SPECIAL HANDLING

REPORT FROM THE FEBRUARY 24th PANEL

The panel which was called together to study the Fulcrum device and two other proposals with somewhat similar goals, examined all three of these programs at a meeting February 23d and 24th. A very thorough briefing on the technical status of the Fulcrum camera was presented to the panel. On each of the other devices the briefing was about as detailed as the less advanced state of the engineering development permitted. The system requirements which are reflected in various technical choices in the three systems were outlined by the interested agencies. The panel addressed itself chiefly to the questions:

1. How confident can one be that the device will meet the performance goals?

2. Are there critical technical problems in any one of the proposed systems the solution of which is not in hand?

3. Is there a likelihood that unforeseen technical problems will be encountered in carrying a particular design to completion and operation?

4. In the light of one's judgment on the preceding questions, how great is the risk of serious delays in reaching operational status and assured operational reliability?

The investigation of the Fulcrum system has proceeded along the lines recommended by an earlier study. That panel which reported to you on , judging the Fulcrum concept to be an imaginative and promising approach, had singled out certain key technical problems whose solution was necessary for the success of the device. Among these were the problem of high speed film transport, aggravated by the rather intricate path required in the configuration as then conceived; problems associated with multiple passages of the same film strip; questions of rotational stability connected with the loading and unloading of very large spools; reliability of the cut-and-splice operation. Very significant progress has been made in answering some of these questions. This panel has been impressed by the technical skill and enthusiasm and energy with which the key problems have been attacked, and by the testing equipment and methods that have been developed in a relatively short time. The mechanical aspects of the rapid film transport appear to be under control. Also, a less tortuous and tricky film path has been worked out. Some of the dynamical problems inherent in the earlier configuration are circumvented in the

present design. Nevertheless, many of the questions which were of concern earlier remain open, the time and resources available having not sufficed for all the testing and development that their solution will require. In particular, effects that may arise in the film transport in the real space environment are still worrisome: One cannot be completely confident that the electrical corona problem will not reappear. The repeated exposure of the film strip to a dessicating vacuum is a potential source of trouble. The reliable control of the dynamic balance in the spools throughout a mission does not yet look easy, and the reliability of the cut-and-splice operation cannot yet be taken for granted.

This panel feels that there is a good possibility that all such problems could be solved ultimately. If there were no acceptable alternative to the Fulcrum camera system, a continued vigorous development of this concept would be thoroughly justified. It is the only one of the systems under review capable of a 120° scan. The panel would be unable to suggest any feasible alternate scheme, if the 120° scan requirement were made overriding. On the assumption that it is not an overriding requirement, and taking into account other features in the information-gathering capability of the competing systems, we feel that this unique property of the Fulcrum device does not outweigh the risk, namely, the risk that the novel and difficult problems which still remain cannot all be solved on schedule, and probably at this stage cannot all be foreseen. Not all panel members make the same assessment of this risk, but the majority agree on the recommended action. It shall be noted that our doubts about the practical possibility of timely completion of the Fulcrum system have been reinforced by learning that the engineers engaged in the development themselves foresee real difficulty in carrying through to successful completion on a tight schedule.

The other two systems under review are more conventional in concept. The elements in each system represent a relatively short evolutionary step from present practice. This gives one some confidence that critical and unforeseen technical problems will not prevent or seriously delay development to operation. Neither of these concepts has had as much testing as the Fulcrum system, nor were they as fully described to the panel. There are not many critical areas in the latter two, and nearly all of them are of the type that can be evaluated in ground tests. Other parts of the system can be developed with assurance while the critical areas are being studied. The Fulcrum system, on the other hand, seemed to most of us to have an interdependence of critical problems. However, a point is made by one member that it was not clear from the limited discussion that the thermal problems would be readily handled in systems two and three, and might not present a difficult tolerance limit in themselves. These

problems in past systems had proved to be a difficulty, and in the discussion of the Fulcrum system they did not appear to raise any special problems because of the symmetry of the system.

This panel is composed of members who are not temperamently averse to revolutionary developments, with the concomitant burdens, when they are necessary. Unless the 120° angle is an absolute requirement, it appears to the majority of the panel that in this program a revolutionary development is not necessary and that an evolutionary approach, with its much smaller risks, is the wiser choice for the next addition to the national reconnaissance capability.

One of the panel members believes that "Development of the Fulcrum system from the present laboratory hardware is a straightforward engineering problem, better understood and inherently no more difficult than the development of either of the competing systems." His position is that "Although this system may not be optimum, the good progress to date and the more thorough system analysis which has been done on this system compared with the others, justify at least tentative authorization for full-scale development. It should be remembered that any of these systems, at anywhere near the claimed cost, will actually save money over the present operations, in addition to contributing greatly to the national security." He feels that under such conditions an extended search for an optimum system (as contrasted with a workable system) is not only fruitless but harmful. The country can afford two such developments in order to be more nearly sure that at least one will be operable. His view, in addition, is that a contractor judgment that this system is less than optimum is less relevant than the same contractor's judgment that the system is feasible.

A view has been expressed within the panel that it would be unfortunate if the lines of development opened up by the Fulcrum work are now cut off by a negative decision on the system as a whole. Two members of the panel, in particular, would stress the potential value of new techniques for film transport, thermal control, and optical scan, and would regard any recommendation to abandon the whole Fulcrum approach as, at best, premature.

In conclusion the committee wishes to emphasize that it believes that the investigation undertaken in Fulcrum was valuable, informative, and stimulating, even though it does not seem prudent to the majority to push Fulcrum as a whole to conclusion. Far from regarding Fulcrum as something that should not have been undertaken, we feel it is exactly the kind of investigation that will be repeatedly needed and that its scope is

probably the necessary one for evaluation of any worthwhile fresh approach.

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26 April 1965