[redacted]

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22 December 1965

Dear [redacted]

Subject: Contracts [redacted] - Quarterly Report

We are forwarding herewith [redacted] of the Quarterly Report, Second Quarter FY-66, 10 September 1965 through 10 December 1965, for the subject contracts.

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This Document Contains
135 Pages.

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QUARTERLY REPORT
Contracts [redacted] and [redacted]

Second Quarter FY-66

(10 September through 10 December 1965)

10 December 1965

Prepared by:

[redacted]

Approved by:

[redacted]

for E. L. Green

Prepared at Contractor's Facility
as Specified by
Contracts [redacted] and [redacted]



[redacted]

10 Dec 65

## 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.

10 Dec 65

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# SECTION I

# INTRODUCTION

[redacted]

QUARTERLY REPORT
Contracts [redacted] and [redacted]
Second Quarter FY-66

10 Dec 65

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 10 Sept through 10 Dec 65.

2. A CCB Quarterly Progress Review Meeting was held at the contractor's facility on 6 Oct 65. Contractor's report [redacted] dated 7 Oct 65, summarizes the discussion 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 contracts. In the discussion section which follows, the PAR Status Index is listed numerically and a PAR cross-index, by contract, is also included for reference.

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

a. PAR 66, Travel and Liaison, FY-65.

b. PAR 73, Administration, FY-65.



[redacted]

10 Dec 65

DISCUSSION

5. PAR Status Index: A complete serial listing of PARs and PART XIX Items showing current status is included below. Items marked with an asterisk reflect a change of status or a new PAR since the last quarterly report:

| PAR | Title | Status |
|---|---|---|
| 1 | 10-20-40 Roll Holder | Complete Aug 64 |
| 2 | 3.6 Reduction Lens Design | Complete Jan 64 |
| 3 | 20X Color Lens | Complete Aug 64 |
| 4 | Auto. Exp. Control Printer | Cancelled |
| 5 | Scanning Densitometer | Active |
| 6 | 400-Watt Mercury Arc Source | Complete Oct 63 |
| 7 | Commercial Components | Complete Oct 65 |
| 8 | Frame Coding and Detecting | Complete Dec 64 |
| 9 | Frame Detector and Counter | Active |
| 10 | Automatic IR Densitometer | Active |
| 11 | Testing Unsharp Masks | Complete Aug 64 |
| 12 | Redesign MTR Camera | Active |
| 13 | Frame by Frame Printer | Trans. [redacted] Complete Oct 64 |
| 14 | Modification of Mod 5 Micro-D | Complete Nov 64 |
| 15 | Reversal Processor | Cancelled |

10 Dec 65

| PAR | Title | Status |
|---|---|---|
| 16-1 | 70mm Breadboard | Complete Jan 64 |
| 16-2 | Viscous Developer Coating | Complete May 64 |
| 16-3 | 70mm Prototype Processor | Complete 6 Apr 65 |
| 16-4 | F x F 9.5-Inch Processor (Yardleigh) | Complete 6 Apr 65 |
| 17 | Bidirectional Printer | Trans. [redacted] Complete Oct 64 |
| 18 | Color Printer | Trans. [redacted] Complete Jan 64 |
| 19 | Exp. Control Criteria | Effort Transferred to PAR 24 |
| 20 | Advance Components for Printer | Complete 5 Oct 65* |
| 21 | Phosphor Viewer | Cancelled |
| 22 | Trenton Rec. & Warning Device | Complete Jan 64 |
| 23 | Processing Improvements<br>Printing Improvements | Complete Feb 65<br>Complete Mar 65 |
| 23-5-1 | Frame by Frame Printer | Active |
| 23-5-2 | Contact Print. & Optical Comp. | Active |
| 23-5-3 | Spray Process | Active |
| 23-5-4 | Improved Use of IR Densitometer | Active |
| 23-5-5 | Measle Study | Active |
| 23-5-6 | Gold Treatment | Completed 28 July 65 |
| 23-5-7 | Clean and Protect Film | Active |
| 23-5-8 | Density and Contrast Study | Active |
| 23-5-9 | Dual Printing | Active |
| 23-5-10 | Multiple Generation Study | Cancelled |

* Change of status since last Quarterly Report.

10 Dec 65

| PAR | Title | Status |
|---|---|---|
| 24 | Red Dot Tests; Processing<br>Red Dot Tests; Scene Luminance | Complete Nov 64<br>Complete Sept 64 |
| 24-5-1 | Low Alt. Reconnaissance | Active |
| 24-5-2 | High Alt. Color Acq. | Active |
| 24-5-3 | Night Photography | Active |
| 24-5-4 | Negative Contrast | Active |
| 24-5-5 | Exposure Criteria | Complete 28 July 65 |
| 24-6-5 | Exposure Criteria | Active |
| 25 | Image Analysis | Complete Sept 65 |
| 25-6-1 | Mission Analysis | Active |
| 25-6-2 | Study Refinements in Applications of Microdensitometer Data | Active |
| 26 | Effect of Radiation | Complete Jan 64 |
| 27 | Mod 6 Micro-D | Cancelled |
| 28 | Modular Processor | Cancelled |
| 29 | R&D Processor for QC | Cancelled |
| 30 | Test Waxing on Processor | Cancelled |
| 31 | Ultrasonic Cleaner | Complete Jan 64 |
| 32 | Ultrasonic Splicer | Complete Oct 63 |
| 33 | Mod III Titler | Complete 23 Nov 65* |
| 34 | - | Not Issued |
| 35 | Travel FY-64 | Complete |

* Change of status since last Quarterly Report.

10 Dec 65

| PAR | Title | Status |
|---|---|---|
| 36 | 1000-Watt Source | Complete 28 July 65 |
| 37 | Improved Versamat Processor | Complete Oct 63 |
| 38 | Adj. Slitter | Active |
| 39 | Light Source Test Fixture | Complete Aug 64 |
| 40 | Grafton Conversion | Trans. [redacted] Complete Jan 64 |
| 41 | Speltron | Trans. [redacted] Complete |
| 42 | Adv. Filter Components | Complete Mar 64; Trans. effort to PAR 23-5-2 |
| 43 | Heat Seal Splicer | Complete July 64 |
| 44 | Sens. Edge Printer | Active |
| 45 | Mod EN18 | Cancelled |
| 46 | Ultra Thin Film Handling | Active |
| 47 | S&R Color Printer | Not Issued |
| 48 | Automatic Micro D-5 | Not Issued |
| 49A | Edge Flasher | Active |
| 50 | Optical Add-On Titling | Complete Nov 65* |
| 51 | S&R Color Printer | Active |
| 52 | S&R Drum Printer | Active |
| 53 | Auto. Exp. Control Study | Active |
| 54 | Viscous Proc. Study | Complete Oct 65* |
| 55A | Bimat Study | Active |

* Change of status since last Quarterly Report.

10 Dec 65

| PAR | Title | Status |
|---|---|---|
| 56 | Bimat No. 1 Processor | Active |
| 57 | Bimat No. 2 Processor | Active |
| 58 | Adv. Proc. Techn. Study | Complete Mar 65 |
| 58-5-1 | Wash Water Studies | Active |
| 58-5-2 | Viscous Developer Studies | Active |
| 58-5-3 | Viscous Washing Studies | Active |
| 58-5-4 | Viscous Coating Removal Study | Active |
| 58-5-5 | Film Drying Studies | Withdrawn* |
| 58-5-6 | Solution Carrier Studies | Withdrawn* |
| 58-5-7M | Silver Recovery Study | Active |
| 58-5-8 | Viscous Coating Temperature Study | Active |
| 58-5-9 | Viscous Fix Study | Active |
| 58-5-10 | Long Length Bimat Film Study | Withdrawn* |
| 59 | Flying Splicer | Cancelled |
| 60 | Film Handling Tech. | Active |
| 61 | Improved IR Scanner | Active |
| 62M | Central Control Study | Active |
| 63 | Inv. Raw Stock Cleaning | Active |
| 64 | Wide Film Handling | Withdrawn* |
| 65 | Non-Photo Supply Inv. | Cancelled |
| 66 | Travel & Liaison FY-65 | Active |
| 67 | Study Dist. of Niagara Printer | Cancelled |
| 68 | Ident. Printer | Active |

* Change of status since last Quarterly Report.

10 Dec 65

| PAR | Title | Status |
|---|---|---|
| 69M | Ultrasonic Edge Detector | Active |
| 70 | Film Scanner Recorder | Active |
| 71 | - | Not Issued |
| 72 | B&W, S&R, Flat Bed Printer | Active |
| 73 | Administration FY-65 | Active |
| 74 | Airborne Proc. Lab | Cancelled |
| 75 | Airborne Insp. Work Center | Cancelled |
| 76 | Upgrade Yardleigh Processor | Active |
| 76 Suppl. #1 | Upgrade Yardleigh Processor | Active |
| 77A | Processed Film Slitter | Active |
| 78 | Cross Frame Lacquerer | Active |
| 79 | Unimak Film Titler | Active |
| 80 | Ion Exchange System | Withdrawn* |
| 81M | Versamat Water Reduction | Active |
| 82M | Two-Strand Stereo Viewer | Active |
| 83M | Versamat Rack Washer | Active |
| 84M | Three-Lamp Lamphouse | Active |
| 85M | Airborne Proc. Layout Study | Complete July 65 |
| 86 | Study the Applications of Liquid Gates to Continuous Printers | Deferred |
| 87M | Variability in Resolution Values | Active |

* Change of status since last Quarterly Report.

| PAR | Title | Status |
|---|---|---|
| 88M | Mathematical Color System Model | Active |
| 89 | Study Processing of Stellar Image Records | Active |
| 90 | Film Tension and Transport Study | Active |
| 91 | Respooler for Ultra Thin Base Film | Active |
| 92 | Not Assigned | - |
| 93 | Temp. Control of 70mm Viscous Hoppers | Active |
| 94 | Yardleigh Recorder | Active |
| 95 | Experimental Printer for UTB | Active |
| 96 | Galaxy Printer w/Variable Intensity Light Source | Deferred |
| 97 | Edge Defect Sensor | Deferred |
| 98 | Splicer for Ultra Thin Base Materials | Deferred |
| 99 | Not Assigned | - |
| 100-1 | All-Viscous Chemistry | Active* |
| 100-2 | Temperature Control for 9.5 Inch Viscous Hopper | Active* |
| 100-3 | Film Footage Marker | Active* |
| 100-4 | Developmental 9.5 Inch All-Viscous Processor | Active* |
| 100-5 | IR Scanner and Electronic Control Units | Active* |
| 100-6 | Drying Equipment | Active* |
| 100-7 | Multipurpose - Lightweight Presplice Complex | Deferred* |

* Change of status since last Quarterly Report.

| PAR | Title | Status |
|---|---|---|
| 101 | Macrodensitometer Breadboard | Deferred |
| 102 | Not Assigned | - |
| 103 | Not Assigned | - |
| 104 | Not Assigned | - |
| 105 | High Temp. Proc. Non-Rev. Color Films | Cancelled |
| 106 | Reversal Proc. B&W Acq. & Dupe Films | Cancelled |
| 107 | Drum Printer with Modulated CRT Source | Active* |
| 108 | Air Roller Viewing Table | Cancelled* |
| 109 | Viscous Monobath Techniques Study | Active |
| 110 | Microdensitometer for Roll Film Samples | Deferred |
| 111 | Travel & Liaison (FY-66) | Awaiting Customer Action |
| 112 | Administration (FY-66) | Awaiting Customer Action |
| 113 | Spool Elevator Viewing Table for UTB Film | Deferred |
| 114 | Not Assigned | - |
| 115 | Silver Recovery from Viscous Fix | Cancelled* |

* Change of status since last Quarterly Report.

10 Dec 65

PART XIX

| Item | Title | Status |
|---|---|---|
| 1 | 1000-Watt Continuous Printer | Withdrawn* |
| 2 | Waxer-On Processor | Transferred to [redacted]* |
| 3 | Moveable Head Densitometer | Active |
| 4 | Two-Strand Film Viewer | Active |
| 5 | Automatic Recording Densitometer | Active |
| 6 | Galaxy Continuous Printer | Active |
| 7 | Trenton Processor | Not Submitted* |
| 8 | Lab Contact Printer | Cancelled |
| 9 | Yardleigh Coating Hopper | Active |

6. Active PAR Index by Contract and Task:

a. Contract [redacted] (No Task Designation):

| PAR | Title |
|---|---|
| 5 | Scanning and Recording Densitometer |
| 9 | Frame Detector and Counter |
| 10 | Automation of IR Densitometer |
| 12 | Microscope Resolution Target Camera |
| 20 | Advanced Mechanical Components for Printer |
| 23-5-1 | Exposure Determination for Frame-by-Frame Printing |
| 23-5-2 | Study of Contact Printer Optical Components |
| 23-5-3 | Improvements to Spray Processing |
| 23-5-4 | Improved Use of Infrared Densitometry |
| 23-5-5 | Contact Print Mottle (Measles) |

* Change of status since last Quarterly Report.

| PAR | Title |
|---|---|
| 23-5-7 | Cleaning and Protection of Original in Duplicating Films |
| 23-5-8 | Density and Contrast of Duplicates |
| 23-5-9 | Intraframe Density Variation in Mission Films |
| 24-5-1 | Study of Photographic Films and Processes for Low Altitude Reconnaissance |
| 24-5-2 | High Altitude Color Acquisition |
| 24-5-4 | Contrast of Original Negatives |
| 33 | Mod III Titler |
| 38 | Adjustable Slitter |
| 44 | Sensitometric Edge Printer for Processor |
| 46 | Investigation of Ultra Thin Base Film Handling |
| 51 | Step-and-Repeat Color Printer |
| 52 | Step-and-Repeat Drum Printer |
| 53 | Automatic Exposure Control Study |
| 55A | Preliminary Investigation of Special Applications of the Bimat Process |
| 56 | Bimat Processor No. 1 |
| 58-5-1 | Wash Water Studies |
| 58-5-2 | Viscous Developer Studies |
| 58-5-3 | Viscous Washing Studies |
| 58-5-7M | Study of Silver Recovery |
| 60 | Film Handling Techniques |
| 61 | Improved IR Scanner |
| 62M | Study of Negative Processing Centralized Controls |
| 69M | Ultrasonic Edge Detector |
| 72 | Black-and-White, Step-and-Repeat Flat Bed Contact Printer |
| 76 | Upgrade Yardleigh Processor |
| 77A | Processed Film Slitter |

| PAR | Title |
|---|---|
| 78 | Cross-Frame Lacquerer |
| 81M | Wash Water Conservation on Standard Versamat |
| 83M | Versamat Rack Washer |
| 84M | Three-Lamp Lamphouse for Belair Printer |
| PART XIX | |
| Item 4 | Two-Strand Film Viewer |
| Item 5 | Automatic Recording Densitometer |
| Item 6 | Galaxy Continuous Printer |
| Item 9 | Viscous Developer Coating Hoppers for Yardleigh Processor |

b. Contract [redacted]

(1) Task A:

| PAR | Title |
|---|---|
| 24-5-3 | Night Photography |
| 49A | Edge Flasher |
| 50 | Optical Add-On Titling |
| 57 | Bimat Processor No. 2 |
| 58-5-4 | Removal of Viscous Coatings |
| 58-5-8 | Study Temperature Control of Viscous Coatings |
| 58-5-9 | Viscous Fix Studies |
| 63 | Raw Stock (Film) Cleaning Investigation |
| 68 | Identification Printer |
| 79 | Unimak Film Titler |
| 82M | Two-Strand Stereo Viewer |
| PART XIX | |
| Item 3 | Moveable Head Densitometer |

(2) Task B:

| PAR | Title |
|---|---|
| 24-6-5 | Exposure Criteria for Acquisition Films |
| 25-6-1 | Mission Analysis |
| 25-6-2 | Study Refinements in Applications of Microdensitometric Data |
| 70 | Film Scanner Recorder |
| 87M | Variability in Resolution Values |
| 88M | Mathematical Color System Model |
| 90 | Film Tension and Transport Study |
| 93 | Temperature Control of 70mm Viscous Hoppers |
| 94 | Yardleigh Recorder |
| 109 | Viscous Monobath Techniques Study |

(3) Task C:

| PAR | Title |
|---|---|
| 100-1 | All-Viscous Chemistry |
| 100-2 | Temperature Control for 9.5-Inch Viscous Hopper |
| 100-3 | Film Footage Marker |
| 100-4 | Developmental 9.5-Inch All-Viscous Processor |
| 100-5 | IR Scanner and Electronic Control Units |
| 100-6 | Drying Equipment |

(4) Task D:

| PAR | Title |
|---|---|
| 89 | Study Processing of Stellar Image Records |
| 91 | Respooler for Ultra Thin Base Film |
| 95 | Experimental Printer for UTB Films |
| 107 | Drum Printer with Modulated CRT Source |

7. PARs Completed During the Report Period:

a. PAR 20, Advanced Mechanical Components for Printers; Final Report transmitted 5 Oct 65.

b. PAR 33, Mod III Titler; Final Report transmitted 23 Nov 65.

c. PAR 50, Optical Add-On Titling; Final Report transmitted 2 Dec 65.

d. PAR 54, All-Viscous Processor Study; Final Report transmitted 26 Oct 65.

8. New PARs Submitted during the Report Period:

a. PAR 98, Splicer for Ultra Thin Base Materials [redacted]); transmitted 21 Sept 65. Deferred by CCB 6 Oct 65.

b. PAR 91, Respooler for Ultra Thin Base Film [redacted]; transmitted 22 Sept 65. Deferred by CCB 6 Oct 65.

c. The following PARs were transmitted on 28 Sept 65. Due to late submission, CCB action was deferred (except as noted).

(1) PAR 86, Study the Application of Liquid Gates to Continuous Printers [redacted])

(2) PAR 95, Experimental Printer for UTB Films [redacted]); approved by CCB 6 Oct 65.

(3) PAR 101, Macrodensitometer Breadboard [redacted]).

(4) PAR 113, Spool Elevator Viewing Table [redacted]).

(5) PAR 115, Silver Recovery from Viscous Fix ([redacted]); disapproved by CCB 6 Oct 65.

d. PAR 107, Drum Printer with Modulated CRT Source ([redacted]); transmitted 18 Nov 65; approved by customer message 9547, dated 7 Dec 65.

9. Interim and Special Reports submitted during report period:

a. PAR 24-5-5, Exposure Criteria for Acquisition Films, Interim Report ([redacted]) transmitted 13 Sept 65.

b. PAR 24-5-5, Exposure Criteria for Acquisition Films, Interim Report, titled Properties of Atmospheric Hazes in Relation to Photographic Exposure Criteria ([redacted]) transmitted 15 Sept 65.

c. Minutes of CCB Quarterly Progress Review Meeting, First Quarter FY-66, ([redacted]) transmitted 26 Oct 65.

d. PAR 25-6-2, Study Refinements in Applications of Microdensitometer Data, Special Report, transmitted 2 Dec 65.

10. The following items are recommended for discussion at the next CCB meeting:

a. Action items from last CCB Quarterly Review Meeting (6 Oct 65) including specifically:

(1) PAR 25-6-2, Study Refinements in Applications of Microdensitometer Data; Review Study Plan, Test Program to establish applicability of SPPL's Densitometer and contractor request for authorization, under this PAR, to purchase improved commercial microdensitometer and magnetic tape equipment.

(2) Status report on PAR 76, Upgrade Yardleigh Processor.

b. New PAR submission and review of deferred PARs. New PARs are so noted.

(1) PAR 86, Study the Application of Liquid Gates to Continuous Printers.

(2) PAR 97, Edge Defect Sensor.

(3) PAR 98M, Splicer for Ultra Thin Base Materials.

(4) PAR 101, Macrodensitometer Breadboard.

(5) PAR 102, Spray Sensitometric Processor - NEW. To be transmitted to customer by 23 Dec 65.

(6) PAR 113, Spool Elevator Viewing Table for UTB Film.

# SECTION II

# PAR PROGRESS REPORTS

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 5
10 Dec 65

SUBJECT: Scanning and Recording Densitometer

TASK/PROBLEM

1. To design and fabricate a prototype 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. All mechanical-optical design layout is complete.

3. Mechanical parts fabrication is about 75% complete.

4. The electrical packaging design is about 95% complete. Fabrication of the chassis units is about 50% complete.

PLANNED ACTIVITY

5. Cabinet delivery is anticipated on 13 Dec 65. Assembly effort will commence shortly thereafter and should reach completion during the next quarter.

6. Electrical fabrication of chassis units should be completed during next quarter.

7. Final assembly wiring should be completed during next quarter.



[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 9
10 Dec 65

SUBJECT: Frame Detector and Counter

TASK/PROBLEM

1. To develop and fabricate a frame detector and counter to detect frame lines, 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:

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

(1) The displayed 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 setup switches.

b. Detector Head: A scanning unit to detect frame lines, positioned over the film whose frames are to be counted.

3. Status: In order to detect both positive and negative frame lines, some changes were found necessary in the detector head requiring a change in detector head circuits:

a. New circuitry for the detector head has tested satisfactorily.

b. A new circuit board for the detector head has been designed and fabricated.

c. Designs for new mechanical parts to package the detector head have been released for fabrication.

PLANNED ACTIVITY

4. During the next quarter, the assembly of the detector head and over-all systems tests will be completed. An operation procedure will be prepared. The unit will be installed and given a final checkout.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 10
10 Dec 65

SUBJECT: Automation of IR Densitometer

TASK/PROBLEM

1. Design, fabricate and test an automatic IR Densitometer which will scan 90 percent of a picture frame and base processing level of that frame on 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, stepping switch, weighted shift register and output logic control to the solution spray solenoid valves.

3. Status: Engineering design is complete. Drawings are up-to-date except for installation data. All hardware has been completed, assembled, and checked out. Installation is complete. System check out is 75 percent complete. During this report period, internal and external logic problems and external equipment noise generation problems were encountered. These problems have now been overcome so that the system checkout can resume.

PLANNED ACTIVITY

4. Complete system checkout, test and evaluate.



[redacted]

Contract [redacted]

Second Quarter FY-66

PAR 12

10 Dec 65

SUBJECT: Microscope Resolution Target Camera

TASK/PROBLEM

1. Design and fabricate an instrument to produce high-quality 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 nozzle assemblies for the new fluid injection pumps were adjusted to proper performance.

3. Preparation of the final report was begun.

PLANNED ACTIVITY

4. Complete preparation and publish the final report.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 20
10 Dec 65

SUBJECT: Advanced Mechanical Components for Printers

TASK/PROBLEM

1. To investigate porous air rollers as a means to improve tracking and film handling.

DISCUSSION

2. The final report, PAR 20, Advanced Mechanical Components for Printers [redacted], dated 30 September 1965, was transmitted to the customer on 5 October 1965.

PLANNED ACTIVITY

3. Transmittal of the final report constitutes project termination.



[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 23-5-1
10 Dec 65

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. All experimental comparisons between the current densitometric procedure and the proposed tri-band system were completed and the data summarized. Included were production time comparisons and other feasibility considerations, as well as resultant print quality comparisons. On all counts, tri-band appears slightly superior to the present system of D-min/D-max readings.

3. The experimental effort was confined to 9.5-inch film, but there appears to be no reason why the procedure would not work as well with sizes as small as 5-inch. The procedure should be advantageous even in elaborately-equipped installations, but should be of particular value under field conditions where both equipment and personnel may be limited.

4. Summarized findings are being organized for inclusion in a final report.

PLANNED ACTIVITY

5. Complete the final report. Publication of this report is expected to occur in the coming (third) quarter.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 23-5-2
10 Dec 65

SUBJECT: Study of Contact Printer Optical Components

TASK/PROBLEM

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

DISCUSSION

2. The current series of tests to examine a 250-watt mercury arc lamp when powered at a 400-watt level has been terminated at the end of 1000 hours continuous operation. The results of 206 photographic test samples show a maximum $\triangle$ Log E range of 0.18 for the entire test period. However, during 20 of the 22 days in which tests were run, the Log E variation was 0.10 or less. The photographic test data did not indicate any general trend for the entire test period, but shorter term trends were observed over periods of approximately 3 days. Such fluctuations could be detected and adjusted satisfactorily from normal printer control checks in the event a lamp of this type was incorporated into a current Niagara type printer design.

3. A Macbeth photometer connected to a chart recorder was used to continuously monitor the lamp intensity. The data from this system indicated a long term trend in which the log I (log intensity) decreased 0.27 over the entire 1000-hour operation. This data indicated no abrupt log I changes within a given day of testing.

4. The lack of correlation between the photographic data and the photoelectric data raises some question about the accuracy of each system. To gain further information on the photographic method of measurement, a Niagara printer will be studied using the procedure followed with the 250-watt lamp tests. Results from these tests should serve as a standard for comparison with the test results of paragraph 2.



[redacted]

5. The input power level for the tests described in paragraph 2 was monitored continuously on a wattmeter. The power level was recorded each time a test sample was exposed. Based upon these readings, the input power level remained consistently at 400 watts. For the instrument used, the accuracy of reading the meter is ± 5 watts.

PLANNED ACTIVITY

6. Conduct a test program to study Niagara exposure stability using photographic methods.

7. Upon completion of stability testing final report preparation will begin.

PAR 23-5-3
10 Dec 65

SUBJECT: Improvement to Spray Processing

TASK/PROBLEM

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

DISCUSSION

2. All experimental effort is complete. A preliminary final report has been completed. The report recommends that one Trenton processor be considered for modification to include a fourth level of development. The modification need not interfere with the standard operation of the Trenton.

PLANNED ACTIVITY

3. Submit the final report.

Contract [redacted]
Second Quarter FY-66

PAR 23-5-4
10 Dec 65

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. A set of filters was prepared for a simplified scanner checkout method. Film Type 8430, flashed and processed to various densities, was the filter material. This has not been incorporated into production procedures because of the short life of the filters. (Density changes and wrinkling due to the infrared radiation.) Work is continuing to select a more suitable permanent material that is not excessively expensive.

3. The settable counters were not available for testing because the Trenton processor on which they are installed is undergoing Automation (PAR 10) and Edge Printer (PAR 44) modifications during processor downtime.

PLANNED ACTIVITY

4. Continue investigations into simple checkout methods for the IR scanners.

5. Resume settable counter tests.

Contract [redacted]
Second Quarter FY-66

PAR 23-5-5
10 Dec 65

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 films.

DISCUSSION

2. Tests are continuing using the breadboard fixture. Results to date show that refractive index fluid reduces measles but does not eliminate them. This is being checked.

3. There was a recent consultation with the film manufacturer's representative on the question of surface differences between SO-105 and SO-107. To the best of his knowledge, no manufacturing change had been made on the emulsion surface which would alter the Newton ring or measle problem.

PLANNED ACTIVITY

4. Continue testing and analysis. Special emphasis will be given to differences between SO-105 and SO-107.

Contract [redacted]
Second Quarter FY-66

PAR 23-5-7
10 Dec 65

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. An Interim Report was drafted to cover progress to date on this PAR. This report discusses results of study under four major categories:

a. Dirt Analysis.
b. Cleaning Methods.
c. Film Lubrication.
d. Film Lacquering.

A small item of work on Cleaning Methods (b. above) is being awaited before submitting the Interim Report for internal approval to publish.

PLANNED ACTIVITY

3. Submit the Interim Report.

Contract [redacted]
Second Quarter FY-66

VDW

PAR 23-5-8
10 Dec 65

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. It was previously reported that an array of contrasts and densities had been prepared; the display consisted of a total of twenty-two 70mm rolls of positive prints. Due to the quantity and length of the rolls, it was concluded that quality evaluation would be most tedious.

3. A single sample roll, containing all eighteen of the available subject frames, was sent to the customer for review. He has designated a selection of targets of primary interest, all contained in a total of eight small areas of film approximately two-inches square. We will, therefore, extract these indicated film chips from the originally prepared roll display, and mount them individually on small aperture cards for convenient viewing and identification.

PLANNED ACTIVITY

4. Extract and mount approximately 880 film chips; ship to customer along with previously prepared 10X, 20X, and 40X enlargement display.

5. Prepare and publish an Interim Report which may, depending upon customer response, be acceptable as the Final Report.

PAR 23-5-9
10 Dec 65

SUBJECT: Intraframe Density Variation in Mission Films

TASK/PROBLEM

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

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

DISCUSSION

2. An Interim Report was written on IFDV under date of 29 October 1965. This report is now being reviewed internally for approval to publish.

3. The First Quarter report discussed the equation for CATS angle, and mentioned the attempted correlation with IFDV phenomena. Although the CATS angle will probably find use in other PAR work on Exposure Criteria (PAR 24-6-5), it was found that this angle does not give the correlation expected, or as hoped for with IFDV. There is, however, evidence that this angle in conjunction with off-axis photography is worthy of more extensive study, and such a recommendation is made in the Interim Report.

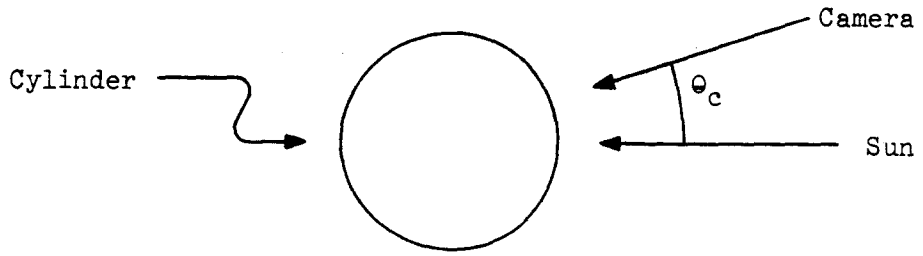
4. The amount of incident illumination on vertical surfaces at opposite ends of the frame does a much better job of explaining IFDV. At one end of the frame the camera is seeing primarily sunlit surfaces, while at the opposite end the camera sees shaded surfaces. The integrated amount of illumination (such as around a cylinder) varies with solar direction, while the maximum possible amount of illumination varies with solar altitude. In this way, we have been able to account for why there is a different effect in Forward and Aft cameras, and why the IFDV decreases with southward orbits. There is a

relationship of this effect to the CATS angle, but its determination would require extended investigation.

5. The equation for determining the amount of illumination around a cylinder visible to the camera is long in derivation, but reduces to:

$$\% \text{ visible illumination} = \frac{(\pi - \theta_{c_r}) \cos \theta_c + \sin \theta_c}{\pi}$$

where $\theta_c$ = ground projected look angle between camera look and maximum sun ray as in the diagram ($\theta_{c_r}$ is in radians).




The details of this equation will be published in the Interim Report, with a more complete description of IFDV. Publication of this report is about one month away.

PLANNED ACTIVITY

6. Publish the Interim Report.
7. Intensify investigation of dual printing methods and criteria.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 24-5-1
10 Dec 65

SUBJECT: Study of Photographic Films and Process 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, processing and duplicating requirements.

DISCUSSION

2. Investigation effort is now complete for this PAR, and an engineering draft of the Final Report was written.

3. The study resulted in several practical guides for conditions and requirements emphasized by the Task/Problem. Important findings of this type are summarized by Combined Planning Tables in the Final Report.

PLANNED ACTIVITY

4. Submit the Final Report.



[redacted]

PAR 24-5-2
10 Dec 65

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. A consolidation of data from the color missions continues. These findings may be released as a special interim report which will update the previous report,(1) plus some additional information.

3. An analysis is being made of contrast attenuation using a method which employs the Log exposures for objects of known reflectance on the ground, and the percent reflectances themselves. An attempt will also be made to employ the same method for objects whose reflectances can be estimated. Briefly, the method takes advantage of the following relationship:

$$\frac{B_{al}}{B_a} = \frac{E_1}{E_2} = \frac{t\,I_o R_1 + B_h}{t\,I_o R_2 + B_h} = \frac{R_1 + \dfrac{B_h}{t\,I_o}}{R_2 + \dfrac{B_h}{t\,I_o}} = \frac{R_1 + C}{R_2 + C}$$

(1) PAR 24-5-2 Interim Report, "An Evaluation of Kodak Special Color Film (Estar Thin Base) Type SO-121," Contract [redacted] 8 Dec 64.

where: $B_a$ = Apparent luminance of the objects.

$t$ = Transmission of the atmosphere.

$I_o$ = Illumination incident on the objects

$R$ = % Reflectance of the objects.

$B_h$ = Haze luminance.

$E$ = Exposure (meter-candle-seconds) on film attributable to object luminances.

$C$ = Constant equivalent to $B_h/tI_o$.

It appears from this that with only the Log E for two objects, and their respective reflectances, that the constant C, or $\frac{B_h}{t \cdot I_o}$ can be determined. From this the contrast attenuation factor, and the Log E for objects other than those for which exposure and reflectance are known, may be estimated. A more complete description of the method is to be found in this quarterly report under PAR 24-6-5 (Exposure Criteria for Acquisition Films).

4. One of the important features of the above method would involve measurements for objects whose reflectances can only be estimated. Work will be done in the third quarter to determine the average reflectance of several man-made and natural objects, to establish the practical measurement of such objects.

5. A second Delta III Hi-C test is planned for the latter part of December, pending availability of an instrument. This test will be designated as 24-5-2-9.

PLANNED ACTIVITY

6. Complete consolidation of data from past color missions.

7. Collect average reflectance data on several types of man-made and natural objects.

8. Accomplish Red-Dot Test number 24-5-2-9.

9. Evaluate results to date in consideration for publishing a special interim report.

[redacted]

Contract [redacted]

Second Quarter FY-66

PAR 24-5-3

10 Dec 65

SUBJECT: Night Photography

TASK/PROBLEM

1. Prepare test program, 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. An engineer's draft of the Final Report was written. Publication of this report is expected early in the Third Quarter.

PLANNED ACTIVITY

3. Publish the Final Report.



[redacted]

Contract [redacted]

Second Quarter FY-66

PAR 24-5-4

10 Dec 65

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. The effort on this PAR will be intensified during the next quarter. Major emphasis will be placed on the various aspects of low contrast processing of appropriate negative materials with perhaps a compromise in optimum speed. This effort will include work directed towards formalization of process specifications, chemistry and equipment.

PLANNED ACTIVITY

3. Continue testing and report results.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 24-6-5
10 Dec 65

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 Criteria 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, PAR 24-6-5 quarterly progress review report will be transmitted under separate cover.



[redacted]

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 25-6-1
10 Dec 65

SUBJECT: Mission Analysis

TASK/PROBLEM

1. Collect, evaluate and publish the results from microdensitometric 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 1023-1, 1023-2, 1024-1, 1024-2, [redacted] 1025-1, 1025-2, 1026-1, 1026-2 and [redacted] have been reduced and the reports have been issued. Both parts of the 1000 series were published in a single report. Section V (individual edge data) consisted of a preprinted form and an IBM 407 listing of the computer data reduction. Considerable time was saved in writing, typing, and publishing the mission report using this technique.

3. TWXs giving the mission resolution summary and listing the location, description, and image quality data for each edge in missions [redacted] and 1025 were sent out. It is expected that these data will be of value to the "Evaluation Team," and it is planned that such data will be sent via TWX within 4-5 days after each mission is traced.

4. An IBM 7044 computer program has been written to convert our edge trace data (computer output on punched cards) to a 5-track paper-tape, compatible with a Teletype system. This greatly reduces the time previously taken to hand punch the tape, as well as reducing the possibility of errors.

PLANNED ACTIVITY

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

6. Continue the study on increased data acquisition.



[redacted]

[redacted]

Contract [redacted]

Second Quarter FY-66

PAR 25-6-2

10 Dec 65

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. Microdensitometer Comparison:

a. The Mann-Data microdensitometer compares favorably with the Kodak Model 5 instrument in the optical performance necessary for edge tracing, and has the superior capability of tracing 9.5 inch missions in all directions along or across the film web. Purchase of the Mann microdensitometer is recommended to improve the capability for acquiring image quality data by edge trace methods. The ROM cost is [redacted] which includes purchase, modification, checkout/installation and operator training.

b. The supporting particulars for recommending the use of the Mann equipment were developed from comparison testing performed at SPPL and the contractor's facility. The analysis of this testing shows the following optical characteristics of the Mann instrument when referenced to the Kodak Model 5 microdensitometer:



[redacted]

(1) Equivalent resolution.

(2) Somewhat lower modulation transfer function at frequencies greater than 80 cycles per millimeter.

(3) Equivalent ability to predict the resolution of a laboratory sample by edge tracing.

(4) A lower noise level in the edge trace data.

From this, it is concluded that the Mann instrument has an optical/slit spread function somewhat wider than the Kodak instrument, but is equally suitable for use in mission edge tracing.

3. Data Smoothing:

a. A subprogram, SLIDE, has been written for the 7044 computer to average multiple microdensitometer edge traces. The resultant "average edge" has less noise than the component edges, and tests have shown that the computed resolution of the "average edge" is a better estimate of the edge resolution than any of the individual edges.

b. The use of the exposure data averaging technique (SLIDE) does not eliminate hand smoothing for multiple traces of less than approximately 36 scans. The improvement in signal-to-noise ratio by the data averaging appears to be proportional to the square root of the number of trace averaged. Initial trials of combining polynomial data smoothing with averaging (SLIDE) have not shown improvement in smoothing raw data.

4. Edge Data Acquisition: As indicated in paragraph 3, Data Smoothing, multiple scanning of each edge seems to be the best way to increase the precision of edge tracing. Within the limited time available for measuring mission edges, the number of scans per edge is restricted by the slow card-punching rate. Conversion to magnetic tape recording should permit a substantial increase in the rate of scanning, permitting a corresponding increase in the number of scans per edge. Purchase of a Hewlett-Packard

magnetic tape recorder is recommended. The approximate price is $10,200 for attachment to the Kodak Model 5 microdensitometer. In preparation for faster recording, modification now is being made in the microdensitometer light source, power supply, and photometer amplifier circuitry to reduce the noise and ripple level.

5. Power Spectrum Measurements: Computer programs are being written for computation of the power spectral density of photographic grain as seen by microdensitometers having rectangular slits. It is expected that this study will give insight into the noise portion of the signal-to-noise ratio in edge tracing. Using the same film strip as a common pseudo-white noise generator, the Mann instrument shows proportionately more noise power at low frequencies and less noise at high frequencies when compared to the Kodak Models 3 and 5 microdensitometers (the crossover is at approximately 100 cycles per millimeter). In this measurement, increased power at a given frequency can come from either increased resolution or spurious noise. The test method and interpretation of the results are being investigated for accuracy and precision as well as to evaluate its practical value in the system.

6. Data Filtering: Work has continued with real grain noise applied to mathematical (i.e., synthetic) edges in the attempt to find a mathematical model for real edges. The use of the math model would be in testing various forms of numerical filters for smoothing and enhancing the signal-to-noise ratio. There has been little progress to date. The math model of an edge still does not have the properties of the real photographic edge. In another study, the use of an Ormsby filter (a numerical, low pass, sharp cutting filter) did not prove to be of value.

7. Literature: There has been a recent increase in the number of published articles on microdensitometer edge trace methods. Currently noted articles concern:

a. The effect of coherence in microdensitometer optics on edge tracing (Watrasiewicz, Optica Acta).

b. A new mathematical method for converting edges to MTF ([redacted], ITEK, J. of Opt. Soc.).

c. The method of non-linear regression analysis ([redacted] EKCo., Photo. Sci. & Eng.).

These references will be checked out in the areas applicable to the PAR.

8. Project Study Plan: At the CCB meeting of 6 October 1965, the request was made that a detailed study plan be written for this project. This was done. The plan, dated 1 November 1965, was published and forwarded to the customer.

9. Microdensitometer Test Plan: An additional request of the CCB meeting was a preliminary draft of a microdensitometer comparison method. A plan which can be used to compare the optical performance of the Mann-Data microdensitometer with that of the Kodak Model 5 instrument was written under date of 20 October 1965. Approval to publish has just now been secured, and publication is expected to occur in the next few days.

PLANNED ACTIVITY

10. Continue evaluation of the power spectrum test method.

11. Continue current studies on:

a. Optics/slit influence on edge tracing.

b. Data smoothing.

c. Numerical filtering.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 33
10 Dec 65

SUBJECT: Mod III Titler

TASK/PROBLEM

1. Develop and fabricate a developmental model of a programmable titler.

DISCUSSION

2. The final report, PAR 33, Mod III Titler, dated 15 Sept 65 was transmitted to the customer on 23 Nov 65.

PLANNED ACTIVITY

3. Publication of the final report constitutes project completion.



[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 38
10 Dec 65

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. Fabrication and assembly have been completed on the slitter console and one slitter assembly. This slitter assembly allows reducing any standard width up to 9.5 inches to one, two or three 70mm wide rolls. A second slitting assembly is nearing completion. This unit will be interchangeable with the 70mm unit and will be used to slit one five-inch or one five-inch and one 70mm width from a standard width roll film up to 9.5 inch wide rolls.

3. Engineering check out of the machine with the 70mm slitting attachment is underway. With five strands (three 70mm strips and two salvage edges) emerging from the slitter, it has been necessary to install guides, to position the webs adjacent to the film cleaner attachment to aid in threadup of the machine.

PLANNED ACTIVITY

4. Complete second slitting attachment and check out.

5. Do additional testing including the slitting of duplicating films under process light conditions for photographic check.

6. Test and evaluate.

7. Publish final report.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 44
10 Dec 65

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. The sensitometric edge printer is positioned at the head of a Trenton Processor to provide a local calibration for evaluation of exposed material. The local calibration will be effected by flashing nine different densities on the edge of the material prior to processing. The density wedge used for this purpose has nine steps of .3 Log E densities each and will expose an area 1/8-inch wide by 1-inch long.

3. The unit is completed and has been installed on a Trenton Processor.

PLANNED ACTIVITY

4. Conduct tests and evaluate performance.



[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 46
10 Dec 65

SUBJECT: Investigation of Ultra Thin Base 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. A total of four UTB mock missions have been handled by our Production Group with technical observers present. Two missions were 70mm simulations and two were 9 1/2-inch simulations. Each mission was 3000 feet in length.

3. The first mission exhibited several cases of folding and wrinkling along the edges. Although it could not be determined exactly what piece of equipment or operation caused the damage, it was known to occur after the processing stage.

4. Other difficulties noted during the first exercise were as follows:

a. Splicing difficulties.

b. Splice impressions on roll convolutions.

c. Titling difficulty and excessive embossing.

d. Flowing of white pigment titling material.

There were no images on the first mission, hence no evaluation could be made relating to this area. To complete the simulated exercise, however, each part was reprinted eight times on Niagara type printers with no apparent difficulty. Following the evaluation of the first mission, an internal report was prepared to alert all people concerned about the problems involved so that action could be initiated.

5. The second, third, and fourth missions have been completed; however, the evaluation and analysis is not complete at this time.

PLANNED ACTIVITY

6. Complete evaluation of the second, third, and fourth UTB missions.

7. Make arrangements and prepare materials for future UTB exercises. These are to be conducted during periods of relatively low production activity.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 49A
10 Dec 65

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. Design and drafting is complete. All work is released for fabrication.

PLANNED ACTIVITY

3. Fabrication will be completed during the third quarter. Checkout will be completed during the fourth quarter.



[redacted]

PAR 50
10 Dec 65

SUBJECT: Optical Add-On Titling

TASK/PROBLEM

1. Investigate various methods by which the title might be applied to film by optical means, thereby eliminating any possibility of distortion.

DISCUSSION

2. The Final Report, dated 1 October 1965, was published during the quarter.

PLANNED ACTIVITY

3. None. Publication of the Final Report constitutes project completion.

Contract [redacted]
Second Quarter FY-66

PAR 51
10 Dec 65

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 overall print density or permit changes in print density without altering color balance.

DISCUSSION

2. The design and mechanical drawings are 98% complete. Fabrication of all make parts is complete.

3. The mechanical assembly is 50% complete.

4. The electrical design layout is complete and the electrical assembly is 80% complete.

PLANNED ACTIVITY

5. Continue with mechanical and electrical assembly.

6. Test and check out.

PAR 52
10 Dec 65

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:

a. Fabrication effort is 90% complete.

b. Approximately 70% of assembly drawings have been completed.

c. Printer cabinet final assembly started.

3. Electrical:

a. Electronic control console is complete and has been checked out.

b. Printer electrical design complete. The assembly is approximately 30% complete.

c. Printer subassemblies such as meter roll drive, fly-in densitometer, and lamphouse are complete and are undergoing test and evaluation.

d. Life test on the sungun lamp, which is to be used in photocell reader, is being conducted. The life of the lamp at reduced voltage and output of the lamp over its useful life are to be determined in these tests.

e. All electrical purchased components have been received.

PLANNED ACTIVITY

4. Continue assembly and begin system checkout.

Contract [redacted]
Second Quarter FY-66

PAR 53
10 Dec 65

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 required 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 present printer operating procedure, the proper exposure for a negative frame is determined manually by operators choosing and measuring 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 design and demonstration of a workable automated frame-by-frame density measurement system in breadboard form.

3. Electrical: Construction and testing of the electrical system is completed. The outstanding problem involved in testing was a multiplexer which was not working due to damage in shipment. The multiplexer was shipped back and repairs were made by the vendor. We have recieved

this unit and it appears to be working satisfactorily. Indicator lamps have been incorporated in the system to sample the maximum, minimum, and integrated transmission densities. These lamps were added as an aid in the initial setup of the equipment.

4. Mechanical Status: Construction and testing of the table is completed with the exception of a back cover which must be made.

5. Systems Test Status: Approximately 85% of the static testing has been completed using step wedges for density measurement. Arrangements have been made to obtain a test film for use in dynamic testing.

PLANNED ACTIVITY

6. Complete system testing, operational test and evaluation.

7. Begin final report.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 55A
10 Dec 65

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. No further contacts have been made with personnel of the intelligence community since the last report.

3. Processing of duplicating film in remote locations appears to be a potential application for the Bimat Process. Tests to evaluate sensitometry and image quality are planned. A small supply of presoaked Bimat Film has been obtained.

4. Interest has again been expressed in a Bimat Processor to process gun camera films and provide quick access to a positive without resorting to a separate printing and processing operation. It is desired to project the positive during pilot debriefing. Additional study has been given to the problem. The Bimat processing of films suitable for use in gun cameras is technically feasible; however, the mechanical complexity required to obtain stable alignment of perforations and frame lines in the positive image looks formidable.

PLANNED ACTIVITY

5. Complete sensitometric testing and prepare final report.



[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 56
10 Dec 65

SUBJECT: Bimat Processor No. 1

TASK/PROBLEM

1. Investigate, design and demonstrate the feasibility of processing short lengths (up to six(6) feet) of Plus-X, Tri-X, and Royal-X type films in 16-, 35- and 70mm 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, lightweight and simplicity of operation.

DISCUSSION

2. Fabrication has been completed on the revised processor designed to fit an attache case. The basic processor handles 70mm cassettes and an accessory has been made to handle 35mm film in cassettes. Debugging has been completed, and the device may now be used for testing various operating techniques.

3. The outfitting of the attache case is about complete. The remainder of this work depends on the method of post-processing treatment of the films. At present the supplies, inaddition to the processor, include six cassettes of 70mm or 35mm Panatomic-X Film, six prespooled cores of Bimat Film, several bottles of Imbibant MX533, water and liquid Carbowax and a bottle of waste fluids. Tools to aid the operator include a thermometer, scissors, film clips, scotch tape, a stirring rod, sponges, a squeege, and two linen towels.

4. Under some conditions, certain imbibants may have to be heated moderately. An electric heater blanket for the tank has been designed and includes thermostatic control. Fabrication of this heater blanket has not been started.

PLANNED ACTIVITY

5. A limited amount of testing with a single emulsion type is planned in order to develop good handling techniques with both 70mm and 35mm films. The greater part of the effort will be spend developing post-processing methods including rapid drying with Carbowax.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 57
10 Dec 65

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 investigation of the use of Carbowax for the extraction of water from processed Bimat and negative films is continuing. Specialized laboratory equipment to implement the work has just been completed.

3. The Bimat Film rewind presoaker was completed. The apparatus is basically a Zeiss rewind processor to which has been added a removable final take-up spindle and builder roller assembly. Also, a recirculating system has been provided for filtering the imbibant and controlling its temperature.

4. The laminator for the wrap-up mode of Bimat Processing has been completed except for electrical wiring. The laminator will handle films up to 9.5-inches wide. In addition to processing film, it will also be used to conduct experiments in laminating a cover sheet onto the processed Bimat Film.

PLANNED ACTIVITY

5. The rewind presoaker will be tested and modified as necessary. Techniques in the use of this machine will be developed to yield satisfactorily imbibed Bimat Film.



[redacted]

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 58-5-1
10 Dec 65

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]

PAR 58-5-2
10 Dec 65

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. At the beginning of the program, it was believed that the system might not yield material of satisfactory uniformity when viscous developer was used in the initial stage of the process. Tests run on the 70mm breadboard processor using viscous developer in the primary station appeared to produce a product free from streaks and mottle when developer was extruded directly onto dry unprocessed film, at an operating speed of eight feet/minute. In these tests, film Type 3404 was used as product material and developer MPG-130D, thickened to 12,000 centipoise was the developing agent. The sensitometric curve shown in Figure 1 was processed at these conditions.

3. In a subsequent test, the operating speed of the processor was increased to 16 feet/minute and MPB-111-D, thickened to 12,000 centipoise, was used for the developing agent. In these tests, it was found that decreased development time made possible by the more active developer was not sufficient to permit adequate congealing when the congealing agent was applied over the coated developer. This condition resulted in incomplete transfer of the developer to the cotton transfer belts and left a sticky residue on the surface of the film.

4. This was corrected by prewetting the film with a congealing agent prior to coating, thus, impregnating the film with congealant. When this was done, the coated developer congealed satisfactorily after treatment with the congealing agent in the normal manner, i.e., sprayed on over

Emulsion 3404

Date

Experimenter Date Witness Date

**EXPOSURE**

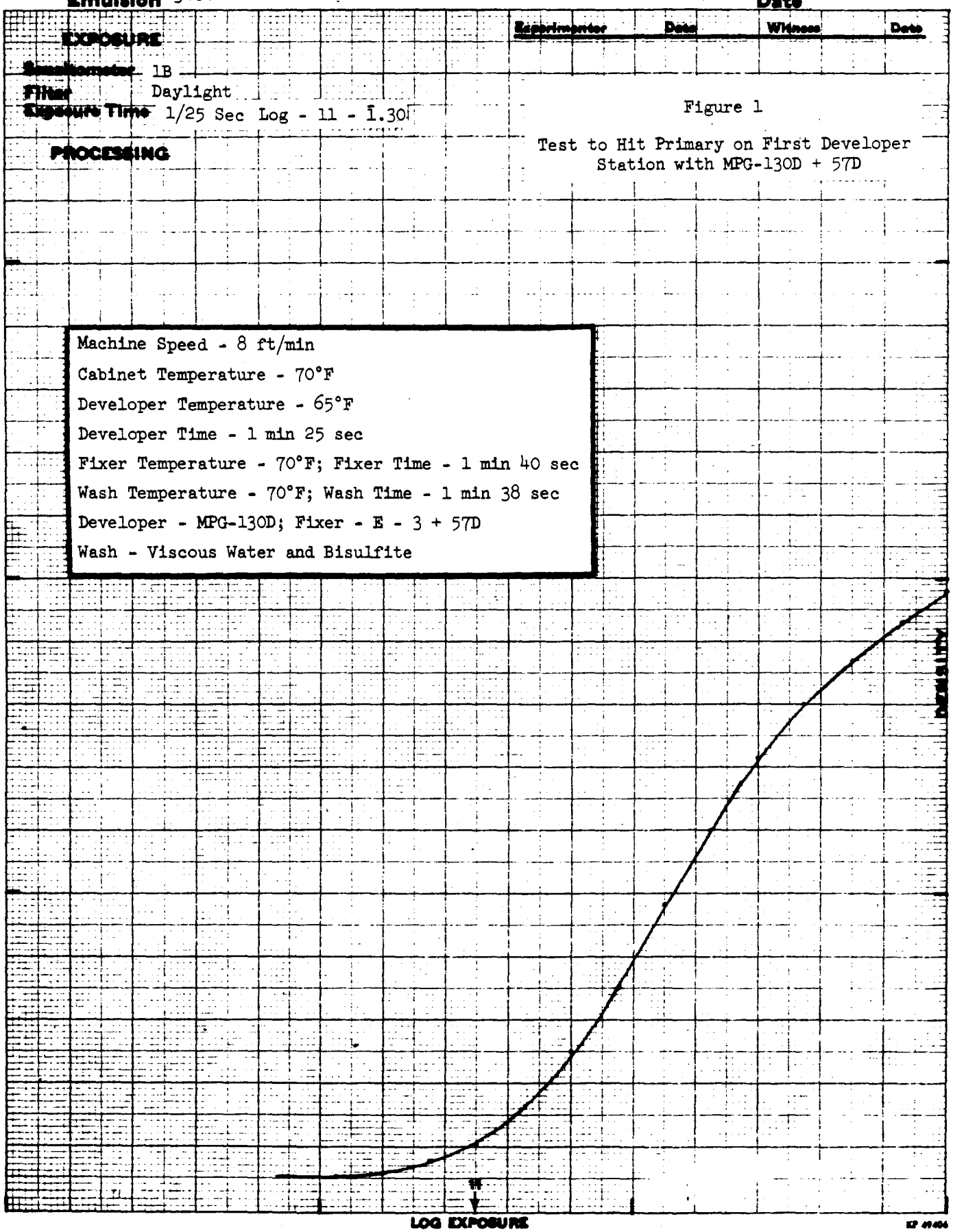
Sensitometer 1B
Filter Daylight
Exposure Time 1/25 Sec Log - 11 - 1.30

**PROCESSING**

Figure 1

Test to Hit Primary on First Developer Station with MPG-130D + 57D

Machine Speed - 8 ft/min
Cabinet Temperature - 70°F
Developer Temperature - 65°F
Developer Time - 1 min 25 sec
Fixer Temperature - 70°F; Fixer Time - 1 min 40 sec
Wash Temperature - 70°F; Wash Time - 1 min 38 sec
Developer - MPG-130D; Fixer - E - 3 + 57D
Wash - Viscous Water and Bisulfite



the coated viscous developer. The developer then transferred to the cotton belt. The film, after stripping from the belt, was free of the sticky residue previously noted.

5. Sensitometric step wedges run under these conditions indicate no loss in speed due to the pretreatment with the congealing agent. The curves shown in Figure 2 were processed under these conditions.

6. In addition, it was noted that prewetting with a congealing agent did not contribute additional evidence of streaking or mottle.

7. On the basis of these tests, it is concluded that either dry film or pretreated film can be coated with viscous developer in a primary development station and that streaking and mottle are not problem areas. It is also concluded that film Type 3404 can be pretreated with the congealing agent without loss in speed.

8. In a subsequent series of tests, the transfer belt was removed from the breadboard processor and a set of rubber covered roller squeegees was used to remove the waste viscous developer.

9. Where this was done, a residue of viscous developer which remained on the surface of the emulsion continued to develop. This appeared as in Figure 3 when the film was fixed, washed and dried.

10. An applicator roller was installed directly behind the squeegee set and the test was repeated using stop bath formula SB-1A in the applicator assembly. Film processed under these conditions not only was free of developer residual on the emulsion surface but also was free of the mottle effect shown in Figure 3.

11. On the basis of these tests, it is concluded that a set of rubber covered squeegee rollers can be used to remove waste viscous developer from film developed by applying a static layer of viscous developer to the emulsion surface.

Emulsion 3404 Date 10 Dec 65

EXPOSURE
Sensitometer
Filter
Exposure Time

PROCESSING

Experimenter Date Witness Date

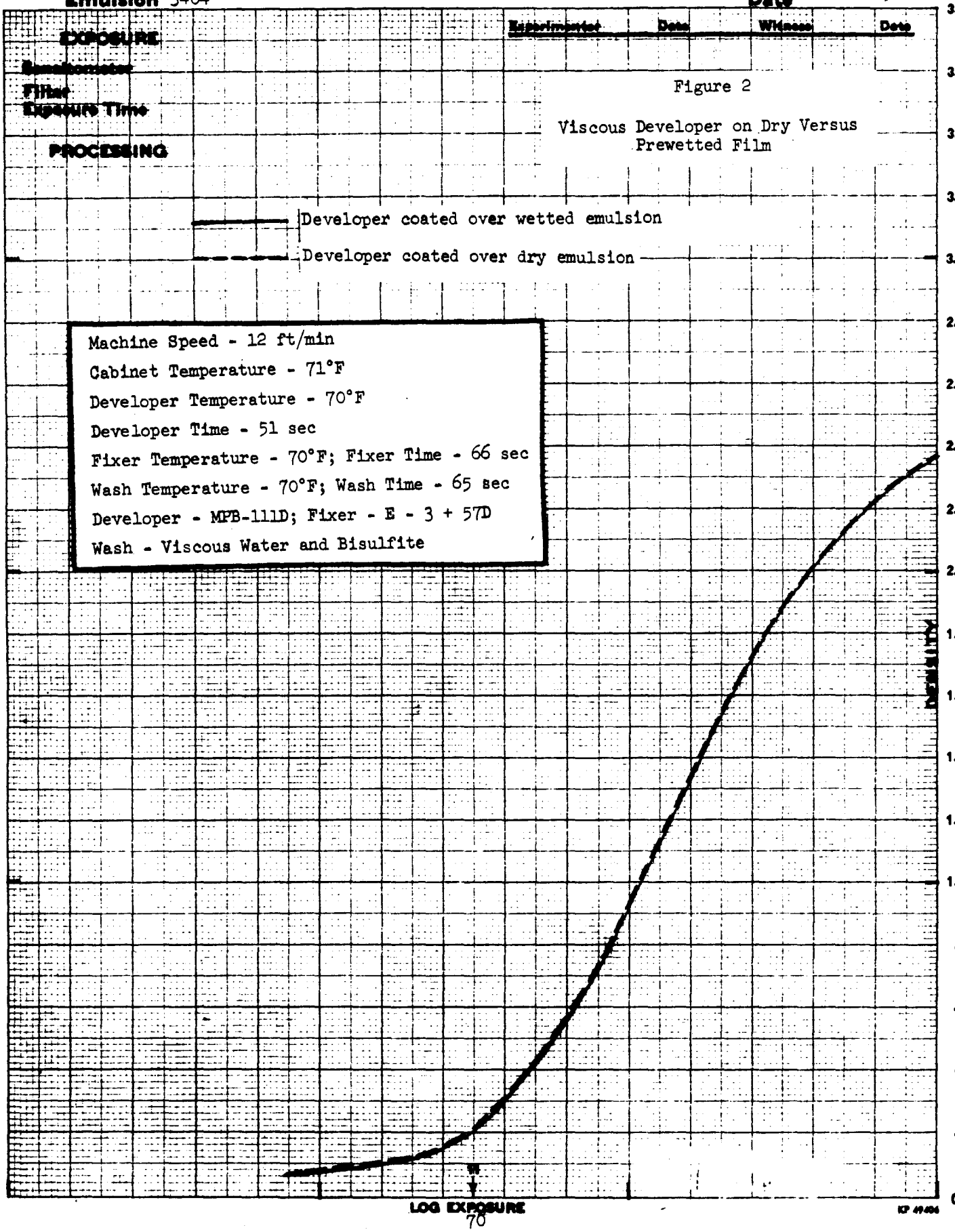
Figure 2

Viscous Developer on Dry Versus Prewetted Film

Developer coated over wetted emulsion

Developer coated over dry emulsion

Machine Speed - 12 ft/min
Cabinet Temperature - 71°F
Developer Temperature - 70°F
Developer Time - 51 sec
Fixer Temperature - 70°F; Fixer Time - 66 sec
Wash Temperature - 70°F; Wash Time - 65 sec
Developer - MPB-111D; Fixer - E - 3 + 57D
Wash - Viscous Water and Bisulfite



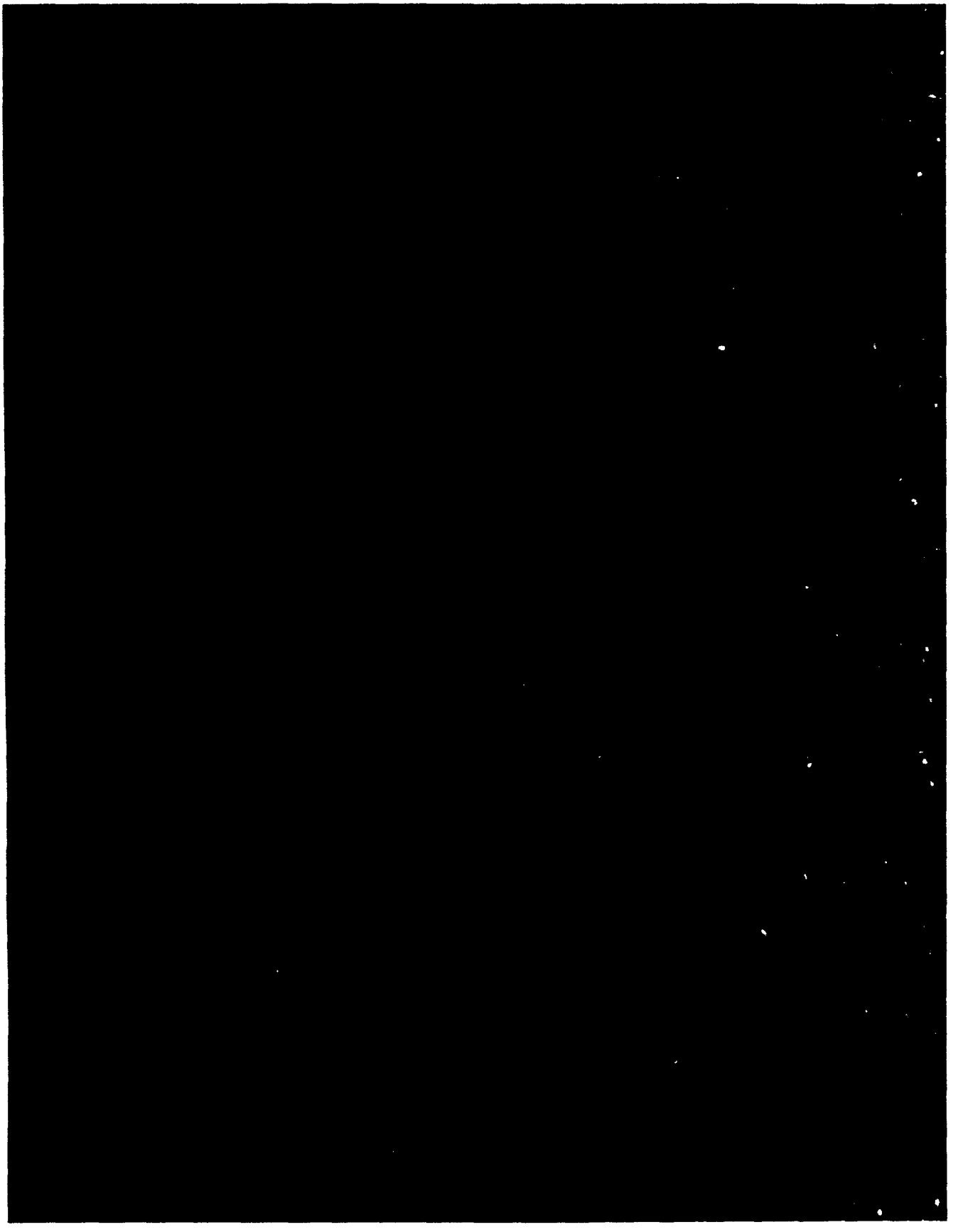


Figure 3 Mottle Effect

PLANNED ACTIVITY

12. Future testing in the primary development phase of the processing cycle will be confined largely to sensitometric testing to determine the formula, operating temperature and development time that will yield optimum results.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 58-5-3
10 Dec 65

SUBJECT: Viscous Washing Studies

TASK/PROBLEM

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

DISCUSSION

2. The two-stage viscous wash cycle for removal of residual hypo has not changed since the last report. Continued tests indicate that even at increased operating speed, the residual hypo remains consistent with commercial quality.

3. Sodium bisulfite dripped into a roller nip, in contact with the back of the film, just after the fix station has effectively converted the anti-halation dye in the pelloid-coated support to a very light pink. However, residual bisulfite salts on transport rollers create a dirt problem in the machine.

PLANNED ACTIVITY

4. Tests will continue in an effort to develop a satisfactory method for removing antihalation dye from the pelloid-coated support.



[redacted]

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 58-5-4
10 Dec 65

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. Recent tests have demonstrated that viscous developer can be adequately removed by using a set of rubber covered squeegees. This method has the advantage of eliminating the complexity of mechanical equipment required to mount and track endless belts. It also has the advantage of eliminating from the processing system chemicals required to congeal the developer prior to stripping from the film.

3. This method of removal can be used advantageously when operating speed of the equipment and reaction time is such that contact with face rollers is not required. If, however, contact with face rollers is necessary in order to achieve a threading configuration which will yield the required reaction time, the use of congealing chemicals and transfer belts will permit face rollers to be used.

PLANNED ACTIVITY

4. Continue to evaluate the use of squeegee assemblies versus transfer belts.

5. Prepare final report.



[redacted]

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 58-5-7M
10 Dec 65

SUBJECT: Study of Silver Recovery

TASK/PROBLEM

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

DISCUSSION

2. Based on the results of the study to date, the metallic replacement method of silver recovery appears to be feasible and will be installed, under another contract, at the contractor's facility. To complete this study, additional evaluation will be made of an electrolytic recovery system.

PLANNED ACTIVITY

3. Continue investigating electrolytic silver recovery system and begin final report preparation.



[redacted]

PAR 58-5-8
10 Dec 65

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. Introduction:

a. It has been demonstrated, in the course of company sponsored investigation, that the speed of Type 3404 film can be varied over a range of approximately two stops when the coating temperature of viscous developer is varied between 70°F and 100°F if the temperature and humidity of the reaction chamber are maintained at constant values.

b. To be useful for development rate control in a primary-secondary multilevel processing system, the temperature of the viscous developer solution must be variable at the point of application to the film, between predetermined maximum and minimum temperatures, and must have a rapid rate of response.

c. The feasibility of development rate control by temperature modulation is being studied by:

(1) The development and construction of a 70mm breadboard test hopper having heating elements at or near the coating lips.

(2) The development and construction of a simplified temperature adjustment system.

(3) Empirical evaluation of the breadboard equipment followed by necessary modification and retest to determine optimum design parameters.

3. Status: Because the basic principle in this interrupted system is one of continuous application of developer, it is necessary that secondary development rate be modulated to achieve desired process level. The secondary developer will always be applied, and modulation will be accomplished by varying the developer temperature. Current areas of investigation are:

a. Temperature of Viscous Developer as it Enters the Hopper: A rapid increase of the developer temperature can be achieved by increasing the current through a heating element. However the rate at which the coating temperature can be reduced (even at minimum heater power) depends on the developer supply temperature. Tests with available heat exchangers resulted in a hopper inlet temperature of 52°F, which was not as low as we require. An attempt to increase the heat transfer rate in the heat exchanger by reducing the developer viscosity was unsuccessful. Therefore, a new heat exchanger is being designed to provide a lower supply temperature.

b. 70mm Coating Hopper Heater: The first heater tested consisted of a single heater strip suspended within the .010-inch wide hopper extrusion channel parallel to the longitudinal hopper lip dimension. Although the results of testing this configuration were encouraging, there was a tendency for the viscous developer to divide unevenly above and below the heating element. The observed "wandering" was random and variable and resulted in viscous developer temperature variations. To overcome this, a rigid mechanical configuration of the heater has been designed. In the new design, an Invar heating strip will be bonded to each of the insulating blocks which form the upper and lower surfaces of the .010-inch extrusion channel.

PLANNED ACTIVITY

4. Continue breadboard development and testing of the heat exchanger and the hopper heater.

Contract [redacted]
Second Quarter FY-66

PAR 58-5-9
10 Dec 65

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. Liquid fixer, thickened to a viscosity of 10,000 centipoise, is still being used successfully for this operation.

3. At an operating speed of 16 feet/minute, a single-stage, fixing cycle of 53 seconds appears to be adequate, however, no tests have been run to determine the residual silver content of the fixed-out film.

4. Results of experiments at the fix station, conducted to establish the best congealing properties at this point, have proven satisfactory. A congealing solution used at a pH of 13.0 congeals the fix very well at 16 feet/minute and presents no problems in stripping from the film surface.

PLANNED ACTIVITY

5. Fixing tests will continue at a low level of activity assuming no unforeseen problems arise.

6. Tests to determine the quantity of residual silver in the fixed-out product will be conducted.

[redacted]

Contract [redacted]

Second Quarter FY-66

PAR 60

10 Dec 65

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. A breadboard incorporating three floating loop air dryer tubes has been tested. Data has been obtained such as:

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

b. Optimum design of air tubes (holes -- no slots).

c. Corrections for Venturi effect.

3. This breadboard has been modified to accept a larger diameter tube and similar data is being obtained for comparison. Preliminary indications are that this tube is superior in terms of its ability to handle all widths of film at higher web tensions.

PLANNED ACTIVITIES

4. Tests will be run with the large diameter tube, and data will be collected.

5. After complete evaluation of this unit, the final report will be prepared.



[redacted]

Contract [redacted]

Second Quarter FY-66

PAR 61

10 Dec 65

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 .020 x .020-inch spots and will be capable of determining the Dmin 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 .025" apart and feeding through operational amplifiers into a 100 KC multiplexer. The sampled output is to be compared to preset Dmin trigger levels and these outputs will be accumulated in preset registers. The register outputs indicate required processing level.

3. Electronics:

a. The electronics checkout has been completed and necessary changes made to drawings and hardware as required. The video line capacity problem was overcome by momentarily shorting the line after each data channel is sampled.

b. Analysis of checkout data indicates accuracy of ±1% or ±20mv from the front end of the system through the comparison circuitry. From this point on, the circuitry is digital. The measured accuracy gives the system a working range of 0 to 1.3 N.D. with the specified accuracy ±0.03 N.D.

c. Work on installation has started. Sketches for necessary brackets etc., have been released to the shop.

4. Optics:

a. The readout lamphouse has been assembled and operated. Internal heating of optics did not prove to be a problem. External hot spot temperature has been made acceptable. Visible light output from the filter was excessive and fogged film. Wratten No. 87 or No. 88A gelatin filters have been added to the cool side of the filter assembly in an attempt to eliminate fogging. The suitability of the combination must be more completely tested.

b. The cell assemblies have been mated with the light pipes for alignment. Preliminary data indicates output uniformity of ±20% and cross talk level of about 2%. The output variations are intended to be trimmed out in the electronics. The cross talk is being further investigated.

PLANNED ACTIVITY

5. Make more complete tests of film fogging and photocell response with the added Wratten No. 87 or No. 88A filter described above. If the performance is satisfactory, we will complete optics checkout, alignment and assembly and mate optics and electronics for system test. Continue with installation preparatory work.

Contract [redacted]
Second Quarter FY-66

PAR 62M
10 Dec 65

SUBJECT: Study of Negative Processing Centralized Controls

TASK/PROBLEM

1. Conduct study to determine 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. No activity.

PLANNED ACTIVITIES

3. Start work mid-way of the third quarter and complete the project (to include the Final Report) in the Fourth Quarter, FY-66.

Should be done by EK funding brought by you. because finished article will be

Contract [redacted]
Second Quarter FY-66

VDW

PAR 63
10 Dec 65

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. Fabrication of the breadboard device has been completed. Cleaner and associated components were assembled to form the breadboard system.

3. Preliminary test results indicated that additional design effort was required to determine the optimum rate and direction of air flow for efficient dirt removal. Modifications have been made to the breadboard equipment.

PLANNED ACTIVITY

4. Continue testing to determine air flow patterns and the effects on film transport and dirt removal.

5. Make additional modifications as required.

should not be a subsidized effort.

Contract [redacted]

Second Quarter FY-66

PAR 68

10 Dec 65

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. The identification printer design will provide identification leaders and trailers in the formats shown in Figure 1, for four mission types.

3. The mission number and type, pass number, part number, camera, classification and facility identification will be selected at the control panel prior to printer operation which will be completely automatic upon initiating the start sequence.

4. In order to provide means of rapidly differentiating between several (up to five) missions (of the same or different types) which may be in the contractor's facility at one time, an in-house facility identification is provided. These consist of the following five symbols:

Whether the symbol arbitrarily selected for a particular mission is printed once or twice (  or   ) in the facility identification space shown in Figure 1 will denote fore or aft camera.

5. The capability of using the present method of rapidly identifying fore or aft camera by a series of xxxx's or ----'s will be maintained but can be switched out if so desired.

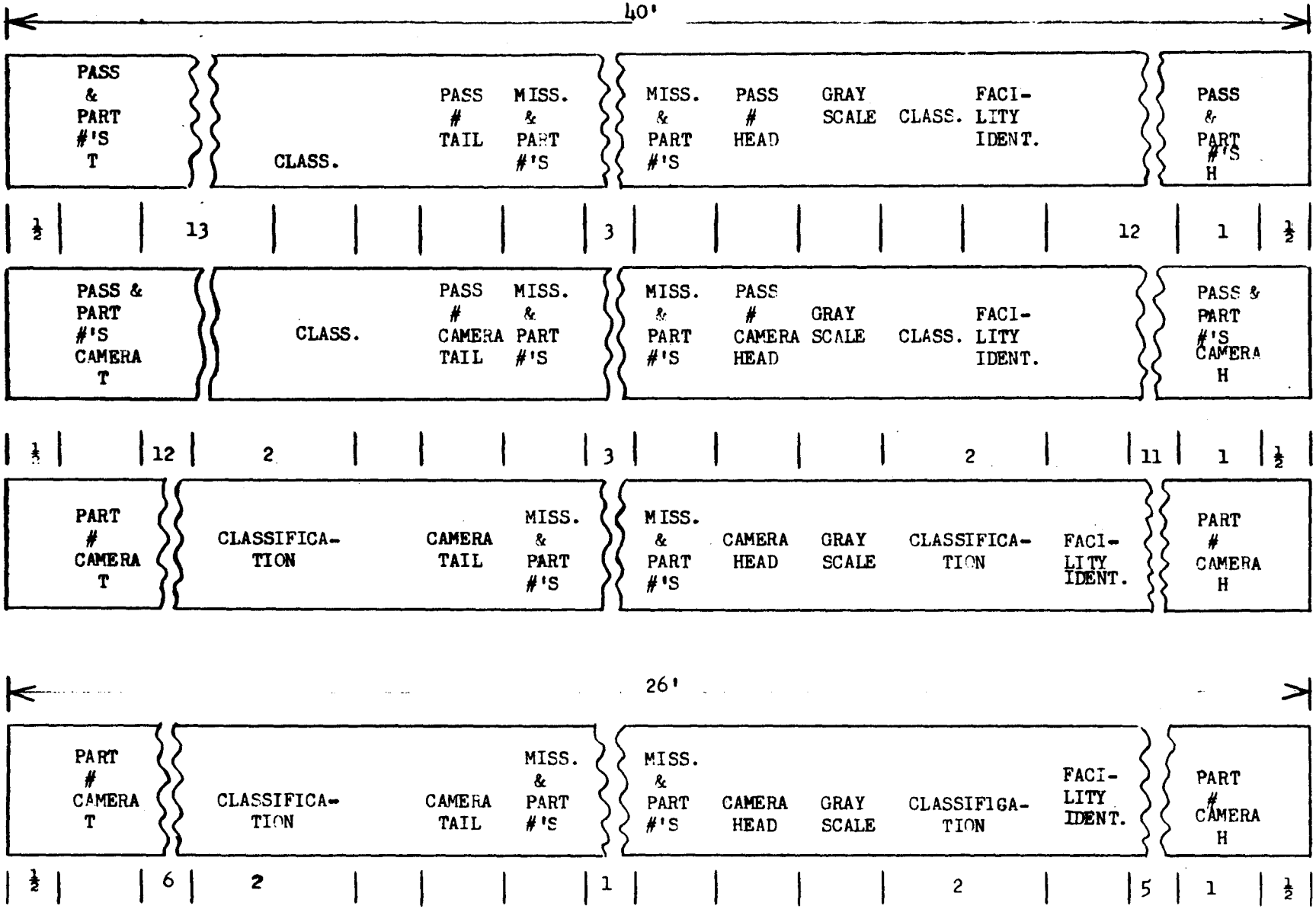



Fig. 1 Identification Printer Formats PAR 68

6. The electrical design as described above has been completed. The mechanical design is currently in progress.

PLANNED ACTIVITY

7. Order remaining purchase parts, and complete the mechanical layout of the printer enclosure, the transport system and the mounting of electrical items.

Contract [redacted]
Second Quarter FY-66

PAR 69M
10 Dec 65

SUBJECT: Ultrasonic Edge Detector

TASK/PROBLEM

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

DISCUSSION

2. The purchased ultrasonic web edge detector was promised for delivery by 6 September 1965. Due to a heavy work load at the vendor's facility, the assembly was not completed until 9 November 1965. Three more weeks were required for testing and calibrating the unit. A new delivery date for the week ending 15 December 1965 has been promised.

3. The servo motor, amplifier/modulator and power supply have been received.

PLANNED ACTIVITY

4. Design and fabricate sensor mounting plate and install tracking mechanism on an available film transport table upon delivery of the web edge sensor.

5. Check out and test edge detecting capability and servo response for edge tracking control.

PAR 70
10 Dec 65

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. General Approach:

a. The proposal requires that .020" x .020" density readings be taken at 0.2" spacing across the film, with successive readings taken at spacings of 0.02" to 0.2" along the film. These data are to be recorded in a magnetic tape format compatible with the IBM 7440. The film widths to be scanned vary from 70mm to 9.5 inches.

b. The 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 construction is similar to that used in PAR 61, Improved IR Scanner.

3. Film Transport System:

a. The drawings for the film transport system have been completed and released for manufacture. Provision has been made for mounting a blower to provide an independent source of air for the air arch.

b. Operating controls for the system will be in a cabinet above the table.

c. Parts for the air arch assembly, lamphouse assembly and mounting platform have been completed.

4. Data System:

a. The data acquisition system concept has been changed from a self-contained system to one employing the IBM Model 1800 Computer which is specifically designed for this type of application. In this configuration, using the Model 1800 computer, each photocell will drive a logarithmic converter to provide an output proportional to density. All multiplexing, analog to digital conversion, tape formatting and control functions will be provided by the IBM system.

PLANNED ACTIVITY

5. Film Transport System: Continue fabrication.

6. Data System:

a. Prepare operating procedure for use of equipment.

b. Work with Computer Service Group to provide information for program and hardware requirements.

c. Evaluate logarithmic converter circuit as applied to this application.

d. Prepare film transport control wiring information.

7. Optical System: The possibility is being explored of employing fiber optics in the hope of realizing a considerable cost saving as well as a shorter elapsed manufacturing time. Regardless of whether the fiber optics approach or the PAR 61 optical system is employed, optical design will be completed and fabrication started during the next quarter.

Contract [redacted]
Second Quarter FY-66

PAR 72
10 Dec 65

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

TASK/PROBLEM

1. Design and fabricate two (2) 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 and have undergone tests.

PLANNED ACTIVITY

3. Evaluate test and performance data.
4. Prepare final report.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 76
10 Dec 65

SUBJECT: Upgrade Yardleigh Processor

TASK/PROBLEM

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

DISCUSSION

2. All mechanical parts to effect the upgrading effort are on hand.

3. All electrical and electronic items are on hand.

4. Several meetings have been held to determine the best possible method and minimum downtime to upgrade the unit. These meetings resulted in a requirement to improve the accuracy of the manual tape cabinet.

5. A supplementary work order was issued to provide hardware for the manual tape system improvement.

6. All mechanical items required for the improvement noted above were received 6 December 65. All electrical and electronic items were available on 6 December 65.

7. The new viscous supply system was installed and declared operational during the week ending 5 December 65.

8. The installation of the new hoppers and their mechanisms and alterations to the manual tape cabinet were begun 6 December 65.

9. Supplement No. 1 ([redacted]-Frame Mark Detector) Status: The mechanical design is complete and the electrical design is approximately 90 percent complete. Fabrication has been started.

PLANNED ACTIVITY

10. Complete the [redacted]-Frame Mark Detector fabrication.

11. Complete the installation and checkout of the new hopper and manual tape systems.

12. Continue to plan the remainder of the upgrading effort to effect a minimum downtime.



[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 77A
10 Dec 65

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. Modifications, engineering checkout and final tests have been completed on both slitters. The units are available for delivery.

PLANNED ACTIVITY

3. Deliver both slitters.

Contract [redacted]
Second Quarter FY-66

PAR 78
10 Dec 65

SUBJECT: Cross-Frame Lacquerer

TASK/PROBLEM

1. Investigate and test means of applying lacquer uniformly to a one-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. Design, fabrication, and assembly of a breadboard cross-frame lacquering unit has been completed. This unit is based on an interrupted wheel-type applicator and is mounted on an existing printer mechanism to utilize its film transports.

3. Preliminary testing indicates that Parlon lacquer can be applied as required and that further investigations into other types of lacquer applicators will no longer be required.

4. The operation of the cross-frame lacquerer has been demonstrated to production personnel. With the aid of a hair dryer, simulated missions have been lacquered at the rate of one title every four seconds.

5. The lacquering device has been delivered to production for evaluation.

PLANNED ACTIVITIES

6. Publish final report.

[redacted]

VDW

Contract [redacted]
Second Quarter FY-66

PAR 79
10 Dec 65

SUBJECT: Unimak Film Titler

TASK/PROBLEM

1. Design, fabricate and test two (2) Universal Titlers capable of accepting standard longitudinal heads, binary titling heads and transverse titling heads as well as an arbor head in which all type will be self-contained on manually settable wheels.

DISCUSSION

2. The subject of this PAR has been changed from "Universal Titler" to "Unimak Film Titler". This title change in no way reflects a change of scope or schedule.

3. The general design concept has been finalized; layout and detail drafting are progressing.

4. Each unit will have a complex of four different titling heads:

a. Universal Head.

b. Rotary Head.

c. Binary Head.

d. Index Head.

5. The titler console, of clean room design, will utilize the standard editing table motorized rewinds with slight modifications.

6. Eight mode control selector switches will be used. Each switch will have eight positions serving the following functions: count on command, count by 2's, count, print, print alternately A, print alternately B, print once after command, and off. Functional control for each mode will be accomplished by relay circuitry in conjunction with an operator command button or switch. Any function of any titling head may be plugged into any one of the eight mode control switches. A separate air circuit will control



[redacted]

advance of the titling tape on all heads. A separate switch will allow advance of the titling tapes prior to start up.

7. A brief description of the function of each of the four titling heads follows.

a. The universal head incorporates a nine-wheel counter with pull-out characters on all but the index wheel, thereby allowing insertion of characters in place of numerals. It will also have removable type holders for inserting the desired message with printers' type.

b. The rotary head will have forty-eight character wheels, each having forty-eight characters including the alphabet (capitals) and numerals 1 through 9. Each of these wheels can be manually set to any of the forty-eight characters.

c. The binary head will be a four-wheel indexing counter for printing the frame number in binary code for photoelectric readout and small numerals for visual readout.

d. The index head will incorporate a nine-wheel indexing counter, the same as that used in the universal head. This head shall be used for printing frame numbers, index numbers, etc., where up to nine characters are desired. Any special character may be inserted in any wheel except the units wheel.

8. The universal, rotary and index heads will be constructed in such manner that print out may be at the border or across the film on the frame line. The binary head will only print out on the border edge.

9. An internal final design progress review was held 3 and 4 Nov 65. All phases of design were approved for completion of detail drawing and fabrication of parts.

PLANNED ACTIVITY

10. Complete assembly and engineering testing on the first unit by 5 Feb 66.

11. Acceptance testing of the first unit is scheduled for the period of 5 Feb through 19 Feb 66.

VDW

Contract [redacted]
Second Quarter FY-66

PAR 81M
10 Dec 65

SUBJECT: Wash Water Conservation on Standard Versamat

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, is now in progress for publication. The summary statements for this report are:

a. Several methods of reducing the amount of water required to adequately wash aerial films in a Versamat processor were investigated. One method which uses a total of 1/2-gallon per minute of water was found to wash film as well as the conventional Versamat wash which uses at least four gallons per minute. Testing at 1/4-gallon per minute proved too marginal to be recommended.

b. The reduced rate method can be employed by the addition of a modification kit along with minor plumbing changes.

PLANNED ACTIVITIES

3. Publish the Final Report.

[redacted]

Contract [redacted]
Second Quarter FY-66

VDW

PAR 82M
10 Dec 65

SUBJECT: Two-Strand Stereo Viewer

TASK/PROBLEM

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

DISCUSSION

2. This project as outlined in the TASK/PROBLEM was deferred by the CCB at the 7 - 8 Apr 65 progress review meeting. However, to take advantage of a temporary favorable price (40% savings), the contractor was authorized to purchase, as a minor project, one Modified Versatile Stereoscope. An order has been placed for this item.

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

PLANNED ACTIVITY

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



[redacted]

[redacted]

Contract [redacted]
Second Quarter FY-66

VOW

PAR 83M
10 Dec 65

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, is in progress for publication. Summary statements for that report are:

a. A preliminary study of cleaning methods indicated that the design of a breadboard cleaner should incorporate pressure spray jets. These jets would be capable of delivering both cleaning solution and water in sequence to the Versamat rack and crossover assemblies.

b. Following this approach, a breadboard Versamat rack cleaner was designed and built to evaluate cleaning effectiveness and to study various chemical cleaners and techniques under production circumstances. Both manual and automatic modes of operation were investigated.

c. Testing using the breadboard rack washer has demonstrated that:

(1) It is practical to clean Versamat racks and crossovers in a unit separate from the processor.

(2) The spray jet concept is both an efficient and practical method to clean Versamat racks and crossovers.

(3) The equipment can be automated to provide a complete cleaning and rinsing cycle in twenty-six minutes and need not be attended.

(4) The only requirements necessary to use the breadboard washer are a power supply, adequate water at 115°F, the commercially available chemicals, and a sewer drain.

PLANNED ACTIVITIES

3. Publish the Final Report.



[redacted]

VDW

Contract [redacted]
Second Quarter FY-66

PAR 84M
10 Dec 65

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. The completed lamphouse assembly has been installed on the modified Belair Printer.

3. Preliminary mechanical and electrical checkouts are complete.

PLANNED ACTIVITY

4. Test and evaluate.

Contract [redacted]
Second Quarter FY-66

PAR 87M
10 Dec 65

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. A series of resolution target test objects has been fabricated at various exposure and process conditions. These originals have been printed on a Niagara printer and are being evaluated. Results to date indicate a variation in printed resolution. There has been no attempt as yet to correlate the data with original fabrication conditions.

PLANNED ACTIVITY

3. Continue experimental tests and analyze data.

Contract [redacted]
Second Quarter FY-66

PAR 88M
10 Dec 65

SUBJECT: Mathematical Color Model

TASK/PROBLEM

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

DISCUSSION

2. The mathematical model is being designed to treat a color photographic system as being composed of four basic stages:

a. Acquisition.
b. Processing.
c. Duplication.
d. Viewing.

It is believed that acquisition, duplication, and viewing can be simulated with a common framework that involves three general constituents: illuminants, filters/reflectors, and receivers. Table 1 illustrates the manner in which color system elements can be categorized. The similarity of the acquisition, duplication and viewing stages, therefore, permits one model to simulate any one stage.

3. The primary characteristic to be used for describing illuminants is the spectral energy distribution. Such data relate the amount of energy at each wavelength throughout the spectrum of interest. Although absolute energy units are advantageous, relative energy units can be very useful and usually are easier to obtain or calculate.

4. Filters and reflectors are characterized by spectral transmittance or spectral reflectance information. Such data are readily obtained for lenses, gel or glass filters, and dye deposit images. The characteristics

Table 1

| | Acquisition | Duplication | Viewing |
|---|---|---|---|
| Illuminant | Sunlight<br>Skylight | Printer Source | Viewer Source |
| Filter/ Reflector | Ground Objects<br>Camera Lens<br>Camera Filters<br>Atmospheric Haze | Printer Filters<br>Dye Images | Color Correction Filters Dye Images |
| Receiver | Acquisition Film<br>Red Sensitive Layer<br>Green Sensitive Layer<br>Blue Sensitive Layer | Duplication Film<br>Red Sensitive Layer<br>Green Sensitive Layer<br>Blue Sensitive Layer | Eye Sensitivity<br>Red Sensitivity<br>Green Sensitivity<br>Blue Sensitivity |

of ground objects and atmospheric haze are more difficult to cope with but new data are constantly being derived on other projects.

5. The sensitivity of the film must characterize the spectral sensitivity of each emulsion layer. Such information is expressed as the reciprocal of the energy at a given wavelength necessary to produce a given density within the layer. Therefore, the calculated energy reaching a given area on the film multiplied by the individual layer sensitivities is a measure of the spectral response occurring in each layer.

6. The computer program will contain subprograms to make the model more flexible and convenient. One subprogram will use an input of color temperature to calculate the spectral distribution of a tungsten light source based upon Planck's equation for black body radiators. A second subprogram will modify the spectral transmission of unit dye deposits according to Beer's law upon the input of a given analytical density measurement. A third subprogram will produce graphs of spectral response versus wavelength to permit visual analysis of prospective systems. Such flexibility will expedite the analysis of a system and make optimum use of illuminant, filter/reflector, and film data stored in the computer.

7. The processing stage of the model will be accomplished by an empirical transformation of calculated integrated response values to density values. Using the information from Density versus Log Exposure curves for a real or assumed film-process combination, three one-dimensional matrices will be formed for the computer to use. In this way, the computer can look up the density which corresponds to a calculated response in any given film layer.

8. To treat the dye deposit in each layer as an individual colorant, densitometry values must be of the analytical density type. Such measurements are calculated from integral density values which are easily made. A computer program can readily convert the data.

9. Several preliminary color model programs have been written to date. Although no attempt has been made to integrate them into one network, they have been useful for pointing out the needs of a future integrated program. They have also been used for other projects to select glass filters for new printer designs, calculate T-numbers for a film-camera system and study the photographic effect of various distributions of daylight and skylight.

10. The computer programs presently being written will simulate the acquisition, duplication, or viewing situations. Spectral response calculations will be made in 5 mμ increments throughout the range of the data available with a maximum range of 280 to 995 mμ. This range was selected to accommodate the problems of black-and-white and infrared systems as well as normal color systems. After calculating the spectral responses, an integrated response for each layer will be computed. This value should be indicative of the exposure present in each layer and will be used in conjunction with process information to determine the dye deposit expected in each emulsion layer. In the viewing situation, the eye response will be calculated in terms of the C.I.E. color coordinate system.

11. In preparation for the use of the mathematical model, a catalog is being planned for storing input data. Information pertaining to illuminants, filters/reflectors, films, dyes, etc., is being organized for storage on magnetic tape for those items of known interest. Consideration is also given for addition of new items. Information stored in this manner is immediately available to the computer upon insertion of a coded calling card.

PLANNED ACTIVITY

12. Continue with the development of computer programs for the model.

13. Continue cataloging data on system components.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 89
10 Dec 65

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. Formal study planning was completed and committed to writing. Following the written plan, a literature search was started in conjunction with contacting of key personnel for discussion of the technical problems.

PLANNED ACTIVITIES

3. Use stellar image records from 1027 for the first formal evaluation effort.



[redacted]

PAR 90
10 Dec 65

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:

a. Idler rollers with internal strain gages have been designed for both the Niagara and Yardleigh equipments. Four twelve-inch rollers will be used on the Niagara to measure and record film tension values at each roller simultaneously. These rollers are dimensionally interchangeable with standard Niagara idler rollers. One fifteen-inch roller will be used on the Yardleigh. This roller will be capable of being mounted in several locations on the processor and will adapt to the two different roller mountings used on the Yardleigh in the area of interest.

b. All commercial strain gage roller parts have been ordered.

3. Electrical:

a. Based on operating specifications, versatility and cost, the Honeywell Model 1508 direct recording "Visicoder" oscillograph was selected for monitoring and recording film tensions. This twelve-channel recorder will utilize eight channels for recording film tension. Each channel will be fed from a foil type strain gage and will be capable of measuring up to 25 pound film tension. A one-pound film tension with a 180° wrap angle will induce a strain of two microinches/inch with the recording deflections as follows:



[redacted]

| Number of Channels | Frequency Response (CPS) | Deflection (Inches) | Noise |
|---|---|---|---|
| 2 | 0 - 60 | 8 | Less than trace width |
| 4 | 0 - 120 | 5 | Less than trace width |
| 2 | 0 - 240 | 3 | Less than trace width |

b. The Honeywell Recording System and the relay rack have been ordered.

PLANNED ACTIVITY

4. Begin fabrication of mechanical hardware.

Contract [redacted]
Second Quarter FY-66

PAR 91
10 Dec 65

SUBJECT: Respooler for Ultra Thin Base Film

TASK/PROBLEM

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

DISCUSSION

2. The subject PAR was approved on 20 October by customer message [redacted] Work was started on 2 November 1965.

3. Preliminary layout work is in progress for the formulation of a basic design concept. A search is being made of various sensing devices and steering systems.

PLANNED ACTIVITY

4. Establish a basic design concept and begin detail design effort. It is anticipated that the design may include a device for intermediate steering in addition to steering by shifting the takeup or supply spools.



[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 93
10 Dec 65

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 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 temperature within 0.25 inch of film travel (62 milliseconds). The viscous developer will be supplied to the hopper at ambient temperature or below. Heating strips in the lips of the hopper will be controlled by 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. The hopper and test stand parts are fabricated except for the heater element. Final assembly is expected by 1 Jan 66.

b. Various experimental heater strips were evaluated using pyrex as a base material. Vacuum deposited coatings of Invar and chromium respectively would not handle the power level requirements. Nickel electroplating on a chromium/gold vacuum deposited sub-coat destroyed the sub-coat. Metallizing processes are presently being tried.

c. Thermal calculations on the hopper heater configuration indi-

cate excessive heater surface temperatures. In order to reduce the temperature to a reasonable level, while maintaining the desired heat quantity, the width of the heater element will be increased. This will result in longer heating periods and slower response times for the system. Two wider heater configurations are being considered. One configuration will be the same as the present type except that it will be one-inch instead of one-half inch wide. The second configuration is a single suspended element, one-inch wide, but wrinkled. The purpose of the wrinkled strip is to gain the same heater surface area as a flat one but to keep the width (response time) to a minimum.

d. The wrinkled heater element appears to have many advantages. The slot dimension can be better controlled since it is machined out. The thermal mass of the heater is reduced since it is mostly suspended. The wrinkle will maintain the position of the heater in the slot.

4. Electrical Status:

a. Delivery of a 250-watt magnetic amplifier is scheduled for 15 Feb 66.

b. Temperature response test made on the thermocouples indicates time constants of a millisecond for bare wire and 40 milliseconds for the grounded junction.

c. Response calculations on the hopper configuration indicate a severe frequency limitation for a closed-loop feedback temperature control system. The delay time of viscous material transit from the heater to the sensor is the prime factor. The proposed system of combining direct drive to the heater with the limited closed-loop error correcting feedback circuit will give faster step changes and good correction for steady-state errors.

d. Another temperature stability approach under consideration is time base sampling. This method has the advantage of higher level sensor signals and possibly faster response time. Higher level sampling currents

can be used without detrimental heating effects in the temperature sensitive resistance wire. Since corrections have to be made during the sampling period, this requires a fast response in the correction circuit. Overall response is then limited by the sampling interval. The sampling interval is controlled by the viscous material transit time from start of heat until sensing.

PLANNED ACTIVITY

5. Test metallized heaters upon arrival.
6. Set up hopper test stand for evaluation.
7. Continue design effort in basic heater control circuit.

PAR 94
10 Dec 65

SUBJECT: Yardleigh Recorder

TASK/PROBLEM

1. Design, fabricate and test an automatic data recorder which will provide records of Yardleigh Processor and operation 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:

a. Provide information useful in the post-processing analysis of missions.

b. Provide some check information on the valid operation of the control circuits of the Yardleigh during a mission run.

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

3. Electrical Status: The format for the recorder print-out has been established using continuous paper feed and increased print-out cycle speed. Print-out for process levels, IR scan levels, and frame detection will be in the form of symbols, in assigned columns (in this case, probably a minus sign) to indicate "action" and blank for "no action". Symbols or blanks will be recorded for every inch of film travel. Numerical footage will be printed out for every foot of film travel. The continuous paper feed will allow symbols to be printed six per line and the footage numbers to be printed every other line on the printer tape.

a. The construction of the electrical chassis has been started. Some of the components not received from the vendor have been promised for delivery before 1 Jan 66. The lack of these components will not delay the wiring of the electrical chassis.

b. Schematics and wiring diagrams are being completed to reflect the final product design.

c. Installation problems are being investigated. Material required will be ordered as soon as the details are resolved.

d. The digital recorder has been received and designs are being considered for modification of the paper drive mechanism.

4. Mechanical Status:

a. Investigation was continued with regard to the feasibility of a continuous paper feed for the digital print-out. A practicable approach was found where continuous feed of the printing paper would be provided by the addition of a motor drive coupled to the printer mechanism paper roller. Access to permit the addition of a drive is quite restricted due to miscellaneous apparatus that is located on both sides of the printer mechanism.

b. The principle of moving the tape, with the paper advance roller, ahead of the print gate was approved by the manufacturer. It was indicated that very slight smearing of the characters might occur, but this was not considered serious enough to give up this approach. Detail part drawings are being provided by the printer manufacturer. A layout of the printer advance mechanism has been started.

c. Due to the requirement of keeping a record of each inch of film travel, it is necessary to add an additional cam and switch to the shaft that drives the metering roller on the processor. An examination of the Yardleigh Processor indicated that no serious problems are expected in making this change.

d. Ordering of mechanical components is in progress.

e. Adequate space for location of the recorder was found in the Yardleigh entrance ante-room. Minimal equipment changes will be required for this installation.

PLANNED ACTIVITY

5. Continue design efforts and fabrication.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 95
10 Dec 65

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. The subject PAR was approved by customer message [redacted] dated 20 Oct 65.

3. To date, preliminary investigation effort has led to the following conclusions:

a. A printer can be adapted to either of two general types of web guidance devices:

(1) Web steering device, and

(2) Axially shifting windup.

b. Although the rate and amount of corrections will be small, the accuracy required for UTB film is much greater than in any known commercial web guidance device.

c. Most commercial units use air-hydraulic or air-electric-hydraulic systems for web guidance. This means providing a complete hydraulic system if adopted.

d. An air-only system would be more susceptible to fluctations because of compressibility. It requires an automatic controller for smooth operation.

e. An electrical-mechanical system should be considered if available.



[redacted]

PLANNED ACTIVITY

4. Evaluate advantages and disadvantages of:
   a. Web steering device near windup.
   b. Axial shifting of windup unit.
5. Select the simplest web guidance system.
6. Start design utilizing elements adaptable for use on actual printer.

Contract [redacted]
Second Quarter FY-66

PAR 100-1
10 Dec 65

SUBJECT: All-Viscous Chemistry

TASK/PROBLEM

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

DISCUSSION

2. An intensive literature search is in progress to acquaint engineering with the most recent developments in viscous solution preparation, handling, and processing techniques.

3. Several long range keeping tests were initiated for determination of keeping characteristics associated with the more prominent developers.

4. In order to accumulate necessary data for a "best" choice, several wetting agents are being tested and evaluated.

5. Some experimentation was undertaken to determine techniques or facilities required to make rapid, gross sensitometric evaluation of viscous solutions or additives.

PLANNED ACTIVITIES

6. Continue long-range evaluation program.

7. Prepare individual testing criteria and goals to meet priority problems associated with all-viscous processing.

8. Continue literature search.

9. Full scale activity on this PAR is expected by January 1966, when PAR 100-1 will continue the associated efforts now in progress on PAR 58.

Contract [redacted]
Second Quarter FY-66

PAR 100-2
10 Dec 65

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

b. Authorization to proceed on the subject project was received by customer message [redacted] dated 20 Oct 65. Actual design effort was started by the contractor on 11 Nov 65.

3. Status: Effort expended to date consists primarily of general overall preliminary design including the review of data generated to date on PAR 93. The 400-cycle magnetic amplifiers capable of 500- to 1000-watt outputs, respectively have been ordered.

PLANNED ACTIVITY

4. Continue design effort.

Contract [redacted]

Second Quarter FY-66

PAR 100-3

10 Dec 65

SUBJECT: Film Footage Marker

TASK/PROBLEM

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

DISCUSSION

2. Authorization to proceed on PAR 100-3 was received by customer message [redacted] dated 20 Oct 65. Contractor effort was started on 20 Nov 65.

3. The investigation of a special reflective material to be used on a selected counter has been initiated.

4. Possible sources for commercial material and equipment are being contacted.

5. The layout of a breadboard illumination and projection system that will print the counter numbers 1/16-inch high on typical negative material has been started. The lens for this system has been selected and ordered.

PLANNED ACTIVITY

6. Continue with the investigation of a reflective material to coat the numerals of a selected counter.

7. Complete layout of illumination and projection system.

8. Build a prototype unit that will be compatible with sensitometric edge printer.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 100-4
10 Dec 65

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. Authorization to proceed was received by customer message [redacted] dated 20 Oct 65.

3. Preliminary planning for the accomplishment of the PAR objectives has been completed.

4. Data generated in the PAR 58-5 series is being analyzed and evaluated in conjunction with the pre-engineering study of the equipment.

PLANNED ACTIVITY

5. Continue pre-engineering study.

6. Construct breadboards as required

7. Complete final design of developmental 9.5 Inch All-Viscous Processor.



[redacted]

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 100-5
10 Dec 65

SUBJECT: IR scanner and Electronic Control Units

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. The general engineering approach to this problem is complete and specific system and circuit design has started.

3. The system will consist of an IR sensitive photocell block of eighty cells, each .080" square, a multiplexer circuit with eight output levels and the associated logic circuits. The multiplexer output will be stored in a shift register, which will also supply the necessary delay time required for the scanner level signal to travel from the scanner to the coating station.

4. The film will be scanned in approximately one-half inch segments and the output level of the multiplexing circuit will depend upon the density minimum found in that one-half inch segment.

5. The density minimum level for each one-half inch of film will be coded into digital form and inserted into a shift register for storage and correction. The shift register will have as many stages as there are one-half inch segments between the scanner cells and the coating station (expected to be 8 to 10 inches). This stored information will be shifted serially through the register by a timing pulse which will be generated after every one-half inch segment is scanned.

6. Since there is to be no frame detector, a major problem to be solved is the possible false full-process level reading resulting from scanning a frame line. A false full-level reading is defined as the



[redacted]

reading which results when all 80 cells of a complete line scan produce a density minimum signal equal to film base density. Logic circuitry will be used to monitor and control the shift register. When a false level reading is detected, the logic will determine if the reading should be corrected to equal the value in the adjacent scan section. Frame lines will be processed at the same level as adjacent areas. If a flase full-level reading is obtained which is not a frame line, the logic will determine, by inspecting adjacent segments, whether to adjust the reading to that of adjacent areas or not.

7. The output of the shift register, which is in binary form, will be converted into a digitized analog voltage proportional to the multiplexer output levels. The analog voltage will then be used to control the temperature of the viscous hopper.

PLANNED ACTIVITY

8. Complete system design requirements and continue circuit design.

Contract [redacted]
Second Quarter FY-66

PAR 100-6
10 Dec 65

SUBJECT: Drying Equipment

TASK/PROBLEM

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

DISCUSSION

2. Authorization to proceed was received by customer message [redacted] dated 20 Oct 65.

3. A plan for achieving the design objectives has been written and preliminary studies have been started.

PLANNED ACTIVITIES

4. Continue studies.

Contract [redacted]
Second Quarter FY-66

PAR 107
10 Dec 65

SUBJECT: Drum Printer with Modulated CRT Light 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. Authorization to proceed was received by customer message [redacted] dated 7 December 1965. To date, no effort has been expended.

PLANNED ACTIVITY

3. Start design.

[redacted]

Contract [redacted]
Second Quarter FY-66

PAR 109
10 Dec 65

SUBJECT: Viscous Monobath Techniques Study

TASK/PROBLEM

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

DISCUSSION

2. The secondary section of the Snowflake processor has been installed with some modifications and has been redesignated the VIXEN (for Viscous Experimental Engineering) processor. The machine has undergone shakedown testing and is now operational. We now have facilities for evaluating viscous monobaths in a processing machine.

3. Search of available literature on monobaths is a continuing effort. All avenues are being investigated to orient efforts on this PAR to the state-of-the-art.

4. Several formulae from the literature have been compounded and tested. Of these, two seem to warrant further investigation with Types 3400 and 3401 film. Thus far, no formula has been found which shows promise for Type 3404 or the duplicating films.

PLANNED ACTIVITY

5. Continue literature search.

6. Continue compounding and testing of promising monobath formulae to determine sensitometric desirability in terms of requirements.

7. Determine image characteristics of films processed in the monobaths that display acceptable sensitometry.

8. Begin thickening tests on monobaths which meet sensitometric and image quality standards.

9. Machine test thickened monobaths on the VIXEN Processor.



[redacted]

Contract [redacted]
Second Quarter FY-66

PART XIX
Item 3
10 Dec 65

SUBJECT: Moveable Head Densitometer

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. During this period, two discussions were held at the subcontractor's plant on technical and contract subjects of the proposed prototype design and fabrication contract.

3. In the subcontractor's first proposal, the use of a proprietary design involving the use of a "bifurcated" fiber optics arrangement to provide better means for seeing the photograph image area immediately around the point to be read was described. The idea appears very attractive, but the possibility of a flare-like effect in the fiber optics bundle was suspected. The subcontractor conducted experiments at his own expense to learn the magnitude of the flare condition and found it to be objectionable. Again at his own expense, he procured a second bifurcated bundle in which the central 0.5mm bundle of fibers which are to supply light for densitometry were enclosed in a 0.5mm I.D. stainless steel tube having 0.1mm wall thickness. This arrangement completely eliminated the flare condition.

4. In the second visit to the subcontractor's plant on 3 Dec 65, a proposal was developed for the design and fabrication of a prototype densitometer utilizing the bifurcated fiber optics bundle for sample illumination including the metallic sheath. The subcontractor has made a

fixed price quotation for the design and fabrication of the prototype densitometer according to that proposal.

PLANNED ACTIVITY

5. Issue a subcontract for design and fabrication of the prototype Moveable Head Densitometer according to the 3 Dec 65 proposal and quotation.

Contract [redacted]
Second Quarter FY-66

PART XIX
Item 4
10 Dec 65

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. Design, fabrication, and assembly of the entire mechanism are complete.

3. Alignment of the rotating components has been accomplished to provide tracking of both strands in both directions of travel.

4. Operating instructions for the viewer have been completed.

5. The two-strand film viewer has been delivered for checkout, test and evaluation.

6. The final report is being written.

PLANNED ACTIVITY

7. Complete and publish final report.

PART XIX
Item 5
10 Dec 65

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. The two automatic recording densitometers were received. A demonstration-training session was held for operators and maintenance personnel. Tests of the densitometers indicate that they are functioning well and according to specifications.

3. There is a difference in the collection efficiency of two types of laboratory densitometers in use in the contractor's organization. The earlier one (EP-1000) is not as good as the recent type (TD-100 and TD-203). The better collection system, TD-100/TD-203, shows lower shoulder densities for Type 3404 film (low Q factor) than the EP-1000. All data currently released is from earlier EP-1000 equipment. The ARD density readings agree closely with those on the TD-100/TD-203 instruments.

4. In order to make use of the automatic recording densitometers, it is necessary to produce sensitometer strips exposed to a constant gradient wedge modulator. Two different cemented M-carbon modulators providing a combination of wedge and step tablet exposures were produced as a part of this project. Photographic checks of these modulators and densitometer calibration of them combined with a recalibration of the Tablet No. 711-150, used in our 1b Sensitometer over the past two years shows that:

a. Average density gradients in the new combination modulators are consistent among themselves but are less than that in Step Tablet No. 711-150.

b. There is a difference in "curve shape" between the step tablet and the continuous wedge in both combination units plus an error of placement of the "eleventh step" position mark on the wedge in one of them.

In summary, it is not possible to make changeover to use either of the present combination modulators for on-line operation without the need for numerous and highly technical explanations to data users.

5. To allow orderly changeover to the use of the ARD's, we will try again to provide, as a part of the project, combination modulators which produce sensitometric exposures equivalent to those now being produced by Tablet 711-150.

6. Rather than procure additional cemented combination assemblies for the 1b Sensitometer, we will purchase step tablets and wedges with laminated acetate covers to be mounted between glass cover sheets. This mounting technique will permit us to select, match, and adjust step tablets and wedges after careful calibration. It is also pointed out that accidental damage to the glass covers can usually be repaired without damage to the carbon wedge or step tablet. In another operation performing high accuracy sensitometry, such assemblies are taken apart, cleaned and recalibrated annually.

7. Specification 469-328, "Step Tablets for the 1b Sensitometer", and Specification 469-329, "Continuous Wedge for the 1b Sensitometer", have been prepared to aid in procuring "premium grade" modulators for use in the 1b Sensitometer. These specifications represent considerable experience in the balance between modulator casting technology and the desire for "perfect" modulators. The yield in fabrication with this specification is usually 25% to 35%. We are ordering three each modulators to these specifications to

provide for some matching and for spares.

8. From a -328 Step Tablet matched with a -329 Continuous Wedge, we hope to fabricate two combination modulators to expose a 35mm wide "step" sample area and a 35mm wide "wedge" sample area at each exposure on the 1b Sensitometer.

9. A third specification, No. 469-330, has been prepared for 10-centimeter long wedge for use as a wedge modulator only in the EGG or the Kodak Model 101 Sensitometer. Three wedges to this specification are also being ordered, for use in a color process control operation at a location remote from the 1b Sensitometer.

10. Fabrication, assembly and engineering testing of two sample cutters have been completed. Some necessary reworking of parts delayed this until just before the end of the quarter.

PLANNED ACTIVITY

11. In the next quarter, we expect to

a. Accept delivery of the new premium grade wedge and step tablet units, select suitable sets, and assemble them between cover glass for installation in the 1b Sensitometer.

b. Provide user checkout of the sample trimmer units.

c. Continue effort to place the Automatic Recording Densitometer "on-line" for production sensitometric control.

VRW

Contract [redacted]
Second Quarter FY-66

PART XIX
Item 6
10 Dec 65

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. The design was accomplished by providing alternate light paths and filter arrangements so that exposure level for each frame could be programmed prior to actual frame printing. The synchronized shutter drive accomplishes this rapid exposure change entirely within the frame interspace without interruption in printer output.

b. The purpose of the subject project is to apply the design concept of the development model 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 to a paper tape frame number and if the numbers match, print at optimum exposure levels indicated by density data stored on the paper tape.

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

3. Current Mechanical Status:

a. Frame Code Readout: Detail and assembly drawings have been released to the shop. Fabrication of parts is complete. Assembly operations are in progress. Selection of a lamp that produces enough light for adequate signals with a reasonable life has been a problem. A small 250-watt, 30-volt iodine quartz lamp operated at 20 volts has been tested. Adequate light is produced through about 600 hours of burning time. This test was conducted

under study-state conditions. Cycling the light on and off will shorten the useful lamp operating life. A 75-watt, 28-volt, 2,000-hour life iodine quartz lamp has been recommended by the manufacturer. A number of these lamps are on order. These will be evaluated for this application.

b. Lamphouse: Drawings and fabrication of parts of the filter bank have been completed. One filter bank has been assembled for electrical and timing checkout. This unit will also be life tested. Long life, 67.5° rotary solenoids are being used in order to have "overtravel" available when used with the new stops. These stops are made with a special rubber formulation that reduces bounce of the filters to acceptable limits. Tests conducted on this assembly have produced satisfactory results. A number of changes in the application of these solenoids to improve performance have been made.

c. Cabinet: The cabinet has been received from the vendor.

d. Mechanism Plates: The mechanism plate has been received from the vendor and has been finished.

e. Lower Cabinet Assembly: The design, detail and assembly drawings of the solenoid driver drawer and the lower cabinet assembly are 95% complete.

f. General: The special two-speed main drive motors were received from the vendor and checked out along with the final drive system and memory drums. One motor was rejected and returned to the supplier because of oil leaks and low output torque. This motor has been repaired and is being checked out. The final assembly drawing of the printer is 95% complete. Final assembly operations on the printer have been started.

4. Electrical Control System Status:

a. Logic Control System:

(1) The memory drum system as received from the manufacturer was found to be unreliable, with most of the channels operating improperly. The equipment was returned for reworking. The reworked systems have been re-

ceived and found to be satisfactory.

(2) A test setup has been made to determine the power and timing requirements of the filter changing solenoids. These tests are underway.

(3) Wiring information for the logic card boxes and electronics console has been 85% completed. Design of the console panels and chassis are about 70% complete.

(4) Assembly of special circuit cards and plug-in units is 75% complete. The logic card box internal wiring has been completed.

(5) Of the material required, 95% has been ordered and about 90% delivered.

b. Motor Control System: Wiring information for the printer has been completed and several of the sub-assemblies have been wired.

PLANNED ACTIVITY

5. Mechanical:

a. Continue tests on the filter bank.

b. Complete the remaining drawing documentation.

c. Complete fabrication of the remaining parts and final assembly of the printer.

6. Electrical:

a. Continue assembly and wiring of electronic console and printer sub-assemblies.

b. Continue preparation of wiring information for electronic console.

c. Start wiring of printer.

d. Complete ordering and continue follow-up of overdue items.

VDW

Contract [redacted]
Second Quarter FY-66

PART XIX
Item 9
10 Dec 65

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-, and 8-inch wide film on the Yardleigh Processor.

DISCUSSION

2. Hoppers are complete and have been checked out. Installation will take place with PAR 76, Upgrade Yardleigh Processor, installations.

PLANNED ACTIVITY

3. Install and test on Yardleigh Processor as schedule permits.