PRS A-1

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HANDLE VIA BYEMAN CONTROL SYSTEM

~~IST~~ NATIONAL RECONNAISSANCE OFFICE
WASHINGTON, D.C.

7

THE NRO STAFF

10 October 1969

MEMORANDUM FOR COLONEL ALLEN

SUBJECT: Accelerometer System for KH-9

BACKGROUND

This past June, Lt Col Bill Williamson entered into discussions with [redacted], DIA, and [redacted] concerning reduction of HEXAGON 12" SI camera associated costs. The accelerometer system appeared to be a likely candidate, permitting savings of over $2M in the next two fiscal years.

Inclusion of the accelerometer system and the doppler beacon was approved by the USIB (TAB B) in support of precise positioning of hard missile targets. The purpose of the accelerometer package was to permit separation of drag from higher order gravity effects through direct measurement. These observations, in conjunction with the doppler tracking, would hopefully lead to tighter post-flight ephemerides and a more accurate gravity model.

The exact contribution of the accelerometer system to target positioning accuracy is difficult to assess, since only limited experience has been acquired to date (LOGACS experiment). Lockheed studies have shown that an accelerometer system would be of substantial advantage if one was restricted to SGLS tracking only. An accelerometer addition produces only a very small improvement over the SGLS plus TRANSIT doppler tracking case. (See curves at TAB C).

With regard to the contribution of an accelerometer system to an improved gravity model, Mr. Richard J. Anderle from NWL has published a paper indicating the potential for such a determination is very good, with accuracies exceeding that of surface gravity efforts. What he hypothesizes, however, is a group of drag compensated satellites, i.e., satellites which sense drag and negate its effects by precise thrusting, producing an orbital path perturbed by gravity only. Further, meaningful results from satellite derived

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gravity determinations require observations on satellites in a variety of inclinations. The HEXAGON program would not exactly satisfy these latter two conditions.

DISCUSSION

The various references to the memo at the right (TAB A) appear at TABs D-G. They document a certain amount of vacillation on the part of DIA with regard to the urgency of the accelerometer requirement. The accelerometer system cannot be strongly defended for precise positioning. The contribution to an improved satellite derived gravity model represents a better argument, since it may be possible to show that savings can be realized over surface gravity acquisition (research ships, airborne gravimetry operations, etc.). Of course, those savings offer no relief to the NRP unless they can be transferred to the NRO. [redacted] has indicated that he will seek Air Force support in this area, since gravity uncertainties are of considerable concern to him in the missile Geodetic and Geophysical budget.

I think it is appropriate that all applicable arguments be aired in the COMIREX at an early date. Depending on the nature and strength of these arguments, we could adopt one of the following courses of action:

a. Fund the accelerometer system at the estimated amount ($.850M FY 70, $1.490M FY 71).

b. Fund the system at the minimum amount to permit its inclusion in HEXAGON and hope that necessary additional funds materialize. I have informally asked Lt Col Bill Johnson, SP-7, to look into this possibility. It is significant to note the tri-axial accelerometer development is funded in SP-6, with HEXAGON utilization in mind.

c. Seek funds from DOD for a or b.

d. Drop the accelerometer system from HEXAGON. This is the status quo from the funding standpoint but should be formalized by a withdrawal of the requirement.

The memorandum at TAB A will hopefully get DIA on a realistic basis. It is senseless for them to keep alluding to their requirement for a system they have previously said they did not need and which we have dropped from the program. I am treating the DIA request for an additional two transit beacons on the CORONA program (TAB G) as a separate matter. This appears practical if they can provide the money.

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RECOMMENDATION

It is recommended that the memo at TAB A be signed and dispatched.

ROBERT A. SCHOW, JR.
Major, CE, U. S. Army

Atchs
TAB A, Prop Memo (BYE 13299/69)(PRO A-1-f)
TAB B, M/R, 8 Nov 68,
USIB Appr of NRP to Meet
Geodetic Reqmts (PRO A-1-f)
TAB C, Figures, Standard
Deviation in In-Track/Radial
Direction
TAB D, DIAMC 09132, 22 Jul 69 (PRO A-1-f)
TAB E, Pg 21, BYE 2297-69
TAB F, BYE 78285-69 (PRO A-1-f)
TAB G, TCS 658114-69 (PRO A-1-f)

E. Hennessy

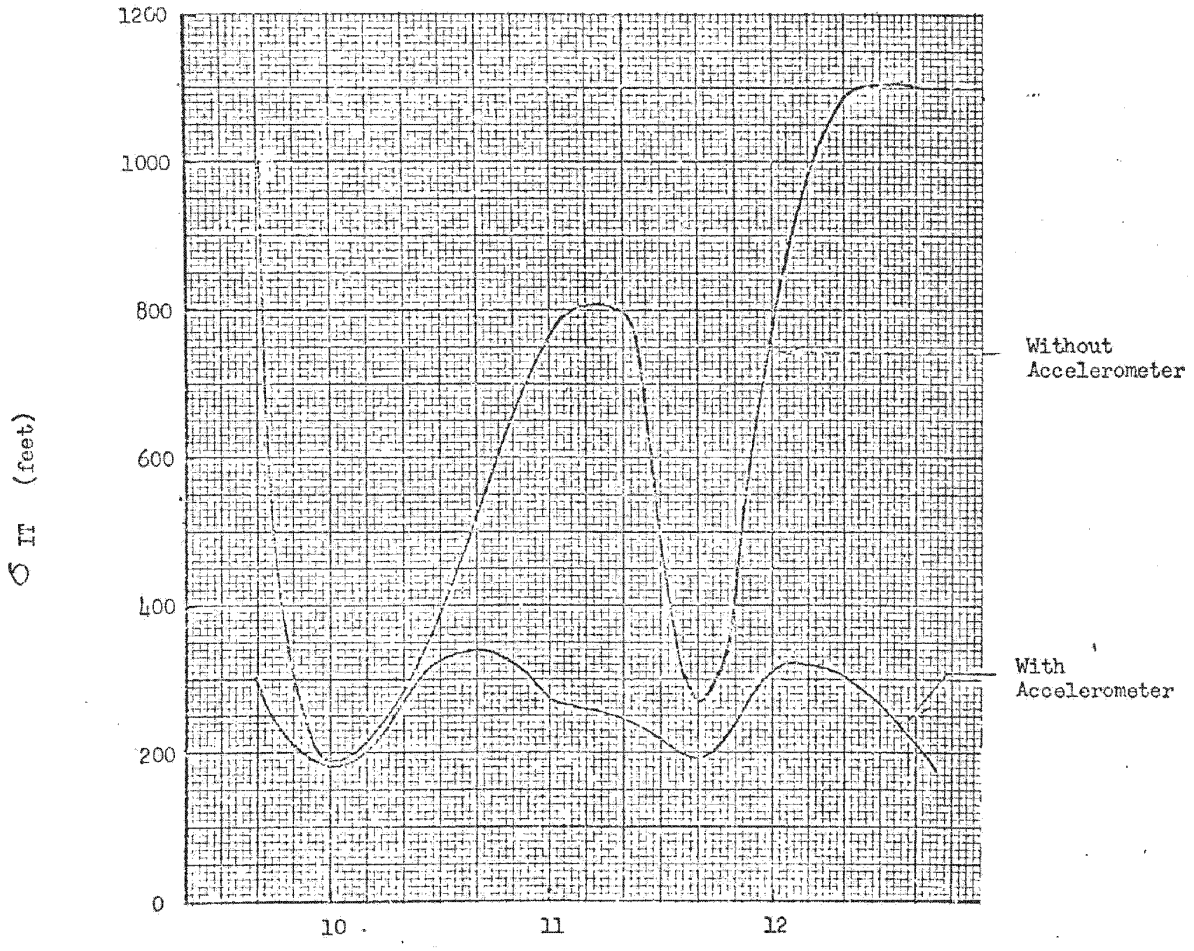

Figure 7.1 STANDARD DEVIATION IN IN-TRACK DIRECTION (SGLS Only)

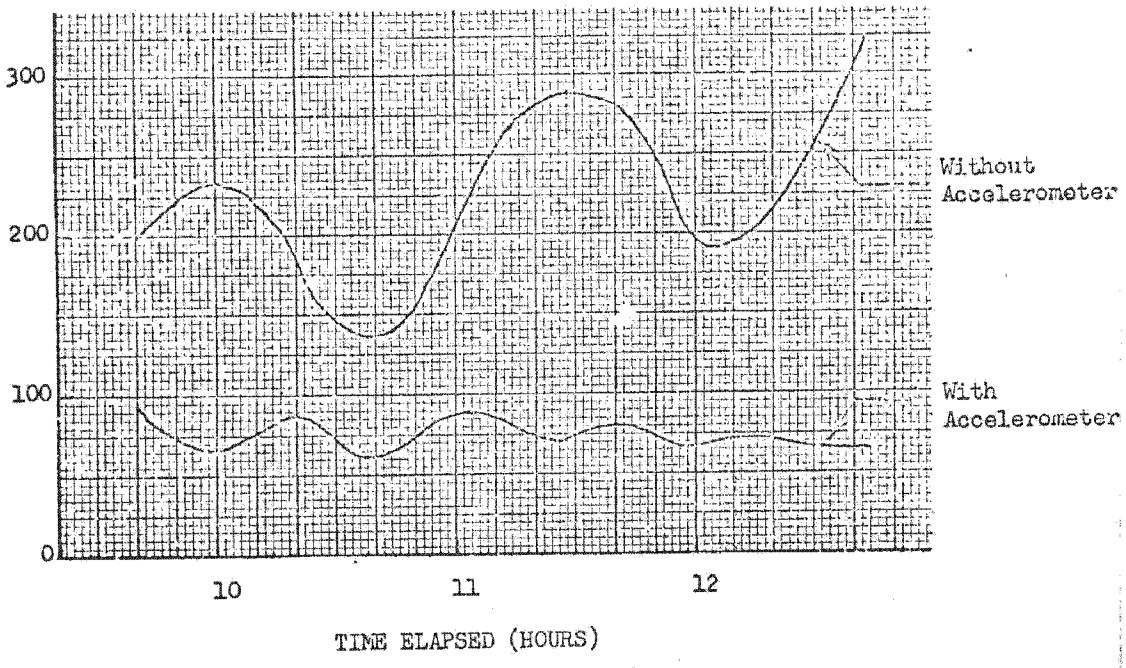

Figure 7.2 STANDARD DEVIATION IN RADIAL DIRECTION (SGLS Only)

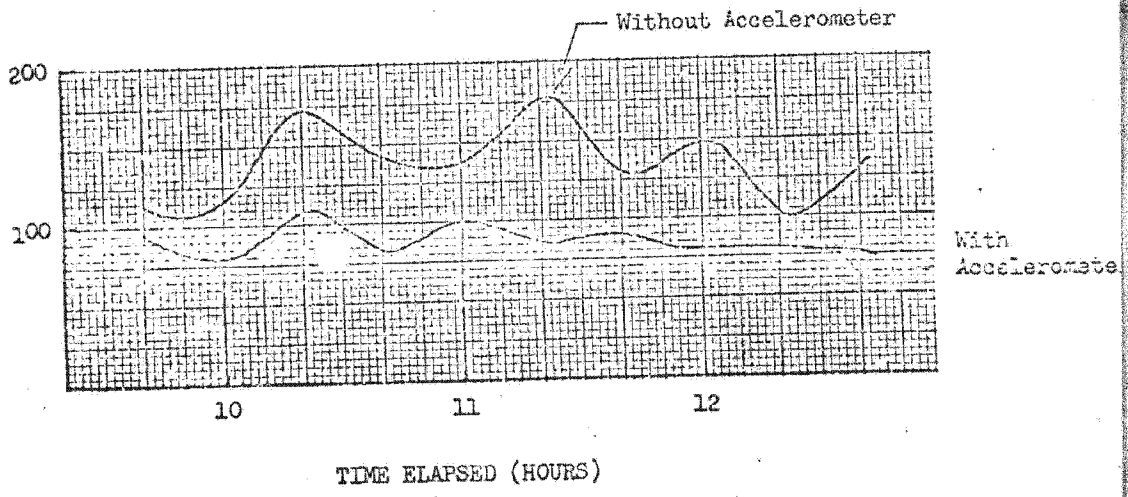

Figure 7.3 STANDARD DEVIATION IN CROSS TRACK DIRECTION (SGLS Only)

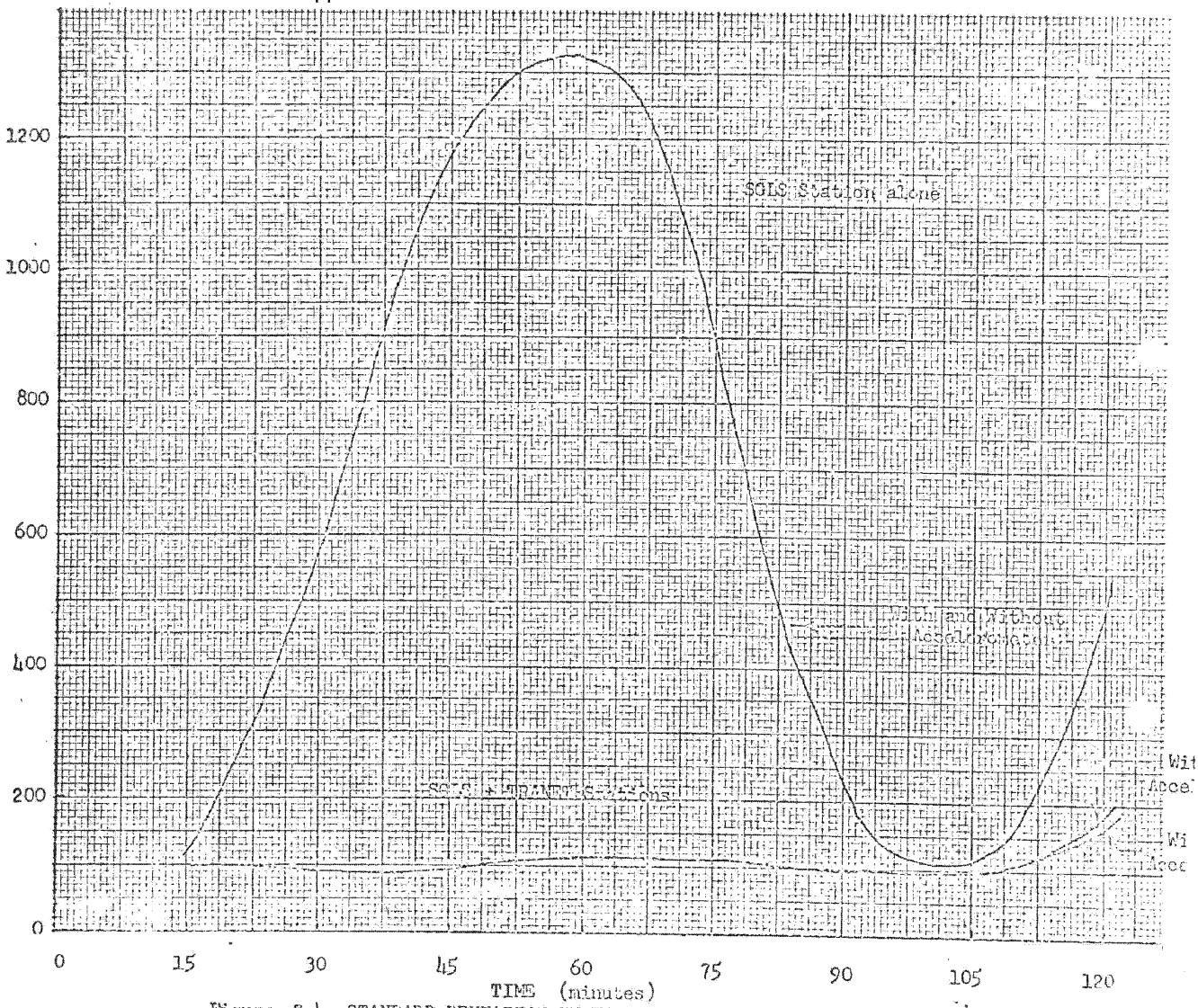

Figure 7.4 STANDARD DEVIATION IN IN-TRACK DIRECTION (SGLS + TRANET)

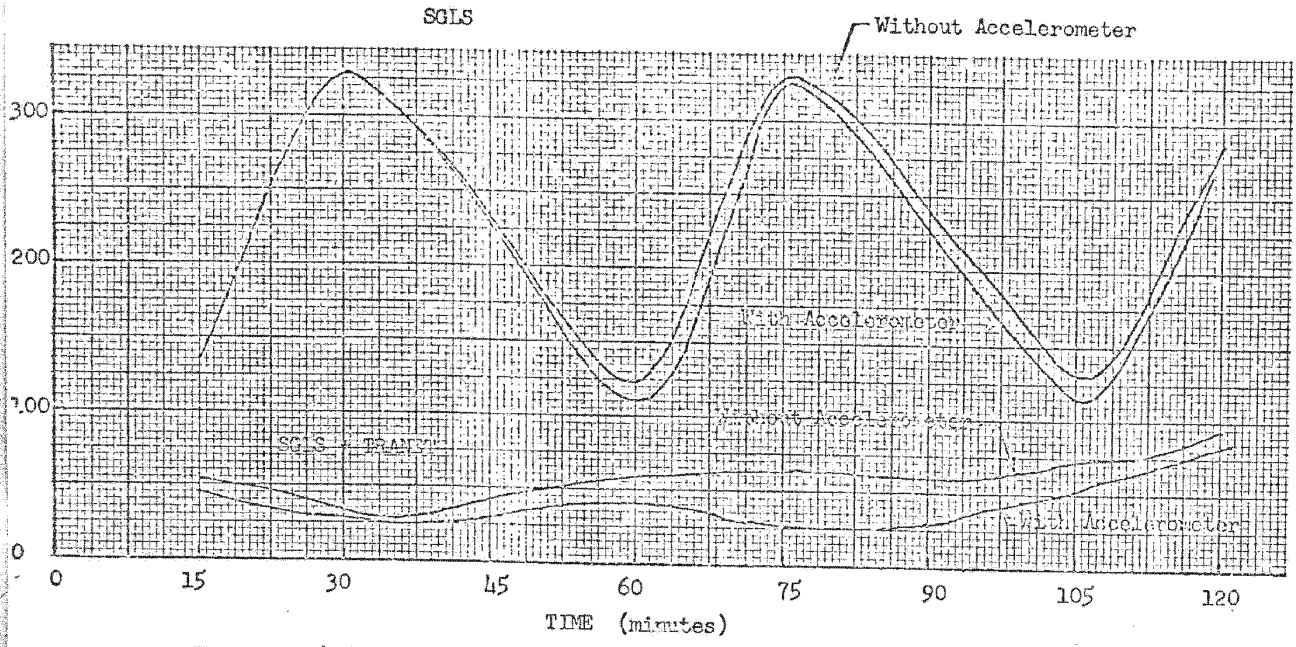

Figure 7.5 STANDARD DEVIATION IN RADIAL DIRECTION (SGLS + TRANET)

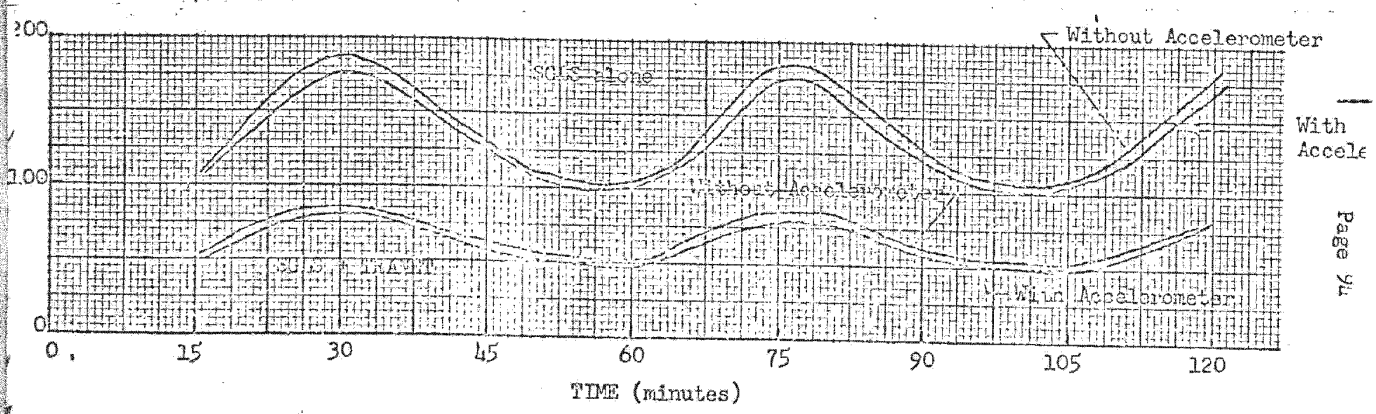

Figure 7.6 STANDARD DEVIATION IN CROSS TRACK DIRECTION (SGLS + TRANET)

that there were some residual software and computer problems, especially with regard to changes in the tracking stations.

3. Referring to the footnote on the satellite operations schedule, see page 15, Colonel Sweeney was unable to advise whether the next KH-4B mission would be 1108 or 1109. He was reminded that [redacted] had advised COMIREX that this information should be available by 15 August (COMIREX-M-74, page 16, paragraph 2). In commenting in general on the CORONA program and the 5-5-2 stretch-out, Colonel Sweeney informed COMIREX that NRO is giving particular attention to climatology and will take into consideration such factors as the improvement in KH-4 coverage during winter months as opposed to the summer.

Review of Mapping, Charting, and Geodesy Requirements
(BYE, T-KH, COR)

4. [redacted] alerted COMIREX to the possibility that MCGWG may request two more Doppler beacons to be flown on CORONA in addition to the four presently authorized.

5. With specific reference to KH-9, [redacted] advised that the R&D people in the Pentagon plan to specify a tighter geodetic requirement in the horizontal plane. The present opinion of the MC&G community is that the combination of the 12-inch SI and the Doppler beacon will be sufficient to satisfy this requirement.

6. [redacted] reported that recent simulation studies confirmed a previous but tentative MC&G feeling that the accelerometer would not be needed on KH-9 insofar as MC&G requirements are concerned. The Chairman, MCGWG, felt that this should be made a matter of record in case the space and weight thus saved could be used for something else. The Chairman directed a specific request to Colonel Sweeney to apprise NRO of this in case it could change its planning for use of available space.

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PRO A-1-f

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NATIONAL RECONNAISSANCE OFFICE
WASHINGTON, D.C.

THE NRO STAFF

16 October 1969

MEMORANDUM FOR CHAIRMAN, COMIREX MAPPING, CHARTING, AND GEODESY WORKING GROUP

SUBJECT: Accelerometer System for KH-9

REFERENCES: a. USIB-D-46.4/24 (TCS 074-68)

b. DIAMC message, 09132, subject as above, 231716Z July 1969

c. Minutes COMIREX-M-77, 14 August 1969 (BYE 2297-69)

d. MC&G Working Group Memorandum for the Chairman, COMIREX, Subject: Planning for USIB-COMIREX Activities Involving MC&G Matters, 22 August 1969 (BYE 78285-69)

e. Meeting of the MC&G Working Group, 24 September 1969

f. MC&G Working Group Memorandum for the Chairman, COMIREX, Subject: Worldwide Positioning Requirements, 1 October 1969 (with enclosure), TCS 658114-69

In June of this year you were advised informally by my Staff that the costs associated with the inclusion of an accelerometer system in the KH-9 to support precise target positioning with the 12" SI camera appeared disproportionate with the advantages to be derived, particularly since severe budgetary limitations were being experienced. In reference b you requested the military departments to evaluate the benefits of the accelerometer system in view of the high costs and advise you of the results of their investigations by 10 August. As reflected in reference c, you informed the COMIREX on 14 August that studies confirmed that an accelerometer would not be needed on the KH-9 to meet MC&G requirements. In reference d you advised the Chairman, COMIREX, that the MC&G requirement (as reflected in reference a) would be adjusted with regard to accelerometers since they now appeared

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of marginal benefit. In the draft USIB paper constituting the enclosure to reference f, it is stated that the accelerometers will probably be needed, and the COMIREX will be advised on this matter by the latter part of November 1969.

Because of the possible reversal of your previous position regarding the need for accelerometers indicated by reference f, it is important that you fully understand the current status of this system in the KH-9 program. As you were advised by the NRO representative at the MC&G Working Group meeting on 24 September, funding approval for this item has not been granted to the project office for FY 70, based on the earlier indications that the requirement would be withdrawn. Development and procurement costs have further been deleted from the FY 71 budget estimates. The costs of this system were to be $.850 million in FY 70 and $1.490 million in FY 71. Since work was not to begin until the current quarter, savings of the full $2.340 million can be realized. This is a substantial amount, materially supporting essential cost reduction objectives. Reinstating funding would be difficult, and lead time is rapidly becoming critical from a system engineering viewpoint.

In the light of the above information, it is requested that you finalize your considerations with regard to the accelerometer requirement and notify the COMIREX in detail as to your recommendations at the earliest possible date.

LEW ALLEN, JR.
Colonel, USAF
Director

Cy to: Chairman, COMIREX
Col Sweeney, SS-4