NPIC/D-81-6
20 MAY 1964

MEMORANDUM FOR: Assistant Deputy Director (Intelligence) for Management

SUBJECT : Research and Development Project Approval Request for a Laser Display Feasibility Study

REFERENCE : DDCI Memo ER 63-8121, dated 23 December 1963: Approval of Research and Development Activities

In compliance with paragraph 5.b. of the reference, it is requested that the Project for A Laser Display Feasibility Study outlined in Annex A be approved.

ARTHUR C. LUNDAHL
Director
National Photographic Interpretation Center

APPROVED:

/S/
Paul A. Borel
Assistant Deputy Director (Intelligence) for Management

22 May 64
Date

Distribution:
Orig & 1 - AS/LB/NPIC
2 - Director, NPIC
1 - A DD/I (Mgmt)
2 - P&DS/DB, NPIC

25X1A

NPIC/P&DS/DB: [redacted] mbf/3308 (1 May 1964)

Research and Development
Project Approval Request

1. Identification

The project will come under the Technical Development Program of the P&DS, NPIC, at a total estimated cost of [redacted] It was originally included in the NPIC's 1964 financial plan at the [redacted] level under the category "Special Techniques and Development Studies." Its internal designation is Feasibility Study for Laser Scanning Display System.

25X1A
25X1A

II. Objectives

This project is a study to determine the most promising approach for advancing the state-of-the-art in concepts and techniques for both direct and indirect dynamic viewing of photographic aerial transparencies.

The primary objective is to effect comparative analyses of various modulation techniques, scanning techniques, screens and light sources in various combinations to determine the feasibility of improving the display functions presently performed by CRT systems. A secondary objective is to perform a comprehensive analysis of capabilities and limitations of the elements of viewing systems to form a basis for guiding future efforts in the area of visual presentations. From results of this study, optimum systems for both the present and future will be defined.

III. Background

For many years the photointerpreter has been restricted to standard methods of viewing films, such as direct viewing over flourescent illuminated boxes and by rear projection on ground or opalescent screens. Direct viewing frequently lacks in total illumination, has no facility for masking out extraneous light or for image attenuation or modulation. Rear projection lacks sufficient illumination, suffers prohibitive loss of resolution and provides no facility for image manipulation or modulation. Kinescope displays suffer prohibitive losses in resolution.

The magnitude of the viewing limitations cited above cannot be overrated, because the ability of the photointerpreter to read-out that which is recorded on the film is highly dependent upon the quality of the viewing tools provided.

Great effort is being applied to indirect methods of viewing such as the Kinescope. However, its severe limitation in resolution, excessive bandwidth requirements and limited physical tube size make it imperative to explore other concepts and principles for image display.

The only other means known at present is optical scanning which involves the optical formation of an extremely small light spot and facility for proper modulation, with a suitable scan angle and scanning rate. The scan angle must be sufficient to cover the viewing area. The scan rate must be sufficient to paint an entire image, on a plain (non-phosphor) viewing surface, within the persistence ability of the human eye, or at a slower rate on a phosphor surface with proper decay characteristics to present a continuous image.

It can be seen that the problem is formidable indeed with many facets, each requiring considerable research. It seems that the first essential element is a white laser. Although not yet available its realization is expected within the foreseeable future, probably as a combination of red, green and blue emissions from separate laser sources. A second essential element is a modulation device preferably with no mechanical moving parts. A third is a scanning means, with scan rates in excess of TV scan rates, also with no physically moving parts. The fourth and last essential element is a practical screen capable of imaging the subject with no degradation.

It is expected that the proposed study will contribute significantly to solutions of the problems stated above and will provide guidance related to methods and concepts showing the most significant potential.

IV. Technical Specifications

The technical specifications were stated to the proposed contractor in terms of study objectives directed towards improving concepts and techniques for both direct and indirect dynamic viewing and analysis of intelligence information on film. One major objective is to explore the feasibility of optical scanning as a means of overcoming the inherent limitation of electron scanning in vacuum, such as its serious loss of resolution and the degrading effects of light dispersion by phosphor coatings. Some aims of the study are: (1) to reduce the bandwidth below that required of high resolution Kinescope Systems; (2) to maximize the presently available scan angle of the optical scanning system; (3) to increase the scan rate of optical scanning systems to exceed that of the Kinescope; (4) to analyze potential uses of lasers with emissions in regions other than red; (5) to minimize image signal to noise ratio; (6) study incoherent light sources as a substitute for lasers and their effect when projected on various types of screen materials.

V. Contractor and Financial Arrangements

25X1A 25X1A

This study contract will be placed with [redacted] on the basis of their proposal at a [redacted] level of effort for a 9 month period.

25X1A

[redacted] was selected for this study because of their conceptual originality and superior understanding of the requirements and problems involved. A further reason for their selection is their current work in solid state piezo electric modulation crystals and bi-morph bender crystals for beam scanning. These devices have been demonstrated and appear to hold great promise for solution of the modulation and scanning problems.

VI. Coordination

The proposed program has been coordinated internally with DD/S&T and externally with Air Force SPPL, Army GIMRADA and Industry. In addition, investigation throughout DOD components and Industry show that this program does not duplicate any other study efforts capable of meeting NPIC's requirements.

VII. Security

The program is to be negotiated on an SC-1 Secret basis.