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RESEARCH AND DEVELOPMENT PROGRAM OBJECTIVES

MODULATED LIGHT IMAGERY SYSTEMS PROGRAM

1. INTRODUCTION. This document conveys the background, concept and requirements of a government-sponsored research and development program in the field of modulated light imaging systems as these systems relate to imagery exploitation processes.

1.1. Background. Images recorded by reconnaissance systems are generally extremely small-scale replicas of real-world scenes stored in a wide range of density patterns. The range of tones captured on the photograph often exceeds the accommodation of the human eye. The original recording of the information and the human integration of optical patterns cannot yet be readily controlled; therefore, efforts to improve the exploitation of imagery must be concentrated on the manipulation of density patterns. Sometimes the acquisition and processing systems induce spurious tone effects such as hot spots, flare and halos which cause difficulties in the image perception process; experiments have been made to reduce these effects by modulating the illumination. Attempts have also been made to eliminate these effects by converting the image to an electronic signal in order that the unwanted characteristics may be isolated and compensated for -- thus enhancing the signal and TV image by which it is displayed. The Government desires to develop equipment to improve the performance of the interpreter which would present information to him at density and contrast levels most readily acceptable to the eye while at the same time reducing eye fatigue and increasing the accuracy of read-out.

1.2. Concept. The contracted organization selected to accomplish this research must be capable of independent management of the program. The contracted organization must also: (1) provide and/or obtain through sub-contract leading technical authorities in the field; (2) be responsive to government requirements; (3) be aggressive and effective in achieving the objectives; and (4) furnish forthright technical guidance to the Government. Representatives of the Government involved in this program will maintain an open mind in evaluating any new concepts which, if successfully pursued, would add to the store of relevant knowledge and advance the state-of-the-art. Organizations engaged in these technical developments are encouraged to present new ideas which they believe will advance the program. It is the intention of the Government to permit freedom for imagination and creativity.

1.3. Scope. The program will be planned on the basis of a five-year term. This paper defines only initial objectives; proposals in response to them should contain an evaluation of their significance as related to cost and time. Careful utilization of reputable industrial management will be required, as well as obtaining maximum efficiency in all technological aspects.

2. ADMINISTRATION. The Government will retain ultimate control of the program. Objectives, costs, priorities, sub-contractors and consultants involved in the program come under the purview of the Government, and approval must be obtained before these factors are employed.

2.1. Projects. Each project under this program will be divided into major accomplishment/cost phases to facilitate government review and control.

2.2. Contract Information.

2.2.1. The contractor is expected to provide competent and cooperative administrative services; he will be vested with certain authority to control the direction and degree of technical effort within the bounds of estimated costs as approved by the Technical Representative.

2.2.2. The contractor shall be responsible for the work performance of his sub-contractors.

2.2.3. The Contracting Officer of the Government will designate a Technical Representative to authorize specific development efforts of the contractor. Such authorization shall be given in the form of written work orders either in its original form or to confirm an oral authorization.

2.2.4. Certain written progress reports will be required on a regular basis by the Technical Representative to include status of project, money expended and money required to complete the projects. In addition, the contractor will be expected to provide the Technical Representative with written reports concerning research and development efforts when deemed advisable by the Government, as well as verbal elaborations as may be desired by the Technical Representative or Contracting Officer.

3. TECHNICAL REQUIREMENTS. Modulated light imaging systems are required which will automatically control viewing and reproduction illumination as a function of local characteristics of the image, in order to achieve significant improvement in the perceptibility of near-subliminal imagery.

Four general areas of research will be included in this program: study, fabrication, test and evaluation. Research in this program will also require the inclusion of certain physiological and psychological testing involving the interpreters' application of the systems. Within the context of the broad objectives set forth in this paper the technical requirements are:

3.1. Consultation to the Government in the modulated light imagery systems research field.

3.2. Awareness of all commercial and non-profit organizations working in this field. Possession of the current and historical knowledge in order to preclude duplication of effort and to maintain awareness of the state-of-the-art.

3.3. Improve perceptibility by (1) defining the nature of images; (2) defining optimum criteria for image perciptibility; (3) developing photographic techniques for achieving optimum image perceptibility with both good and poor original images. Improved image characteristics may be achieved in two ways as follows:

3.3.1. Automation of Photographic Techniques in Reproduction Processes.

3.3.1.1. Contact printing.

3.3.1.2. Projection printing.

3.3.1.3. Development process.

3.3.2. Automation of Photographic Techniques in Viewing Processes.

3.3.2.1. Direct optical viewers

3.3.2.2. Indirect optical viewers

3.3.2.3. Electronic viewers

3.4. Research in the area of information transmission from photographs to the human mind, in order to interpret the maximum amount of information in the minimum of time with the lowest error rate. These ultimate parameters shall be established by the contractor for constant illumination and various forms of modulated illumination, and also show the results of varying them.

3.5. Fabricate and test breadboards with which theories of modulated light viewing and printing may be analyzed.

3.6. Manufacture prototype and production equipment which has been proven to be practical in terms of increasing useful information from the photograph to the interpreter, and remain within optimum costs. The models should also reduce the time factor and interpretation error factor in the exploitation process.

3.7. Tests involving interpretation or exploitation processes will be made employing government photo interpreters under operational conditions.