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[redacted]

MF
PRC 415

14 February 1967

MEMORANDUM FOR: Colonel Dave Carter

Attached is a copy of a document prepared by our CORONA Program Office people in support of [redacted] study. The comparison between piggy-backing the framing camera on HEXAGON as opposed to integrating it into the CORONA space vehicle comes out in the same direction as that presented by [redacted] to Dr. Flax but some of the numbers are slightly different. I don't think the suggestion of recovering the framing camera would be very attractive if all the details were examined. A point raised in this memorandum however, is the question of compatibility between the basic HEXAGON intelligence mission with its wide swath width camera and the mapping mission with the much narrower swath. I have started a small study to examine this question in more detail and will pass along to you any results which seem relevant.

LESLIE C. DIRKS

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FEASIBILITY OF A CORONA MAPPING SYSTEM

A large frame camera (HEX SI, GOPPS, or similar design) could be flown on the CORONA Program as an alternate CORONA mission payload.

By using existing CORONA checkout facilities, contract management, hardware, and design concepts, costs associated with the payload portion of the program could be minimized.

A CORONA cost/HEX cost comparison is shown in Attachment A.

Major CORONA costs for such an MC&G program are Thorad and Agena costs. Since the MC&G camera is the primary payload, all launch costs were considered to be direct program costs in the cost effectiveness analysis.

No cost has been shown for the Titan Booster on the HEX Program since it is assumed that sufficient lift capability is available to accommodate the frame camera as a piggy-back payload.

Using these ground rules it is concluded that the "Mapping" mission can be accomplished at less cost on the HEX Program.

MAPPING EFFECTIVENESS

From a consumer standpoint there are advantages to having the cartographic camera on the same platform as the high resolution camera. Indexing and data retrieval are simplified and residual errors resulting from use of non-similar materials (varying solar elevations, different time of year, etc.) are minimized. The magnitude of these benefits cannot be accurately defined without further study, but since cost is also less, it follows that for meeting the 1:50,000 scale mapping requirement it would be most advantageous to fly the frame camera on the HEX Program.

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SUBJECT: Feasibility of a CORONA Mapping System

Although the HEX SI has a cross-track coverage of 42° as opposed to 120° for the Pan System, it is not believed that this apparent inconsistancy will cause a lack of frame camera access over a long range period. A study conducted with the past years actual CORONA ground tracks (CORONA Pan coverage 70°) has shown that the 12 mo. cumulative access for a 42° system would have been 99.2% of the earths land mass.

W.G.S. REQUIREMENTS

One distinct advantage of a separate MC&G system is its ability to be utilized on geodetic or high altitude orbits. Analysis has shown however, that if several CORONA J-3 or PG launches could be devoted to the W.G.S. requirements, that the RQM could be satisfied more rapidly and less expensively through this already existing system.

For the special CORONA geodetic orbits, it would be desirable to add certain orbit determination refinements such as a radar altimeter, accelometers, etc. to the vehicle.

ADDITIONAL COST CONSIDERATIONS

In conducting the cost effectiveness analysis, many configurations were examined, including some in which recovery of the entire camera system was programmed. The cost of a HEX SI is approximately $1,000,000.00 of which 50% or $500,000 is in the index lens alone. This unit could be reflown if recovered.

Preliminary studies showed that it was feasible to mount and recover the entire camera system in a HEX type R.V. For a small number of launches the costs of R.V. optical door development outweighed the savings in camera cost. For this reason the idea was not pursued in detail. It appears, however, that in a long term program like HEXAGON, that a modular concept for the SI could possibly be incorporated and that SI's could be recovered and reflown thus reducing the SI program cost significantly.

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SUBJECT: Feasibility of a CORONA Mapping System

The technical engineering aspects of the HEXAGON system design were not addressed by the R. O nor have cost aspects been considered should the 1000 - 1500 # weight of the SI subsystem result in an increased system boost requirement. If a booster change is dictated by the SI, the cost effectiveness analysis would most certainly be reversed. Also, should the reliability or operational flexibility of the HEXAGON system be adversely affected by inclusion of the SI subsystem, it could be that the additional cost expenditure associated with a CORONA flight program may be considered warranted by the D/NRO. No definition information on these subjects is currently available.

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PROGRAM COST COMPARISON

(Millions of Dollars)

	CORONA	HEXAGON
Assumed launch rate	1/5 mo.	1/2 mo.
Assumed number of launches	5	12
Film wt/launch	180#	75#
Film wt. total	900#	900#
Instrument cost	19.0	26M[1]
Integration costs one time	5.8	5.8[2]
Integration cost at 1.5M per system	6.5	18.0[3]
RV cost one time	.5	---
RV cost flight hardware	1.6	3.4[4]
Booster/Agena cost	32.5	
Incl launch SVC		
6.5 M/launch		
	65.9	53.2

1. Acquisition phase cost for 6 flight units of the more expensive of the HEX SI's is 20M. Follow-on orders beyond the acquisition phase are 1M/unit.

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2. Assumed as equal to CORONA.

3. Assumed per system as equal to CORONA.

4. HEXAGON cost assumes one bucket required specifically for SI recovery.

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