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Declass Review by NIMA / DoD

TS-159675-66
27 January 1966

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MEMORANDUM FOR: Chief, Technical Intelligence Division, NPIC
THROUGH: Chief, Information Processing Division, NPIC
SUBJECT: Computer Programming for the AP3 Stereo Plotter

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1. The meeting held between TID and [REDACTED] proved to be a most interesting event. Several very important points were brought up by [REDACTED] which directly affect TID, P&DS, and IPD. It is apparent that the mode of operation of this new piece of equipment has not been thoroughly thought out. At present there are several alternatives to the problem of preprocessing the necessary parameter data for the various camera systems. No matter what the decision is, its effect will be very far reaching. The three possibilities to the preprocessing technique are:

a. Measure and produce the necessary data on another comparator and process the data on the UNIVAC 490 in an off-line or batch mode. The output from this program would then be acceptable to the AP3 via the medium of paper tape.

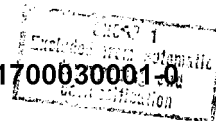
b. Measure and reduce the necessary data using the computer in the AP3.

c. Measure the data on the AP3 and transmit this information via the secured communication lines to the UNIVAC 490. The resultant data would be transmitted to the AP3 either electronically or to the teletype and punched into paper tape.

2. Considering the above proposals, b shows to be the weakest. This is because the computer imbedded in the AP3 is very slow with limited memory capacity and instruction repertoire. At present there is no software to aid the poor programmer in writing and debugging the program. All programs must be written in absolute code (i.e. numbers). This alone makes any programming for the AP3's extremely difficult and time consuming. Symbolic language compilers or assemblers have been

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part of the computer industry since early 1956. To return to the primitive ways would be a step backward. It is IPD's opinion that [REDACTED] is very delinquent in not supplying at least some form of symbolic language for their computer. Because of the difficulty in evolving programs for this machine and its hardware limitations, this consideration should be rejected.

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3. The most promising item and one which should be investigated carefully would be to have the AP3 in an on-line environment. The advantage of this system is that you have the complete power and flexibility of a large computer at the time you need it. The drawback for this consideration, however, is that it may take a much longer time to put the equipment on the air with a possible increase in cost. This consideration, however, should be carefully evaluated and not just rejected out of hand.

4. Consideration a has the best chance of producing a workable condition in the shortest period of time. This system would utilize in-house talent to develop the necessary preprocessing programs with the ability to update this preprocessor as new systems become available. IPD stands ready to support this project in whatever form TID requires.

5. The computer imbedded in the AP3 has many limitations which should be surmised to this time because I foresee serious problems in the development of sufficiently accurate math models. At present [REDACTED] assumes they are dealing with aircraft photography, that is, altitude of the exposure station in the neighborhood of 70,000 feet or less. A problem may occur, however, when the altitude is increased to satellite altitude, that is, [REDACTED]. This number converted to binary uses 21 bits. Any mathematical manipulation concerning altitude and other scaled numbers is subject to loss of significance and the resultant answers may have large inherent errors. The [REDACTED] computer has only 26 bits of significance, and because it has only fixed point arithmetic it is difficult to develop programs which will retain at least six significant digits of accuracy.

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6. If the above problems can be overcome and [REDACTED] produces the necessary computer programs, I believe that it would be a dilution of manpower and a waste of the Center's money to train TAB personnel on the AP3. To my knowledge, the cost of computer programmer training by all computer vendors is not chargeable. In this case I feel that NPIC should not be charged for any training. Programming in absolute language is terrible at best. To overcome this problem, it is strongly recommended that IPD monitor the programming portion of this contract. IPD alone in the Center has the experience and talent necessary to monitor a technical programming task.

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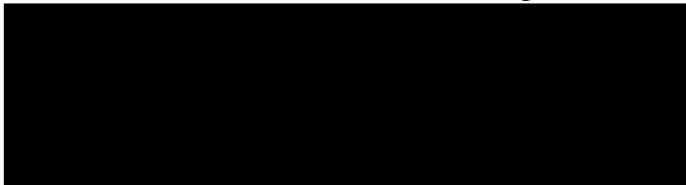
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7. The present status of the programming effort seems to still be within the general specifications stage. It is strongly urged that a detailed set of specifications be required of [redacted] before any additional programming is begun. It is further recommended that a definite amount of money be set aside for any programming identified within the contract; otherwise, delays and overrunning of the budget is highly possible.

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Chief, Programming Branch, IPD

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