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~~(S)~~ NATIONAL RECONNAISSANCE OFFICE
WASHINGTON, D.C.

THE NRO STAFF

13 November 1968

MEMORANDUM FOR DR. FLAX

SUBJECT: Future NRP Satellite Imagery Systems

Purpose.

To provide an evaluation of the Bureau of the Budget (BOB) draft, see TAB A, regarding the choice of satellite imagery system mixes which will be operational during the period of FY 71 through FY 74.

Background.

USIB HEXAGON collection requirements are contained in USIB-D-41.14/294, dated 21 June 1966, see TAB B; USIB D-46.4/3, dated 5 January 1968, see TAB C; and USIB-D-46.4/13, dated 4 April 1968, see TAB D. These requirements statements are validated by the National Intelligence Resources Board assessment of the intelligence gain provided by the KH-9 over the KH-4 and KH-8, dated 22 July 1968, see TAB E.

The majority of data contained in the paper was obtained from these requirements documents and from statements of actual and estimated performance provided by CIA/OSP, SAFSP, and the DNRO Staff.

Alternatives.

The alternatives presented by the paper are:

| ALTERNATIVE I | ALTERNATIVE II |
|---|---|
| Cancel HEXAGON | Buy 5 HEXAGON |
| Buy 7 CORONA | Buy 5 GAMBIT |
| Buy 6 GAMBIT | |



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Discussion.

This discussion is limited to a detailed inspection of the subject paper's interpretation of USIB requirements statements, an assessment of the validity of its interpretation of the USIB requirements, and a verification of NRP collection potential by the HEXAGON, GAMBIT, and CORONA systems as presented in the BOB position paper.

The BOB draft presents an accurate assessment of the latest USIB-approved surveillance and technical intelligence collection requirements and the satisfaction of these two requirements by a GAMBIT/CORONA and by a GAMBIT/HEXAGON system mix.

The BOB paper does not directly assess the GAMBIT/CORONA satisfaction, or lack of satisfaction, of the 2.5 to 3.5 foot ground resolution area search requirement. Nor does it address the interpretability trade-offs which occur between 3 and 5 foot ground resolution. Neither does it consider the operational trade-offs which occur in the GAMBIT/HEXAGON combination in the [redacted] to 5 foot resolution range. Furthermore, the paper questions the validity of the USIB high-resolution search requirement and attempts to evaluate the ability of the exploitation community to interpret this quality of imagery and then to produce usable intelligence from it.

An optimistic double-bucket GAMBIT operational capability is projected by the paper--it assumes all system design goals, including resolution improvement and life growth to 20 days, will be realized. Conversely, it questions HEXAGON's ability to meet the current system design specifications, e.g., the range of ground resolution is given as 2.7 feet at nadir to 8 feet at 60 degrees obliquity in the BOB paper, when CIA/OSP quotes 2.3 to 4.6 feet for the same camera positions with HEXAGON operating at its nominal mission perigee of 82 nautical miles.

The last major discrepancy is that the paper applies the degrading effects of cloud cover, haze at obliquity, and decline in resolution with obliquity to HEXAGON performance estimates, but it does not apply these natural phenomena to other photographic satellite collection systems. Additionally, the paper criticizes the fact that

adjacent HEXAGON revolutions over a specified area of interest are displaced approximately 22.5 degrees in longitude, while all near-earth photographic satellites must observe this same physical law.

Recommendation.

In view of the requirement for 2.5 to 3.5 foot ground resolution for area search, it is recommended that the DNRO continue to pursue the projected GAMBIT and HEXAGON schedules.

RUSSELL A. BERG
Brigadier General, USAF
Director

Attachment
Detailed Analysis of
BOB Position Paper

# DETAILED ANALYSIS OF BOB POSITION PAPER

First Section: The Need for the HEXAGON Photographic Satellite.

| | |
|---|---|
| Note 1, Page 1. | MOL ground swath width is 1.5 nautical miles. |
| Note 2, Page 1. | CORONA swath width averages 120 nautical miles in the Bloc and mission life is 18 days. |
| Note 3, Page 1. | HEXAGON resolution is expected to range between 2.3 and 4.6 feet. |
| Note 4, Page 3. | CORONA/GAMBIT does not meet high-resolution search requirements. |
| Note 5, Page 4. | Does not address additional surveillance requirements levied by USIB for HEXAGON. Tab B et al. |
| Note 6, Page 5. | Misstatement of HEXAGON resolution. See Note 3. |
| Note 7, Page 5. | But not at the specified high-resolution. |
| Note 8, Page 6. | Limitations of HEXAGON are equally degrading to CORONA and GAMBIT because all are subject to the same physical laws as the paper states in the next sentence. As presented in the paper, it is a gratuitous statement. |
| Note 9, Page 7. | Adjacent revolutions of 22.5 degrees longitude displacement is common to all near-earth orbits for photographic satellites. |
| Note 10, Page 7. | There is no stated requirement for this type of coverage but, if there were, HEXAGON would be the most effective collection system. |

Note 11, Page 7. HEXAGON's variable sector scan should provide a significant increase in cloud-free photography.

Second Section: Issue: Termination of HEXAGON.

Note 12, Page 1, Incorrect resolution figures again. Slightly optimistic for GAMBIT and slightly pessimistic for HEXAGON.

Note 13, Page 3 Present and any proposed improved CORONA does not satisfy the 2.5 to 3.5 foot resolution search requirements.

Note 14, Page 5, This is an optimistic viewpoint of double-bucket GAMBIT and assumes that all proposed specification values are achieved or exceeded.

Note 15, Page 6, For the same 18-day period, HEXAGON would access the whole Moscow area eight or nine times, about a 50 percent increase.

Note 16, Page 7, Thoroughly concur.

Note 17, Page 7, This completely ignores that this HEXAGON resolution is a twofold improvement in ground resolution and hence a substantial improvement in imagery interpretability. It is noted that by STAFF. DORIAN also provides approximately a twofold increase in resolution.

Note 18, Page 7. HEXAGON resolution misstated again.

Note 19, Pages 9 thru 16. This entire section of the BOB paper refutes the validated requirements of the intelligence community, especially in the areas of Soviet and

Chinese force levels, violations of disarmament agreements, mobile ICBM target problems, and a general enhancement of our intelligence on a number of significant other problems.

| OPTIONS | I | II | III | IV | V | Minimum Requirement |
|---|---|---|---|---|---|---|
| GAMBIT | 4 | 4 | 3 | 3 | 4 | |
| HEXAGON | 4 | 3 | 3 | 4 | 2 | |
| Percent Satisfaction HEXAGON Surveillance (64 Percent CCRP) | 98 | 95 | 95 | 98 | 88 | 80 Percent |
| Percent Satisfaction GAMBIT Surveillance (36 Percent CCRP) | 83 | 83 | 72 | 72 | 83 | None Stated |
| Percent Satisfaction Overall Surveillance | 92.5 | 90.7 | 86.8 | 88.6 | 86 | None Stated |
| Percent Satisfaction Search, 6-Month | 89 | 84 | 84 | 89 | 75 | 80 Percent |
| Percent Satisfaction Search, 12-Month | 98 | 96 | 96 | 98 | 92 | 80 Percent |

Assumes 18-day GAMBIT life and 30-day HEXAGON life.