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# COMPARISON OF SENSITIZED MATERIALS FOR AERIAL RECONNAISSANCE

173049


*WILLIAM MALLIOS*
*PHOTOGRAPHIC RECONNAISSANCE LABORATORY*


*SEPTEMBER 1952*

**WRIGHT AIR DEVELOPMENT CENTER**

79 10 5 84

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# COMPARISON OF SENSITIZED MATERIALS FOR AERIAL RECONNAISSANCE

*William Mallios*
*Photographic Reconnaissance Laboratory*

*September 1952*

*RDO No. R-677-30*

Wright Air Development Center
Air Research and Development Command
United States Air Force
Wright-Patterson Air Force Base, Ohio

McGregor & Werner, Inc.
Dayton O. 100, 20 Nov. 52

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## FOREWORD

This report was prepared by the Photo Reconnaissance Lab. Directorate of Laboratories, Wright Air Development Center, under Research and Development Order No. R-677-30, entitled "Color Photography". Mr. William Mallios was the Project Engineer.

Acknowledgment is hereby made to the contributing photographic interpreters who are listed on Page 4 of the report. It is also desired that particular acknowledgment be made to both Purdue University and Boston University for their valuable contributions to the mission of this report.



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## ABSTRACT


With the exception of hydrographic, geological, and forestry studies, black-and-white film is the overwhelming choice of photo interpreters as a source of aerial photographic intelligence. For certain specific purposes, however, color film and camouflage detection film are superior sources of information. Unfamiliarity of the interpreters with color and camouflage detection films exerts more influence on the film choices than the actual values and qualities of the films themselves. Lack of proper viewing equipment, with special regard to stereo, was an equally strong influencing factor on these choices. Recommendations are made that more instruction be made available through the photo interpretation schools and that more and better equipment be made available for their use, all of which should be specifically aimed at special-purpose films.


The security classification of the title of this report is UNCLASSIFIED.

PUBLICATION REVIEW

This report has been reviewed and is approved.

FOR THE COMMANDING GENERAL:

Delwin B. Avery

DELWIN B. AVERY
Colonel, USAF
Chief, Photo Reconnaissance Lab
Directorate of Laboratories



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TABLE OF CONTENTS



LIST OF ILLUSTRATIONS

## SECTION I

## PURPOSE

At the request of the Panel on Photography and Optics of the Research and Development Board, a project was initiated to evaluate the relative values and uses of black-and-white, color, infrared, and camouflage detection films for strategic reconnaissance. Since black-and-white is the only film that has been in general use by operational units, it was necessary to solicit the opinions of photographic interpreters of the Army, Navy, and the Air Force in order to determine the potentialities of color, infrared, and camouflage detection films. While the actual use of the materials will probably be a compromise between the operational problems involved and the information required by interpreters, it was the intent of this project to establish a preferred pattern for using the available materials to obtain the maximum amount of intelligence information.

## SECTION II

## FACTUAL DATA

### DESCRIPTION OF FILMS FOR AERIAL PHOTOGRAPHY

At the present, the Air Force has available four distinct types of aerial films for tactical and strategic reconnaissance, mapping, charting, and for all photographic coverage needed by the military in war or peace. There are many variations in the speed, contrast, and sensitivities of films, but this report will concern itself with only the four distinct types mentioned below. Each of the films has been designed to accomplish a specific job, and theoretically these four types of films should render any information desired by the photo interpreter, if used properly. The four materials are black-and-white, infrared, color, and camouflage detection film. A short description of each is given here to acquaint the reader with these materials.

(1) Black-and-white Film: This film is considered an all-purpose film for reconnaissance and mapping work. The advantages of this film are speed, small grain size, wide latitude, ease of processing, long shelf life, ease of manufacturing, and ease of reproducing the original record. The principal disadvantage of this material for interpretation work is that objects of similar brightness are recorded as similar gray densities regardless of color. Standard black-and-white films available: Class L, and Class N. Normal processing time is 28 minutes (not including drying time). Processing temperature required is 68°F and is fairly critical for one solution. The equipment required is the B-5 developing assembly.

(2) Infrared Film: This material is designed primarily for recording in the invisible part of the spectrum at 750 mu and above when used with an 89A filter. This characteristic enables this material to penetrate haze and to obtain a relatively clear record when other materials fail. The contrast is relatively high, and tonal gradations in the intermediate densities render a comparatively poor record for interpretation. In theory, infrared film has excellent possibilities as a camouflage detector, but to date, no conclusive evidence is available. It has relatively short shelf life due to the rapid deterioration of the infrared sensitizers. The processing requirements are the same as black-and-white film. The standard infrared film available is Class K, with a speed index of 50.

(3) Color Film: The present standard color film is a dye-coupled, reversal type film that renders a positive transparency in full color. This material gives the interpreter not only the form, size, and texture of a target, but also the color, which is an important source of information. The disadvantages of aerial color film are low resolving power, relatively slow emulsion speed, relatively long processing time, critical processing temperatures, and narrow exposure latitude. Normal processing is 88 minutes (not including drying time) Temperature required is 70°F and is critical for two solutions. Equipment required is the B-5 developing assembly and a suitable light source for the re-exposure.

(4) Camouflage Detection Film: The present camouflage detection film is a three-color, dye-coupled, reversal type color film. This film is designed to detect camouflage through the infrared reflection characteristics of chlorophyll, which is present in almost all living vegetation. The sensitivity of each emulsion layer is diagrammed below:

| | | |
|---|---|---|
| Infrared Sensitive | - - | Cyan positive image |
| Green Sensitive | - - | Yellow positive image |
| Red Sensitive | - - | Magenta positive image |

As a result of the reversal procedure, the natural greens of living trees, bushes, grass appear as red, while dead trees, dead vegetation, and materials not containing chlorophyll, such as camouflage nets, green paints, etc. appear as green. This gives a maximum of color contrast for the detection and penetration of camouflage. The exposing and processing of this material is identical with that for aerial color film; in fact, the same chemical kits are used for either film. The storage qualities of this film are relatively poor, due to the somewhat rapid deterioration of the infrared sensitizers.

DESCRIPTION OF PRINTING MATERIALS FOR AERIAL PHOTOGRAPHY

The following four types of printing materials were considered in this study:

(1) Black-and-white Paper: No effort shall be made here to cover the field of bromide and chloride papers available, since everyone is familiar with the more common types.

(2) Black-and-white Print Film: The material furnished for this study was a long-scale, fine-grain material that is capable of reproducing a negative with a minimum loss of detail. The long scale available in this material readily lends itself to reproducing almost any negative by variance of the developers and developing time. This material is tray-processed in the same manner as black-and-white paper. The drying is accomplished in the same manner as any film. The normal processing time is 18 minutes.

(3) "Printon" Color Print Material: "Printon" is a dye-coupled, reversal color material coated on a high-reflection, white, acetate base. For this project, all prints were made on roll material, exposed in the C 1A continuous printer, and processed in the B-5 developing assembly. Some difficulty was experienced at first with color changes occurring from roll to roll when a fresh kit was used for each roll. These variations were virtually eliminated by mixing large batches of the developers and establishing a replenishment rate that produced uniform results. Normal processing time is 75 minutes. (The new high-speed kits now permit the processing time to be reduced to 15 1/2 minutes.) The temperature control is critical for two solutions.

(4) Color Duplication Film: Aerial "Ektachrome" duplicating film is a dye-coupled, reversal material coated on a matte base for easy viewing. All duplicates made for this project were exposed on the C 1A continuous printer and processed in the B-5 developing assembly. After establishing the proper filtration and exposures, it was possible to make the runs without difficulty. Normal processing time is 47 minutes (not including drying time). Temperature control is critical for two solutions: 70°F for the first developer and 80°F for the color developer.

OPERATIONAL PROCEDURES

Operationally, the obtaining of intelligence through aerial photography is divided into two separate functions. One group gathers the photographic data, and the second group extracts the intelligence information from the photography. Similarly, this project was divided into two phases. All of the work of the first phase was accomplished by Airmen technicians, with some of them doubling as aerial photographers as well as laboratory technicians. All flight and exposure data are given in Appendex I. Standard Air Force equipment was used throughout. The entire setup could be duplicated by any fairly well-equipped photographic squadron in the field. In some cases, outdated film had to be used, but the results obtained were a close approximation of the results which could be expected under normal operating conditions.

The interpreters were, therefore, relieved of any operational problems. Complete sets of photographs were submitted to them for analysis and evaluation at their leisure. In order to obtain opinions other than those of military personnel, sets were sent to Purdue University and to Boston University as well as to interpreters of the Army, Navy, and Air Force. (For comparative purposes, the results of the University studies are separated from those of the military in this report.) Sent along with the sets of photographs, a standard questionnaire was distributed to simplify the analysis and compilation of results.

Upon completion of the reproduction phase of the test, complete sets of photographs, consisting of a print and a transparency from each negative, were prepared and distributed to the following photo interpretation centers:

(1) Strategic Air Command, Offutt AFB, Nebraska.

(2) U. S. Army, Fort Riley, Kansas.

(3) U. S. Naval Photographic Interpretation Center, Washington, D. C.

(4) Hq USAF Reconnaissance Branch, Washington, D. C.

(5) USAF Photographic Interpreters School, Lowry AFB, Denver, Colorado

(6) USAF 4203rd Photographic Technical Squadron, Washington, D. C.

(7) Boston University, Optical Research Laboratory, Boston, Massachusetts

(8) Purdue University, Lafayette, Indiana.

COMPILATION OF THE RETURNED QUESTIONNAIRES

The participating interpreters were classified according to experience as shown in Table I. In only a few isolated instances did the difference in experience result in a difference of opinion.

TABLE I

| | Navy | USAF | Army | Total |
|---|---|---|---|---|
| No experience* | 5 | 16 | 3 | 24 |
| Experienced | 14 | 12 | 4 | 30 |
| Total | 19 | 28 | 7 | 54 |

* Previous experience in black-and-white prints only.

The answers to the questionnaires submitted to military interpreters are compiled as follows.

(1) Question: Of the three types of photographic materials considered, what is your choice for a particular type of target? The results are given in Table II.

TABLE II

| | First Choice % of Group | | Second Choice % of Group | |
|---|---|---|---|---|
| a. Aircraft Manufacturer | B&W | 91 | C | 84 |
| b. Petroleum Cracking Plant | B&W | 76 | C | 65 |
| c. Hydroelectric Plant | B&W | 100 | C | 88 |

| | First Choice % of Group | | Second Choice % of Group | |
|---|---|---|---|---|
| d. Heavy Industry | B&W | 76 | C | 73 |
| e. Oceanography | C | 85 | B&W | 82 |
| f. Shipping | B&W | 75 | C | 62 |
| g. Camouflage Areas | CD | 59 | C | 34 |
| h. High Altitude Obliques (Gen'l) | B&W | 96 | C | 86 |
| i. Low Altitude Obliques | B&W | 96 | C | 77 |
| j. Troop Areas & Movements | B&W | 85 | C | 70 |
| k. Chemical Manufacturer | B&W | 64 | C | 57 |
| l. Water Pollution | C | 93 | B&W | 88 |
| m. Tank, Field Pieces | B&W | 89 | C | 79 |
| n. Marshalling Yards | B&W | 95 | C | 85 |
| o. Underground Installations | B&W | 81 | C | 67 |
| p. Coastal Defenses | B&W | 83 | C | 68 |
| q. Geological Studies | C | 67 | B&W | 62 |
| r. Forestry Studies | C | 72 | B&W | 53 |

(2) Question: What type of photography and related reproduction material are preferred for maximum intelligence in routine photographic reconnaissance? The results are tabulated in Table III in order of preference.

TABLE III

| | Film | Reproduction Material |
|---|---|---|
| a. | Black-and-white | Paper |
| b. | Black-and-white | Transparency |
| c. | Infrared | Paper |
| d. | Infrared | Transparency |
| e. | Color | Color Print |
| f. | Color | Color Transparency |
| g. | Camouflage Detection | Color Print |
| h. | Camouflage Detection | Color Transparency |

(3) Question: Is your present interpretation equipment adequate for viewing and analyzing transparencies in stereo?

| | |
|---|---|
| Yes | 19% |
| No | 30% |
| No Response | 1% |

(4) Question: From the study of this photography, which material:
a. Yields the most accurate interpretation?

| | |
|---|---|
| Black-and-white | 39% |

Color 8%

No Response 3%

b. Is the fastest to interpret?

Black-and-white 89%

Color 7%

No Response 4%

c. Is the simplest to interpret?

Black-and-white 93%

Color 4%

No Response 3%

d. Is the most difficult to interpret?

Infrared 56%

Color 20%

Camouflage Detection 13%

No Response 11%

(5) Question: Do the colors in the color prints and transparencies appear exaggerated?

Yes [illegible]

No 31%

No Response [illegible]

Is this beneficial to interpretation?

Yes 17%

No 63%

(6) Question: In this set of color materials, some of the prints and transparencies are slightly off-color. Do you find this

detrimental for interpretation?

| | Experience | No Experience |
|---|---|---|
| Yes | 19% | 24% |
| No | 39% | 19% |

(7) Question: Do you feel that color film renders sufficient additional information to warrant the additional time lag?

| | |
|---|---|
| Yes | 70% |
| No | 30% |

(8) Question: Are the present aerial camera lenses adequate for accurate interpretation studies?

| | |
|---|---|
| Yes | 52% |
| No | 6% |
| No Response | 42% |

(9) Question: Would additional training be beneficial for interpretation of the materials that are different from the medium in which you have been working?

| | |
|---|---|
| Yes | 87% |
| No Response | 13% |

(10) Question: From the study of this photography and your previous experience, do you recommend stocking all of the items or materials used on this project?

| | |
|---|---|
| Yes | 33% |
| No | 56% |
| No Response | 11% |

Note: The "Experienced" group was equally divided on whether or not to stock all items. 75% of the "No Experience" group was against stocking all of the items.

(11) Question: If it should become possible to furnish the interpreters a color negative material with much greater latitude than the present color material, from which black-and-white prints, color prints, color transparencies, and black-and-white transparencies could be made, do you feel that a requirement exists for such a material?

| | |
|---|---|
| Yes | 70% |
| No | 12% |
| No Response | 18% |

Should this material replace the present color material?

| | |
|---|---|
| Yes | 64% |
| No | 10% |
| No Response | 26% |

COMMENTS REGARDING ANSWERS SUBMITTED BY MILITARY INTERPRETERS

From the results tabulated above, the films are listed below in order of their value for aerial reconnaissance. Should conditions arise that make it necessary to eliminate production of any materials, the following list could serve as a guide for reducing the number of materials with a minimum loss of intelligence.

(1) Black-and-white panchromatic

(2) Color

(3) Infrared

(4) Camouflage detection

Extending the same line of reasoning to the reproduction materials, the materials, in the same order of importance, are:

(1) Black-and-white print paper

(2) Color print paper

(3) Black-and-white transparency

(4) Color transparency

BOSTON UNIVERSITY STUDY

The study conducted by the Boston Optical Research Laboratory was a quantitative study for resolving power, contrast, and clarity of image rather than a qualitative study for intelligence information. Two analysts spent approximately 60 hours on this study, and, almost without exception, they rated the materials in the following order:

(1) Class L - Prints and transparencies

(2) Color - Prints and transparencies

(3) Infrared - Prints and transparencies

(4) Camouflage detection - Prints and transparencies

PURDUE UNIVERSITY STUDY

Mr. R. E. Frost of Purdue University volunteered the services of the Airphoto Analysis Laboratory in conducting a study of the film comparison tests. This offer was accepted in view of the fact that the Airphoto Analysis Laboratory has an experienced group of interpreters who have specialized in terrain, forestry, and environmental interpretation, and who could offer a non-military interpretation. Some of the following comments and recommendations of the Purdue group are quoted verbatim, since their findings from an identical set of photographs reflect such a wide difference of opinion from the military interpreters, especially with regard to the use of infrared and color films.

(1) "Transparencies are more difficult to interpret, primarily from the standpoint of equipment involved and the care necessary in handling."

"Infrared has many possibilities. Some agencies have already discovered its usefulness in vegetation studies. It will soon become useful in other studies of a natural environmental character."

"Color material has good possibilities for forest and vegetative studies as well as for drainage and waterway studies."

(2) "It is recommended that infrared be given consideration as a material to be used in the interpretation of target areas which involve natural features of the earth's surface. In this regard, it is recommended that the Fort Knox Area be "flown" at a scale of 1/20,000, that a mosaic be compared with a 1/20,000-scale, black-and-white mosaic made from ordinary panchromatic negatives. It is believed that some startling features will be revealed to the alert interpreter. It is also believed that this material will play an important part in the interpretation of terrain features, which is important when one considers that the natural physical and environmental features of the earth's surface is dominant in the formation of air-photo patterns.

(3) "It is believed that all of the types of photographic materials involved herein have a definite use in the specific target areas. Further research of these materials is recommended."

TABLE IV

| | B&W | I R | Color | C D |
|---|---|---|---|---|
| 1. Aircraft Factory or Precision Mfr | | | | |
| 2. Petroleum Cracking Plant | | | | |
| 3. Hydroelectric Plant | | | | |
| 4. Heavy Industry (Steel Mills, etc.) | | | | |
| 5. Oceanography | 2 | 3 | 1 | 0 |
| 6. Shipping | | | | |
| 7. Camouflaged Areas (Launching Sites) | 3 | 2 | 1 | 1 |
| 8. High Altitude Obliques (General) | 2 | 1 | 2 | 3 |
| 9. Low Altitude Obliques | 2 | 1 | 2 | 3 |
| 10. Troop Areas and Movements | 2 | 0 | 1 | 0 |
| 11. Chemical Manufacturer | | | | |
| 12. Water Pollution Studies | | | | |
| 13. Tanks and Motorized Field Guns | 2 | 3 | 1 | 0 |
| 14. Marshalling Yards | | | | |
| 15. Underground Installations | | | | |
| 16. Coastal Defenses | 2 | 1 | 3 | 0 |
| 17. Geological Studies | 1 | 3 | 2 | 0 |
| 18. Forestry Studies | 3 | 1 | 1 | 0 |

For a comparative military analysis, refer to Table II.

## SECTION III

## CONCLUSIONS

By combining the opinions of 54 interpreters of the Army, Navy, and Air Forces, a preferred pattern was established for using the available types of sensitized materials for aerial photography. (See Table II) This list was compiled on the basis of the choices of the majority of the interpreters. However, it will be noted that the interpreters varied widely in their favored selections.

It is believed, however, that the results of this investigation should not be considered as conclusive as to the potentialities of all the materials utilized because of the following factors, which became apparent during the course of the investigation:

(1) The lack of proper interpretation equipment undoubtedly influenced the results of this study. Only 20% of the participating interpreters had adequate equipment available for viewing transparencies in stereo.

(2) Much closer liaison is needed between the photographic and intelligence agencies to promote optimum operation. From all indications, each group needs a better understanding of the capabilities and limitations of its opposite group.

(3) One important factor was overlooked by both this Laboratory in preparing the questionnaires and by the interpreters in analyzing the photography. This was the application of the various materials for second-and third-phase interpretation. This consideration should be included in any future tests of this type.

(4) From the results of this project and a knowledge of sensitized emulsions, it can be stated conclusively that black-and-white panchromatic film is the one single film most valuable for aerial reconnaissance. Exploration into the reasons for this categorical statement of superiority reveals that materials other than black-and-white panchromatic film have certain inherent characteristics that limit their use, and, as a result, their value. The following is a list of these limiting factors in the order of their importance to photographic interpreters and operational photographic personnel.

a. Resolving Power

b. Film Speed

c. Latitude

d. Processing Time

e. Storage-ability or Shelf Life

The infrared, color, and camouflage detection films do not individually have all of the above shortcomings, but it is true that each one does have some combination of two or more when compared with black-and-white film. From present knowledge of sensitized materials, it must be concluded that any improvements in special color materials will be a rather slow process, unless some new and radical approach is presented. Of course, the ultimate goal of the Air Force Color Program is the selection of one or more materials that will approach or surpass the performance of the present black-and-white materials in all respects.

(5) From the results of this study and the observations of color technicians in the Korean theater of operations, the present camouflage detection film has certain limitations, which are indicated below.

a. Camouflage detection film is designed for summer use only. With the possibilities of large-scale operations in the Arctic and polar regions, a camouflage detection material that is useful in snow areas would provide a much-needed and valuable intelligence tool.

b. In the Korean theater of operations, it was discovered that certain trees and foliage peculiar to the area did not reflect infrared as would be normally expected. Since it is on the basis of infrared reflectivity that detection and penetration of camouflage is effected, the film is of doubtful value in that particular locality. It is entirely possible that similar situations may also be found to exist in other parts of the world.

c. Photographic interpretive and intelligence personnel have little knowledge of camouflage detection film and its uses.

d. Camouflage detection film and black-and-white infrared film have a relatively short shelf life due to the instability of the present infrared sensitizers. Either more stable sensitizers must be developed, or a more efficient supply system must be instituted to compensate for such rapid losses in film speed.

## SECTION IV

## RECOMMENDATIONS

(1) Similar studies should be conducted to cover such fields as low-altitude tactical-support photography, strip-camera photography, night photography, bomb-damage photography, atomic bomb assessment and damage photography, more extensive soil and terrain photography, underwater depth studies, gun-sight-aiming-point photography, which undoubtedly will result in more efficient utilization of materials and better intelligence.

(2) The photographic interpreters schools should include in their curriculums a course or courses to acquaint the interpreters with the materials available and to explain the use of specialized materials which render results otherwise unobtainable.

(3) The operational personnel in photography should be educated in the use and handling of special-purpose materials. This instruction should include techniques for exposing and processing the various materials, resulting in an understanding of the problems involved.

(4) Research should be continued and extended to eliminate the deficiencies of the materials as brought out in this report. In the case of color films, development work should be attempted to obtain higher resolving power, more emulsion speed and shorter processing times. In the case of infrared and camouflage detection film, more stable infrared sensitizers should be investigated or a better or special supply system set up to compensate for the rapid loss of speed in infrared emulsions.

(5) Only the freshest film should be supplied to the field. (One step to alleviate this condition has already been taken by one film manufacturer by placing the expiration date on the outside of the film containers. This enables depot personnel to move the older stocks first. However, the amount of materials on hand should not be allowed to accumulate in such amounts that materials issued are past the expiration date or are very "short-dated".)

(6) If well-qualified personnel are assigned to field photographic organizations, high quality work can be produced in a minimum of time.

(7) In order to obtain the optimum use of color film in the field the following recommendations are made:

a. The photo interpreter who requests a particular mission should brief the reconnaissance crew on the types of coverage desired.

b. Target areas which will require repeated coverage should first be photographed in color, with subsequent coverage in black-and-white. The first sortie would establish the colors and contrasts of the area and would be used as a reference for the later black-and-white coverage.

c. In order to overcome the inherent relatively low resolving power of aerial color film and still have the advantages of natural color for interpretation, the use of two vertical cameras is recommended. One of these cameras should be loaded with black-and-white film and the other with color film. One frame from each camera should be used to make a stereo-pair for interpretive study.

# APPENDIX I

## FLIGHT AND EXPOSURE DATA

### FLIGHT PROCEDURES

Upon completion of the planning for this project, the necessary equipment was obtained, and the aerial flights were executed as outlined below.

(1) This phase of the project was conducted in a modified B-17 aircraft. This particular aircraft had a camera port opening that permitted the use of four cameras in a single mount. For this project, four standard 24-inch K-17 cameras were mounted in a single wooden mount and operated simultaneously from an intervalometer. (See Figures 1 and 2) The cameras were bench-tested for focus and for accuracy of shutter speeds. Where necessary, corrections were made to insure a fair and impartial test of the materials. The camera used for the infrared film was refocussed as recommended by Technical Order No. 10-10-41, entitled "Service Instructions For Camera Lenses". The wooden camera mount was fabricated and mounted in the aircraft by personnel of the Photo Reconnaissance Lab, WADC. This mount was flight-tested with and without Lord mounts to determine which system functioned with the least vibration. An analysis of the film indicated that the best results were obtained with the Lord mounts. This wooden mount functioned perfectly throughout the entire project.

(2) Two local flights were conducted to determine the operational status of the equipment. The film was analyzed for vibration, focus, shutter speed, and color balance. A few minor corrections were made, and the project flights were started. In order to simulate operational conditions as nearly as possible all flights were scheduled for 30,000 feet altitide. However, on the first two flights, one of the crew members suffered an attack of the "bends", so the flight altitude was reduced to 25,000 feet. After reducing the flight altitude, no further difficulties were encountered with personnel or equipment. The camera filters and exposures used on the test flights are listed below; the exposures given are average.

| FILM | FILTER | EXPOSURE |
|---|---|---|
| Black-and-white | Minus Blue | 1/150 sec. f 11 |
| Infrared | Wratten #25 | 1/100 sec. f 6 |
| Color | As Recommended | 1/150 sec. f 6 |
| Camouflage Detection | As Recommended | 1/100 sec. f 6 |

### LABORATORY PROCEDURE

All sensitized materials were processed in a routine manner with relatively close control on times, temperatures, and solutions. A short description is given on the next page of the techniques used.

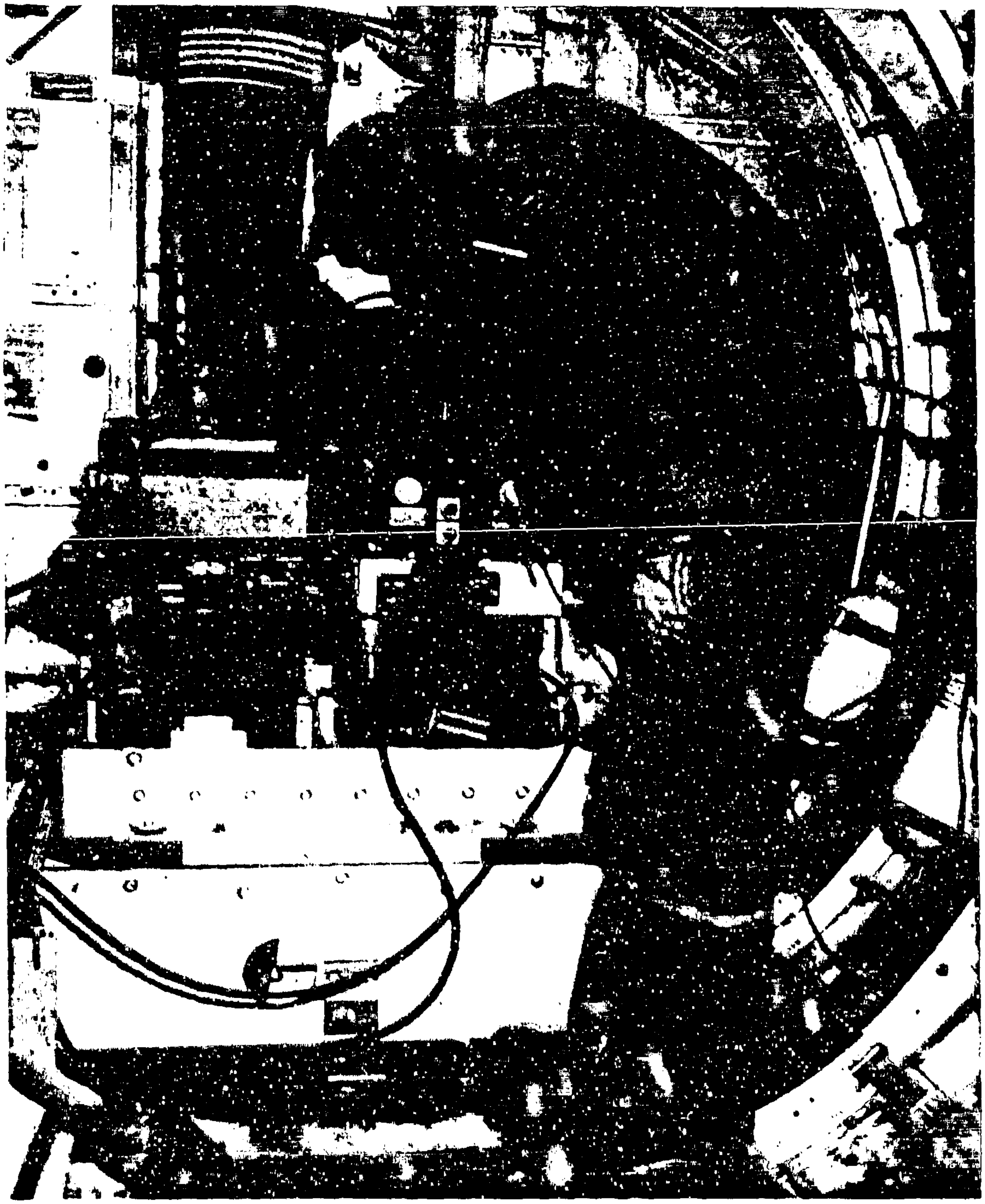

Figure 1. Camera Installation in RB-17G Just Aft of Radio Compartment, Four K-17 24 in. Cameras in Wood Mount Ready for Operation

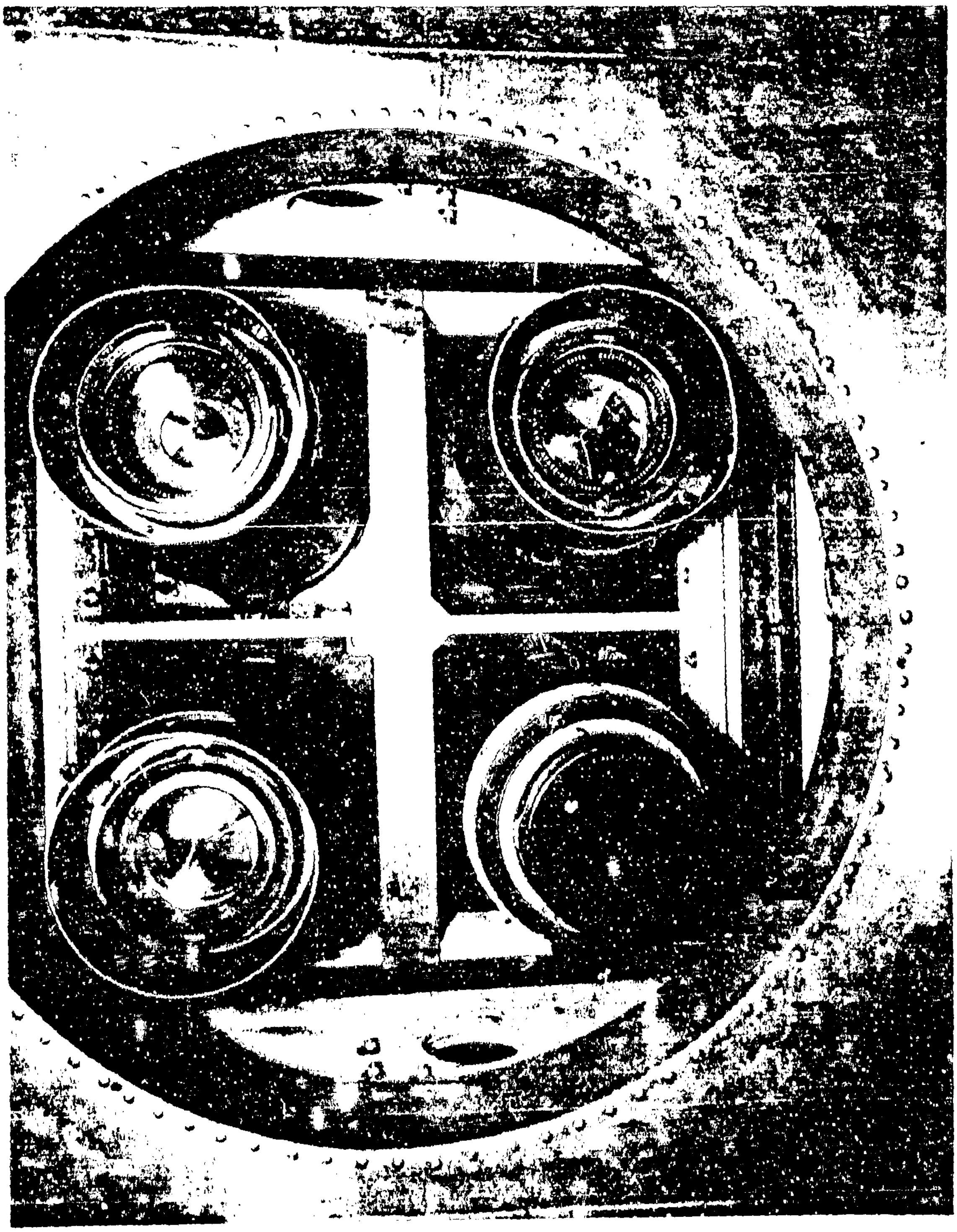

Figure 2. External View of Four-Camera Installation in RB-17G, Showing Oversize Camera Port

(1) Class L film was processed at 68°F in a Williamson continuous processing machine to a gamma of 1.2. Results were uniform throughout the project.

(2) Class K (Infrared sensitive) film was processed in the same manner as Class L film. For this project, it was necessary to use outdated film; consequently, processing control by gamma could not be maintained. Results were not uniform, and the quality was below that which can be expected when using fresh film. Some doubt was expressed concerning the accuracy of the infrared camera focus, but no definite conclusions were reached.

(3) Color film was processed at 70°F in B-5 developing units according to the manufacturer's recommendations. Over-all results were very good, with the exception of two rolls in which the color balance varied from the normal. This shift in color balance was due to haze conditions and improper filtration.

(4) Camouflage detection film was processed in the same manner as the aerial color film, utilizing the interchangeable color kits. The results were very poor with the outdated film which was available for this project.

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