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January 23, 1962

Dear [redacted]

Itek Labs is pleased to submit the following proposal for a program of evaluation and analysis to be performed on operational material produced by the CORONA Program.

Historically, the development of conventional cameras and camera systems has involved an extended program of flight tests not only as a proving medium but also as a development tool. Such a flight test program has typically been characterized by: accessibility of the flight environment; relative low cost of the flight test in comparison with the cost of the development program; and the availability of personnel qualified to assess the results of the flight program. In this connection, since photographic imagery is a largely subjective device, a team of qualified assessors would normally include not only photographic scientists and engineers but personnel experienced in reconnaissance and able thereby to make a thoughtful subjective evaluation based upon past experience.

The program in which we are now engaged appears to be unique in that none of the three conditions cited above are readily realized. While the flight environment is accessible, it is not readily simulated in all respects. Even a reasonable approximation is extremely expensive, and certain aspects of the flight environment (such as gravitation forces) are effectively impossible to simulate except in very limited situations. If we despair of adequately simulating flight environment and use actual operating conditions as a test medium, the cost of a single such flight test greatly exceeds the entire development program cost. The very high quality of photographic results expected from this system, and indeed already achieved, appear to take it out of the experience of a great many reconnaissance men who would ordinarily be qualified to evaluate flight test results. The number of such persons qualified

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not merely to apply their past experience but to extrapolate it in order to achieve a subjected evaluation is very limited. There is therefore a need on the one hand to consolidate the limited number of such people into a task force, and on the other hand to include a high proportion of photographic scientists in the evaluating team.

Itek is fortunate in having available a relatively large number of persons experienced in one or more areas appropriate to the proposed task. In particular, men renowned in the field of military reconaissance form the hard core of Itek's technical complement. The significant contributions which Itek has made to the field of photophysics were made by scientists who are still on our research staff. Finally, of course, the Itek team that designed, built and tested the Corona instruments is intact and available to assist in this evaluation. We feel confident therefore that at no other institution will the Government find conditions so well suited to a careful, practical and exhaustive analysis of Corona material as at Itek Laboratories.

The analyses we propose fall into three main groups: photophysical measurements and analyses; detailed examination of physical characteristics; subjective analysis to determine quality of imagery. All three types of analysis will be performed against a historical background consisting of laboratory logs, instrument logs, test evaluation reports, post-flight evaluation and analysis reports, and a compendium of comments and other contributions from personnel at PIC and elsewhere.

The photographic analysis should include not only examination of the main format photography but the horizon optics as well. All auxiliary data should be examined. For the most part, it is unfortunately necessary to examine the original negatives since much information is lost in the positive print.

PHOTOPHYSICAL MEASUREMENTS

Microphotographs of a wide variety of detail will be made, at carefully-measured magnifications, to permit computations of ground-resolved distances.

Microdensitometer traces of the same areas will be made and correlated with the photomicrographs to obtain quantitative data about the contrast and frequency of fine detail.

Assuming that data will be available concerning the processing of the film, analyses of the reduction of contrast by the atmosphere can be made. By correlating densitometric data with solar elevation angle and processing information, it will be possible to develop exposure data which will confirm or correct the classical approach to exposure prediction that has been used to date. The results of this particular study will have direct application to future systems and to our ability to predict system performance.

It is possible that microdensitometer traces made at different attack angles through the same area can be cross-correlated to detect image

movement even though subjective viewing of the detail fails to reveal any movement.

EXAMINATION OF PHYSICAL CHARACTERISTICS

Format dimensions and physical locations of format elements will be measured at many places throughout the mission, in order to deduce as much as possible about the mechanical action of the instrument.

Thorough analysis will be made of physical defects in the film, such as scratches, pinholes, and other abrasions. Every attempt will be made to distinguish between defects developed during flight and those developed during processing.

Other degradations such as those caused by static charges, light leaks, chemical stains, etc. will be analyzed and their source determined wherever possible.

A detailed study and a history of the performance of the auxiliary optics will be made. This is particularly important in view of the recently developed hypothesis concerning shattering of the filter. For this analysis, a complete dossier of the performance throughout the entire series would be invaluable. It is worth noting that even in such a straightforward matter as the performance of the horizon optics, the limited viewing community is divided in its opinion.

EVALUATION OF IMAGERY

A detailed analysis of image quality over the format and throughout the mission will be made, particularly in order to show variations in the position of the film with respect to best focus position. This analysis is particularly important for those missions on which photographic performance was considerably below expectations. Although a tenable hypothesis has been developed to account for this poor performance, and although subsequent adjustments and modifications based on this hypothesis seem to have corrected the difficulty, it must be recognized that a very limited number of confirming flights (to wit, one) have since been recovered.

Comparison of the quality obtainable on different film types under identical conditions will be made. Such comparisons are important in making decisions concerning choice of film and/or camera system. It is widely recognized that flight results to date are in many cases inconsistent with predictions based upon published data or classical concepts.

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One of the prime benefits to accrue from a massive evaluation of the type proposed is that the individual facts learned during the evaluation can be integrated into a cohesive body of experience which will have direct applicability to future flights in the current series and to future designs for the same general mission.

SECURITY PROBLEMS

It is recognized that certain unique security problems would attend such an undertaking. Your comments in this area are solicited. Although it is likely that the security problems would be lessened if the proposed operation were conducted in Washington, we feel quite strongly that the risk involved is substantially outweighed by the gains which would be realized through performing this analysis in Boston, where personnel and equipment are available without delay. In this connection it should be noted that [redacted] from your security group is being attached as a resident security officer at our Newton plant and will be able to provide reliable supervision of our security controls.

You may wish to consider the desirability of distinguishing between photography of the ZI and other photography, thus probably decreasing the number of special clearances required; however, this would require the establishment of two evaluation phases, the first to be performed on engineering material only.

Although we visualize a total evaluation period of approximately four months, during which time two complete missions would be analyzed, it would probably not be necessary to hold the original negatives in Boston continuously. The early portion of the program would involve extensive measurements and the generation of duplicate materials, and would require that the originals remain in Boston for approximately two weeks. It might again be necessary to return the originals to Boston for approximately one week later in the four-month period.

We believe that the relative isolation of our Newton plant will make storage and handling of this material quite practicable. In any event, we are sure that there are no security problems which cannot be resolved to your satisfaction.

Sincerely,

Walter J. Levison

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