

SAPC 1153
Cy 1 of 2*H.I.M. Talked to Bob Scott —**281 As of 11 July 55 he has
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May 26, 1955

H.I.M.

In my last letter to you, I suggested that I would try to review the state of affairs on the Peco portion of our project.

On Tuesday, May 24, we had a day-long meeting in which all aspects of each project were discussed. I met with each of the project engineers in turn and brought myself up-to-date as to just where we stood.

I. Rework of 24" Lens. To date we have received 43 Pacific Optical lenses and 40 pairs of filters. We have had an opportunity to check the performance of 26 of these lenses and 23 of the pairs of filters. The last shipment was received on May 19, and at the moment is being examined. We have found that all lenses suffer more or less from inaccurate centering, and have come to the conclusion that the cells should be reworked to improve this purely mechanical defect. This work is now underway on a pilot run. From the optical point of view, under JGB's direction we have passed through two stages and are now engaged in a third. JGB provided us with a new formula calling for the modification of the radii of two of the curves and a respacing of the various elements. The lens was made incorporating these changes but showed a disappointingly small improvement in performance. The second attempt was the application of an aspheric figure to one of the surfaces in order to maximize the performance on-axis. The improvement was considerable, bringing the resolving power from 28 lines/mm up to 48 lines/mm in the immediate vicinity of the center of the field but the change at larger field angles was exceedingly small. Only the central portion of the surface is employed in producing on-axis images so we are now at work modifying the outer portions of the lens to improve the field performance. The results are not yet available from this third rework.

Two-thirds of the red filters examined do not show an appreciable reduction in resolution at the 50 lines/mm level. The remaining third must be discarded on the basis of this test. One-third of these filters, but not necessarily the same individuals, as the one-third above, show some striae. On the yellow filters, 24" examined do show striae but the reduction in resolution is only slight. A definitive report of all of these tests including the latest shipment of filters is now in preparation. As soon as this data is accumulated, we will ask JGB's opinion as to which individuals he would consider acceptable. One question, however, does face us. Since we plan to use the same filters with the new 24" lens as they gradually replace the reworked 24", we will have to obtain from some source additional filters as there are not enough acceptable ones in the present lot. The problem is in the glass and thus rework is not possible. Should we attempt to obtain additional finished filters for further selection or should we place an order for glass from which new ones could be made? It is to be borne in mind that the process of making the filters which have been supplied to us has already involved a selection of satisfactory glass from a larger lot.

II. Windows. As I mentioned to you a week or so ago, the tooling for the manufacture of the windows has been delayed by a strike at the foundry making the basic casting. Nevertheless, we are proceeding with finishing the first sets by hand. At the moment of writing, the entire requirement for June has been ground and polished and is now being edged. The first phase of this project involved some work on the physical properties of glass in order to establish appropriate thicknesses. This work has now been completed and a report covering results is enclosed.

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III. New 2 1/2" and New 36" Lenses. These lenses utilize two kinds of glass. The first type, LaK-9 is now on hand in sufficient quantity to make two 36" and fifteen 2 1/2" lenses. The other type, KzFs-4, we have been notified, is being shipped today from Germany. Melt data will be supplied to JGB during the early part of next week. From this he will have to supply us with a definitive optical design before we can proceed with the actual construction of any lenses. Prototype schedules are quite close but are still realizable if JGB can give final formulas very quickly. The cell designs are complete and have been released for manufacture. Coordination of these lenses with their various shutters and cameras has been completed so that work in those areas may proceed.

IV. Lens Test Device. This device has been in operation approximately one month and is being used for the determination of the resolution of the 2 1/2" lenses and their filters. We are extremely pleased with the data which this device is yielding and a report covering its operation and results is in preparation. We are somewhat disappointed with the lenses which have been tested by this method since the contrast capabilities of these lenses have proved to be considerably below what we expected based on the normal limiting resolution numbers. As an example, a lens having a limiting resolution of 25 lines (quite a good lens) turns out to have 50% contrast at only 8 or 10 lines.

V. Charting Camera. The optical design is complete and many of the glass parts are well advanced in their fabrication. The film transport mechanism for the prototype is now in operation and with the samples of film available works extremely well. After our conversation at Rochester, some careful measurements of the uniformity motion indicates that satisfactory operation may be expected. The big difference between the operation of this camera and the sort which we were talking about the other day is that the camera will work on reasonably carefully handled fresh negative stock whereas the devices which we were looking at are expected to operate with well-used positive stock over and over again under a wide variety of conditions as to past history of the stock. It turns out that the minimum slit openings are actually considerably wider than I had thought and that the real requirement is resolution rather than uniformity of exposure. These factors added together to give us considerable assurance that the mechanism as it is now designed will be satisfactory. The project engineer working on this problem has had considerable experience both with sound on film projection equipment and with projectors designed for television work. He wasn't unaware of the problem which was pointed out to us.

The automatic exposure control device has been made up in prototype form and looks very satisfactory on the bench. The schedule for delivery of the first camera appears wholly practical.

VI. Periscope. The optical design is complete and glass is now on order. The final specifications are as follows: The field lens has a 6 3/4" clear aperture, the entrance pupil is 3/4", and with an eye relief of 26" the true field is 38°, the power 0.375 and the exit pupil 2" in diameter. A power changer increasing the power and reducing the field has been under consideration and at various times was in or out depending upon the balance of the various advantages and disadvantages. At the moment the thought is it would be included but there is still some question as to getting it within the weight limit. Coordination of the mounting and the space requirements for this periscope have been worked out in considerable detail with EM. The present cockpit mock-up includes a model with the specifications described above.

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My recent trip to California turned up the information that the aircraft people had spent a considerable amount of time in establishing just what they wanted in the way of a hand control and other knobs and indicators. Among other things, we have now decided on a reversal of the direction of sensing of the hand control. This, unfortunately, will require a redesign of a portion of this control, and it is estimated that a two weeks' delay will result. We have examined the schedule with some care, and while it may not any longer be possible to meet the exact dates shown on some previous pieces of paper, the installation of this device will not materially suffer in any case. It was the opinion of all concerned that the change was worthwhile and should go ahead. We have coordinated the problem of coupling between the hand control and periscope since this will require some shafting through already crowded portions of the aircraft but no real difficulties have yet appeared. We are now building a wooden mock-up of the control panel for installation and approval.

VII. Computer. A report covering the design background on both the periscope and computer is enclosed, and although the report covers work carried on some weeks ago, there has been no significant change in our approach to this problem. Some portions of the memory unit have been built and placed on life-test. After 30,000 cycles, equivalent to perhaps 20 missions, no malfunction or significant wear has been uncovered. The moving pins which form the heart of the memory unit were a source of concern to us but we have been greatly encouraged by the life-test. A considerable problem in coordination of the electrical connections involving the computer, the hand control and the control panel, the recorder and other pieces of electronic equipment now faces us. We have made a small start but I am sure that it will take a considerable application of effort to straighten out all the details. I am sure that in the very near future it will be necessary for me to visit BFM for some other required information.

VIII. Mirrors for "B" and "C". There is very little new to report here since we have proceed about as far as we can go in our preliminary thinking and must await the delivery of the larger pieces of quartz, which are expected very soon, before continuing with the fabrication of mirrors.

IX. Configuration C. Our primary need is a more definitive optical design in order that we may get glass on order and begin to attack the details of the mounting. Some lay-out and study work is in process and some coordination with the engineers working on the film transport and reel mechanism has been started but it is not well-advanced. I have suggested that a quarter scale wooden model be constructed to simplify the problem of fitting the business together.

X. Test Equipment This aspect of our program is still practically at a standstill because except for certain standard pieces of equipment, collimators, illuminators, eyepieces, etc., we are awaiting description from JGB.

GENERAL. By and large I feel that all is going pretty well. We have not encountered any serious breaks in schedule or any technical problems of a sort which lead to difficulty. It is possible that the first periscope will be delayed because of the hand control but otherwise I am very encouraged. One area in which I am becoming apprehensive is the extremely heavy load which is building up for JGB within the next month. We expect him to complete the rework data on the 24" within the next week or so. Our schedule calls for the delivery of a definitive design on the 24" and 36" for Configuration B within just a few days of our delivery of the melt data to him. We are still pressing for preliminary design data on "C" and the optical

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test equipment of the special nature is still before us.

I hope this report will serve to bring you up-to-date with our progress.

A handwritten signature in cursive script, appearing to read "RMS", with a horizontal line underneath.

RMS/dmg