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CONTRACT FILE

PAR 212-A

COLOR ACQUISITION SYSTEM REVIEW
STUDY

Date: 20 February 1964

Declass Review by NGA.

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PROJECT AUTHORIZATION REQUEST

No. 212-A

February 20, 1964

TITLE: Color Acquisition System Review Study

TASK/PROBLEM

In view of the increased interest and anticipated continued use of color for photo reconnaissance, it is very evident that more information is required concerning the capability of present and possible future acquisition systems in order to predict future requirements to support exploitation and data reduction of the collected color photo intelligence material.

PROPOSAL

In the investigation of color photography as a possible anticipated intelligence collection item, many factors must be taken into account, tabulated, evaluated, and in some instances experiments must be preformed to insure reaching the proper conclusion.

The study will include review of currently available color films and those in the development stages. However, should the studies and findings indicate a desire or dictate requirements for a new or improved color film or sensor, no effort will be expended in this area since this company does not accept contracts for the development of sensitized products.

It must be assumed that all effort expended in the development of acquisition systems will be directed to insure collection of the maximum amount of intelligence information. Therefore, no part of this study will be directed toward making recommendations for improvement of such systems.

1. Collection Systems (Camera): A review will be made of presently known systems and their capabilities to handle color materials. These findings will be projected toward possible future developments in an attempt to determine collection system capabilities in the next five- to ten-year period.

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2. Lenses: A survey will be made of potential lenses to determine their capability to record target data on all types of color sensors. Firm conclusions must depend upon the availability of these lenses to verify theoretical data.
3. Filters: Investigation will be made for the possible use of filters to aid in the exploitation of intelligence. This investigation may be in two parts.
 - (a) Possible use of filters in the collection system to enhance the data reduction capability.
 - (b) Possible use of filters, on exploitation equipments to extract or add colors to the correctly exposed material, as an aid in the intelligence data reduction process.
4. Scale and Altitude: The effect of focal length, altitude, and haze upon image size vs resolution, (grain, color smear, and etc.) will be studied to determine design parameters for read-out equipments.
5. Film: Both negative and reversal type film will be compared and their capabilities including resolution, reproducibility, and suitability for intelligence data collection will be analyzed.
6. Processing: Since this study is not oriented toward equipments except those for use in read-out of the intelligence information, it will be assumed that color film will, in all cases, be processed in accordance with manufacturers' recommendations.

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7. Post Processing Operations: A study will be made of the methods for handling, titling and cleaning of processed colored materials since these functions play an all important part in the data reduction cycle. This part of the study may also include possible digital and alpha-numeric recording of data in the collection system.
8. Stereo Combinations: Stereo taking and viewing systems will be examined and experiments conducted as needed. Both color, and color in conjunction with black-white will be studied. A compatible combination of black-white and color might be formed which retains the resolution capabilities of the former while utilizing the area color discrimination of the latter.
9. Special Color Materials: Special color materials such as the two-color MTI (Moving Target Identification) film, and infrared Ektachrome will be reviewed during the course of this study.

The analysis of any color material undertaken will be in respect to its intended use (photo interpretation). In addition, as new color materials are developed and/or information becomes known regarding new acquisition system capabilities, they will be included in this study and evaluated.

Liaison will be established with the customer's representatives in order to provide a better understanding of the needs of the PI community as a whole; and to assist in anyway possible to standardize a desirable level of quality wherever feasible.

The objective of this program will be a final report with organized data regarding color materials and discussing in detail the work accomplished. The report will also contain recommendations for the following:

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- (a) Most suitable utilization of present exploitation equipments.
- (b) Future exploitation equipments for use with color materials to include viewers, (direct, and indirect) enlargers and printers.
- (c) Recommended design goals for future exploitation equipments.
- (d) How color materials should be handled and exploited to insure maximum utilization.

STUDY PROGRAM OBJECTIVE

Color Acquisition System Review (PAR 212)Problem

With the increased interest in color for photoreconnaissance it is becoming evident that more information is needed as to capabilities of the entire acquisition system when used with for this purpose.

Development Proposal

In this investigation of color acquisition systems, many factors will be taken into account, tabulated, evaluated and in some instances where necessary, experiments will be performed. The investigation will include color acquisition films currently on the market, and those in the development stages.

Among the factors to be considered will be:

1. Cameras

The characteristics of the various taking systems will be evaluated to determine their suitability for handling color materials on both thin base and standard support. Film transport systems will be analyzed with respect to their specific capability to handle these materials without the unwanted effects of pressure marks, static, etc. Emphasis will be placed on shutter speeds as related to exposure control and the reciprocity characteristics of color taking materials.

2. Lenses

A survey will be made of potential lenses which may be used for color applications. Dependent upon the availability of these lenses, their capabilities in a color system will be analyzed.

3. Filters

Investigation will be made into the possible use of filters best suited to improve, or correct color rendition.

4. Scale and Altitude

Potentials of all systems will be studied in respect to their possible use with color films under normal operations.

5. Films

Both negative and reversal types will be compared and their capabilities, including resolution, color rendition, reproducibility, etc. properly analyzed.

6. Processing

Study in this field will be minimal and limited only to such equipment and processes as are compatible with the taking films involved.

7. Post Processing Operations

A study will be made of the methods and equipment for titling, cleaning and the application of protective coatings.

8. Stereo Combinations

Stereo taking and viewing systems will be examined and experiments conducted as needed. Both color, and color in conjunction with black-white will be studied. A compatible combination of black-white and color might be formed which retains the resolution capabilities of the former while utilizing the area color discrimination of the latter.

9. Viewers

Recommendations will be made for providing the most suitable equipment for viewing the processed original materials.

10. Special Color Applications and Material

Special color materials, such as the two color MTI (Moving Target Identification) films and Infra-red Ektachrome types will be included in the study.

The analysis of any color system undertaken will be in respect to its intended usage, either airborne, ground to air or static. In addition, as new color systems, taking materials, or acquisition equipment are developed, they will be included in this study and evaluated.

This combined study of camera characteristics, lens performance, the study of taking materials and processing requirements, consideration of vehicle characteristics and operating parameters should provide the knowledge which will determine:

1. What systems can now use color, or be readily adapted for use with color.
2. What filters can best contribute to the effectiveness of color systems.
3. What taking films should be used.
4. How the films should be processed.

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Sufficient testing and analysis will be performed to prove the above conclusions and to demonstrate their potential value.

The prime objective is to provide organized data regarding color acquisition systems and to assist in the evaluation of their usefulness to the Photo-Interpreter. Data will be provided on color versus black and white, color in stereo, and color in conjunction with black and white in stereo.

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24 Qtr Report: Study Objective submitted.

Estimated Factory Cost

25X1

31 Jan 64: See MFR, this date, regarding reorientation of the study objectives at a meeting ~~is~~ scheduled for 3-4 Feb '64.

3-4 Feb 64 will write a revised PAR to accentuate the output rather than the acquisition.

3 Feb 64: See message this date to redirect PAR objectives.

25X1

20 Feb 64: Message of this date schedules delivery of new PAR on 24 Feb 64.

24 Feb 64: First copies of PAR-212-A received.

24 Feb 64: MFR -- PAR approved

27 Feb 64: Memo Requesting TWX

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3 Mar 64: TWX sent

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1-7-65 In discussion with it was agreed to get a final report and terminate work.

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