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26 November 58

MEMORANDUM FOR: Director of Development and Procurement, DPS/DCI

SUBJECT : Exploitation Equipment for CORONA Photography

REFERENCES : A. Draft letter from ITEK (Mr. Walter Levison) dated 19 November 1958.
B. Memorandum for SA/PD/DCI, subject "Trip Report - Program Review Conference, WS-117L and CORONA" from Director of Operations, dated 25 November 1958 [redacted]

1. Reference A. which is attached herewith is a draft letter from ITEK to me which was handed to me informally by Richard Leghorn on 20 November. He preferred to deliver it in this fashion still labeled as a draft and unsigned because it is by implication critical of Eastman and Leghorn understandably does not wish to have such a document become official and would prefer not to have it remain in our files. I request therefore that it be handled with appropriate discretion by all concerned.

2. The differences of opinion revealed in Levison's letter apparently came out into the open at the CORONA Program Review Conference on 20 November and is reported by [redacted] in paragraph 4 of Reference B. [redacted] recommends in paragraphs 4. and 5. of Reference B. that the Eastman and ITEK processors be studied by Headquarters personnel in order to resolve the conflict of opinion.

3. When Mr. Leghorn delivered Reference A. to me, I read it quickly and discussed it with him. In it Levison explains that the ITEK representative at [redacted] has not found it easy to evaluate photography processed on the Eastman processor and that there is, therefore, no objective comparative evaluation of the several types of equipment. Mr. Levison also states his impression that Eastman has other types of processors in mind of which ITEK has no knowledge. I explained to Mr. Leghorn that in view of the obvious delicacy of this situation I felt that we should immediately arrange for an evaluation of the equipment [redacted] is presently proposing to use, both the Eltron processor and any other that [redacted] may have in mind and that the individuals who do this evaluation should also study Mr. Levison's claims for the ITEK machine. I explained that I believed

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a quick preliminary evaluation of this sort was essential before we could either definitely authorize ITEK to rework the second machine of their design or alternatively reach a firm decision to use the Eastman equipment. Leghorn agreed that such a step was necessary and that we would have to make this judgment employing persons neutral as between the two companies.

4. At an Eastman minicard meeting which I attended coincidentially on 20 November I saw [redacted] and explained to him briefly that I would like to send someone to [redacted] in the near future to look at their processor. I believe he understood that I was concerned with the choice between Eastman and ITEK equipment and that we had a decision to make concerning further development work on the latter.

5. This is plainly a rather delicate competitive situation. It will be greatly contrary to our interest to allow this disagreement between ITEK and Eastman to develop any further and I am sure, at least at the level of top management, the two companies wish to preserve good relations. Accordingly I believe it to be essential and rather urgent that we use neutral personnel to evaluate the competing claims and to enable us to reach a prompt decision with respect to any further work to be done on the ITEK machine. This view, which I had arrived at independently in the manner recounted above, is in agreement with [redacted] recommendation in Reference B .

6. The main question I have concerns the choice of an individual or a group of individuals to perform this task. I am inclined to believe, especially since we must move quickly, that we should ask Mr. Lundahl for the best qualified person he can supply and that that individual and [redacted] should be our representatives for this purpose. There may well be a need for a meeting including a communications or electronics specialist and a representative of Operations but I believe this pressing matter of the selection of a processor should be handled separately. Accordingly, if the above-outlined course of action seems appropriate to all concerned, I would ask that Mr. Kucera immediately communicate with Mr. Lundahl and then telephone [redacted] to arrange for a visit of our people to [redacted] early next week. It is important, I feel, that Mr. Kucera explain frankly to [redacted] what is the purpose of the visit. Either before or immediately after such a visit our representatives should also meet with Walter Levison to hear anything further he has to say and to explain their views. I would like to have a

recommendation from our representatives through Mr. Kucera as soon as possible but not later than 4 December as to the action we should take on the ITEK proposal and to rework their second machine.

6. On 20 November I forwarded a request to [redacted] to have the second 461-L processor left in Boston until we could make this determination. If we should decide to have it reworked by ITEK appropriate steps will have to be taken with the Air Force to obtain the use of the equipment.

7. I have no comment to make on the quite separate subject of a 70mm printer and understand this business is going forward in channels. I would only comment that we are going to have to find some way to cut the total cost of new photo-interpretation equipment for CORONA.

RICHARD M. BISSELL, JR.
SA/PD/DCI

[redacted]

"DRAFT"

19 November 1958

Dear Sir:

At our meeting in Washington on 3 November 1958, the question of whether Itek should continue work on the processing machine for the special film was raised. At that time, I did not feel that I could give you a definite answer as to whether or not we had any positive contribution to make in this area. After reviewing the status of the processing equipment at ITEK Corporation and in New York, I now feel that we have something to contribute.

The situation is complicated to some extent by having equipment conceived by ITEK personnel, developed by [redacted] and operated by the New York group. To partially alleviate the communications problem, we have had one of our people stationed at the New York site on almost a continuous basis for the past few months. Nonetheless, his separation from the mother company has made it difficult for him to be as effective as we had originally hoped. Additionally, security procedures necessitate that all of the things which go on at the New York site do not necessarily fall under his cognizance. Furthermore, I have not as yet been privileged to read the comments prepared by the New York people on the equipment we had furnished to them and, as a consequence, I am in the peculiar position of having to rebut arguments which are as yet unknown.

The New York people have stated that machines capable of processing this film are in existence at their facility. Our man who has been stationed there knows of the existence of two pieces of equipment - - the Eltron Processor and the Dayton Machine. I further have information that the New York people have developed another machine, the characteristics of which are unknown to me. Conseuqently, we can discuss only the two pieces of equipment of which we do have knowledge.

The Eltron Processor

This machine uses a two stage processing technique and requires two separate processors, each in an individual room with a third room for film viewing and inspection. Each processor is approximately 26 feet long and has individual film dryers attached. The equipment requires total darkroom operation and this consists of:

1. First Processor - initial development, short stop, stabilization, Tamol and film drying.

2. Inspection - the film is then removed from the dryer and inspected under infrared light in a separate room. While viewing the film, a technician selects the amount of additional development required for each section of the roll and the film is cut into corresponding lengths according to the requirement for additional development.

3. Secondary Processor - separate film sections are passed to the secondary processors which contain developer, short stop, fixing bath, wash and drying.

4. Reassembly - after drying, the film sections are reassembled into their original order.

We are a little disturbed by the fact that the film is actually dried after it has been stabilized, and then of necessity rewet to continue development. This cannot enhance or maintain maximum image quality. We strongly suspect that a single processing procedure, or at least a machine which does not dry the film in the middle of processing, is highly desirable.

In order to control development on such a machine, it is necessary to pre-establish the minimum density level in the first processor and subsequently select additional time of processing for each section. The characteristics of the anticipated photography for this mission are such that this technique is not very satisfactory. The awkwardness of the operation, i.e., the drying, subsequent inspection and redevelopment, and the necessity for having essentially a separate machine for each new development time makes one compromise the number of second development steps. Our representative has observed that only two different additional development rates and one "no further processing" rate are normally selected. On the mission we are planning, illumination will change by at least one order of magnitude as the vehicle proceeds from north to south on each pass. Optimum development, consequently, would call for an infinite number of steps in development time. This is not compatible with the Eltron Processing technique.

par. 5

One additional point, applicable to both the Eltron and the Dayton machines, is that alternate rollers are on the emulsion side of the film. We consider this a severe disadvantage since this construction is conducive to scratching the emulsion and the consequent possible obscuration of detail.

The Dayton Machine

This processor utilizes spray processing techniques with variable processing rates of one foot per minute to eleven feet per minute. No provisions are available for viewing film during processing. We cannot consider the Dayton Machine as an adequate processor for this special mission.

Itek Processor

In designing the Itek Processor, we were interested in maintaining maximum image quality with a maximum variability in development to correspond to the changes in illumination which occurred in the 461-L mission. Whereas in the 461-L mission, photography was obtained from dawn to dusk with corresponding predictable illumination changes, in the current mission we envisage an illumination change which will start off at a minimum level and end at a maximum level on each successive pass. Nonetheless, the change in illumination level is gradual and again predictable. As a consequence, a processing machine should be capable of making small and programmed gradual changes in processing.

The Itek Processor is capable of being operated in just this way. The machine was designed to provide viewing of the developed negative with a minimum amount of film in the developer. A red light and infrared viewing station is provided after ten feet of film are developed. A white light viewing station is provided after 20 feet of film are developed and fixed. The development time is controlled by the rate of film flow through the machine and is continuously adjustable from 1 ft/min to 25 ft/min. At no time in the process does the emulsion side of the film pass over a roller. Furthermore, the processing cycle is quite conventional - - develop, fix, wash and dry.

We are aware of three defects in the Itek Processor:

1. Tracking of Thin Base Film

The Itek Processor was not designed for thin base film but rather for standard base. As a consequence, preliminary tests run at the New York site

have indicated that thin base film will not go through the processor. At this time, our analysis is insufficient to ascertain what is needed to correct this fault. We think, however, that overcoming defect number 2 (discussed below) would greatly help the situation. In addition, the material now used for the rollers is a relatively rough surfaced rubber. We believe that the substitution of a smoother surface on the rollers will materially help the tracking problem.

2. Torque Control on Feed Spool and Take-Up Spool

Insufficient attention has been paid to the problem of maintaining constant tension on both the feed spool and the take-up spool in the design of the Itek Processor. This has resulted in tracking difficulties on the standard base film. We would anticipate this has contributed greatly to tracking difficulties on the thin base film as well. We have, as a consequence, considered a fix on this problem which would essentially consist of putting a constant tension device on both the feed spool and the take-up spool. The device we have in mind is quite simple and is being used as a take-up method on the HYAC II camera. This modification can be performed quite simply.

3. Dryer Difficulties

The material chosen for the dryer rollers will deform under dryer temperatures. Consultation with the designer of the machine has indicated that new materials may be substituted for those used in the current design. However, it should be borne in mind that Mr. L. has requested that we investigate the use of a dehydration dryer in order to better preserve the geodetic characteristics of the film. Should this be done, the roller problem in the dryer section becomes insignificant.

The advantageous features of the Itek processing machine are that it is capable of being adjusted in small, gradual steps of processing time, it is designed so that the emulsion side never touches a roller and it is designed to produce maximum image quality by utilizing conventional techniques, i.e., development, fixing, and wash.

Because of the secure aspects of the processing laboratory, we have been unable to make direct comparisons between 461-L film processed on the existing equipment and 461-L film processed on the Itek machine. However, our representative has been able to do so indirectly and reports that there is a significant difference in the quality of the product as produced by these two machines. In all cases, the Itek machine produces a superior product.

Our position in this matter is to say the least anomalous. We recognize the difficulty of having a piece of our equipment at a processing station

which is run by essentially competitive personnel and because of this, we have more or less agreed that equipment which was to be operated by the New York people should be built by the New York people. We are at the same time more than competitively interested in the results of this mission and at this point, we cannot guarantee the results of the mission on the basis of the equipment of which we have knowledge.

70 Millimeter Printers

To the best of our knowledge, the 70 millimeter printer described by the representative from New York at the November 3, 1958 meeting is the same piece of equipment which is in service at SAC. This printer utilizes an uncollimated ultra-violet light source with manual exposure control which is achieved by means of selecting and adjusting one of six neutral density filters in the light path. Tension control is achieved by manual adjustment of two rheostats during the printing operation. We believe that this duplicator is capable of being operated by an extremely skilled man but is subject to many difficulties. Of maximum importance is the potential of slippage between the negative and the positive because of inequalities in tension. The machines which are in service are considered unsatisfactory for this very reason. The device that Itek modified - the Photo Devices Machine - has partially solved the problem of maintaining constant tension by the simple expedient of making the current in a torque motor proportional to the amount of film on the spool. This is achieved by a rheostat which is automatically adjusted by a follower on the take-up spools. We are not aware of any materials which have been printed on the New York device which have managed to achieve a 100 line per millimeter resolution. Indeed, early in the 461-L project, HYAC negatives were supplied to the New York facility for the purpose of duplication. The results were of poor quality in that they were improperly exposed and a significant reduction in the resolution had occured. Automatic exposure control in the Itek modification, the collimated light source, as well as the constant tension device all contribute to the high quality reproduction. It is our understanding that a relatively minor problem exists in the duplicator in that some banding may occur on the end of the frame due to insufficient response time of the servo system in the automatic diaphragm control. This is caused by the large DC pulse generated by the clear area between frames of succeeding exposures. This can be compensated for by changes in circuitry or by widening of the scanning slit. We have yet to see a

To R. S. Leyhor[redacted]

Date 11/19/58

From [redacted]

We must have
some sort of answer
on this by this Friday (11/21)
The equipment is
scheduled for shipment
next Monday (11/24).

[redacted]

"DRAFT"

19 November 1958

demonstrated capability on the part of the New York facility for reproduction at the 100 lines per millimeter level.

As a result of this evaluation, we are now prepared to offer an alternative proposal. First, we would propose to install the second 461-L processing machine in our facility, to modify it, and to test it sufficiently to guarantee its performance on thin base film. Installation of a machine such as this is a relatively expensive procedure. Nonetheless, we are not aware of a real existing capability for processing this film, and consequently, we are now firmly convinced that a modification to this machine would be a worthwhile program. Should this suit your requirements, we would be pleased to submit a proposal to you for accomplishing this task.

Insofar as the printers are concerned, we have agreed to modify one printer for Mr. L. and are preparing a cost estimate on this. We would suggest that one of your representatives run comparative tests on the Itek machine, currently at the New York facility, and the New York machines which are considered capable of doing the reproduction. Depending on the outcome of these tests at which we would prefer to have one of our representatives present, the decision could be made as to which machines should be used for the duplication. We would strongly advise that these tests be conducted as soon as feasible.

We trust you understand that our motives in preparing this brief memorandum are in the interest of obtaining the best possible product from this mission. We do not want to get into the processing business, but feel that there has been inadequate demonstration of a capability at the New York facility to guarantee the best possible product from this mission.

We would be pleased to elaborate further on any subject treated in this memorandum as you desire.

Very truly yours,

W. J. Levison