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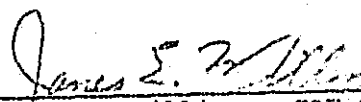
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FILM HANDLING PROCEDURES

FOR

SKYLAB S-056 EXPERIMENT

These procedures have been reviewed  
and are approved.

  
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Dr. James Milligan, S&E-S&L/T  
Principal Investigator

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FILM HANDLING PROCEDURES

FOR

SKYLAB S-056 EXPERIMENT

INTRODUCTION:

This document presents step-by-step procedures for handling the S-056 film, type SO-212. It documents the procedures and controls for each step of the film flow within the Photographic Technology Division from the flight film acceptance testing through original film processing to the duplication of the original film.

FILM HANDLING PROCEDURES  
FOR  
SKYLAB S-056 EXPERIMENT

1.0 Flight Film Certification Tests

1.1 The Photo Science Office of the PTD shall conduct a certification and acceptance testing of each new SO-212 film emulsion received. The test shall assure that the film is as the manufacturer and the Marshall Space Flight Center purchase order specified and is within tolerance. The criterion for the certification test is the manufacturer's specification. The sensitometric plot made by the PTD shall be within the data point parameter specified by the Principal Investigator and manufacturer. Film from each lot will be selected at random and the following physical and photographic parameters measured where applicable and essential.

1.1.1 Length - when large spools of film are received, the manufacturer's spooling data are accepted as correct verification.

1.1.2 Thickness

1.1.3 Width

1.1.4 Integrity (scratches, emulsion and/or base imperfections)- This parameter is particularly important for this film type and will be evaluated by examining unprocessed and processed raw stock.

1.2 Sensitometric Measurements

Because of inherent subtle changes unique to every emulsion coating, continuing sensitometric measurements are necessary. The proper environment will minimize these changes, but will not prevent them. Additional information concerning sensitometric measurements can be found in Photographic Technology Division Quality Control Procedures.

2.0 Sensitometric Preparation of Skylab S-056 Film

Establish pre- and postsensitometric preparation of the S-056 experiment film. Steps 2.1.1 through 2.1.9.1 will be accomplished upon availability of the mission film and before loading of the flight magazine(s).

## 2.1 Precalibration Handling

Each roll of flight film will be identified by number (1,2,3,...n) by a PSO representative upon arrival at PTD/JSC.

NOTE: EXTREME CARE WILL BE TAKEN IN HANDLING THE SO-212 FILM DUE TO ITS SENSITIVITY TO PRESSURE. THE FILM WILL, AT ALL TIMES, BE CARRIED AS A "PANCAKE" TO PREVENT TELESCOPING.

2.1.1 The raw stock will be carefully removed from the can and bag (in the dark), placed onto a film-spool-flange and then onto the film rewinds on the table of a laminar flow bench. The film will unwind in a counterclockwise direction when correctly placed on the right side of the rewinds with the flange facing the rear wall of the bench.

NOTE: THE FLIGHT FILM IS WOUND EMULSION OUT.

2.1.2 Carefully remove the piece of tape which retains the integrity of the spooled film.

2.1.3 Due to the possibility of manufacturing handling marks on the head end of the roll, ten feet of film will be removed and identified for white light inspection. Cut the sample footage, identify by the roll number from which it was taken, and lay it aside.

2.1.4 Advance (from right to left) the unsecured end and attach it to a S-056 film core located on the left rewind. The film core will be mounted on the rewind with a film flange so that the open side of the core is facing the side of the flange which is facing the operator.

Two samples (Emulsion Out), one 25-foot section and one 35-foot section from each prime and backup roll, will be removed utilizing this rewind configuration.

Remove each sample from the rewind and place in its light-tight bag, then into the can provided by MSFC, and seal the can with black vinyl tape.

(Twelve 35mm S-056 film cores are required to secure the 25 and 35-foot test sections from the prime and backup S-056 film loads.)

2.1.5 Secure each unsecured section of film with tape.

2.1.6 Upon completion of the above sampling, a 10-foot section will be removed and stored for PSO testing and Houston Controls.

After the sampling has been concluded, carefully return the rawstock to its appropriate container and seal with black vinyl tape.

2.1.7 Each 10-foot section will be identified according to film type, load, and date loaded.

2.1.8 The load will be identified as follows:

Load No. 1	(L-1) Magazine 208
Load No. 2	(L-2) Magazine 208-1
Load No. 3	(L-3) Magazine 208-2
Load No. 4	(L-4) Magazine 208-3
Backup Load No. 1	(BL-1) Magazine 206-3
Backup Load No. 2	(BL-2) Magazine 216-1
Backup Load No. 3	(BL-3) Magazine 216-2
Backup Load No. 4	(BL-4) Magazine 216-3

2.1.8.1 The can labels will be as follows:

Primary Load:

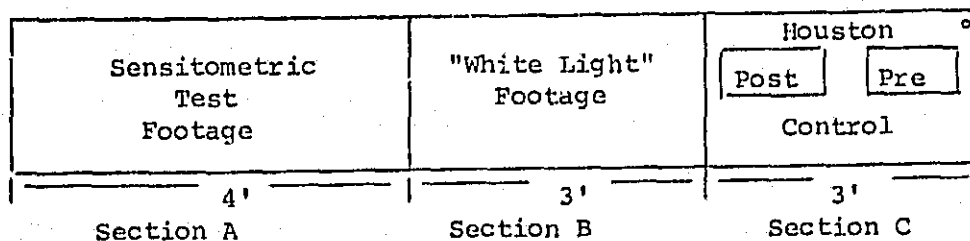
Example: L-1/S-056/month-day-year/SO-212/Emulsion No.

Backup Load:

Example: BL-1/S-056/month-day-year/SO-212/Emulsion No.

2.1.9 Each of the MSFC Test Sections will be sent to MSFC for pre-mission calibration application. The 25-foot sample section will be returned to PTD, on a S-056 film core, to be incorporated in the flight and backup magazine loads.

2.1.10 Each 10-foot section retained at PTD will be tested for its sensitometric characteristics and physical integrity as follows:



#### 2.1.10.1 Section A

This section will be used to test the sensitometric characteristics of the material. Three strips, each 16 inches in length, will be exposed and processed according to the exposing and processing procedures detailed in Sections 2.2 and 3.0 of this document. The results will be evaluated and reported.

#### 2.1.10.2 Section B

This section will be inspected in white light for physical anomalies. An evaluation report will be written and a copy of this report forwarded to the cognizant personnel at MSFC. This report will include a copy of the sensitometric evaluation report (Section 2.1.10.1).

#### 2.1.10.3 Section C

This section represents that area to be used for the Houston Control. Sensitometry will be applied per Section 2.3 of this document. The Control will be double canned, sealed with black vinyl tape, and appropriately identified by film type, experiment, and date sensitometry was applied. The can will then be stored at room temperature.

#### 2.2 Sensitometry Application on Flight Roll - to be accomplished prior to flight magazine(s) loading.

2.2.1 Carefully remove the flight rawstock from the bag and can and place it onto a film-spool-flange with the open side of the core facing the flange. Place the rawstock on a rewind located on a table to the right of the sensitometer so that the film will come off the roll in a clockwise direction- emulsion down. Advance the unsecured film (from the supply core) to the left edge of the sensitometer table and hold secure. Grasp the film at the table's right side, advance it to the table's left side, and hold it secure.

2.2.2 Grasp the film on the right, side, of the sensitometer tablet, and advance it to the table's left edge. (This will position the premission sensitometry 6 feet in from the leading edge of the film.)

2.2.3 Place the film, emulsion down, on the step tablet. Carefully lower the pressure platen and expose the film to the following conditions\*:



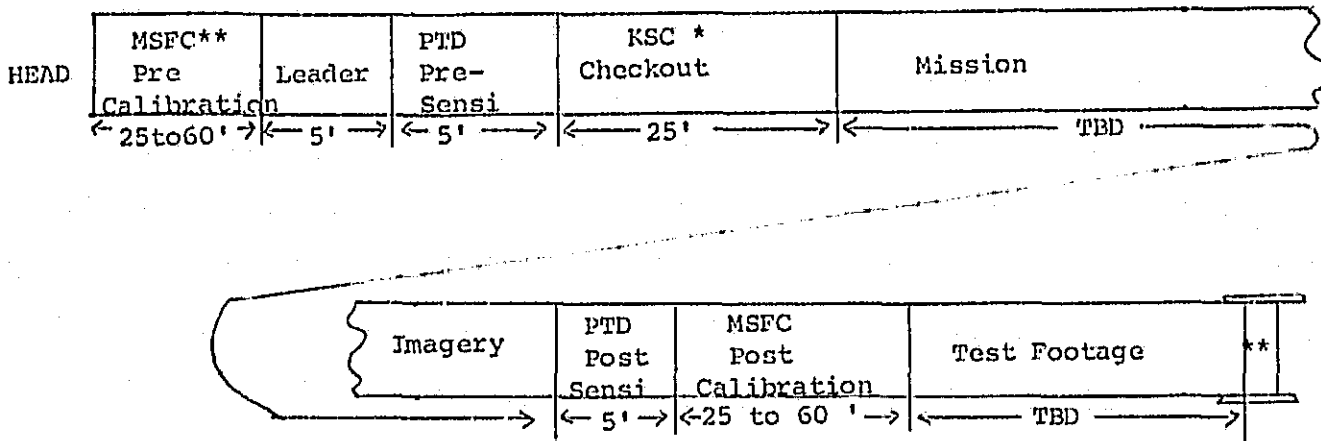
Step Tablet	772-150
Illuminant	2850°K
Exposure/sec	1/50
Filter	5500°K
Bulb	72-3-2269

\* This setup step must be accomplished before the room is darkened.

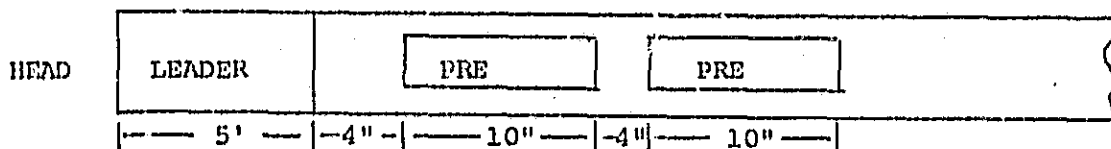
2.2.4 After exposing the film, raise the tablet pressure platen and advance the film (from right to left) the length of the step tablet plus approximately four inches. Again place the film, emulsion down, on the tablet; lower the platen and expose.

2.2.5 After exposing the film, raise the tablet pressure platen and carefully rewind the film onto the supply core.

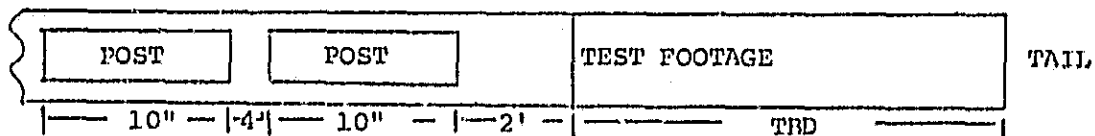
2.2.6 The pre- and postmission sensitometry will be applied to the S-056 mission films in the following configuration:



Premission:



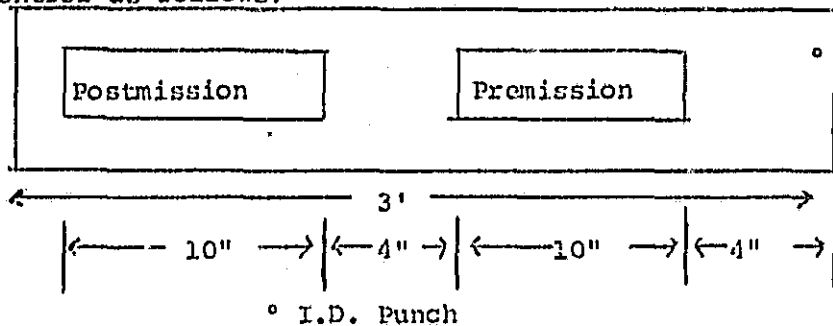
Postmission:\*\*\*



- \* KSC camera checkout will be accomplished on the first load only, Magazine No. 208.
- \*\* MSFC Premission Calibrations will be wrapped around the flight takeup core.
- \*\*\* NOTE: Upon downloading the S-056 magazine, the test footage will be removed from the flight roll, double canned, sealed with black vinyl tape, and properly identified.  
This footage will be used to determine the extent to which the radiation has effected the sensitometric characteristics of the flight film.

2.3 HOUSTON CONTROL - Pre- and postmission sensitometry  
(Primary and Backup Loads)

Following the application of the sensitometry on the mission film, the premission sensitometry will be applied to the film strips retained for the Houston Control as follows:



The exposure configuration will be the same as that used for the mission film.

The postmission sensitometry application will utilize the same procedures.

2.3.1 Upon completion of the above step, the strips will be returned to their respective cans, sealed with black vinyl tape, and stored at room temperature.

2.4 Postmission Sensitometry

2.4.1 The S-056 flight magazine will be visually inspected and the results recorded when delivered to PTD.

2.4.2 The flight magazine will then be taken to Room 248B (within PTD) where it will be downloaded and postmission sensitometry applied (Re: Sections 2.2.3 and 2.2.6).

Prior to the sensitometry application, an estimate of the footage remaining on the supply side of the magazine will be made. If there is found to be film on the supply side, the film will be cut to insure that a minimum amount of unexposed film (approximately 5 feet) is retained on the flight footage to enable the PTD postmission sensitometry to be applied.

Following Sections 2.1.1 through 2.1.8, a 25-foot section will be removed from the remaining supply footage and sent

to MSFC for the postmission calibrations. This test footage will be processed with the flight film upon return to PTD.

The remaining footage will be utilized in any mission film preprocessing tests deemed necessary by PSO and the Principal Investigator.

Each roll of film (mission and the remaining supply footage) will be separately canned. The cans will be sealed with black vinyl tape and identified.

2.4.3 The mission film will be turned over to the cognizant NASA personnel of the PTD for distribution to the appropriate laboratory (MPL).

2.4.4 Until the mission film is processed, it will be stored in an approved bonded storage cold vault (Room 226A, Building 8).

2.5 Preprocessing Preparation of the Flight Film

2.5.1 The sequence for preparation and makeup for processing of each of the flight rolls shall be as follows: (Performed with room relative humidity  $55 \pm 5 \%$ ).

DUE TO THE MAKEUP SEQUENCE, IT WILL BE NECESSARY FOR EACH ROLL TO BE REWOUND. THE OPERATION WILL BE UNDERTAKEN WITH EXTREME CARE. NO MOTOR DRIVEN REWINDS WILL BE USED. ALL POSSIBLE PRECAUTIONS WILL BE TAKEN TO INSURE THE LACK OF STATIC ELECTRICITY DISCHARGE AS THE FILM IS REWOUND.

HEAD	Machine Leader	Scratch	Process Control Strip	Houston Control Strip	MSFC* Premission Calibrations	Mission
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Film	MSFC * Postmission Calibrations	Process Control Strip	Machine Leader
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\* NOTE: This section will include flight and/or flight simulation calibrations.

In the event a short length of film is cut from the prime roll and processed, the above makeup will be followed for the short length also with the exception that the Houston Control will be retained and processed with the bulk of the mission film.

All splices will be tape splices. No reinforcing staples will be used with the tape.

### 3.0 Photographic Processing Controls

This section presents the processing requirements for the original film from the S-056 experiment.

#### 3.1 Process Certification

3.1.1 Each primary processing solution will be chemically analyzed. The analysis will then be compared against the standards set forth by the PTD Quality Control Department. If the results are in compliance with the standards, the solutions will be classified as certified. If they exceed the preestablished tolerance levels, they will be remixed and the analytical procedures repeated before being delivered into the respective processors.

3.1.2 For each of the flight rolls to be processed, a series of five sensitometric control strips of the flight emulsion will be processed. At the completion of the processing, the strips will be read on the MacBeth TD217DR densitometer, the points averaged (step by step), and the resultant average plotted. At this point, the resultant plot will be compared to a pre-established AIM (or process control) curve. Figure 1 represents the sensitometric curve for the process condition to be used for the flight films. In the event adjustments to the process are required, another series of tests are run until the average is within tolerance.

3.1.3 Appropriate procedures will be followed for mechanical certification of the processor.

3.1.4 Final Approval on film and chemistry certification will be made by the NASA and Technicolor personnel of PSO.

4.0 Postprocessing Inspection of Original Mission Film

Upon completion of processing of each roll of original film, PTD postinspection procedures will be followed and an evaluation report written.

4.1 Procedures

4.1.1 Personnel handling original film must be completely outfitted in clean room attire, including hats, masks and gloves.

4.1.2 The original film is received from the processor, tail out.

4.1.3 Wind the original film above a light table, emulsion up, onto another 35mm core.

4.1.4 The inspector notes and records on the inspection sheet all physical defects, camera malfunctions, percentage of fog, and general quality of the original film.

4.1.5 Upon completion of the inspection, turn the inspection sheet over to the supervisor.

5.0 Duplication

5.1 The standard products produced for dissemination will be second generation direct negative transparencies. Third generation positives (produced from a direct negative) will be limited to special requests.