A PROPOSAL INCLUDING PRELIMINARY SPECIFICATIONS FOR A NEW CONCEPT IN AERIAL RECONNAISSANCE FILM PROCESSING

A review of the advances made in the aerial reconnaissance field for the past twenty years shows that there have been some very impressive system advances both to improve the quality of the photographic product and to keep pace with other related technological improvements. Considering the camera platform (whether aircraft or some other vehicle) the camera ~~film system~~ and the processing technology all as a complete system cycle, I continue to note one serious and continuous shortcoming. This is in the film processing methods which have not significantly changed since the invention of the flexible nitrate film base to replace glass plates. Essentially, ~~all~~ present processes are "wet" processes. They require the mixing of chemicals, complicated machines, skilled personnel and large quantities of water and power. ~~In addition, there are several operations involved in the production of duplicates.~~

The reason, in my opinion, for slow advances in processing technology is principally that no one has been successful in identifying the whole problem as well as detailing specific problem areas and following through to find a solution to these problems. This proposal is an attempt to identify specifically the most significant problems in film processing today and offer a new concept ~~and using new ideas~~ which could be a solution to these problems.

The Problems:

Presently, aircraft reconnaissance detachments can be deployed on short notice to cover almost any area of the world. The movement of such a detachment, its support equipment and personnel takes some time and from a logistics standpoint would appear to be the long time increment of the whole cycle noted above. However, frequently the detachment can be in place in a shorter time than it takes to transport, process, and deliver the film to the consumer, particularly when the processing site is remote from the forward reconnaissance base. Even when a processing laboratory is established overseas it becomes a semi-fixed installation at best, requiring buildings to be built or modified, procurement of electric power, a large source of fresh, near pure water and ~~many~~ qualified, technically trained personnel to accomplish the processing. When trailers are used there is still the problem of water, chemicals, power and trained personnel. Thus, a statement of the problem:

1. How can a film processing system be devised which is highly mobile (transportable), uses little or no water, a fraction of the normal power requirements and no highly trained processing personnel, as well as be immobile or transportable?

2. Can such a processing system maintain the volume, quality and timeliness of a permanently fixed overseas processing facility ~~reduce the processing time to one third~~ significantly compared to

such as [redacted] 25X1A

25X1A [redacted]

These are only two questions incorporating manifold problems and together would appear to require revolutionary new techniques to accomplish, however, I feel that most of the problems can be solved with "off the shelf" items and the others by employing recent "state of the art" 25X1A developments, all put together in proper sequence and physical layout.

In the fall of 1966 I discussed with [redacted] of Eastman Kodak the problems the Services have had in manning and equipping an aerial reconnaissance ~~Class A~~ film processing laboratory. The personnel problems are still serious service-wide for manning a lab with competent personnel and historically the problem will remain as it has in the past. The human element is too prevalent in today's processing and we still see ~~continuous~~ failures in ~~present~~ processing techniques mostly as a result of human error but to some degree a failure of overly complicated processing equipment.

25X1A Having identified the problems to [redacted] and having provided him 25X1A with detailed preliminary specifications, [redacted] and his technicians 25X1A worked on the problems item by item. We critiqued some of the solutions provided by [redacted] and work continued at Eastman in an attempt to meet 25X1A all the specifications. At the invitation of [redacted] I recently visited Eastman taking [redacted] along for technical advice. The meeting

25X1A

at Eastman was very encouraging and we ~~are convinced~~ feel certain that the major problems have now been solved.

Attached is a draft of a proposal with our specifications. Details of this specification paper have been attacked on an item by item basis and I am now convinced that the specifications can be met. There are some revolutionary techniques involved, but Kodak Park Research Laboratories ~~Park~~ developed materials which are unique for this processor system and I have seen the system elements operate in small prototype with not only interesting but exciting results.

The advantages of this processing concept are covered generally in the system description which follows; however, the impact of such a system on the reconnaissance business (not to mention other uses) is only limited by the imagination. One prime example is the consideration for use aboard an aircraft carrier where frequently over half the ship's daily fresh water supply ~~each day~~ is used by the photo lab; another is ~~the~~ as much as that photo lab installations at Tan Son Nhut where large quantities of polluted water are hauled by a tank truck from the river to settling tanks then filtered through a mass of frequently replaced filters to a storage tank for use in the lab. The proposed system obviously has exceptional merit for OSA operations. The savings in manpower, time and money are all significant and make the system desirable from several stand points.

in addition to bulk chemical shipments required

Recommendation:

That the Deputy Director for Science and Technology investigate this proposal, validate the specifications, and if proven consider requesting NRO to review the concept and proposal with the idea in mind of DD/S&T managing the development and production of the prototypes under NRO funding. I feel strongly enough about the concept that since the application potential is so widespread, and DSH represents only a small fraction of the possible consumer list I would encourage approval for NRO recommended to further pursue this project.

Some attention has been ~~paid~~ given to BIMAT for the processing of original negatives. This is a diffusion transfer process in which chemicals carried by one film base are brought in contact with the exposed but unprocessed negative. This results in a rapid "dry" development of the negative. Further, it is possible, under some conditions, to obtain a "usable" positive from the BIMAT film. Both the camera film and the BIMAT film are sticky and have a limited life without further treatment. In fact, they require further treatment before they can be used for viewing, printing, etc. Some alleviation of these problems has been accomplished by covering the BIMAT film (when it is useful as a positive) with a thin clear sheet which will adhere to the sticky surface. The life of such cover-sheeted film is still quite short. The same technique

cannot be applied to the negative without preventing it from being used for further reproduction in contact printers. And the life remains short.

Therefore, BIMAT has not attained great popularity since it still requires additional conventional equipment to extend its life and to permit reproduction. Nevertheless, attempts have been made to adopt it for such problems as gun camera films, the Morepix program etc., where short lengths of narrow films are involved which do not require a long life or multiple reproduction, (or where subsequent treatment is acceptable).

~~Recently~~ Now two additional components have been developed which can be used in conjunction with BIMAT and which, when used in conjunction with proper equipment, provide all the elements of a complete "dry" system for the processing and multi-reproduction of long lengths of any width film up to 9-1/2 inches. These two components are currently termed DRIMAT and DESIMAT.

DRIMAT is a chemically coated film which exhibits low covering power, i.e., there is little or no density developed in those areas in contact with low density areas of the film bein g processed. (This is the opposite of BIMAT). This makes it ideal for the production of printed duplicates since the DRIMAT acts simultaneously as a developing

agent and as a cover sheet. It could be used equally as well to process camera films where limited life is acceptable and reproduction is not required. Since the chemicals remain in the emulsion, deterioration of the image with time must be expected. We have, however, DRIMAT processed samples which have been maintained at 70-75° F for five months without loss of contained information (they do have a distinct yellowish cast). The product is too new to permit us to state probable useful life under other temperature and/or humidity conditions.

DESIMAT, the other new component, is a chemically treated absorbent tape which acts as a blotter to remove the water (and some salts) from BIMAT processed films. It leave them dry, clean and without stickiness. Films so treated can be handled in printers, viewers, etc., just as are conventionally processed films. Such DESIMAT treated films are not archival in keeping quality. They can be rendered so by washing and drying at a later date - several months later under normal conditions.

The machines required for this BIMAT - DRIMAT - DESIMAT system are simple, compact machines similar in many respects to a continuous contact printer. In fact, the DRIMAT can be applied using a modified printer, thus, combining a printer and processor in one machine.

Let's look at the advantages of such a system.

1. No local chemical mixing required. The materials can be prepared at any centralized location where facilities and skills are available. Transportation of bulky chemicals is eliminated.

2. Required equipment is compact and simple. Machines operating at 100 fpm or faster occupy less floor space than a conventional desk. Very little instruction in their use is required. A high degree of training and/or skill in photo-science ~~are~~ is not required.

3. Machines are versatile. One machine can be made to apply BIMAT, DRIMAT and DESIMAT. In effect, one machine, plus one printer is a complete processing lab.

4. Maintenance is low. There are few parts to corrode, wear, or become misaligned.

5. The processes are relatively independent of ambient and time. Close control of ambient temperature and humidity is not required. Hence, air-conditioning can be simple. Since the processes go to completion, time between operations is not critical (beyond a minimum).

6. Water requirements are extremely low. To insure contact of the film and the DESIMAT tape, the film surface is dampened. This requires about one gallon per 1000 square feet of film. As a corollary, no sewers are needed.

7. Power requirements are low. Conventional equipment requires considerable power to drive many rollers and to pump chemicals. Even more is required to heat air for drying the film. These conditions are eliminated or minimized in this system.

8. Independent of base facilities. Since little water and power and no sewers are needed, operation can be achieved almost anywhere by adding a small engine-generator.

9. Air transportable in a ready-to-use condition. All of the above add up to a layout which can be placed in a trailer or hut which is easily transported intact in conventional (C-130, C-141) cargo aircraft.

10. Low spare parts requirements. Since the machines are simple and use many parts in common, the spare parts support is greatly simplified.

11. Quality of the original negative is at least as good as that now produced by the best military field laboratories.

12. > see next page While they by no means offset the advantages, there are a few disadvantages to the proposed system.

1. Three new materials have been introduced. BIMAT, DRIMAT and DESIMAT can be likened to the other two films (camera and duplicating) in the system. In fact, it is not only desirable, but essential that BIMAT and DRIMAT be kept at a constant low (50° F or

or lower) temperature from manufacture until just before use. We envision this as the transport of a small completely stocked ~~reefer~~ refrigerated cooler.

2. DRIMAT processed duplicates are not reproducible. This is a true statement as written but, if a duplicate negative is required, the positive can be processed by BIMAT, cleaned by DESIMAT and then printed to obtain a dupe negative.

This can be restated as an advantage.

12. DRIMAT processed duplicates are normally ~~delivered to the PI~~ processed in this system in such a fashion that the duplicate itself is not reproducible. However, if a duplicate negative is desired it is a simple matter to process a dupe positive by BIMAT, clean by DESIMAT and then print to obtain a duplicate negative.

insert as #12 on preceding page.

NOTE: The whole idea of this system is to get the high quality sophisticated film to the P.I. in the shortest possible time by use of a very simplified processing system. If multiple duplicates of negatives or positives (made from 2 or 3) are needed, we would suggest that the original film be ~~processed~~ ~~air~~ delivered by air to the nearest Overseas Processing Center and duplicating and titling be done ~~as it is done today~~ in the conventional manner.