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QUARTERLY REPORT
Contract [redacted] and [redacted]

Third Quarter FY-66

(11 Dec 65 through 11 Mar 66)

11 March 1966

Prepared by:

[redacted]

Approved by:

E. L. Green

Date: 31 March 1966

Prepared at the Contractor's Facility
As Specified by
Contract [redacted] and [redacted]

SECRET

11 Mar 66

PROGRAM OBJECTIVE

Through study, review, evaluation, design, fabrication of engineering breadboard equipment, and testing, to investigate new methods in photographic processing and printing techniques and practices pertaining to aerial reconnaissance, with special emphasis on the best means of exposing, processing, and duplicating photosensitive materials, but excluding practices or techniques used solely for exploitation.

11 Mar 66

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SECTION I

INTRODUCTION

Contracts [redacted] and [redacted]
Third Quarter FY-66

11 Mar 66

SUMMARY

1. By customer direction, transmittal of Quarterly Reports will be made at least two weeks prior to CCB meetings. CCB meetings will be scheduled no earlier than fifteen days after the end of a quarter. In order to meet these requirements, this report covers the period from 11 Dec 65 through 11 Mar 66.

2. A CCB Quarterly Progress Review Meeting was held at the customer's facility on 11 Jan 66. Contractor's report [redacted] dated 28 Jan 66, summarizes the discussions and actions taken at that meeting.

3. Although this report covers both Contracts [redacted] and [redacted] no attempt has been made to separate PAR discussions by contract.

4. Detailed reports covering progress on all active PARs and PARs completed during the report period are included and are listed in the Table of Contents with the exception of

a. PAR 111, Travel and Liaison (FY-66).

b. PAR 112, Administration (FY-66).

11 Mar 66

DISCUSSION

5. PAR Index and Summary - A complete serial listing of all Contract [redacted] and [redacted] PARs appears in the Appendix. At the customer's direction, the following information is included:

a. Each PAR, where applicable, is identified as being a study, breadboard, or hardware project.

b. Each Contract [redacted] PAR is identified by its Task assignment.

c. Each PAR is identified by a category classification -- Printing, Processing, Handling, Investigation, or Miscellaneous.

d. Where an interrelationship exists between several PARs, a listing of associated PARs is included.

6. PARs Completed During the Report Period:

a. PAR 81S/M, Wash Water Conservation on Standard Versamat; Final Report ([redacted]) transmitted 22 Dec 65.

b. PAR 83S/M, Versamat Rack Washer; Final Report [redacted]) transmitted 22 Dec 65.

c. PAR 77B/R1, Processed Film Slitter; Final Report [redacted] transmitted 16 Feb 66.

d. PAR 12P, Microscope Resolution Target Camera (MRTC); Final Report [redacted]) transmitted 1 Mar 66.

e. PART XIX, Item 9P, Viscous Developer Coating Hoppers for Yardleigh Processor; Final Report [redacted]) transmitted 3 Mar 66.

f. PAR 58-5-7S/M, Study of Silver Recovery; Final Report [redacted]) transmitted 10 Mar 66.

g. PAR 23-5-3S, Improvements to Spray Processing, Final Report [redacted]) transmitted 11 Mar 66.

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7. Interim and Special Reports Submitted During the Report Period:

a. PAR 25-6-2S, Performance Comparison Test Plan for Mann-Data Microdensitometer Versus Kodak Model 5 Microdensitometer; Special Report [redacted]) transmitted 20 Dec 65.

b. PAR 23-5-9S, Intraframe Density Variation in Mission Film; Interim Report [redacted]) transmitted 2 Feb 66.

c. PAR 23-5-8S, Density and Contrast of Duplicates; Interim Report [redacted] transmitted 11 Mar 66.

d. PAR 23-5-8S, Density and Contrast Duplication Series; Special Report [redacted] transmitted 11 Mar 66.

SECTION II

PAR PROGRESS REPORTS

Contract [redacted]

Third Quarter FY-66

PAR 5B

11 Mar 66

SUBJECT: Scanning and Recording Densitometer

TASK/PROBLEM

1. To develop* and fabricate a breadboard* scanning densitometer capable of reading stationary or moving film to aid in exposure prediction. The unit to be capable of scanning selected areas of 70mm to 9.5-inch wide film and providing recorded graphs of the pertinent data.

DISCUSSION

2. Development, fabrication, and assembly effort is complete. The Scanning and Recording Densitometer is ready for initial testing.

PLANNED ACTIVITY

3. Perform engineering checkout and, upon completion, begin production testing and evaluation. In-house operating instructions will be provided for the production testing phase.

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* Under the definition of the new PAR numbering system now in use, the subject PAR is a breadboard-type project. To be consistent, the wording of the TASK/PROBLEM has been changed from "design and fabricate a prototype" to "develop and fabricate a breadboard".

Contract [redacted]
Third Quarter FY-66

PAR 9B
11 Mar 66

SUBJECT: Frame Detector and Counter

TASK/PROBLEM

1. To develop and fabricate a frame detector and counter to detect frame lines, and count and locate a given frame in a roll of positive or negative film.

DISCUSSION

2. Physically, the frame detector and counter consists of two units as described below.

a. Control Chassis - A portable enclosure containing the major portions of the electronic circuits, the visual numeric display (frame-count indicator), and all operating controls and set-up switches.

(1) The display frame count can be preset at any initial number and will add or subtract (depending on direction of film travel) with each detected frame.

(2) A separate indicator lamp will be energized when the frame-count indicator arrives at a preselected frame number inserted into the system by the set-up switches.

b. Detector Head - A scanning unit through which the film is threaded. A light source, solar cells, and electronic input circuits are provided to detect frame lines.

3. Status

a. The detector head assembly has been fabricated, wired, and tested. The anodized aluminum roller has been replaced with a nickel-over-aluminum roller for protection of the film.

b. The unit was installed on a 40-inch editing table used for negative breakdown. Its initial use showed difficulties which were caused by the film handling characteristics of the manual rewinds on that table. Manual rewinds make no provision for maintaining film tension at all times and result in the following problems:

(1) Loss of reference position due to longitudinal slipping.

(2) Loss of margin reference cell signal due to lateral slipping.

(3) Loss of logic state due to reversal of direction sensor.

c. A preliminary draft of the in-house operating instructions was completed.

PLANNED ACTIVITY

4. Check out the Frame Detector and Counter on a motorized table.

5. Prepare and publish the final report.

Contract [redacted]

Third Quarter FY-66

PAR 10B

11 Mar 66

SUBJECT: Automation of IR Densitometer

TASK/PROBLEM

1. Design, fabricate, and test an automatic IR Densitometer which will scan 90 percent of the picture frame and base processing level on the trend of the absolute minimum density measured.

DISCUSSION

2. Introduction. The automatic IR Densitometer for the Trenton Processor will control the present IR scanner and Dynac switch functions by means of a frame detector, a stepping switch, a weighted shift register and the output logic control to the solution spray solenoid valves.

3. Status. Engineering drawings are current, except for installation data. All hardware has been completed, assembled, checked out, and installed. The preliminary draft of the in-house operating instructions has been completed.

4. Results of Testing. The initial series of tests by engineering using 70mm and 9.5-inch film indicated satisfactory system operation. One minor logic shortcoming which was found in the stepper switch has been corrected. Evaluation of the automatically processed material is continuing and additional tests are currently being conducted under production conditions.

PLANNED ACTIVITY

5. Complete the in-house operating instructions and prepare and publish the final report.

Contract [redacted]
Third Quarter FY-66

PAR 12P
11 Mar 66

SUBJECT: Microscope Resolution Target Camera (MRTC)

TASK/PROBLEM

1. Design and fabricate an instrument to produce high-quality test patterns on roll films 70mm to 9.5 inches wide, by optical reduction with microscope optics. Instrument to provide improvement over the present 20X Resolution Target Camera thus supplementing present in-house capability.

DISCUSSION

2. The final report, PAR 12P, Microscope Resolution Target Camera (MRTC), [redacted], was transmitted to the customer on 1 Mar 66.

3. Preparation of the MRTC Operating Instructions is in progress. Much of the material in the final report will be utilized in the operating instructions.

PLANNED ACTIVITY

4. Complete and publish the in-house operating instructions.

Contract [redacted]
Third Quarter FY-66

PAR 23-5-1S
11 Mar 66

SUBJECT: Exposure Determination for Frame-by-Frame Printing

TASK/PROBLEM

1. Study the effectiveness of a multi-density print as a tool for the selection of exposure for each frame.

DISCUSSION

2. The Final Report was **prepared,** and publication is expected by the end of March. The SUMMARY is extracted from this report and given below for information purposes.

SUMMARY

An experimental film-duplicating exposure determination technique, based on the time-proven multiple trial-exposure procedure often used in amateur photography, as well as the motion picture industry, has been investigated under production conditions. When compared with the densitometric exposure evaluation technique now widely used for aerial reconnaissance film duplicating, the experimental "tri-density" technique appears to be somewhat superior. Improved print density, operating efficiency, and film-process flexibility are the more obvious benefits to be obtained from its use. While readily adaptable to existing major laboratory systems, the technique can be most useful in mobile or remote field installations where significant convenience and print quality improvement may be particularly evident.

PLANNED ACTIVITIES

3. Publish the Final Report.

Contract [redacted]
Third Quarter FY-66

PAR 23-5-2S
11 Mar 66

SUBJECT: Study of Contact-Printer Optical Components

TASK/PROBLEM

1. Conduct study of new contact-printer optical components to determine effects on image quality.

DISCUSSION

2. This project will be terminated and a Final Report written. Further activity relating to this area of study will be conducted under another contract.

PLANNED ACTIVITY

3. Write the Final Report.

Contract [redacted]
Third Quarter FY-66

PAR 23-5-3S
11 Mar 66

SUBJECT: Improvements to Spray Processing

TASK/PROBLEM

1. Evaluate certain photographic developers and experimental films aimed at improving existing spray processing systems.

DISCUSSION

2. The Final Report was transmitted to the customer on 11 March 66.

PLANNED ACTIVITY

3. None. The Final Report completes this project.

Contract [redacted]
Third Quarter FY-66

PAR 23-5-4S
11 Mar 66

SUBJECT: Improved Use of Infrared Densitometry

TASK/PROBLEM

1. Collect and evaluate infrared densitometric data as a basis for improved calibration and control of interrupted processing equipment.

DISCUSSION

2. <u>Scanner Checkout</u>:

a. A simplified checkout method for use with the Trenton processor scanners has been established. It is used before mission processing as a last-minute check of the scanner which has been electronically calibrated a few hours before. The established procedure uses readily available flashed and processed Type 8430 film. In practice, the neutral density strips are placed in a bracket centered over the scanning cells and the scanner is activated. A total of five strips of different densities are used, each density requiring indication of a specific process level.

b. The method was used with one mission. No problems were encountered and it seems to be operationally suitable. However, the nature of the checkout requires that it be conducted by technicians who understand the purpose and principles involved; otherwise, false indications of trouble can be obtained.

c. The method is not applicable for use on the Yardleigh processor because of inherent physical and mechanical differences between the Yardleigh and Trenton processors.

3. <u>Improved Scanner Design</u>. To date, several characteristics of the scanner have been noted which should be upgraded in the design of future units so that the over-all performance of the scanner will be equal to more sophisticated processing requirements and equipment. The

performance of the current generation of IR scanners is a correct match for the current processing system which makes processing level changes for exposure shifts of 1/3 stop. In the future, however, this interval will undoubtedly be subdivided into smaller increments and the accuracy and sensitivity of the scanners will have to be improved accordingly. Two areas already investigated are discussed below along with the results obtained.

a. Calibration. The current calibration procedure uses film type 3400 raw stock. This material is placed between the IR source and the cells. Its purpose is to reduce the intensity to a level which produces an output of 200 mv (millivolts) from the photocells. In practice, the material is inserted and a resistor is adjusted in each cell circuit to give all cells an identical output of 200 mv. However, because the film material is perishable and changes with time, it is not an entirely satisfactory material. In fact, if it is not held perfectly flat, or is inserted base down instead of base up, a slight variation in cell output is obtained. A more durable and suitable standardized material will be essential in the future and is highly desirable now. An investigation will be conducted to obtain such a material as soon as possible.

b. Cell Characteristics. The purpose of the calibration described above was to match the characteristic curves of the cells as closely as possible. At the present time, even after this adjustment, small differences exist. The results of a test showed that the cell characteristics were more nearly alike when the cells were linearized at the 140 mv level than at the normal 200 mv level. This result is interesting but somewhat academic since the scanners were designed to operate with the Full-process-level trigger point at about 200 mv. In future designs, however, this improvement should be included. An investigation will be made to determine whether the present scanners can be altered to operate at the lower level.

4. Settable Counters:

a. The checkout method for the settable counters was expanded to include the processing of long lengths of simulated mission imagery. This was required to augment the analysis of the individual components of the scanner network. (The purpose of the individual component analysis is to determine capability; on the other hand, the purpose of the simulated missions is to demonstrate effectiveness.) A considerable amount of 70mm simulated mission material was processed with different settings on the counters, all with a 1/2-second scan time. (With these conditions, 20 cells x 1/2 sec x 50 cycles/sec = 500 individual cell outputs produced.) The results appeared to favor the lower processing levels, but this did not necessarily translate to better or worse processing. Counter settings of less than 30 did not have any effect; therefore, for a conservative beginning, the next 1000-series mission will be processed with a count of 10 in the Intermediate and Full processing trigger circuits. During processing of the mission, strict attention will be paid to detect any shortcomings and if any are detected, a setting of 1 will be used thereafter. This difference between the Trenton processors--Trenton No. 1 with counters and Trenton No. 2 without--will be included in the post-processing density analysis made under PAR 24-6-5S.

b. Because the tests with simulated mission images were not conclusive as to what the actual counter setting should be, the repeatability of the counter-scanner-timer output was examined. This was done by repeatedly scanning and recording the counts for flashed films and for an open space between the IR source and the cells. Data were collected for the following conditions:

TABLE 1

SET-UP CONDITIONS WHICH GENERATED THE COUNTER DATA IN TABLE 2

Condition	No. of Exposed Cells	Density (N.D.)	Scan Time (Sec.)
I	20	1.20	1/2
II	20	0.60	1/2
III	80	1.20	1/2
IV	80	0.60	1/2
V	8	0.00	1/2
VI	6	0.00	1/2
VII	6	0.00	1
VIII	6	0.00	3
IX	2	0.00	1/2

c. One of the outputs of the counter is a display on an illuminated scale showing the number of counts received which exceeded the Full and Intermediate level-of-development trigger-point settings. However, since the maximum display is 99, it only represents the last two digits of the actual count. As indicated above, the approximate number of outputs is:

No. of counts = (No. of cells) x (Scan time) x (Scan frequency)

For example, 10 cells and a 1-second scan time will generate a count of about 500; if the scale were to show 10, it could be interpreted to be actually 510. Other conditions can be calculated in the same way. The data in Table 2 were adjusted in this manner.

d. In Table 3 the average, highest value, lowest value, and range are listed for each condition. They show that for a constant 1/2 second scan interval as the total count increases the error (range) increases proportionately. However, for condition VIII, where a count of about 900 was generated with a three second scan time, the relative error was drastically reduced. Additional data will be collected, but these results

[redacted]

TABLE 2

SETTABLE COUNTER REPEATABILITY DATA

(See Table 1 for Test Conditions)

Condition I		Condition II		Condition III	
Int	Full	Int	Full	Int	Full
525	487	559	554	2022	2024
534	495	542	543	1992	2001
542	500	508	512	1970	1974
526	466	537	538	1991	1993
543	486	514	515	2015	2018
526	541	525	526	1968	1970
522	534	561	560	2026	2033
542	539	509	508	1980	1978
508	524	523	527	2038	2052

Condition IV		Condition V		Condition VI	
Int	Full	Int	Full	Int	Full
1992	1994	175	150	156	131
2026	2027	177	151	156	130
2028	2030	182	156	164	135
1956	1958	175	150	156	130
1958	1958	189	162	160	133
2043	2046	178	150	150	126
1955	1963	182	163	144	120
2038	2042	168	145	159	135
1979	1980	187	161	150	123
2035	2029	168	144	156	130

Condition VII		Condition VIII		Condition IX	
Int	Full	Int	Full	Int	Full
323	268	894	945	54	54
312	260	894	945	54	53
306	255	894	945	56	56
312	260	898	950	54	59
324	270	898	950	54	54
306	255	900	950	50	50
319	265	899	953	52	52
314	263	894	945	54	54
328	277	889	943	57	59
318	265	894	945	52	53

[redacted]

TABLE 3

AVERAGE AND RANGE VALUES FOR DATA IN TABLE 2

Condition	Average Count	High	Low	Range
I Int	529	543	508	35
I Full	508	466	531	65
II Int	531	561	508	53
II Full	531	560	508	52
III Int	2000	2033	1968	65
III Full	2005	2052	1978	74
IV Int	2001	2043	1955	88
IV Full	2003	2046	1958	88
V Int	178	187	168	19
V Full	153	163	144	19
VI Int	155	164	144	20
VI Full	129	135	123	12
VII Int	316	328	306	22
VII Full	264	277	255	22
VIII Int	895	900	894	6
VIII Full	947	950	943	7
IX Int	54	57	50	7
IX Full	54	59	50	9

indicate that even though the present mechanical timer is not absolutely precise, it probably will be sufficiently accurate for the anticipated settable counter method of operation.

PLANNED ACTIVITY

5. It is planned to continue investigation on methods to improve future IR scanning equipment and techniques. This would be in keeping with the over-all objectives of the PAR. (Portions of this effort will be accomplished in conjunction with the evaluation of equipment being fabricated under PAR 61B.)

6. Search for a material of greater permanency and suitability for use in the electronic calibration of the scanner and possibly for cell calibration levels below 150 millivolts.

7. Continue testing related to the settable counters.

8. Operate with a counter setting of 10 on a future 1000-series mission and evaluate density data to determine if any effect can be detected.

9. Investigate a checkout method for scanner operation on the Yardleigh processor.

Contract [redacted]
Third Quarter FY-66

PAR 23-5-5S
11 Mar 66

SUBJECT: Contact Print Mottle (Measles)

TASK/PROBLEM

1. Study causes and evaluate possible methods of eliminating mottle associated with contact printing on fine grain duplicating film.

DISCUSSION

2. Samples of film showing the effect of liquid-gate contact printing were prepared for the January CCB Meeting. The samples consisted of flashed 3404 and 3401 printed onto 8403 and SO-107 print stock. For each combination of films, several samples were prepared using liquid-gate printing and several using standard dry methods. The effectiveness of refractive index fluid to eliminate Newton rings and reduce measles was evident.

3. To supplement the demonstration material, an MTF target was printed using refractive index fluid, and again with no liquid. The resulting MFT curve indicated that liquid-gate printing was slightly better than dry printing up to 220 lines/mm. Since most mission resolution is within this range, liquid-gate printing would not impair the resolution of normal picture material.

PLANNED ACTIVITY

4. Within the limits of available funds, conduct further tests on MTF with liquid-gate printing; then, prepare the Final Report.

Contract [redacted]
Third Quarter FY-66

PAR 23-5-7S
11 Mar 66

SUBJECT: Cleaning and Protection of Original and Duplicating Films

TASK/PROBLEM

1. Investigate and evaluate improved methods for cleaning and protecting processed films.

DISCUSSION

2. The small item of work on Nacconal cleaning was completed. Density build-up in the D-max of Type 3404 washed in Nacconal was read by the densitometer and was apparent to the eye as a heavier blue tinge in the shoulder. An attempt to print this apparent density increase resulted in the opposite effect. Densities in the duplicates indicate the more normal effect of wash-out of some of the "real" developed silver density, as with similar tests made earlier on Type 8430 washed in Nacconal. The way should now be clear to finish the Interim Report.

3. Work with a proposed new lacquer has proceeded from discussion with Production personnel to the designing, scheduling, and initiating of suitable tests on 70mm Type 8430. The major item of interest is optimum drying time of this lacquer. While test data are still being established, the following statements summarize current status:

a. Increased drying time for the new lacquer versus currently used lacquer should require only minor equipment modification.

b. The results from breadboard experiments on PAR 78S, Cross-Frame Lacquerer, were adapted to this project. An experimental cleaner-waxer, the "Hi-Boy," was modified and coupled to the cross-frame lacquerer as a drying cabinet. For a sketch of this arrangement, see Figure 1.

PLANNED ACTIVITY

4. Complete and submit the Interim Report.

5. Finish the lacquer work and make recommendations in a Final Report.

[redacted]

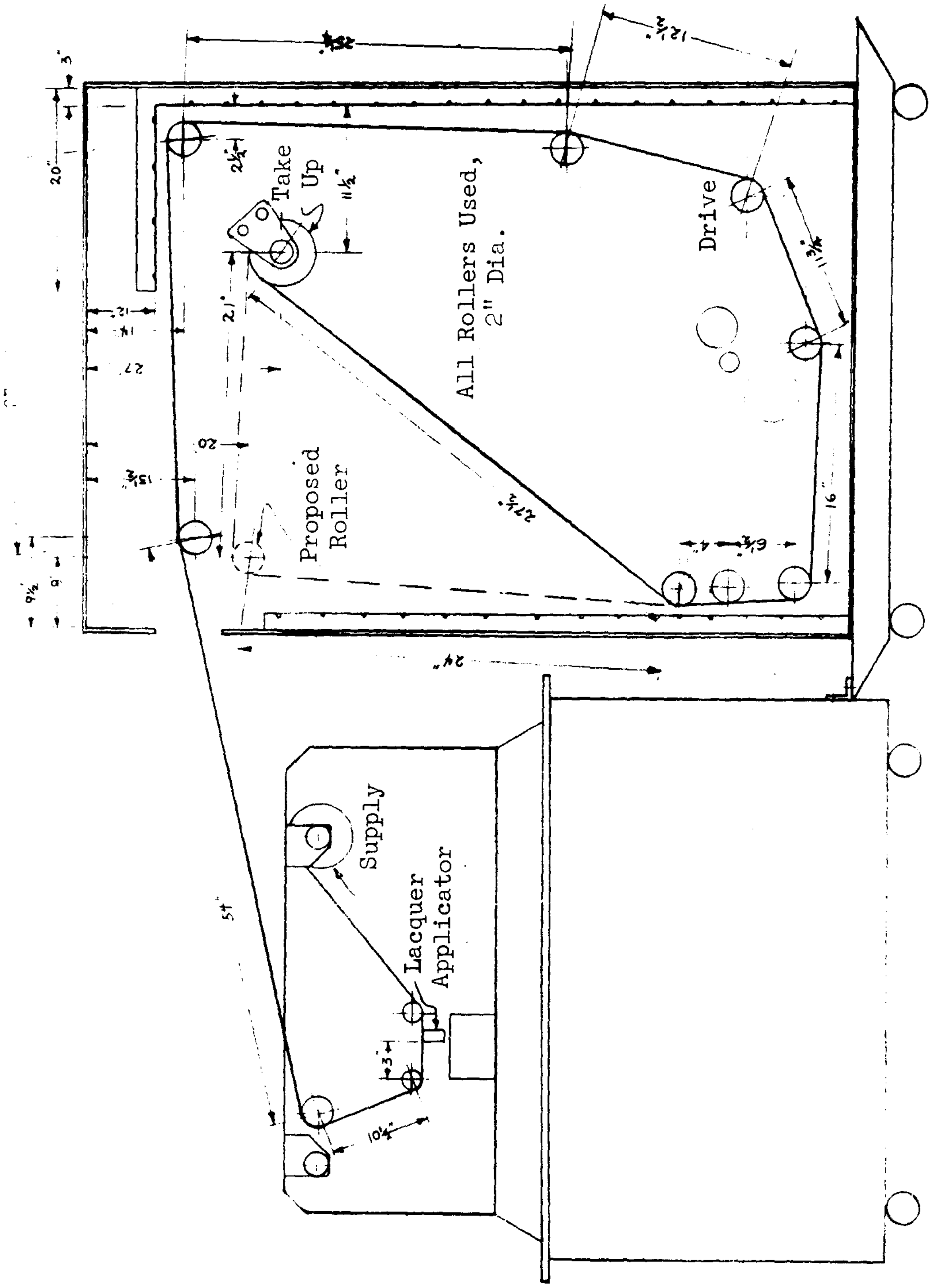

Figure 1. Cross-Frame Lacquer Set-Up (Sketch)

[redacted]

Contract [redacted]
Third Quarter FY-66

PAR 23-5-8S
11 Mar 66

SUBJECT: Density and Contrast of Duplicates

TASK/PROBLEM

1. Prepare from selected negatives an array of duplicate prints demonstrating the practical available range of contrast and density; collect and tabulate user reactions.

DISCUSSION

2. The array of contact-printed film chips, mounted on 3" x 7" aperture cards, and of 10X, 20X, and 40X enlargements, has been completed and shipped to the customer. A Special Report was written and published to provide a suggested evaluation procedure for the arrays of duplicates.

3. An Interim Report was written and published to constitute termination of effort until after the arrays have been evaluated and formal response has been received from the customer. Each copy of the Interim Report was accompanied by a copy of the Special Report sent with the array.

PLANNED ACTIVITY

4. Summarize customer density and contrast preferences in a Final Report. This action must await response to the duplicate array.

[redacted]

Contract [redacted]
Third Quarter FY-66

PAR 23-5-9S
11 Mar 66

SUBJECT: Intraframe Density Variation in Mission Films

TASK/PROBLEM

1. Evaluate mission acquisition films which exhibit extreme intraframe density variation, reexamine criteria for dual printing and investigate alternate methods for making acceptable duplicates.

NOTE: IFDV (Intraframe Density Variation) is the term applied to 70mm mission panoramic camera frames which show a visible density wedging effect within the length of a single frame.

DISCUSSION

2. The Interim Report on IFDV, "Intraframe Density Variation in Mission Films," dated 29 October 1965, was published. Date of transmittal to the customer was 2 February 1966.

3. Work on the phase dealing with dual printing criteria was intensified after close of effort on the above Interim Report. New criteria were formulated and given limited successful testing.

4. Essentially, the proposed criterion for dual printing is a system using the density range exhibited in the negative. The system will be a procedural guide for when this range exceeds a practical limit for printing at a single level. Further testing is expected to prove the method valid for improving dual printing. Suitable recommendations will then be made (and included in the Final Report) concerning the criteria for a standard printing procedure.

5. Recalled mission material was received 20 January to be used for investigating the possible connection between IFDV and dual printing. Microdensitometer D-min/D-max measurements of the opposite ends of IFDV frames were made. This is expected to settle the question of whether the D-min/D-max at the dark end of the frame is substantially different from D-min/D-max at the light end.

[redacted]

PAR 23-5-9S

11 Mar 66

PLANNED ACTIVITY

6. Continue testing of the new criteria for a dual print procedure.

7. Establish the effect, if any, of IFDV on D-min/D-max.

8. Prepare and submit the Final Report.

Contract [redacted]

Third Quarter FY-66

PAR 24-5-1S

11 Mar 66

SUBJECT: Study of Photographic Films and Processes for Low Altitude Reconnaissance

TASK/PROBLEM

1. Study black-and-white film and processing needs of existing low-altitude reconnaissance systems in terms of exposure conditions and processing and duplicating requirements.

DISCUSSION

2. The Final Report requires only minor additional work to reproduce illustrative material for the <u>Combined Planning Table</u>. Publication is expected in the next few weeks. The SUMMARY is extracted from this report for information purposes and given below.

SUMMARY

Black-and-white photography was studied in the area of customer needs for low altitude reconnaissance. Many of the needs were defined by an analysis of information obtained from the following organizations:

a. TAC Headquarters

b. 4444th Reconnaissance Tech Sq.

c. TARC Headquarters

d. 363d Reconnaissance Tech. Sq.

e. TAC Air War Center

f. 5th Reconnaissance Tech. Sq.

g. 1st Air Commando Group

h. VAP - 62

i. Fleet Air Photo Labs., Jacksonville NAS

j. Avionics Lab, Wright-Patterson AFB

As requirements were established, they were examined against the current capabilities of equipment, film, and processing methods. The result of this approach was a determination of practical guides for exposing, processing, and duplicating. Although it was found that all customer needs could not be satisfied, limitations were illustrated in such a way as to indicate alternatives for achieving the highest degree of photographic information possible.

Important findings were condensed and summarized in Combined Planning Tables. Planning guides of this type are recommended for adoption by tactical units.

In some areas, such as camera selection, adequate recommendations were precluded by lack of information. Wherever such limitations were recognized, they were noted in the discussion. No summary of these was made inasmuch as there is a question of project scope as well as of importance to the customer.

Of apparent importance in the conclusions is a real need for standardizing the procedures for planning and for processing and printing. Coupled with centralized collection and analysis of information by a suitable agency, it is definitely possible to upgrade the quality of photographic information from low altitude reconnaissance both by maximizing use of available material and equipment and by uncovering deficiencies in the system.

PLANNED ACTIVITY

3. Publish the Final Report.

Contract [redacted]
Third Quarter FY-66

PAR 24-5-2S
11 Mar 66

SUBJECT: High-Altitude Color Acquisition

TASK/PROBLEM

1. Through investigation, local flight test, and evaluation, attempt to determine optimum exposure requirements and color balance criteria for high-altitude color reconnaissance photography. Duplicate selected areas of each color high-altitude flight accomplished in FY-65 and evaluate against findings of preliminary test results.

DISCUSSION

2. The analysis of data from Hi-C color missions is nearly complete. It appears that some quantitative analysis of haze is possible from density data taken of the image of concrete and asphalt objects. The variability appears to be high, however. A considerable number of data points may be necessary for an accurate description of the effect.

3. Reflectance data on asphalt and concrete has been collected locally. About 20 measurements of each surface have been made. As soon as weather permits, considerably more data will be obtained.

4. The values below were determined from barrier layer photocell readings. Both visual photometry and broad-band radiometry were accomplished. The approximate peak relative response of the cells with filters, plus that for SO-121+2E, are as follows:

a.	Visual	555 mμ
b.	Cell with W#29	630 mμ
c.	Cell with W#58	530 mμ
d.	Cell with W#47B	430 mμ
e.	SO-121, blue layer	430 mμ
f.	SO-121, green layer	550 mμ
g.	SO-121, red layer	650 mμ

5. The average and range reflectances relative to the response of the eye were found to be:

	Average	Maximum	Minimum
Asphalt	16%	20%	10%
Concrete	45	47.1	40.8

6. The average radiometer ratios relative to green were:

	Red	Green	Blue
Barium Sulfate	1.11	1	0.67
Asphalt	1.33	1	0.587
Concrete	1.28	1	0.54

7. The concrete and asphalt ratios, normalized with respect to the Barium Sulfate ratios, become:

	Red	Green	Blue
Asphalt	1.2	1	0.877
Concrete	1.15	1	0.806

8. The average reflectance relative to green cell is:

	Red	Green	Blue
Asphalt	19.2%	16%	14%
Concrete	51.7%	45%	36.2%

9. On the basis of these data, it appears that the Log E shifts caused by departure from neutrality, relative to the red layer, would be in the order of:

	Log E		
	Red	Green	Blue
Asphalt	0.0	-0.08	-0.14
Concrete	0.0	-0.07	-0.16

10. A word of caution is needed with respect to the average reflectance value for concrete. Due to circumstances, only readings from primarily new concrete could be taken. It was found in the past that "old" concrete exhibits a percent reflectance (visual) much closer to 30%.

11. Only one of the several A-2 camera, atmospheric contrast attenuation tests planned for February (test 24-5-2-8) was accomplished, because of the non-availability of vehicles. The single test conducted at the Edwards AFB resolution range appears to have been highly successful.

a. A considerable amount of ground data was collected during the test. These data included information from two photographic photometers, five low-resolution readiometers, and three photocell photometers. In addition, a request was made for CORN target deployment of the 100-foot edge, the medium contrast "T", and the eight-step gray scale. Three radiosondes were accomplished during the tests by Edwards Weather Station.

b. This test should provide information not only on contrast attenuation in three spectral bands, but also information (for each spectral band) on point-spread function, resolution, and aerial image modulation. The information will also correlate data for a solar altitude range between 15° and 45°.

12. A quasi-operational color test, 0026H, using Type SO-121-17, in the Delta III configuration was accomplished by the customer.

a. The exposure level, predicted from results of Red Dot tests conducted over the past two years, was good.

b. The data block, timing track, and counter records were the best to date. The lamps for the various units were masked with a 0.92 Inconel filter.

c. The general quality of the material was good. The principal defect was a red-record-coating skip which occurred approximately every 400 feet. Although this caused image degradation, there was not a total information loss.

13. A special Interim Report is being prepared on "The Influences of Films, Filters, Lenses, and Illuminants on Data Analysis."

PLANNED ACTIVITY

14. Analyze the results of test 24-5-2-8.

15. Complete the report on consolidated color data.

Contract [redacted], Task A
Third Quarter FY-66

PAR 24-5-3S
11 Mar 66

SUBJECT: Night Photography

TASK/PROBLEM

1. Prepare test program and arrange and monitor flight tests to provide materials for the study of exposure levels of black-and-white films exposed at night in high altitude systems over artificial lights. Evaluate and report on results.

DISCUSSION

2. The Final Report was prepared and is being published. The SUMMARY of that report is given below for information purposes.

SUMMARY

Study shows that considerable detail can be recorded at night using available black-and-white materials. Ambient night lighting of military and industrial scenes is sufficient for recording image on these materials at suitably low shutter speeds, and without serious problems from uncompensated image motion. Mensuration of an object in one of the night scenes is demonstrated.

Lower contrast processing appears to be a practical method of extending exposure latitude for night photography. Investigation of this, however, was not undertaken.

Two films of different emulsion speed provide better coverage of night scenes. The faster film provides more detail at low illumination levels; the slower, more information in brightly lit areas of a scene. The faster film record may be adequate for most photo-intelligence purposes. The two films studied appear to define the practical limits of available products as used in current systems.

Further study of black-and-white night photography is recommended only if justified by urgent customer needs or the availability of new materials and equipment.

Study by this contractor of flash-bomb color photography is recommended, based on the belief that such photography is of strategic importance.

PLANNED ACTIVITY

3. Publish the Final Report.

[redacted]

Contract [redacted]

Third Quarter FY-66

PAR 24-5-4S

11 Mar 66

SUBJECT: Contrast of Original Negative

TASK/PROBLEM

1. Through test, investigation, and study, determine if original, small scale, aerial negatives processed to low contrast retain more reducible intelligence data than those processed to high contrast. Prepare, arrange for, and monitor a flight test program that will provide materials as required to allow effective evaluation by the intelligence community.

DISCUSSION

2. An experiment is being conducted to correlate resolution, target contrast, exposure level, acutance, granularity, and process contrast on Type 3404 film. In the near future, the contractor will attempt to correlate recognition with the above factors.

3. Preliminary data are shown in Figures 1 through 4. These data are for target contrasts of 1.2:1, 1.6:1, and 2:1, for process contrast gammas of 2.24, and 0.75. It is interesting to note the differences between the two process contrasts. Note that Figure 2 for 0.75 gamma indicates a broader peak resolution range over the log E scale, than does Figure 1 for 2.24 gamma. The lower contrast process thus has a broader peak resolution scale with respect to the log E axis than does the higher contrast process. However, it must be realized that the lower contrast process does not exhibit the same speed as the higher contrast process, such that a direct comparison on the basis of resolution is not altogether valid.

4. Figure 3 are data for the 2:1 contrast targets from Figures 1 and 2, indicating isoresolution values for the two processes. Note that in the toe portion of the curves, the resolution values appear to be independent of the processes, for a given log E value.

[redacted]

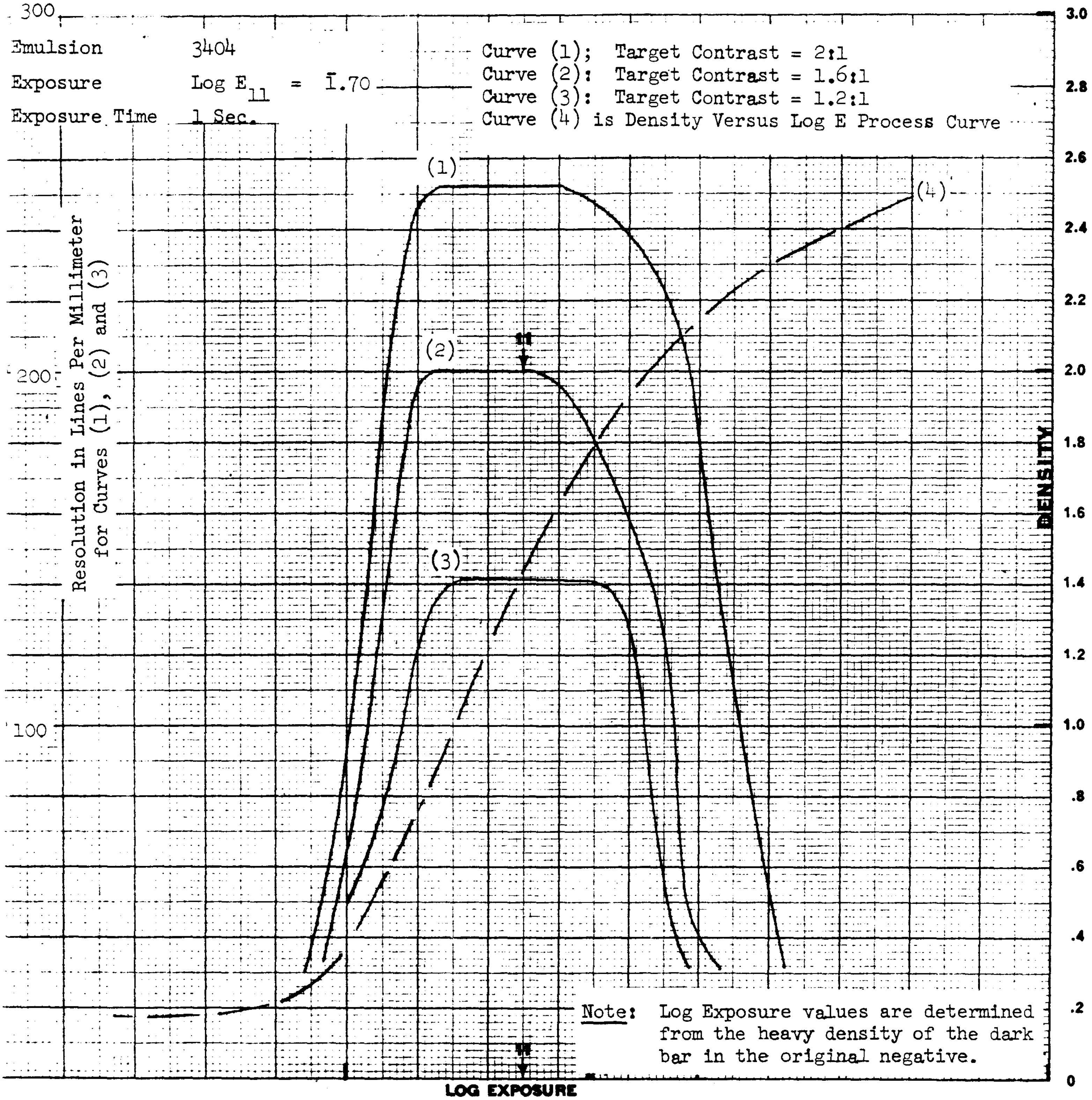

Figure 1. Resolution Versus Log Exposure for Process Gamma of 2.24

Emulsion 3404

Exposure Log E_{11} = $\bar{1}.70$

Exposure Time 1 Sec.

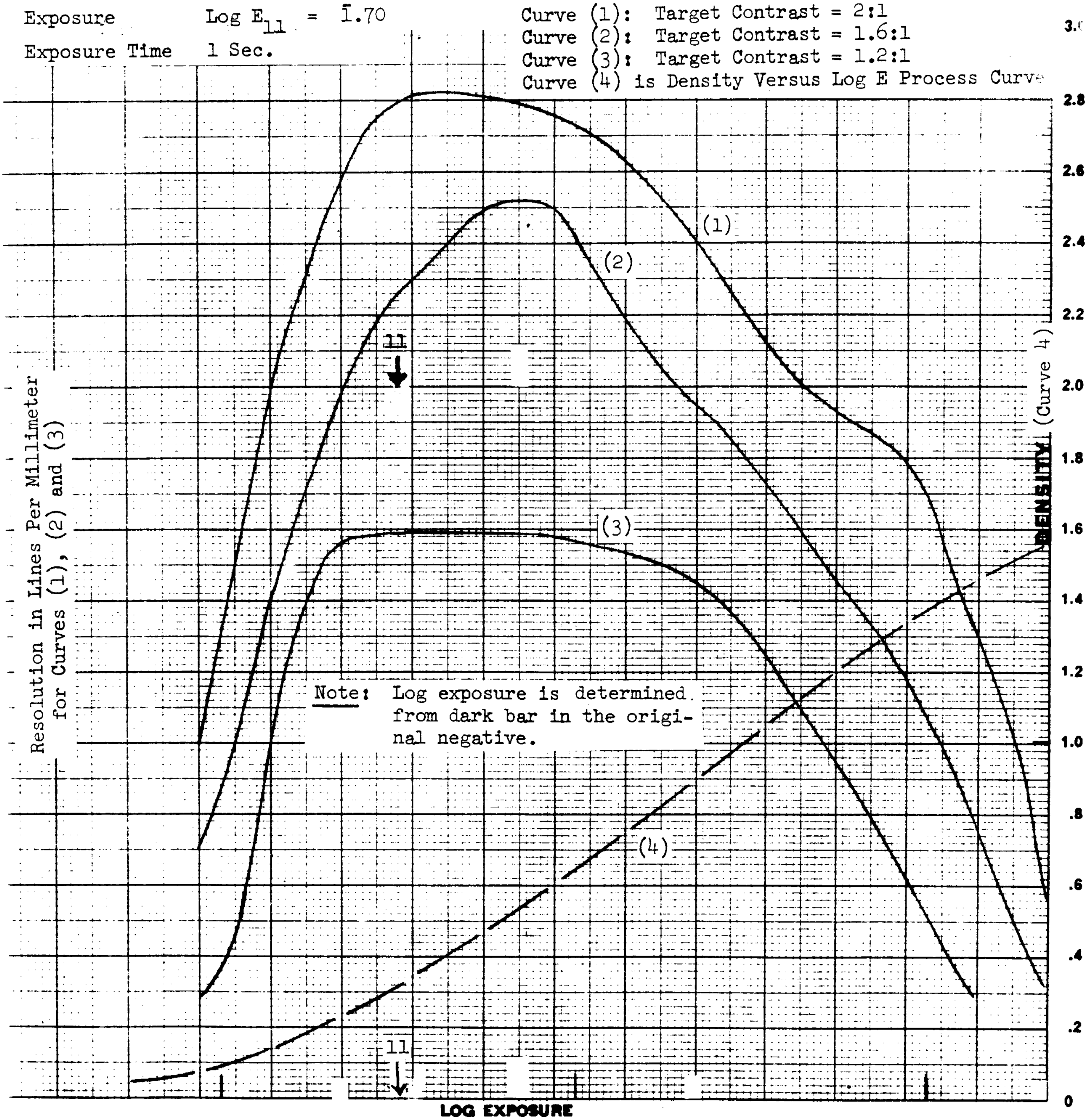

Figure 2. Resolution Versus Log Exposure for Process Gamma of 0.75

[redacted]

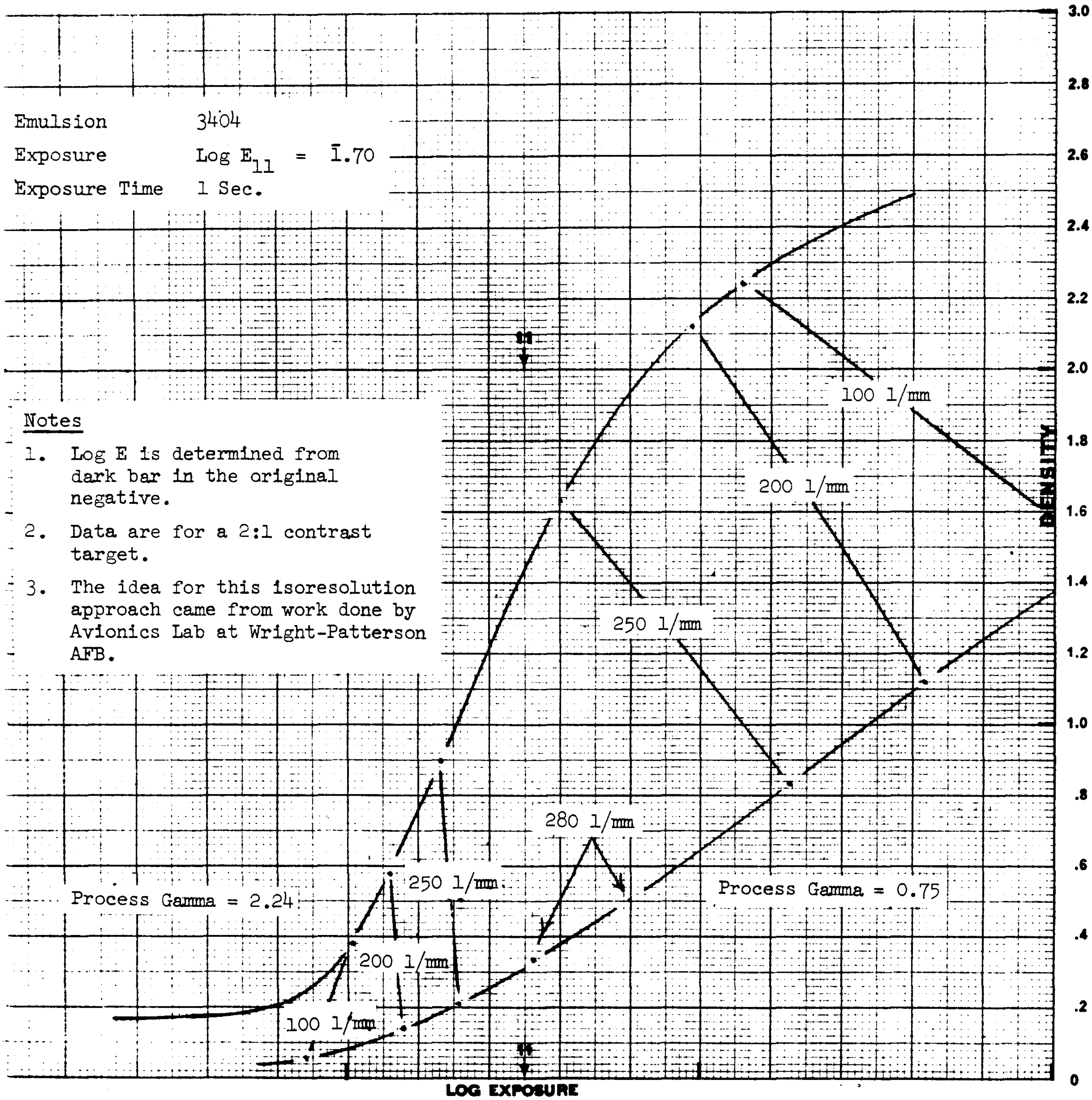

Figure 3. Isoresolution Values in Lines/Millimeter (l/mm) for Two Process Contrasts

[redacted]

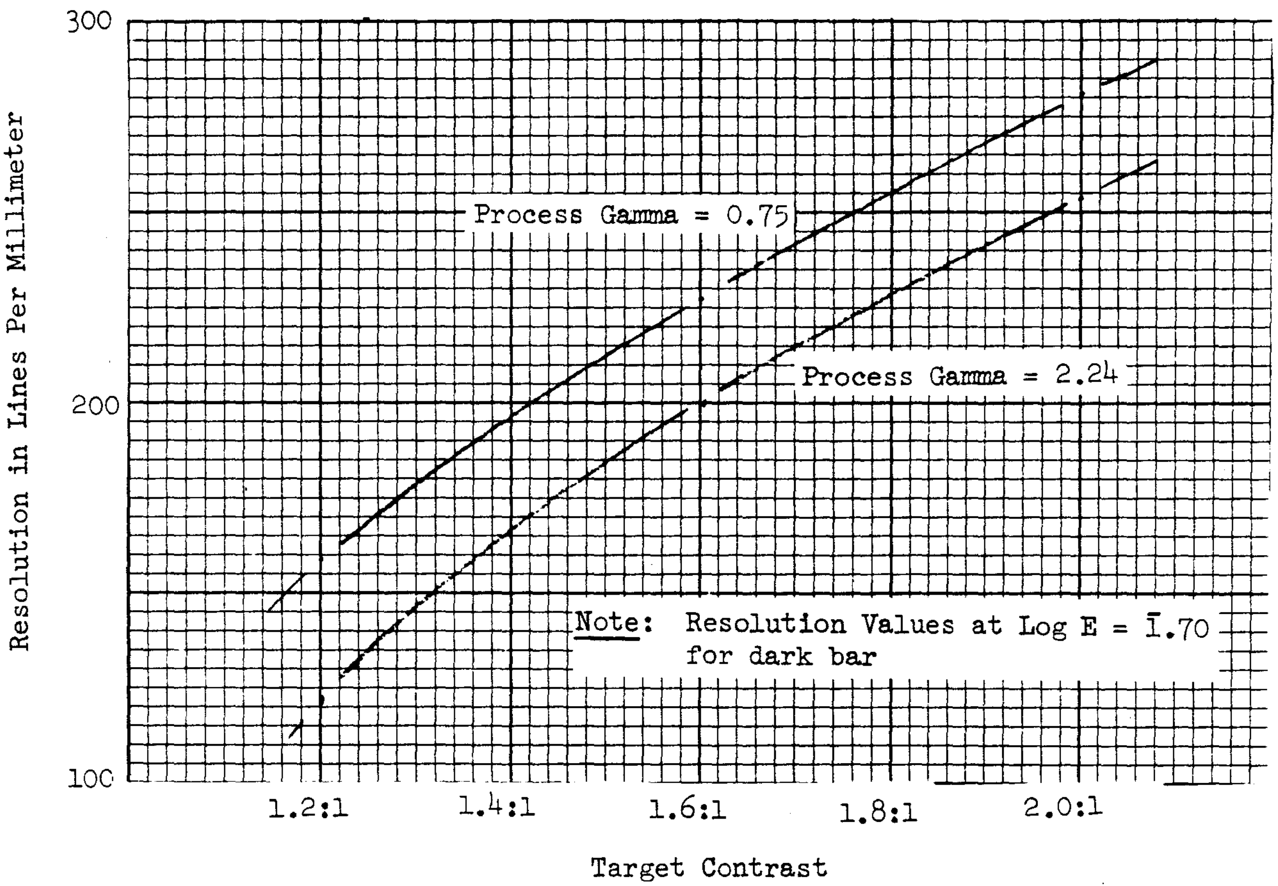

Figure 4. Target Contrast Versus Resolution for Two Process Contrasts at the Same Exposure Level

5. Figure 4 illustrates the relationships of target contrast, process contrast, and resolution, for a given log exposure. This suggests a method of handling these data in matrix form, for a thorough analysis, including parameters other than those for the film.

PLANNED ACTIVITIES

6. Complete testing and analysis of resolution and other correlative data on type 3404.

7. Attempt to use some factor of recognition as a correlate.

[redacted]

Contract [redacted], Task B
Third Quarter FY-66

PAR 24-6-5S
11 Mar 66

SUBJECT: Exposure Criteria for Acquisition Films

TASK/PROBLEM

1. Modify and refine the criteria for exposure of acquisition films through analysis of data from operational missions, controlled flight tests, laboratory tests, and scientific literature. Integrate into the Exposure Criteris studies data on geographical location, sun direction, and air masses, and evaluate their effect on exposure. As significant results are determined, disseminate updated exposure recommendations to the reconnaissance collections community.

DISCUSSION

2. Because of its classification, the PAR 24-6-5S quarterly progress report was transmitted under separate cover.

SECRET

Contract [redacted], Task B
Third Quarter FY-66

PAR 25-6-1S
11 Mar 66

SUBJECT: Mission Analysis

TASK/PROBLEM

1. Collect, evaluate, and publish the results from microdensitometer readings of photographic image edges contained in operational missions in an attempt to provide objective techniques for evaluating overhead photographic reconnaissance systems.

DISCUSSION

2. Image-quality data derived from edges on Missions 1027-1, 1028-1, 1028-2, 1029-1, 1029-2, [redacted], and [redacted] have been reduced and the reports have been issued using a new shortened format.

3. At the request of SPPF, contents of the contractor's mission edge trace report were reviewed to highlight the essentials and reduce the volume and time needed to publish the report. A copy of the proposed report format was sent to SPPF for Missions 1026-1 and 1026-2. The following items were deleted from the standard report format:

a. Index

b. Introduction

c. Conversion of Scene Edge to MTF and Spread Function (drawing).

d. Summary of M.I.P. Ratings

e. 10X enlargement of selected frames

f. System MTF and Spread Function plots

g. Resolution/Spread Function versus Pass Number, Latitude, Longitude, and Solar Altitude plots

h. Original and hand smoothed edge trace

i. Replication-Repetition Series

j. Reference system for edge location and orientation

k. Tabulation of Reciprocal Spread Function Width

l. Individual listing of Resolution and Spread Function Width for multiple scans (only the average value is included).

4. A "one-time" report is planned detailing the procedures and equipment used in mission photographic evaluation. Revision of this "one-time" report will be made as thought necessary.

5. The IBM 7044 computer program "SWRDR" is being revised as follows:

a. Inclusion of a subprogram to convert edge-trace data to a 5-track paper-tape compatible with a Teletype system.

b. Changing the format of the data output cards of the computer program to be consistent with the new report format.

c. Calculation of the D-min, D-max, and the contrast for each edge traced.

d. A new A.I.M. curve for Type 3404 (Full process - Trenton/Yardleigh) has been added to the program.

6. The IBM 1620 computer program "GOOFYD," used to trap and identify key-punch errors and replace erroneously punched data with calculated estimates of the correct data, was enlarged to check for the following additional errors:

a. Information missing from the data header card.

b. Too large a number of data points (more than the program had been calculated to handle).

c. Too small a number of data points which would lead to an invalid answer.

7. An insert for the 10X-20X-40X enlarger easel has been made to hold 8 1/2 x 11" photographic paper giving a 7" x 7 1/2" image. This enables us to place the 40X enlargement of the selected frame directly into the report, eliminating the need to trim 10" x 10" prints.

8. The microdensitometer electrical circuitry was modified to eliminate 120 cycle a-c noise present in the signal. The changes consisted of converting from ac to dc in the power supply for the main lamp and the power supply for the vacuum tube filaments in the Macbeth photometer amplifier. Tests are presently being conducted to determine the effectiveness of these modifications.

9. New laboratory test edges have been made on Type 3404 film in the Trenton process (Full). These edges will be used as controls for each mission traced.

PLANNED ACTIVITY

10. Trace, analyze, and report the image quality of new missions.

11. Continue the upgrading of the SWRDR computer program.

12. Issue the "one-time" report on procedures and equipment used in mission photographic evaluation.

Contract [redacted], Task B
Third Quarter FY-66

PAR 25-6-2S
11 Mar 66

SUBJECT: Study Refinements in Applications of Microdensitometric Data

TASK/PROBLEM

1. Study methods for improving the applicability of the microdensitometric techniques and computation procedures as applied to the evaluation of reconnaissance materials. Studies to include a proposed mathematical technique to determine if hand smoothing of edge data can be minimized or eliminated. Complete investigation on the Hermite mathematical technique and modify the present 7044 computer program (SWRDR) for more efficient operation.

DISCUSSION

2. CCB Meeting. A formal review was made of PAR 25-6-2S at the recent (4 January) CCB Meeting. Approval was given to purchase digital magnetic-tape recording equipment for the Model 5 Microdensitometer, but a request for approval to purchase a Mann-Data Microdensitometer was denied. At this meeting, both the validity and the value of edge tracing were questioned on the basis of the same arguments presented at the meetings of the Image Evaluation ("Swing") Committee and the Ad Hoc Mission Reporting Committee. The alternative to edge tracing which was proposed was use of a catalog of simulated scenes called "GEMS" which vary in sharpness, contrast, scale, and scene content. GEMS is an acronym for Graded Estimated Measuring Samples.

3. SPPF Meeting:

a. A meeting was held at SPPF on 3 and 4 February for the purpose of reviewing current technology in edge trace methods and acquainting those present with the effects of partially coherent illumination in the microdensitometer used for edge tracing. [redacted], of

Technical Operations, presented a review of the types of errors introduced by assuming linearity (incoherent situation) in deriving a modulation transfer function, when the microdensitometer appears to be nonlinear to some degree (partial coherence). No indication was given of the magnitude of the "coherence" error present in the resolution value computed from the intersection of the MTF and AIM curves.

b. SPPF presented a statistical study which indicated good correlation between the two teams routinely making edge-trace image-quality measurements.

c. The contractor described a series of tests which showed good agreement between visual-resolution measurements and edge-trace-resolution measurements when both are made under laboratory conditions.

4. Study Plan. The plan published in the second quarter as a Special Report (dated 1 November 1965, transmitted 2 December 1965) is now being revised. The new plan will take into account the current need for definition of the effect of partial coherence on edge tract MTF. Coherence studies will therefore be included, and less emphasis will be given to new mathematical techniques for data reduction.

5. Coherence Studies. Experimental studies have started which are aimed at measuring the partial coherence in a microdensitometer and its effect on edge analysis. Initial results indicate that it may not be possible to construct an incoherent microdensitometer and that any instruments approaching this goal may contain excessive stray light. The gelatin relief-image experiment demonstrated by Parrent at SPPF was attempted locally, but the results noted seemed to indicate refraction of light rather than prove partial coherence in the illumination system.

6. Equipment:

a. Sketches were prepared for the fabrication of a special film-viewing table for use in locating mission edges. This table is to have the capabilities of:

(1) Viewing under magnification.

(2) Photomicrography of the selected edges.

(3) Position determination in the coordinates of a special grid.

No schedule has been set for fabrication of this table.

b. Two modifications were made to the moving stage of the Kodak Model 5 Microdensitometer to permit longer continuous scans for use in power spectrum (e.g., grain noise) studies, as follows:

(1) The original one-inch micrometer-stage lead screw was replaced by a better quality screw having two inches of travel.

(2) A vacuum stage plate having a 1- x 2-inch clear aperture was constructed.

7. Microdensitometer Test Plan. A Special Report (dated 20 October 1965, transmitted 20 December 1965) was published to provide a program and proposed test procedures for comparison testing of microdensitometers. The comparison of immediate interest was between the Mann-Data and Kodak Model 5 instruments. Correlation data presented later by SPPF (at the meeting referred to in paragraph 3) and testing conducted by the contractor show equivalent performance for the two instruments, eliminating the need for additional "crossover" testing at this time.

8. Continuing Work:

a. Power spectrum measurements are being continued in an attempt to describe the nature of film noise (i.e., grain) as seen by a microdentitometer. Of particular interest is the low-frequency noise which comes from the matte backing on Type 3404 film. Optical reduction or elimination of the matte problem through use of a liquid gate, diffusion in the illumination system, and wide pre-slits is being tried.

b. Computer programs are being written to perform the following jobs: (1) a convolution program should permit the synthesis of the interaction of object functions (such as edges) with the variables of optical degradation, image motion, processing, and microdensitometer parameters, and (2) a second program will convert edge-trace data in density units to exposure units so that read edges can be compared with mathematical edges having added noise.

PLANNED ACTIVITY

9. PAR 25-6-2 Study Plan. Prepare a revised study plan for this project incorporating investigations in the influence of partial coherence on edge-trace-image measurements.

10. Partial Coherence Studies. Continue the study of the causes and effects of partial coherence in the illumination system of the microdensitometer. Study will include experiments in the dependence of coherence on various microdenstiometer parameters, the preparation of coherence test objects, and attempts to determine the error introduced by coherence.

11. Other Continuing Studies. Investigations will be continued on grain noise, correlation of edge measurements with CORN visual determinations, and improved edge-data handling and data-reduction methods.

[redacted]

Contract [redacted]

Third Quarter FY-66

PAR 38B

11 Mar 66

SUBJECT: Adjustable Slitter

TASK/PROBLEM

1. Develop and design an adjustable slitter to provide emergency capability for slitting all standard-width materials of larger sizes.

DISCUSSION

2. The adjustable slitter is equipped with two separate slitting attachments as follows:

a. One slitter assembly can be used to slit any standard width up to 9.5 inches into one, two, or three 70mm widths. The other slitting attachment can be used to slit one 5-inch strand, or one 5-inch and one 70mm strand from any standard-width size from above 5 to 9.5 inches wide.

b. The slitter console was equipped with guides for automatically threading the slit strips to a position where threading can be conveniently completed by the operator.

3. Fabrication, assembly, and engineering checkout of the adjustable slitter was completed and final testing and evaluation is in progress.

PLANNED ACTIVITY

4. Complete testing and prepare the final report.

[redacted]

Contract [redacted]
Third Quarter FY-66

PAR 44B
9 Mar 66

SUBJECT: Sensitometric Edge Printer for Processor

TASK/PROBLEM

1. Design and build one experimental edge printer that will print a step wedge along the unexposed negative edge prior to processing.

DISCUSSION

2. Printer Operation. The sensitometric edge printer is positioned at the head of a Trenton Processor to provide local calibration for evaluation of exposed material. This local calibration will be accomplished by flashing a step wedge on the edge of material before it is processed. The density wedge used for this purpose has nine steps of 0.3 log E densities each and will expose an area 1/8 inch wide by 1 inch long.

3. Status. The unit was completed and installed on a Trenton Processor. Preliminary tests were completed and design changes based on the test results below were made and checked out.

a. Flash lamp operation was interlocked with processor drive and alarm sensor.

b. Flash lamp output intensity was excessive and has to be decreased. The necessary filter is to be determined and inserted in the light path.

c. The air supply to the system was 40 psi rather than the 25 psi which was anticipated. A regulator was added to maintain 25 psi pressure. Impedance of line and regulator caused an 8 psi drop at the controller during peak demand. A local storage reservoir was added to the downstream side of the regulator to supply transient demands.

4. Variances from the original specifications are listed below.

a. The flash rate is fixed at 8/min which was the maximum printing rate required. This rate can be changed by replacing the timer.

b. Electronic and pneumatic packages are currently not sealed but are protected against direct liquid contact (splash) and can be pressurized if required to meet the original specification.

c. The step wedge consists of nine steps of 0.3 Log E instead of the three steps specified in the original specifications.

5. The unit is ready for final checkout.

PLANNED ACTIVITY

6. Conduct final checkout and tests.

7. Prepare and submit the final report.

[redacted]

Contract [redacted]
Third Quarter FY-66

PAR 46S
11 Mar 66

SUBJECT: Investigation of Ultra Thin Base (UTB) Film Handling

TASK/PROBLEM

1. To thoroughly investigate and conduct tests in order to determine the handling characteristics and problems associated with handling ultra thin base films. The investigation is to include simple breadboard equipment in an attempt to determine the magnitude of effort required to overcome the problems.

DISCUSSION

2. The total length of UTB film processed through production facilities amounts to 30,000 feet. This was accomplished in increments of 3,000 feet at various time intervals when the normal production work load was light. To date, the effort represents 18,000 feet of 9.5-inch and 12,000 feet of 70mm material.

3. The primary difficulty in handling UTB material continues to be the titling operation. Because routine adjustments have not solved the problem, the titling operation has been omitted from further investigation on this PAR. The problem is being studied, however, on PAR 79B, Unimak Film Titler, and UTB titling operations will be resumed as soon as the Unimak Titler is available.

4. A problem of deckled edges has been encountered, but only to a slight degree. This defect has been traced to the cleaner/waxer equipment. The problem can be alleviated by using oversize spools for take-up on the equipment. There is also a need for revised operation instructions for handling UTB materials, and this will be accomplished.

 [redacted]

5. Testing of the Yardleigh processor during the past quarter was limited to 3,000 feet of UTB material. Although some tracking problems were encountered, they were corrected by roller adjustments. Approximately 2,000 feet of the test length was processed with no damage occurring. It should also be noted that readjustment of the rollers was required to track thin base materials after the UTB test.

6. During the examination of recent UTB test materials, a defect in the form of tiny cracks in the emulsion was found. To the naked eye, these appear the size of a fine hair several inches long, meandering from the edge of the film toward the center. Under 100X magnification, however, the cracks are composed of many fine, short, closely spaced parallel cracks running transverse to the long crack noted without magnification. Careful re-examination of earlier test material revealed their presence also. Samples of the defect have been forwarded to the film manufacturer.

7. UTB testing has been initiated on the Versamat 11-A and 11-C and the EH6A. The total test lengths appear as follows:

	70mm	6.6 inch	9.5 inch
Versamat 11-A	400 ft.	----	900 ft.
Versamat 11-C	400 ft.	300 ft.	900 ft.
EH6A	400 ft.	300 ft.	900 ft.

The processed material displayed wrinkling at the splicer on all machines. It was also found necessary to attach leader and trailer sections to insure good tracking on the Versamat machines. The tracking characteristics of the EH6A were unacceptable for sizes other than 70mm. Splicing of UTB film is currently being investigated under PAR 118S/M, Ultra Thin Base (UTB) Film Splicing Study.

PLANNED ACTIVITY

8. Continue UTB testing with emphasis on the Yardleigh processor.

Contract [redacted] Task A
Third Quarter FY-66

PAR 49B/R1
11 Mar 66

SUBJECT: Edge Flasher

TASK/PROBLEM

1. Design and fabricate a prototype self-tracking edge flasher for exposing a longitudinal border on reversal materials to permit subsequent opaque titling of this edge.

DISCUSSION

2. Status

a. Design effort was completed. The fabrication of the machine is scheduled for completion by 17 Mar 66.

b. The two film handling trucks used in conjunction with the edge flasher are on hand.

PLANNED ACTIVITY

3. Test and evaluate the unit, and begin preparation of the final report.

Contract [redacted]
Third Quarter FY-66

PAR 51B
11 Mar 66

SUBJECT: Step-and-Repeat Color Printer

TASK/PROBLEM

1. Design and construct a three-color, flat-bed, step-and-repeat printer. Electronic controls will be provided as required to permit discrete manual changes in color balance without altering over-all print density or permit changes in print density without altering color balance.

DISCUSSION

2. Status:

a. Mechanical. Mechanical assembly and preliminary engineering checkout have been completed, and preparation of the operating instructions is in progress.

b. Electrical. Matrix calibration was completed. An error in the matrix coefficient value was discovered and has been corrected. The rough draft of the matrix description and calibration procedure was completed.

PLANNED ACTIVITY

3. Complete engineering checkout and begin final testing and evaluation.

Contract [redacted]
Third Quarter FY-66

PAR 52B
11 Mar 66

SUBJECT: Step-and-Repeat Drum Printer

TASK/PROBLEM

1. Develop and fabricate a drum printer with a step-and-repeat capability. The printer will be designed in a manner that the negative material can be reciprocated across the print drum in an effort to enjoy all the advantages of the drum printer (i.e., high resolution, elimination of dirt, etc.). Design goal should include the ability to automatically locate specific frames, step off the required number of prints, and be able to respond to frames of any length including those of such length that flat bed printing is not feasible.

DISCUSSION

2. Mechanical. Fabrication effort is complete and final assembly is 95% complete.

3. Electrical. Electrical assembly of the printer is complete. System checkout of printer and control electronics is in progress.

PLANNED ACTIVITY

4. Complete final assembly and continue printer system checkout.

Contract [redacted]
Third Quarter FY-66

PAR 53B
11 Mar 66

SUBJECT: Automatic Exposure Control Study

TASK/PROBLEM

1. To develop, design, and fabricate an automatic exposure control system that will scan film continuously on a frame-by-frame basis, and automatically furnish data to set the exposure for each frame. Design objective will be to scan film, establish exposure, and punch a paper tape that can be used on a Galaxy frame-by-frame printer. Necessary means and/or controls will be provided to change various criteria in an attempt to establish optimum parameters for automatic exposure printing.

DISCUSSION

2. Introduction:

a. Under current printer operating procedure, the proper exposure for a negative frame is determined manually by operators who choose and measure the density of selected areas of the frame. These manually measured values in combination with graphs predict the proper printing light intensity to produce the optimum print. With the introduction of frame-by-frame printing, the task of individually measuring each frame, determining the proper exposure, and recording this information becomes a time-consuming operation.

b. The subject PAR is concerned with the development and demonstration of a workable automated frame-by-frame density measurement system in breadboard form.

PAR 53B

11 Mar 66

DISCUSSION

3. Status:

a. Electrical. Construction and testing of the electrical system was completed.

b. Mechanical. Construction and testing of the table was completed.

c. System Testing. Engineering tests on the system have been made under both static and dynamic conditions. Simulated production-type testing is in process. A component failure which occurred in the multiplexer was repaired. Testing so far has indicated that a change in the detected density levels may be desirable. The necessary adjustments for this change will be made as soon as the proper density filters for the set-up can be obtained.

PLANNED ACTIVITY

4. Readjust density level detectors.

5. Continue testing and evaluation.

Contract [redacted]
Third Quarter FY-66

PAR 55S/R1
11 Mar 66

SUBJECT: Preliminary Investigation of Special Applications of the Bimat Process

TASK/PROBLEM

1. Through investigation and study, determine the feasibility of using the Bimat Process to satisfy special and/or unique processing problems of the intelligence community.

DISCUSSION

2. The contractor has developed a technique for Bimat processing 16mm gun-camera film that minimizes the drift of frame lines with respect to the perforations. On the basis of projection of several test films, it was concluded that the quality was satisfactory and that the frame-line drift is approaching an acceptable level. Actual gun-camera footage was requested from TARC to permit a more realistic evaluation of the proposed processing method.

3. Exploratory tests to evaluate sensitometry and image quality of Bimat-processed duplicating film were started. The sensitometry of Bimat-processed Type 8430 film is reasonably close to that of conventionally processed material. The image quality must still be evaluated as well as the Bimat processing of Type 5427 film.

PLANNED ACTIVITY

4. Provide advice and liaison on the gun-camera film problem.

5. Complete sensitometric testing and prepare the final report.

Contract [redacted]
Third Quarter FY-66

PAR 56S
11 Mar 66

SUBJECT: Bimat Processor No. 1

TASK/PROBLEM

1. Investigate, design, and demonstrate the feasibility of processing short lengths (up to six feet) of Plus-X, Tri-X and Royal-X type films in 16-, 35- and 70-mm widths on a variety of cores. Unit to be designed for operation under adverse conditions; i.e., no darkroom, water, etc. Design objectives will be directed to small size, light weight, and simplicity of operation.

DISCUSSION

2. An attaché case was outfitted and used in a number of demonstrations. In general, the Bimat Processor No. 1 has worked quite well.

3. Photographs were taken out-of-doors of miscellaneous subjects using Panatomic-X film and Plus-X film with identical exposures. The Plus-X films were processed conventionally but the Panatomic-X films were Bimat-processed in the subject device. Examination of the processed films showed that the Bimat-processed Panatomic-X films had an effective emulsion speed equivalent to that of conventionally processed Plus-X films. 40X enlargements of portions of these negatives demonstrated clearly the superior image quality of the Bimat-processed Panatomic-X films.

4. One of the accessories in the attache case is a device for treating the processed negative and Bimat films with Carbowax. A new applicator has been built consisting of a plastic box with a tight-fitting cover on which is fastened a rubber squeegee. This device does not leak in use as the older designs did, and the new style squeegee makes it easier to use.

5. While presoaking, excess imbibant is carried out of the tank by the Bimat film and it tends to seep out through the spindle bearings onto the cranks. Although this condition does not affect the processing results, it is an annoyance to the operator. Combinations of snap rings, rubber "O" rings and various greases have been tried in an effort to stop this seepage but only partial success has been achieved.

6. A set of operating instructions has been written and tried on a novice operator. Because the actual trial revealed some omissions and suggested other changes, the instructions were revised.

7. Effort has started on writing the final report and the illustrations have been planned.

PLANNED ACTIVITY

8. Work will be continued at a low level to eliminate the seepage of imbibant onto the cranks.

9. The final report will be completed, published, and distributed.

[redacted]

Contract [redacted]
Third Quarter FY-66

PAR 57S
11 Mar 66

SUBJECT: Bimat Processor No. 2

TASK/PROBLEM

1. Investigate methods and demonstrate the feasibility of processing and making available for prompt use in remote field installations up to 400 feet of 9.5-inch-wide aerial film by means of the Bimat Process. The system will be planned for occasional use by non-photographic personnel under adverse conditions; i.e., no darkroom, but water and electrical power as normally found in remote sites. In addition, consideration will be given to the processing of 70mm and 5-inch-wide films through the use of spool adapters or similar means.

DISCUSSION

2. The specialized laboratory equipment for extracting water from the processed Bimat positive and negative films by means of Carbowax proved very effective in drying the negative at 10 ft/min. A slight residue of Carbowax on the surface of the negative resulted in only slight shading on 10X enlargements as compared to enlargements of the same negative after the Carbowax was washed off. Moderate success has been achieved in drying Bimat Film with Carbowax but satisfactory accomplishment will require more effort than to dry the negative.

3. To provide presoaked Bimat material for the test phases of this PAR, a Zeiss rewind processor has been modified for use as a Bimat presoaker. Although the machine is underpowered and would not be at all suitable for field use, it is adequate to provide the short lengths of material we will need for our work with the laminator and with post treatment. Since development of a presoaker is not within the scope of this PAR, no further testing or modification of the Zeiss rewind processor is planned.

 [redacted]

4. Testing of the laminator was started and results of these early tests look very promising. Both 70mm and 5-inch-wide SO-390 negatives were processed with Kodak Bimat Film. Only minor defects were observed at speeds up to 100 ft/min and virtually no defects at 50 ft/min. Cover sheet was applied successfully to some of the resulting Bimat positives. Improvements which were indicated by test results are being made in the machine. For example, considerably less-massive sets of laminating rollers with ground rubber surfaces were installed to replace the original rollers, and a pneumatic cylinder is now used instead of dead weights to apply laminating pressure. These changes were made to eliminate a lamination defect attributed to the inertia of the laminating roller system.

PLANNED ACTIVITY

5. Because the feasibility of Carbowax film drying has now been established, a format test plan will be used to explore the parameters of Carbowax post-processing treatment of Bimat-processed films. An examination will be made of the effect that Carbowax residues have on the subsequent storage, handling, and use of treated films.

6. Improvements will be made in the laminator so that operation at higher speeds will be entirely satisfactory.

Contract [redacted]
Third Quarter FY-66

PAR 58-5-1S
11 Mar 66

SUBJECT: Wash Water Studies

TASK/PROBLEM

1. Investigate ion exchange, and other systems of water treatment which show promise, to determine their ability to remove hypo and other accumulative salts in used wash water. Acquire and assemble laboratory apparatus to carry out the investigation.

DISCUSSION

2. All testing has been completed. Test details will be reported in the final report which is in preparation.

PLANNED ACTIVITY

3. Complete and transmit the final report.

[redacted]

Contract [redacted]

Third Quarter FY-66

PAR 58-5-2S

11 Mar 66

SUBJECT: Viscous Developer Studies

TASK/PROBLEM

1. Conduct tests and studies to determine the feasibility of using viscous developers. Design and build necessary breadboard.

DISCUSSION

2. The final report is being prepared.

PLANNED ACTIVITY

3. Complete and transmit final report.

[redacted]

[redacted]

Contract [redacted]
Third Quarter FY-66

PAR 58-5-3S
11 Mar 66

SUBJECT: Viscous Washing Studies

TASK/PROBLEM

1. Investigate washing techniques for removing residual fixer from viscous fixed film emulsion. Develop, fabricate, and test necessary breadboard equipment.

DISCUSSION

2. The final report is being prepared.

PLANNED ACTIVITY

3. Publish and transmit the final report.

SECRET

Contract [redacted] Task A

Third Quarter FY-66

PAR 58-5-4S

11 Mar 66

SUBJECT: Removal of Viscous Coatings

TASK/PROBLEM

1. Investigate dry cutoff techniques for removal of viscous processing solutions. Develop and fabricate and test necessary breadboard equipment.

DISCUSSION

2. The final report is being prepared.

PLANNED ACTIVITY

3. Publish and transmit the final report.

[redacted]

Contract [redacted]

Third Quarter FY-66

PAR 58-5-7S/M

11 Mar 66

SUBJECT: Study of Silver Recovery

TASK/PROBLEM

1. To determine the economic feasibility of recovering silver from the in-house Trenton and Dalton processors as presently used.

DISCUSSION

2. The final report PAR 58-5-7M, Study of Silver Recovery [redacted] was transmitted to the customer on 10 March 66.

PLANNED ACTIVITY

3. None. Submission of the final report completed this project.

[redacted]

Contract [redacted] Task A
Third Quarter FY-66

PAR 58-5-8S
11 Mar 66

SUBJECT: Study of Temperature Control of Viscous Coatings

TASK/PROBLEM

1. Investigate and evaluate the feasibility of controlling secondary development by inducing temperature changes in a viscous solution coating hopper at the point of application. Build and test necessary breadboard equipment.

DISCUSSION

2. Preparation of the final report is in progress.

PLANNED ACTIVITY

3. Publish and transmit the final report.

Contract [redacted] Task A
Third Quarter, FY-66

PAR 58-5-9S
11 Mar 66

SUBJECT: Viscous Fix Studies

TASK/PROBLEM

1. Conduct tests and studies to determine the feasibility of using viscous fix solutions in dry cutoff removal applications.

DISCUSSION

2. Prepare final report.

PLANNED ACTIVITY

3. Transmit final report.

Contract [redacted]
Third Quarter FY-66

PAR 60S
11 Mar 66

SUBJECT: Film Handling Techniques

TASK/PROBLEM

1. Design and fabricate a breadboard film dryer to investigate film handling techniques using air support as a means of reducing film abrasions, tracking problems, etc.

DISCUSSION

2. Status. A breadboard incorporating three floating-loop air-dryer tubes was tested. Data such as the following was obtained:

a. Running clearance, based on different web tensions, volumes, and air pressure.

b. Optimum design of air tubes (holes-versus-slots).

c. Correction for the Venturi effect.

This breadboard was modified to accept a larger-diameter tube and similar data was obtained for comparison. This tube was proven to be superior in terms of its ability to support all widths of film at higher web tensions.

3. Preparation of the final report was completed and it is currently being published.

PLANNED ACTIVITY

4. Publish and transmit the final report.

Contract [redacted]
Third Quarter FY-66

PAR 61B
11 Mar 66

SUBJECT: Improved IR Scanner

TASK/PROBLEM

1. To design and fabricate an improved IR scanner that will scan the negative image area as film passes between the primary and secondary development in a Trenton processor. The unit will be designed to scan the width of the image area in the film being processed through a series of 0.020 x 0.020-inch spots and will be capable of determining the D_{min} for any exposure in the roll of film with an accuracy of plus or minus 0.03 density.

DISCUSSION

2. Introduction. The improved IR scanner will use 320 cells spaced 0.025 inch apart. Cell outputs will be fed through operational amplifiers into a 100 kc multiplexer. The sampled output is to be compared to preset D_{min} trigger levels and these outputs will accumulate in preset registers. The register outputs indicate the required processing level.

3. Electronics:

a. The engineering design was completed.

b. Engineering sketches were completed and are current.

c. Hardware was fabricated and checked out to an accuracy of ±1% or ±20mv over the required supply voltage variation and temperature range.

d. Equipment was mounted in a rack with necessary auxiliary controls for convenience in system testing.

e. The rough draft of the operating instructions has been prepared.

f. Fabricated parts required for installation have been received.

4. Optics:

a. Fabrication and assembly of the row of 360 optical collector bars into the air-arch unit was completed. The photocell blocks were aligned to the optical collector bars and the wiring to the photocell completed. This assembly was combined with its light source and connected with the scanning multiplexer unit and the remainder of the electronic system.

b. In testing the complete assembly, the response of the photocells at the ends of the array was found to be a small fraction of that of the photocells in the center, directly under the source. The cause was traced to a highly directional characteristic of the optical collector bars. Light which enters a given bar in a direction more than 3 or 4 degrees away from parallel (to its length) is highly attenuated before reaching the photocell. This property was checked in a breadboard model of the collector bar. A change of the type of diffuse white coating of the bars from the breadboard to this model produced the unanticipated change of optical performance.

c. The optical assembly in its present form is not suitable for film sample widths greater than about 3 inches, and the "geometry" of the observed density is highly specular.

d. The manufacturing process used for the optical collector bars in this model is quite expensive and consideration had been given to the use of fiber-optics fabrication techniques instead of those used here. The preliminary results of tests conducted with a single bundle of clad glass fibers were very promising from the standpoint of collection efficiency. A design utilizing fiber optics for the light collection system has been developed on another project (PAR 70B), and a retrofit set of optics has been ordered for this scanner (PAR 61B).

5. Breadboard. A change in the plan for evaluation of the scanner has become necessary because a careful review of the Trenton workload schedule showed that there is very little time available for checkout of

this scanner on the processor. The realization that considerable operating time will be required to achieve correlation of this scanner with the existing Trenton scanner has led the contractor to seek a different approach to the checkout problem. To provide for this checkout, a breadboard system is being constructed which consists of supply and take-up devices, a constant-speed metering roller, a viewer, the necessary idler rolls, the 320-cell scanner developed in this project, and an accurate simulation of the existing operational Trenton scanner. A web of film is sequentially scanned by both devices, thus providing what currently appears to be the best possibility of comparatively evaluating their outputs. In the interest of economy, electronic simplifications limit to 70mm the film width that can be handled by the simulated Trenton scanner. It is currently planned to replace the original 320-cell optical assembly with the new fiber-optics assembly before test operations begin. This plan presents no scheduling problems because the finished optics are due to be delivered at about the time that the breadboard set-up will be completed.

PLANNED ACTIVITY

6. Complete assembly and preliminary checkout of the breadboard.

7. Install the new retrofit optical assembly in the 320-cell scanner when it is received, and realign the scanner head cells to these optics.

8. Check out and realign the electronics to equalize cell response to light distribution across the entire scanner width.

9. Start testing the 320-cell scanner for comparison with the Trenton scanner.

Contract [redacted]
Third Quarter FY-66

PAR 62S/M
11 Mar 66

SUBJECT: Study of Negative Processing Centralized Controls

TASK/PROBLEM

1. Conduct study to determine the desirability and feasibility of a single location of controls, indicators, and recorders used for negative-processing equipment such as the Trenton Interrupted Processor.

DISCUSSION

2. This study was activated near the end of the quarter. Effort to date has been restricted to the collection of ideas and to planning, in some detail, the approach to the study.

PLANNED ACTIVITY

3. Complete the study during the fourth quarter.

Contract [redacted] Task A
Third Quarter FY-66

PAR 63S
11 Mar 66

SUBJECT: Raw Stock (Film) Cleaning Investigation

TASK/PROBLEM

1. Fabricate and test a breadboard device and study its effectiveness in removing minute dirt particles from duplicating film.

DISCUSSION

2. Status. Air-flow direction and velocity have been studied. The cleaner was modified as follows:

a. Two blowers are now used: one for air supply, and one for air removal. Filtered supply air is directed to both film surfaces immediately after a brushing station. The air passes both over the film and through the brushes. Some air is exhausted into the room and the remainder is removed through the combs at the brush station on the suction side of the cleaner. Air velocity over the film is as high as 8,500 feet per minute. The total pressure differential is 6.5-inches water gage.

b. Modifications were made in the film path and the orifice opening at the entrance to the film cleaner.

c. The static eliminator bars, previously located in the air supply plenum, were repositioned in the air stream preceding air contact with the film.

d. The brushes now provide uniform contact with the film surface, which results in a more uniform air flow through the cleaner. The amplitude and frequency of oscillation can now be adequately controlled. (Raw stock run through the film cleaner indicated that the brushes do not scratch or damage the film.)

3. As a result of gaining control over the frequency and amplitude of the oscillation of the film, it is now possible to increase the speed of operation. It was found that the allowable film speed varies inversely with the brush speed and directly with film tension in maintaining adequate control of film oscillation as follows:

a. 70mm-width Types 8430 and 2427, and 9.5-inch Type 2427 can be run at a maximum brush speed of 348 feet per minute and maximum film speed of 325 feet per minute. Film speed may be reduced to any lower value and operation remains satisfactory.

b. 9.5-inch-wide Type 8430 material can be operated at a maximum brush speed of only 210 feet per minute and maximum film speed of 200 feet per minute. Higher speeds result in objectionable flutter and some film damage. To study this limitation and to check film tensions, a meter was wired into the motorized heads to determine approximate film tensions during operation. Tensions on the film never exceeded 3 3/4-pounds. An increase in supply tensions should improve film handling and permit operation using Type 8430 material at maximum brush and film speeds.

PLANNED ACTIVITY

4. Conduct tests to determine the effectiveness of the cleaning device.

5. Modify controls to increase the film tension on the supply side and then evaluate further the operating speeds.

6. Prepare the final report.

Contract [redacted] Task A
Third Quarter FY-66

PAR 68B
11 Mar 66

SUBJECT: Identification Printer

TASK/PROBLEM

1. Develop, fabricate, and test a breadboard printer for production of thin-base and standard-base identification leaders and trailers.

DISCUSSION

2. All purchase parts were ordered and 95 percent have been received.

3. The mechanical design is complete and 95 percent of all make parts have been fabricated.

4. Fabrication and wiring of the electrical chassis and the readout enclosure was completed.

PLANNED ACTIVITY

5. Continue the electrical wiring of subassemblies.

6. Begin the mechanical and electrical assembly of all parts.

Contract [redacted]
Third Quarter FY-66

PAR 69B/M
11 Mar 66

SUBJECT: Ultrasonic Edge Detector

TASK/PROBLEM

1. Breadboard and test a film-edge guiding device operating on the ultrasonic principle.

DISCUSSION

2. Introduction:

a. The ultrasonic web-edge detector was received from the manufacturer on 15 December 1965. An earlier delivery date was delayed by ambient temperature changes affecting the ultrasound velocity which reduced the sensor accuracy one percent for every 9°F temperature change. This defect was corrected by the addition of a reference ultrasonic pickup sensor located out of the web path and at a fixed distance from the ultrasonic transmitter. The reference circuit was modified to receive the output signal of this sensor so that it would, in effect, compensate for the temperature variations.

b. Sensor sensitivity, as measured by the manufacturer, was one volt output per 0.0025-inch, web-edge displacement over a ±0.030-inch range. The "dead" band at null is 0.0025 inch. Test materials from 0.0015 to 0.010 inch thick were used for these tests.

3. Status:

a. After the sensor was received, tests for determining static accuracy were performed using a micrometer with 0.01mm increments. The following discrepancies in specification requirements were found:

(1) The "dead" band is 0.010 inch rather than 0.0025-inch as specified.

(2) When the web was moved 1/8-inch beyond null, the output signal oscillated.

(3) The output d-c signal contained an unwanted a-c signal.

b. The unit was shipped back to the manufacturer on 5 January 1966 on a no-charge-for-correction basis. Items 3a(1) and (2) were attributed to component failure; item 3a(3) was caused by poor isolation of the output amplifier.

c. After the above corrections were completed, the unit was received on 17 February 1966. Tests for determining static accuracy were again performed using UTB test materials. The following results were obtained:

(1) The "dead" band zone is 0.001 inch minimum and can be adjusted up to 0.008 inch.

(2) The unwanted a-c signal had been reduced but additional modifications were necessary. The output signal is now acceptable.

(3) The repeatability is better than 0.001 inch over a range of 1/4 inch.

PLANNED ACTIVITY

4. Continue static accuracy tests.

5. Assemble sensor with servo motor and test for dynamic accuracy using ultra-thin, thin, and standard-base materials at various film wandering rates.

Contract [redacted] Task B
Third Quarter FY-66

PAR 70B
11 Mar 66

SUBJECT: Film Scanner Recorder

TASK/PROBLEM

1. Design, fabricate, and test a scanning densitometer capable of encoding digital output information on tape or cards in a form suitable for computer analysis of density distribution in large quantities of aerial photographs.

DISCUSSION

2. <u>General Approach</u>:

a. The PAR requires that density readings with a spot-size area of 0.020 x 0.020 inch be taken at 0.20-inch intervals across the film with successive readings taken at spacings of 0.02 to 0.20 inch along the film. These data are to be recorded ultimately in a magnetic tape format compatible with the IBM 7440. The film widths to be scanned vary from 70mm to 9.5 inches.

b. A film transport table is being designed to carry the film over an air arch and scanning head. The film travel rate is governed by a metering roll with an optical pick-up device on its shaft to determine the spacing of successive scans across the film. The air arch and scanning head construction are similar to that used in PAR 61B, Improved IR Scanner.

3. <u>Film Transport System</u>:

a. The film transport table is under construction and delivery is scheduled for mid-April.

b. The transport electrical control system is scheduled for completion by early May. The material required for this phase has been ordered.

4. Optical System. A breadboard fiber optical system which was tested displays good efficiency, controlled field of response, and low crosstalk. The design concept utilizes glass fibers of numerical aperture equal to 0.6, which will produce a response cone of about 37 degrees half angle. The fiber bundles will be potted in a high-optical-density black epoxy. The mechanical parts to house the optics and light-source components have been completed.

5. Data System:

a. Laboratory investigation of the logarithmic converter circuit was started.

b. The Computer Group has been consulted on installation and programming of the IBM 1800. They have been advised that the equipment is scheduled to leave IBM's San Jose, California, plant on 15 July 1966. The Computer Group has been unable to obtain a quotation from IBM on the cost of the remote station equipment. This equipment is necessary to permit installation of the IBM multiplexer and analog to digital converter at a location which will be more than 100 feet from the central computer. The current plan is for the Computer Group to purchase the equipment from other suppliers, providing interface equipment and programming as required.

c. Information for starting the initial programming effort has been given to the Computer Group. This information concerned the required external operating controls and included a description of the signals to be processed by the computer.

PLANNED ACTIVITY

6. Continue coordination with the Computer Group on programming and installation. Continue circuit investigation of the logarithmic converter and upon completion, start the packaging design for the electronics and the wiring of table motor controls.

Contract [redacted]
Third Quarter FY-66

PAR 72B
11 Mar 66

SUBJECT: Black-and-White, Step-and-Repeat, Flat-Bed Contact Printer

TASK/PROBLEM

1. Design and fabricate two black-and-white, step-and-repeat, flat-bed contact printers capable of printing format sizes from 2 1/4 inches by 2 1/4 inches to 9 by 18 inches. (Format requirements were changed by the customer to include format sizes from 1.7 inches to 5 inches).

DISCUSSION

2. Both printers have been assembled, tested, and evaluated. Test results indicate that the specifications have been met.

3. The final report and operating instructions are being prepared.

PLANNED ACTIVITY

4. Complete and submit the final report.

[redacted]

Contract [redacted]
Third Quarter FY-66

PAR 76B
11 Mar 66

SUBJECT: Upgrade Yardleigh Processor

TASK/PROBLEM

1. Develop modifications to the Yardleigh Processor to improve reliability, accuracy, and performance.

DISCUSSION

2. Status:

a. The upgrading effort, except for the [redacted]-frame mark detector (Supplement No. 1) was completed on 10 Feb 66. Engineering checkout was completed on 17 Feb 66 and the Yardleigh Processor was released for production testing on that date. On 21 Feb 66, an operational run was successfully completed.

b. The [redacted]-frame mark detector was completed and ready for installation on 18 Feb 66. However, to prevent undue down time on the Yardleigh Processor, installation was not attempted during the above checkout period.

PLANNED ACTIVITY

3. Complete the installation of Supplement No. 1 ([redacted]-frame mark detector).

4. Complete machine checkout on the remaining formats.

5. Prepare and submit the final report.

[redacted]

Contract [redacted]
Third Quarter FY-66

PAR 77B/R1
11 Mar 66

SUBJECT: Processed Film Slitter

TASK/PROBLEM

1. Modify two (2) 70mm fine-film-slitting machines to provide more accurate slitting control and minimize operator fatigue.

DISCUSSION

2. Both slitters were delivered.

3. The final report was published and transmitted to the customer on 16 Feb 66.

PLANNED ACTIVITY

4. None. Publication of the final report and delivery of the slitters completed this project.

[redacted]

[redacted]

Contract [redacted]

Third Quarter FY-66

PAR 78S

11 Mar 66

SUBJECT: Cross-Frame Lacquerer

TASK/PROBLEM

1. Investigate and test means of applying lacquer uniformly to a 1-inch by 3.5-inch strip across film up to 9.5 inches wide to cover and protect between-frame titles (cross-titles). Fabricate necessary breadboard equipment.

DISCUSSION

2. Testing and evaluation of the Cross-Frame Lacquerer breadboard is complete. The feasibility of this device has been proven. The final report is being prepared.

PLANNED ACTIVITY

3. Publish and transmit the final report.

 [redacted]

Contract [redacted], Task A
Third Quarter FY-66

PAR 79B
11 Mar 66

SUBJECT: Unimak Film Titler

TASK/PROBLEM

1. Design, fabricate, and test two Universal Titlers capable of accepting standard longitudinal heads, binary titling heads, and transverse titling heads, as well as an arbor head, in which all the type will be self-contained on manually settable wheels.

DISCUSSION

2. Status:

a. The first unit, with two universal heads, is rescheduled for engineering acceptance testing in mid-March 1966, with binary, index, and rotary heads to follow.

b. Fabrication of the first console is complete; fabrication of the second console is nearly complete.

c. Sample titles on ultra-thin base, made on the universal-head test unit, indicate that the new adjustable platen design will be a desirable feature.

d. A sample print of the characters for the rotary head wheels was submitted by a vendor. The ampersand (&) was the only character not acceptable for the reason that it was oversize. This information was given to the vendor with an approval of all the other characters.

e. A universal head was assembled from test castings and engineering model parts for debugging prior to fabrication of parts for all heads. This prototype head has been tested with excellent results using various weight materials.

PLANNED ACTIVITY

3. Acceptance test the first unit after fabrication is completed.

Contract [redacted]
Third Quarter FY-66

PAR 81S/M
11 Mar 66

SUBJECT: Versamat Processing, Water Usage Reduction Investigation

TASK/PROBLEM

1. Investigate and test means of reducing the quantity of fresh water required for Versamat processing.

DISCUSSION

2. The Final Report, dated 29 November 1965, was transmitted on 22 December 1965.

PLANNED ACTIVITIES

3. None. Project completed.

Contract [redacted] Task A
Third Quarter FY-66

PAR 82B
11 Mar 66

SUBJECT: Two-Strand Stereo Viewer*

TASK/PROBLEM

1. Design, fabricate, and test an engineering model binocular microscope viewer for two photographic stereo images existing on two different strands of roll film, 70mm to 9.5 inches wide.

DISCUSSION

2. The contractor was authorized to purchase, as a minor project, one Modified Versatile Stereoscope to take advantage of a temporary favorable price (40% savings). An order has been placed for this item.

3. There was no activity on this PAR during the report period.

PLANNED ACTIVITY

4. Unless directed otherwise by the customer, no further work will be done on this minor project. Delivery of the Modified Versatile Stereoscope is promised for April 66. A final report will not be submitted for the subject minor project.

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* Effort on this task has previously been reported under PAR 82M.

Contract [redacted]
Third Quarter FY-66

PAR 83S/M
11 Mar 66

SUBJECT: Versamat Rack Washer

TASK/PROBLEM

1. Study cleaning methods and techniques for cleaning Versamat racks. Build simple breadboard equipment as required.

DISCUSSION

2. The Final Report, dated 23 November 1965, was transmitted on 22 December 1965.

PLANNED ACTIVITY

3. None. Project completed.

Contract [redacted]
Third Quarter FY-66

PAR 84B/M
11 Mar 66

SUBJECT: Three-Lamp Lamphouse for Belair Printer

TASK/PROBLEM

1. Fabricate and test a lamphouse for three-color additive printing on the Belair Printer.

DISCUSSION

2. Status. Testing of the lamphouse was completed and mechanical operation is satisfactory; however, tests indicated that temperatures of the color filters are higher than was anticipated.

PLANNED ACTIVITY

3. Complete testing and prepare the final report.

Contract [redacted] Task D
Third Quarter FY-66

PAR 86S
11 Mar 66

SUBJECT: Study the Applications of Liquid Gates to Continuous Printers

TASK/PROBLEM

1. Modify an existing five-inch continuous contact printer to incorporate breadboard solution applicators and removers so that index matching solutions can be applied in the printing beam. Evaluate the performance of the modified printer with various solutions and methods of application.

DISCUSSION

2. Mechanical Status:

a. Printer conversion design layouts have been started following the general approach as outlined in the subject PAR.

b. Some preliminary investigations have been made with respect to various materials and their use in the highly corrosive fluids normally used in wet gate printing.

c. The problem of evaporating fluid from the material and removing it from the printing area is being studied.

3. Electrical Status:

a. There was no action pending establishment of the mechanical design.

PLANNED ACTIVITY

4. Continue the investigation and the design layouts.

Contract [redacted], Task B
Third Quarter FY-66

PAR 87S/M
11 Mar 66

SUBJECT: Variability in Resolution Values

TASK/PROBLEM

1. Using resolution targets produced in accordance with existing fabrication techniques, perform a preliminary study designed to determine, if possible, the causes of variations in resolution values when these targets are used in accordance with established checkout procedures.

DISCUSSION

2. There was no activity which is reportable.

PLANNED ACTIVITY

3. Complete evaluation of the series of resolution targets printed on the Niagara.

Contract [redacted], Task B

Third Quarter FY-66

PAR 88S/M

11 Mar 66

SUBJECT: Mathematical Color Model

TASK/PROBLEM

1. Describe a mathematical model for a generalized color photographic system and develop digital computer programs to implement the model. The system design will accept theoretical and empirical characteristics of color systems.

DISCUSSION

2. The computer program which forms the nucleus of the mathematical model is operational. This program can be used to calculate the response of a source-filter-film combination. Its capability has been utilized to compute lens T/numbers for each emulsion layer of a color film and filter factors for PAR 24-5-2. It has also been used to select narrow band filters for color printer designs.

3. Several subprograms are planned to complement the nucleus program. The following have been written but require some checking before they will be considered operational.

a. Generate the spectral distribution of tungsten light sources at a given color temperature using Planck's equation for black-body radiators.

b. Modify the intensity of a source while maintaining constant color temperature.

c. Modify filter thicknesses and dye concentrations according to Beer's law.

d. Plot graphs of response, log response, and normalized response versus wavelength.

e. Modify the spectral distribution of illuminants as a result of Rayleigh-type scatter or any similar type of analytical function.

f. Calculate the Tri-chromatic coefficients and chromaticity coefficients for C.I.E. color specification.

A separate program has been written to convert integral three-color density measurements to analytical densities.

4. A cataloging system has been established to store source, filter, dye, and film characteristics on magnetic tape. Each item is assigned a 4-digit, alpha-numeric code name. Submission of this code to the computer calls the characteristics of the element into position for computation. The cataloging system will accommodate 200 sources, 400 filters, 100 dye sets, and 200 films. Presently, data is stored for 14 sources, 70 filters, 1 dye set, and 9 films.

PLANNED ACTIVITIES

5. Continue cataloging source filter, film data, on magnetic tape.

6. Complete computer subprograms and check out.

7. Implement the model where applicable to gain experience and assess its usefulness.

Contract [redacted]

Third Quarter FY-66

PAR 89

11 Mar 66

SUBJECT: Study Processing of Stellar Image Records

TASK/PROBLEM

1. Investigate methods and study techniques to reduce the effects of non-image forming light in stellar image records.

DISCUSSION

2. In order to properly evaluate the problem and to apply techniques to reduce the effects of non-image forming light or "fog," it is necessary to extract density data from stellar photographic missions to determine the magnitude of the problem. Specifically, the "photographic record evaluation" is presently being made to determine the following:

a. Effect of fog density variation on stellar density.*

b. Determination of stellar and fog density ranges.

c. Comparison of above density ranges with presently used mission processing and film capabilities.

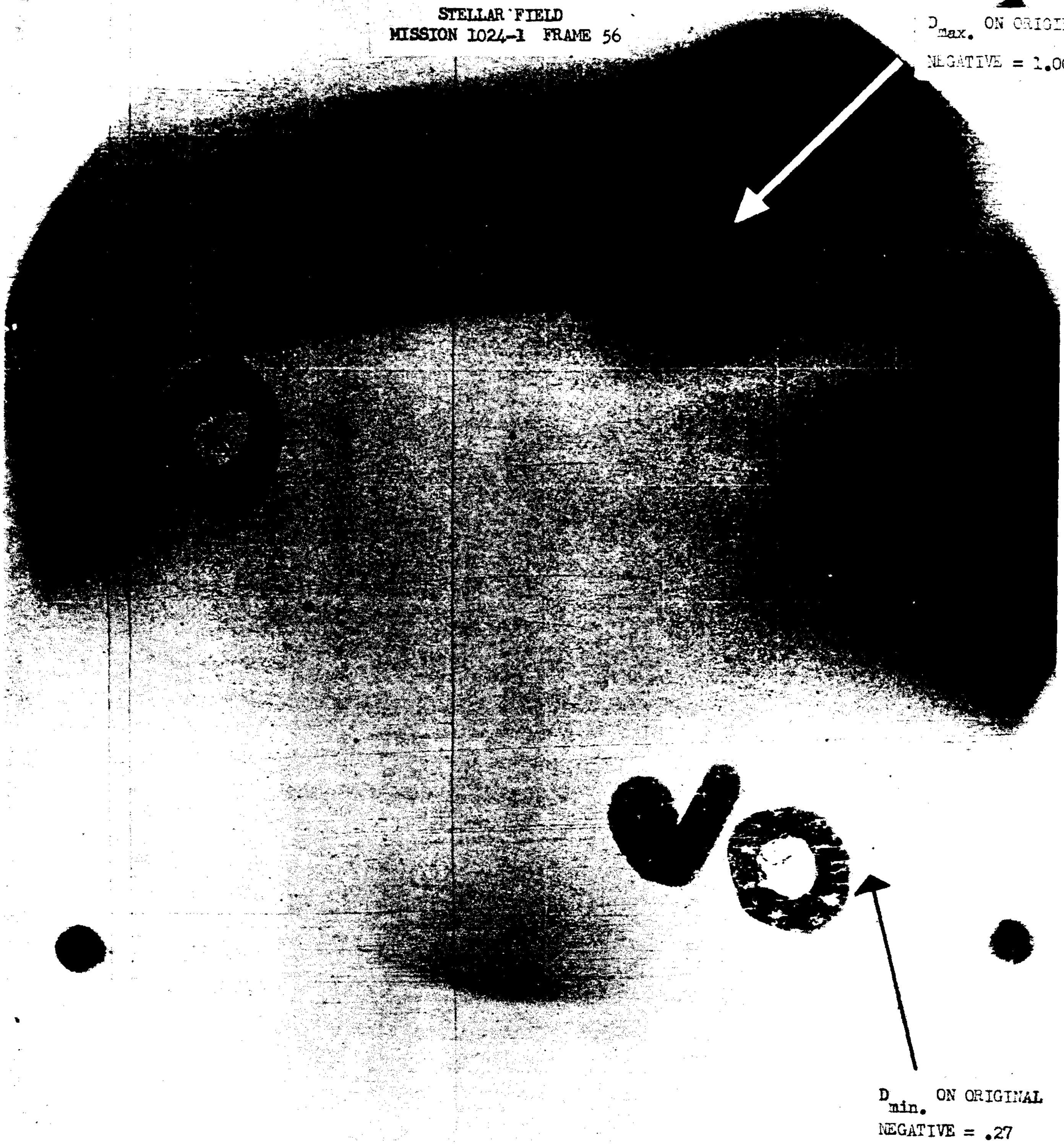
3. Though the collection and evaluation of data is not complete, some conclusions can be made from the records of previous missions. At present, only the original negative of Mission 1024-1 is on hand for continued testing, although data will continue to be taken from missions as they arrive in-house.

4. There are areas of high and low density which appear on all frames of the original stellar negative. These areas appear in the same positions on each frame regardless of pass as seen on the four negative photographs of Figures 1 through 4. The difference in density from orbit to orbit is probably a function of solar altitude and solar direction.

* The term "stellar density" refers to density of star images.

FIGURE 1

STELLAR FIELD
MISSION 1024-1 FRAME 56



PAR 89S
11 Mar 66

FIGURE 2

STELLAR FIELD
MISSION 1024-1 FRAME 240

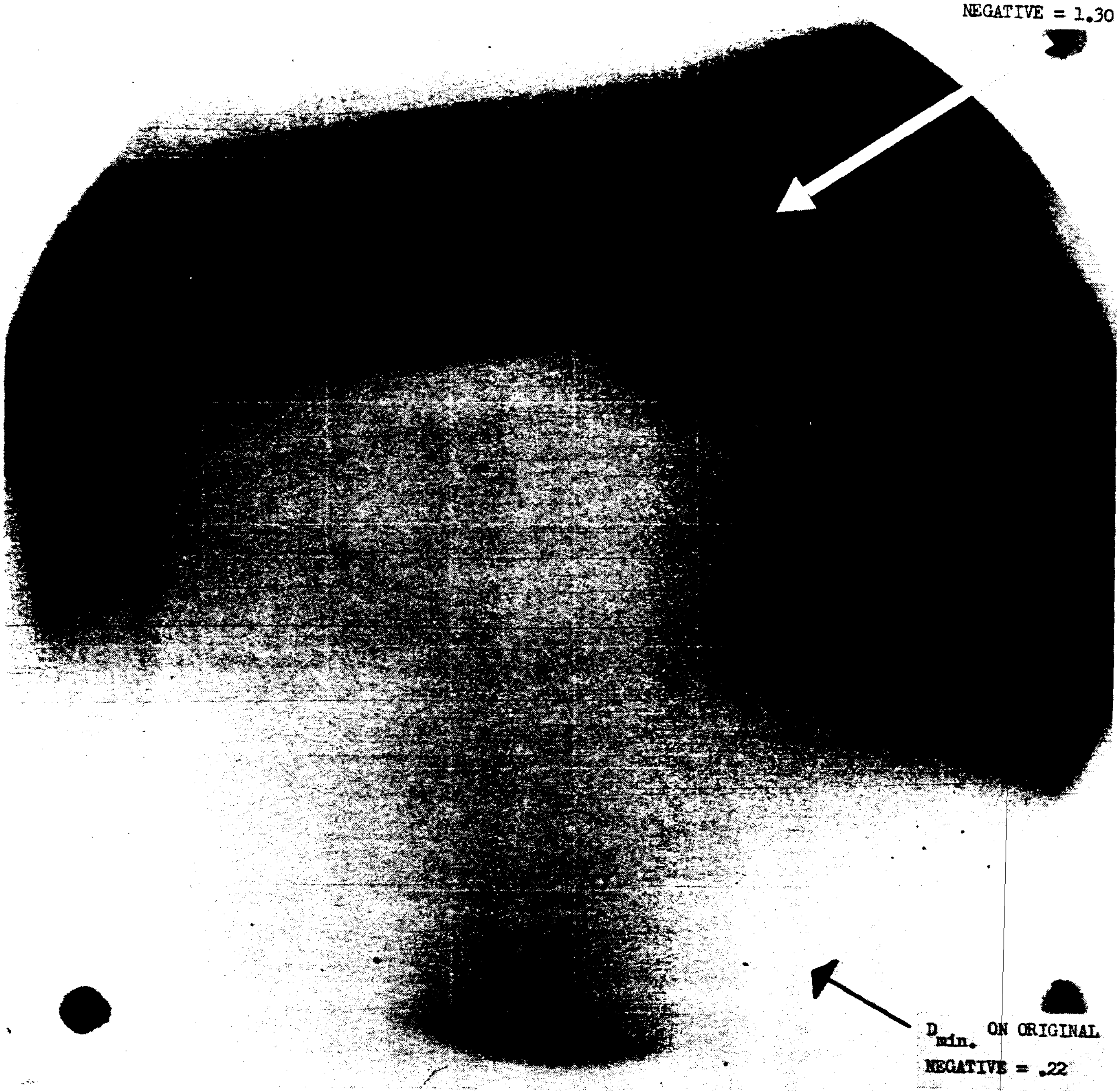
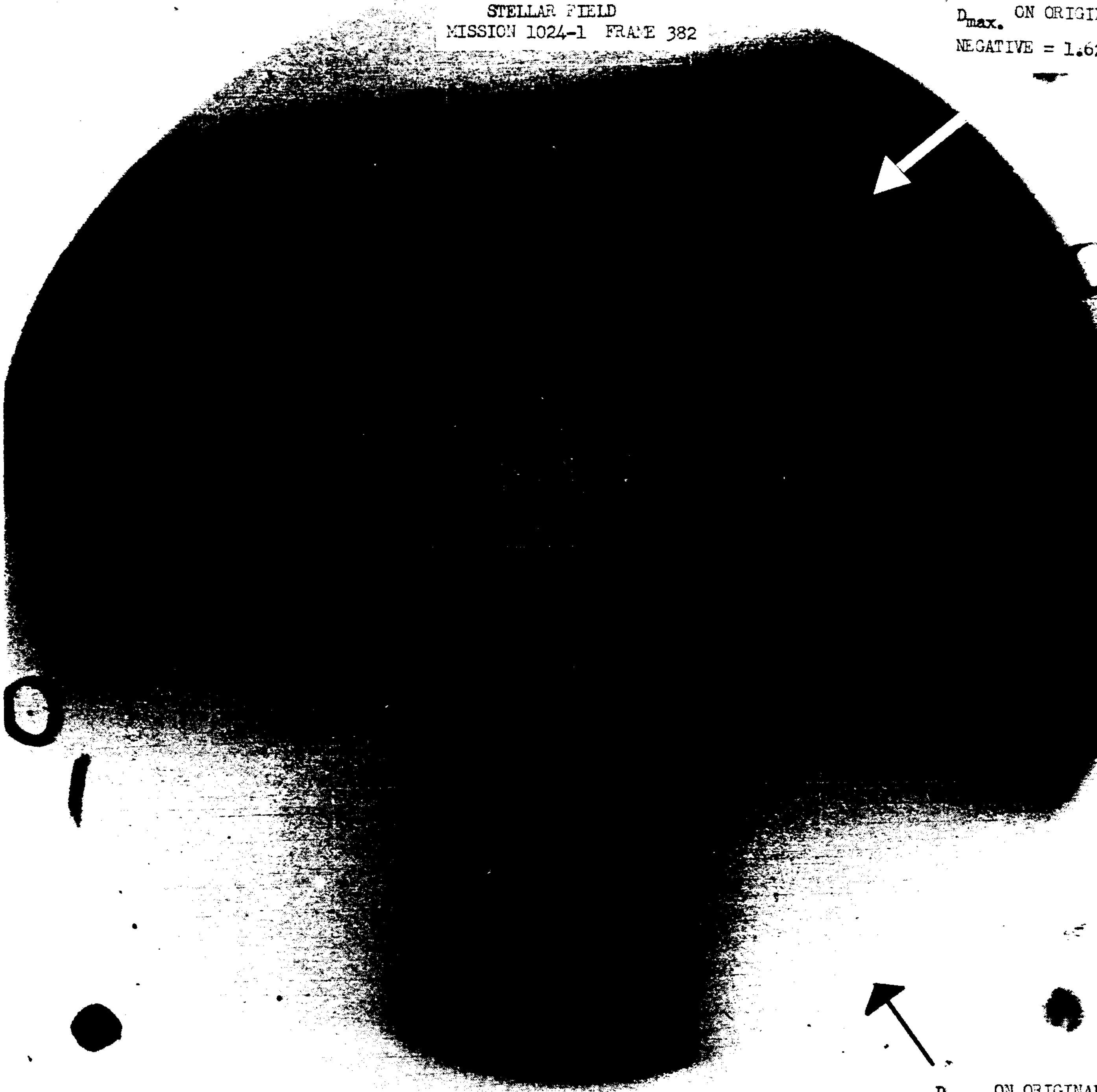


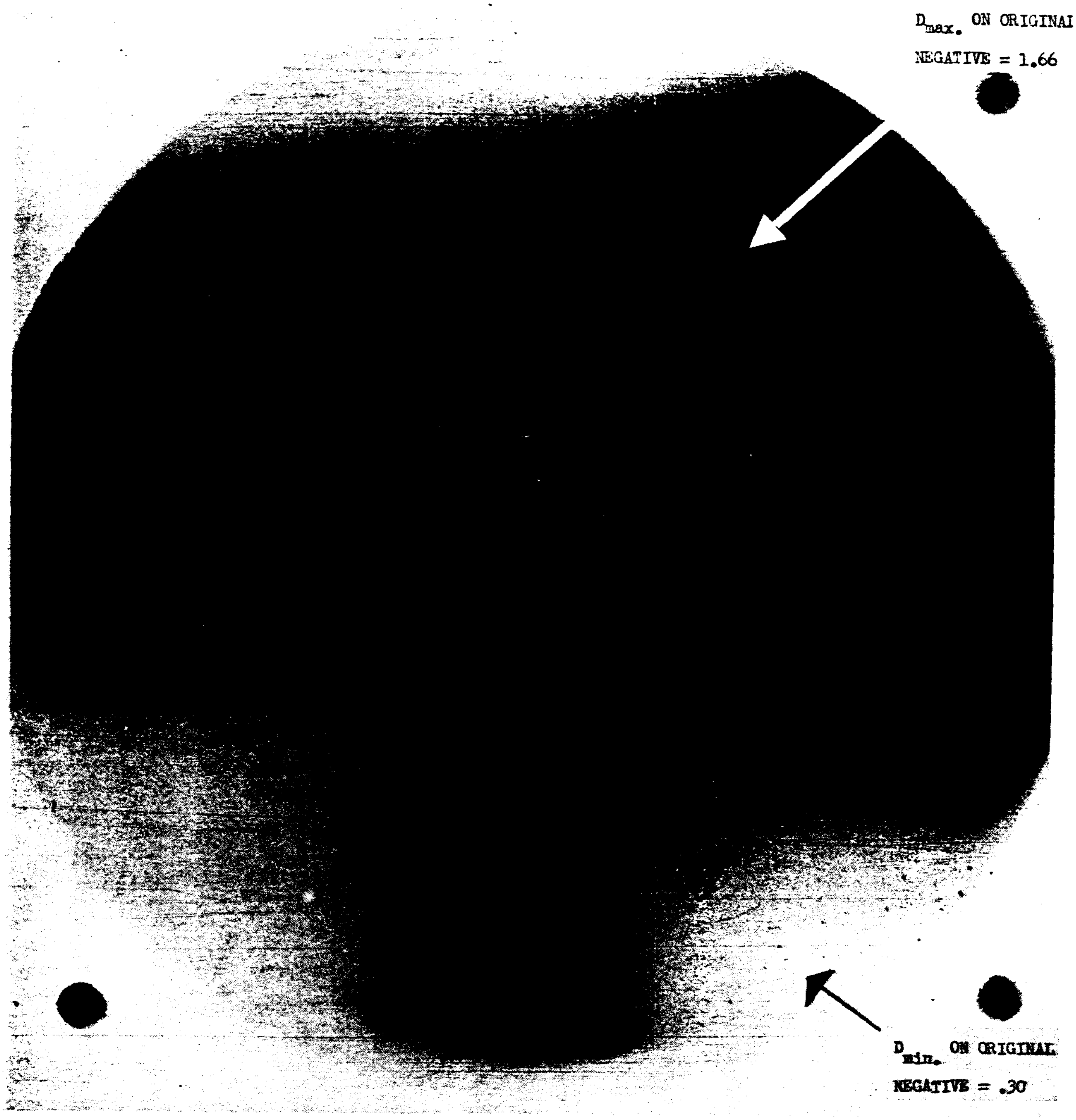
FIGURE 3
STELLAR FIELD
MISSION 1024-1 FRAME 382



PAR 895
11 Mar 66

FIGURE 4

MISSION 1024-1 FRAME 231



5. From time to time, streaks of extremely high density appear on the original negative as shown on the Polaroid prints, Figures 5 through 8. These streaks maintain the same angular orientation, though their lengths and widths vary.

6. As of now, no conclusive data is available relating the effects of increased fog density on stellar image density. At this writing, only one stellar image has been traced on the microdensitometer at two different fog levels. In this case, the maximum density was found to be identical, though the apparent size of the stellar image was smaller in the higher background density trace. If stellar density is found to increase with fog density increase in high density frames, then the level of processing or exposure can be decreased in order to put the background or "fog" density nearer the toe of the process curve.

7. From the stellar data tabulated in Table 1 of this report, it is seen that the background fog densities in all frames of Mission 4024 range from 0.40 to 2.50, while the stellar images traced from one frame on the microdensitometer range from 1.64 to 3.42. Although these two density ranges do not necessarily overlap in the frame traced on the microdensitometer, it is apparent that the less dense stellar images of some frames will be obscured by the higher fogged background densities. This is illustrated by Figure 9, which is the process curve of Mission 4024 with the pertinent density ranges superimposed on it.

8. It can be seen that stellar images can be obscured in frames having a high density background near the shoulder of the process curve. However, this condition of obscured stellar images has been found to occur on frames of extremely low density backgrounds because background and stellar exposure levels appear on the toe of the process curve.

9. In all cases, it is desirable to have as many stars as possible visible to the observer in each frame. Though low density background is desirable, it must not be brought too low, in the process cycle, so that the low density stars are obscured.

10. It is possible that in the process cycle, by means of experimentation with development time, temperature, etc., a means may be found to arrive at a satisfactory background density level which will be uniform from frame to frame.

PAR 89S
11 Mar 66

FIGURE 5 & 6

EXAMPLES OF EXTREME HIGH DENSITY AREAS ON ORIGINAL NEGATIVE OF STELLAR IMAGES

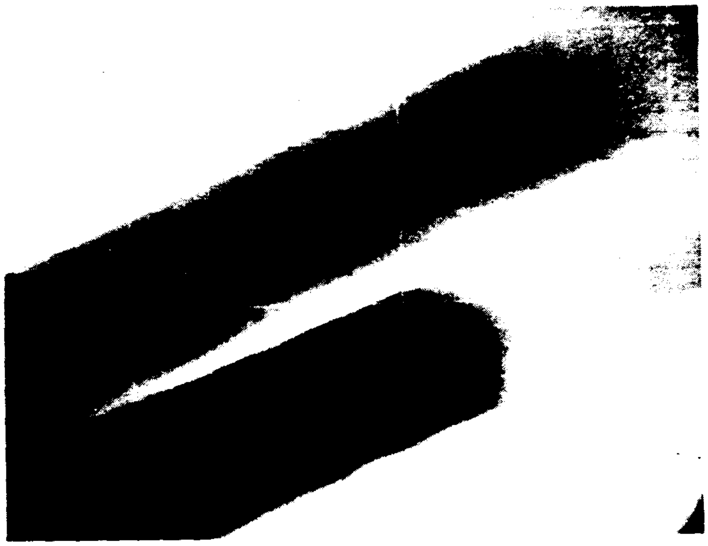


FIGURE 5

MISSION #1024-1
FRAME #8

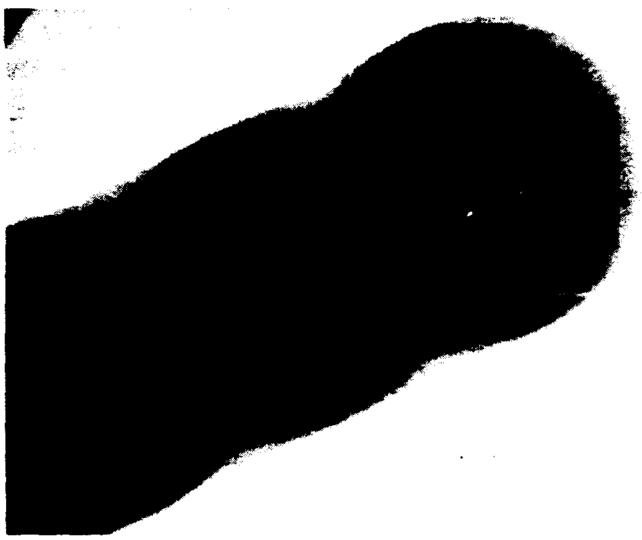


FIGURE 6

MISSION #1024-1
FRAME #86

FIGURE 7 & 8

EXAMPLES OF EXTREME HIGH DENSITY AREAS ON ORIGINAL NEGATIVE OF STELLAR IMAGES (Continued)

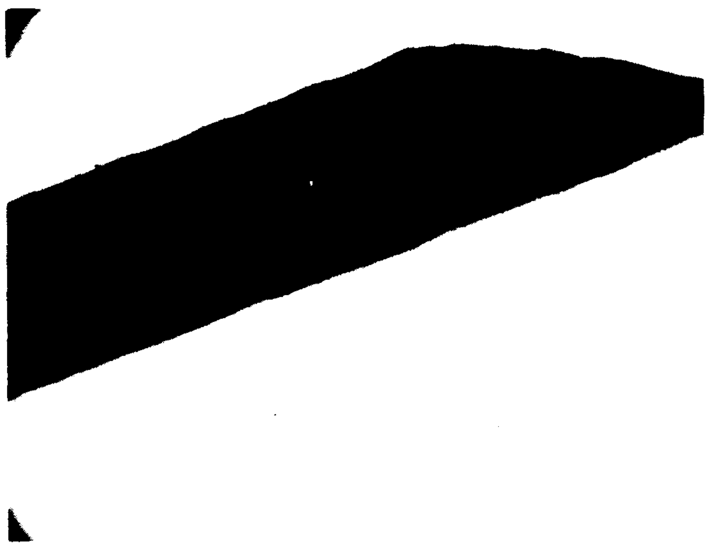


FIGURE 7

MISSION #1024-1
FRAME #172

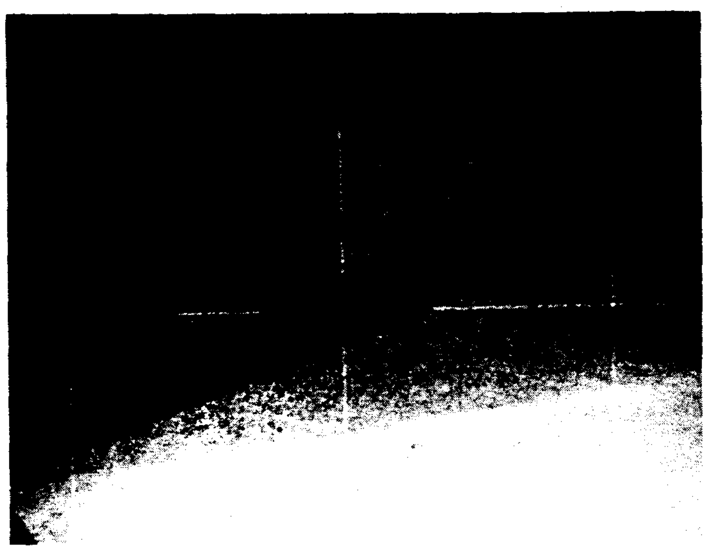


FIGURE 8

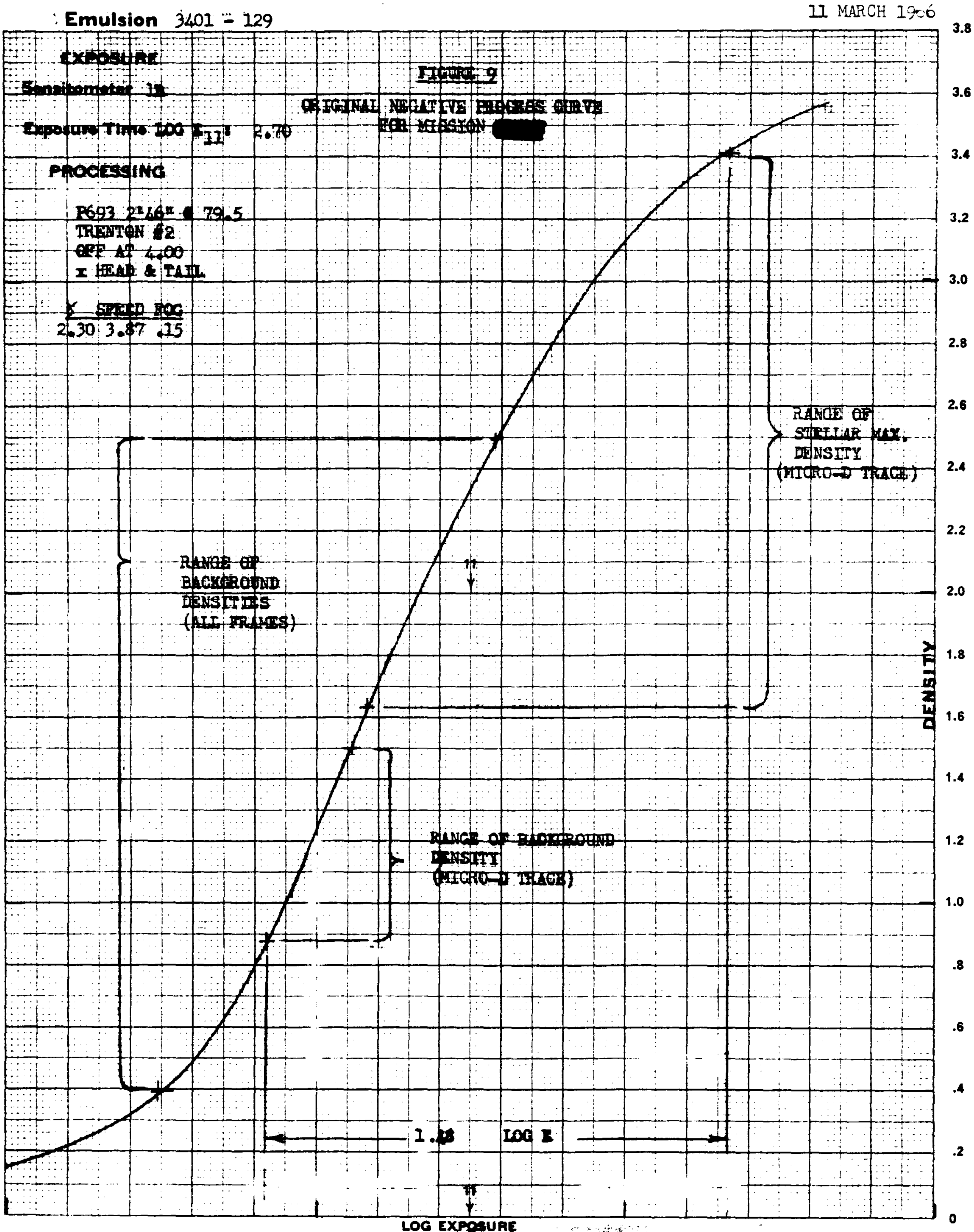
MISSION #1024-1
FRAME #331

Table 1

Background Density Ranges of Various Stellar Mission Original Negatives

Mission	Max. Background Density	Min. Background Density	Comments
1024-1	2.09	0.18	Stars apparently lost in toe of process curve.
1028-2	2.01	0.42	
[redacted]	2.50	0.40	
[redacted]	3.40	0.30	Stars apparently lost in shoulder of process curve.

[redacted]



[redacted]

PLANNED ACTIVITIES

11. Continue evaluation of stellar image records so as to definitely determine the effect of fog on the photographic records.

12. Experiment with processing techniques involving the changing of developer time as well as the developer solutions themselves.

[redacted]

Contract [redacted], Task B

Third Quarter FY-66

PAR 90S

11 Mar 66

SUBJECT: Film Tension and Transport Study

TASK/PROBLEM

1. Through the use of breadboard modifications and/or additions to existing equipment, develop and investigate techniques for tension measurement and transport analysis in moving film webs.

DISCUSSION

2. Mechanical. Fabrication of mechanical parts was started on 13 Jan 66. Fabrication of strain tubes for Niagara rollers was completed and gages have been bonded to one of the tubes for checkout. The stainless steel strain tube for the Yardleigh analysis is nearly complete. The remaining parts are scheduled for completion by 30 Mar 66.

3. Electrical. Initial calibration of electronic monitoring equipment was completed. One defective amplifier was found and returned to the manufacturer for repair; this, however, will not delay the program.

PLANNED ACTIVITY

4. Mechanical:

a. Perform checkout on the first strain tube; complete bonding of gages to the remaining strain tubes after initial checkout.

b. Assemble and calibrate strain rollers.

c. Make a suitable storage box for rollers.

5. Electrical. Complete circuitry on one strain tube and perform checkout; complete the remaining assembled strain rollers; analyze and evaluate project.

[redacted]

[redacted]

Contract [redacted] Task D
Third Quarter FY-66

PAR 91B
11 Mar 66

SUBJECT: Re-spooler for Ultra-Thin-Base Film

TASK/PROBLEM

1. Develop, fabricate, assemble, and test a breadboard device to re-spool ultra-thin-base film.

DISCUSSION

2. The design has been developed for several major components of the system.

3. An estimate for a sensor and control system has been received from one vendor, and a second estimate from another source is expected within the week.

PLANNED ACTIVITY

4. Continue work on the design of components; prepare detail drawings for fabrication of parts.

5. Requisition a sensor and control system.

6. Where possible, release orders to purchase parts.

[redacted]

Contract [redacted], Task B
Third Quarter FY-66

PAR 93S
11 Mar 66

SUBJECT: Temperature Control of 70mm Viscous Hoppers

TASK/PROBLEM

1. Develop, fabricate, and test breadboard equipment for controlling and rapidly changing the temperature of viscous developer solutions in a 70mm hopper at the point of application to film. The solution temperature must be uniform across the width of the 70mm film and must change rapidly in response to an input signal.

DISCUSSION

2. Introduction. The design goal is to be able to change the viscous developer within 1/4 inch of film travel (62 milliseconds). The viscous developer will be supplied to the hopper at ambient or lower temperature. Heating strips in the lips of the hopper will be controlled by a feedback system to increase or decrease the quantity of heat applied. Temperature sensing of the developer at the output of the lips will be accomplished either by a bare wire thermocouple or a resistance wire (resistance temperature dependent) immersed in the heated viscous developer to supply a control signal for the feedback system.

3. Mechanical Status:

a. An experimental hopper for test purposes was fabricated. The heater element in this hopper is made of wrinkled Invar, 3/4 inch wide, 0.047 inch high, with a wrinkle pitch of 0.1 inch. Two mounted thermocouples permit temperature measurements to be made of the viscous developer leaving the heater and the hopper lips.

b. Results of flow tests made on the hopper were acceptable. Flow calculations based on this particular heater element configuration indicate a 0.6-second transit time for the viscous developer past the heater.

4. Electrical Status:

a. Heat transfer tests on the hopper were performed. The viscous developer temperature increased 1°F per 2.5 watts heater power input. The temperature plot for sudden power-level changes indicates a heater thermal time constant of 0.15 second. The heater thermal time constant was confirmed in further tests made on the heater element alone. The time required to make a temperature change in the viscous developer output measured from 10% to 90%, was 1.3 seconds.

b. Temperature profile tests were conducted on the hopper viscous developer discharge. Long-term temperature stability at any given position is good. The temperature profile, however, contains drastic variations from point to point especially when the measuring increments are reduced in size. This result dictates the use of a resistance wire as temperature sensor for determining the mean viscous developer temperature.

c. Earlier calculations of hopper response times were reviewed. The review took into account the significant heater thermal time constant which was originally assumed to be negligible. The results indicate that there is good correlation between mathematical and actual response data.

PLANNED ACTIVITY

5. Test the 1/8-inch-wide wrinkled heater and correlate results with the existing heater to aid in further designs.

6. Investigate the feasibility of a number of successive narrow heater elements. Consider sequential power cycling of these heater strips to give the net effect of having only one heater element.

7. Start construction of the control circuitry to achieve closed-loop-feedback operation.

Contract [redacted], Task B
Third Quarter FY-66

PAR 94B
11 Mar 66

SUBJECT: Yardleigh Recorder

TASK/PROBLEM

1. Design, fabricate, and test an automatic data recorder which will provide records of the Yardleigh Processor and of operator actions, processing level, and IR scanner outputs related to film footage. The device is also to provide manual back-up for operating the Yardleigh Processor in case of control electronics failure.

DISCUSSION

2. Introduction. A device which will record the Yardleigh Processor actions as a function of film footage will serve at least three purposes by providing:

a. Information useful in the post-processing analysis of missions.

b. Some information with which to check on valid operation of the control circuits of the Yardleigh during a mission run.

c. Manual back-up for the operation of the Yardleigh in the event of control-electronics failure.

3. Electrical Status:

a. The format for the recorder print-out was established using continuous paper feed. Print-out for process levels, IR scan levels, and frame detection will be in the form of symbols in assigned columns. In this case, a minus sign will probably be used to indicate action and a blank for no action. Symbols or blanks will be recorded for each inch of film travel. In addition, numerical footage will be printed out for every foot of film travel.

b. Construction of the electrical chassis, and fabrication of the console interconnecting cables was completed.

c. Preliminary checkout of the electrical chassis was started using simulated signals.

d. A problem has arisen in the digital recorder print-out. It appears that the platen pressure or clearance is not proper, resulting in excessive embossing of the paper and background smudging. This condition is quite apparent when one or two columns are used to print a minus character and the other columns are programmed blank. The vendor has been contacted to advise and assist in finding a satisfactory solution.

4. Mechanical Status. The design and documentation of the recorder is 98 percent complete and parts fabrication is complete. Modification of the printer and assembly of the console are in progress.

PLANNED ACTIVITY

5. Complete checkout of the electrical chassis.

6. Complete mechanical assembly.

7. Perform checkout of the mechanical and electrical operation of the completed unit.

8. Arrange for installation of the completed unit.

Contract [redacted], Task D
Third Quarter FY-66

PAR 95 B
11 Mar 66

SUBJECT: Experimental Printer for UTB Films

TASK/PROBLEM

1. Develop, fabricate, test, and evaluate a breadboard drum-type continuous printer with necessary controls and mechanisms to insure that physical damage to film is held to a minimum. A Niagara Printer must be made available for the breadboarding.

DISCUSSION

2. Introduction. UTB film can be easily damaged on a printer; for example, misalignment at the negative windup will cause rolled edges or creasing. Although the film usually tracks within ±1/32 inch of its normal run position, it can also have considerable offset. Normal splices may cause ±1/16 inch offset. Positioning the film on the drum at startup may result in more than 3/4 inch offset.

3. Status:

a. Tests were made to establish the rates of correction needed for a web guiding system. During normal run conditions, the amount and rate of correction required are both small. However, offset and bias in the web, when it is placed on the printer drum at threadup, can result in sidetracking at rates greater than one inch per second.

b. No commercial web-guiding system could be found which was suitable for this application. The best available commercial units require a hydraulic system, are designed for larger machines, and seem unduly complex for this application.

c. Many types of edge-position sensing devices were considered and the following three types, listed in order of preference, are considered adaptable:

[redacted]

(1) The first choice is an ultrasonic device which offers no disturbance to the product and is the least sensitive to sag and curl of the product.

(2) The second choice is an electrical gaging head with a probe which rides the film edge under low pressure. It has good accuracy but extensive rework would be required to expand the range of travel of this device.

(3) The third choice is an air-nozzle-type sensor with a pneumo-electric converter. It operates on a pressure of 1/4 inch of water and was designed for use on 1/4-mil polyethylene sheet.

d. A preliminary layout for a dynamic web-guiding system was made which is 80 percent complete. This consists of a movable windup section shifted axially by an electro-mechanical servo system to align it with the oncoming web. The edge position sensor is located just before the last idler roll and is an ultrasonic device. Design effort on this system was temporarily discontinued to study and evaluate a new approach.

e. A method of guiding with stationary rollers is now being developed. The film approaching the windup roll is formed into a shallow "U" shape and positions itself when it flattens out onto the windup roll. The test results on a Belair printer were good. Subsequent tests on a Niagara Printer showed that a limited amount of self-correction is achieved when tensions are low. A method of aligning the film during threadup is currently being studied.

PLANNED ACTIVITY

4. Investigation will continue on methods of aligning the film at startup.

5. Further tests will be made on the stationary type of web guide when threadup aids are ready.

[redacted]

Contract [redacted] Task C
Third Quarter FY-66

PAR 100-1S
11 Mar 66

SUBJECT: All-Viscous Chemistry

TASK/PROBLEM

1. Develop viscous chemistry specifically applicable to the 9.5-inch All-Viscous Processor (PAR 100-4B).

DISCUSSION

2. Activities associated with this PAR may be categorized under three general headings: Support Activities, Evaluation Activities, and Long Range Investigation.

3. Support Activities. This effort is primarily the preparation of the required chemical mixes for all viscous processing on the present All-Viscous Breadboard Processor (Blizzard). The burden of adequate supply has been more affected by variety rather than quantity. Almost all of the mixes used in the fourteen-step original process presented operational problems and required either adjustment or modification. There were problems in accomplishing effective and satisfactory gelation (congealing) of viscous coatings. The mechanism of congealing is understood, however, and has been effectively achieved for all solutions in the laboratory and in practice on the Blizzard. A high pH is essential for optimum gelation. Because the product itself undergoes a wide variety of pH changes throughout a complete processing cycle, achieving optimum pH at each gelation stage is the central problem. Because of results from work done under PAR 100-4B, the decision was made to eliminate the gelation phases and go to a squeegee removal system throughout the processing cycle. This eliminates a significant range of chemically related problems as well as problems of application technique.

4. Evaluation Activity:

a. Total evaluation of all viscous processing, required chemistry, sensitometry, and physical quality are the objectives of this activity. First priority was given to determining the preferred first- and second-stage developers that will produce an acceptable process on emulsion 3404. Early development work on the Blizzard was confined to MX578 as a possible first and second stage developer. The general aim is for a process equal in speed, gamma, and sensitometric quality to conventional processing systems for this product. Specific requirements generated by the needs of all viscous processing require an initial scanner curve* which represents for the infrared scanner a satisfactory slope or gradient for the toe region such that it can be differentially scanned. In terms of minimum acceptable process range, at least a 0.3 Log E difference at a density of 1.0 between the primary condition and full condition curve has been a design goal. Such a process was achieved with MX578 on the Blizzard at 8 ft/min. Thus far, it has not been possible to duplicate this process at faster transport speeds with MX578 on the Blizzard. Continued experimental work with MX578 on the Blizzard is being done under PAR 100-4B.

b. Evaluation of different developers with a potential for use in all-viscous interrupted processing is being done in the Vixen. A complete time and temperature series for several developers has been completed on film type 3404, both single and double coat in some cases as well as mixed double coats, where one type of developer is used for the first coat and another for the second coat. The most important of these developers are MX574, MX578, MX577, and MX575. The curves for developer MX574 (Figures 1-4) are a representative sample of the type of investigation being done on developers. The complete range of development, after initial scanning, must

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* The initial scanner curve is one which shows sensitometric values for the film which correspond to the time of scanning.

Emulsion 3404-217
Sensitometer 1B
Exposure Time 1/25 Sec. Log E_{11} = $\bar{1}.30$

Hopper	Strip	Fog	Gamma	0.6G/Speed	Second Coat Dev. Temp.	Second Coat Cab. Temp.	Dev. Time
Full	A	.07	1.63	$\bar{1}.64$	80°F	80°F	40"
Full	B	.07	2.11	$\bar{1}.53$	60°F	80°F	40"
Full	C	.07	2.09	$\bar{1}.49$	70°F	80°F	40"
Full	D	.07	2.12	$\bar{1}.42$	80°F	80°F	40"
Full	E	.07	2.40	$\bar{1}.44$	90°F	80°F	
Full	F	.08	2.51	$\bar{1}.40$	100°F	80°F	

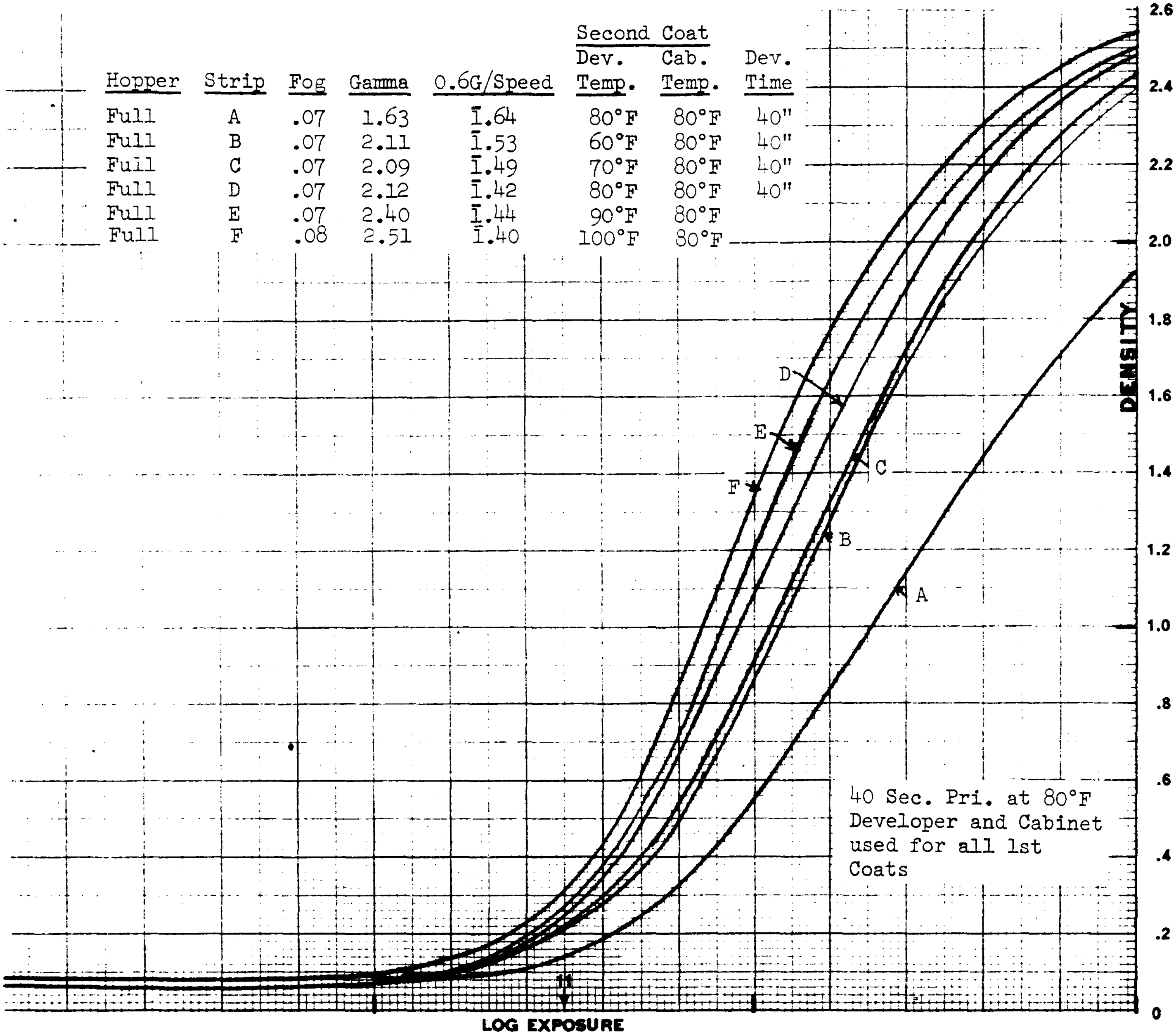


Figure 1. Vixen Test No. 158 Double Coat Temp Series on 2nd Coat Viscous MX574 1st Coat on all Strips, 40 Sec., Dev. 80°, Cab. 80°

[redacted]

Emulsion 3404-217
Sensitometer 1B
Exposure Time 1/25 Sec. Log E_{11} = $\bar{1}.30$

Hopper	Strip	Fog	Gamma	0.6G/Speed	Dev. Temp.	Cab. Temp.	Dev. Time
Inter	A	.08	.94	0.17	70°F	70°F	20"
Inter	B	.08	1.14	$\bar{1}.95$	70°F	70°F	40"
Full	C	.07	1.37	1.74	70°F	70°F	60"
Full	D	.08	1.64	$\bar{1}.72$	70°F	70°F	80"
Full	E	.07	2.00	$\bar{1}.59$	70°F	70°F	120"

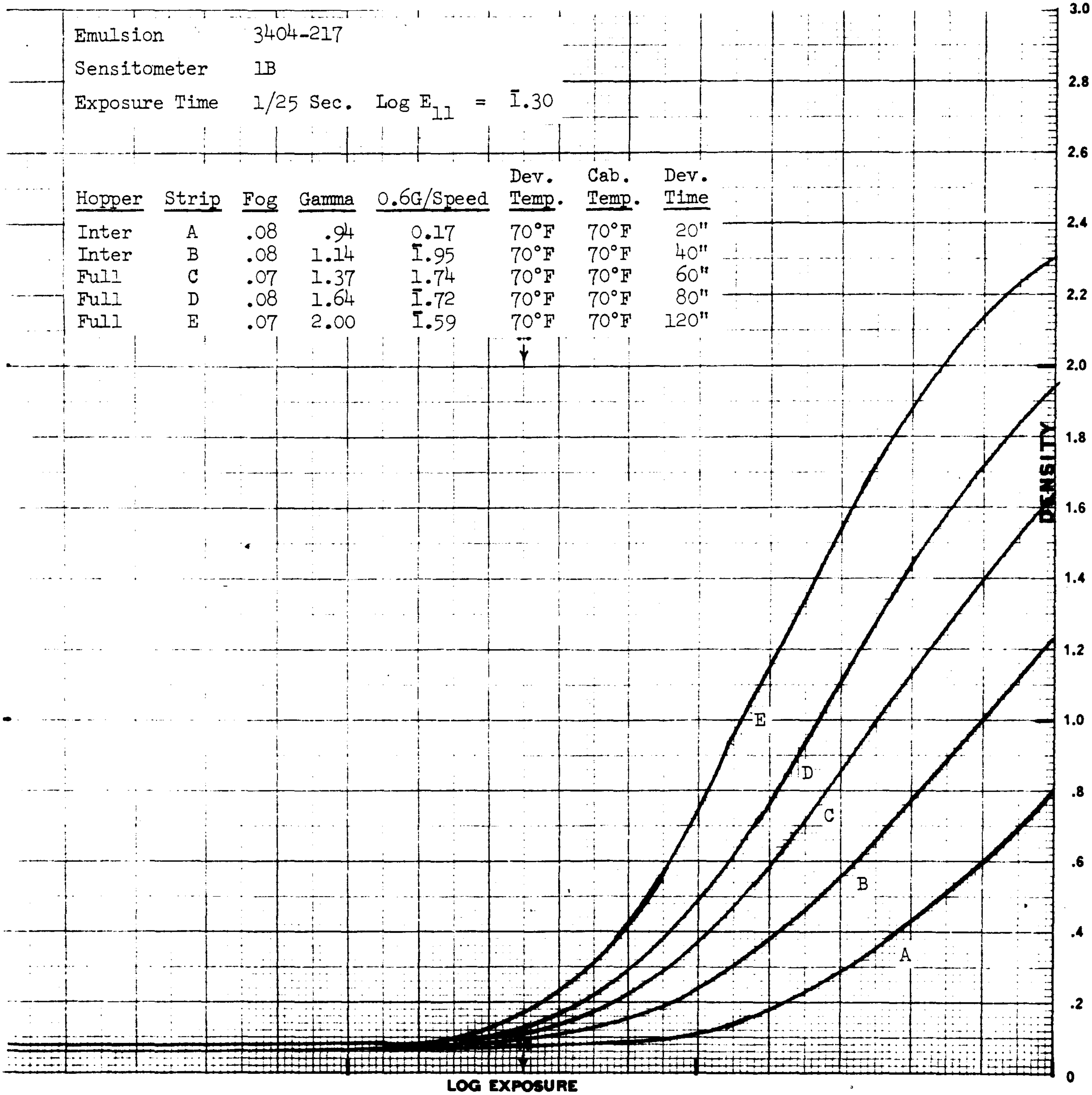


Figure 2. Vixen Test No. 126 ABCDE, Time Series at 70°F
Viscous MX574

[redacted]

[redacted]

Emulsion 3404-217
Sensitometer 1B
Exposure Time 1/25 Sec. Log E_{11} = $\bar{1}.30$

Hopper	Strip	Fog	Gamma	0.6G/Speed	Dev. Temp.	Cab. Temp.	Dev. Time
Inter	A	.07	1.12	$\bar{1}.85$	80°F	81°F	20"
Inter	B	.06	1.58	$\bar{1}.66$	81°F	80°F	40"
Full	C	.07	2.07	$\bar{1}.52$	80°F	80°F	60"
Full	D	.08	2.32	$\bar{1}.41$	80°F	80°F	80"

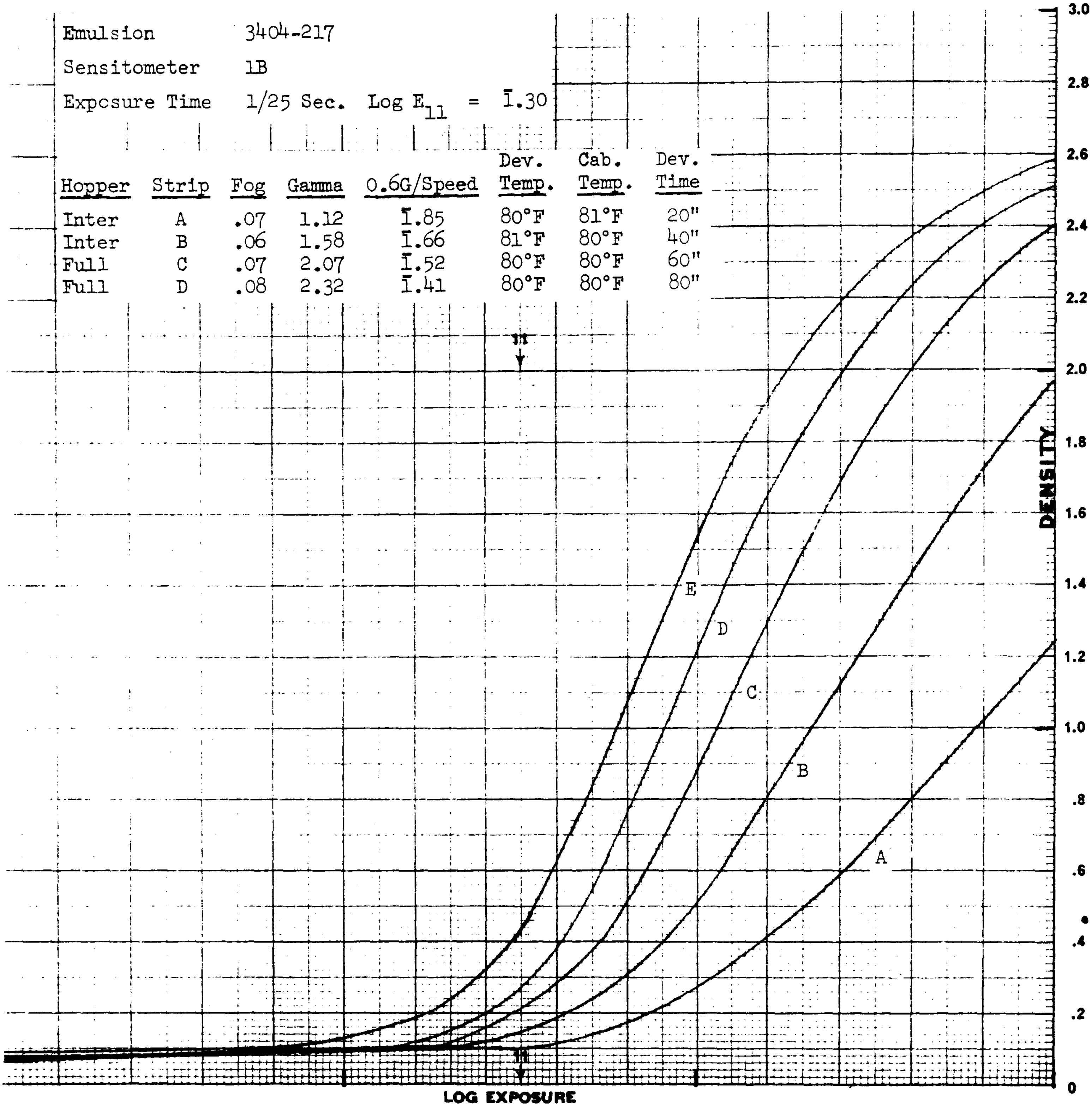
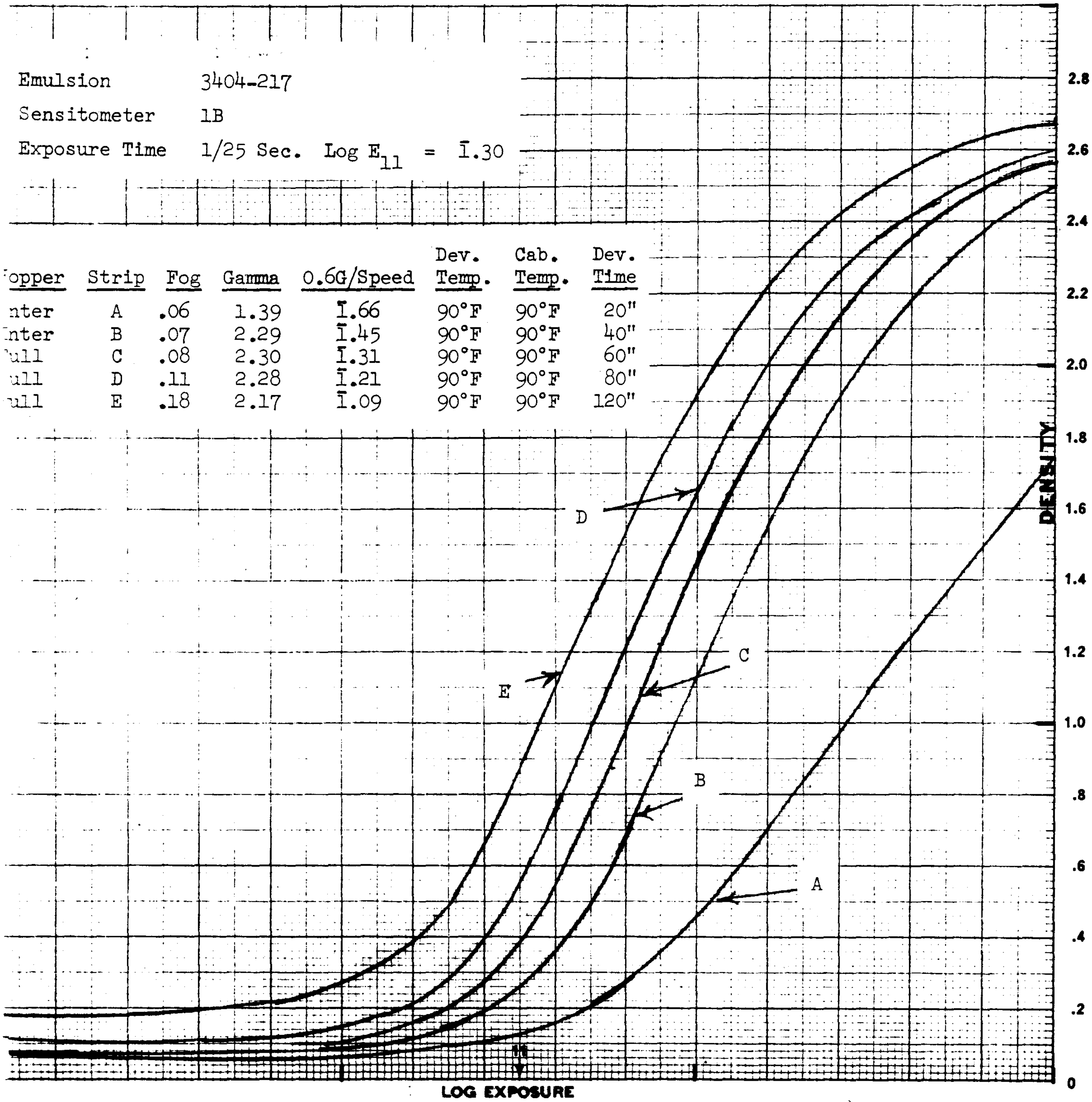


Figure 3. Vixen Test No. 133 Time Series at 80°F
Viscous MX574

[redacted]

[redacted]



opper	Strip	Fog	Gamma	0.6G/Speed	Dev. Temp.	Cab. Temp.	Dev. Time
nter	A	.06	1.39	$\bar{1}.66$	90°F	90°F	20"
nter	B	.07	2.29	$\bar{1}.45$	90°F	90°F	40"
ull	C	.08	2.30	$\bar{1}.31$	90°F	90°F	60"
ull	D	.11	2.28	$\bar{1}.21$	90°F	90°F	80"
ull	E	.18	2.17	$\bar{1}.09$	90°F	90°F	120"

Figure 4. Vixen Test No. 138 Time Series at 90°F
Viscous MX574

[redacted]

be accomplished by modulation of secondary developer temperature at constant cabinet temperature. In imposing these limitations, consistent with machine parameters, many of these developers must be rejected as common first and second stage developers. In most cases, two different developers are necessary to achieve desirable sensitometry. The exception to this, thus far, is MX577 and its variations (Figures 5 and 6).

c. Several aim points must be considered in selecting developers or developer combinations to be used in this process. An initial scanner curve, for example, should very nearly duplicate the Yardleigh/Trenton primary standard curve in the toe region to simplify infrared scanner construction. In addition, it is desirable to keep the gamma and maximum density lower than the process standard since some degree of additional development will always be present and this, at its lowest temperature, should not exceed the standard primary curve, gamma and speed. Also to be considered is the desirability of maintaining a gamma and speed somewhere near the process standard as the full process curve is approached. Curves for MX574 with an MX577 secondary (Figure 4) are illustrative of reasonable secondary development curves and an undesirable initial scan curve. Curves for MX577 (Figures 5 and 6) are much more satisfactory for scanner purposes, but they require more investigation in terms of matching standard processing curves.

d. Tests are being conducted to find acceptable processing curves for film types 3401, 2427, and 8430. Thus far, acceptable sensitometry has been obtained only on duplicating stocks (Figures 7 and 8). Work to obtain processes more consistent with machine parameters, for these films, is under way.

e. Evaluation of viscous fixing and washing techniques has been started. Since washing and fixing are somewhat inter-dependent, it was decided to consider this study from a fix-wash system standpoint. Prior to actual testing, certain ground rules were established and, for clarity, they are now stated here as follows:

Emulsion 3404-232

Sensitometer 1B

Exposure Time 1/25 Sec. Log E_{11} = $\bar{1}.30$

Strip	Fog	Gamma	0.6G/Speed	1st Dev. Time	1st Dev. Temp.	2nd Dev. Time	2nd Dev. Temp.	Cab. Temp.
A	.09	2.12	$\bar{1}.57$	20"	70°F	--	--	70°F
B	.10	2.45	$\bar{1}.54$	20"	70°F	20"	48°F	70°F
C	.25	3.10	$\bar{1}.16$	20"	70°F	20"	105°F	70°F

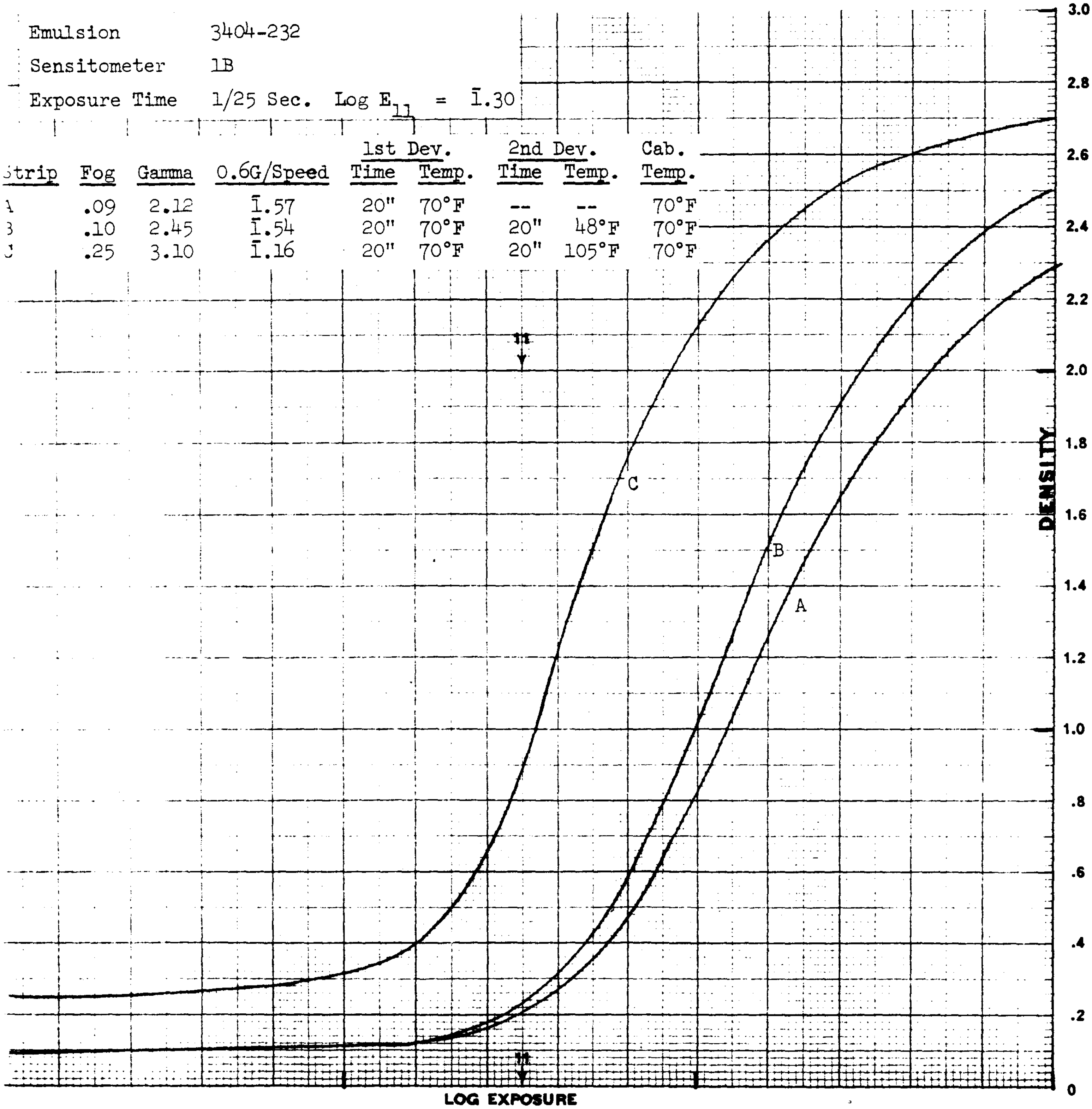


Figure 5. Vixen Test No. 207
Viscous First Coat MX577
Viscous Second Coat MX577

Emulsion 3404-232

Sensitometer 1B

Exposure Time 1/25 Sec. Log E_{11} = $\bar{1}.30$

Strip	Fog	Gamma	0.6G/Speed	1st Coat Dev. Temp.	1st Coat Dev. Time	2nd Coat Dev. Temp.	2nd Coat Dev. Time	Cab. Temp.
A	.08	2.06	$\bar{1}.51$	75°F	20"	--	--	All
B	.10	2.54	$\bar{1}.48$	75°F	20"	48°F	20"	Coats
C	.12	2.85	$\bar{1}.39$	75°F	20"	75°F	20"	70°F
D	.20	2.64	$\bar{1}.14$	75°F	20"	100°F	20"	

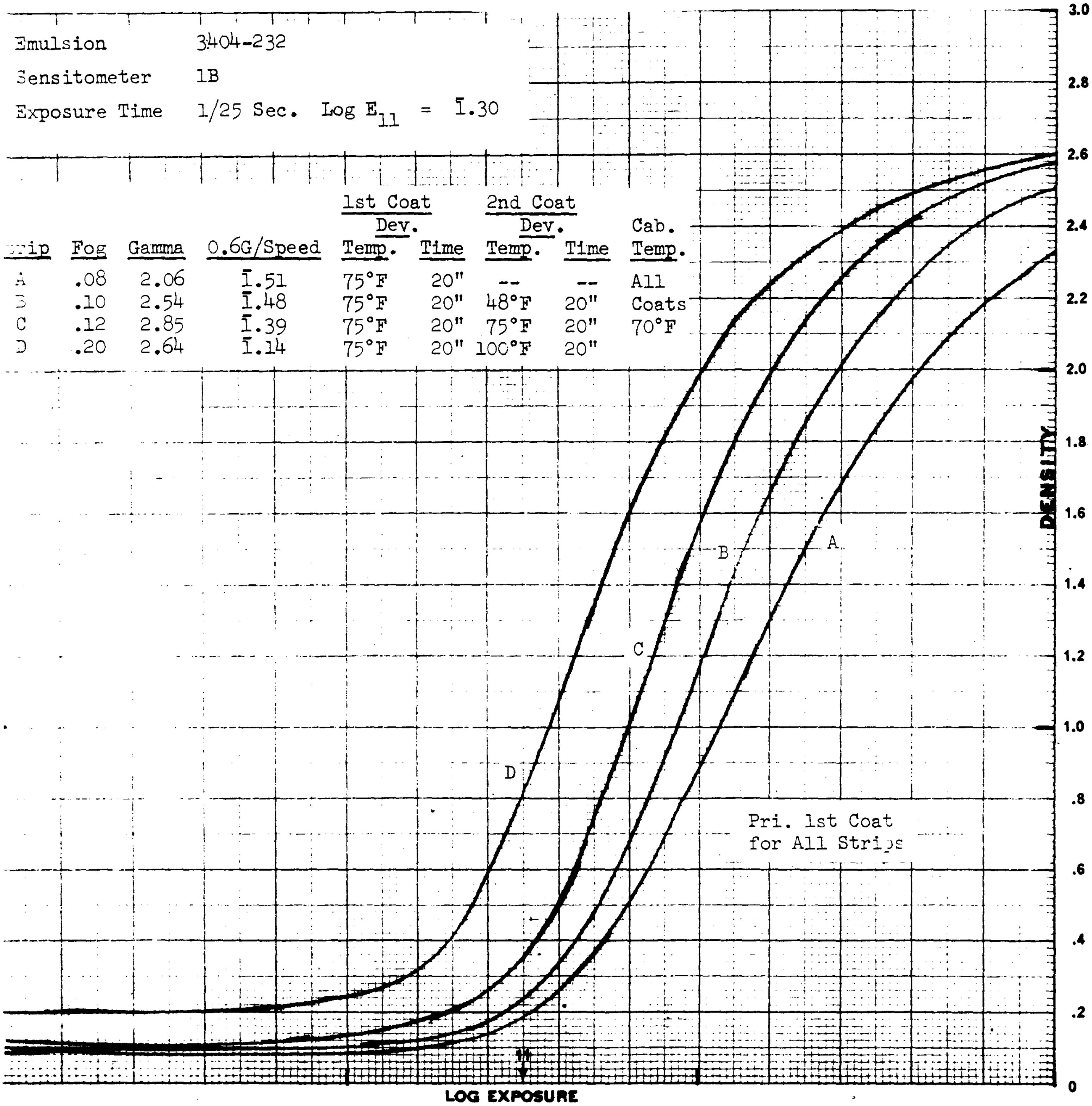


Figure 6. Vixen Test No. 228 A-D
Viscous First Coat MX577
Second Coat MX577 (Modified)

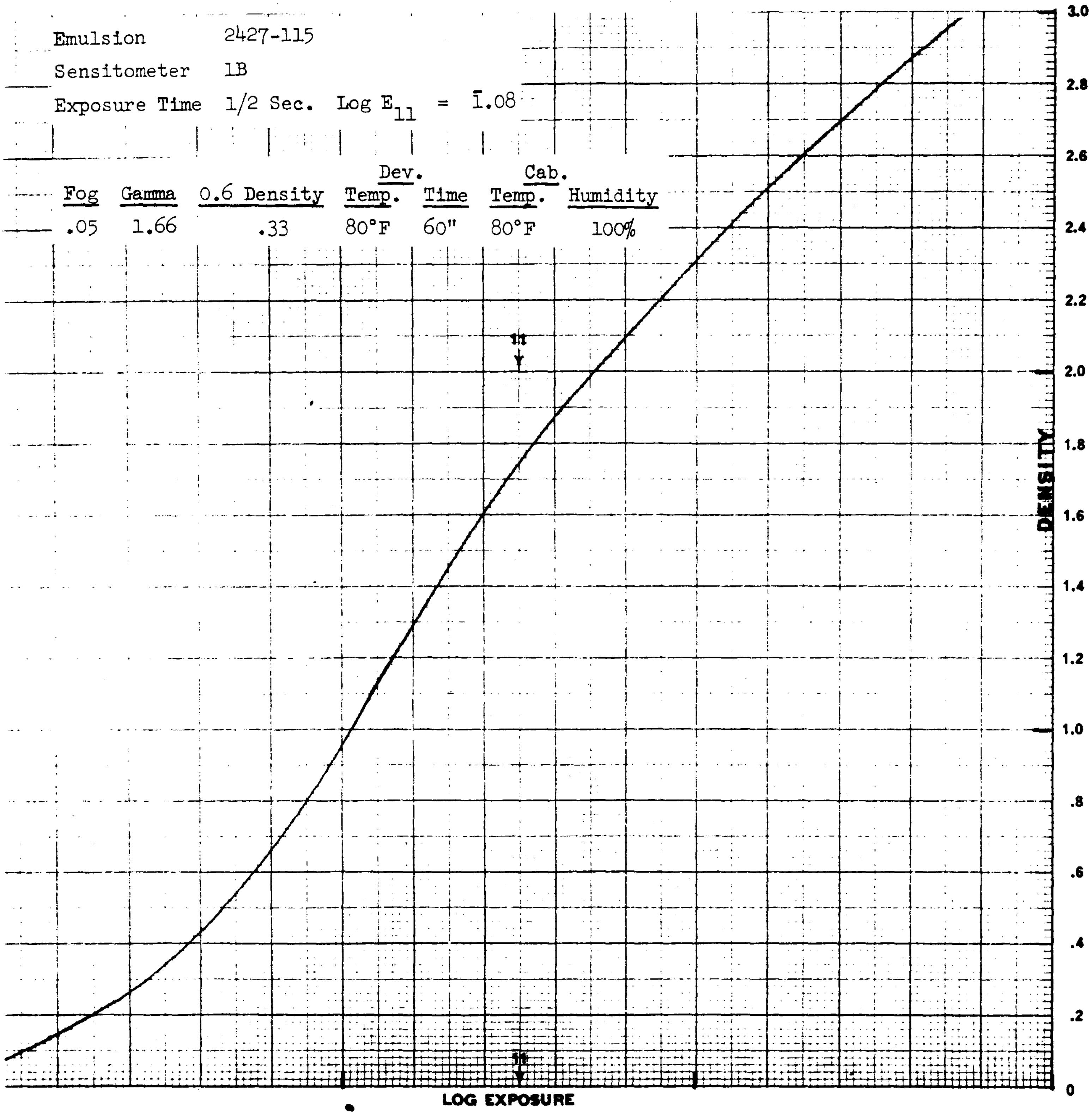


Figure 7. Vixen Test No. 256
Viscous MX575

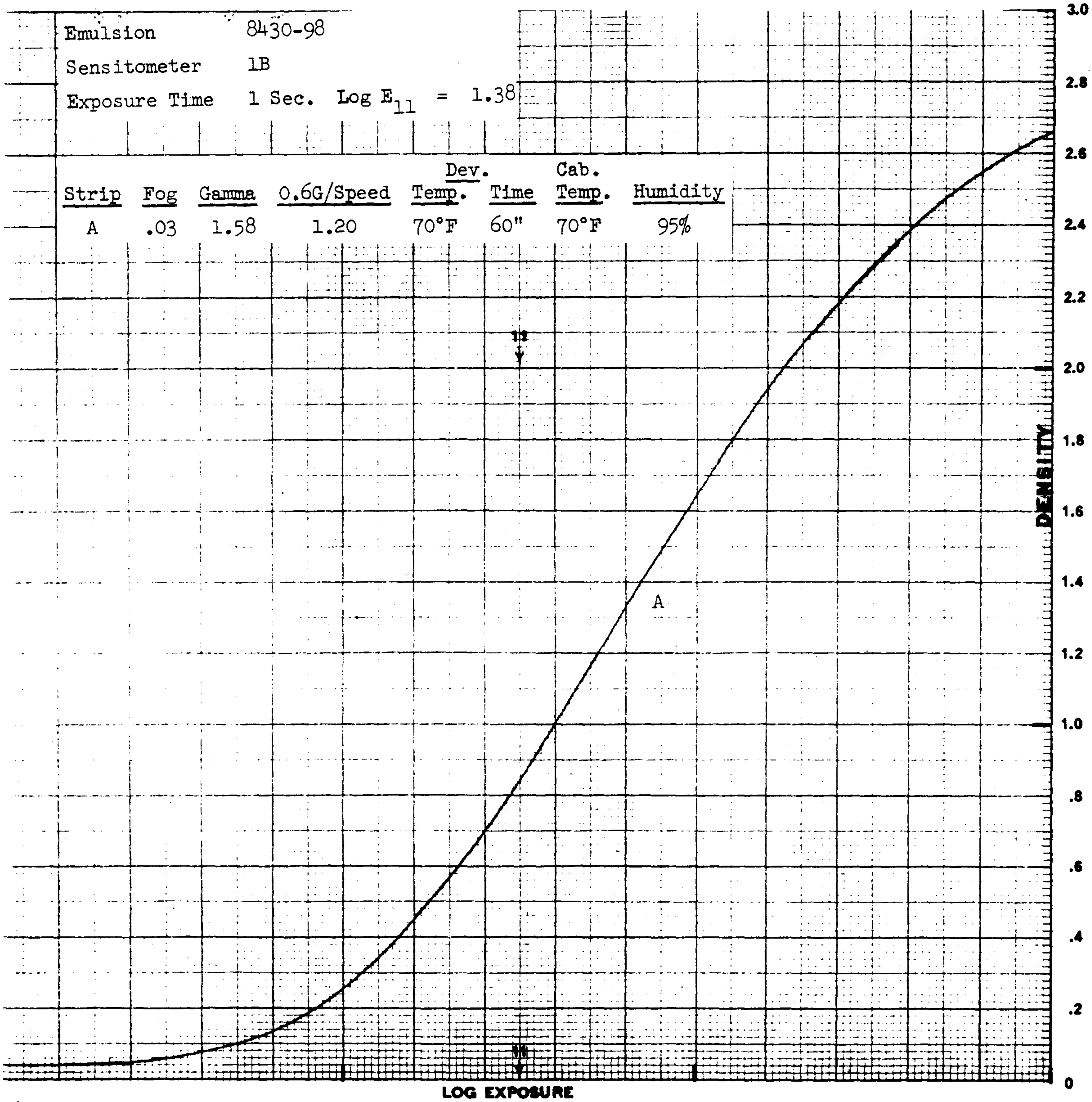


Figure 8. Vixen Test No. 248 Single Coat Viscous MX574

(1) Fixing time should be at least twice the clearing time. This is a time-honored "rule of thumb" and no attempt is made here to evaluate it.

(2) The quality of fix and wash was to be determined on the basis of HT-2 and ST-1 tests to evaluate whether archival, commercial, or other standards were being met. The quality standards used are summarized in Table 1.

(3) The number of applications of each solution should be kept to a minimum, consistent with good quality.

(4) The working time of each solution should be as short as possible, consistent with good quality.

The results of testing, to date, are summarized in Table 2. Fluid wash refers to water and is included as a basis for comparison. Although test results are good, there is still a possibility that additional washing subsequent to processing may be necessary, to obtain archival quality.

f. Evaluation testing of squeegee viscous removal has been carried out and no serious deterrents in this method are apparent. There is evidence that some residual solution remains, although it is not always visible. This problem is under investigation. If serious, ways to counteract it will be studied. All testing at present has been confined to the developer application stages of the Blizzard.

g. Backing dye removal becomes a significant problem in all-viscous processing. The dye is never completely removed and yielding of a neutral tone is a consequence of actual dye removed and pH effect on the residual dye. Tests are being conducted to determine the agent and ideal application for dye effect removal. It appears, at present, that the slightly bluish tone remaining after development is a cosmetic effect only and will in no way diminish the practical value of the negative.

h. Tests were conducted to find adequate slurry agents which are used to disperse thickener materials for good uniformity in some viscous mixes. Machine tests have verified the acceptability of these slurry agents.

TABLE 1
QUALITY STANDARDS USED

Film Type	Class	Archival (mg/in^2 Ag)	Commercial (mg/in^2 Ag)
3404	1	.005	.02
8430	1	.005	.02
3401	2	.02	.10
3400	2	.02	.10
2427	2	.02	.10

HT-2 Patch No.		
1	=	.005
2	=	.01
3	=	.04
4	=	.10

ST-1		
No Stain	=	Archival
Slight Stain	=	Commercial
Heavy Stain	=	Reject

TABLE 2

RESULTS OF TESTING

Film Type	Clearing Time	2X Clearing Time	Fix Time Tested	Wash Time	Hypo HT-2	Silver ST-1
			45"	10 Min. Fluid	A	A
3401	25"	50"	48	2-15"	C	C
			48	4-15"	A	C
			48	2-30"	C	C
			2-15	4-15"	A	A
			45	15" Fluid 75°	C	C
			45	30" Fluid 75°	A	A
3404	5-10	20	32	2-15"	A	A
			32	1-30"	C	C
			32	1-15" Fluid 75°	A	A
4400	15	30	32	10 Min. Fluid	A	A
			32	2-30"	A	A
			32	2-15"	C	C
			32	3-15"	A	A
			32	15" Fluid 75°	A	A
8430	5-10	20	15	10 Min. Fluid	A	A
			32	2-15"	A	A
			32	2-30"	A	A
			32	15" Fluid 75°	A	A
2427	10-15	30	45	10 Min. Fluid	A	A
			2-15	2-15"	C	A
			32	2-30"	A	A
			32	3-30"	A	A
			32	4-30"	A	A
			32	15" Fluid 75°	A	A

A = Archival Quality

C = Commercial Quality

5. Long Range Investigation:

a. This area of activity encompasses gathering data generated almost exclusively in the laboratory. Testing associated with mixing techniques, viscous chemistry, thickening agents, viscosity effects, certification of mixes, and keeping data was initiated on some of the principal developers and solutions. More practical laboratory experience and data must be generated to gain a comfortable familiarity with viscous processing solutions.

b. Long-range keeping tests have been initiated to determine sensitometric, physical, and chemical stability of several developers. The developers under investigation thus far are: MX574, MX577, MX578, and MX689. Complete keeping data for MX574 is included (Figures 9 through 12). Other potentially applicable developers are to be added to the test schedule.

c. Difficulty in thickening some of the developers has been experienced. It is believed that this is because of a high salt concentration in these developers. Investigations are being initiated to determine whether this difficulty can be overcome by the reduction of the quantity of some of the salts. Any developer so modified will be subjected to long range keeping tests before being considered as a production mix.

PLANNED ACTIVITY

6. Complete evaluation of MX578 developer potential on Vixen.

7. Continue laboratory and Blizzard testing of MX577 to determine maximum capability.

8. Continue the investigation of long-range keeping of viscous processing solutions.

9. Continue to search for and evaluate alternate thickening agents.

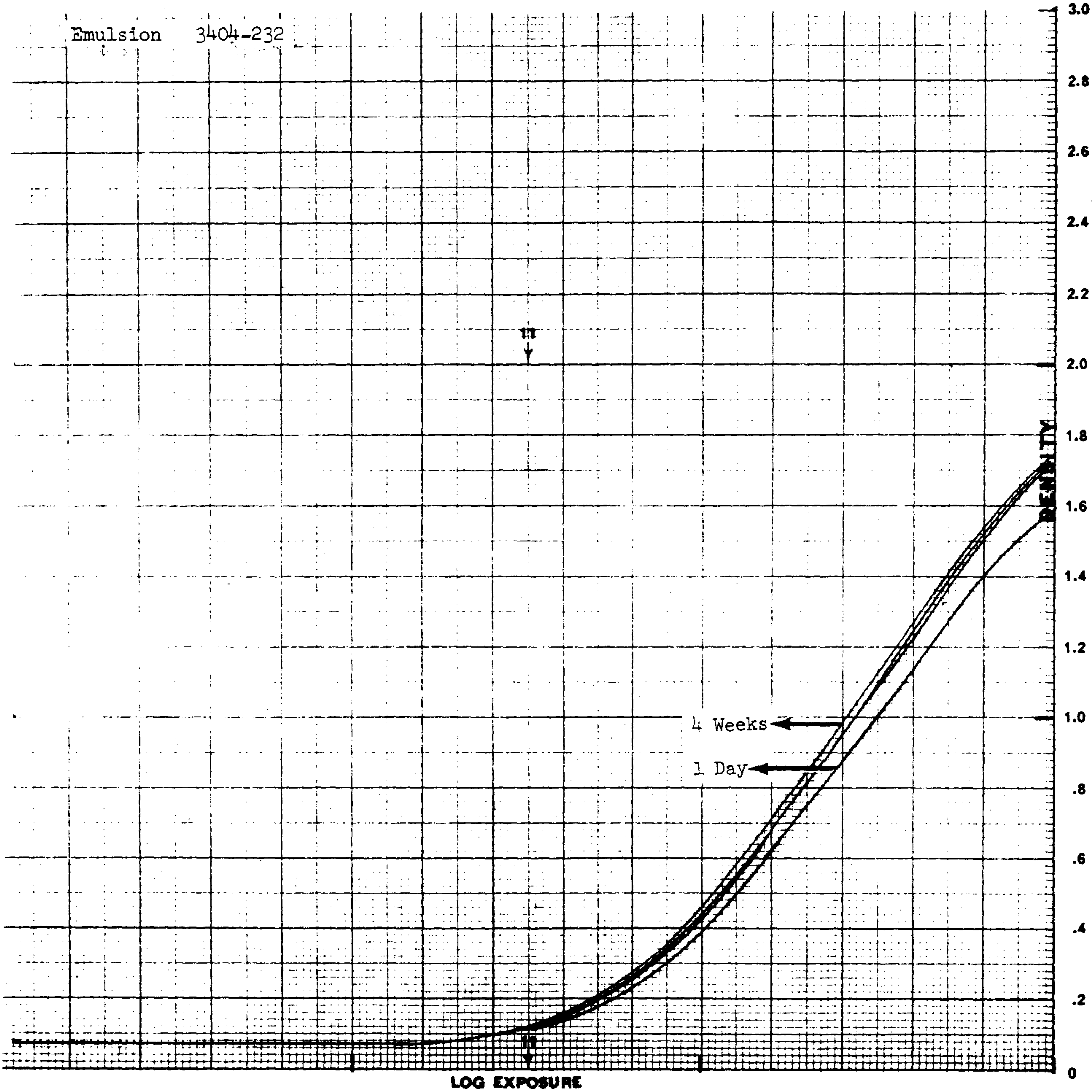


Figure 9. Sensitometric Keeping Test of Viscous Developer MX574 (Vixen Results)

PAR 100-1S
11 Mar 66

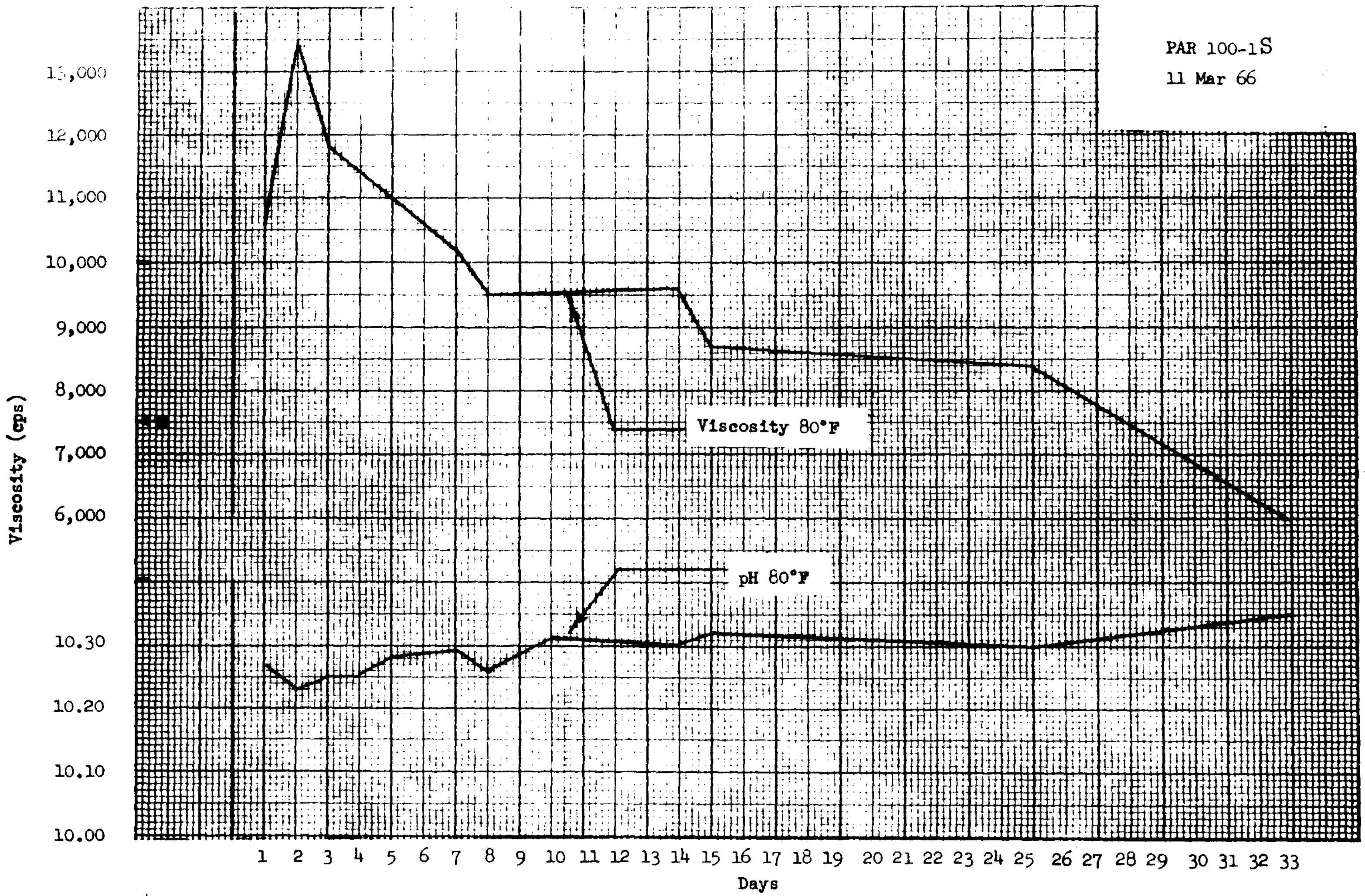


Figure 10. Viscosity and pH Keeping Test for MX574

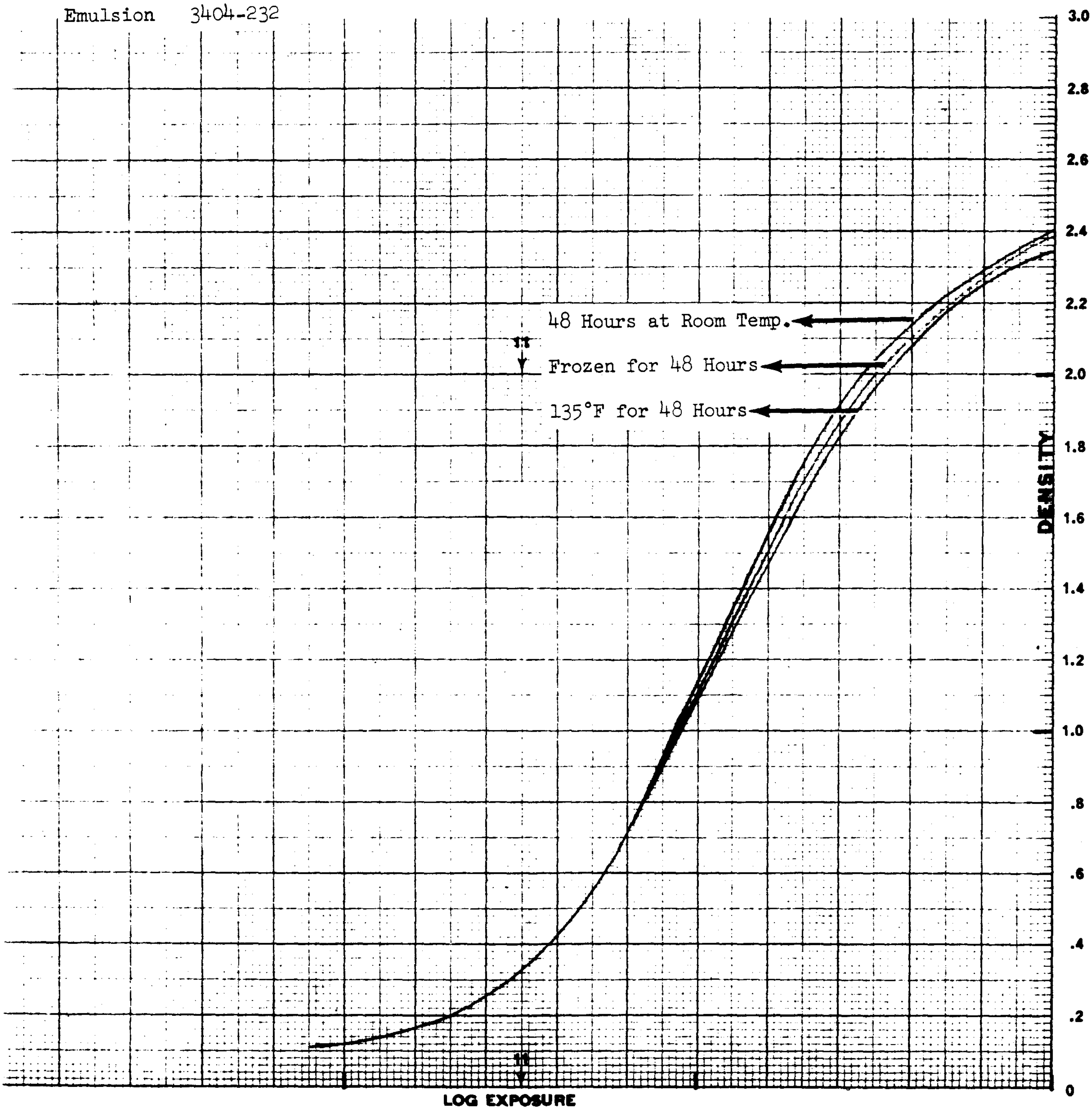


Figure 11. Keeping Test of Fluid Developer MX574
(Dip Test Results)

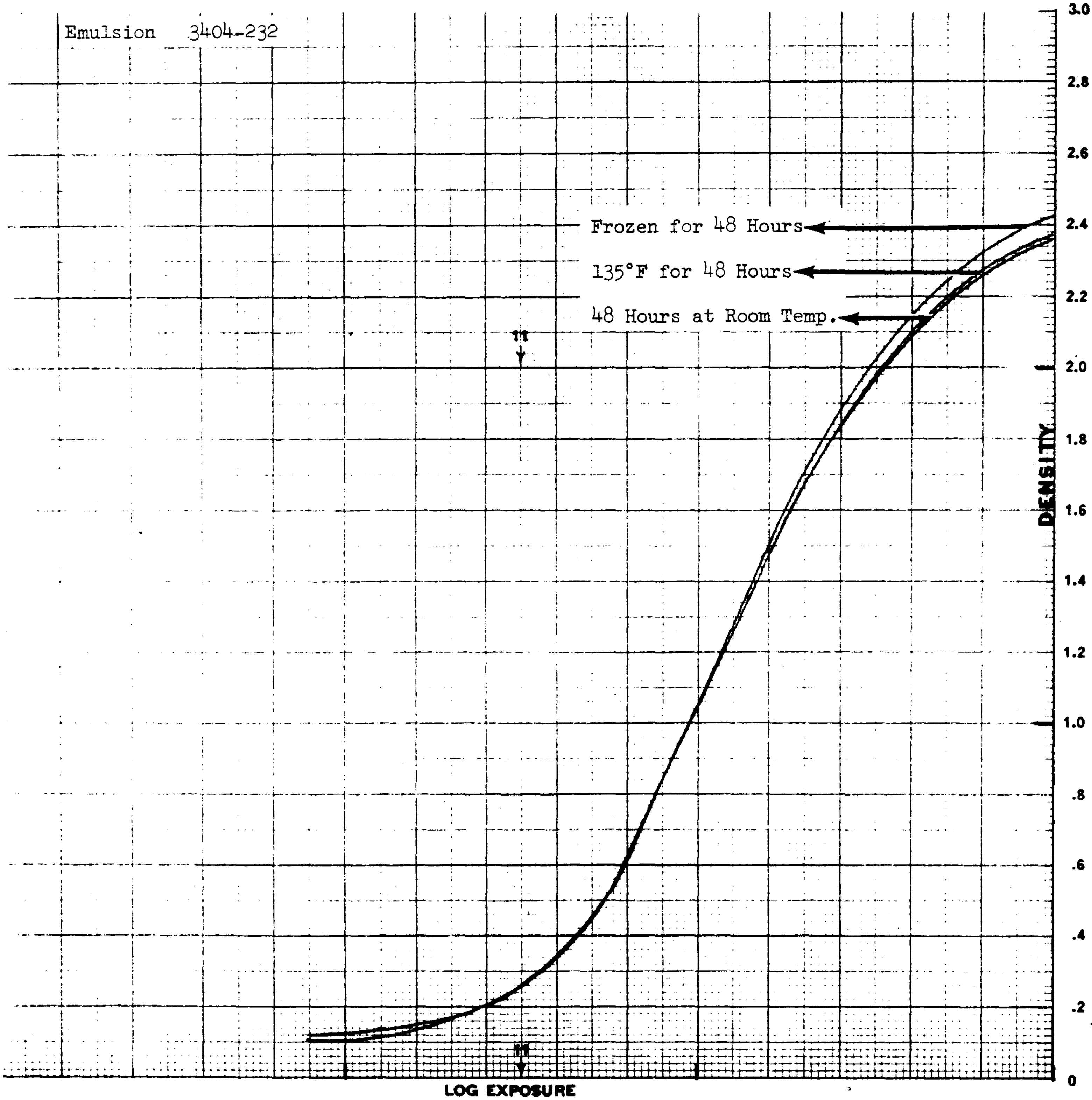


Figure 12. Keeping Test of Viscous Developer MX574
(Viscous Platen)

10. Complete evaluation of backing dye removal techniques and establish extent of problems.

11. Initiate residual salt evaluation testing of all viscous processed film.

12. Continue to investigate fix and wash techniques.

PAR 100-2B
11 Mar 66

SUBJECT: Temperature Control of 9.5-Inch Viscous Hopper

TASK/PROBLEM

1. Develop, fabricate, and evaluate a 9.5-inch coating hopper and power control circuits required to modulate the temperature of viscous developer.

DISCUSSION

2. Introduction:

a. A 70mm hopper is being developed under PAR 93S, Temperature Control of 70mm Viscous Hoppers, to modulate the temperature of viscous developers and thereby to rapidly alter the development-process level to accommodate density changes found between adjacent frames of aerial film. The objective of the subject PAR 100-2B is to expand data generated on PAR 93S into a 9.5-inch configuration to resolve the more complex problems anticipated in the wide 9.5-inch hopper.

b. The design goal is to provide the capability of changing the development process level from maximum to minimum, and vice versa, within several inches of film when the film is traveling at the rate of four inches per second. Developer heating will take place in the lips of hopper. Developer temperature sensing elements, in the form of bare wire thermocouple or resistance wire, will monitor the developer temperature. The control voltage generated by these sensing elements will be fed to the hopper control system. The hopper control system will also be receiving a command voltage (temperature) which is determined by the IR Scanner System (PAR 100-5B) to provide the optimum process level. The hopper control system compares these two voltages to develop heater-drive correction as required.

3. Status:

a. Experimental approaches are being evaluated to determine the most satisfactory method of heating the viscous developer solution. These approaches include a variety of metallic heater-element configurations and the application of the dielectric heating principle.

b. The feasibility of dielectric heating was investigated by placing a sample of viscous developer on film between two one-inch-square copper capacitor plates spaced one-eighth inch apart. Power from a 400-watt, 250-megacycle generator was applied to the plates. In the preliminary testing accomplished to date, no temperature or time measurements were made. However, the heating effect was noted by observing steam arising from the developer. Film alone, tested under the same conditions, showed little if any heating effects.

c. A configuration of the capacitor plates in the form of a roller and shoe was constructed and tested. The results were poor because of the inability to tune this configuration for maximum power transfer.

4. A manual back-up control for heater-operation will be incorporated in the over-all design. It will by-pass all electronic controls and use a calibrated four-position variac to select the proper heat level as determined by an operator using an IR viewer. This mode will protect against failure of the IR Scanner System (PAR 100-5B) and electronic hopper temperature control circuitry to be developed under PAR 100-5B.

PLANNED ACTIVITY

5. Continue development effort.

Contract [redacted], Task C
Third Quarter FY-66

PAR 100-3B
11 Mar 66

SUBJECT: Film Footage Marker

TASK/PROBLEM

1. Study, develop, breadboard, and test a film footage marker to facilitate post-processing breakdown.

DISCUSSION

2. Introduction. Authorization to proceed on PAR 100-3B was received in TWX 9106 from the customer dated 20 Oct 1965, and contractor effort was started on 20 Nov 65.

3. Status:

a. The breadboard of an illumination and projection system that will print 1/16-inch-high numbers on typical negative material was completed; preliminary test results were excellent.

b. The reflectivity of the figures on the selected standard counter is sufficient to eliminate the need for special reflective coating material.

c. Standard GE flash lamp No. FT-118 provides ample illumination.

d. The design of a lamphouse compatible with the Sensitometric Edge Printer (PAR 44B) is complete and parts are being fabricated.

e. Design of the timing device for actuating the flash is in progress.

PLANNED ACTIVITY

4. Complete design, fabrication, and assembly of the breadboard; install, test, and evaluate on the Sensitometric Edge Printer.

Contract [redacted], Task C
Third Quarter FY-66

PAR 100-4B
11 Mar 66

SUBJECT: Developmental 9.5-Inch All-Viscous Processor

TASK/PROBLEM

1. Develop, fabricate, and evaluate an all-viscous breadboard processor for film widths up to 9.5 inches.

DISCUSSION

2. Test Results:

a. A development time of 35 to 45 seconds having been established as a workable range for primary developer MX547, Film Type 3404 was developed in viscous MX574 developer, coated at 90°F in an 80°F reaction chamber for 40 seconds, and produced satisfactory sensitometric results. The curve generated under these conditions is shown in curve A of Figure 1.

b. Additional secondary development, using a coating hopper equipped to control the coating temperature in the extrusion channel as the developer is coated, produced curve B, Figure 1. The coating hopper was fed with 55°F developer MX578, and 30 amperes at 1.4 volts was imposed across the heater. Under these conditions, the coating temperature of the developer was 65°F. The secondary development time was 30 seconds and the reaction chamber was at 70°F.

c. With amperage across the heater raised to 85 amperes at 3.9 volts, a sensitometric step wedge was developed for 30 seconds in a 70°F reaction chamber and produced curve C shown in Figure 1. The coating temperature of the developer under these conditions was 115°F. The temperature of the developer fed to the hopper was again maintained at 55°F.

[redacted]

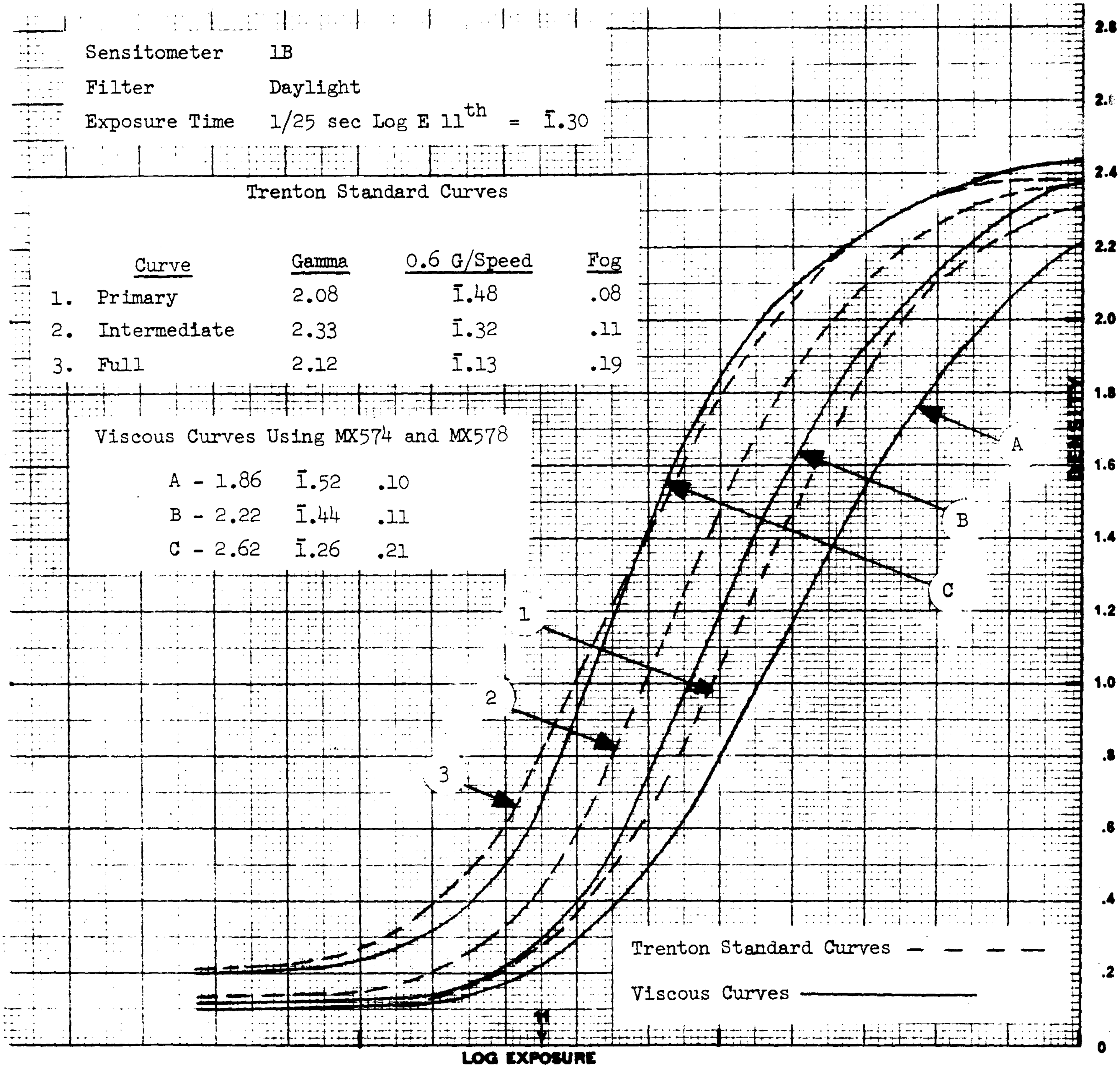


Figure 1. Curves Generated in Primary Secondary Development Treatment Using Controlled Temperature Secondary

[redacted]

3. Testing Data and Procedures:

a. The heater strip used in these tests consisted of a 7/8-inch-wide Invar strip 0.003 inch thick which had been fluted by passing between a pair of loosely meshed, 32 teeth/inch spur gears.

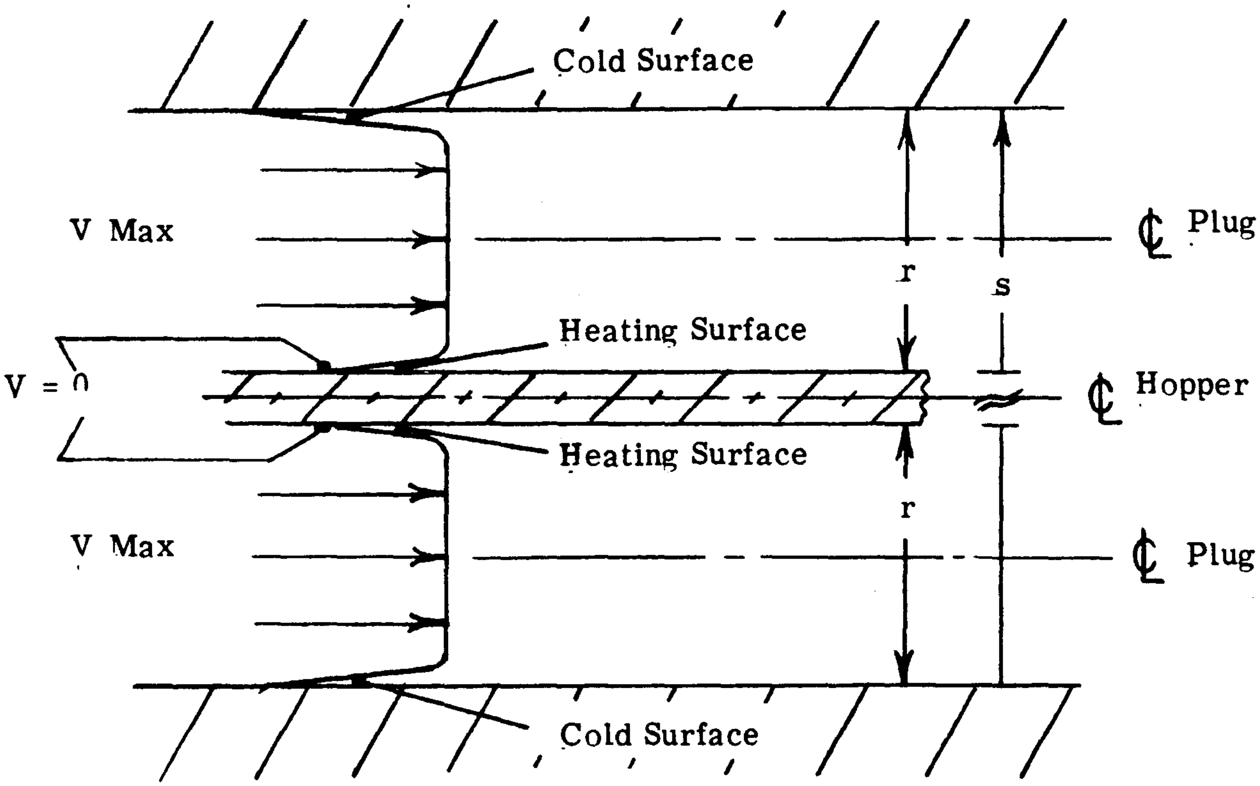
b. The heater was placed across a 0.022-inch slot directly ahead of a 0.010-inch extrusion channel.

c. Both primary and secondary developer were removed by squeegee, followed by a surface application of SB1A stop bath.

4. Additional Test Results. The speed loss in the toe region of the curve C has caused concern and a developer study to improve this condition is now underway. A developer which is satisfactory will not only achieve the increase in speed in the toe region but will do so at a lower temperature, thus reducing the driving force required across the heater.

a. The high driving force currently required results in heater surface temperatures in excess of 150°F which results in hot spots that show as streaks in the processed film.

b. Attempts to correlate data taken from experimental heat controlled hoppers with the basic heat transfer formula for turbulent and laminar flow have not been successful. Because of this, an analysis of the heat transfer characteristics was made in which the extruded viscous developer was considered to be a solid slab rather than a viscous fluid. The validity of this approach is based on the assumption that plug flow, rather than laminar flow, is a characteristic of viscous developer and as such has a flow profile as shown in Figure 2.



s = Slab Thickness

r = Distance, Heating Surface to Cold Surface

s = 2r = Effective Thickness of Channel

Note: r = Heating Surface to Midplane if Heating Surface is Outside Walls of Channel

Figure 2. Plug Flow Through a Coating Hopper (Heater suspended in center of channel)

5. <u>Analysis of Heat Transfer Characteristics</u>:

a. Using the assumption above, two basic equations were developed as follows:

$$T_{Ho} = \frac{Qt}{A_H}\left[\frac{r}{2k}\right] + T_i$$

$$T_{Hl} = \frac{Qt}{A_H}\left[\frac{r}{2k} + \frac{XF}{Vr\rho\, C_p}\right] + T_i$$

where:

T_{Ho}	=	Temperature of heater surface at entrance, in °F
T_{Hl}	=	Temperature of heater surface at exit, in °F
Q_t	=	Total heat load, in Btu/hr
A_H	=	Total area heating surface, in ft^2
r	=	Distance, midplane, of slab to heated surface of slab, in ft
k	=	Thermal conductivity, in Btu/(hr)(ft^2)(°F/ft)
X	=	Heater width in direction of flow, in ft
F	=	Ratio of effective area fluted heater to straight heater
V	=	Velocity of the slab past the heater, in ft/hr
ρ	=	Density, in lb/ft^3
C_p	=	Specific heat, in Btu/(lb)(°F)
T_i	=	Entering temperature of slab*, in °F

* The slab is analogous to the extruded sheet of developer

b. In using these equations, the thermal conductivity and heat capacity of viscous solutions is assumed to be essentially the same as water.

c. The equations appear to predict heater shapes that will operate at low surface temperatures and thus are useful in the design of heaters that will minimize hot spots in the extruded developer.

6. Current Status:

a. Heater shapes now being evaluated include sine wave shapes formed by passing thin strips of metal between a pair of spur gears and square wave shapes formed in a stepping die.

b. Other shapes being considered include those formed by stacking short sections of square and rectangular tubing.

c. During the preliminary investigation phase, major effort has been placed on the use of various configurations of metalic heating elements in the viscous hopper lips. In order to gain optimum results, it is the intention of the Contractor to explore parallel methods of viscous developer heating. Preliminary tests have been conducted on dielectric heating. Results are reported under PAR 100-2B, "Temperature Control for 9.5-Inch Viscous Hopper." In addition, other methods such as infrared or microwave heating are being considered. To evaluate these proposed methods with a minimum expenditure of time and money, feasibility studies will be limited to 70mm film.

d. It was found that residual stop bath in the film after secondary development lowered the pH to the extent that viscous fix could not be congealed and removed by transfer belts. Adjustment of pH by application of an alkaline solution to the emulsion solved the congealing problem but caused an increase in fog that could not be tolerated.

e. Because of the critical control of pH required, development of the all-viscous processing system has shifted from chemical removal by congealing and belt transfer to one of removal by roller squeegees.

PLANNED ACTIVITY

7. Continue the study of flow distribution in coating hoppers; design and build test hoppers required to complete the study.

8. Continue the study of heater shapes to attain optimum design.

9. Consider the feasibility of replacing the heater in the hopper with a dielectric, microwave or infrared heater.

10. Make design changes in the 70mm breadboard processor required to evaluate use of second-stage waste fix in a first-stage fix station.

11. Make design changes in the 70mm breadboard processor to evaluate use of second-stage waste wash water in a first-stage wash station.

PAR 100-5B
11 Mar 66

SUBJECT: IR Scanner and Electronics Control

TASK/PROBLEM

1. Develop, breadboard, and test an IR scanner, light source, and control electronics to provide the necessary signals for driving the temperature-controlled hopper for the all-viscous processor.

DISCUSSION

2. Introduction. The scanner and control electronics will provide a signal which will define the secondary processing level required for each one-half inch of film. The web will be scanned in approximately one-half-inch segments using eighty IR-sensitive solar cells (0.80 inch square) distributed across the web. The magnitude of the signal delivered to the temperature-controlled hopper will be a function of the density minimum measured in each one-half-inch segment of the web. False processing level signals produced by scanning a frame line will be eliminated by the logic electronics. The logic will discard the false reading and substitute a processing level equal to the segment adjacent to the frame line.

3. Two manual operating modes will be provided to supplement the automatic operation.

a. Manual Mode One. The operator will select the area to be scanned and an indicator will display the processing level required for that area. The operator will then manually select the processing level indicated by the scanner. This mode of operation is similar to that now employed on the Trenton processor and is a back-up in the event of failure of the electronics control and delay logic.

b. Manual Mode Two. This mode of operation provides a fully manual system independent of all scanner and control electronics. The operator will determine the processing level required by visual observation of the film in the IR viewer and control the temperature of the hopper manually.

4. Electrical Status:

a. The design of the scanner electronics is 90 percent complete.

b. The multiplexer specifications were completed and are being forwarded to the purchasing department for manufacturer's quotations.

c. A recommendation was made to incorporate an electronic film follower in the scanner-multiplexer system. This would eliminate the need for an edge detector - servo system to maintain film tracking. If this change is incorporated, it will require modification of and additions to the current electronics design.

5. Optical Status. Design layout drawings for the air arch assembly, including optics and solar cell mountings and the light source assembly, were started. Further design layout effort has been temporarily halted until the processor design is further along and a more precise space allotment for the air arch assembly and light source is known.

PLANNED ACTIVITY

6. Complete the design of circuits and packaging of electrical components.

7. Place orders for purchased electrical components.

8. Order the solar cell block from the manufacturer.

Contract [redacted] Task C
Third Quarter FY-66

PAR 100-6S
11 Mar 66

SUBJECT: Drying Equipment

TASK/PROBLEM

1. Study, develop, and fabricate breadboards to evaluate rapid drying methods.

DISCUSSION

2. Introduction. Preliminary design work has been started to determine the size, shape, air requirements and other basic parameters of a dryer which will be compatible with the processor being developed under PAR 100-4B.

3. Progress to date is summarized below:

a. Analytical work is under way on the physics of drying and the effect of various parameters on the drying coefficients, including reduced ambient pressure.

b. A preliminary survey was made of common desiccants and their properties.

c. On the basis of preliminary analytical studies, a configuration is being designed for breadboard evaluation.

d. Various compounds of osmotic substances were tried in the laboratory and emulsion swell and shrink measurements indicated good drying under these laboratory conditions.

e. Laboratory study was begun on methods for removing osmotic drying material residue from dried films.

PLANNED ACTIVITY

4. Continue analytical investigation of all drying parameters which affect film-drying efficiency.

5. Build a single-pass breadboard for evaluating the proposed dryer configuration, optimizing the dryer slot (nozzle). If feasible, conduct a breadboard dryer test at reduced ambient pressures.

6. Investigate the most promising desiccants further and other air dehumidifying systems.

7. Continue laboratory investigation of osmotic drying and residue removal. A small breadboard is under way for studying the application of osmotic drying to continuous webs.

Contract [redacted] Task D
Third Quarter FY-66

PAR 101B
11 Mar 66

SUBJECT: Macrodensitometer Breadboard

TASK/PROBLEM

1. Develop, fabricate, and test breadboard equipment for measuring specular, integral densities of 0.25 to 0.50mm diameter spots at selected positions on black-and-white and color roll films. Means to photograph the area to be measured is required to provide sample identification.

DISCUSSION

2. Authorization to proceed with this project was given in TWX [redacted] dated 18 Jan 1966.

3. At the time the proposal for this project was submitted, the contractor was aware of effort by another manufacturer to develop a microdensitometer which could, with minor modification, meet PAR 101B requirements.

4. After telephone discussion with this manufacturer on 8 Mar 66, the contractor witnessed a demonstration on one of two production prototype instruments. After technical evaluation and discussion of the necessary modifications with the manufacturer's staff, it is recommended that a subcontract be negotiated by the contractor with this manufacturer to procure the required instrument. Completion time may be much shorter than the schedule originally presented in the proposal.

PLANNED ACTIVITY

5. Initiate procurement of the required instrument.

6. After award of the subcontract, re-evaluate the schedule for project completion.

Contract [redacted], Task D
Third Quarter FY-66

PAR 107B
11 Mar 66

SUBJECT: Drum Printer with Modulated CRT Source

TASK/PROBLEM

1. Develop, fabricate, test, and evaluate breadboard equipment combining standard flying-spot (CRT) feedback light-control techniques with the known high performance of the Niagara-type printing system.

DISCUSSION

2. Fabrication of the Niagara-type 70mm film transport components was started.

3. Empirical studies have been started on possible exposure non-uniformities caused by second-order torsional vibrations at the drum. The studies are being conducted on similar equipment which is available utilizing the narrow exposure slit inherent in the CRT source.

4. The 70mm CRT source arrived from the vendor on 7 March, and is undergoing electrical testing.

PLANNED ACTIVITY

5. Complete fabrication of the 70mm film-transport components and continue investigation of exposure non-uniformities.

6. Combine the 70mm CRT source with the film transport components and initiate testing to determine the effect of source on resolution.

7. Procure a 9 1/2-inch CRT with feedback control of scanning spot intensity.

Contract [redacted], Task B
Third Quarter FY-66

PAR 109S
11 Mar 66

SUBJECT: Viscous Monobath Techniques Study

TASK/PROBLEM

1. Establish the potentials of viscous monobath processing of aerial reconnaissance acquisition and duplicating films.

DISCUSSION

2. Tests to determine the applicability of Bimat imbibants to this program were begun. All the imbibants tested so far yield low gamma and low speed compared to conventional processing. The major difference between the imbibants tested is the development time required. The imbibants tested were MX603, MX527-1, and MX572.

3. Additional work has been done with a modified version of MX404, a conventional monobath developer. A series of tests was conducted to determine the effect of the concentration of the fixing agent. As was expected, speed and gamma were increased with decreasing concentration of fixing agent, but not enough at room temperature operation to meet the desired aims. Film types 3400, 3401, 3404, and 2427 were used in this test as well as in the imbibant testing discussed in 2. above.

4. Tests were conducted to determine the effect of thickening some of the monobath formulae. The characteristically high salt concentration of most of those tested is higher than can be tolerated by thickening agents which are chemically compatible. A thickened version of the modified MX404 proved feasible and was subsequently tested sensitometrically. Two previously unsuspected phenomena became apparent during the course of these sensitometric tests on MX404:

a. Film gamma is increased by thickening the monobath.

b. Thickening agents may be sensitometrically active in monobaths even though they do not exhibit this propensity in normal solutions. Curves which illustrate these phenomena are shown in Figures 1 and 2 for film types 8430 and 2427. These curves also show that reasonably acceptable sensitometry can be obtained for these duplicating films. Thus far, such favorable results have not been obtained on negative stocks.

5. There have been several modifications on the Vixen processor since it was installed. The most important of these were:

a. Addition of the capability to do straight-through processing. Previous to this modification, it was necessary to reverse the machine drive and return the processed film to the starting point for removal. Where a single process is required, it is more convenient to be able to remove the processed film from the machine at the end of a single pass. Where a double coating is necessary, the reversing feature of the machine is still used.

b. A defective bypass valve was replaced with an electrical solenoid valve. (The solenoid valve was used because it was commercially available and satisfied the immediate need.)

c. The existing plumbing and control systems were rearranged to allow for individual supply temperature control for each hopper. The change gives much better control of the machine as well as greater flexibility.

PLANNED ACTIVITY

6. Re-examine Bimat imbibants in light of new information on thickening.

7. Continue experiments with MX404 at elevated temperatures.

8. Conduct further tests to determine the various effects associated with thickening of monobaths; include both chemical and sensitometric testing.

[redacted]

Emulsion 2427-115

Exposure Log E_{11} = 1.08

Sensitometer 1B

Exposure Time 1/2 Sec.

	Fog	Gamma	Speed at 0.6 Density
Processing Specification Nos. 623, 641, 644	0.07	1.48	0.35 (dashed line)
Modified MX404	0.02	1.26	0.81 (1)
Viscous Modified MX404	0.26	1.64	0.26 (2)

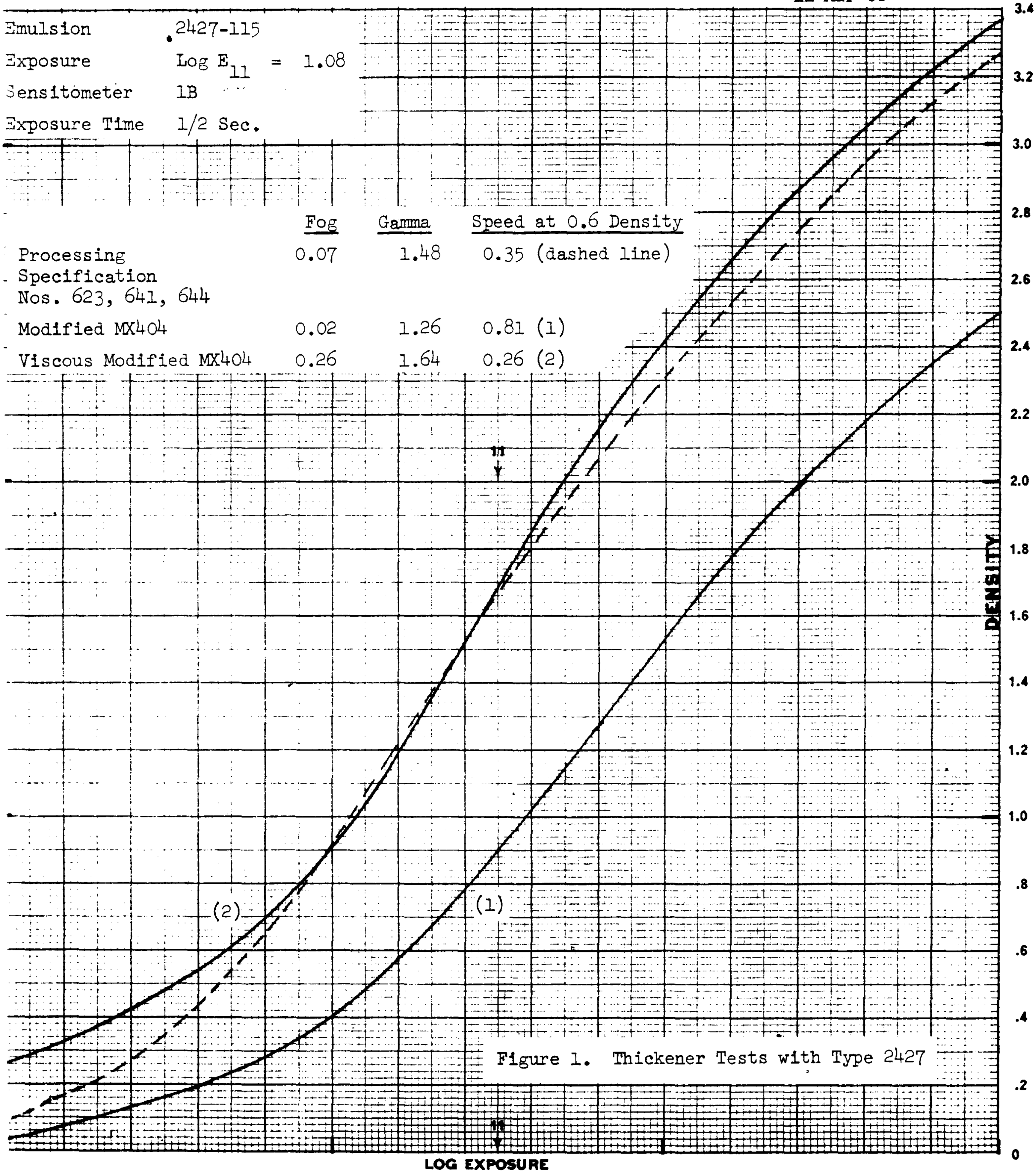


Figure 1. Thickener Tests with Type 2427

 [redacted]

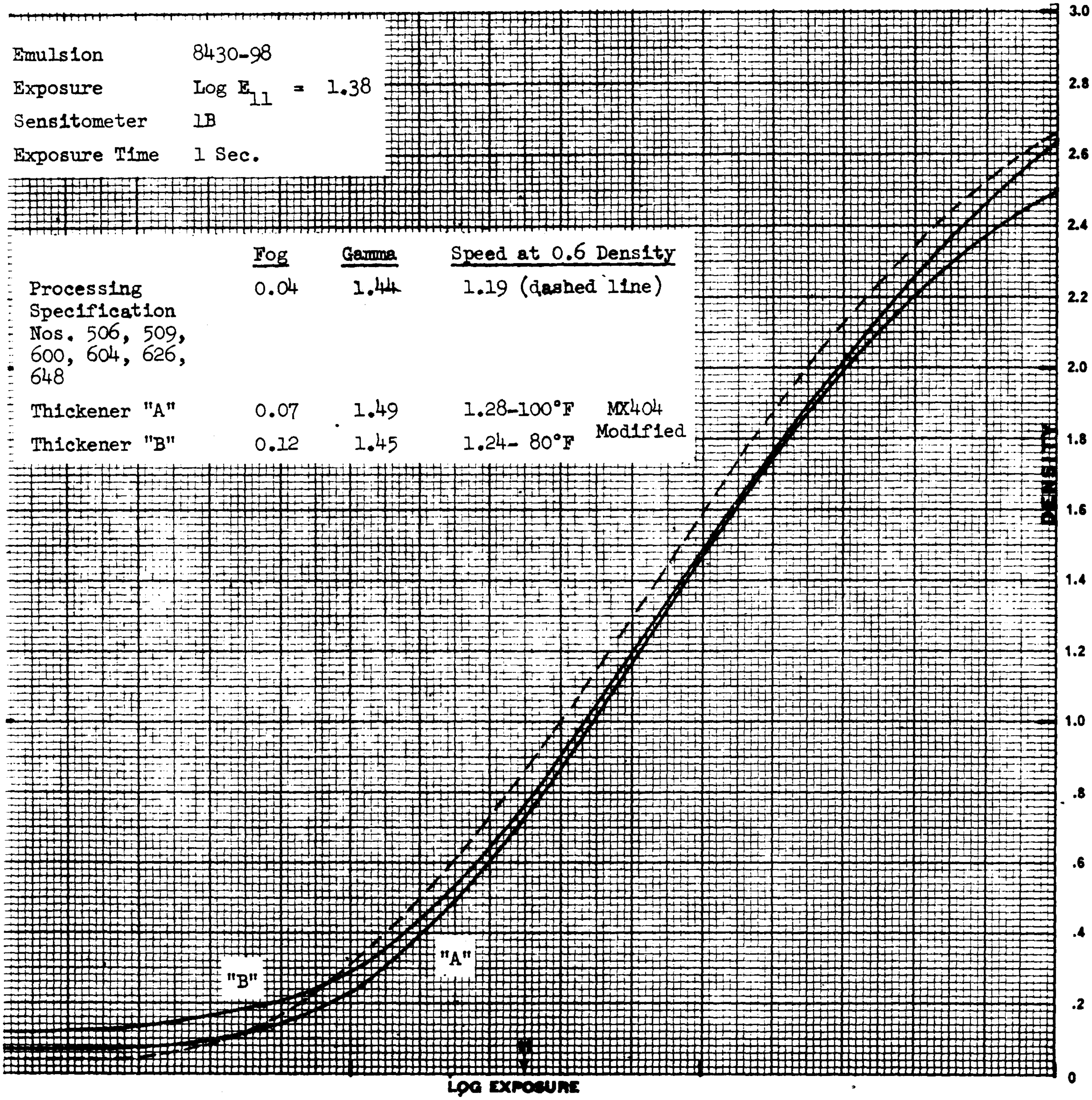


Figure 2. Thickener Tests with Type 8430

Contract [redacted], Task D
Third Quarter FY-66

PAR 113B
11 Mar 66

SUBJECT: Spool Elevator Viewing Table

TASK/PROBLEM

1. Develop, fabricate, and test a breadboard viewing table for handling UTB and other film materials without the use of idler rolls.

DISCUSSION

2. This PAR was approved by TWX [redacted] from the customer dated 18 Jan 66.

3. An elevator mechanism and film position sensor is being developed.

4. The contractor is currently gathering information on lathe-bed-type slides for the elevating mechanism.

5. A simple edge-rider roll was breadboarded and is to be tested on a viewing table to determine whether it will be satisfactory for use as a stock spool diameter or position sensor. The purpose of this evaluation is to verify the fact that the rider roll will not mar or damage the film surface, the titling, or the image on films without an edge border.

PLANNED ACTIVITY

6. Complete the development study, and begin layout and detail drawings and fabrication.

Contract [redacted], Task D
Third Quarter FY-66

PAR 118S/M
11 Mar 66

SUBJECT: Ultra-Thin-Base (UTB) Film Splicing Study*

TASK/PROBLEM

1. Investigate methods and means available for thin-sheet splicing and determine their applicability to UTB film splicing.

DISCUSSION

2. Preliminary investigations were started and consideration was given to the content of the specifications required.

PLANNED ACTIVITY

3. Specifications will be completed and submitted to prospective vendors.

4. Evaluate proposals and prepare and submit the final report.

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* This PAR was originally submitted as PAR 98M. In order to avoid confusion with PAR 98B, Splicer for Ultra-Thin-Base (UTB) Materials, which is deferred, PAR 98M was changed to 118S/M.

Contract [redacted] Task A
Third Quarter FY-66

PART XIX
Item 3P
11 Mar 66

SUBJECT: Movable Head Densitometer (MHD)

TASK/PROBLEM

1. Design, fabricate, and test one prototype model spot densitometer providing convenient, two-direction movement of a low-mass reading head over the photographic sample.

DISCUSSION

2. A fixed-price subcontract for the design and fabrication of a prototype movable head densitometer was initiated 15 Dec 65. It is to be completed by 15 Aug 66.

3. Design studies and a rough model of a possible mechanical probe-closing mechanism for the MHD were made by the contractor's staff. On 11 Jan 66, this model was taken to the subcontractor's plant for engineering discussions. Use of this proposed design in the prototype densitometer was considered by the subcontractor following that conference. It appears desirable to continue the use of solenoid drives in preference to the mechanical linkage system for the probe-closing mechanism (as in the breadboard). Current thinking on this design includes the use of rotary solenoids enclosed in the 1.5-inch-square arms of the head. The result is a smooth, clean exterior surface.

4. The type 7767 photomultiplier tube (3/4-inch nominal diameter, in-line dynode structure) which is proposed for the prototype densitometer was received and has been the basis of the design studies of the head assembly.

5. The subcontractor will attempt to "pot" the lower fiber bundle (illuminated system, bifurcated bundle) into a heavy-wall-metal tube with its end polished as the film-contacting surface and the light-locking "anvil" to provide optimum conditions for protection of the films to be read.

6. The head movement brake will be simplified to use a single electromagnet to brake in both x and y directions. A new (smaller section and shorter length) square-bar track which is different from that in the breadboard will be used for the front-to-back motion.

PLANNED ACTIVITY

7. Continue monitoring engineering progress at the subcontractor's plant.

Contract [redacted]
Third Quarter FY-66

PART XIX
Item 4B
11 Mar 66

SUBJECT: Two-Strand Film Viewer

TASK/PROBLEM

1. Design, fabricate, and test a mechanism to handle two independent strands of film in a synchronous manner over a viewing surface. Mechanism to accept all film sizes from 70mm to 9.5-inches wide.

DISCUSSION

2. The final report was prepared.

PLANNED ACTIVITY

3. Publish and transmit the final report.

Contract [redacted]
Third Quarter FY-66

PART XIX
Item 5P
11 Mar 66

SUBJECT: Automatic Recording Densitometer

TASK/PROBLEM

1. Provide two densitometers and the necessary associated equipment for making density readings with automatic D/log E curve plotting from sensitometric control strips. Capability for both black-and-white and color materials is required.

DISCUSSION

2. New flexible, premium-grade, step tablets and wedge modulators were ordered for use in the 1B Sensitometer; 10-cm wedges were also ordered for use in the EGG or Kodak Model 101 Sensitometers. A simple computer program was written to test the calibration data for these wedges against performance specifications. The first "cast" of wedge modulators was not usable; a second made before 11 Mar 66 has not been evaluated.

3. Checkout of the sample trimmer units was made at the user's location. It was found that users must often read material immediately after it is removed from the dryer, and material sometimes curls after removal before it has had time to stabilize. The vacuum hold-down provided in the trimmers did not hold the curled film. A mechanical hold-down system to supplement the vacuum was designed and installed on one trimmer. Preliminary user tests indicated that the design is basically suitable. Some minor problems remain and agreement for solution has been reached. Both units can be now be completed.

PLANNED ACTIVITY

4. Mount the premium-grade wedge and step-tablet units; complete user checkout and refinement of the sample trimmer units.

Contract [redacted]
Third Quarter FY-66

PART XIX
Item 6P
11 Mar 66

SUBJECT: Galaxy Continuous Printer

TASK/PROBLEM

1. Design, fabricate, and test Galaxy Continuous Printer, Model II.

DISCUSSION

2. Introduction:

a. The Galaxy Printer developmental model was built under PAR 13 to solve the problem of printing reconnaissance photographs where the optimum exposure varies greatly for consecutive frames. This design provided alternate light paths and filter arrangements so that the exposure level for each frame could be programmed prior to actual frame printing. The synchronized shutter drive accomplished this rapid exposure change entirely within the frame interspace without interruption in printer output.

b. The purpose of this project is to apply the developmental model design concept to the design and fabrication of a prototype model incorporating the following major improvements:

(1) The ability to read binary frame numbers titled on film, compare them with a paper-tape frame number and, if the numbers match, print at optimum exposure levels which are indicated by data stored on the paper tape.

(2) The capability to accommodate 2 3/8-inch short frames.

3. Assembly Operations. All assembly and wiring operations on both the electronics console and the printer console were completed.

4. Checkout Operations:

a. Tests on the readout heads showed that excessive heat was encountered. This problem was eliminated by redesigning the cooling system to exhaust air from the lamphouse instead of blowing it over a lamp baffle.

b. A new lamp was obtained from the vendor which has a much higher light output, a considerably extended life, and lower power consumption. In tests on this lamp, excellent results were obtained, and the readout heads are being modified to accept the new lamp. Checks on the Galaxy printer system have reached the point where the filters and the shutter have been operated through the electronic circuitry except that the film frame number and reference mark signals were simulated for these tests by switches.

c. Instead of exposing film for timing and system performance tests, a photocell monitoring arrangement has been installed in the print gate. This change will simplify testing procedures considerably and produce more usable information.

d. A laboratory indicator-lamp panel which was used to indicate the contents of various storage registers proved so useful that a similar panel is being designed for installation in the electronics rack.

PLANNED ACTIVITY

5. Complete engineering checkout.

Contract [redacted]
Third Quarter FY-66

PART XIX
Item 9P
11 Mar 66

SUBJECT: Viscous Developer Coating Hoppers for Yardleigh Processor

TASK/PROBLEM

1. Design, fabricate, install, and test viscous developer coating hoppers to process 5-, 6.6-, 8-inch wide film on the Yardleigh Processor.

DISCUSSION

2. The final report was transmitted to the customer on 3 Mar 1966.

PLANNED ACTIVITY

3. None. Submission of the final report constituted project completion.

[redacted]

SECTION III

APPENDIX

[redacted]

APPENDIX

CONTRACTS [redacted] and [redacted]

PAR INDEX AND SUMMARY

11 Mar 66

PAR No.(1)	Title	Task(2)	Status	Effort Category	Associated PAR Numbers
1B	10-20-40 Roll Holder	N/A	Complete Aug 64	Printing	
2S	3.6 Reduction Lens Design	N/A	Complete Jan 64	Printing	
3B	20X Color Lens	N/A	Complete Aug 64	Printing	
4S	Automatic Exposure Control Printer	N/A	Cancelled	Printing	
5B	Scanning Densitometer	N/A	Active	Printing	
6S	400-Watt Mercury Arc Source	N/A	Complete Oct 63	Printing	36S
7S	Commercial Components	N/A	Complete Oct 65	Miscellaneous	
8S	Frame Coding and Detecting	N/A	Complete Dec 64	Printing	
9B	Frame Detector and Counter	N/A	Active	Printing	
10B	Automatic IR Densitometer	N/A	Active	Processing	61B
11S	Testing Unsharp Masks	N/A	Complete Aug 64	Printing	
12P	Redesign MRT Camera	N/A	Complete Mar 66	Printing	
13B	Frame by Frame Printer	N/A	Complete Oct 64*	Printing	53S, XIX-6P
14B	Modification of Mod 5 Micro-D	N/A	Complete Nov 64	Miscellaneous	
15B	Reversal Processor	N/A	Cancelled	Processing	
16-1S	70mm Breadboard	N/A	Complete Jan 64	Processing	54S, 58S, 58-5-1S, 58-5-2S, 58-5-4S, 58-5-8S, 58-5-9S, 74S, 76B, 76B/Rev. 1, 85S/M, 93S, 94B, 100-1S, 100-2B, 100-4B, 100-5B, 100-6S, XIX-9P
16-2S	Viscous Developer Coating	N/A	Complete May 64	Processing	
16-3S	70mm Prototype Processor	N/A	Complete Apr 65	Processing	
16-4B	FxF 9.5-Inch Processor (Yardleigh)	N/A	Complete Apr 65	Processing	
17B	Bidirectional Printer	N/A	Complete Oct 64*	Printing	84B/M
18B	Color Printer	N/A	Complete Jan 64*	Printing	
19S	Exposure Control Criteria	N/A	Trans. to PAR 24	Investigation	24S
20S	Advance Components for Printer	N/A	Complete Oct 64	Printing	
21S	Phosphor Viewer	N/A	Cancelled	Miscellaneous	

(1) a. A letter following the number identifies the PAR as one of the following types: S - Study; B - Breadboard; P - Prototype --

Study - A theoretical and/or empirical analysis or examination of techniques, and methods. Development and fabrication of hardware is limited to special equipment for data acquisition or determination of feasibility of techniques.

Breadboard - The development, fabrication and testing of equipment to prove production feasibility of a design concept. Documentation will consist of sketch drawings and operating instructions suitable for in-house fabrication, testing, and operation.

Prototype - The design, fabrication and testing of equipment for production use. Documentation will consist of drawings, parts list and manual suitable for external fabrication, testing, operation and maintenance.

b. A letter following a slant line (/) identifies the PAR as: /R1, Revision 1; /R2, Revision 2, etc.; /M - Minor Project.

(2) Task designations are not applicable (N/A) to Contract [redacted] PARs.
Contract [redacted] PARs are identified by one of the following designations:

A, B, C etc. - The task to which the PAR is assigned.
U - No task assigned.

*Transferred to [redacted]

CONTRACTS [redacted] and [redacted]

PAR INDEX AND SUMMARY

PAR No.(1)	Title	Task(2)	Status	Effort Category	Associated PAR Numbers
22B	Trenton Recorder and Warning System	N/A	Complete Jan 64	Processing	
23S	Processing/Printing Improvements	N/A	Complete Mar 65	Proc./Print	23-5-2S, 23-5-4S, 42S
23-5-1S	Frame by Frame Printing	N/A	Active	Printing	
23-5-2S	Contact Print. & Optical Components	N/A	Active	Printing	23S, 42S
23-5-3S	Spray Process	N/A	Active	Processing	
23-5-4S	Improved Use of IR Densitometer	N/A	Active	Processing	23S
23-5-5S	Measle Study	N/A	Active	Investigation	
23-5-6S	Gold Treatment	N/A	Complete Jul 65	Investigation	
23-5-7S	Clean and Protect Film	N/A	Active	Handling	
23-5-8S	Density and Contrast Study	N/A	Active	Investigation	
23-5-9S	IFDV in Mission Films	N/A	Active	Investigation	
23-5-10S	Multiple Generation Study	N/A	Cancelled	Printing	
24S	Red Dot Tests; Processing	N/A	Complete Nov 64	Processing	
	Red Dot Tests; Scene Luminance			Investigation	
24-5-1S	Low Altitude Reconnaissance	N/A	Active	Investigation	
24-5-2S	High Altitude Acquisition	N/A	Active	Investigation	
24-5-3S	Night Photography	A	Active	Investigation	
24-5-4S	Contrast of Original Negatives	N/A	Active	Processing	
24-5-5S	Exposure Criteria, Acquisition Films	N/A	Complete Jul 65	Investigation	
24-6-5S	Exposure Criteria, Acquisition Films	B	Active	Investigation	
25S	Image Analysis	N/A	Complete Sept 65	Investigation	25-6-1S, 25-6-2S
25-6-1S	Mission Analysis	B	Active	Investigation	25S
25-6-2S	Study Refinements in Applications of Micro-D Data	B	Active	Investigation	25S
26S	Effect of Radiation	N/A	Complete Jan 64	Investigation	
27B	Mod. 6 Micro-D	N/A	Cancelled	Miscellaneous	
28S	Modular Processor	N/A	Cancelled	Processing	
29S	R&D Processor for QC	N/A	Cancelled	Processing	
30S	Test Waxing on Processor	N/A	Cancelled	Handling	
31S	Ultrasonic Cleaner	N/A	Complete Jan 64	Handling	
32S	Ultrasonic Splicer	N/A	Complete Oct 63	Handling	
33B	Mod. III Titler	N/A	Complete Nov 65	Handling	
34	-	N/A	Not Issued	-	
35	Travel FY-64	N/A	Complete	Miscellaneous	66, 111
36S	1000-Watt Source	N/A	Complete July 65	Printing	6S, XIX-1B
37S	Improved Versamat Processor	N/A	Complete Oct 63	Processing	
38B	Adjustable Slitter	N/A	Active	Handling	
39B	Light Source Test Fixture	N/A	Complete Aug 64	Printing	
40B	Grafton Conversion	N/A	Complete Jan 64*	Processing	
41B	Speltron	N/A	Complete*	Processing	
42S	Advanced Filter Components	N/A	Complete**	Printing	23S, 23-5-2S
43B	Heat Seal Splicer	N/A	Complete Jul 64	Handling	
44B	Sens. Edge Printer for Processor	N/A	Active	Printing	

(1) See Page A-1.

(2) See Page A-1.

* Trans. to [redacted]

** Trans. to PAR 23-5-2

CONTRACTS [redacted] and [redacted]

PAR INDEX AND SUMMARY

PAR No.[1]	Title	Task[2]	Status	Effort Category	Associated PAR Numbers
45B	Mod. EN18	N/A	Cancelled	Processing	
46S	Ultra Thin Film Handling	N/A	Active	Handling	98B, 98S/M
47B	S&R Color Printer	N/A	Not Issued	Printing	
48B	Automatic Micro D-5	N/A	Not Issued	Miscellaneous	
49B/R1	Edge Flasher	A	Active	Handling	
50S	Optical Add-On Titling	A	Complete Nov 65	Handling	
51B	S&R Color Printer	N/A	Active	Printing	
52B	S&R Drum Printer	N/A	Active	Printing	
53B	Automatic Exposure Control Study	N/A	Active	Printing	13B, XIX-6S
54S	All-Viscous Processor Study	N/A	Complete Oct 65	Processing	16-1S, 16-2S, 16-3S, 16-4B, 58S, 58-5-2S, 58-5-3S, 58-5-4S, 58-5-8S, 58-5-9S, 93S, 100-1S, 100-2B, 100-4B, 100-5B, 100-6S
55S/R1	Bimat Study	N/A	Active	Processing	
56S	Bimat Processor No. 1	N/A	Active	Processing	
57S	Bimat Processor No. 2	A	Active	Processing	
58S	Adv. Proc. Techn. Study	N/A	Complete Mar 65	Processing	See 58-5-2S
58-5-1S	Wash Water Studies	N/A	Active	Processing	80B
58-5-2S	Viscous Developer Studies	N/A	Active	Processing	16-1S, 16-2S, 16-3S, 16-4B, 54S, 58S, 58-5-2S, 58-5-3S, 58-5-4S, 58-5-8S, 58-5-9S, 93S, 100-1S, 100-2B, 100-4B, 100-5B, 100-6S
58-5-3S	Viscous Washing Studies	N/A	Active	Processing	
58-5-4S	Removal of Viscous Coatings	A	Active	Processing	
58-5-5S	Film Drying Studies	N/A	Withdrawn	Processing	100-6S
58-5-6S	Solution Carrier Studies	N/A	Withdrawn	Processing	
58-5-7S/M	Study of Silver Recovery	N/A	Active	Miscellaneous	
58-5-8S	Viscous Coating Temperature Study	A	Active	Processing	See 58-5-2S
58-5-9S	Viscous Fix Studies	A	Active	Processing	See 58-5-2S
58-5-10S	Long Length Bimat Film Study	N/A	Withdrawn	Processing	
59S	Flying Splicer	N/A	Cancelled	Handling	
60S	Film Handling Technique	N/A	Active	Handling	
61B	Improved IR Scanner	N/A	Active	Processing	10B
62S/M	Central Control Study	N/A	Active	Processing	
63S	Raw Stock (Film) Cleaning Inv.	A	Active	Handling	
64S	Wide Film Handling Study	N/A	Withdrawn	Handling	
65S	Non-Photo Supply Investigation	N/A	Cancelled	Miscellaneous	
66	Travel and Liaison FY-65	N/A	Complete	Miscellaneous	35, 111
67S	Study Dist. of Niagara Printer	N/A	Cancelled	Printing	
68B	Identification Printer	A	Active	Printing	
69S/M	Ultrasonic Edge Detector	N/A	Active	Handling	
70B	Film Scanner Recorder	B	Active	Investigation	
71	-	-	Not Issued	-	
72B	B&W, S&R, Bed Printer	N/A	Active	Printing	
73	Administration FY-65	N/A	Complete	Miscellaneous	112

(1) See Page A-1.

(2) See Page A-1.

CONTRACTS [redacted] and [redacted]

PAR INDEX AND SUMMARY

PAR No.(1)	Title	Task(2)	Status	Effort Category	Associated PAR Numbers
74S	Airborne Proc. Lab	N/A	Cancelled	Processing	
75B	Airborne Insp. Work Center	N/A	Cancelled	Handling	
76B	Upgrade Yardleigh Processor	N/A	Active	Processing	16-4B, 76B/R1, XIX-9P
76B/R1	Upgrade Yardleigh Processor	N/A	Active	Processing	16-4B, 76B, XIX-9P
77B/R1	Processed Film Slitter	N/A	Complete Feb 66	Handling	
78S	Cross-Frame Lacquerer	N/A	Active	Handling	117P
79B	Unimak Film Titler	A	Active	Handling	
80B	Ion Exchange System	N/A	Withdrawn	Processing	58-5-1S
81S/M	Versamat Water Reduction	N/A	Complete Dec 65	Processing	
82 B	Two-Strand Stereo Viewer	A	Active*	Handling	
83S/M	Versamat Rack Washer	N/A	Complete Dec 65	Processing	
84B/M	Three-Lamp Lamphouse	N/A	Active	Printing	17B
85S/M	Airborne Proc. Layout Study	N/A	Complete July 65	Investigation	
86S	Study Application of Liquid Gates	D	Active	Printing	
87S/M	Variability in Resolution Values	B	Active	Investigation	
88S/M	Mathematical Color System Model	B	Active	Investigation	
89S	Study Proc. of Stellar Image Records	D	Active	Processing	
90S	Film Tension and Transport Study	B	Active	Handling	
91B	Respooler for Ultra Thin Base Film	D	Active	Handling	
92	-	-	Not Issued	-	
93S	Temp. Control of 70mm Viscous Hoppers	B	Active	Processing	16-4B, 54S, 58S, 100-2B, 100-4B, 100-5B
94B	Yardleigh Recorder	B	Active	Processing	
95B	Experimental Printer for UTB Films	D	Active	Printing	
96B	Galaxy Print w/Variable Intensity Light	-	Withdrawn	Printing	
97S	Edge Defect Sensor	U	Deferred	Handling	
98B	Splicer for Ultra Thin Base Materials	U	Deferred	Handling	46S, 98S/M
99	-	-	Not Issued	-	
100-1S	All-Viscous Chemistry	C	Active	Processing	See 100-4B
100-2B	Temp. Control 9.5-Inch Viscous Hopper	C	Active	Processing	58-5-8S, 93S, 100-4B, 100-5B
100-3B	Film Footage Marker	C	Active	Handling	100-4B
100-4B	Devel. 9.5-Inch All Viscous Processor	C	Active	Processing	16-1S, 16-2S, 16-3S, 16-4B, 54S, 58-5-2S, 58-5-3S, 58-5-4S, 58-5-8S, 58-5-9S, 93B, 100-1S, 100-2B, 100-3B, 100-4B, 100-5B, 100-6S, 100-7B
100-5B	IR Scanner and Electronic Control Units	C	Active	Processing	100-2B, 100-4B
100-6S	Drying Equipment	C	Active	Processing	58-5-5S, 100-4B
100-7B	Lightweight Presplice Complex	U	Deferred	Handling	100-4B
101B	Macrodensitometer Breadboard	D	Active	Miscellaneous	
102B	Sensitometric Spray Proc. Breadboard	U	Deferred	Processing	
103B	Printer-Processor Breadboard	U	Cont. Preparing	Print-Proc.	
104	-	-	Not Issued	-	

(1) See Page A-1.

(2) See Page A-2.

*Only the purchase of the stereoscope has been authorized and has been previously reported under PAR 82M.

CONTRACTS [redacted] and [redacted]

11 Mar 66

PAR INDEX AND SUMMARY

PAR No.[1]	Title	Task[2]	Status	Effort Category	Associated PAR Numbers
105S	High Temp. Proc. Non-Rev. Color Films	-	Cancelled	Processing	
106S	Reversal Proc. B&W Acq. & Dupe Films	-	Cancelled	Processing	
107B	Drum Printer with Modulated CRT Source	D	Active	Printing	
108B	Air Roller Viewing Table	-	Cancelled	Handling	
109S	Viscous Monobath Techniques Study	B	Active	Processing	
110B	Microdensitometer for Roll Film Samples	U	Deferred	Miscellaneous	
111	Travel and Liaison (FY-66)	D	Active	Miscellaneous	35, 66
112	Administration (FY-66)	D	Active	Miscellaneous	73
113B	Spool Elevator Viewing Table for UTB Film	D	Active	Handling	
114	-	-	Not Issued	-	
115S	Silver Recovery from Viscous Fix	-	Cancelled	Miscellaneous	
116S	Study Distortion in Photo Duplication	U	Cont. Preparing	Print-Proc.	
117P	Cross-Frame Lacquerer	U	Cont. Preparing	Handling	78S
118S/M**	Ultra Thin Base Films Splicing Study	D	Active	Handling	46S, 98B
PART XIX					
Item 1B	1000-Watt Continuous Printer	N/A	Withdrawn	Printing	6S, 36S
Item 2B	Waxer-On Processor	N/A	Withdrawn	Handling	
Item 3P	Moveable Head Densitometer	A	Active	Miscellaneous	
Item 4B	Two-Strand Film Viewer	N/A	Active	Handling	
Item 5P	Automatic Recording Densitometer	N/A	Active	Miscellaneous	13B, 53B
Item 6P	Galaxy Continuous Printer	N/A	Active	Printing	
Item 7B	Trenton Processor	N/A	Not Submitted	Processing	
Item 8B	Lab Contact Printer	N/A	Cancelled	Printing	
Item 9P	Yardleigh Coating Hopper	N/A	Complete Mar 66	Processing	

(1) See Page A-1.

(2) See Page A-2.

*Transferred t [redacted]

** Submitted to the customer as PAR 98M. To avoid confusion with deferred PAR 98B, Splicer for Ultra Thin Base Materials, the number of PAR 98M has been changed to PAR 118S/M.