

~~TOP SECRET~~**A. INTRODUCTION**

In April 1973, the DIA Scientific Advisory Committee (SAC) established a special panel to review system options and requirements for improved quality satellite imagery. The panel was chaired by Dr. Fubini. A discussion of the panel effort, including Conclusions and Recommendations, is summarized as follows.

B. REQUIREMENTS

1. High resolution requirements currently registered for collection were reviewed and the value of increasing resolution on these targets, in steps, [] was considered. The Panel examined past reports and found little correlation (at the high end of the resolution spectrum) between resolution on the one side and mensuration accuracy and the National Imagery Interpretability Rating Scale on the other.

2. They were unable to find a significant number of uniquely important national strategic issues that could justify [] resolution instead of [] resolution. National issues considered were: Indications and warning, survivability of our strategic forces, ability of our strategic forces to penetrate, effectiveness of our strategic forces, and verifiability of SALT. In all cases, resolutions of [] appear to be adequate or satellite photography cannot provide the most critical intelligence.

3. The panel found that most, if not all, presently validated requirements would be satisfied by existing or planned systems. On the other hand, an analysis of the process through which requirements are established or validated revealed that some additional requirements could

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be justified even if not validated. The reasons are the following:

- a. Current system [redacted] photography at better than 1 foot resolution. A system with [redacted] resolution could provide [redacted] of its imagery at resolutions of 1 foot or better.
- b. Significantly higher resolution may uncover important programs unknown to us because of our resolution limitation.
- c. Improved resolution may lead to the same assessments of strategic or tactical weapons capability currently achieved, but at an earlier date, allowing greater lead time in the development of countermeasures.
- d. In some international confrontations it may be desirable to make a public release of imagery information or at least to make a convincing presentation to national leaders. In such cases, the desired resolution would have to be much higher than that required by photo interpreters.
- e. Requirements for resolution may increase in order to detect and possibly, read through, camouflage.
- f. A convincing requirement exists for [redacted] resolution to get detailed information on a few tactical weapons but the intelligence value of this information is uncertain.

4. The conclusion that mensuration accuracy is weakly correlated with resolution, at the high resolution end of the spectrum, is due both to the type of systems we fly and the methods used to make measurements. Improvements in mensuration are possible both by changes in collection and exploitation.

C. CAPABILITIES

1. By 1976, GAMBIF imagery will be available such that 10% of the

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pictures will have a GRD of [redacted] and 50% will have a GRD of [redacted] KENNEN Block I imagery will provide maximum

[redacted]

2. After projected improvements in GAMBIT are made, little improvement is possible with existing optics unless improvements in smear rate and/or film are achieved. The most immediate improvement may be obtained by the use of film with less noise or finer grain characteristics. The use of free radical film, if it ever becomes available, would give a GRD

[redacted]

3. It is possible to increase the diameter of the optics in GAMBIT, (now 44") to 70" without a complete change in launch pad and vehicle. The changes would require at least \$200 million non-recurring costs and would improve resolution up to a maximum of 60% better than SV-48 GAMBIT.

[redacted]

D. RECOMMENDED R&D

1. As stated above, after considering the currently validated high resolution requirements and the additional anticipated requirements, the

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panel concluded that there is not sufficient reason at this time to justify the initiation of a major new UHR system. They found however, that significant advances over currently programmed performance could and should be achieved by evolutionary improvements of existing and planned systems. Consequently, continued R&D is recommended in:

- a. Film technology in the areas of finer grain/lower noise conventional film and in non-conventional film technology such as FRF.
- b. Mensuration technology utilizing all a priori information on the shape of shadows and research in the area of edge/point location.
- c. Electronic image processing to improve resolution and increase mensuration accuracy.
- d. Investigation of atmospheric limitations on increased resolution systems.
- e. Improved processing, reproduction and enlargement hardware, techniques and materials.
- f. Effects of various types of imagery storage, retrieval, and dissemination especially including electronic transmission and reconstruction.

E. CONCLUSIONS

1. The Imagery Panel has concluded that both film-based and electronic-based systems can evolve in the direction of UHR. The ultimate resolution within the next 10 years, and without very radical changes in technology or major changes in orbit altitudes, is likely to be about the same for both systems. A given resolution however, will be obtained sooner with film-based systems and at a lower cumulative cost. In addition, the required modifications to equipment involved in ground handling the output

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of improved film-based systems are going to be less expensive than those required by electronic-based systems.

2. The Panel issued the caution that at VHR and UHR the meaning of the word resolution and its application to intelligence value is very uncertain (see B.1. above). Additional factors should also influence the comparison between systems:

- a. Timeliness of the information.
- b. Number of different target views.
- c. Signal to noise ratio.

The superiority of KENNEN, when available, over GAMBIT in these three factors is clear.

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