BYEMAN

~~TS~~ NATIONAL RECONNAISSANCE OFFICE
WASHINGTON, D.C.

PRO-N-4

THE NRO STAFF

10 March 1971

MEMORANDUM FOR COLONEL SWEENEY

SUBJECT: Requirements for the KH-9 Mapping Camera

For over a year Major Lehmann and myself have been needling the COMIREX MC&G Working Group on the matter of improving the statement of requirements for the HEXAGON mapping camera.

While our comments have at least provoked some thought among the users, nothing in the way of a formal response has been forthcoming. Major Lehmann has advised me that we will have the software capability to simulate mapping camera operation about the first of April. Such simulations will be critical to SS-4 in developing efficient collection procedures and likewise important to SS-7 in providing harder criteria on which to base projected launch/procurement rates.

The requirements as presently stated only establish the total area for collection and do not specify location, relative priority, and applicable collection constraints and specifications. This latter information must be provided before any decent simulations can be attempted. Background documents which establish the currently stated requirements are at TABs A, B, and C.

An additional matter, again related to requirements, is consideration of any mapping camera system improvements. Itek has suggested a number of these which they would be most happy to pursue. These were referred to SAFSP (SP-7), who in the absence of any requirement referred them to SP-6 as potential applied research, who passed them to me (TAB D). I in turn have mentioned them to the MC&G Working Group and to the TOPOCOM people who are in direct support of the project. Not much enthusiasm resulted. This I believe is due to two factors. The launch of the first camera is some time off (December 1972), which is not conducive to thinking about system changes, and nobody wants to rock the boat on a

project that was difficult to get initiated in the first place. I would, however, like to get some sort of formal response on the subject before dropping it from consideration and telling Itek to forget it.

The proposed memorandum at the right is designed to get the MC&G Working Group moving on the above subjects. It is recommended that you dispatch it.

ROBERT A. SCHOV, JR.
Major, CE, USA

Atchs
TAB A, Pgs 13-15, BYE 157-69,
Reqmts for Mapping/Charting
Coverage
TAB B, Pgs 15-16, BYE 2250-68,
KH-9 Collection Rate Outside
Sino-Soviet Area
TAB C, TCS 654179/70 (PRO A-1-f/70)
TAB D, BYE 94902/70 w/atch (PRO A6e1)

TALENT-KEYHOLE

NATIONAL RECONNAISSANCE OFFICE
Washington, D.C.

22 March 1971

MEMORANDUM FOR CHAIRMAN, COMIREX MAPPING, CHARTING, AND GEODESY WORKING GROUP

SUBJECT: Requirements for the KH-9 Mapping Camera

It has come to my attention that amplification of the MC&G requirements currently recognized by the COMIREX is required to support adequate planning by the NRO for efficient management of the KH-9, 12-inch focal length mapping camera program.

The currently recognized requirements, as specified in USIB-D-48.4/32 (COMIREX-D-15.2/14), dated 10 November 1969, state a requirement of 14.3 - 21.1M NM^2 of net coverage to be obtained during the first three years of operation of the main and mapping cameras and 2.3 - 3.6M NM^2 annually thereafter. As such, this statement of requirements reflects only that portion of the coverage for mapping camera collection which coincides with the MC&G requirement for main camera collection outside the Sino-Soviet area.

In recognition of the fact that the above did not represent the total collection requirement for the mapping camera, the NRO made certain increases to these figures for planning purposes. Based on draft input by the MC&G Working Group to COMIREX-D-15.2/8, dated 5 June 1968, it was noted that there was an additional requirement for some 7.5 - 11.5M NM^2 during the first three years for mapping camera coverage only, followed by .75 - 1.5M NM^2 annually thereafter in support of small and medium-scale production. Based on the advice provided by the MC&G Working Group in February 1970 that there was a requirement for the mapping camera to collect 50 - 60% of the area inside the Sino-Soviet Bloc during the first three years of operation, the initial requirement was increased by another 5-6M NM^2.

In summary, it would appear that some 26.8 - 38.4M NM^2 have been identified for collection by the mapping camera during the first three years of operation (up to 12.8M NM^2 annually) followed by 3.0 - 5.3M NM^2 annually thereafter.

TALENT-KEYHOLE

TOP SECRET

TCS-37371-71

The above information has been adequate in the past for general planning. There are, however, several reasons why a more specific and detailed amplification of the requirements is needed in the immediate future.

The NRO will acquire the software capability to realistically simulate mapping camera mission operations about 1 April. Such simulations will be very critical to the development of efficient collection procedures for the mapping camera and for forecasting requirements satisfaction. A necessary input will be the exact geographical delineation of the area requirements, relative priorities, and any applicable collection restraints and specifications such as sun angle, percentage of stereo overlap, altitude, seasonal considerations, etc. It is requested such guidance be furnished as soon as possible. In addition, action should be taken to ultimately obtain formal COMIREX approval of the total MC&G requirement.

A related area of concern is the matter of mapping camera procurement. Six instruments are currently under contract. Proposals for the follow-on buy have already been received and can be expected to be negotiated next month. The above mentioned simulations are required if better planning factors are to be developed with regard to launch/procurement rates, and the negotiations and/or subsequent adjustments to system procurement would benefit materially.

In addition, the mapping camera contractor has suggested a number of potential system improvements for study and possible incorporation. A summary of the suggested improvements is attached. The NRO has no basis for proceeding with any of these and has in general made no provision for any system changes within the NRP. It is requested that you review the attached listing and provide such comment and justification pertaining to these or any other potential system improvements as you may deem appropriate. It should be noted that even though the launch of the first mapping camera is nearly two years in the future, procurement/development lead times and the limited availability of NRP resources dictate that this matter receive the earliest possible consideration.

The NRO recognized that the KH-9 mapping camera has been designed and will be operated for the sole benefit of the MC&G community; a situation which has not existed since

the KH-5 program. We are most desirous of achieving the maximum potential from the system. Our success will depend to a very great degree on the guidance you provide.

EDWIN F. SWEENEY
Colonel, USAF
Director
NRO Staff

Atch
Suggested Potential KH-9
Mapping Camera Improvements

DCS-37571-7

Suggested Potential KH-9 Mapping Camera Improvements

Tasks

A. Task 1 - Increase SI Cycle Rate

1. Objective - Introduce a minimum cycle time of six seconds to attain quadruple overlap at 80 NM, i.e., to assist in better determination of relative heighting determination at any given altitude (approximately 10 percent improvement).

2. Description - Study to determine effects on system design of implementing a six-second minimum cycle time.

3. Impact - Category 1.

B. Task 2 - Filter Changer

1. Objective - To insure optimum performance with mixed film loads of color and black-and-white in the SI. Lens design with adequate color correction for compatibility is identified as a more costly way to go.

2. Description - Study to be conducted to define design parameters and estimate cost for two-position optical filter changer.

3. Impact - Category 1.

C. Task 3 - UTB Utilization

1. Objective - Determine degree of compliance of UTB with film distortion criteria for MC&G requirements and define system changes which would enable UTB photography to be practical.

2. Description - Study to be conducted to determine the usability of UTB in the SI.

3. Impact - Category 2.

D. Task 4 - Film Path Studies

1. Objective - Permit qualification of alternate films (IR, color, UTB, etc.) utilized in current SI configuration, if possible, or revised structures if necessary.

2. Description - Mock-up the film paths for evaluation of tracking and marking phenomena in vacuum.

3. Impact - Category 1.

E. Task 5 - Auxiliary Sensor

1. Objective - Determine what accelerometer instrumentation will provide for KH-9.

2. Description - System Studies and cost analysis.

3. Impact - Category 1.

F. Task 6 - Terrain Lens Design

1. Objective - Initiate preliminary designs to define performance capability, size, and probable complexity of:

a. 12-inch, f/4, 9 x 18 format system - improve dynamic resolution by use of slower film.

b. 18-inch, f/8, 18 x 18 format system - determine configuration of next generation SI cameras.

G. Task 7 - Forward Motion Compensation Improvement

1. Objective - Prospect of lens improvement leads to a motion limited system without improvements in forward motion compensation.

2. Description - Study to define system improvements leading to reduced blur rates.

3. Impact - Category 2.

H. Task 8 - Improved Stellar Lens

1. Objective - Define benefits and practical limits of stellar lens improvements.

2. Description - Study to determine the effect on control point location accuracy of improved orientation determination (better than five arc seconds specification).

3. Impact - Category 2.

I. Task 9 - Increased SI Film Load

1. Objective - Self-explanatory.

2. Description - Study to determine the most cost-effective means to doubling the SI film load.

3. Impact - Category 2.

J. Task 10 - Photographic Studies

1. Objective - Dynamic performance optimization; color film performance criteria, haze, cut-off filtration; extend red sensitivity; color film utilization.

2. Description - Studies to cover the above objectives.

3. Impact - Category 3.

K. Task 11 - SI Configuration Changes

1. Objective - Determine changes required in SI system which will enable it to meet changing MC&G requirements.

2. Description - Study to determine optimum camera configuration to establish 1:10,000 scale maps.

3. Impact - Category 3.

CATEGORY DEFINITIONS

Category 1 - Near-term, minimum hardware impact.

Category 2 - Interim-term, requires hardware work.

Category 3 - Long-term, major hardware change.

Atch to:
TCM-37371-71

PRO A-1-f

BYEMAN

~~TS~~ NATIONAL RECONNAISSANCE OFFICE
WASHINGTON, D.C.

THE NRO STAFF

4 August 1970

MEMORANDUM FOR GENERAL ALLEN

SUBJECT: KH-9 Mapping Camera Processing

BACKGROUND

The memorandum from DIAMC at TAB A represents a somewhat belated response to our message of April 1969 (TAB B) which recommended that Army TOPOCOM accomplish the duplicate processing of the 12" KH-9 mapping camera material for the NRO. Colonel Hoy sent a follow-up message on 2 July 1970 (TAB C).

DISCUSSION

The DIA memo indicates they would be pleased to have TOPOCOM do the work if the NRO pays all the expenses. This is not altogether a satisfactory proposal. It is proper for the NRO to pay for special equipment, training, and materials, however, as in the case with Army support to the SOC, ACIC support for [redacted] and NRTSC photo support, manpower should be programmed by the supporting agency. There has been at least informal agreement that this would be the case.

TAB D reflects some coordination conducted by Lt Col Bill Williamson with TOPOCOM and DIAMC in May of 1969. This paper reflects estimated manyears to be provided by TOPOCOM for NRO support and under what line items they would be programmed in the CIP. TOPOCOM was to include these in their CIP submittal, and DIAMC was to approve them based on the prior agreement that these items were for the NRO. For example, the IVB9*« SPECIAL PROCESSING was for the KH-9 mapping camera processing, the IIIAA*15* was for SOC support, the other items were to cover support of KH-4 and KH-9 frame camera calibrations both at Cloudcroft and in-flight.

I have briefly discussed the matter with Colonel Rall, and he has indicated he is willing to negotiate. I might observe, for example, that to talk of authorizing additional manpower spaces for this effort makes little sense, since DOD budget cuts have left them with more spaces than they can afford to pay anyhow.

~~HANDLE VIA~~

BYEMAN/TALENT-KEYHOLE

~~TOP SECRET~~

Internal
1 of 2
1 of 3
008-04-018

In discussing the matter with Colonel Hoy just before he went on leave, he pointed out that a number of other considerations must be resolved. He has not yet received any formal indication as to how many copies of the KH-9 mapping camera record will be required and by what agencies. He further feels that the use of free radical materials for duplicate processing may well be indicated for the mid-1972 time frame.

CONCLUSION

The matter of KH-9 mapping camera duplicate processing merits further discussion between DIAMC and the NRO on both administrative and technical aspects before reaching any hard agreement.

RECOMMENDATION

It is recommended that the memo at the right covering further discussion be signed and dispatched.

ROBERT W. SCHEA, JR.
Major, CE, USA

Atchs
TAB A, TCS 635074-70
TAB B, WHIG 8700 (FPP E-8)
TAB C, WHIG 0513 (PRO A-1-f)
TAB D, TCS 101033-69 (PRO A-1-c)

Internal