[redacted]

MEMORANDUM FOR : Director of Central Intelligence

SUBJECT : Comparison of the MURAL, [redacted] and LANYARD Systems

1. This memorandum contains the requested comparison of the LANYARD, [redacted] and MURAL Reconnaissance Systems.

2. Attachment A compares the technical features of the LANYARD and MURAL systems. Primarily the LANYARD camera has a much larger scale factor and covers a narrower swath; design resolution is about twice as good. The LANYARD camera, being a single lens system, produces gaps in coverage when stereoscopic photography is desired.

3. Attachment B compares those attributes of our present satellite reconnaissance systems needed to evaluate the ability of the various systems to fulfill intelligence missions. We define these intelligence missions as falling into three categories:

a. search/surveillance

b. indications

c. technical intelligence

4. The CORONA M or J systems are partially satisfying our needs for search/surveillance and indications coverage. If 10' resolution and quality consistency were achieved, these systems would approach full satisfaction of these requirements. The Purcell Report indicated that our R&D effort should be in large measure directed toward these ends and that achievement is possible.

5. [redacted]

Handle via [redacted]

6. Current resolution delivered by the L system is slightly better than that yielded by the M system. However, the L system does not have the ability to cover as many targets as the M system, and therefore will not serve the search/surveillance and indications missions as well. It was not designed to approach [redacted] in resolution and therefore should not be considered for technical intelligence use.

7. The primary deficiency of LANYARD is in the operational area. Because of the gaps of stereo coverage and the requirement for rolling the camera to cover off-track targets, the programming of LANYARD is much more difficult; in addition, limitations are imposed on the geographical spacing of targets for acquisition. With a more involved programming of LANYARD, there is a concurrent requirement for a more elaborate on-orbit programmer and more elaborate command and control; this is inherently less reliable. The narrow swath requires adjustment of the program to compensate for differences between actual track of the vehicle and the pre-flight planned tracks.

8. The major question mark in our minds at this point is that the uncertainties involved in establishing the location of a satellite in orbit, combined with the small swath width delivered by the [redacted] system, may make it extremely difficult for us to have adequate assurance of covering the targets for which high resolution photography is required. It is possible, therefore, that neither [redacted] nor L will meet our technical intelligence requirement, and that we may have to develop a system with greater swath width and less resolution than [redacted] but smaller swath width and greater resolution than L and M. We may also find that we cannot achieve a useable system yielding [redacted] ground resolution from satellite vehicles.

9. Considerable background history is available on the performance of the MURAL system. The quality, while not consistent, is apparently satisfying much of the needs of the community. A program is underway to understand better the reasons for the apparent inconsistency in performance, as well as to improve the peak performance. It is probable, however, that the atmospheric limitations are such that the MURAL system is performing approximately as well as can be expected in the future. A similar spread performance has been evaluated on only one mission. This mission

showed certain system deficiencies which are now being corrected. It is expected that peak performance equivalent to projected estimates will be achieved, with a spread of apparent performance similar to the MIRAL performance, scaled appropriately.

10. It is our opinion that ground resolution achieved by the LANYARD system is not sufficiently better than that of MIRAL to offset the problems associated with programming and target acquisition. The needs in the community for high resolution photograph for technical intelligence must be met by other system.

ALBERT D. WHEELON
Deputy Director
(Science and Technology)

CONCURRENCE:

[redacted]
Deputy Director (Intelligence)

2 Attachments: A & B

cc: DCI

[redacted]

Distribution:

[redacted]

ATTACHMENT A

DESIGN PARAMETERS FOR MURAL, [redacted] AND LANYARD

FACTOR/SYSTEM	MURAL	[redacted]	LANYARD
Focal Length	24" f:3.5	[redacted]	66" f:4
Swath (Degrees)	70°	[redacted]	22°(Steerable)
Design Resolution	140 l/mm 12 microradians		100 l/mm 6 microradians
Total Coverage (Millions Square Miles)	Single 5.25 Double (J) 10.5		1.0
Film	4402 (SO-132)		SO-206*
Film Weight	75-150		75
Type	Two-Camera Stereo (Single Camera Operation Possible)	[redacted]	Single Camera (Intermittent Stereo or Continuous Mono)
Booster RQO	Single: THOR-AGENA Double: Thrust-Augmented THOR-AGENA	[redacted]	Thrust-Augmented THOR-AGENA

*Film type most suited for LANYARD is still under evaluation.

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PERFORMANCE COMPARISON OF MURAL, LANYARD AND [redacted] ATTACHMENT B

	M	[redacted]	L
Resolution Achieved	10'-20'	[redacted]	8'-10'
Resolution Expected	About 10' consistently	[redacted]	5'-8'
Type of Coverage	Continuous Stereo coverage of 200 mile swath	a. [redacted]	a. Continuous zone coverage of 40 miles swath with roll capacity up to 30°.
		b. [redacted]	b. Non-continuous to mile stereo squares with equivalent gaps with roll capacity up to 30°.
		c. [redacted]	
Target Coverage Capability	Excellent	[redacted]	Fair to good
Intelligence Use	Search/Surveillance Indications	[redacted]	Surveillance

Approved by Director, NPIC
18 September 1963

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