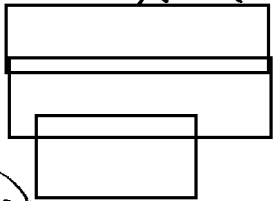


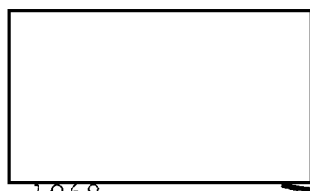
22641-8 folder

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August 27, 1968

MEMORANDUM FOR THE RECORD

SUBJECT: Measured Performance of the [redacted] Camera Planned for Photographic Experiments on the Apollo 205 Mission

25X1

A single hand-held frame camera will be flown on the Apollo 205 mission now scheduled for flight in mid-October. This camera is manufactured by [redacted] and modified for space flight by the MSC. The same type camera and lens were flown on all Gemini missions. The model type is the 500C available commercially throughout the world. For this mission the [redacted] is equipped with a single lens having a focal length of 80 mm and a maximum aperture of f/2.8. The lens is a [redacted] manufactured in [redacted]. Up to twelve film cassettes will be carried on this mission and two film types will be utilized -- Type 3400 (Panatomic X), and S. O. 121 (a fine grain color film first flown on Apollo 502).

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The purpose of the two experiments that utilize the single frame camera will be as follows:

1. S-005 will obtain synoptic terrain photography. The Principal Investigator is [redacted]

25X1

2. S-006 will obtain synoptic weather photography. The Principal Investigator is [redacted] of the U.S. Weather Bureau.

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The photographic system performance of the flight camera was measured in the laboratory at KSC on August 1st and 2nd. These experiments were conducted by MSC and KSC personnel. The procedures used in this evaluation were as follows:

Declass Review by NIMA/DOD

NASA review(s) completed.

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1. National Bureau of Standards (NBS) targets were placed in an array to cover a full field of view. These were low contrast targets having a contrast ratio of 1.6/1.
2. The flight camera was mounted on a stable support.
3. The camera lens-to-object distance prescribed in the NBS procedures (83") was established and the camera properly focused.
4. Best exposure was determined, and between 5 and 10 frames were exposed under each of the following conditions:
  - No window - no filter
  - Window - no filter
  - No window - filter
  - Window - filter
5. The window was the outside window of the Command Module (CM) which has a thermal coating -- it has a transmission cut-off above approximately .83 microns. In cases when used the window was aligned normal to the lens principal axis. This is the optimum viewing angle -- it could seldom be achieved in flight, and the two additional window elements though not part of this test could only cause further degradation of photo system performance.
6. The filters used were a Wratten 25A for the b-w Type 3400 and a 2A for the S. O. 121 color film.
7. Two complete sets of test data were obtained at the KSC facility for evaluation at MSC and at NASA Headquarters.
8. All test photography was processed by the Photographic Technology Laboratory at MSC.

Summary of evaluation of photographic system performance

MSC evaluation - The best resolution read under any combination of filters and CM windows (and/or-neither) did not exceed 28 L/mm using these low contrast NBS targets. Measurements were made only at the principal optical axis.

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NASA Headquarters evaluation - The test films were studied at the NPIC on 20 August with the aid of a [ ] binocular microscope. 25X1  
There was evidence of exposure and lighting problems, such as "hot spots", but it is felt that this test, the first of a series planned to be accomplished prior to all future photographic operations, has sufficient data to predict performance of this system.

The MSC finding that the best performance that can be obtained with this photographic system is approximately 28 L/mm measured on low contract NBS targets, on axis, should be accepted.

A few observations may help qualify the data. Though not planned for flight experimentation on this mission, the test at KSC included test exposures using Type 3404 film -- a [ ] film of extremely fine grain. An evaluation of these test targets revealed a fine grain pattern, obviously better "crispness" and higher acuteness, but in fact the limiting resolution was no better than with a coarser grain film. The optical performance of the Hasselblad being tested is lens limited with such fine grain films, as would be expected. 25X1

Another observation is that the degrading properties of the filters and of the CM windows through which all earth observation photography must be obtained are not limiting elements in the total photographic system; the lens, and to a lesser extent, the films planned for flight on the Apollo 205 mission, are the limiting elements in the photographic system.

Conclusion

25X1 The [ ] camera planned for flight on the Apollo 205 mission is capable, based on the data evaluated, of approximately 28 L/mm when viewing low contrast NBS targets in the center of format (area about lens axis is area of best resolution). This performance is equivalent to an angular resolution of approximately .45 milliradians.

/s/

[ ]  
Technical Coordinator  
Office of DoD and  
Interagency Affairs 25X1

25X1 [ ]