

UNITED STATES GOVERNMENT

Memorandum — ~~SECRET~~

NRO APPROVED FOR RELEASE
DECLASSIFIED BY: C/IAAT
DECLASSIFIED ON: 3 AUGUST 2012

DATE: AUG 21 1967

TO : AD/Deputy Administrator

FROM : M/Associate Administrator
for Manned Space Flight

SUBJECT: Termination Plan for the LM&SS

REF : (A) Memo to M from AD, subject: Termination of the Lunar Mapping
and Survey System, dated 25 July 1967

(B) LMX to MSC (Thompson, Pilana), Regarding implementing LM&SS
termination, dated 2 August 1967

CURRENT STATUS

The LM&SS development is in the process of being reoriented as directed in the references. MSC and the Air Force program office have issued termination notices to all contractors and appropriate Center offices for the termination of all activities associated with the hardware and software procurement, development and test for LM&SS flight articles numbers 3, 4 and 5. With respect to the first two flight units, the Air Force has restricted the scope of the camera contractors' activities to allow an orderly termination, and has issued a stop work order to the integrating contractor.

The hardware status at the time of initiating termination called for five LM&SS flight units to be developed, with delivery of the first unit to be compatible with vibration/acoustic testing at MSC commencing on 15 September 1967. Deliveries of all systems for subsequent flight units were planned to be completed by winter of 1967-1968. Generally two systems would have been built-up at LMSC by the fall of 1967, though qualification/acceptance testing was planned for completion in early 1968. With the earth test of the LM&SS on AAP-1A cancelled, the first flight date was scheduled for a Lunar contingency mission in February 1969.

Total funds committed to the LM&SS development have been approximately \$36.0 M. Depending on the two termination alternatives discussed below present funding will be sufficient to effect total termination (Option A) or approximately \$7.5 M additional funding to DOD would be required if Option B were selected.

Enclosure 1 provides detailed program status and details of the two options for termination of the program together with conclusions.

GROUP 1:

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Downgrading and
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2.

Enclosure 2 contains a detailed financial status.

TERMINATION PLAN

Termination plan Options "A" and "B" (Reference charts 9-12) have been derived through recent joint AF/NASA coordination meetings and are premised on the general assumption that storage of the major hardware components is possible.

Option A is based on storage of two flight qualified Mapping Cameras plus an engineering model that could be qualified as a flight system, and two flight configured (but not flight qualified) Survey Cameras, a Test Function Compatibility Model and three assembled basic units. Payload Modules and their subsystems exclusive of the camera systems, will be stored as piece parts and components. All documentation would be stored as is. Charts 9 and 10 show the application of this option to major line items in the program along with associated cost and schedule implications.

Qualification testing of the Survey Cameras and certain other Payload Module subsystems would be required prior to flight. The cost to accomplish this would be significantly greater than the cost of Option B, if carried out later.

Option B is based on storage of two fully assembled Payload Modules containing: (1) qualified camera units and subsystems, (2) two units of all Apollo Spacecraft interfacing hardware such as the Rack, SC Modification Kits and Command Data Interface Hardware, and (3) one complete set of qualified ground support equipment. This option does not consider mission oriented activities such as mission planning, operational software build-up at MCC, or launch base operations.

Option B is a significant extension beyond "A" in that hardware build-up is effected through the completed assembly level for two flight qualified Payload Modules (including camera systems and supporting subsystems). This option considers integrated systems level testing of these units prior to storage, and completion of vibration/acoustic testing at MSC. This test could be deferred until re-activation if desired. The MSC test would utilize an existing Payload Module model specially configured to satisfy test requirements. No thermal-vacuum testing will be accomplished in any event subsequent to reuse of stored hardware. Certain CSM modifications will be deferred pending Mission assignment.

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Chart 12 identified the application of Option "B" to major line items. NOTE: Five (5) survey cameras have been assembled, however; only two units are in IM&SS peculiar flight configuration. The two flight configured units will be flight qualified in Option "B" prior to vehicle assembly and the remaining 3 will be stored in their present configuration.

Chart 11 shows the cost and schedule implications for Option "B."

ACTIONS REQUIRED TO IMPLEMENT PLAN

1. Inform MSC and the Air Force of the recommended option for redirecting the IM&SS development.
2. Continue to effect termination. It is assumed that approximately two months will be required to conclude major items if Option A is pursued, or approximately seven months in the case of Option B. In any event, program office functions at MSC and the Air Force will be required for some time though those activities will be reduced as practicable.
3. Start immediately debriefing NASA, Air Force, and contractor personnel. NASA Headquarters will coordinate with MSC and the Air Force in preparing a plan to accomplish this task.
4. The policy regarding NASA internal and public release of information relative to the IM&SS termination will be determined in coordination with the Office of Program Plans and Analysis. The Office of Public Affairs will then be contacted for assistance in the dissemination of this information as required.
5. MSC will continue working with the Air Force to locate and secure a storage facility. The most likely location is a secure area at either Vandenberg AFB or Sacramento owned by the government.
6. MSC will continue working with the Air Force and contractors in determining the best disposition of piece parts and other equipment not needed as part of the two systems to be stored. The overriding problem in disposition of equipments is the security classification requirements of the program. Mr. Krueger will discuss the possibility of having the security classification of the Mapping Camera system removed, or at least reduced, to make possible the utilization of this mapping system on other programs such as the Earth Resources Program or for early lunar exploration. The Air Force has been contacted regarding their interest in obtaining three of the survey cameras, but there appears to be no interest at this time.

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FACTORS AFFECTING TERMINATION PLAN

In addition to the cost considerations entering into a decision concerning the method of IM&SS termination a number of other factors must be considered.

1. Although the Lunar and Planetary Missions Board recently indicated no scientific requirement for the IM&SS, the Geodesy and Cartography, Geophysics and Geology Working Groups at the recently concluded Santa Cruz Conference strongly endorsed the need to obtain additional lunar photography. The Geodesy and Cartography and Geophysics groups are requesting metric quality photography to allow them to establish a network of geodetic control points on the moon. This network, when compared with gravitational field information obtained from tracking lunar satellites, can provide information on the internal structure of the moon. They strongly emphasized the need for film return in order to provide the required geometric characteristics. The interests of the Geology group are primarily in obtaining additional high-resolution photography (1 meter resolution) for detailed planning of scientific surface activities. Enclosure C shows the system recommended at Santa Cruz to provide the necessary data.

The IM&SS, as presently configured, would not satisfy the requirement for geodetic photography. The survey camera could easily obtain the required resolution, but would require minor modifications to obtain the areal coverage desired. The 24" convergent panoramic camera system recommended by the group would require development by DOD contractors. The recommended 6 inch focal length metric cameras could be incorporated without significant payload module modification.

2. The Santa Cruz conference recommended the flight of a photographic/scientific sensor orbital mission as early as possible in the lunar phase of AAP. They also recommend surface missions at sites for which inadequate photography has been obtained for mission and operations planning. The initiation of a new photographic system program to satisfy these requirements would undoubtedly be more expensive than carrying out Option B as proposed in the anticipation that as both the scientific and operations requirements become more firm during the next year appropriate mission plans around the use of a modified IM&SS would be developed.

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RECOMMENDED TERMINATION PLAN

The IM&SS represents a real program capability that is capable of supporting contingency, operational and scientific lunar objectives. Continuation of the program must be reconsidered in recognition of the severe funding limitations currently being anticipated for this year and subsequent years. It is therefore necessary to make judgments on priorities and in view of the anticipated funding levels we would recommend termination of the IM&SS program as outlined as Option A in this memo and in Enclosure 1.

Original signed by
Frank A. Bogart
for George E. Mueller

Enclosures (3)

Approved: R. Seamans

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ENCLOSURE 1

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- Chart 1 - LM&SS Schedules
- 2 - AFE/ASE Status
 - 3 - AFE Subsystem Status
 - 4 - NASA Contract Elements - Status
 - 5 - ASE Status
 - 6 - Software Status
 - 7 - Termination Options
 - 8 - Implementation of Options
 - 9 - Termination Plan Option A
 - 10 - Cost and Schedule Summary - Option A
 - 11 - Termination Option B
 - 12 - Cost and Schedule Summary - Option B
 - 13 - Conclusions
 - 14 - Action Taken
 - 15 - Action Required

2. AFE STATUS

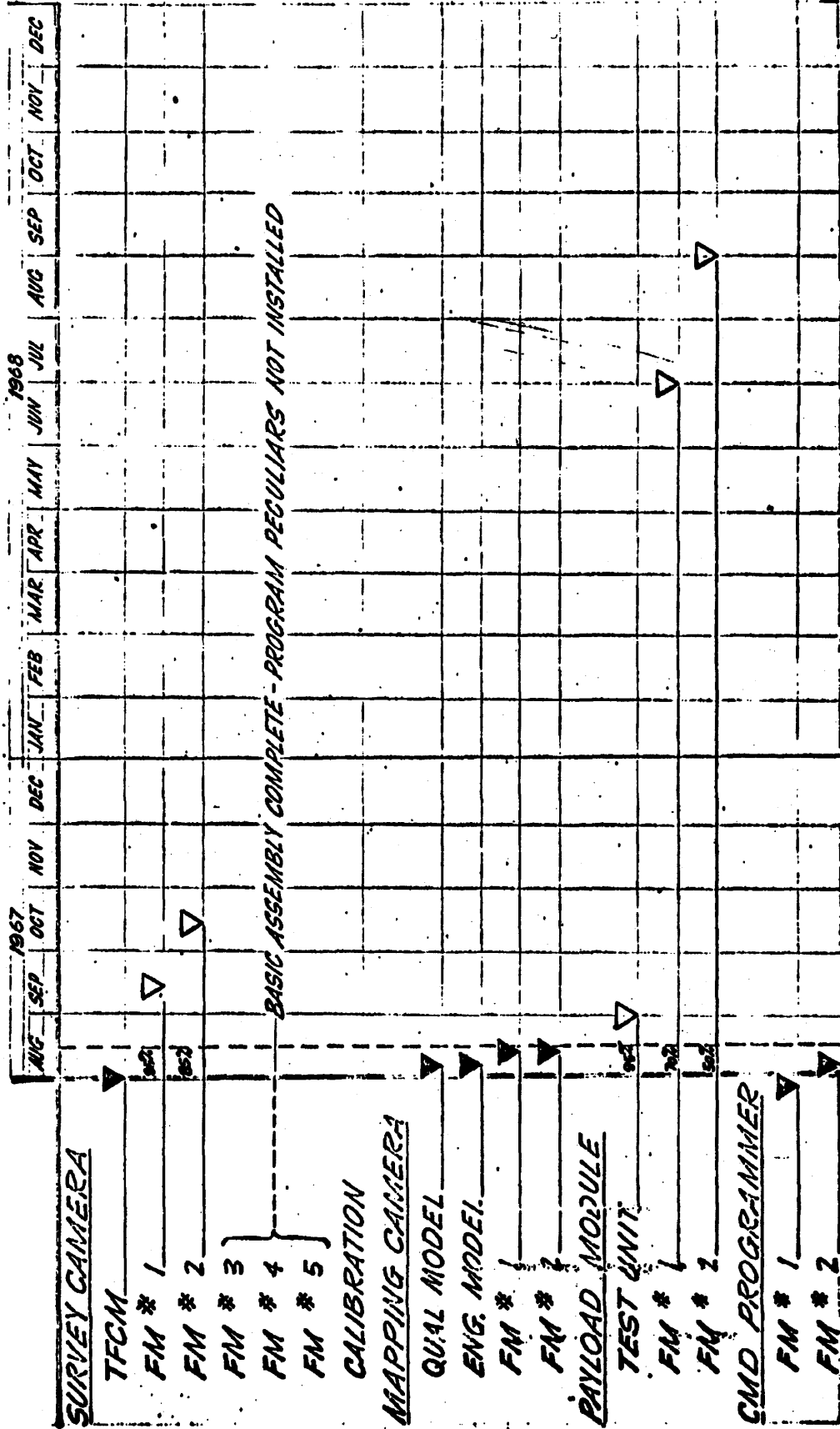
ASE STATUS

AS OF AUG. 15, 1967

MISS PROGRAM INVENTORY

3. AFE SUB-SYSTEM STATUS

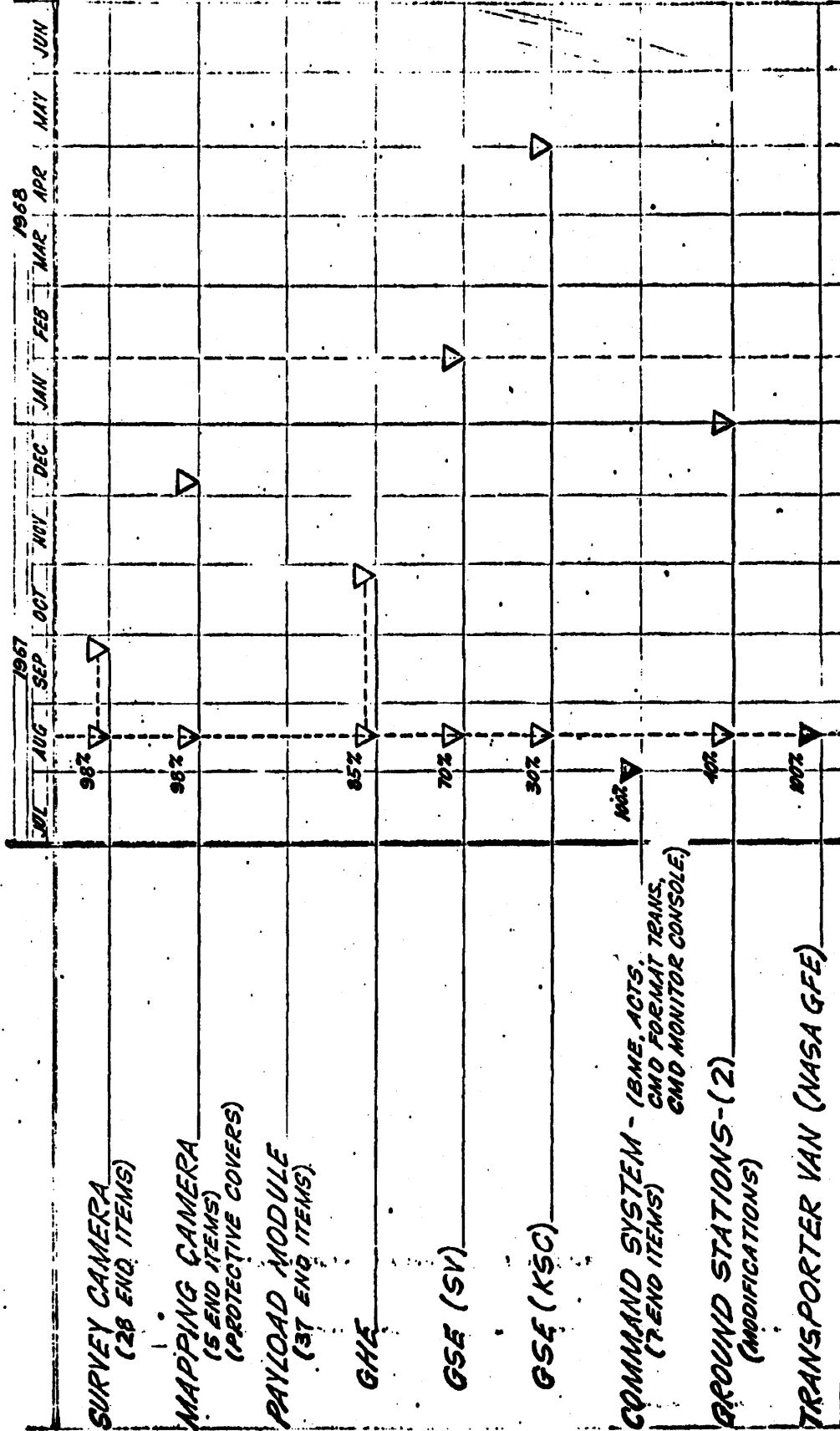
AS OF 15 AUG 67



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5. ASE STATUS

AS OF 15 AUG 67



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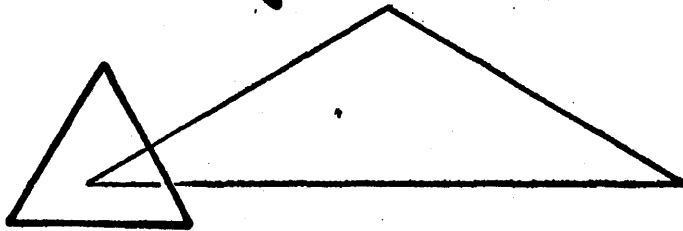
6. SOFTWARE STATUS

AS OF 15 AUG 67

	AUG 1967	SEP	OCT	NOV	DEC	JAN	FEB
COMPUTER PROGRAMMING	90%			40%			
DOCUMENTATION							
(90) ICD'S	100%						
(190) SPECS	90%						
(5000) DRAWINGS	90%						

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*TERMINATION
OPTIONS*



7.

8. IMPLEMENTATION OF OPTIONS

SCOPE OF EFFORT

IMPLEMENTATION OF OPTIONS REVIEWED HEREIN WILL RESULT IN:

- CLOSE OUT OF LMSS CONTRACTS IN ACCORDANCE WITH "ASPER," AND CONTRACT DIRECTION
- TEMPORARY PROTECTION, MAINTENANCE & STORAGE OF ALL HDW DURING "TERMINATION"
- COMPLETE INVENTORY OF LMSS RESOURCES

COST ESTIMATES FOR OPTIONS CONSIDERED DO NOT PROVIDE FOR:

- GENERATION OF "LONG TERM STORAGE" PLAN OR ITS IMPLEMENTATION
- CRATING, SHIPPING, HANDLING ASSOCIATED WITH HDW TRF
- LONG TERM STORAGE & MAINTENANCE
- DISPOSITION OF HDW
- HDW REHAB

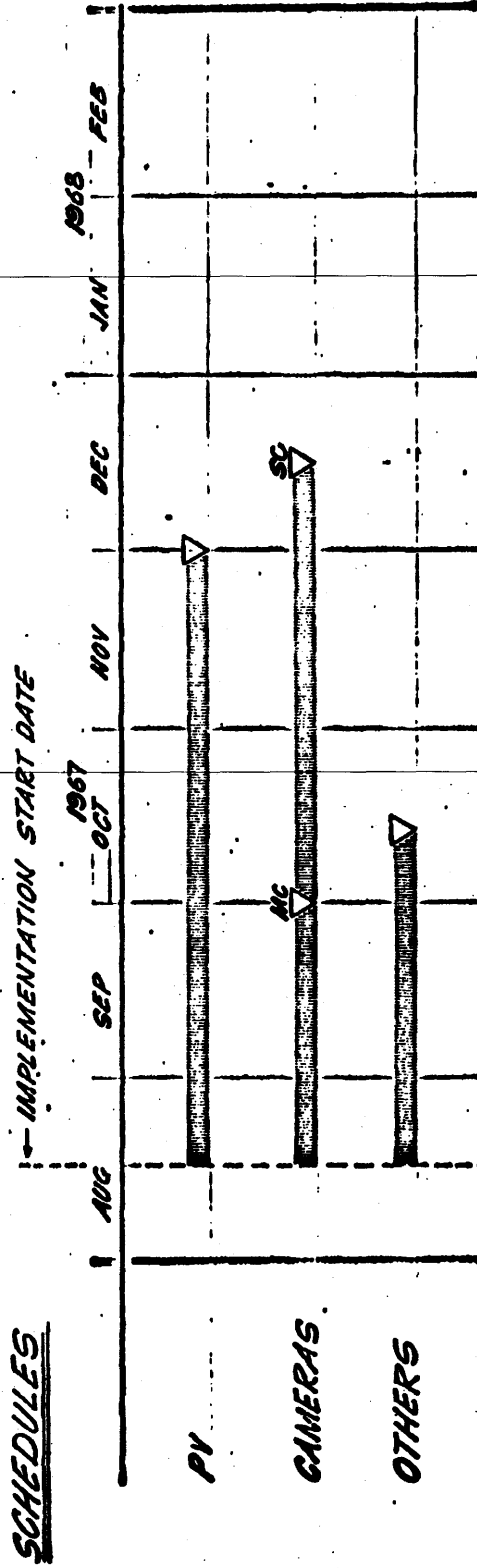
9. TERMINATION PLAN - OPTION A

- o TERMINATE ALL IMSS EFFORT IMMEDIATELY IN MOST COST EFFECTIVE MANNER
- o TERMINATION PLAN

HARDWARE ELEMENT	OPTION A APPLICATION
Payload Vehicle	As is storage (Piece Parts/Assemblies etc)
Mapping Camera	2 Units ^{2r} to DD 250 Status, then store
Survey Camera	Assembly of 2 Units to IMSS Configuration, then storage As is storage of 3 Basic Units
Software	Finish Effort to Milestone II (25 August)
GMD Programmer	As is storage (two articles compl'd by 7-15-67)
S/C Modif. Kits	As is storage (piece parts)
FM Decoder & Buffer Module	As is storage (of two completed items)
Rack	As is storage (piece parts, mat'ls, tooling)
AF/NASA ASE	As is storage

10. COST & SCHEDULE SUMMARY-OPTION "A"

COST	PROGRAM COST (15 AUG 67)	TERMINATION COST	OPTION "A" TOTAL	COMMITTED FUNDS
AF	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
NASA				
TOTAL				



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11. TERMINATION PLAN - OPTION B

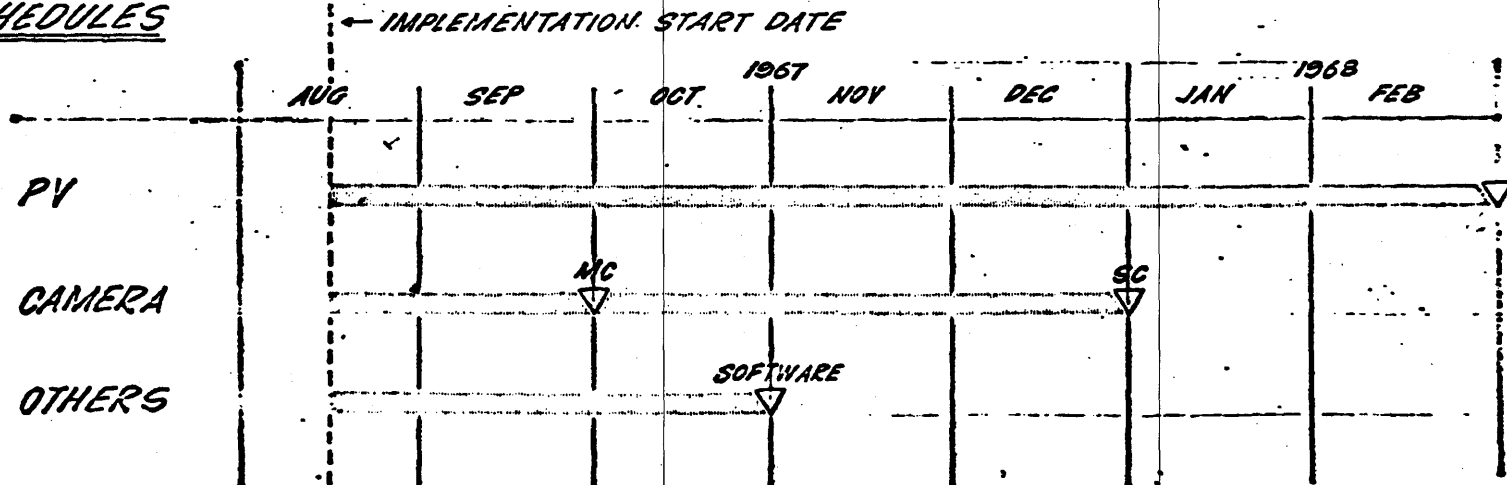
- o Complete two Payload Module Assemblies & Systems Level Testing prior to storage
- o Termination Plan

HARDWARE ELEMENT	OPTION B APPLICATION
Payload Vehicle	2 Flight Units to DD 250 Status (No TV Test), then storage
Mapping Camera	Same as Option "A"
Survey Camera	2 Flight Units to DD 250 Status, then storage
	3 Basic Units - Same as Option "A"
Software	Continue to Milestone IV
Command Programmer	Same as Option "A"
S/C Modification Kits	Defer
PM Decoder & Buffer Module	Same as Option "A"
Rack	2 Qualified Flight Units
AF/NASA ASE	Build Up to One complete Set and store

12. COST & SCHEDULE SUMMARY - OPTION "B"

<u>COST</u>	PROGRAM COST (15 AUG 67)	ESTIMATED OPTION "B" COST	OPTION "B" TOTAL	COMMITTED FUNDS
AF				
NASA				
TOTAL				

SCHEDULES



8-10-67

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13.

CONCLUSIONS

- CAN TERMINATE PER OPTION "A" WITHIN EXISTING TRANSFERED FUND. MAJOR STORABLE ITEMS ARE:
 - (A) THREE MAPPING CAMERAS
 - (B) FIVE SURVEY CAMERAS
 - (C) COMPONENTS AND SUB-ASSEMBLIES OF PAYLOAD MODULE & AGE

- CAN TERMINATE PER OPTION "B" FOR ESTIMATED ADDITIONAL TRANSFER OF ████████ TO DOD. MAJOR STORABLE ITEMS ARE:
 - (A) TWO COMPLETE PAYLOAD MODULES UP TO SYSTEM LEVEL QUALIFICATION
 - (B) ONE COMPLETE SET OF ASE

1A. ACTION TAKEN

▶ TERMINATION

- ✓ ALL EFFORT ON FLIGHT ARTICLES 3, 4, AND 5
- ✓ ALL LAUNCH BASE ACTIVATION & C/O TASK
- ✓ ALL MCC-H OPERATIONAL SUPPORT TASK
- ✓ ALL MSC TEST PLANNING

▶ STOP WORK

- ✓ PAYLOAD VEHICLE NO. 1 & 2
- ✓ ALL EFFORT AT LMSC, NAA, MOTOROLA, MSFC, & GAEC

▶ REDIRECTION

- ✓ SOFTWARE EFFORT
- ✓ SURVEY CAMERA

▶ NO ACTION

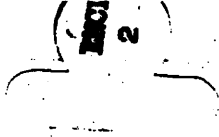
- ✓ MAPPING CAMERA

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15. ACTION REQUIRED

- NASA DETERMINATION OF TERMINATION PLAN
 - OPTION A OR B
 - OTHER
- FOLLOW-UP DIRECTION TO CONTRACTORS
- JOINT AF/NASA MONITORING & DIRECTION OF TERMINATION PLAN (DISPOSITION OF HARDWARE ELEMENTS)

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ENCLOSURE 2

Chart 1 - Financial Report

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FINANCIAL REPORT

EST. INVEST. A/O 15 AUG 1967	EST. DELTA OPTION "A" COSTS	OPTION "A" TOTAL COSTS	DELTA OPTION "B" COSTS	OPTION "B" TOTAL COSTS
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AIR FORCE

SURVEY CAMERA
MAPPING CAMERA
PAYLOAD MODULE
CMP PROGRAMMER
SOFTWARE
AEROSPACE
MISC
FRIDR CMPL/TERM

SUB-TOTAL

NASA

DECODER
S/C MOD KITS
RACK
DOCKING TARGETS
FEASIBILITY STUDIES

SUB-TOTAL

TOTAL

NOTE:

NASA FUNDING TO AF - [REDACTED]
FUNDS COMMITTED BY AF - [REDACTED]
FUNDS UNCOMMITTED BY AF - [REDACTED]

GROUP 1:

Excluded from Automatic
Downgrading & Declassification

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ENCLOSURE 3

**Chart 1 - Systems to Measure the Size and Shape
of the Topographic Surface of the Moon**

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CHART 1

SYSTEMS TO MEASURE THE SIZE AND SHAPE OF THE TOPOGRAPHIC SURFACE OF THE MOON

System	Focal Length	Surface Resolution	$(\sigma_x^2 + \sigma_y^2)^{1/2}$	σh	Map Control	Map Content	Contour Interval	Frames for 100% Coverage	Film Weight 100% Coverage
Geodetic Frame Camera	12"	6m	8m	11m	1:50,000	1:25,000	30m	14,700	322#
Geodetic Frame Camera	6"	10m	17m	18m	1:100,000	1:50,000	50m	6000	82#
Twin Convergent Panoramic Cameras	600mm	1.2m	2.0m	1.0m	Nominal photoscale		Exposures per site	Film weight per site	
					156,000				
Star Camera (2 required)	6"	Format	Aperture	σ roll	σ pitch	σ yaw	Film Weight		
		60 x 60 mm	76 mm	3"	15"	3"	14# for 12,000 exposures if used with 6" Geodetic camera	34# for 29,400 exposures if used with 12" Geodetic camera	

Information taken from "Lunar Geology and Cartography" - A Portion of the Proceedings to be published of the Sixth U.S. Lunar Exploration Science Study 1967.

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