14 May 1963

MEMORANDUM FOR: Assistant for Plans and Development

THROUGH : Executive Secretary, IEC

SUBJECT : Staff Study - Development of a Versatile, High Precision, Stereoscopic Point Transfer Device

1. PROBLEM:

To develop a highly versatile system which will provide means for precisely identifying and marking conjugate images on many different types of photography.

2. FACTS:

a. The use of the scanning type camera (panoramic) in photographic reconnaissance has generated a unique system of distortions which is dependent on the scan time of a single frame and the motion of the camera during the scan. Some of these distortions are quite evident; others are very difficult to identify, analyze and compensate.

b. One of the best and often the only means for detection and analysis of these distortions is through comparison with conventional framing photography of the same subject. Several different comparisons are required to substantiate the character and magnitude of such distortions. In order to provide significant information these comparisons must be based on very precise measuration data.

c. The anticipated frequency of requirement for this process indicates that it should be performed on original or contact-duplicated roll film, in order to minimize image degradation, processing time and storage requirements.

d. No currently available equipment such as the [redacted] Comparators, the [redacted] Stereocomparators or the [redacted] PUG series [redacted] provide satisfactory means for obtaining the data required for this analysis. 25X1 25X1 25X1 25X1

3. DISCUSSION:

a. On the basis of these facts a formal Design Objective was prepared. In this process it became evident that the following basic operations were involved:

(1) Stereoscopic viewing of conjugate images on a wide variety of film sizes.

(2) Precision registration and marking of selected conjugate images.

(3) Precision measurement of corresponding distances between selected images.

(4) Analytical evaluation of the relative dimensions.

It was concluded that currently available equipment could be used to accomplish operations (3) and (4); consequently, the design objectives were limited to operations (1) and (2).

b. On the basis of specific requirements, it was determined that development of a device with the following functional capabilities was indicated:

(1) Independent continuously variable magnification from 5X to 125X.

(2) High contrast resolution up to 625 lines per millimeter.

(3) Large area scanning up to 10" x 20".

(4) Several image manipulations such as rotation and reversion.

(5) Film handling for one or two rolls of film varying from 35mm to 9½" width.

(6) Precision point marking and identification marking.

25X1

c. [redacted] commercial facilities were invited to propose development of a device to satisfy the design objectives. Proposals were received from three, 25X1 [redacted] Brief descriptions of these proposals are as follows:

25X1

(1) The [redacted] proposal tendered essentially complete descriptions of the means whereby each of the design objectives would be accomplished. The optical scanning system proposed is an extension of the fiber-optics 25X1 system used in the production of their [redacted] Stereo Viewer. This system 25X1 has demonstrated resolution capability which [redacted] will be able to accomplish the 625 l/mm resolution requirement. The marking 25X1 system proposed employs a laser. Investigations performed prior to the proposal indicate the probable feasibility of this approach. The basic 25X1 cost of the [redacted] proposal [redacted]

25X1

(2) [redacted] takes exception to the resolution requirement and promises only 375 l/mm. The marking system is briefly described and does 25X1 not appear feasible. The cost is prohibitive [redacted]

25X1 (3) [redacted] proposes a viewing system that is an obvious copy of the
25X1 [redacted] development. Several functions are not well-defined and the working system description is particularly incomplete. There would probably be patent problems involved in the viewing system. The estimated cost is
25X1 [redacted]

4. CONCLUSIONS:

a. The need for development of the subject device is confirmed by locally-evolved requirements, the limitations of existing systems and the current development programs of the photo-reconnaissance and photo-mapping communities.

b. The performance, range and versatility requirements of the stereoscopic-scanning and roll-film-handling systems are believed to comprehend all aspects of existing and anticipated collections systems. Therefore, these components of the subject development are judged to be of considerable significance to the photointerpretation phase and should be regarded as collateral in scope.

25X1 c. The [redacted] proposal, supported by their previous experience and proven capability, comprehends the spirit of all aspects of the design objectives at a reasonable price. In the recent past the requirements for financing over-
25X1 runs in [redacted] development programs have been moderate.

d. All of the options in the [redacted] proposal for additional auto-
25X1 mation of the device show a good comprehension of the work situation; however, it is felt that accomplishment of the basic requirements should be confirmed by breadboarding before the options should be considered. There are two exceptions:

(1) Option 2 proposes a system for total independent correlation of the scan direction and velocity with the magnification and the image rotation of the corresponding optical train. Satisfactory and efficient stereo-scanning requires this correlation. The complexity of such development indicates that it requires maximum lead time.

(2) Option 5 proposes that the basic carriages be made of stabilized castings rather than welded girders. This construction will assure rigidity and precision over an extended period of usage and will provide necessary characteristics for eventual incorporation of a mensuration system should it be proven feasible. The basic nature of this option requires that it be developed concurrently with the total system.

5. RECOMMENDATIONS:

25X1 a. That the [redacted] proposal including options 2 and 5 be accepted and that an CPFF contract be negotiated in accordance with this proposal at a
25X1 total cost [redacted]

b. That the other options tendered with the proposal as well as the feasibility of incorporating a mensuration system be considered during the course of the development and that on this basis final recommendations concerning these options correlate the requirements of the ultimate user, the indicated performance based on breadboarding and the performance and cost estimates furnished by the contractor.

[redacted] 25X1

25X1 [redacted]

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25X1 [redacted]

FILE

25X1 [redacted]

for: Proposal generally unacceptable.

against:

1. Poor resolution (375 lines/mm.).
2. Marking system has many weaknesses. Maintenance of alignment could be a problem.
3. A general lack of understanding of the spirit of the design objectives.
4. Optical design overly complicated.
5. Much too expensive.

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[redacted]

1000 ft reels, removable ink
take up 15 ft copy [redacted]
control console

against:

1. Smaller fiber optic cable than

 [redacted]

2. Unproven image integrater. They could run into patent problems here.

3. Untested scanning system, with what appears to be an insufficent range in the scanning speeds.

4. Many design areas have not been defined well enough to permit a logical evaluation of their approach. For example.

a. Method for changing sense of scan.

b. Relating speed of scan to magnification.

c. Method of introducing marking system under optical system.

5. Design appears to be a copy [redacted]

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