J-1 OPERATING INSTRUCTIONS

By designing the J-1 Camera System to remain under positive control at all times while in orbit, efficient photography of only the desired objects visible to the camera is achieved. This control is attained by selecting the proper Stored Program Commands (SPC) carried on board the vehicle through Real Time Commands (RTC) sent by Telemetry Links (TM) from the tracking and commanding stations about once per Revolution (Rev).

The heart of the control system is the "H" Timer which contains four parallel mylar tapes. These tapes control all vehicle and payload functions. (The vehicle herein mentioned is the Agena which contains the power supplies, command and telemetry equipment and attitude control system. The payload contains the cameras and camera associated "black boxes"). Just before the flight the mylar tapes are accurately punched with a program of operations that, as the camera passes over the pre-selected targets, will turn the camera on and off at precisely the correct position in the camera's orbit. The tapes further control the Agena's TM beacons for the tracking stations and enable and disable the Vehicle commanding circuits. The four tapes are slowly and continuously driven over a contact head in the control unit (H-Timer) by an accurate timer motor. The contact head allows completion of the circuit when contacted by brushes dropping through the punched holes in the tape. The drive motor speed is controlable from the ground and is corrected to maintain the tape program completely in phase with the vehicle's orbital position.

The payload control tapes have nine different selectable programs available. Each program has its own channel and each channel has two sub-channels; one for the "on" brushes and one for the "off" brushes. Each program during a Rev has an average of eight controlable operations. (Sometimes there are more than eight operations punched into a particular pregram. Only eight of these programs

can be assured unique control.) An "operation" is the sequence of events from one "on" brush to the next "on" or "off" brush. The distance between an "on" and an "off" brush (or "off" command) determines the length of camera operation.

In conjunction with the tape program system there is a stepper switch control which is electrically in series with the tape brushes. RTC 9 commands the eleven position program stepper selector switch. Positions 1 through 9 of the program selector stepper switch select brushes 30 through 47 of the "H" Timer. For example, with RTC 9 in position 3, tape channels 34 ("on") and 35 ("off") are active. Usually not all desired operations are contained in a single program, so other programs are selected when desired. To control those operations within a program that are desired and those that are not wanted RTC 12 and RTC 15 have been set up as an intermix to control which operations are taken and which denied.

Stepper switches RTC 12 and RTC 15 with 16 positions each can provide all binary combinations up to binary number 16, ie. 0-0-0-1, 0-0-1-1, etc. A"0" on the stepper means an "off". A "1" means an "on". As the stepper steps singly it will cause a certain pattern of "off's" and "on's" to be effected. These patterns are pre-selected from a table and the stepper switch is commanded to that position which will allow the desired pattern and operations to be taken. RTC 12 is designed so that it will take or deny only four operations before it will automatically transfer control over to the RTC 15 stepper switch. RTC 15 can be pre-programmed to take any desired combination up to four. Then RTC 15 will be stepped until such time as it reaches position 16 where it"homes on". The stepper switches of the particular program are stepped each time an "on" brush on the tape passes over the contact head. If a program has more than eight"on"punches on a particular Rev, the added punches above eight will be the ones that continue to step RTC 15.

A "1" is an "on" position and electrically completes the series circuit with the program brush. Each time the "on" brush makes a contact, the camera is turned on and the stepper switch advanced one position. The camera will remain on until an "off" brush comes up on the program tape. It is possible to keep the camera on by having a series of "1's" on the RTC 12 & 15 stepper and a punched program that overlaps "on" and "off" brushes. If an "on" brush comes up with a "0" on the stepper, then the operation will be denied. The electrical series is broken.

Stepper control can be returned to RTC 12 from RTC 15 by commanding RTC 12 to the desired position. However, if RTC 15 has control and RTC 12 is in position 3 (as an example) and RTC 12 position 3 is desired for the next Rev, then RTC 12 must be stepped around 16 times and back to position 3. There is no other way to return control to this position. RTC 12 is now ready to control four operations before it will again return control to RTC 15.

As mentioned above there are times when there are more than eight operations in a program that require positive control. As this cannot be done with the RTC 12 and 15 combination a compromise situation has been built in using what is know as a brush intermix control.(BIC). BIC provides a brush (Brush 48) which will step the stepper switches in the same manner as an "on" brush in any of the nine programs. RTC 12 and RTC 15 are set up as before to accept or deny the operation. The RTC's are set according to the desired latitudes to be covered as is shown by consulting the Interference list and the Consumption List. Brush 48/operation will not provide accurate coverage. It will allow a compromise operation that will take some or most of what is desired. The purpose is to conserve the maximum amount of frames of payload. It is possible that less frames will be used by taking the normal course of RTC commanding rather than going to Brush 48. The Duty Operator will have to determine this. To get to BIC, RTC 11 is commanded into one of positions 6 through 10 to the appropriate position (usually 6).

EMERGENCY SITUATION: If RTC 12 and RTC 15 should become inoperative or stick in an off position, then RTC 9 may be commanded into position 10 or 11 where it will respectively allow all operations in stereo of program 1 or 4 to be taken. This by-passes the Ops Mode Select (RTC 11) and RTC 12 and RTC 15.

OPERATIONS

During his watch the Duty Operator (DO) regularly uses four different computer produced lists: The Operations Control List, Consumption Listing, Acquisition Schedule and Interference List.

The Acquisition Schedule gives the Rev Number, Station acquiring, elevation in degrees of the vehicle above the [redacted]horizon as seen from the station, GMT of acquisition, latitude of rise and fade and duration of acquisition in seconds. This listing is updated daily.

The Operations Control List (Ops List) gives the Rev. Number, Station acquiring, and commanding, Programs and their operations and number of operations per program. This list is updated daily.

The Interference List gives the vehicle tape time of all events occuring during the tracking station acqhisition and shows the restricted times when no commanding is to be sent to the vehicle unless during the emergency situations.

The Consumption Listing is a list of the Rev. Number, Programs and number of frames taken per operation in each program.

COMMANDING of the vehicle can only take place under strict conditions. Tracking stations must have 5° elevation (except a minimum of 6° for [redacted] before the Consumption List will use that station as the Primary Commanding Station. However, depending upon obscura, some stations can achieve commanding

with elevations of 2° or lower. This case always requires careful analysis to determine the feasibility of such an operation. The maximum elevation of a station can be determined from the Acquisition List. The Time Limitations on commanding can be determined from the Interference List. In the Acquisition Schedule the length of tape time that a particular station sees the vehicle is given as well as the events that are to occur in the payload and vehicle during the acquisition.

On several Revs during the day a program of engineering operations are scheduled while the tracking station has acquisition of the vehicle. These operations are listed in the Interference List. During these engineering periods the payload cameras will be operating unless the engineering operation has been denied. At any time the camera has the potential to operate during a station pass, that period is designated a Restricted Period. During this Restricted Period no commanding is allowed unless special circumstances prevail which necessitate the exercising of careful commanding. This will be done only under the direction of Chief of Operations, ~~only~~.

The special circumstances arise when the operator has less than 100 seconds before or after the Restricted Period in which to command the vehicle. If such a situation should arise and the operator does not have a back up station with which to complete his commanding, then he must determine what commanding can be done during the restritted period and what before and after. The operator consults the Interference List to determine which programs are operational during the pass. If possible, the operator will command the RTC 9 into a program that has no operations during the ~~pass~~ restricted Period. Then during the Restricted Period the operator will be able to set RTC 12 and RTC 15 into the desired settings without fear of causing a problem ~~on the vehicle~~ To The PayLoad. After the Restricted Period ends, the operator has only to command RTC 9 into the desired program.

The reason caution is desired is because it is possible to command ~~the~~ From ONE Program to another ~~camera out of a~~ program while the camera is actually operating. If this is done, the camera ~~will~~ may continue to operate ~~throughout the pass~~ until such time as ~~the~~ the next "on" or "off" brush is reached or a "redundant off" brush is reached ~~at the end of~~ later in the pass. This will waste frames.

Commanding of RTC 6, 8, 10, 11, 14 is done only under the direction of the Chief of Operations. The payload section is disabled by placing RTC 11 in position 11. The payload is activated again by placing RTC 11 into the appropriate position. The payload is disabled only ~~with the consent of the Chief of Operations.~~ after we are assured that no Command problems

OPERATING PROCEDURES

The Duty Operator shall familiarize himself with the possible camera operations, acquisitions, times of acquisitions, loading restrictions, station restrictions and possible number of bundles (operations taken in one or more successive Revs where no station acquisition is possible) at least three Revs ahead of the current Rev in progress. The operator will notetthose stations with an acquired elevation of 2° or more that can be used for commanding.

The operator shall fill out the Operator's Log with the selector positions that should be indicated when the vehicle is first acquired on a Rev. The operator will note those autosteps (steps of the selector caused by camera operation during a station acquistion) which will occur during a particular stations acquisition. The operator will further note on the log the station and GMT of the first acquisition as well as any command restriction times. The operator should be ready to receive the command order about one half hour before vehicle acquisition. The command order or "Loading" is called a [redacted] and will be called in from the AP TWX facility in the form given in the [redacted] manual. Upon receipt of the "Loading" the operator will repeat back to the AP TWX facility the letters and numbers given over the telephone.

The operator will then bracket in pencil on the Consumption Listing the program to be taken and circle the operations in that program that are desired. Nothing is marked with the operations to be denied. As the commanding operation is in binary form, ie. either on or off, the operator will place a "1" (on) in the square on the Operator's Log opposite the operation number on the log that is desired. He will place a "0" (off) after the operation number on the log that is to be denied. The "0, 1" listing is the binary complement of the circles on the Consumption Listing. The operator will place the program number to be used under the proper space under the RTC 9 column. The operator will note the pattern of 1's and 0's formed by writing in those operations desired and denied in the Operator's Log. He will then consult the table in the back of the operator's log book and choose the combination of binary numbers that match the first four operations. The stepper number for RTC 12 will be found above the first of the four binary numbers in the horizontal table. This stepper number is placed in the column on the operator's log under RTC 12. The remaining operations binary numbers in the vertical column on the operation log are checked for their combination and again looked for in the stepper combination table at the back of the operators log. The group that matches will provide the proper stepper number for RTC 15.

The operator will list the priority of RTC commanding on the log and await the call from the FTFD area to confirm the commanding or lack of commanding as well as the priorities of commanding and the time restrictions. The RTC selector positions will be confirmed as to the order in which they will be as the vehicle fades from the station acquisition. The operator will monitor the tracking station briefings given by the STC personnel to determine that the proper commanding is sent. The operator will monitor the TV screen to see that the commands appear on the "augi" data as received by the vehicle.

NOTE: If the command loading from the AP TWX facility has not been received fifteen minutes before the time of final station briefing by either the operator or the FTFD, then the operator will call the AP TWX facility to inquire as to the arrival of the command loading. If the TWX facility is unable to provide any message due to delays in Washington, then the operator will call the SOC in Washington ten minutes before acquisition. The operations loading will be requested directly over the outside telephone. As soon as the loading is received it should be relayed to the FTFD for his use and to provide double checking of the correct vehicle commanding.

After the vehicle has been successfully commanded, the number of frames to be taken are totaled on the consumption listand added to the estimated total of frames already taken. At the noon and night engineering passes the operator will receive the actual count of frames taken from the TM Analyst and will continue the frame count using the actual totals. A [redacted] message is sent out after each engineering pass according to the form set forth in the [redacted] book.

ABBREVIATIONS

AP - Advanced Projects

Brush - Brush, as in "Brush 48" refers to the holes punched in the mylar tape as well as the actual brush itself making contact through the holes.

FTFD - Field Force Test Director

MICROWAVE - The microwave link with [redacted] from the STC. It is used to transmit accurate telemetry readouts from the vehicle. It is usually used only during [redacted]

Payload - Refers to the AP side of the vehicle. Also refers to the film which is measured in frames for consumption.

RTC - Real Time Command

SCF - Satellite Control Facility

SOC - Satellite Operations Center [redacted]

SPC - Stored Program Command

STC Satellite Test Center

TWX - Teletype Exchange

[redacted]

Vehicle - As in vehicle side means the Agena or Agena side of the interface.

242.0
242.0

SECRET

VERILY, I SAY UNTO THEE, THE MANUAL COMMAND GENERATION PROCEDURES

ARE:

I. PRIOR TO RECEIPT OF R-203 THE RODO/FTFD SHALL AGREE ON:

A. KNOWN REAL-TIME-COMMANDS (PAYLOAD ONLY)

B. DSR LOADING REQTS. IN THE EVENT THAT NO OPS. ARE SELECTED BY THE SOC.

C. FIRST WORD OF MANUAL LOAD IN THE EVENT THAT OPS. ARE SELECTED.

II. AS SOON AS R-203 ARRIVES THE RODO SHALL:

A. COMPUTE MANUAL LOAD AND CHECK LOAD WITH T/M DATA MAN'S MANUAL LOAD.

B. COMPARE MANUAL LOAD WITH FTFD MANUAL LOA.

C. COMPARE MANUAL LOAD WITH LETHAL 2 AUTO. LOA.

III. IF DISAGREEMENT EXISTS BETWEEN RODO/FTFD, C.G. LOADS THEN RODO SHALL:

A. GO TO FTFD OFFICE AND IRON-OUT ALL DISAGREEMENTS.

IV. IF NO LOAD CAN BE AGREED ON BY ALL INVOLVED:

A. ALLOW NO DSR COMMANDS TO BE SENT DURING ACQ.

B. GO TO EMERGENCY PROGRAM, IF SPECIFIED.

C. SEND TWX TO [redacted] AND [redacted] EXPLAINING.

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SECRET

SYSTEM _____

	ACTION ITEM	RESPONSIBILITY	DUE DATE	CALENDAR DA
____ 1.	Flight Requirements	Tech. Staff	L-60	
____ 2.	Exposure Analysis	A/P	L-60	
____ 3.	Cam & Filter Orders	Tech. Staff	L-45	
____ 4.	Flight Film Order	Tech. Staff	L-45*	
____ 5.	Flight Load Verified at A/P Storage	Tech. Staff	L-15	
____ 6.	Cam & Filters to A/P	Boston	L-15	
____ 7.	[redacted] (Corn message)	Tech. Staff	L-10	
____ 8.	Film Loading	Tech. Staff	L-10	
____ 9.	Flight Splices	Tech. Staff	L-10	
____ 10.	Final Run Before Buyoff & Ship	Tech. Staff	L-9	
____ 11.	Audit - pre storage	Tech. Staff	Prior to Buy-off.	
____ 12.	[redacted]	Tech. Staff	72 hrs. after recpt. of [redacted]	
____ 13.	[redacted] to Solar (S/C Camera Data)	Tech. Staff	L-9	
____ 14.	[redacted]	A/P	L-8	
____ 15.	[redacted] to Beach Selector Positions	Tech. Staff	L-8	
____ 16.	[redacted] Meeting	Tech. Staff Ops Staff	L-7	
____ 17.	Buyoff DD-250	Tech. Staff	L-7	
____ 18.	[redacted] Camera Data	Tech. Staff	L-4	

SECRET

19. [redacted] A - T/U Footages	Tech. Staff	L-4	
20. [redacted]	A/P	L-1	NO LONGER APPLIE
21. "A" T/U Footage Msg.	Tech. Staff	L-0	
22. [redacted]	A/P	L-0	
23. [redacted] (only if film shipped from [redacted])	Security	A&B Recovery	
24. [redacted]	A/P	Daily	
25. [redacted]	A/P	Daily	
26. [redacted]	A/P	3-day after "B" Recovery	
27. [redacted]	A/P	Daily	
28. [redacted]	A/P	Daily A Recovery B Recovery	
29. [redacted]	A/P	Daily B Recovery	
30. [redacted]	A/P	L-1 and Daily	
31. [redacted]	A/P	A&B Recovery	
32. [redacted]	A/P	A&B Recovery	
33. [redacted]	A/P	3-days after B Recovery	
34. DP Request for Boston	Tech. Staff	A to B Transfer B Recovery for Material Exhaustion	

[redacted]

PRE-FLIGHT [redacted] MESSAGES.

PURPOSE OF MESSAGE	FREQUENCY	STATIONS
WINDOW INFO TO [redacted] MISSION CAPABILITY	N.L.T. 5 DAYS PRIOR TO SAMSO DECISION TIME	[redacted] TO [redacted]
ORBIT SELECTION PLANNING ORBIT	N.L.T. R-15	
DISIC AREA REQUIREMENTS	N.L.T. R-16	[redacted] TO [redacted]
EMERGENCY PROGRAM REQUIREMENTS	N.L.T. R-16	[redacted] TO [redacted]
NOM. COVERAGE & CONSUMPTION DATA	N.L.T. R-12	[redacted] TO [redacted]
PLANNED EPHEMERIS DATA	N.L.T. 72 HRS AFTER RE-55	[redacted] TO [redacted]
ORBIT ELCN. /ACQ. PLANNING ORBIT	48 HRS. AFTER RE-55	[redacted] TO [redacted]
LONG RANGE CORN ALERT MESSAGE	R-10	[redacted] TO [redacted]
MISSION STATUS REPORT	ESTIMATED LAUNCH -5	[redacted] TO [redacted]
PRELIMINARY CAMERA DATA [redacted]	N.L.T. R-4	[redacted] TO [redacted]
CAMERA DATA	N.L.T. R + 24 HRS	[redacted] TO [redacted]

NUMBERS PRESENTLY NOT ASSIGNED TO THESE MESSAGES.

IN-FLIGHT

ULUILI

[redacted]	PURPOSE OF MESSAGE	FREQUENCY	[redacted]
[redacted]	UPDATED ORBITAL ELEMENTS No Preflight	DAILY	TO [redacted]
[redacted]	CAMERA OPERATION COMMAND CONTROL DECISION	N.L.T. 45 MIN. PRIOR TO COMMAND CONTROL	TO [redacted]
[redacted]	NOTIFICATION OF INACTIVE REVS	N.L.T. 1700Z AND 24 HRS PRIOR TO REPORT PERIOD.	TO [redacted]
[redacted]	INITIAL PROGRESS REPORT	A.S.A.P. AFTER LAUNCH	TO [redacted]
[redacted]	PAYLOAD / VEHICLE STATUS REPORT	R + 24 HRS AND DAILY	TO [redacted]
[redacted]	FILM MOVEMENT REPORT	A.S.A.P. AFTER INFORMATION IS AVAILABLE	TO [redacted]
[redacted]	NORMAL RECOVERY	A.S.A.P. AFTER RECOVERY	TO [redacted]
[redacted]	PRE-RECOVERY REPORT	A.S.A.P. BUT N.L.T	TO [redacted]

[redacted] ULUILI

[redacted] MESSAGE CHECK-OFF LIST

1106

MSG. NO.	5 L	6 +1	7 +2	8 +3	9 +4	10 +5	11 +6	12 +7	13 +8	14 +9	15 10	11	12	13	14	20 15
[redacted]	✓	✓	✓	✓	✓	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
	✓	✓	✓	✓	✓	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
	✓															
		( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
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		✓	( )	✓	✓	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
	✓	✓	✓	✓	✓	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
		✓														
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	✓	✓	✓	✓	✓	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
																NA To DSR
	( )															
	✓	✓	✓	✓	✓	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )

"A" RECOVERY	"B" RECOVERY	TO BE SENT
✓	( )	When Acft. sched known
✓	( )	H/F Rec. -10 hrs.
( )	( )	Rec. +ASAP
( )	( )	Rec. +ASAP
✓	( )	Rec. +ASAP
✓	( )	Rec. +ASAP
( )	( )	Rec. +ASAP
✓	( )	Rec. +ASAP
( )	( )	Rec. +ASAP
( )	( )	Cap. departs Hickam
( )	( )	ASAP Cap. Arrives CONUS
( )	( )	ASAP Cap. Departs West Coast
✓	( )	After Arrival [redacted]
( )	( )	Rec. +1 day
✓	( )	H/F Rec. +60 hrs.
( )	( )	H/F Rec. +3 days
✓	( )	H/F Rec. +3 days
✓	( )	H/F Rec. +3 days

[redacted]

	MESSAGE OR REPORT IDENTIFICATION	FREQUENCY OF REPORT	COVERAGE OF REPORT	REPORT OR MESSAGE PROVIDED TO				
				ROTS	DATA	FTFD	C.G.	OTHER
	[redacted]	DAILY	BAL. OF MSN.	--	--	--	--	NORMAL COMMO ADDRESSES
	[redacted]	DAILY	NEXT 80 REVS	--	--	--	--	NORMAL COMMO ADDRESSES
	[redacted]	DAILY/POST REC.	DAYS OPS/ ENTIRE BUCKET	--	--	--	--	NORMAL COMMO ADDRESSES
	[redacted]	POST RECOVERY	ENTIRE BUCKET	--	1 COPY	--	--	NORMAL COMMO ADDRESSES
	[redacted]	DAILY	ALL OPS BAL. OF MSN. IN DA-12	--	--	--	--	NORMAL COMMO ADDRESSES
	[redacted]	DAILY/POST REC.	DAYS REVS/ ENTIRE BUCKET	--	1 COPY	--	--	NORMAL COMMO ADDRESSES
	[redacted]	POST RECOVERY	ENTIRE BUCKET	--	1 COPY	--	--	NORMAL COMMO ADDRESSES
	[redacted]	POST RECOVERY	ENTIRE BUCKET	--	1 COPY	--	--	NORMAL COMMO ADDRESSES
	[redacted]	DAILY/POST REC.	DAYS OPS/ ENTIRE BUCKET	--	1 COPY POST REC.	--	--	NORMAL COMMO ADDRESSES
	[redacted]	DAY PRIOR TO RECOVERY	ENTIRE BUCKET	--	--	--	--	NORMAL COMMO ADDRESSES
	[redacted]	POST RECOVERY	ENTIRE BUCKET	--	--	--	--	NORMAL COMMO ADDRESSES
12.	[redacted]	DAILY	BAL. OF MSN.	1 COPY	1 COPY	1 COPY	1 COPY	NORMAL COMMO ADDRESSES
13.	[redacted]	DAILY	BAL. OF MSN.	--	--	--	--	[redacted] ONLY
14.	[redacted]	DAILY	NEXT 32 REVS	1 COPY	1 COPY	1 COPY	--	[redacted] ONLY

MESSAGE OR REPORT IDENTIFICATION	FREQUENCY OF REPORT	COVERAGE OF REPORT	REPORT OR MESSAGE PROVIDED TO				
			ROTS	DATA	FTFD	C.G.	OTHER
15. [redacted] (RESET TWX)	DAILY	AS REQUIRED	BY PHONE & NOTE	--	BY TWX	--	NO RESET BIAS LESS THAN 4 SECONDS THIS MISSION
16. [redacted] (SRV T/R SUMMARY)	POST RECOVERY	ENTIRE BUCKET	--	RESP. FOR REPORT	--	--	DATA/COMP. OPS PROVIDE MESSAGE - NORMAL ADDES.
17. [redacted] (SRV T/R EPHEM.)	POST RECOVERY	ENTIRE BUCKET	--	--	--	--	NORMAL COMMO ADDRESSES
18. [redacted] (PRECIS. CLOCK CORR.)	POST RECOVERY OF 2ND BUCKET	BOTH BUCKETS	--	1 COPY	--	--	NORMAL COMMO ADDRESSES
19. [redacted]	DAILY	NEXT 24 REVS	1 COPY	1 COPY	2 COPIES	--	
20. CASCEL DATA	DAILY	NEXT 24 REVS	1 COPY	--	1 COPY	--	
21. GIGO DATA	DAILY	NEXT 24 REVS	--	1 COPY	--	--	
22. ACQUISITION DATA (SPOT)	DAILY	NEXT 80 REVS	1 COPY	2 COPIES	1 COPY	1 COPY	DATA GIVES 1 COPY TO [redacted]
23. RAMP LISTS (J3CYRATE)	WITH EACH RAMP CHANGE	NEW RAMP	--	1 COPY	--	--	
24. EXPOSURE ANALYSIS (XSUM)	DAILY	PRIME DESC. BLOCK PASS OF DAY	1 COPY	1 COPY	--	--	