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

Dr. Cook

FILE
PRO

A 6 e(4)b

THE NRO STAFF

MEMORANDUM FOR MR. PLUMMER

SUBJECT: Itek's Analysis of the Metric Pan

A copy of Itek's briefing to Dr. Cook and Dr. Hall which raised questions about the utility and feasibility of the Metric Pan System (MPS) is at TAB A. Itek had two main points:

A. An MPS with a 5 arc second attitude error would not be useful, and

B. The ability to hold the error to 5 seconds is doubtful.

We had DMA double check the vertical positional error claimed by Itek due to the 5 second attitude error, and they determined that Itek must have been assuming a scan angle of 60°. As DMA's 25 February 1975 input to us shows (TAB B), a 5 second MPS will not meet the requirement outside 45° scan. DMA has considered this in their collection analysis, as we take little imagery outside 45°.

Lt Colonel Hutchison, Colonel Anderson (SP's HEXAGON Program Manager), and Dr. Howard of Aerospace reviewed the Perkin-Elmer error budget and supporting analyses and test results at the Danbury plant on 16 October 1975. As the result of that review, it was concluded that the largest concern of Itek's, 20 microns of non-linear smear, was invalid. It was also concluded, however, that Perkin-Elmer's 4.9 second error budget might be optimistic, more suitable for a goal than a hard specification. A summary of Perkin-Elmer's analysis is at TAB C.

At this point DMA stated that their analysis (TAB B) shows that 5 seconds is acceptable as a goal, if 10 seconds is set as the limit. Based on this 5 to 10 second requirement set by DMA, SAFSP concluded that the MPS was a low risk program.

HEXAGON

It is our understanding that Itek has presented their analysis to ASD(I) and generated enough concern for Dr. Hall to delay sending a Mapping Camera System/MPS decision memorandum until after he has consulted with you.

In summary, we have shown the Itek Analysis to be invalid, and it is recommended that it be so reflected in your discussion with Dr. Hall. There is no technical reason that this decision memorandum should be further delayed.

HAROLD P. WHEELER, JR.
Colonel, USAF
Director

Attachments

ABSOLUTE POSITIONING
(METERS, 1∇)

REQUIREMENTS

	1965 USIB	6/75 J SOP FIRM	6/75 J SOP TECHNICAL OBJECTIVE	75/55 EXPECTED FUTURE REQMT (1,4)
∇_x	64	29 64 62	36 12	29 10.7
∇_y	64	29 64 62	36 12	29 10.7
∇_z	55	17 46 29	32 14	18 10.6

CAPABILITY

	CURRENT FRAME(1)	FRAME WITH GEOPACK (3)	3 SEC PAN (2) WITH GEOPACK	5 SEC PAN WITH GEOPACK
∇_x	19	13	10	11
∇_y	19	13	11	11
∇_z	14	12	13	16

NOTES (1) SOURCE: DMA

(2) ABSOLUTE ATTITUDE DETERMINATION

(3) GEOPACK OPERATIONAL ON SV-13 (1977)

(4) COVERAGE 3000 HARD TARGETS IN DENIED AREAS

DMA SAYS ~10.4

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RELATIVE POSITIONING
(METERS, 1 ∇)

	REQUIREMENTS			CAPABILITY		
	1:50,000 CLASS A MAP	PAVE STRIKE	1:250,000 CLASS A MAP	CURRENT FRAME	2 SEC PAN	5 SEC PAN
∇_x	12	13	59	8	2	4
∇_y	12	13	59	8	4 - 7	8 - 14
∇_z	3	9	15	6(1)	8(2)	15(2)
IST.	10-20 N. MI	300 N. MI.	20 N. MI.			
OVERAGE REQUIRED	SELECTED		WORLD WIDE			

NOTES

1) PRODUCTION ACTUALS
2) BEST-CASE ESTIMATE INCLUDING ATTITUDE ERROR AND 10 μM MENSURATION ERROR ONLY; ONLY 2 MODELS

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SOURCES OF UNCERTAINTY IN PAN CALIBRATION

- STUDY 10176 (1974) - ADVANCED PAN CAMERA BREADBOARD TEST

  ± 20 MICRONS DYNAMIC FILM STRETCH

- STUDY 10092 (1975) - PAN CALIBRATION VERIFICATION (SV 7)

  UNEXPLAINED INCONSISTENCY BETWEEN SCAN ANGLE AND TIMING MARK POSITIONS

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1.6μ → 1 sec

SOURCES OF PAN ERROR

	SEC
DYNAMICS BETWEEN SCAN ANGLE MARKS	2.5
.001 INCH BEARING RUNOUT .0002" spec	2.0 → 1.5
13 BIT ENCODER (J% CALIBRATION ACCURACY)	1.0
STELLAR TO PAN BORESIGHT (KNEE) CALIBRATION	2.0 → 2.2
STELLAR TO PAN BORESIGHT STABILITY	1.0
ATTITUDE SENSOR INTERNAL STABILITY	1.0 ½ → 1.5
SCAN RATE UNCERTAINTY	1.8
PLATEN-LENS LOCK UNCERTAINTY	2.0 < 1
RSS TOTAL	4.9

CONCLUSION: 5 SEC REQUIRES UNREALISTIC ERROR BUDGET

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REASONS FOR MORE FRAME CAMERAS

- UNCERTAINTY IF PAN CAN BE CALIBRATED TO REQUIRED ACCURACY
- IMPROVED ABSOLUTE POSITIONING WITH GEOPACK STARTING IN 1977
- ECONOMY IN MAP PRODUCTION
- RELIABILITY - LOSS OF SINGLE PAN MEANS NO MAPPING
  - LOSS OF SINGLE STELLAR HAS 3X IMPACT ON PAN COMPARED TO FRAME
- DEDICATED COVERAGE FOR MAPPING REQUIREMENTS

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