

May 8, 1972

KOLLSMAN'S INQUIRY FOR APOLLO 16 (OUA) DEBRIEFING

REF: Document No. AE-72-005

1.0 INTRODUCTION

This inquiry is addressed to Astronaut Ken Mattingly. The items listed below are areas of concern reported by Mattingly during the Apollo 16 flight. The following summary briefly describes the four occurrences during the flight:

- a. The inverted image of the Earth Horizon in the Sextant (SXT) field-of-view.
- b. SXT reticle visibility during "P23" acquisition .
- c. Scanning Telescope (SCT) Eyepiece defocussing and eyeguards (SCT and SXT) unscrewing problem.
- d. SCT Shaft Angle Counter acoustical noise.

2.0 The following questions should be addressed to Astronaut K Mattingly at the NASA Debriefing:

- a. Reference to the inverted image of the Earth Horizon in the SXT field-of-view.
 1. Could you see the inverted image of the Earth's horizon in the SXT field-of-view at all times throughout P23?
 2. If not, was it just while acquiring certain stars or in transition from one star to another?

3. Could you at any time during "P23" see two separate Earth's Horizon images (one erected and the other inverted) and a star at the same time?
4. Could you see the inverted image when the star image was superimposed on the normal Earth Horizon?
5. Did the inverted image move with the SXT SLOS (Star-Line-of-Sight) movement?
6. What was the color of the normal Earth-Horizon image and the reported inverted Earth image as observed on the SXT reticle?
7. What is your opinion or comment to the following "hypothesis" proposed by Kollsman Corp. as an explanation for the observed inverted Earth image?

"Based upon the actual down-link data of (a) space vehicle distance to Earth of Approx. 48,900 nautical miles (b) GET: between 9 Hr. 58'23.10" and 10 Hr. 13' 14.40". (c) vehicle substellar point at $N29^{\circ}$ latitude and $E80^{\circ}$ longitude. (d) SXT trunnion and shaft angles of 10.179° and 76.340° at time of inverted image viewing, Kollsman rationalizes that the Astronaut really did not view an inverted Earth-horizon image on the SXT reticle;

but was actually viewing the opposite lower Earth-Curvature Horizon through the SXT LLOS (Landmark-Line-of-Sight). Concurrently the other SXT SLOS (Star-Line-of-Sight) was viewing at the Upper Earth-Curvature Horizon. Also, since the actual empirical data of OUA S/N 17 luminous transmission SLOS/LLOS ratio was seven to one, this would account for the reported difference of the image brightness of the Upper Earth Curvature image to the reported inverted image (Lower Earth Curvature)."

b. Reference to the SXT reticle visibility during "P23".

1. Did the visibility sharpness of the reticle image improve as you focus the eyepiece on the reticle?
2. Did you find it necessary to refocus on the reticle for each sighting?
3. Did you have the reticle illumination control at its high-end that it caused the reticle lines to glow with a blurred halo-smear?
4. How much time was allowed for the eyeballs to become dark adapted when the SXT is slewed from sighting on a bright Earth-landmark to a dark space condition before using the illuminated SXT reticle lines for star marking?

5. Did you take into consideration that the optical training reticle simulator is very much brighter than the reticle in the actual flight OUA?
- c. Reference to SCT Eyepiece defocussing and eyecups unscrewing.
 1. The use of adhesive tape to prevent rotational movement of the SCT eyepiece adjustable focus appears to be inadequate? Do you feel that a more positive locking device is required?
 2. Reference to the SCT and SXT eyecups unscrewing, was the white teflon lock ring ineffective when tighten against the eyepiece after you focussed?
 - d. SCT Shaft Angle Counter Noise
 1. The shaft counter rotates approx. twix as fast as the trunnion counter when in high speed slew. The audio pitch increases as the drive speed increases. Is the difference in drive speed and noise compatible in which you noticed in flight?
 2. Were there any changes in sound in the shaft counter during the remainder of the flight?

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