[redacted]

DEC 5 1967

MEMORANDUM FOR DR. LEONARD

SUBJECT: ATS Resolution Capability

You will recall, during a recent visit, that I expressed some concern to you and Mr. Bernstein about the resolution capability of the Acquisition and Tracking Scope in the high magnification range. More specifically, I doubted that the practical ATS resolving capability would be anywhere near GAMBIT results and therefore questioned that the "active indicator" mode would be as worthwhile as our simulations indicated. If so, I wondered if we should not relax the resolution goals for the ATS, require only one or two magnification ranges, and thereby reduce weight, complexity, and cost. The reasons behind my concern are set forth briefly in the following paragraphs.

As you know, NPIC and EK did comprehensive analyses of all readable photography from the GAMBIT missions. The effects of haze, altitude, obliquity, and illumination were therefore present. Attachment 1 is a smoothed plot of all data from both sources showing relatively frequency of occurrence of the varying ground resolutions measured. The best from GAMBIT were judged to have a resolution of [redacted] while 20 percent were better than 30 inches, and 85 percent better than four feet. This would indicate the GAMBIT system performed much better than its initial resolution goal [redacted] because of improved optics, film, lower operating altitude, etc. A more realistic specification for the last 15 or so GAMBIT's probably was closer to two feet at 80 miles and 2:1 contrast ratio.

By comparison, I understand the ATS design specification in the high magnification range to be 3.6 or 3.7 feet at 80 miles and 2:1 contrast ratio. However, in use,

the ATS will almost always be looking ahead at angles of 20° or more when operated in the weather avoidance or "active indicator" role. Attachment 2 is a predicted resolution range for the ATS system, in the high magnification range, under various contrast conditions, at 37° pitch and 0° obliquity. Attachment 3 is a predicted resolution range at view angles varying from 20° to 60°. These indicate that the <u>average</u> resolution will be somewhere in the 7-10 foot range.

Attachment 4 is a 1965 study by COMOR on the resolutions needed for identification and mensuration purposes for intelligence information elements among the various target categories. This document would indicate that unless one does achieve GAMBIT-like resolution, there is not much to be gained between 7 and 20 foot resolutions.

The preceding suggests to me that the astronauts are not going to detect any subtle "active indicators" at the resolutions which the ATS apparently will provide. Perhaps, an image enhancement technique will improve apparent resolution. If not, it appears that we may have set a goal that's somewhere in-between the best trade-off positions. At the least, if the attachments are anywhere near correct, if appears that we need to re-evaluate the simulation results.

Let us discuss this subject further at your convenience.

JAMES T. STEWART
Major General, USAF
Vice Director, MOL Program

4 Attachments
a/s

cc: General Bleymaier

2 2
4 5

BYE 21347-67

HANDLE VIA
BYEMAN-TALENT-KEYHOLE
CONTROL SYSTEMS JOINTLY
DORIAN/GAMBIT

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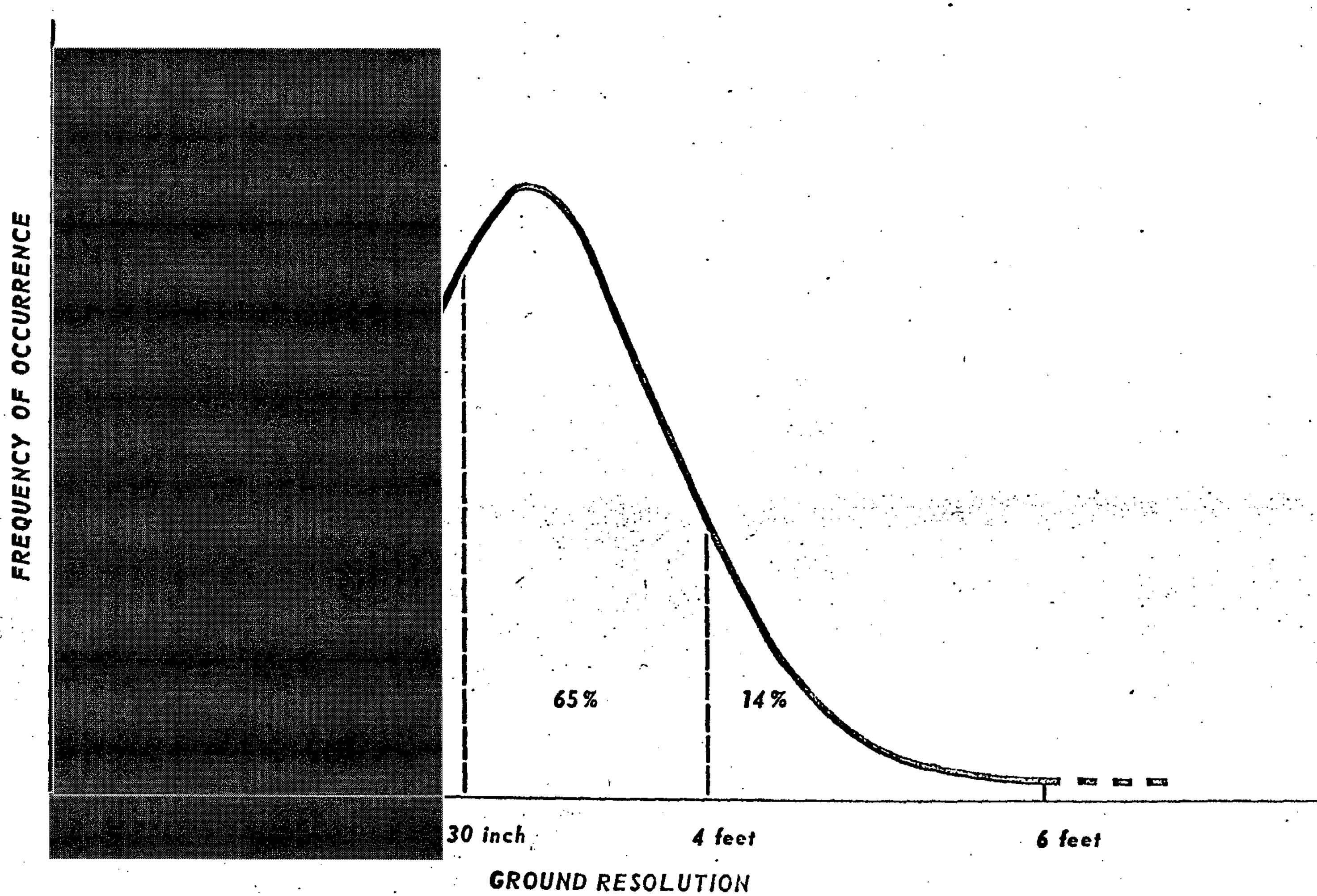
MEASURED KH-7 PERFORMANCE



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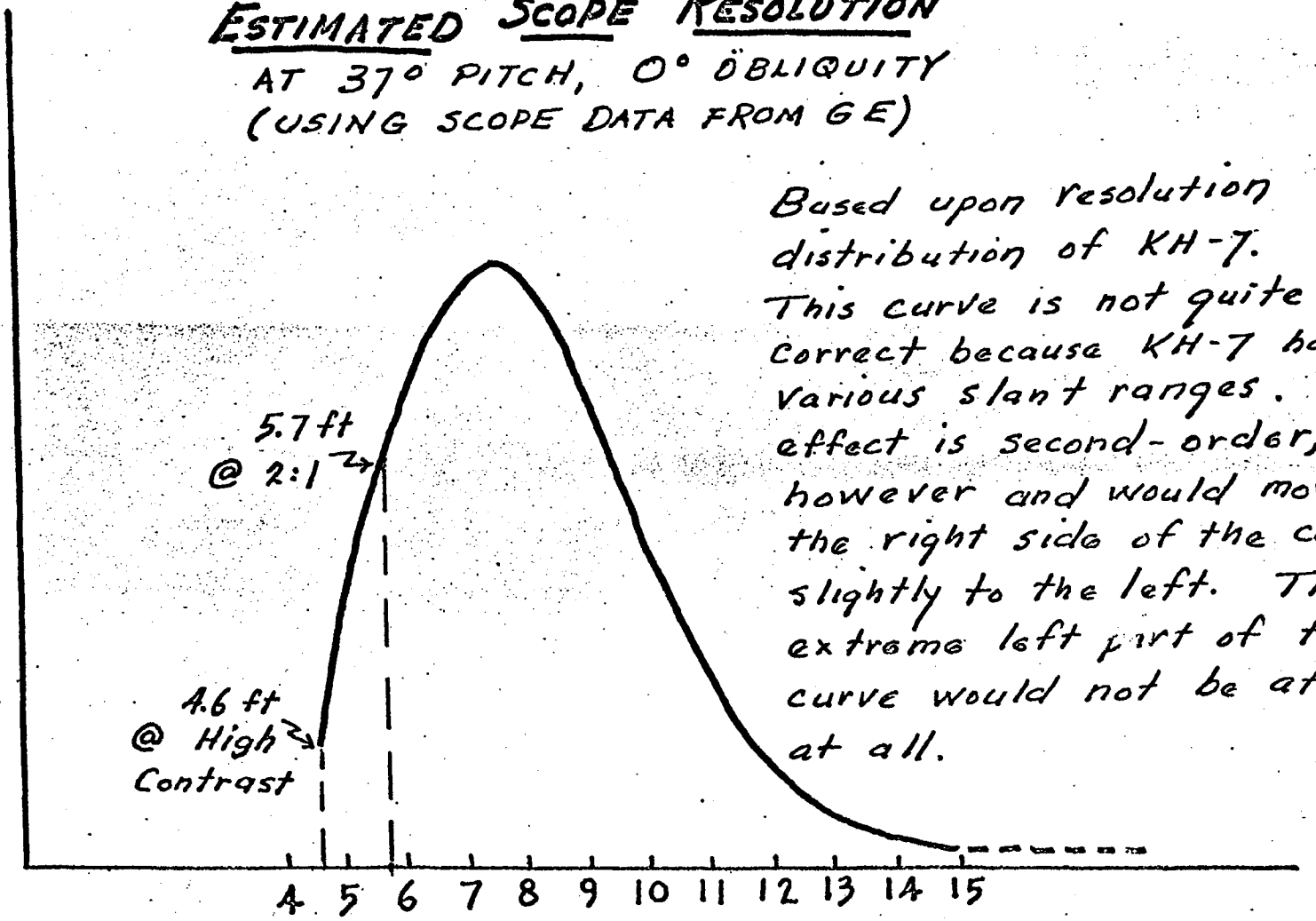
Atch 1

ESTIMATED SCOPE RESOLUTION

AT 37° PITCH, 0° OBLIQUITY
(USING SCOPE DATA FROM GE)



Based upon resolution distribution of KH-7. This curve is not quite correct because KH-7 had various slant ranges. The effect is second-order, however and would move the right side of the curve slightly to the left. The extreme left part of the curve would not be affe[illegible] at all.

Atch 2