins. None were found.

2. Verified takeup voltage was present at P28 for both instruments.

3. SRV-A was sent to the recovery checkout area for diagnostic testing. No indications of any problems were found. (Note: after TASC #2 the cassette was replaced via Boston repeat)

4. Retrieved payload from "B" bucket to observe any unusual marks. None were found.

5. Retrieved payload from Instrument #2. No indications of any problems were found.

The system was then reassembled and with a take-up voltage monitor installed. During reassembly misthreading of the payload was discovered in Instrument #2. Also found during confidence run was the fact that when take-up voltage was applied the supply cassette brake released. The breakout box on P28 was disconnected, inspected, and reconnected. No bent pins were found. It is believed that the breakout box connector was clocked incorrectly although inspection of the connector did not show physical evidence of this. Upon reinstallation of the box the supply cassette problem disappeared.

An additional test was conducted on the operate relay to determine whether it would malfunction, but the relay closed normally.

The system was returned to TASC and test started. On Rev. 1 the heat flux simulator on the aft section of the chamber blew a fuse. On Rev. 9, instrument #2 fail-safed, but this time was reset and test continued. On Rev. 9, instrument #2 fail-safed and again reset worked. A short confidence run was performed and cut and wrap performed.

On the last orbit Instrument #2 fail-safed again but this time all of the payload had been expended. Upon removal from the chamber, it was noticed that the "R" barrel had pitting in the area of the #2 DFC index door. 250 volts was applied to the heat flux simulators in the chamber, but no evidence of arcing at ambient conditions was found. Later investigation proved that the tape used on the alphatron cables had come loose and fallen down on the heat flux simulator and caused the arcing. Conductive tape was used on the cable.

Upon retrieval from the "B" SRV it was discovered that the #1 instrument had a bad cut and wrap. The payload was badly wrinkled and torn. At this time STI's (attached) were issued to investigate the various problems.

[redacted]

[redacted]

As a result of the tests conducted in compliance with the STI's, Boston made the following corrections:

1. Increased the distance between 101 shuttle switches and fail-safe switches, since the spacing was tooclose.

2. Reset the supply cassette torque to 13 ounces (spec) from 9 ounces (out of spec).

3. System was installed on block, resolution run and rejected. Boston discovered they had installed the negator assemblies incorrectly. This was corrected, resolution rerun and found acceptable.

4. Replaced lens rotation TM switch since anomolies were noted in the TASC data.

5. Replaced "A" takeup cassette T35 with T13 per the attached CARD 1899. (This ties back to the TASC #1 failure when the "A" SRV was suspected by AP but no out of spec conditions could be found. At that time Boston expressed complete confidence in the cassette.)

6. Installed a 99/100 clutch TM monitor per data reductions request and mislabeled the leads. AP engineers did not check and when voltage was applied this caused a short. As a result, Boston replaced the relay package that was effected.

AP in parallel conducted the following tests:

1. Ran ditmico on all cables. No problems were found.

2. Returned junction boxes to Components Test for retest. No deficiencies.

After all of the above was accomplished the system was reassembled with the "P" barrel installed. Tracking and cut/wrap tests were conducted and no problems were noted. The "P" barrel was removed and two out of three cut/wrap tests failed. Later Tests with the felt door open and closed proved that the felt door was not contributing.

At this time (Feb. 25) the tests were stopped and measurements on the "A" SRV, "B" SRV and IR roller assembly were taken. It was discovered that the cassettes were not referenced to the latest agreements between Boston and AP. This is being corrected, should solve the problem, and the system will be returned to TASC next week.

[redacted]

Manager

[redacted]

[redacted]

16 February, 1965

TO: [redacted] DEPT.: 60/64

FROM: [redacted] DEPT.: 60/61

SUBJECT: J-20 RETESTING

Much effort has been taken in past days to determine the cause/causes for the repeated System failures in the Chamber. Many contributing factors have been uncovered and corrective actions have been incorporated. Though the investigation operation is continuing, it is necessary to establish a policy of retesting for scheduling and planning.

Since all the failures occurred in the chamber while none was noted during other phases of ground testing, upon completion of current activities a repeat chamber test shall be required to confirm that corrective actions taken on the system components can indeed satisfy operational parameters under Thermal-Altitude environments. A one-day sixteen-orbit chamber test with 2500 cycles programmed into the SRV-"A" and 500 cycles programmed into the SRV-"B" is recommended to accomplish this purpose.

The above requirements may be altered as our investigation progresses further; new policy and requirements shall keep pace with the developments as needed.

[redacted]

cc: [redacted]

[redacted]

18 February, 1965

TEST PLAN
for
J-20 CHAMBER RETESTING

1. SCOPE

This Test Plan shall define the testing effort required of the flight system to verify that corrective actions have rendered it capable of meeting the operational requirements under simulated thermal-altitude environment.

2. SYSTEM CONFIGURATION

The system shall be in full flight configuration with the following exceptions:

a) Expolsive squibs NOT required.

b) Parachutes NOT required.

c) Retro-Rockets NOT required.

d) Thermal paint pattern NOT required.

e) Recovery batteries NOT required.

f) Hardwiring of Commutator NOT required.

g) DFD NOT required.

h) Back-up cutters NOT required

3. PAYLOAD DRYING

Test payload shall be predried. A minimum of 3000 cycles of payload per supply spool shall be required.

4. CHAMBER PROGRAMMING

I. THERMAL INPUT - 70° Soak throughout the test period.

II. OPERATIONAL SEQUENCING

a) 24-hour soak after pump-down.

b) Operate the system in STEREO mode at V/H step R2-All (2.4 second per cycle) with 50-cycle bursts at 15 minute intervals until the SRV "A" has accumulated 2500 cycles.

c) Perform Cut and Wrap operation.

DRAFT

TEST PLAN for J-20 CHAMBER RETESTING (continued)

d) Repeat step "b)", above, until 500 cycles have accumulated in in the SRV "B".

e) Home the Instruments. (The "B" dump sequence is not necessary.)

f) Dive the Chamber.

5. INSTRUMENTATION

Normal dynamic T/M's and the following monitor outputs shall be recorded continuously:

a) Clutch rotation (both instruments).

b) T/U voltage.

c) Internal pressure.

6. DEMPLE MOTOR INSTALLATION

a) SRV "A" - main Water Seal.

b) P/L Door.

7. FOGGING DEVICE INSTALLATION

a) All H/O's.

8. PRESSURE MAKE-UP SYSTEM

Pressurized to 1000 PSIG and operative on all operations.

9. OPERATIONAL RESPONSIBILITY

a) Payload Test Department shall make all necessary preparations and conduct the Chamber Test as outlined in this Test Plan.

b) Data Reduction Department shall analyse all T/M data and submit a summary to the Payload Integration Department for evaluation. Data relating to the clutch operation shall be tabulated and submitted with the report.

c) Performance and Evaluation shall analyze all processed payload and submit summary and recommendations to Payload Integration for evaluation.

d) Payload Integration shall monitor and evaluate the operation to assure proper execution of the plan and achievement of basic objective.

cc: [redacted]

[redacted]

INTERDEPARTMENTAL COMMUNICATION

TO: [redacted] DEPT.: 60/64 DATE: Feb. 6, 1965

FROM: [redacted] DEPT.: 60/61

SUBJECT: SUPPLEMENTAL TECHNICAL INSTRUCTION

S.T.I. NUMBER: J-2001-1
(Supplement Number 1 to S.T.I. J-2001)

TEST PROCEDURES EFFECTED: (None)

TITLE: J-20 Chamber Failure Study

The J-20 System shall conduct testing to isolate the cause of malfunction during the Chamber Test Periods in the following order of Phase sequencing:

A. PHASE I MECHANICAL INSPECTION

Inspect for proper operation of

1. Shuttle movements.
2. Micro-switches on Fail-Safe circuits.
3. Micro-switches on 99% - 101% Clutch.
4. Clutch Slippage.

B. PHASE II POWERED OPERATIONS

Mount Test Cassette on "R" barrel and conduct powered operation to check, monitor, and observe the following

1. Clutch switching indications
   a. T/M levels
   b. Coil response
      i. Repeatibility
      ii. Voltage Limits

cc: [redacted]

[redacted]

c. Metering responses (S-110)

i. Repeatibility

d. Elapsed time relationship

2. Erratic shuttle pulsation

3. Clutch ratios. - The system shall be operated in Stereo Mode in 50 cycle bursts, with V/H rate set at 3.0 sec./cycle. Maximum cycles to be run shall be 1000 cycles.

4. Supply Cassette tension and brake response.

C. PHASE III COMPONENT INSPECTION

Should Phase I and II fail to turn up the cause for operational malfunction the following detail operations shall be conducted;

1. SRV - Detailed check and inspection of the take-up circuit on Cassette "A".

2. Instrument - Check the contact resistance on Operate Relay No. 2 for repeatibility, (25 times). Check the minimum pull-in voltage on Operate Relay No. 2, (25 times). Check for electrical wiring defects from Operate Relay No. 2 to the J-101 interface.

3. Junction Boxes - Check Barrel No. 2 "J" Box and Transfer Box for wiring and connection defects.

4. Electrical Cables. "DIT-M-CO" cables associated with take-up circuit from the instrument to P-28-A.

D. PHASE IV RETESTING

If the cause of malfunction is located and corrective action has been taken, the system shall be mated and 500 cycles in Stereo Mode programmed to confirm consistency of operation. The level of retesting subsequent to 500 cycle operation shall be determined depending on the cause and component or components involved.
In the event that the cause/causes cannot be determined and isolated, supplemental instruction shall be issued at a later date.

[redacted]

[redacted]

INTERDEPARTMENTAL COMMUNICATION

FROM: [redacted] DEPT.: 60/61 DATE: 22 Feb. 1965

TO: [redacted] DEPT.: 60/64

SUBJECT: SUPPLEMENTAL TECHNICAL INSTRUCTION

S.T.I. NUMBER: J-2002

TITLE: VERIFICATION OF CUT & WRAP AND LIGHT LEAK INTEGRITY

I. A special C/W Test shall be conducted on J-20 prior to Chamber retesting in the following order;

(1) Visually inspect the film path from SRV "A" to SRV "B" for potential mechanical obstruction or sharp edges that may cause physical damage to the passing payload.

(2) Perform FIVE successful Cut & Wrap operations on the System with the "P" Barrel installed between the "R" Barrel and the No.1 Barrel.

(3) Perform TWO successful Cut & Wrap operations on the System without any GSE structure attached to the System.

II. A special test shall be conducted on the System to locate and repair the light leak evidenced on the previous Chamber Test run. Live film verification of light tightness is necessary prior to Chamber Retesting.

[redacted]

cc: [redacted]

[redacted]

[redacted]

[redacted]

INTERDEPARTMENTAL COMMUNICATION

TO: [redacted] DEPT.: 60/64 DATE: 23 Feb., 1965

FROM: [redacted] DEPT.: 60/61

SUBJECT: SUPPLEMENTAL TECHNICAL INSTRUCTION

S.T.I. NUMBER: J-2003

TITLE: REASSIGNMENT OF "A" TAKE-UP CASSETTE (J-20)

TEST PROCEDURE EFFECTED: (NONE)

Take-up Cassette number T-35, currently assigned to J-20, shall be replaced by Take-up Cassette number T-13.

Recovery Check-out shall perform acceptance tests, calibration, and alignment operations on the new Cassette to assure compatibility with the payload system. (Ref. J-1303, J-1307 and J-1308)

Payload Testing shall perform the Tracking, Cut & Wrap and dynamic operation to verify the achievement and maintenance of system compatibility with the new cassette. (Ref. J-0702)

The above tests and operations shall be completed prior to the third Chamber Test scheduled.

[redacted]

cc: [redacted]

[redacted]

DATE 22 February 1965 CARD NO. (Same as FEDR No.) [redacted]

CORRECTIVE ACTION REPAIR AND DIAGNOSIS

UNIT NAME Instrument PART NO. 42650 DWG. NO. _____ SER. NO. 137

MANUFACTURER Boston SYSTEM SERIAL NO. J-20

CARD COMPLETED BY [redacted] SECTION Boston TELEPHONE EXT. [redacted]

WAS REPORTED CONDITION (a) Verified: (X) Yes ( ) No

(b) Found to be different: ( ) Yes ( ) No, description below:

Description of the apparent failure based on engineering analysis: (IDENTIFY THE FAILURE MODE(s)

K104 contacts #1 & #7 were welded together due to excessive current breaking. Reference FEDR 1559 for cause.

A condition existed which was not specified on FEDR 1559. "Reset" was given without investigating the fail safe condition. Because of Reset and a power-up condition, Relays K104, K103, K101 & K106 were subjected to making and breaking a short to return on the unregulated D.C. line.

CORRECTIVE ACTION REQUIRED:

(a) Spec change	( )	Repair as Indicated -	( )
Drawing change	( )	1 Type of Failure -	( )
Procedure change	( )	2 Type of Failure -	( )
Evaluation effort	( )	New requirement on Q.A.	( )
Design Change	( )	Random failure—no corrective action required	( )
Supplementary CARD Required	( )	Procurement Action	( )
		Other	(X)
		Production Control Action	( )
		Handling Improvement	( )

(b) Description of corrective action

1. Remove [redacted] relay control package S/N S127 and replace with Relay Control S/N 175.
2. Return Relay Control S/N S127 to Boston for disposition.
3. Rev. A CARD required for resulting disposition on S/N S127.
4. Investigate reason for fail safe action prior to initiating reset.

(c) [redacted]

(d) Are supplemental CARD sheets a part of this CARD: Yes ( ) No ( )

DISTRIBUTION: [redacted]

[redacted] S.I. 2/22/65

[redacted]

SECRET

DATE 22 February 1965 CARD NO. (Same as FEDR No.) [redacted]

CORRECTIVE ACTION REPAIR AND DIAGNOSIS

UNIT NAME Payload Assembly PART NO. _____ DWG. NO. _____ SER. NO. J-20

MANUFACTURER _____ SYSTEM SERIAL NO. J-20

CARD COMPLETED BY [redacted] SECTION Boston TELEPHONE EXT. [redacted]

WAS REPORTED CONDITION (a) Verified: (X) Yes ( ) No

(b) Found to be different: ( ) Yes ( ) No, description below:

Description of the apparent failure based on engineering analysis: (IDENTIFY THE FAILURE MODE(s)

During two Altitude Chamber tests, the instruments experienced several fail safe actions, all in the "A" mode. The first failure occurred when T/M indicated a loss of take up on #2. The subsequent incidents occurred following a change in the 99/101 cycle change frequency. (Typical - 6 cycles in 99%, 4 cycles in 101%, 7/5, 9/8, fail safe). After each occurrance, reset was accomplished & system completed the test. Evaluation resulted in the following: (1) Payload was pulsing due to S/C being set at 9 ozs. (2) Take-Up T-35 does randomly stop rotation during 7 sec. reduced torque mode. (Ref. T-35 problem history sheet).

CORRECTIVE ACTION REQUIRED:

(a) Spec change	( )	Repair as Indicated -	( )
Drawing change	( )	1 Type of Failure -	( )
Procedure change	( )	2 Type of Failure -	( )
Evaluation effort	( )	New requirement on Q.A.	( )
Design Change	( )	Random failure—no corrective action required	( )
Supplementary CARD Required	( )	Procurement Action	( )
		Other	(X)
		Production Control Action	( )
		Handling Improvement	( )

(b) Description of corrective action

1. Replace T-35 with T-13.
2. Return T-35 to Boston for evaluation and disposition.
3. Rev. "A" CARD required on T-35 disposition.
4. Reset S/C tension + 13 oz ± 1 @ 24 VDC. [redacted]

(c) Reference IDCs and Engineering reports Request Engineering Analysis Report

(d) Are supplemental CARD sheets a part of this CARD: Yes ( ) No ( )

DISTRIBUTION: [redacted]

Approved [redacted]

Statement (1) above - that pulsing was due to S/C setting is questionable. [redacted]

SECRET

T-35 FAILURE HISTORY

At East Coast:

1. 2/20/64. During 10 minute stall test, the unit draws excessive current. Transistors Q402 and Q404 have been improperly mounted. Under vacuum condition, this would not allow a proper heat sink. Replaced transistors Q402, Q403, Q404, and Q405.

2. 3/27/64. Halted testing because of erratic tension and excessive bearing noise from both hubs. Failure was caused by defective brush rings and intermediate gears. Replaced brush rings and intermediate gears.

3. 5/25/64. Spool speed under low limit when puck arm is resting on empty spool #1 master side. Replace bias pot R-426.

At A/P:

4. 11/17/64. Slave side has excessive noise during operation. Disassembled #2 side, checked all bearings, gear play and connections. Small amount of gear play and side play, but not excessive.

5. 12/29/64. Master side outboard flange has squawk because of rubbing; also, master side supposed to be pulsing. During check, no evidence of either.

6. 1/29/65. TASC failure in T/U; checked torque with payload, RPM also okay. Ran pot graph, no opens. Check for possible stoppage by stalling and pulsing voltage, okay. Checked torque at 4 quadrants and torque okay.

7. 2/13/65. Test for possible pulsing on slave side. A special fixture was set up to take up payload with a positive back tension. While in operation, T-35 operated smooth and steady with no evidence of pulsing.

8. 2/1/65. In ascent condition, it was possible to pull back payload without it taking up. This occurred at approximately 300' of payload from core .518 VDC TM (slave side).

[redacted]

SECRET

17 February 1965

mm1020

TO: [redacted]

FROM: [redacted]

SUBJECT: J-20 TASC TEST FILM EVALUATION

Examination of processed film from subject test has revealed the following anomolies:

A. A-Bucket, Master (136)

1. Scratches under data block inside format and near timing track.
2. Slur pulse approximately $3\frac{1}{2}$" long.
3. Minor startup Corona (3rd frame) on some operations.
4. Six frames prior to cut/wrap badly damaged.
5. Light leak fog, 5th frame, from end of pass on takeup side occurred several passes.
6. Several "Clock Interrogates" during metering.

B. [redacted]-Bucket, Slave (137)

1. Some scan head roller scratching.
2. Minor startup Corona.
3. Light leak indication $6\frac{1}{2}$ frames from end of pass on several passes.
4. Same "Clock Interrogate" during metering as on master.

C. B-Bucket, Master

1. Scan head roller scratches present on both sides.
2. Long slur pulse.
3. Minor startup Corona.
4. No time word on one frame.
5. Major film damage at cut/wrap.

[redacted]

SECRET

[redacted]

D. B-Bucket, Slave

1. Scan head roller scratches
2. Minor rail scratches.
3. Minor start-up Corona.

E. A-Bucket S/I

Index

1. - D specks, probably dirt on platen.
2. Some emulsion cracking and handling marks.
3. Multiple exposure 3rd frame from end.

Stellar

1. 3 fiducials excessively bloomed.
2. Minor edge static.
3. Correlation lamp (17) bloomed.
4. Unusual +D marking, one frame, 63 frames from start.

F. B-Bucket S/I

Index

1. - D specks.
2. +D spots at 1.98" pitch starting about frame 206, and ending near end of test.
3. Some edge static.
4. 1 frame no exposure.

Stellar

1. Some Corona between frames.
2. - D specks.
3. Minor edge static.
4. 3 fiducials marginal.
5. 1 frame no exposure.

 [redacted]

[redacted]

SECRET

GENERAL COMMENTS

The two principal problems arising during this TASC test were:

1. Faulty cut/wrap operation on the master.

2. Two fail-safe events during the A mode and one during the B mode.

The fail-safe item is under investigation after which this system is to go into the TASC chamber for further testing.

Payload removed from the master instrument B bucket takeup spool during retrieval of J-20 TASC film sustained serious physical damage during altitude testing.

Film damage was confined to approximately 8 feet of Inst. 136 film located at the core of the B bucket takeup spool. Inst. 136 film was torn in one place and contained multiple folds and creases at the core of the B bucket immediately following the cut and wrap sequence. The film tear was located seven feet from the end of the film cut by the water seal/knife located in the A bucket. The normal film path length from the A bucket water seal/knife to the core of the B bucket is seven feet. When the damaged film sample was threaded back into the film path using the A bucket water seal for reference, the tear in the film was positioned at the core of the B bucket. In addition, the torn film was folded back upon itself in a direction suggesting that the tear occurred at the core of the B bucket during the B bucket wrap portion of the cut and wrap sequence. The multiple creases and torn film indicate film was abnormally loose in the film path. The cause of the loose film in the master instrument may be related to tension problems observed by Systems Test in the slave instrument during altitude test when the fail-safe switch indicated the shuttle bottomed and shut power off to the instrument.

Subsequent to the TASC test examination of the J-20 system failed to reveal the true cause of the problem. It is recommended that the J-20 system be operated again in flight configuration to prove the flight certification of the cut and wrap and takeup cassette performance.

APPROVED [redacted]

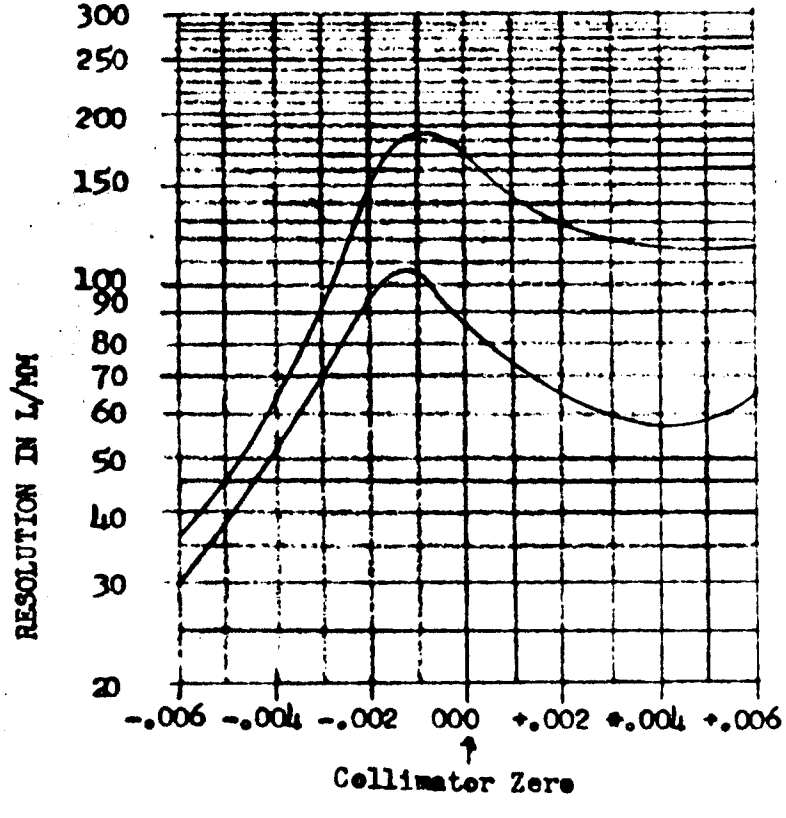
Manager
Operati[redacted]Analysis

[redacted]
Performance Evaluation

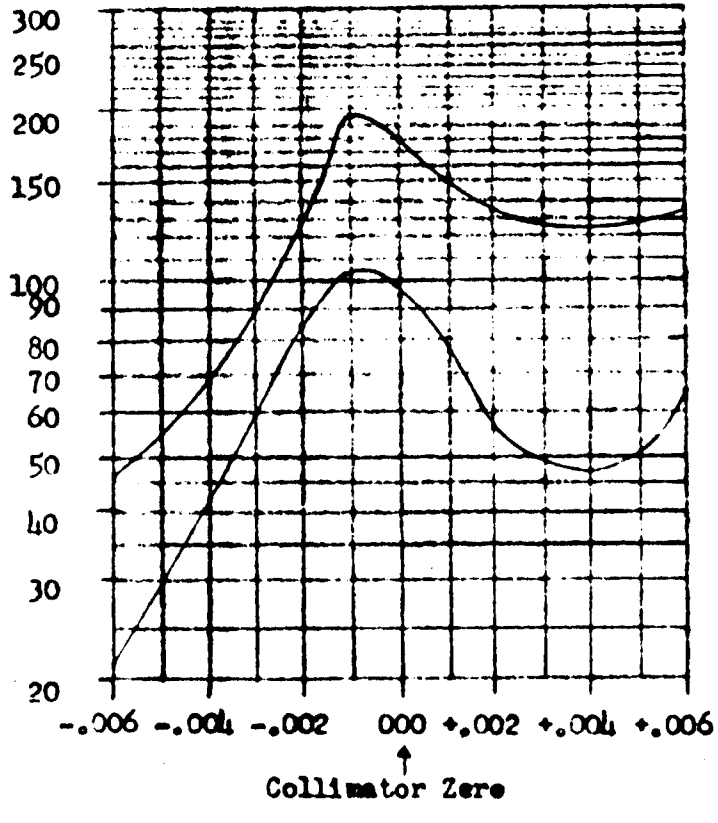
cc: [redacted]

DATE FEBRUARY 16, 1965 READER [redacted] TEST LOCATION A/P J-20

INSTRUMENT # 136



INSTRUMENT # 137



THRU-FOCUS INCREMENTS AT INSTRUMENT. ←——Toward Taking Lens

Max Hi con 189 L/mm

Max Lo con 107 L/mm

Max Hi con 194 L/mm

Max Lo con 102 L/mm

1

SECRET
SECURITY

J-20

INST.# 136
DATE 16 February 1965
READER [redacted]

ECP.#	-.006		-.004		-.002		-.001		.0000		+.001		+.002		+.004		+.006	
I.C	DMC	SCAN	DMC	SCAN	DMC	SCAN	DMC	SCAN	DMC	SCAN	DMC	SCAN	DMC	SCAN	DMC	SCAN	DMC	SCAN
1	28	28	56	56	90	90	90	90	90	90	72	72	72	72	50	50	64	64
2	28	28	64	50	112	90	100	100	90	90	72	72	64	64	56	50	72	72
3	25	25	56	50	100	90	112	112	90	90	72	72	72	72	64	56	64	64
4	28	28	50	45	90	90	128	100	80	80	72	72	72	64	72	64	64	64
5	28	28	56	50	100	90	100	100	80	90	72	72	72	64	56	56	72	72
6	32	28	56	56	90	90	128	112	100	80	72	72	72	64	50	72	64	56
7	36	28	50	50	90	90	112	112	80	80	72	72	72	72	56	56	64	64
8	36	28	50	50	100	100	112	112	90	90	80	80	64	56	64	56	72	64
9	36	28	50	45	100	100	100	100	90	90	72	72	72	64	56	56	64	64
10	32	28	56	50	100	100	112	112	90	80	72	72	64	64	56	56	64	64
Average	31	28	54	50	97	93	109	105	88	86	73	73	70	66	58	57	66	65
	30		52		95		107		87		73		68		58		66	

SECRET
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J-20

INST.# 1 8 6

DATE [redacted]

READER [redacted]

15° Hg Con[redacted]

EXP.#	-.006		-.004		-.002		-.001		.0000		+.001		+.002		+.004		+.006	
	IMC	SCAN	IMC	SCAN	IMC	SCAN	IMC	SCAN	IMC	SCAN	IMC	SCAN	IMC	SCAN	IMC	SCAN	IMC	SCAN
1	36	56	64	56	144	112	160	160	160	160	144	144	160	112	128	128	100	100
2	36	40	72	64	160	144	200	160	200	200	144	144	128	128	128	128	112	112
3	36	36	64	56	160	144	200	160	180	180	144	128	128	128	128	128	112	112
4	36	36	64	64	144	128	144	180	180	180	144	128	112	112	112	112	128	128
5	36	36	72	64	180	144	200	200	160	160	144	144	144	144	144	144	100	100
6	36	36	64	64	160	112	200	200	180	180	160	144	128	112	144	112	112	112
7	36	36	64	56	160	144	180	160	160	160	144	144	144	128	100	112	100	112
8	36	36	72	64	160	144	200	200	180	160	144	144	144	128	128	128	112	112
9	36	36	72	64	160	144	200	200	180	180	144	144	144	128	128	128	112	112
10	36	36	56	56	200	128	200	180	160	160	144	144	144	144	112	112	112	112
Average	36	38	66	61	163	134	182	180	174	172	146	141	132	126	125	123	110	111
	37		64		149		184		173		144		129		124		111	

SECRET

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J-20

INST.# 137

DATE [redacted]

READER [redacted]

EXP.#	-.006		-.004		-.002		-.001		.000		+.001		+.002		+.004		+.006	
	DMC	SCAN	DMC	SCAN	DMC	SCAN	DMC	SCAN	DMC	SCAN	DMC	SCAN	DMC	SCAN	DMC	SCAN	DMC	SCAN
1	22	22	45	45	90	90	112	112	112	[illegible]	72	72	56	50	45	45	72	72
2	22	22	45	45	90	90	100	100	90	10	72	72	64	56	50	50	72	72
3	22	22	45	45	72	72	100	100	90	10	90	90	56	56	50	50	72	72
4	25	22	50	45	90	90	100	100	90	90	72	72	56	56	50	50	64	64
5	25	20	45	45	80	80	100	100	112	100	72	72	50	50	50	50	72	64
6	25	22	45	45	90	90	100	100	100	10	72	72	64	56	45	45	72	72
7	22	22	45	45	90	90	100	100	100	100	72	72	64	56	45	45	64	64
8	22	22	45	45	90	90	112	112	90	90	80	80	64	56	45	45	72	64
9	22	22	36	36	80	80	100	100	90	90	80	80	56	50	45	45	72	72
10	22	22	45	40	72	72	100	100	90	90	40	72	56	50	45	45	64	64
Average	23	22	45	44	84	84	102	102	96	94	76	75	57	54	47	47	70	68
	23		45		84		102		95		76		57		47		69	

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J 20

INST.# 121

DATE [redacted]

READE [redacted]

EXP.#	-.006		-.004		-.002		-.001		.0000		+.001		+.002		+.004		+.006	
	IMC	SCAN	IMC	SCAN	IMC	SCAN	IMC	SCAN	IMC	SCAN	IMC	SCAN	IMC	SCAN	IMC	SCAN	IMC	SCAN
1	36	56	45	64	160	144	200	180	200	180	160	160	112	112	112	112	128	128
2	36	56	100	100	112	112	200	200	200	160	144	144	112	112	144	144	144	144
3	36	64	80	80	112	112	225	225	180	180	180	160	128	128	128	128	144	144
4	36	72	80	80	160	160	180	160	180	160	144	144	144	144	128	128	128	128
5	32	56	72	72	112	10	180	190	180	190	144	144	144	144	112	112	128	128
6	36	56	56	72	144	128	200	160	200	200	144	144	144	144	128	128	128	128
7	36	56	50	56	100	100	200	180	160	160	144	144	144	144	128	128	144	144
8	36	64	50	56	160	144	200	200	200	200	160	160	144	144	112	112	144	144
9	22	50	50	72	144	112	225	200	160	160	160	144	144	144	112	112	144	144
10	36	50	50	64	144	112	200	180	200	160	160	144	128	128	144	144	128	112
Average	34	58	63	72	135	121	201	187	186	174	152	149	134	134	125	125	136	134
	46		68		128		194		180		151		134		125		135	