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CONTROL SYSTEM

~~(S)~~ NATIONAL RECONNAISSANCE OFFICE
WASHINGTON, D.C.

Pro A 66

THE NRO STAFF

30 September 1975

FYI

WHEELER

MEMORANDUM FOR COLONEL WHEELER

SUBJECT: HEXAGON PCADs

Precision Cloud Area Delineators (PCADs) are used in the HEXAGON program to rapidly assess cloud cover on the processed imagery during interbucket countdown. DMA operates these devices for us at DMA-TC.

In the package at TAB A, DMA identifies a need for replacement units. In the memo at TAB B, we tasked Program B to develop a program to replace the PCADs. After considerable research and interface with DMA, OD&E determined that the new units are required and that they could best be procured by DMA (TABs C and D).

The message at the right advises DMA of our decision to fund the effort through them.

~~Recommend you sign the message.~~

DANIEL B. HUTCHISON
Lt Colonel, USAF

Attachments
1. BYE-47534-75
2. BYE-12898-75
3. PILOT 8034
4. PILOT 8803

Mr. [redacted] pulled the message and is working with DMA to get the job done. DMA will provide funding requirements by INOV; NRO Comptroller will then transfer funds.

HEXAGON

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DEFENSE MAPPING AGENCY
BUILDING 56, U.S. NAVAL OBSERVATORY
WASHINGTON, D.C. 20305

PPS

07 APR 1975

SUBJECT: Replacement of PCAD Equipment

TO: Director
National Reconnaissance Organization
ATTN: Lt Col D. Hutchinson
Washington, D.C. 20301

1. In accordance with telephone conversations during the week of 24 March 1975, between Lt Col Hutchison, NRO and [redacted] the Defense Mapping Agency requests your office initiate procurement of equipment to replace two Photo Coverage Assessment Digitizers (PCAD) which due to age and extensive use are becoming more difficult to keep in proper working order. [In the above conversations, Lt Col Hutchison agreed that NRO would purchase the replacement equipment.] The PCAD's were given to the DMA Topographic Center (DMATC), then USATOPOCOM, in January 1971 by SAFSS to be used exclusively in the evaluation of satellite photography for the Intelligence and MC&G communities. During satellite orbital operations, following each bucket return, the instruments must be operable 24 hours per day to meet DMA commitments for timely response to NRO.

2. During the past year, the PCAD's were down for maintenance 105 times, or approximately 400 hours. Based on a request for replacement from DMATC (Enclosure 1), a shut down during a critical operations period would force the evaluation team into manual procedures, resulting in a 4X slow down or up to 12 days based on present response time.

3. As a precaution against such a breakdown, and in view of the amount of maintenance required to date, DMA recommends that this equipment be replaced during FY 76. The estimated cost of replacement equipment, including software, is $150,000 each for a total cost of $300,000. A contractor's evaluation concerning the condition of the PCAD hardware is enclosed for your information (Enclosure 2). DMA has not discussed cost with this contractor. Our estimates are based on replacement of hardware and software rather than modification of present components which is an alternative mentioned in Enclosure 2. In our opinion, modification of the present components is not acceptable since it is, in essence, merely

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BYE-475334-75

HANDLE VIA TABA BYEMAN-TALENT-KEYHOLE CONTROL SYSTEMS JOINTLY

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postponing the inevitable without obtaining any compensating benefits. Replacement is indicated to solve the problem.

4. DMA can provide NRO technical assistance, as required, in fulfilling this request. Point of contact in DMA is [redacted]

FOR THE DIRECTOR:

[redacted]

2 Enclosures a/s

Deputy Director for Programs,
Production and Operations

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EQUIPMENT PROCUREMENT PROPOSAL

Component: DMATC

DMIS/E Category: 1G

Line Item Ident: 01

Item: Photo Coverage Assessment Device

1. MISSION AND PROGRAM SUPPORTED:

a. The Photo Coverage Assessment Digitizer (PCAD) is a Calma digital table interfaced with a Raytheon 703 computer and tape drive unit. It is used to determine areas of clear photography accessed by Keyhole missions. The results are relayed to NRO operations facilities per DMA commitment. There are two PCAD's located at DMATC which require 6,000 manhours a year to operate.

b. These devices have been in operation since January 1971. In FY 1974, the PCAD's were down 105 separate times for a total of 400 hours, and $3,965 was spent for parts. The required repair costs so far this year have totaled over $2,500 and it is anticipated that the PCAD's will require increasingly more maintenance next year. An engineer hired to perform some trouble shooting has prepared a paper to identify specific problem areas.

2. COST DATA:

a. Evaluations could be performed manually, however, this would require a greater expenditure of manhours and materials and would increase the calendar time for completion. Manhour costs for a manual evaluation are estimated to be approximately 4.2 times greater than a PCAD evaluation. The estimated savings per annum over the manual operation is $148,000. The manual operation will take an average of 30 minutes per frame as opposed to 7 minutes for the PCAD. One complete manual evaluation process (one mission) would cost $192,000.

b. The equipment, the central processing unit, the tape drives and digital table are requiring abnormal amounts of repairs. Parts that are necessary for some repairs are becoming increasingly harder to find, as some of the equipment is now obsolete and no longer manufactures.

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3. Impact Statement:

The PCAD's were acquired to perform timely and accurate photographic evaluations in support of Intelligence and mapping requirements. It is imperative that the equipment be reliable and in a state of readiness. If one of these devices were to become inoperable during critical "turnaround" time (27-35 hours for Keyhole mission operations), the loss of response time (using one PCAD with, or without, supplemental manual evaluations) could not be recovered. Information vital to the success of the mission could not be used effectively because of its non-availability.

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Chesapeake
INSTRUMENT CORPORATION

Shadyside, Maryland 20867
Telephone (301) 867-2151

26 February 1975

Defense Mapping Agency
Topographic Center
6500 Brooks Lane
Washington, D. C.

Attention: Mr. [redacted]
Code 50310

Dear [redacted]

In response to your request, I have made an attempt at making an evaluation of the present PCAD systems. I am also making general recommendations for any new PCAD systems you may procure in the near future.

The primary considerations of the two existing PCAD systems are their reliability and maintainability. Due to the nature of your application, long downtimes are intolerable. From my own experience in assisting you in maintaining the equipment, it has become obvious to me that the reliability of the systems has diminished considerably due to their age. Mechanical parts are wearing out. Aged germanium transistors are losing gain and causing intermittent and marginal operation, which means, more times than not, a lengthy and extremely difficult troubleshooting session to find and correct the problem. We are having more and more problems locating replacement parts, simply because many of them are no longer in production. The state-of-the-art has improved considerably and replaced these older parts almost universally. The market for the older parts is no longer sufficient to entice continued production. As an example, there was recently a problem with worn tape heads. The manufacturer, Potter Instrument Company was contacted and it was found that the heads are no longer in production. After some delay they were able to replace the heads with some of nearly the same type as the original, only because their field service man happened to have a couple left over. He said that we were lucky because our tape transports were obsolete and that these were probably the only ones still in use. The newer tape heads are made using a new process which makes the head much harder and improves wear characteristics dramatically. I inquired about the possibility of replacing the worn heads with the newer type, and was informed that it would require considerable modification to our machines and the cost would be prohibitive.

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INSTRUMENT CORPORATION

It is, therefore, my opinion that the present PCAD systems can no longer satisfy your reliability requirements. I recommend a more thorough evaluation of the possibility of updating the present systems in order to improve reliability and maintainability, than I have had time to do thus far. There is some hope that the old systems can be salvaged. Unfortunately, all too often it is not practical to update old equipment with newer components because the state-of-the-art is such now that the system, as a whole, must be restructured in order to use the newer components.

Concurrent with this investigation, I recommend that a new, but similar, PCAD system be developed using state-of-the-art components with demonstrated reliability. It is my opinion that any thought of duplicating the old PCAD systems should definitely be abandoned. I feel confident that a much simpler, more reliable system can be developed today, and that the cost of the hardware will probably be significantly less than that of the original systems. The cost of the investigation and development I have recommended would be almost certainly worthwhile, if not absolutely necessary to meet your requirements.

Reliability should be kept uppermost in mind in the development of any new PCAD system. The old systems successfully achieved reliability in producing error-free tapes. What we would like to improve is the hardware reliability.

Maintainability is at least of equal importance. Every design effort should be made to simplify system hardware troubleshooting and maintenance. Failures are not so much a problem if they can be quickly repaired. I feel that the old systems are much more difficult to troubleshoot than they should be; some past failures have required days of troubleshooting by trained personnel. I am sure that with today's technology, we can improve the PCAD system in this regard also.

A device which I think will contribute greatly to the solutions of the aforementioned problems is the micro-processor, sometimes referred to as micro-computer or micro-controller. These devices, which have been around for several years now, have demonstrated reliability and are being used increasingly to replace complicated, special-purpose logic systems. In the PCAD system there are several interfaces and controllers which can now be replaced with a much cheaper and simpler micro-processor system. The cost and size of such a micro-processor system should be low enough that spares could be kept on hand. When a controller fails, replace it with a spare and repair the defective unit later. The size, complexity and cost of the present PCAD interfaces and controllers make this concept most impractical.

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Chesapeake
INSTRUMENT CORPORATION

Defense Mapping Agency
Attn: Mr. [redacted]

26 February 1975

I hope this evaluation is helpful and sufficient for your present needs. I will be glad to do what I can to answer any other questions you might have concerning this or other matters. I am presently associated with Chesapeake Instrument Corporation of Shady Side, Maryland, a company experienced in the development and design of high reliability military electronic systems. We have personnel who routinely perform system reliability studies, as well as a well-rounded electronic and mechanical engineering staff. I am sure that Chesapeake would welcome the opportunity to assist you in any further examination of your systems. If you are at all interested in this idea, I will promptly arrange a meeting with our management. Our plants are near enough to you that we can meet with you whenever you desire.

Whatever your decision is, I hope that I have rendered some assistance and that I can continue to assist you.

Very truly yours,

CHESAPEAKE INSTRUMENT CORPORATION

Donelson Christmas

Donelson Christmas
Senior Engineer

DC:elw

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THE NRO STAFF

15 May 1975

MEMORANDUM FOR MR. DIRKS, D/OD&E/DDS&T

SUBJECT: Procurement of Photo Coverage Assessment Digitizers for DMA

The Defense Mapping Agency has requested that the NRO procure new Photo Coverage Assessment Digitizers (PCAD) to replace the existing worn-out hardware. The DMA correspondence on technical requirements and estimated costs is attached.

Since OD&E procured the original items, and since you have the compatible software and the technical capability to support the procurement, it is requested that you evaluate the DMA procurement request. If you concur in the DMA assessment, please submit the funding requirements as an addenda to the FY 76/77 HEXAGON support budget. The desired schedule (to be accelerated if practical) is as follows:

30 May 1975 - Budget to NRO Comptroller

1 July 1976 - Delivery of first unit

31 December 1976- Delivery of second and final unit

Contractual arrangements for new PCAD hardware should be such that the contractor is responsive to DMA for installation, checkout, acceptance and warranty maintenance.

Harold P. Wheeler

HAROLD P. WHEELER, JR.
Colonel, USAF
Director

Atch
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cc: [redacted], SAG/OD&E
DMA

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R 122240Z
BT
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GUARD 054
GUARD PASS WHIG

S E C R E T 122240Z SEP 75 SPECIAL DESIGNEES
CITE PILOT 0034.
TO: WHIG.
FOR HUTCHISON
HANDLE VIA BYEMAN CHANNELS ONLY
SECUR HEXAGON
SUBJ: PCAD

1. THE PCAD DEVICE PURCHASED IN LATE 1974 COST APPROX 225K. THIS DEVICE IS A BASIC UNIT WITH NO PERIPHERAL. DMA HAS IDENTIFIED SEVERAL FUNCTIONAL ADDITIONS THAT ARE DESIGNED TO IMPROVE HIS ACCURACY AND TURN AROUND TIME.

2. CONSIDERING THE BASE UNIT COST OF 225K AND THE IDENTIFIED PERIPHERAL COST OF APPROX 100K, THE UNIT COST COULD BE 325K, OR 650K FOR BOTH UNITS. THIS PRICE DOES NOT INCLUDE SPARE PARTS OR A MAINTENANCE CONTRACT.

3. OTHER VENDORS ARE BEING CONTACTED WHICH HAVE BUILT INSTRUMENTS SIMILAR TO THE PCAD DEVICE. IT IS FELT THAT SOME OF THESE CAN BUILD A COMPARABLE INSTRUMENT FOR LESS THAN THE 325K QUOTED ABOVE. YOU WILL BE KEPT INFORMED OF OUR INVESTIGATION. E-2 IMPDET.

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TAB C

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XXXXX
GUARD 085
GUARD PASS WHIG

AA 9862

~~S E C R E T~~ 292337Z SEP 75 SPECIAL DESIGNEES
CITE PILOT 8833.
TO: WHIG.
HANDLE VIA BYEMAN CONTROL SYSTEM
ATTN: COL. HUTCHISON
SUBJ: PCAD PROCUREMENT
REF: A. BYE-12898-75
B. PILOT 8834

1. REFERENCE A REQUESTED THAT WE EVALUATE THE DMA PROCUREMENT REQUEST FOR PCAD AND, IF WE CONCURRED WITH THE NEED FOR THE UNITS, SUBMIT FUNDING REQUIREMENTS.

2. ESTIMATED FUNDING REQUIREMENTS WERE SUBMITTED IN REFERENCE B BASED ON SOLE SOURCE PROCUREMENT FROM AUTOMETRICS/RAYTHEON.

3. SUBSEQUENT TO THE SUBMITTAL, WE HAVE IDENTIFIED ANOTHER CONTRACTOR, CALMA, WHO IS CAPABLE OF FABRICATING THE DEVICE AND IT APPEARS THE COST WOULD BE LESS THAN THE AUTOMETRICS ESTIMATE.

4. WE CONCUR THAT DMA NEEDS THE UNITS AND RECOMMEND THAT:

A. THE PROCUREMENT BE ACCOMPLISHED BY DMA.

B. THE RFP'S SHOULD BE FOR AN UNCLASSIFIED PROCUREMENT.

C. OD&E TO REVIEW THE PROPOSALS AND DMA DIRECTIVE ACTIONS

PAGE 2 PILOT 8833 ~~S E C R E T~~
TO ASSURE THAT THE PCAD REMAINS COMPATIBLE WITH NRP REQUIREMENTS. E-2 IMPDET.
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TAB D.

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