

NAFC 1152

Cy 1 of 1

May 23, 1955

25X1

H. I. M.

I thought you might like to have an informal report on my recent trip West.

A. Trip to Hycon - General

I must admit I was very favorably impressed by all aspects of the job which is being carried on at Plant 9. I had a bit more time this trip than previous ones and so dug quite deeply into the layouts and detailed drawings of their job. I feel that they have come directly to grips with the real problems and are not just skirting around the edges. Many of these problems have been solved in what looks to me like a workmanlike way and while there remain some that are yet to be brought under control, these are well recognized and manpower is being put to work on them. There are many pieces of hardware being worked on as well as much detailed drafting completed. All in all, it looks like a going operation.

I tried to arrive at an independent estimate as to how their schedule looks, and it is my opinion that we are about two weeks late on the very first items but that the schedule for the later items is still okay. They were aware of this shortage and were making strong efforts in the way of additional manpower both at high levels as well as in the ranks to make up the deficit. We talked to EM a bit on this subject and he pointed out that the original schedule between the photographic equipment and the aircraft had some elasticity and so he wasn't worried. It is one point, however, which I will continue to give close attention to. [redacted] whom you have met and who is their chief engineer, has been recently freed-up to give at least half his time to this specific project and he is taking as his primary task to make up this two weeks.

B. Specific Problems

B1. Film: At Hycon we talked a bit about the impact of the discussion at Rochester on the program. It was their unanimous opinion that any attempt to perforate this thin film would only lead to disaster. The stock is sufficiently on the borderline as far as physical strength is concerned as it is and any holes would be a fruitful source of tears and other breakdowns. They did feel, however, that the general problem of marking the film could be attacked and will go ahead on study of this approach with full steam. I understand that FT has postponed his trip to Europe and I plan to get in touch with him immediately to profit by his experience in this field, which I understand is wide. A tentative program would be to mark the film with consecutive numbers at one foot intervals so that there could never be any question of the order of the exposures. This would be done by the film manufacturer. We would then put a mark on the film while it was in the camera to indicate the location of the separation between pictures, and an additional mark at the end of each sequence, burst or interruption in the operation. These marks would be of such a nature as to be readable with infrared light or electrical contact before development. I have initiated a request, copy of which is enclosed, with Hycon for this new additional work. They understand the urgency but it will probably turn out that the very first units delivered will not be equipped with this device simply because of the lack of time. Before actual operations proceed, however, we should have the equipment and gain this experience with it. The reels for B & C have been decided upon and the enclosed sketch shows the standard arrangement.

CONTAINS SENSITIVE  
COMPARTMENTED INFORMATION

-2-

B2. Configuration A. As indicated above, the progress looks very good. It has been helped along considerably by EM for his group has aided in the structure analysis for the mounts. There is now no doubt in my mind that this configuration will be a satisfactorily operated one.

B3. Configuration B. I went over the layouts and design studies for this camera and it all looks good. Coordination drawings have passed back and forth, and I do not believe there are any major areas yet to be settled. I did check that alternate modes of wide or narrow strips may be selected as set on the ground before take-off.

B4. Configuration C. The principle problem here is one of vibration. I have reference to the long period oscillation of the aircraft itself in roll, pitch and yaw. High frequency vibrations are well under control. Our original simple concept of mounting the mass at center of gravity and letting the aircraft oscillate about the mass has gradually gone by the board. This concept appeared practical at the time when the only motion within the mass other than the film advance was that slow and easily counterbalanced change of oblique angle. Now, however, we have introduced a stereo angle and burst programming, both of which are fast, high acceleration in start and stop. It is felt that the dynamics problems of balancing out those real active torques produced by these motions will make the center of gravity mount quite impractical. Several alternatives were discussed. One of them, the standard AF Torquer mount appears to offer a solution. You will remember that this camera mount senses the angular oscillation of the mass and applies torques to the mass to counterbalance those oscillations. The air force has spent a very large sum of money for the development of such mounts and as yet they have not proved successful. In addition, they would be quite impractical for our application since they are quite heavy and rather large for weights as great as 450 lbs. The original thought of clamping the mass until such time as the angular velocities were small and then releasing it does not stand up to analysis for it turns out that the R M S value of the angular velocities as reported by the aircraft people never gets down to a low enough value to permit satisfactory exposure with this camera..

We examined in some detail the possibility of vibration release at minima in the individual directions of roll, pitch and yaw. The idea is to clamp the mass to the aircraft while changes were going on inside the mass and then release the mass in roll at the instant of minimum angular velocity, and then in pitch at the instant of minimum angular velocity, and then in yaw at its minimum angular velocity. This procedure would give a very stable mass but unsatisfactory at the periods of oscillation with which we are faced. This process would take some twelve seconds on the average. For coverage we must take exposures at intervals of the order of two seconds. I plan to ask Ed Purcell for his suggestions and advice in this general area.

One other point came up on Configuration C. The original layout shows the stereo axis as rotating with the mirror. While this might be arranged in such a way as to maintain the stereo angle independent of the oblique angle, it would call for an extremely complex programmer for the interval between stereo pairs would then depend on the oblique angle. We decided that a proper compromise would be to maintain the stereo axis horizontal and thus as the oblique angle increases the effective stereo angle decreases. Relationship is  $S = S_0 \cos \alpha$  where S is the true stereo angle,  $S_0$  is the angle at the Nadir and  $\alpha$  is the oblique angle.

-3-

When I saw you last I gave you a proposal on ground handling equipment and operations. You indicated a desire to make some revisions in our approach and I would very much appreciate an indication of your thoughts on this matter. I have received a definitive quotation from Hycon based on this approach but I would certainly like to revise it so as to agree with the one which you desire before submitting this quotation.

I spent some time discussing what was desired by your people in the way of technical support. It was our feeling from those discussions which [ ] and I had attended that you wished considerably more that what normally falls under the manufacturers Tech. Rep. activity. I have a proposal for Tech Support but before submission of this proposal I would like to have a clearer idea of just what you wish. The questions which are open in my mind involve such things as operational responsibility, engineering at the operational base, at depots and at the manufacturer's plant. The degree of training to be given to technical support personnel; are they to be capable of doing all jobs associated with operations; are they to be capable of teaching others to do these jobs, and are certain of our employees to be trained to assume responsibility for operations not only in the true technical sense but in planning, management, etc. The basic question here, of course is what is the role of the corporation whose employees are utilized for Tech Support. 25X1

#### EM AND THE VEHICLE

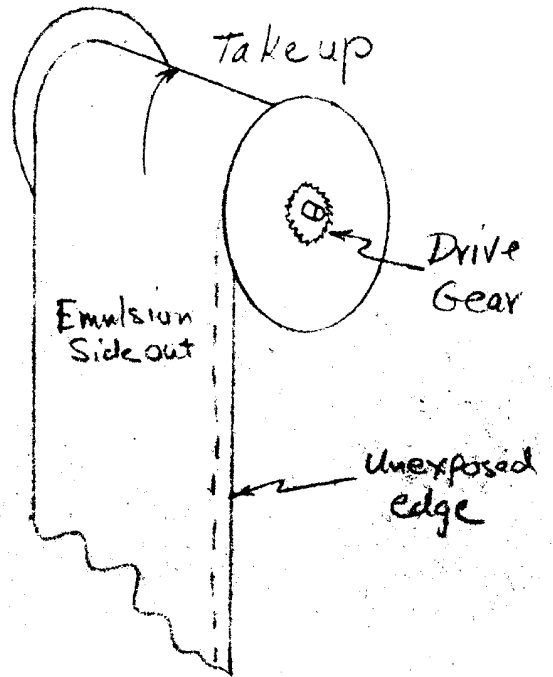
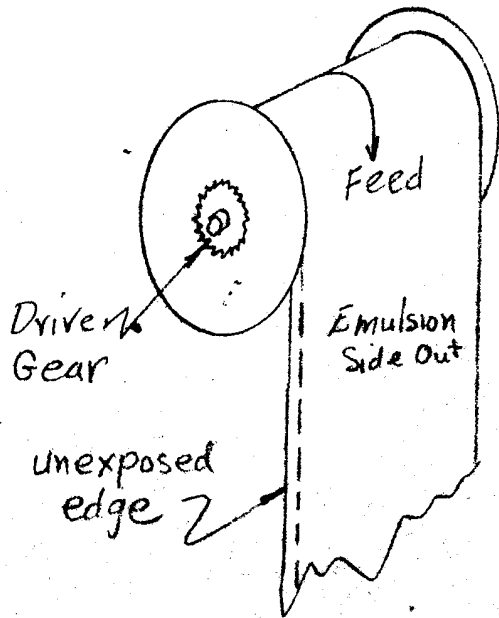
In the interim since my last visit, the test pilots and others have arrived at a clear cut desire as to the operation of the periscope. This involves first a reversal of the direction of the hand control. I would like to have you try this one out on Oz in order to obtain his reaction. The requirement now is that as you pull the hand control towards you this should move the line of sight ahead, and thus bring into view the same area that would be brought into view through a hole in the bottom if you had pulled the stick towards you and thus lifted the nose of the aircraft. In the same way positioning the control to the left is equivalent to dipping the left wing and thus the line of sight would go out to the right. I tried this myself in mock-up and I am inclined to agree that this is the natural direction for anyone with flight experience. A request for a certain mechanism permitting the direct reading of drift angle and ground support was made and it appears that these can be incorporated right on the panel. Some redesign of the hand control mechanism will be required but I have not had a chance to determine what effect this will have on the schedule.

We worked out a satisfactory mechanism for mounting the periscope in the aircraft and permitting its easy insertion and removal. I believe now that what looked like a very nasty job involving considerable structural difficulty can be handled quite simply. EM has been more than helpful in every way in making available all of the facilities at his disposal and they have been considerable.

I hope I have not bored you with all of these details but I thought you would like to be brought up to date as to where we stand in as many individual matters as is practical. Within a few days I will try to get another letter off to you covering the work at Peco.

Best personal regards.

P.S. I was not aware of your deep interest in the movies but I will bet as editor of the Exhibitor for 20 years it turned out to be a pretty good thing since this is a well-heeled industry.



Reel Loading for "B" & "C"

R. Bennett 23 May 55