MA-9/20 FLIGHT PLAN

REVISION A

Prepared by

SPACECRAFT OPERATIONS BRANCH

FLIGHT CREW OPERATIONS DIVISION

April 15, 1963

WORD ONE/KEYSEARCH

NG DATA
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Revision - A
Mercury - Atlas 9

NASA Manned Spacecraft Center
Houston, Texas
In reply refer to: OFC (JBJ:mh)
OFC-55610-3m-59
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MEMORANDUM for Those Concerned

Subject: MA-9/20 Flight Plan, Revision A

Enclosed is the Revision A to the MA-9/20 Flight Plan. The revisions reflect modifications to the spacecraft systems and the astronauts pre-flight training. Revisions also include an updating of the nomenclature and corrections of typographical errors.

Due to the number of pages effected, the entire flight plan has been reprinted with the exception of the cover sheet and divider pages. Where changes have been made they are marked by a heavy black vertical line. A new date has been placed on only those pages where changes have been made.

Predicted usage curves for the 22 hour and the 11 hour tape recorders are also enclosed. The 11 hour tape curve has been provided since a possibility still exists that it will be used.

Richard E. Day
Assistant Chief for Training, FCOD

Enc. 2:
1. MA-9/20 Flight Plan, Revision A
2. MA-9/20 Flight Plan Estimated Tape Usage (2)

LAUNCH PHASE

Hr:Min:Sec		
0:00:00	Lift-off	A- Report clock operating
0:00:20	Start backup clock	MCC- Standby for 20 seconds 2, 1, MARK!
		A- Report backup clock operating
0:00:30	Report	A- Fuel and O_2 status Cabin pressure holding at_____
0:01:00	Report	A- Fuel and O_2 status Cabin pressure passing through_____
		MCC- Pitch angle_____ Report passing through max q
0:01:30	Report	A- Fuel and O_2 status Cabin pressure passing through_____
		MCC- Pitch angle_____
0:02:13	BECO	A- Report BECO Fuel and O_2 status Cabin pressure sealed and holding at_____
		MCC- Pitch angle_____ Confirm staging
0:02:30	Jett Tower	A- Jett Tower Ring - PULL Report Jett Tower GREEN Observe tower separation Retro Jett Switch - OFF
		MCC- Pitch angle_____
0:03:30	Report	A- Fuel and O_2 status Complete voltage check

Hr:Min:Sec		
0:03:35	MCC GO-NO GO	MCC- Give GO-NO GO
		A- Give astronaut GO-NO GO
		MCC- Confirm astronaut GO-NO GO Pitch angle_____
0:04:00	Report	A- Fuel and O_2 status_____
		MCC- Pitch angle_____
0:04:30	Report	A- Fuel and O_2 status_____
		MCC- Pitch angle_____ Report when V/VR is over .8
0:05:03	SECO and Sep Cap	A- Report SECO and Sep Cap GREEN
		MCC- Confirm SECO and Sep Cap
0:05:08	Turnaround (FBW-Low)	A- Report Aux Damp OK on ASCS Go to FBW-Low Report turnaround complete orbit attitude
0:07	Orbit GO	A- Go to ASCS Orbit
		MCC- Confirm events Give orbit GO
		A- Electrical systems check Confirm orbit GO TV camera - OFF 16 mm camera - OFF

First Orbit

Note: This orbit will primarily be devoted to systems checkout and monitoring. The prime control mode will be ASCS Orbit.

Hr:Min		
00:08	BDA/MCC (ASCS Orbit)	MCC- Give GET Mark Give V/VR
		A- Blood pressure

Hr:Min		
00:10 to 00:15	Cap Sep + 330 Sec. Checklist Control Systems Check (As required)	A- Complete Cap Sep + 330 Sec. checklist Check MP and FBW-Normal Return to ASCS Orbit
00:14	CYI AOS (ASCS Orbit)	A- TV camera - ON Report status of systems Gyro switch - FREE (T_s + 5 sec. check)
00:21	CYI LOS (ASCS Orbit)	A- TV camera - Off
00:31	ZZB (ASCS Orbit)	A- Gyro switch - SLAVE Readout fuel and O_2 quantities
00:40	Short Status Report (ASCS Orbit)	A- Short status report
00:50	MUC AOS (ASCS Orbit)	A- Blood pressure MUC- Emergency voice check Send end rest command for check
00:58	MUC LOS (ASCS Orbit)	A- S-band beacon - GROUND COMMAND
01:05	Long Status Report (ASCS Orbit)	A- Long status report
01:10	CTN AOS (ASCS Orbit)	A- Oral temperature
01:27	GYM AOS (ASCS Orbit)	A- Give status GYM- Give GO-NO GO decision
1:28	2-1 Retrosequence Point (ASCS Orbit)	
01:34	MCC AOS (ASCS Orbit)	A- TV camera - ON

Second Orbit

Hr:Min		
01:40	Power Down (Drift)	A- ASCS Control - SELECT Cage Gyros Power Down ASCS bus TV camera - OFF Tape recorder - PROGRAM
01:41	Twin Fall Victory LOS (Drift)	A- C-band beacon - GROUND COMMAND
01:48	CYI AOS (Drift)	A- TV camera - ON
01:54	CYI LOS (Drift)	A- TV camera - OFF
02:05	ZZB (Drift)	A- Readout fuel and O_2 quantities
02:15	Short Status Report (Drift)	A- Short status report into tape recorder
02:25	MUC (Drift)	A- Blood pressure Exercise Blood pressure
02:35	Long Status Report (Drift)	A- Long status report into tape recorder
03:00	CAL (Drift)	A- Tape recorder - CONTINUOUS Power up ASCS bus
3:07	MCC AOS (Drift)	A- TV camera - ON
03:10	MCC (FBW-Low)	A- Go FBW-Low Align spacecraft Uncage gyros Go ASCS Orbit Gyros - SLAVE Blood pressure
3:14	MCC LOS (FBW-Low)	A- TV camera - OFF

Third Orbit

Hr:Min			
	Note: The night phases of the third, fourth, and fifth orbits will be devoted to the Flashing Beacon Experiment.		
03:29	Flashing Beacon Experiment Deployment (FBW-Low)	A-	Go FBW-Low Orient spacecraft to beacon-deploy attitude (-20° pitch) Deploy flashing beacon Cage gyros Power down ASCS bus Tape recorder - PROGRAM
03:40	Short Status Report (Drift)	A-	Short status report into tape recorder
03:45 to 04:23	Flashing Beacon Experiment - Observation (FBW-Low)	A-	Orient spacecraft to observe flashing beacon (Approximately 180° yaw) Observe beacon during night phase Also extinct standard light at intervals during the night phase to establish dark adaption level
04:00	MUC (FBW-Low)	A-	Blood pressure
04:23	HAW AOS (FBW-Low)	A-	C-band beacon - CONTINUOUS
		HAW-	Give "Mark" to switch TM transmitters
		A-	On "Mark" from HAW switch TV Control switch-TM Readout fuel and O_2 quantities
04:38	CAL (Drift)	CAL-	Give "Mark" to switch TM transmitters
		A-	On CAL "Mark" switch TV control switch - OFF
04:41	MCC AOS (Drift)	A-	TV camera - ON Send CW for operational check
Fourth Orbit			
4:47	MCC LOS (Drift)	A-	TV camera - OFF

Hr:Min			
04:53	Flashing Beacon Experiment Observation (Manual)	A-	Tape recorder - CONTINUOUS Orient spacecraft, locate and observe beacon during the period of closest approach on the day light phase of the orbit
05:03 to 05:13	Radiation Measurement (Manual)	A-	Radiation experiment ON for 10 minute period
05:07	Long Status Report (Drift)	A-	C-band beacon - GROUND COMMAND Long Status Report
05:13	Tape Recorder (Drift)	A-	Tape recorder - PROGRAM
05:14 to 05:52	Flashing Beacon Experiment Observation (FBW-Low)	A-	Second night observation Repeat same procedures for observations during night phase of the orbit
05:58	HAW (Drift)	A-	Oral temperature Readout fuel and O_2 quantities
06:10	CAL (Drift)	A-	Blood pressure
06:15	MCC AOS (Drift)	A-	TV camera - ON Eat and drink period Turn off cabin fan and cabin coolant flow
Fifth Orbit			
06:19	MCC LOS (Drift)	A-	TV camera - OFF
06:32 to	Radiation Measurement (Drift and FBW-Low)	A-	Radiation experiment ON and tape recorder CONTINUOUS for 15 minute period
06:42 to 07:20	Flashing Beacon Experiment Observation (FBW-Low)	A-	Third night observation Repeat same procedures for observations during night phase of orbit
07:23	Radar Track (Drift)	A-	C-band beacon - CONTINUOUS
07:25	Short Status Report (Drift)	A-	Short status report into tape recorder
07:23	HAW (Drift)	A-	C-band beacon - GROUND COMMAND Readout fuel and O_2 quantities

Hr:Min			
07:40	CAL (Drift)	A-	Blood pressure Exercise Blood pressure
07:45	Power Up (Drift)	A-	Tape recorder - CONTINUOUS Power up ASCS bus
07:50	Attitude Alignment (FBW-Low)	A-	Go FBW-Low Align spacecraft attitude Uncage gyros Go ASCS Orbit
Sixth Orbit			
08:06 to 08:16	Radiation Measurement (ASCS Orbit)	A-	Radiation experiment ON for 10 minute period
08:21	Ground Light Experiment (FBW-Low)	A-	Go FBW-Low Gyro Switch - FREE Orient spacecraft to observe ground light Comment on light acquisition Extinct ground light and standard light as possible and record photometer readings (This experiment will be performed only once. If conditions on this orbit permit observation, the 21st orbit attempt will be omitted)
08:26	Completion of Ground Light Experiment (ASCS-Reentry)	A-	Go to ASCS-Reentry Gyro switch-SLAVE Tape recorder - PROGRAM
08:48	CSQ AOS (ASCS-Reentry)	A-	TV camera - ON Blood pressure
08:55	CSQ LOS (ASCS-Reentry)	A-	TV camera - OFF
09:00 to 10:30	Balloon Experiment (ASCS-Reentry)	A-	Go FBW-Low Stabilize spacecraft at 0°, 0°, 0° Tape recorder - CONTINUOUS 16 mm camera - ON (in window mount) Deploy balloon (Actual time of deployment will be relayed from ground)

Hr:Min			
			After deployment pitch down slightly for observation and photographs Return to ASCS-Reentry 16 mm camera - OFF
Optional	Balloon Observation (FBW-Low)	A-	Go FBW-Low Maneuver to observe balloon and obtain more accurate drag measurements (16 mm camera photographing balloon during this period) Return to ASCS-Reentry
09:08	HAW (ASCS-Reentry)	A-	Readout fuel and O_2 quantities
09:20	Short Status Report (ASCS-Reentry)	A-	Short status report into tape recorder
Seventh Orbit			
09:39	Radiation Measurement (ASCS-Reentry)	A-	Radiation experiment - ON for 10 minute period
09:39 to 10:19	Window Attenuation Evaluation (ASCS-Reentry)	A-	As possible, extinct known stars with the photometer Record the star, the photometer reading and the position in the window Take a photometer reading on the standard light with each star reading
09:58	ZZB (ASCS-Reentry)	A- ZZB-	Give status Give GO-NO GO decision
10:16	Sunrise (ASCS-Reentry)	A-	Observe the stars under the known day light conditions and report visibility. Also report spacecraft lighting conditions
10:22	CSQ AOS (ASCS-Reentry)	A-	TV camera - ON
10:23	7-1 Retrosequence Point (ASCS-Reentry)		
10:28	CSQ LOS (ASCS-Reentry)	A-	TV camera - OFF

Hr:Min			
10:30	Balloon Release and Tracking (FBW-Low)	A-	C-band beacon - CONTINUOUS Release balloon Track balloon for approximately one minute holding it on the window orbit attitude horizon mark 16 mm camera on for entire tracking maneuver (in window mount) Cage gyros Power down ASCS bus
10:40	HAW (Drift)	A-	Blood pressure Readout fuel and O_2 quantities
10:45	HAW LOS (Drift)	A-	C-band beacon - GROUND COMMAND Tape recorder - PROGRAM
10:50	Short Status Report (Drift)	A-	Short status report into tape recorder
11:00	Eat & Drink (Drift)	A-	Eat and drink
Eighth Orbit			
11:15 to 11:25	Radiation Measurement (Drift)	A-	Radiation experiment ON and tape recorder CONTINUOUS for 10 minute period
11:55	CSQ AOS (Drift)	A-	TV camera - ON
12:02	CSQ LOS (Drift)	A-	TV camera - OFF
12:13	HAW (Drift)	A-	Blood pressure Readout fuel and O_2 quantities
12:20	Short Status Report (Drift)	A-	Short status report into tape recorder
12:27	RKV (Drift)	A-	Oral temperature Blood pressure
Ninth Orbit			
12:40 to 14:50	Start Rest Period (Drift)	A-	Start rest period during this time interval (Actual time at astronaut option)

Hr:Min			
Optional	Thruster Check (MP & FBW-Low)	A-	Quick check of manual proportional and FBW-Low thrusters just prior to rest period (Tape recorder - CONTINUOUS for thruster check) Rate indicator - AUTO
13:29	CSQ AOS (Drift)	A-	TV camera - ON Readout of fuel and O_2 quantities (If not resting--astronaut's option)
13:36	CSQ LOS (Drift)	A-	TV camera - Off
13:38	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting--astronaut's option)
Tenth Orbit			
14:50 to 20:30	Rest period (Drift)	A-	8 hours are allotted to rest with the start during the above period with the time at the astronaut's option (TM switch - CONTINUOUS, radar beacons - GROUND COMMAND, HF and UHF volume at comfortable, but readable levels)
15:02	CSQ AOS (Drift)	A-	TV camera - ON Readout fuel and O_2 quantities (If not resting--astronaut's option)
15:08	CSQ LOS (Drift)	A-	TV camera - Off
15:10	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting--astronaut's option)
Eleventh Orbit			
16:40	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting--astronaut's option)
17:07	RKV (Drift)	A-	Readout fuel and O_2 quantities (if not resting--astronaut's option)
Twelfth Orbit			

Hr:Min			
17:38	CYI AOS (Drift)	A-	TV camera - ON (if not resting--astronaut's option)
17:43	CYI LOS (Drift)	A-	TV camera - OFF
18:15	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting--astronaut's option)
18:40	RKV (Drift)	A-	Readout fuel and O_2 quantities (if not resting--astronaut's option)
Thirteenth Orbit			
19:10	CYI AOS (Drift)	A-	TV camera - ON S-band beacon - CONTINUOUS (if not resting--astronaut's option)
19:17	CYI LOS (Drift)	A-	TV camera - OFF S-band beacon - GROUND COMMAND
19:40	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting--astronaut's option).
20:15	RKV (Drift)	A-	Readout fuel and O_2 quantities (if not resting--astronaut's option)
Fourteenth Orbit			
20:30 to 22:52	End rest period (Drift)	A-	Station to send end rest signal will be determined by Flight Director. (MUC 15th orbit will be final station. Execute end rest checklist, TM - GROUND COMMAND)
Optional	Manual & FBW-Low Thruster Check (MP & FBW-Low)	A-	Quick check of manual proportional and FBW-Low thrusters following rest period. (Tape recorder - CONTINUOUS for thruster check)
20:44	CYI AOS (Drift)	A-	TV camera - ON (if not resting--astronaut's option)
20:50	CYI LOS (Drift)	A-	TV camera - OFF
21:00	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting--astronaut's option)

Hr:Min			
21:20	MUC (Drift)	A-	Readout fuel and O_2 quantities (if not resting--astronaut's option)
21:24	MUC (Drift)	MUC-	Ground Command C-band beacon on
22:03	MCC AOS (Drift)	A-	TV camera - ON (if not resting--astronaut's option)
		MCC-	Ground Command C-band beacon on
Fifteenth Orbit			
22:09	MCC LOS (Drift)	A-	TV camera - OFF
22:17	CYI AOS (Drift)	A-	TV camera - ON S-band beacon - CONTINUOUS (if not resting--astronaut's option)
22:24	CYI LOS (Drift)	A-	TV camera - OFF S-band beacon - GROUND COMMAND
22:36	ZZB (Drift)	A-	Readout fuel and O_2 quantities (if not resting--astronaut's option)
22:40	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting--astronaut's option)
22:52	End rest period (Drift)	MUC-	Send end rest command, if required
22:58	MUC (Drift)	MUC-	Ground Command C & S band beacons on
Optional	Eat & Drink (Drift)	A-	Eat and drink prior to ASCS period
23:30	Power Up (Drift)	A-	Tape recorder - CONTINUOUS Power up ASCS bus Rate indicator - Man ON C-band beacon - CONTINUOUS
23:36	MCC AOS (ASCS Orbit)	A-	TV camera - ON Go FBW-Low Align spacecraft Uncage gyros Go ASCS- Orbit
23:40	MCC (ASCS Orbit)	A-	C-band beacon - GROUND COMMAND

Hr:Min			
Sixteenth Orbit			
23:43	MCC LOS (ASCS Orbit)	A-	TV camera - OFF
23:51	CYI AOS (ASCS Orbit)	A-	TV camera - ON Blood pressure
23:57	CYI LOS (ASCS Orbit)	A-	TV camera - OFF
24:07	ZZB (ASCS Orbit)	A-	Readout fuel and O_2 quantities
24:20	Dim Light Phenomenon Photographs (ASCS Orbit)	A-	Go FBW-Low Orient spacecraft to predetermined attitude Stop all rates Cage and uncage gyros Go ASCS Orbit Gyros - FREE
24:22	Sunset (ASCS Orbit)	A-	Using Robot camera, start taking photographs of the zodical light and airglow layers Mark start and stop of each photograph on the onboard tape
24:26	MUC AOS (ASCS Orbit)	A- MUC-	Give status Give GO-NO GO decision
24:32	Sunset + 10 min. (ASCS Orbit)	A-	Gyro switch - SLAVE Continue taking photographs through entire night phase
24:50 to 24:55	Radiation Measurement (ASCS Orbit)	A-	Radiation experiment ON for 5 minute period
25:03	17-1 Retrosequence Point (ASCS Orbit)		
25:05	Power Down Horizon Difinition Quadrant Photographs (FBW-Low)	A-	ASCS Control - SELECT Cage gyros Power down ASCS bus Go FBW-Low Using the Hasselblad camera with the MIT film back take a series of 8 horizon photographs, 2 in each quadrant,

Hr:Min			
			while maneuvering in a modified 360° yaw. Record time and position of each set of photographs
25:10	MCC AOS (FBW-Low)	A-	TV camera - ON
Seventeenth Orbit			
25:16	MCC LOS (Drift)	A-	TV camera - OFF Tape recorder - PROGRAM
25:25	CYI AOS (Drift)	A-	TV camera - ON
25:29	CYI LOS (Drift)	A-	TV camera - OFF
25:41	ZZB (Drift)	A-	Readout fuel and O_2 quantities
25:47	Short Status Report (Drift)	A-	Short status report into tape recorder
25:59	MUC (Drift)	A-	Blood pressure
26:35	Infrared Weather Photographs (Manual)	A-	Tape recorder - CONTINUOUS As possible during the day side of the orbit take infrared weather photographs using the Hasselblad camera with the weather film back Record time, subject of each photograph and detail comments on observations
26:43	MCC AOS (Drift)	A-	TV camera - ON
Eighteenth Orbit			
26:49	MCC LOS (Drift)	A-	TV camera - OFF
26:53 to 26:58	Radiation Measurement (Drift)	A-	Radiation experiment ON for 5 minute period
27:20	Short Status Report (Drift)	A-	Short status report Tape recorder - PROGRAM

Hr:Min			
28:00	HAW (Drift)	A-	C-band beacon - CONTINUOUS Readout fuel and O_2 quantities
28:16	MCC AOS (Drift)	A-	TV camera - ON Blood pressure
Nineteenth Orbit			
28:23	MCC LOS (Drift)	A-	TV camera - OFF C-band beacon - GROUND COMMAND
28:24	Horizon Definition Moon-Earth Limb Photographs (FBW-Low)	A-	Tape Recorder - CONTINUOUS Go FBW-Low Orient spacecraft and take the moon and the earth's limb in one photograph Mark photographs on tape recorder (Actual time of photographs will be relayed from ground)
28:30	Eat & drink Period (Drift)	A-	Tape recorder - PROGRAM Eat and drink as desired
28:55 to 29:00	Radiation Measurement (Drift)	A-	Radiation experiment ON and tape recorder CONTINUOUS for 5 minute period
29:25	Short Status Report (Drift)	A-	Short status report into tape recorder
29:35	HAW (Drift)	A-	Readout fuel and O_2 quantities
29:51	MCC AOS (Drift)	A-	TV camera - ON
29:53	HF Antenna Test (FBW-Low)	A-	Tape recorder - CONTINUOUS Go FBW-Low Orient spacecraft to approximately 0° roll, 0° pitch and optional yaw Transmit on HF dipole for approximately one minute Include indentification, CET time, purpose and estimated attitude Reorient spacecraft to the 90° roll, 0° yaw position (HF dipole pointed at nadir point) Repeat 1 minute call

Hr:Min			
			(Ground stations should not answer but should record during this period) (Sequence of attitudes may be reversed)
Twentieth Orbit			
29:54	MCC LOS (FBW-Low)	A-	TV camera - OFF
30:07	Radiation Measurement (Drift + FBW-Low)	A-	Radiation experiment ON for 15 minute period
30:08	HF Antenna Test (FBW-Low)	A-	Repeat entire HF test
30:22	Tape recorder (Drift)	A-	Radiation experiment OFF Tape recorder - PROGRAM
30:53	CSQ AOS (Drift)	A-	TV camera - ON
30:54	CSQ LOS (Drift)	A-	TV camera - OFF
30:55	Short Status Report (Drift)	A-	Short status report into tape recorder
31:08	HAW (Drift)	A-	Readout fuel and O_2 quantities
31:15	CAL (Drift)	A-	Blood pressure
31:20	Power up (Drift)	A-	Tape recorder - CONTINUOUS Power up ASCS bus
31:25	Attitude Alignment (FBW-Low)	A-	Go FBW-Low Align spacecraft Uncage gyros Go ASCS Orbit
Twenty-first Orbit			
31:56	Ground Light Experiment (FBW-Low)	A-	Go FBW-Low Gyro switch - FREE Orient spacecraft to observe ground light Comment on light acquisition

Hr:Min			
			Extinct ground light and standard light and record photometer values (If sixth orbit experiment was successful, this test will be eliminated)
32:01	Completion of Ground Light Experiment (ASCS Orbit)	A-	Go ASCS Orbit Gyro switch - SLAVE
32:05	Cabin Precooling (ASCS Orbit)	A-	Turn on cabin fan and cabin coolant flow for precooling prior to reentry
32:10	Short Status Report (ASCS Orbit)	A-	Short status report into tape recorder
32:15	Radiation Measurement (ASCS Orbit)	A-	Radiation experiment ON for 5 minute period
32:20	Tape recorder (ASCS Orbit)	A-	Radiation equipment OFF Tape recorder - PROGRAM
32:22	Horizon Definition Photographs (ASCS Orbit)	A-	Using Hasselblad camera take Horizon Definition Photographs at approximately 6 minute intervals over entire day phase (Mark each photograph on tape recorder)
32:23	CSQ AOS (ASCS Orbit	A-	TV camera - ON Oral temperature Blood pressure
32:30	CSQ LOS (ASCS Orbit)	A-	TV camera - OFF
Twenty-second Orbit			
33:15	Short Status Report (ASCS Orbit)	A-	Short status report into tape recorder
33:33	ZZB AOS (As required)	A-	Tape recorder - CONTINUOUS Complete stowage and preretrosequence checklists Check manual proportional and FBW-High thrusters if required Readout fuel and O_2 quantities
33:57	CSQ AOS (ASCS Orbit)	A-	TV camera - ON C & S - band radar beacons - CONTINUOUS Report checklists - COMPLETED

Hr:Min			
		CSQ-	Confirm astronaut ready for retrosequence Confirm retrosequence time setting
		A-	Squib switch - ARM at retrosequence minus 5 seconds
33:59	Retrosequence (ASCS Orbit)	CSQ-	Countdown to retrosequence "Mark"
		A-	Standby to backup with MP and control retrosequence events Report sequence light illuminations
33:59	Retrofire (ASCS Orbit)	CSQ-	Confirm retrosequence Countdown to retrofire "Mark" Confirm retrofire
		A-	Mark each retrorocket firing
34:00	Retro Jettison (FBW)	A-	Go FBW Execute pre-retro Jett checklist Report Retro Jett
34:01	Pitch up to Reentry Attitude (FBW)	A-	Pitch up to reentry attitude Go ASCS Reentry
34:03	CSQ LOS (ASCS-Reentry)	A-	TV camera - OFF
34:05	Blood pressure (ASCS-Reentry)	A-	Blood pressure
34:08	.05G (Aux Damp)	A-	Mark .05G
34:10	Blood pressure (Aux Damp)	A-	Blood pressure (At approximately 1G.)
34:14	Drogue chute (Aux Damp)	A-	Deploy drogue chute manually at 40,000 feet Execute checklist (as required)
34:14	Blood pressure	A-	As possible, take blood pressure
34:15	Main chute	A-	Execute checklist
34:19	Landing	A-	Execute checklist

COMMUNICATIONS

1. Negative reporting will be used in most air-ground transmissions to eliminate unnecessary contacts. UHF will be the prime mode for station communcations.

2. Unless initially contacted by the pilot, the ground stations will not attempt voice contact until after T/M lock-on and inspection of the data.

3. The general voice communications procedure for station passes will consist of the following:

a) Ground Station

1) Report T/M lock-on and status of T/M readouts

b) Ground Station request pilot's report on:

1) T/M values not reliably received on the ground

2) T/M values near unacceptable limits or changing at excessive rates

3) Other values or condtions specifically requested by MCC

c) Pilot reports his status (GO, NO GO, etc.)

d) Ground station relays to pilot and confirms reception of:

1) Retrosequence times for planned landing areas, if different from nominal times

2) Retrosequence times for contingency landing areas if nominal times would not result in water landings

3) Significant clock errors

e) Ground Station - advise pilot of current or impending problems, of known errors in cockpit gage readings, of other information specifically requested by the pilot such as T/M values monitored only on the ground.

4. If ground stations do not establish contact at first attempts, the Cap Com will transmit in the blind within two minutes of T/M contact or at point of closest approach and report appropriate information under a, d, and e of item 3 before again attempting to establish voice contact.

5. The C and S band radar beacons will be used as programmed in the flight plan and activated as required by ground stations when in GROUND COMMAND. Only the GROUND COMMAND and CONTINUOUS switch positions will normally be used during the flight.

6. T/M will be on for every ground station and on continuously during the rest period. The pilot will switch the T/M to ground command when more than a 30-minute gap exists between ground stations. The pilot will maintain control over the T/M switching.

7. A long status report will be read into the tape recorder at 1:05, 2:35, and 5:07. The long status report will consist of the following quantities:

a) "B" nut temperature - pitch down

b) "B" nut temperature - yaw left

c) "B" nut temperature - roll CW

d) 250 VA inverter temperature (or standby if on line)

e) 150 VA inverter temperature

f) Cabin air temperature

g) Cabin heat exchanger dome temperature

h) Suit heat exchanger dome temperature

i) Suit inlet temperature

j) Main 24V DC bus current

k) Main 24V DC bus voltage

This report will permit postflight evaluation of any discrepancies between cockpit indications and ground readouts from T/M.

8. A short status report will be read into the tape recorder roughly once per orbital pass as programmed in the flight plan. The short report will consist of the following quantities:

a) Auto fuel tank, N_2 low pressure

b) Manual fuel tank, N_2 low pressure

c) "B" nut temperature - pitch up

d) "B" nut temperature - yaw right

e) "B" nut temperature - roll CW

f) Auto fuel tank outlet temperature

g) Manual fuel tank outlet temperature

h) Aux fuel tank outlet temperature

i) Isolated bus voltage

9. The consumable quantities of RCS fuel and O_2 will be read out by the pilot over network stations approximately once per orbit as specified in the flight plan.

10. The spacecraft control mode will not be reported to the ground unless it differs from the flight plan.

11. The suit coolant valve, bypass valve, cabin coolant valve, and auxiliary coolant valve settings will be reported in the following manner:

a) When one of the valves is reset, the pilot will record on tape the previous setting, the new setting, and the time at which the valve was reset.

b) The pilot will then report the same information to the next ground station.

12. During the rest period stations will not attempt voice contact with the spacecraft but will monitor spacecraft frequencies. Ground station voice communications checks will be conducted into a dummy transmitter load.

13. The Atlantic and Pacific Missile Ranges will provide additional communcations coverage by SSB-UHF relay from either Kwajalein or Wake Islands, to HAW in the Pacific and from either Antigua or Ascension Islands to MCC in the Atlantic. Specific communications checks will not be made with the spacecraft; however, these stations will monitor spacecraft frequencies particularly at times when the spacecraft is within line-of-sight and transmitting to primary Mercury network stations, i.e., Wake and Kwajalein attempt to receive transmission to CTN.

14. C-band radar ships will be located near the prime recovery areas of Bermuda and Midway to cover the descent phase of the mission. These radar ships and Ascension Island will also track the spacecraft during the orbital phase.

15. Relay aircraft will be provided at both Bermuda and Midway for voice communications during the descent phase. No communications will be attempted during the orbital phase by these aircraft.

16. Use of the onboard, magnetic tape recorder has been carefully scheduled to record critical flight sequences, air-ground communications, experiments, and pilot's comments. The recorder will be in either CONTINUOUS or PROGRAM modes throughout the flight. The PROGRAM mode puts the recorder in operation for a one-minute period every ten minutes. During certain experiments when it is only necessary to record the pilot's comments about his activities or observations, the recorder will be in PROGRAM mode with the VOX power switch in RECORD; this will start the recorder at any time the pilot speaks as well as during the programmed sequences. The pilot will monitor and conserve tape throughout the mission. Ground stations will record all information during station passes.

CW CODE DESIGNATIONS

The following CW code designations will be used by the pilot in the event of transmitter failures:

A A A	·– ·– ·–	Affirmative, I concur, yes
A L	·– ·–··	Abort light
A R	·– ·–·	End of message
B T	–··· –	Message follows
C P	–·–· ·––·	Cabin pressure
EEEE..E	·····	Error
E F	· ··–·	Emergency O_2 rate flow
F	··–·	Off
F A	··–· ·–	Automatic fuel
F M	··–· ––	Manual fuel
G M T	––· –– –	Clock GMT
I M I	·· –– ···	Repeat your last transmission
K	–·–	Over
L K	·–·· –·–	Leaking
M A N	–– ·– –·	Operate Manually
N O	–· –––	No, negative
O	–––	On
O_2	––– ··–––	Oxygen primary and secondary quantities (Followed by four numbers)
O K (X)	––– –·– (X)	Status green for x orbits

Q	––·–	Request, question
R (X)	·–·(X)	End of x orbit retro-sequence time
W	·––	Roger, Wilco
R E	·–· ·	Reentering at indicated contingency area (Followed by contingency area)
R E O	·–· · –––	Reentering at end of this orbit
R S	·–· ···	Retrosequence
S P	··· ·––·	Suit pressure
T	–	Temperature
U U U	··– ··– ··–	Aborting or reentering immediately
X	–··–	Out of operation
Mark	———	Long dask with Mark at end of dash
V A	···– ·–	End of transmission

AERO-MEDICAL STUDIES

Objectives

1. This mission will allow an evaluation of man's cardiovascular system response to the conditions associated with extended orbital flight. In addition, the measured physiological parameters can be used to assess the adequacy of the spacecraft environment and the function of life support systems. Analysis of this information will insure the pilot's well-being, particularly his medical condition.

2. Sufficient rest, eating, and drinking periods have been scheduled during the flight so that the pilot can maintain the proper hydration, nutrition and physiological reserves of energy required throughout the mission.

3. The pilot will use two periods scheduled during flight to perform a calibrated exercise study as a measured load on the cardiovascular system. The first of these exercise periods, which include blood pressure measurements, is scheduled to occur at 02 25 00 during the second pass over Australia, and it will provide baseline data for medical evaluation early in the flight.

4. A study of the pilot's water balance and kidney function will be made by comparing body weight before and after flight, by recording water intake during flight, and by analyzing urine samples collected at intervals throughout the flight.

Methods

1. The oral temperature measuring system consists of a themister imbedded in a latex probe. The probe is stowed on a patch of Velcro on the right ear muff inside the helmet; so, the pilot must open the visor to insert the probe under his tongue. The temperature range of the instrument is 75° - 105°F, and it will provide a backup indication of suit outlet temperature when not being used for body temperature measurements. The output of the thermister bridge circuit is a voltage for T/M to ground stations. During body temperature measurements the probe must be held in a single position under the tongue with the mouth closed for a period of 5 minutes. This rather long period is very necessary because oral temperature is not constant at all points in the mouth, particularly during oral breathing or talking; at least 5 minutes are required to achieve a somewhat stable, accurate reading. Four measurements of temperature are scheduled during the mission; other readings will only be requested by MCC when additional data is necessary to assess the pilot's condition. Several minutes prior to a scheduled measurement for ground T/M readout, the pilot will check for satisfactory cabin pressure, open the visor, insert the probe, and hold his mouth closed. Ground stations may make reports to the pilot, but will not interrogate him or expect replies, except for emergencies, until the measurement is reported complete by the medical monitor.

2. Blood pressure readings are taken by a tailored, occluding cuff on the upper left arm with a microphone under the lower edge of the cuff positioned over the brachial artery. The microphone has a narrow frequency response centered on 35 cps. When the pilot depresses the blood pressure START button on the left panel, the cuff is inflated to 4.4 psig, then deflates slowly. The microphone output and cuff pressure are put on a single T/M channel in place of one of the two ECG outputs.

3. The pilots ECG readings come from 4 sensors located on the torso and positioned essentially the same as in previous manned Mercury flights. The pneumograph uses two sensors measuring changes in transthoracic impedence to determine respiration rate. The pneumograph sensors are located on the mid-axillary line (under each arm) at the 6th rib level. Both ECG and respiration are recorded without active pilot participation.

4. The exerciser consists of a conveniently located two-hand grip anchored to the spacecraft structure. It has a stretchable rubber bungee cord and nonstretching line to limit the length of travel. Pulling the hand grip to its fullest extension requires a precise quantity of work, measured in foot-pounds; therefore, accomplishing a specified number of full extensions imposes a calibrated work load on the pilot. Variations in the measured physiological parameters during and after an exercise period will be used later to evaluate cardiovascular function.

5. Food will be of two types, a ready-to-eat, bit-size food in sufficient quantity to satisfy all caloric requirements and an experimental, dehydrated food and drink prepacked in plastic containers for reconstitution during flight. Preparation of the dehydrated food requires the addition of water to fill the containers carefully in order to avoid spillage under 0 g during the transfer operation. The rehydrated drink is ready for consumption very shortly after the water is added. The rehydrated food may require about 5 minutes mixing to blend with the water. The bite-size food is similar to that provided on MA-8.

6. Four urine samples will be collected by the pilot during flight using a 60 cc hypodermic syringe as a transfer pump to extract the urine from the collecting container inside the suit and deposit it in separate containers located in the honeycomb sections of the pilot's couch. A small hose from the suit container leads to a shut-off valve attached to the outside of the suit on the left thigh. The syringe with inlet and outlet hoses is attached to a mounting frame inboard and below the Abort Handle. The inflow hose is connected to the suit shutoff valve and the outflow hose is routed over to the right panel and ends in a large hollow needle which can be inserted into one of four self-sealing diaphrams on the ends of tubing leading to each of the special sample containers. The four self-sealing tube ends are located on the left side of the temperature control (right) console and just below the Emergency O_2 handle.

FLASHING BEACON EXPERIMENT

Purpose

The objective is to determine the capability of the pilot to acquire a flashing beacon light of known intensity at distances up to 15 miles from the Mercury spacecraft. Furthermore, it will provide results obtained in the space environment for comparison with measured values for similar tests performed in the atmosphere. Ultimate purpose is to obtain data on acquisition aids for rendezvous in Projects Gemini and Apollo.

Description

The experiment uses two xenon lights flashing on for approximately 100 microseconds out of each second. The lights are battery powered and are semiflush mounted on opposite sides of a sphere 5.75 inches in diameter, weighing 10 pounds. The sphere has a ballistic number (B. N. $=W/C_DA$) of 26.66 compared to the spacecraft ballistic number of 45.0. The lights radiate approximately omnidirectionally and are designed to equal a star magnitude of +2 (approximately the same magnitude as Polaris) at a distance of 6-8 nautical miles. The sphere is contained in a cylindrical cannister attached to the retropack and is ejected downward by a compressed spring and piston assembly at 10 ft/sec when the Squib switch is ARMED and a two-position,guarded toggle switch on the left panel is moved to the DEPLOY position firing a squib-activated latch on the container door. After actuation the Lite Experiment switch guard will be closed to mechanically reposition the switch to OFF, and the Squib switch will also be returned to the OFF position.

Procedure

1. Control mode for release of the sphere will be FBW-Low with gyros SLAVED. Release will occur 15 minutes before the third sunset. Prior to this time the pilot will hold 0° roll and yaw while pitching up at less than 1°/second until a special scribe mark on the window is aligned with the earth's horizon. At that instant the pilot will actuate the Squib switch and Lite Experiment switch ejecting the sphere along the -88° pitch radial, relative to the spacecraft gyro attitudes, and voice mark the on-board tape at the instant of the Lite Experiment switch closure.

2. After ejection the sphere will be located in a region ahead of the spacecraft's flight path (180° yaw) and vary in the relative pitch angle between -45° and $+20^\circ$ during the night observation periods.

3. To make visual acquisition the gyros will be CAGED and ASCS bus powered down, then the spacecraft yawed 180° and pitched to an angle appropriate for the elapsed time since release to put the beacon light near the center of the window. A plot of pitch angle from the forward horizon versus elapsed time since ejection of the sphere will be provided to the pilot.

4. The pilot will mark on tape the instant he sees the light and will repeat sightings at 10 minute intervals during the next three night phases and first daylight phase. In addition, he will estimate the relative intensity of the beacon in terms of star magnitudes and/or using the extinction photometer technique. He will also comment on its appearance against the star or earth background, describe ease of acquisition and estimate its relative position from the spacecraft.

DIM LIGHT PHENOMENON PHOTOGRAPHY

Purpose

This experiment will gather photographic data of two dim light phenomena that are best observed from outside the earth's atmosphere, Zodiacal light and the night airglow layer. Photographs of Zodiacal light will help to determine its exact origin, geometric distribution, and its usefulness in studying solar radiation and flare activity. Data on the airflow will provide further information on the solar energy conversion processes occuring in the upper atmosphere.

Description

The nature of Zodiacal light is believed to be sunlight reflected from free electrons and large dust particles in the ecliptic plane, distributed outward from the sun in interplanetary space, or in geocentric orbits about the earth. Its intensity is relatively weak, and measurements from the earth's surface are inhibited by scattering and absorption of light in our atmosphere. Measurements of corona intensity within 2° of the sun's disk during solar eclipses show a bright halo; other measurements near the plane of the ecliptic up to 30° ahead of sunrise or behind sunset indicate a possible light intensity relationship to the solar halo. During this flight the pilot will obtain time exposures on Ansco FPC-132 color film covering the ecliptic region after sunset on the 16th orbit between 2° and 30° from the sun to ascertain if Zodiacal light is a continuous phenomena or if it arises from two distinct processes. The equipment will consist of a Robot Royal 24S, 35 mm camera modified with a special F.6 lens system provided by the University of Minnesota, who proposed this study. The camera will weigh about three pounds including its 50 frames of preloaded and calibrated film.

The airglow consists of a weak continuum in the visible spectrum and three distinct colors, yellow from the sodium D lines (5890 and 5896 A) and green (5577 A) and red (6300 A) lines; the latter two are attributed to "forbidden" transitions in the energy states of atomic oxygen. Recent work indicates that the red occurs near 400 km altitude while the green is prevalent at 90 km. Time exposures using the color film and modified Robot camera throughout the night phase of the 16th orbit may return data on the altitudes and intensities of the various strata as well as their change in appearance at different latitudes.

Procedure

1. In order to perform these studies accurately, the pilot will make maximum use of ASCS so that he can devote most of his attention to the timing of the photographs. Prior to sunset on the 16th orbit the pilot will use FBW-Low to point the spacecraft longitudinal axis (+Z) toward the sun, level the spacecraft to the horizon, then cage and uncage the gyros to FREE position. A predetermined roll will be executed to align the pitch plane with the ecliptic plane, and gyros will again be caged, then uncaged to the FREE position with pitch torquing ON. The pilot will then go to AUTO control.

2. Just after sunset the pilot will begin the first of four sequences of zodiacal light photographs. The tape recorder will be in CONTINUOUS so that the pilot can record comments and mark the beginning and end of each exposure. The photographs will begin 15 seconds after the sun disappears below the horizon, and the following schedule gives exposure times and intervals between exposures.

Number of Exposures per Sequence	Time of Each Exposure	Interval between Exposures	Interval between Sequences
4	1 second	15 seconds	15 seconds
4	3 seconds	15 seconds	15 seconds
4	10 seconds	15 seconds	15 seconds
1	Blank Frame	(For Identification)	
4	30 seconds	30 seconds	
1	Blank Frame	(For Identification)	

3. After the zodiacal light photographs and while on ASCS control, the gyros will be switched from FREE to SLAVED so that the horizon scanners will align the spacecraft to true orbit attitude by slowly torquing the gyro gimbals out of the ecliptic plane. The automatic realignment will normally occur in about 25 minutes without dropping into orientation mode.

4. The airglow will be photographed in sequences throughout the remainder of the night phase with five-minute intervals between sequences. Each sequence will consist of three photographs -- a 2-minute exposure, a 30-second exposure, and a 10-second exposure. The photographs will be taken with a minimum of delay between exposures. At morning twilight the sequence will be changed to one final series of 10 exposures. These will consist of 2 photographs -- a 30-second exposure immediately followed by a 1-second exposure. These will be repeated at 2-minute intervals for a 10-minute period.

HORIZON DEFINITION EXPERIMENT

Purpose

This experiment will study the earth's sunlit limb (horizon and atmosphere) to determine if it can be used as a reliable, sextant reference during the midcourse phase of translunar missions. Results of this test will be of direct use to Massachusetts Institute of Technology, who proposed this study, in the development of the Apollo guidance and navigation system.

Description

This experiment is a continuing effort to accurately define a suitably invariant horizon line in the atmosphere near the earth's surface that will be independent of lighting angle or atmospheric conditions. Photographic observations of the earth's limb have been made through blue and red filters to discover if there is a point of sharp cutoff in either spectral region that might be used as a defining stratum for accurate navigation sightings. Analyses of data from the MA-7 flight and one X-15 flight have failed (1) to indicate a specific altitude for such a well-defined line, and (2) to resolve uncertainties arising from the atmospheric scattering of incident sunlight. The photographs to be taken on this flight will investigate these two particular problems more closely. Useful data will include red and blue filtered , daylight photographs of the limb taken at even intervals as the spacecraft corsses the sunlit portion of the earth. Photographs will also be taken during a short period of all four quadrants of the earth's surface and, if possible, at a known time when the rising or setting moon would also appear in the picture. The first two series of photographs would provide excellent comparisons of the limb through verying sunlight scattering angles. The last set taken at a precisely recorded time will contain a well-known reference object to which measurements of the limbs altitude can be related. The experiment requires the 70 mm Hasselblad camera and a magazine containing the red and blue filter strips mounted just ahead of the film plane. MIT will supply this magazine with filters and black and white film suitably calibrated with step-wedge exposures before and after flight for reference during the micro-densitometer analysis of results.

Procedures

1. The special film magazine will be attached to the Hasselblad camera during the 16th orbit prior to the beginning of the quadrant photographs at 25:05. The onboard tape will be on CONTINUOUS, gyros will be CAGED, and maneuvering will be done on FBW-Low control mode over a short span of time for the quadrant photography. The pilot will take eight pictures of the horizon, two in each quadrant as he performs a pitched-down, yawing maneuver. The time of each photograph will be marked on the recorder. The quadrants will be chosen so that two of the pictures are taken towards the sun's azimuth.

2. From about 32:22 to 33:10 on the 21st orbit, when the spacecraft is in ASCS orbit control mode, the pilot will take approximately six or seven sets of three photographs each looking aft. Again the Hasselblad camera will have the special magazine attached. The photographs will be evenly separated in time (about six minutes) so that they cover the entire daylight period. The time of each photograph will be recorded.

3. A sequence of photographs including the moon and horizon together will use the same flight conditions as in item 1 above. However, since moon position is a function of launch date and time, the exact time for this sequence cannot be scheduled into the flight plan until shortly after launch.

RADIATION MEASUREMENTS

Purpose

The objective of these studies is the measurement of radiation at spacecraft altitudes. In particular, this will provide a survey of fission electrons trapped in the lower regions of the earth's magnetic field approaching closest to the earth's surface over eastern South America and the South Atlantic. This will give additional data on decay of the artificial radiation belt created by high altitude nuclear detonations.

Description

One of two Geiger-Muller counting tubes, sensitive to electrons in the 2.5 - 10.0 MEV range, is mounted on the retropack to view radiation flux from a hemispherical area around a heading of 195° yaw and -140° pitch relative to the spacecraft axes. Within the limitations of possible locations imposed on the mounting for the experiment, this tube surveys a region unobstructed by the spacecraft and is, therefore, unaffected by bremsstrahlung radiation or radiation scattered by the spacecraft structure. The other Geiger-Muller tube is shielded to register incoming radiation along the spacecraft -Z axis over the energy range 0.25 - 10.0 MEV. The area seen is 0.8 steradian in a conical region with rectangular cross-section $\pm$ 30° from the longitudinal axis. Both tubes (Amperex Electronics Corp., No. 18529) have a total wall-stainless steel cathode thickness of of 90 $\pm$ 10 mg/cm^2 and are filled with a low pressure, Neon-Argon plus Halogen admixture. With associated counting circuits they will measure rates as high as 2 x 10^7 counts/sec. A high voltage power supply will maintain an operating plateau of approximately 550 volts across each tube. Total power consumption is 2 watts, and power to the experiment is controlled by a two-position, ON-OFF toggle switch on the main instrument panel. The output from each counter circuit is a voltage proportional to the count rates. These voltages will be multiplexed along with other on-board data and fed to the magnetic tape recorder. Useful data will be recorded anytime the radiation experiment switch is ON, the tape recorder is running, and the radiation levels are within the range of the instruments.

Trapped fission electrons, spiraling along the earth's magnetic flux lines with energies below 7 MEV, will be a primary source of the radiation to be measured. When spacecraft attitudes are known, a crude estimate may be made concerning preferential direction of the incoming radiation. Data obtained should provide a qualitative test of the assumption that radiation near the spacecraft is isotropic.

A pocket ion chamber (0-200 milliroentgen dosimeter), stowed in the Ditty Bag prior to launch, will be secured to the hatch with Velcro about 10 minutes after launch. A radiation detecting film patch will also be attached to the hatch and located beneath the Velcro strip holding the dosimeter. These will give a rough measure of the total interior radiation. Just prior to stowage of the dosimeter, the pilot will voice record its reading onto the tape. The radiation reaching the pilot will be measured by four film patches worn beneath the pressure suit; one will be inside the helmet near the left ear muff, one on the right thigh, and two in the chest region.

In addition, one photographic emulsion pack will be carried in the spacecraft cabin and will be located above the left instrument panel. This high energy particle detector will be provided by the U.S. Navy School of Aviation Medicine. The light-tight pack contains a stack of 8 glass plates coated with Ilford G-5 photographic emulsion. It is sensitive to protons with energies greater than 30 MEV and galactic cosmic rays; sufficiently energetic protons trapped in the earth's radiation belts will also be recorded. After flight a microscopic inspection of the developed grain density in the emulsion along the ionization path of the incident particles will measure their energy loss through the pack; this can be used as direct or, in some cases, indirect evidence of total particle energy. Data obtained will be compared to information being analyzed from film packs carried on previous Mercury flights to indicate new or significant facts about high energy particle radiation in space.

Procedure

During periods of the flight when the higher count rates are expected, the pilot will switch the on-board tape recorder from PROGRAM to CONTINUOUS. Data will be recorded only at the scheduled times given below. Since most of these times occur during drifting flight with gyros CAGED, the pilot will voice-record his most accurate estimates of the spacecraft attitudes and, if possible, name recognizable stars or landmarks including their relative positions in the window.

ORBIT NO.	CET (Hrs - Min)
4	5:03 to 5:13
5	6:32 to 6:47
6	8:06 to 8:16
7	9:39 to 9:49
8	11:15 to 11:25
16	24:50 to 24:55
18	26:53 to 26:58
19	28:55 to 29:00
20	30:07 to 30:22
21	32:15 to 32:20

INFRARED WEATHER PHOTOGRAPHY

Purpose

This series of photographs will use infrared film and filters to study weather phenomena from orbit. Ultimate objective is basic information on infrared reflectance from the earth-atmosphere and design data for instrumentation going into future meteorological satellites.

Description

This study in the 700-900 millimicron range follows previous investigations on MA-8 in the visible region of the spectrum. Analysis of that data indicated that increasing wave lengths appear to improve photo contrast and definition. Comparison of results through Wratten filters W-70, W-88A, and W-87C on infrared film should provide valuable information on spectral characteristics of the cloud and earth radiances, of sunlight scattering by large aerosols, and of contrast variation with wave length. Vegetation is known to reflect infrared very well; hence, coastlines and tropical areas should be clearly defined. The Hasselblad camera with 70 mm film and 80 mm lens will be used. A holder containing the three filters will be inserted into the magazine loaded with infrared sensitive film. Neutral density will be added to the W-70 and W-88A filters to balance the exposure levels with the aperture and time settings to be used. Processing and sensitometric calibration of the film will be done by the U. S. Weather Bureau, who proposed the study, with the aid of Eastman Kodak Company. The planned execution of this experiment will occur during the 17th and 18th orbits, and more times may be added at the discretion of the pilot.

Procedure

Prior to this test, the pilot will ascertain that the proper magazine is in place. Times of photographs, subject matter, and comments on detailed observations will be voice recorded on tape. Control mode will generally be drifting flight so that the pilot will conserve fuel by using targets of opportunity that may have significance for this study; however, some manual fuel is programmed for use, if required. Both oblique and nearly vertical views of coastlines and partially cloud-covered land areas are of interest.

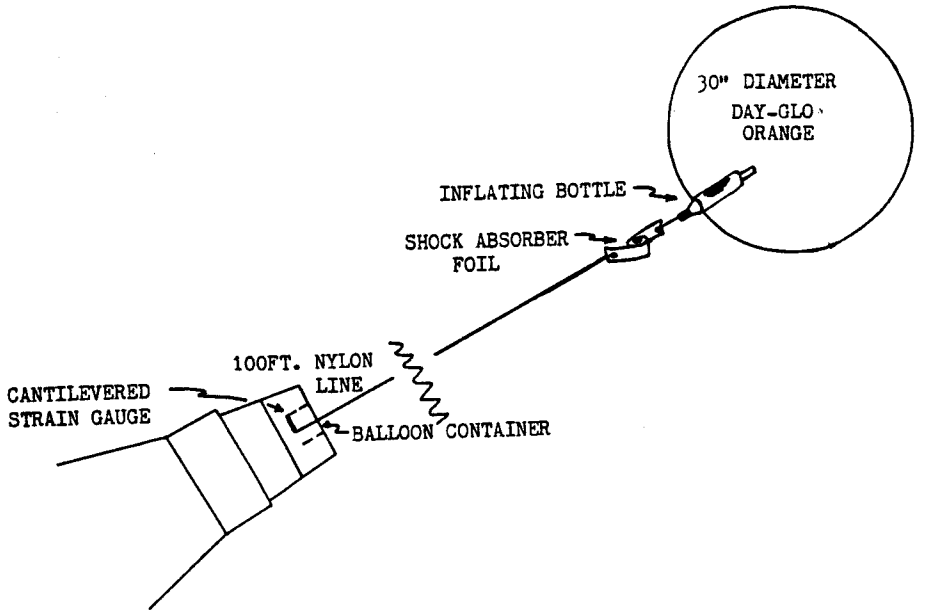
TETHERED BALLOON EXPERIMENT

Purpose

The tethered balloon experiment has two objectives, an aerodynamic study and visual test. The measurement of drag on a known aerodynamic shape in the region of free molecular flow should provide an accurate profile of atmospheric density at spacecraft altitudes. Information on aerodynamic stability and damping will also be obtained. Visually the balloon will provide a conveniently located space object for tracking and ranging after release from the towed position.

Description

The balloon and small nitrogen inflating bottle are packaged in a 3 inch diameter cylindrical container located in the antenna cannister under the destablizing flap. At deployment the squib switch must be ARMED and a three position, guarded toggle switch on the left panel is moved to the EXTEND position which causes a squib activated latch to release the closed container door; the deflated balloon and bottle with tethering line attached are ejected by a compressed spring and piston. A spring loaded valve on the nitrogen bottle opens as the package clears the container inflating the balloon to a 30 inch diameter sphere in less than one second.



After extension the balloon switch guard will be closed to mechanically reposition the switch to OFF without inadvertently moving it to the JETTISON position. The squib switch must be turned OFF until it is again required during the moment of balloon release for ranging and tracking.

The balloon is fabricated from 2-ply Mylar, 0.6 mil thick, and when inflated it holds about 0.1 psi differential pressure to produce 2000 psi tensile stress on the Mylar. The balloon is coated with a fluorescent orange Day-Glo finish.

One end of the nitrogen bottle is attached to the balloon; the other end of the bottle is attached to a roll of 0.005 inch annealed aluminum foil 8 feet long which acts as a shock absorber during deployment by being unrolled to damp the z-axis elastic motion of the tethering line. This line is made of 5-pound test, braided Nylon and is 100 feet long. The outer end of the line is attached to the shock absorber, and its other end is attached to the free end of a cantilevered strain gauge beam located at the bottom of the balloon container in the spacecraft. Before deployment the Nylon line is wound on a special reel at the back of the container.

Aerodynamic drag on the balloon transmitted through the tethering line causes a bending moment on the beam, and this is measured by the strain gauge attached to the beam and recorded on the spacecraft tape recorder. The maximum drag force will occur at perigee and is expected to be on the order of 0.015 lbs.

20

Procedure

1. Balloon deployment will be accomplished at zeroed attitudes and rates on FBW-Low with gyros SLAVED, and this will occur as near to perigee as operationally practical. The recommended time for deployment will be approximately 5 minutes after sunrise on the 6th orbit. Prior to deployment the 16 mm camera with wide-angle lens will be mounted in its bracket and turned on to record the balloon extension sequence, the Recorder switch will be moved to CONTINUOUS, and the Squib switch will be ARMED. If the balloon does not inflate properly, it should be released.

2. After deployment Squib and Balloon switches will be turned OFF and the pilot will pitch down 5-10° very slowly in order to observe and comment on balloon motions. When the balloon is relatively stabilized, which should occur in about 90 seconds, the 16 mm camera should be turned off. During the towed phase of this experiment motions of the balloon induced by attitude changes of the spacecraft must be kept to a minimum. Therefore, ASCS Reentry control mode will be used a majority of the time.

3. On one or two occasions it may be necessary to yaw and/or pitch the spacecraft on FBW-Low to better observe the balloon or to align the tethering line with the longitudinal axis of the spacecraft in order to obtain more accurate measurements of drag. The pilot will comment on all observations and spacecraft maneuvering for onboard recording; this will include times, spacecraft attitudes and rates as well as the relative position of the balloon, wehther or not the line is taut, period and amplitude of balloon oscillations, apparent color or shape changes, angle of lighting, and its appearance against sky or earth backgrounds. In addition, the 16 mm camera with wide angle lens should be used to take four or five sequences of the balloon and its motions. Each sequence should be long enough to obtain sufficient data to determine period and amplitude of oscillations, but no more than two minutes duration, and should be time correlated by pilot's comments on the tape recorder. Also, the pilot should mark a few frames of film between each sequence by putting his hand in the field of view.

4. Near the end of the daylight period as the spacecraft is approaching apogee it is expected that both the period and amplitude of the balloon oscillations will increase. If, at this time, the pilot feels that there is any possibility that the line might foul or catch on the spacecraft, he should jettison the balloon and perform the tracking task described below. Otherwise, he should continue to carry the balloon through the night period on ASCS reentry mode, making whatever observations are possible until the scheduled release of 10:30;00 CET, shortly after sunrise.

5. The 16-mm camera with the telephoto lens should be started, control mode switched to FBW-Low, and Squib switch ARMED just prior to balloon jettison. Comments of all actions must be recorded on tape. The precision tracking task requires the pilot to hold the retroattitude horizon mark in the window on the balloon for approximately two minutes as it recedes and drops below the spacecraft. Thereafter, the pilot will note the appearance and ease of sighting from general observations. In about 5 minutes the balloon should be near the visual limit on the horizon and nearly 3 miles away.

TV SYSTEM OPERATION

Purpose

A special TV camera will be carried on this flight to evaluate its operational value for monitoring the pilot's well being, for obtaining backup readings of the instrument panel indications, and for observing tests, experiments or external phenomena through the spacecraft window. This may determine the need and value of this technique for obtaining data in future manned space flights over methods now in use.

Description

The camera will weigh 10 pounds, consume 56 watts during operation, and be hand-held or mounted on a bracket to the right of the 3-axis controller. The cabling, bracket and required ballast will add an additional 7 pounds. A special telemetry transmitter will be added to the spacecraft to transmit the TV output directly to the ground on the higher of the two standard Mercury T/M frequencies. TV camera data can only be obtained when the spacecraft is in T/M contact with a ground station properly equipped to decode the TV specifically. In order to obtain adequate picture definition within the space and weight restrictions imposed on the flight equipment, the scan rate has been reduced to a non-standard 0.5 frame/second. This necessitates special equipment on the ground to reconstruct the picture for immediate viewing. MCC, CSQ, and CYI are the only stations able to receive TV. At MCC the flight surgeon will have access to a real-time monitor modified to use the two second scan speed; five other TV monitors will also see the picture, but on the standard scan rate after electronic conversion of the telemetered image. Also, 35 mm film will be used to record the picture on the ground. Present plans call for fast-time processing of this film so that it can be made available in about 15-20 minutes. It is also planned that CSQ and CYI will record the T/M signal on magnetic tape for later playback; in addition, CSQ will also have a real-time display at the two second scan rate.

The use of the camera is controlled by the TV Control switch located on the main instrument panel. When this three-position toggle switch is moved from the center "OFF" position to the "TV" position, the camera is operating and transmits data. The third position marked "TM" puts all T/M data using the T/M low frequency transmitter onto the TV transmitter instead; this mode of operation will be used as backup in the event of a failure of the normal T/M transmitter and can be received by all Mercury ground stations. A test of this backup mode is planned over HAW and CAL on the 3rd orbit. Two lens will be provided; the 1" lens will have a 26° field of view and the 6" lens will have a 4.8° field of view.

Procedure

The pilot will turn the TV camera on at approximately the expected T/M lock-on time for each pass over MCC, CYI, and CSQ when required. The pilot may remove the camera from its mounting at any time targets of interest appear during TV contact times, or whenever specific views are requested by the ground. In its mounted position, it normally is directed at the pilot. After station passage the camera will be switched OFF to conserve power. Actual times of usage are listed in the flight plan. Choice of the appropriate lens will depend on subject matter and will be determined in flight by the pilot with advice from the monitoring ground station.

CABIN ENVIRONMENTAL TEMPERATURE STUDY

Purpose

This test will yield information on the temperature balance within the spacecraft cabin and on heat losses into free space without the cabin coolant system in operation. It is predicted that the maximum stable temperature reached without coolant will be within the tolerable limits of the cabin equipment and the man, using suit circuit coolant only. This test should provide engineering design data for future heat exchanger systems.

Description

No equipment other than the usual spacecraft systems is required for this test. The test will begin during the 5th orbit, after the cabin has achieved generally stabilized temperatures under both the ASCS bus powered-up and powered-down conditions. The cabin coolant valve will be turned off and cabin temperature monitored by both the pilot and the ground stations. Suit temperature readings will also be monitored and settings adjusted appropriately, since the suit circuit will have to bear an added portion of the heat load.

Procedure

1. Prior to the start of the test at 6:15, the pilot will record cabin air temperature, cabin and suit heat exchanger dome temperatures, suit temperature and the coolant valve settings for both the cabin and suit. He will then switch the cabin fan OFF and close the cabin temperature control by rotating it full clockwise to the "H" setting. At several minute interevals and whenever suit coolant valve changes are necessary, he will record time and all previously mentioned temperatures and coolant valve settings. Electrical loads and inverter temperatures will be checked frequently until temperatures stabilize to ascertain that no failures are immminent from overheating equipment.

2. If, at any time, during the test, the cabin, suit, or equipment temperature reach critical values as defined in the Mission Rules, the cabin fan switch will be returned to NORMAL and the cabin temperature control opened to an appropriate setting. All values will continue to be recorded until temperatures are stabilized at comfortable levels.

3. If temperatures stablize within the test limits, the cabin fan and water coolant will remain off until approximately 2 hours before retrosequence. This will include the rest period, if temperatures are at a safe level and have been stabilized for several hours.

HF ANTENNA TEST

Purpose

This experiment will provide measurements of antenna polarization and atmospheric effects associated with HF communications between an orbiting vehicle and ground stations. Results will be directly applicable to the vertically polarized HF antenna to be used on the Gemini spacecraft.

Description

The operational procedure for this test requires two HF transmissions from the spacecraft, one with the 28-foot dipole antenna in a horizontal position (horizontally polarized), and the other with the spacecraft rolled 90° so that the dipole points towards the center of the earth (vertically polarized). The test of the two orientations will be performed at 29:53 just north of Panama so that the spacecraft is fairly close to receiving stations where reasonable reception and good coverage of the region just beyond line-of-sight are expected. The test will be conducted a second time at 30:08 over the South Atlantic in a remote area where long ranges well beyond line-of-sight are required for station contact. About five minutes will be required to make a call in one orientation, then roll 90° and transmit in the other position. During the test periods all ground stations will record output from the primary HF receivers with horizontally polarized antennas and also from the backup HF receivers with vertically polarized antennas. Ground stations will make no reply or acknowledgement during these tests, but a comparison of recorded signal strengths will be analyzed after the flight to obtain the information on atmospheric effects and polarizations.

Procedure

1. For this test the control mode will be FBW-Low and gyros must be CAGED to prevent tumbling. The pilot will move the recorder switch to CONTINUOUS just before each test call. Just prior to 29:55 the pilot will make a 60-second test call, using the window to hold either 0° or 90° estimated roll. Each test call will include identification, CET, estimated spacecraft attitudes, and the purpose of the test.

2. The pilot will then put the spacecraft in the second roll position 90° from the previous position using the external view through the window to estimate proper attitude. He will transmit a second test call for 60 seconds in the rolled attitude. After the second test transmission of each set, the recorder will be switched to PROGRAM.

3. The spacecraft attitude will be allowed to drift until the next set of tests at 30:08 to be performed similar to the first set.

GROUND LIGHT EXPERIMENT

Purpose

The ground light experiment should provide data on approximately the minimum intensity for a point-source, ground light that is visible at spacecraft altitudes. This information will indicate feasibility of using ground or high altitude lights as navigation fixes for mid-course and near-earth corrections in Project Apollo. It is also designed to produce rough data on the light attenuation through the atmosphere.

Description

Data from the experiment should be used in conjunction with data from the window attenuation experiment to obtain accurate results. The pilot needs only the extinction photometer and standard light source in the spacecraft. A high intensity xenon light will be located at Bloemfontein in the Union of South Africa. The three million candle-power light will be illuminated continuously for three minutes when the spacecraft is within range on the 6th (8:22) and 21st (31:57) orbits. The spacecraft will be oriented to observe the light on only one occasion; this will depend on best weather conditions over Bloemfontein. Previous attempts to sight ground flares or testlights have failed because of cloud cover; it is hoped that this new location (29° 7'S Latitude, 26° 11'E Longitude) at 4680 feet elevation and away from coastal regions will overcome this problem. The exact time for starting this test is contingent upon the actual orbital trajectory achieved by the spacecraft; therefore, instructions or time changes for the experiment will be relayed by a communications link through Pretoria soon after launch. The pilot will also be advised of time changes, pertinent weather conditions, and if necessary, the elimination of this experiment.

Procedure

1. This experiment will be conducted on FBW-Low control mode with gyros FREE. The Recorder Switch will be in CONTINUOUS so that accurate time markings can be made for each light extinction. Data will consist of pilot's time marks, comments and photometer readings. The pilot will be given the required pitch and yaw attitudes to put the light in view through the window.

2. After acquisition of the ground light, the pilot will occlude the standard source light, the ground light, and then the standard source in the same manner as was done during the window attenuation experiment. Several readings will be taken of each light source.

WINDOW ATTENUATION EVALUATION

Purpose

This experiment will obtain data to evaluate the transmission of light through the spacecraft window.

Description

The extinction photometer (a neutral density, optical wedge) and a calibrated standard light source are used in this experiment. The readings are to be obtained at opportune moments for the pilot and whenever identifiable stars are in view during either the daylight or night phase. Reading the light level of the standard source before and after the star readings provides a measure of light unrestricted by the window and also establishes the degree of the pilot's dark adaptation. Both values must be known to arrive at valid measurements. The ratio of relative star magnitudes to actual magnitudes gives the window transmissivity. It is also necessary to specify the relative position of the star in the window, because there may be uneven streaking on the outer surface by a residue from the escape tower rockets and because the pilot's line of sight undergoes a wide variation in angle of incidence for different positions on the window.

Procedure

1. During times when higher priority work is not in progress, the pilot will attempt to locate stars that he can positively identify and that will remain in the field of view for several minutes. The night phase of the 7th orbit may provide an ideal opportunity for this experiment since the spacecraft will be in ASCS Reentry attitude towing the balloon at this time. Prior to the first reading he will mount the small standard source light at a predetermined place on the instrument panel. All the readings will be accurately recorded on the onboard tape.

2. After locating a star, the pilot will use the extinction photometer to occlude the standard light source several times until repeatable readings are achieved.

3. The same procedure will be used on the known star until repeatability is again achieved. The approximate location of the star in the window and estimates of extraneous or internally reflected lighting should be noted.

4. The standard source will be occluded immediately after the star measurement and general comments recorded.

MICROMETEOROID IMPINGEMENT AND WHITE PAINT PATCH STUDIES

Purpose

The micrometeoroid study will attempt to discover the average number and momentum of micrometeoroids striking the surface of the spacecraft. The skin temperature test will investigate changes in white paint pigments during reentry heating.

Description

Neither of these studies requires pilot participation. The micrometeoroid test will use four of the outer shingles located around the center of the conical section. The oxide film will be removed from the Rene 41 material, and they will have a highly polished surface to record the impacts. The panels will be microscopically mapped before and after flight to distinguish between preflight imperfections and micrometeoroid damage. The depth of the micrometeoroid indentations will yield information on their momentum and size.

The test of three types of white coatings on the outer surface of the Rene 41 will provide data on changes in pigment reflectivity caused by reentry heating. The three test panels are six inch squares baked onto a test shingle located at the small end of the conical section. The three pigments to be tested have a titanium oxide base, a zirconium oxide base, and a zink oxide base. Theoretical calculations indicate that as much as 10-15° F lower cabin temperature might be possible for a spacecraft protected with a low absorptivity coating instead of the present dark colored oxide. Previous attempts to obtain results from similar tests on MA-7 and MA-8 were unsuccessful because the special white coatings contained an acrylic binder and were air-dried rather than baked on. They would char to a darker, more highly absorptive condition or flake off during the thermal pulse at reentry, nullifying the results of the study.

NORMAL CHECKLISTS

Note: Items preceded by asteriks are critical or safety functions.

Prelaunch

1.	Fuel Jett Fuse Switch	OFF
2.	Main Disc Fuse Switch	OFF
3.	Emergency Main Disc Fuse Switch	OFF
4.	All other Fuse Switches	#1
5.	Squib Switch	ARM
6.	Retro Jett Switch	ARM
7.	Recovery Arm Switch	AUTO
[8.	Reserve Fuel Press Switches	OFF & GUARDED]
9.	Decompress & Repressurize Handles	IN & CLIPPED
10.	Balloon Switch	OFF & GUARDED
11.	Lite Experiment Switch	OFF & GUARDED
12.	Fuel X Feed Handle	PULL OFF
13.	Manual Handle	PULL OFF
14.	Roll, Yaw, Pitch T-Handles	PUSH ON
15.	Retro Delay Switch	NORM
16.	Cabin Lights Switch	BOTH
17.	Rescue Switch	AUTO & GUARDED
18.	Launch Control Switch	READY
19.	Press Reg Handle	IN & LOCKED
20.	All 5 Sequence Rings	IN
21.	Retro Attitude Switch	AUTO
22.	Retro Rkt Arm	AUTO
23.	Landing Bag Switch	AUTO

24.	Accelerometer	RESET
25.	16 mm Camera	LOCKED IN PANEL POSITION
26.	Rate Indicator Switch	MAN ON
27.	Light Test Switch	OFF
28.	Aux Lite	STOWED
29.	Satellite Clock	SET & WOUND
30.	Retrograde Time	33 58 26
31.	#1 Temp Select Switch	S - 2
32.	#2 Temp Select Switch	CABIN OUTLET
33.	Programmer Switch	OFF
34.	ASCS Control Switch	AUTO
35.	Mode Select Switch	AUX DAMP
36.	FBW Thrust Select Switch	LOW ONLY
37.	Pitch Torquing Switch	ON
38.	Gyro Switch	SLAVE
39.	Pitch Attitude Switch	ORBIT
40.	Radiation Experiment Switch	OFF
41.	3 Volt Power Switch	NORM
42.	TV Control Switch	TV
43.	Recorder Switch	CONT
44.	Telemetry Switch	CONT
45.	Sponge Switch	AUTO
46.	Suit Fan Switch	NORM
47.	Cabin Fan Switch	NORM
48.	ASCS AC Bus Switch	NORM
49.	DC Volts Select Knob	M

50.	Ammeter Switch	NORM
51.	Stby. Btry. Switch	ON
52.	Isol. Btry. Switch	NORM
53.	Inlet Valve Power Switch	NORM & GUARDED
54.	Recovery Light Switch	AUTO
55.	Audio Bus Switch	NORM
56.	AC Volts Select Knob	ASCS
57.	Fans AC Bus Switch	NORM
58.	UHF Select Switch	HI PWR
59.	VOX Power Switch	TRANS
60.	Receiver Volume Controls	(Pilot's Option)
61.	UHF DF	R/T
62.	Transmit Switch	UHF
63.	C-Band Beacon Switch	CONT
64.	S-Band Beacon Switch	CONT
65.	Warning Lights Switch	BRIGHT
66.	All Audio Tone Switches	ON
67.	Tower Sep Control FS	#2
68.	All Other Main Panel FS	#1
69.	Sidetone Adjust (HF & UHF)	(Pilot's Option)
70.	Emergency O_2 Rate Handle	NORM
71.	Suit Temp Valve	TO MARK
72.	Suit Bypass Valve	FULL OFF (CW)
73.	Cabin Temp Valve	TO MARK
74.	Aux Water Valve	FULL OFF (CW)
75.	HF Antenna Select Switch	BICONE

76. Abort Handle	INBOARD & LOCKED
77. Exerciser Handle	STOWED
78. All 6 Battery Switches	ON
79. Control Stick Locking Pin	REMOVED

Tower Jettison

*1. Jett Tower Ring	PULL AT BECO PLUS 20 SEC
*2. Retro Jett Switch	OFF
3. Electrical System	COMPLETE CHECK
4. Accelerometer	READ & RESET

At Capsule Separation

*1. ASCS Control Switch	SELECT
*2. Mode Select Switch (After Damping of Spacecraft)	FBW

Capsule Separation + 330 Sec

After Umbilical Door, Jett Tower and Sep Cap Sequence Lights go OUT

*1. Squib Switch	OFF
*2. Retro Sequence FS	OFF
*3. Tower Sep Control FS	OFF
*4. Landing Bag Switch	OFF & GUARDED
5. Programmer Switch	AUTO
6. Dosimeter	ON DOOR
7. HF Antenna Select Switch	DIPOLE
8. Electrical System	COMPLETE CHECK
9. Verify TV Control Switch	OFF
10. Verify 16 mm Camera	OFF

Power Down ASCS Bus

*1. ASCS Control Switch	SELECT
2. Mode Select Switch	FBW or OFF
*3. Gyro Switch	CAGE
*4. ASCS AC Bus Switch	OFF
[5. Rate Indicator Switch	AUTO DURING REST PERIOD ONLY]

Power Up ASCS Bus

*1. ASCS Control Switch	SELECT
*2. Gyro Switch	CAGED
*3. ASCS AC Bus Switch	NORM
[4. Rate Indicator Switch	MAN ON AFTER REST PERIOD]

Stowage

1. 2 TV Camera Lenses	IN DITTY BAG/ON CAMERA
2. TV Camera	IN BRACKET AND SECURED
3. 3 16 mm Camera Film Magazine	IN WORKTABLE/ON CAMERA (IN PLASTIC BAG)
4. 2 16 mm Camera Lenses	IN WORKTABLE/ON CAMERA
5. 16 mm Camera	WIDE ANGLE LENS ON, SET F-STO MOUNT & LOCK IN BRACKET
6. 3 Hasselblad Camera Film Backs	IN DITTY BAG/ON CAMERA (IN PLASTIC BAG)
7. Hasselblad Camera	IN DITTY BAG (IN PLASTIC BAG
8. 35 mm Modified Robot Camera	IN DITTY BAG (IN PLASTIC BAG
9. Exposure Meter	IN WORKTABLE
10. Extinction Photometer	IN WORKTABLE
11. Dosimeter	READ & STOW IN DITTY BAG
12. Unconsumed Food and Containers	IN WORKTABLE/IN DITTY BAG

13. Standard Light Source	IN WORKTABLE
14. Hand-Held Cabin Light	IN HOLDER
15. Chart Book	IN WORKTABLE
16. Exercise Handle	SECURED
17. Star Charts	IN WORKTABLE
18. Filter Mosaid for Infrared Photographs	IN GLOVE BOX
19. Flight Plan	IN GLOVE BOX
20. Plastic Bag for Film	COVERING EXPOSED FILM
21. Worktable	STOWED

Preretrosequence

*1. Stowage Checklist	COMPLETE
*2. Retro Sequence FS	#1
*3. Mode Select Switch	OFF
*4. FBW Thrust Select Switch	HIGH & LOW
*5. Pitch Torquing Switch	ON
*6. Gyro Switch	SLAVE
*7. Pitch Attitude Switch	ORBIT
*8. ASCS Control Switch	AUTO
*9. HF Antenna Select Switch	BICONE
*10. Visor	CLOSED & LOCKED
*11. Manual Handle	PUSH ON
*12. Squib Switch	ARM AT RETROSEQUENCE MINUS 5 SEC
13. Verify No's 1, 2, and 3 Retro Rkt FS	#1
14. Verify Retro Jett Switch	OFF
15. Verify Retro Delay Switch	NORM
16. Verify Retro Rkt Arm Switch	AUTO

17. Verify Retro Att. Switch	AUTO
18. Verify Balloon Switch	OFF & GUARDED
19. Verify Lite Experiment	OFF & GUARDED
20. Verify Radiation Experiment Switch	OFF
21. Verify Accelerometer	RESET
22. Verify Warning Light Switch	BRIGHT
23. Verify Retro Man. FS	#1

Return From Retro Preparation

*1. Manual Handle	PULL OFF
*2. Retro Sequence FS	OFF
*3. FBW Thrust Select Switch	LOW
*4. HF Antenna Select Switch	DIPOLE

Preretrofire

*1. In Retro Attitude and Telelight	GREEN
*2. Retro Rkt Arm Switch	MAN

Postretrofire - Preretrojettison

*1. Manual Handle	PULL OFF
*2. ASCS Control Switch	SELECT
*3. Mode Select Switch	FBW
*4. Pitch Attitude Switch	REENTRY
*5. Retro Jett Switch	ARM
6. Verify Emergency Retro Jett FS	#1
7. Verify Retro Jett FS	#1

*8. Control Action	GO TO 0°, 0°, 0°
*9. ASCS Control Switch	AUTO WHEN IN LIMITS

Post Drogue - Pre Main

*1. Snorkel Ring (20K-17K Feet)	PULL
*2. Landing Bag Switch	AUTO
*3. Recovery Arm Switch	MAN
*4. Fuel Jett FS	#1
*5. Fuel X Feed Handle	PUSH ON
*6. Roll, Yaw, Pitch T-Handles	PUSH ON
7. UHF DF Switch	(Pilot's Option)

Post Main - Pre Impact

*1. All H_2O_2 Fuel (Use Manual Handle, if necessary)	DUMPED
*2. ASCS AC Bus Switch (After Fuel Dump)	OFF
*3. Pressure Regulator Handle	PULL-SEALED
*4. Survival Kit	RELEASE LANYARD & SECURE TO SUIT
*5. Preparation for Impact	
a) Urine Transfer Shutoff Valve	CLOSE
b) Urine Transfer Hose	DISCONNECT
c) Blood Pressure Hose	DISCONNECT
d) Bio-Medical Connector	DISCONNECT
e) Helmet Outlet Ventilation Hose	DISCONNECT
f) Expose film	IN PLASTIC BAG & READY FOR EGRESS
g) Visor	UNLOCK & OPEN
h) Helmet	UNLOCK NECK RING SEAL
i) Temperature Probe	DISCONNECT FROM RIGHT EAR MUFF
j) Restraint Straps	TIGHTEN
k) Shoulder Harness Reel	LOCK
l) Hands	HOLD SHOULDER HARNESS AT IMPACT

Post Impact

*1. Main Disc FS	#1
*2. Emergency Main Disc FS	#1
*3. Rescue Switch	MAN
*4. Rescue Switch (Small End Staying Out of Water)	AUTO
*5. Isol. Battery Switch	STBY
*6. Recovery Lite Switch	(Pilot's Option)
*7. Squib Switch	OFF AFTER WHIP EXTENDS
*8. HF Antenna Select Switch	WHIP
*9. All 5 Fuel Valve Handles	PULL OFF

EMERGENCY CHECKLISTS

Total Power Down

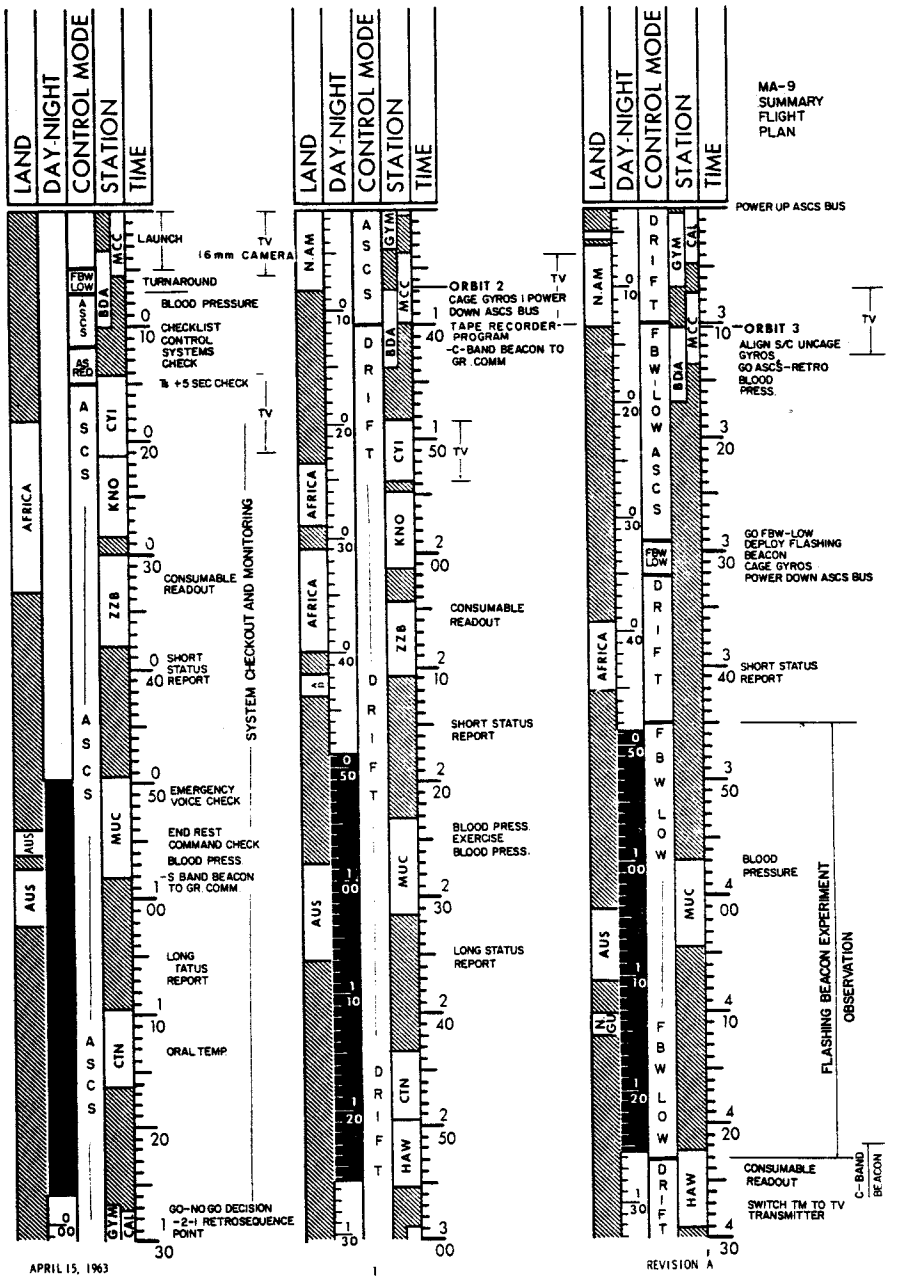
1. Manual Handle	PUSH ON
2. Gyro Switch	CAGED
3. O_2 Handle	EMERGENCY
4. Ammeter Switch	POWER OFF
5. ASCS AC Bus Switch	OFF
6. Fans AC Bus Switch	OFF
7. Squib Switch	OFF

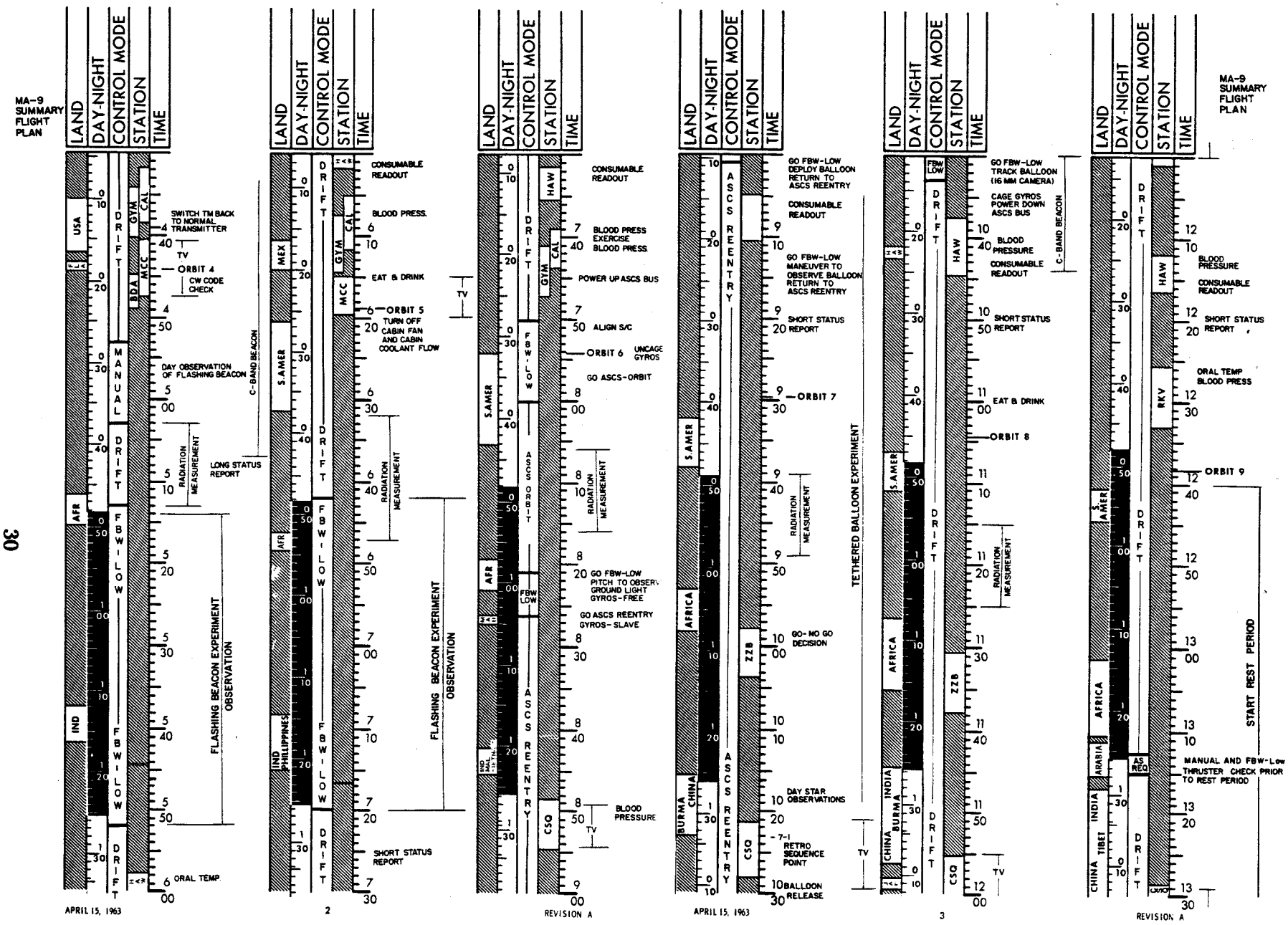
Total Power Up

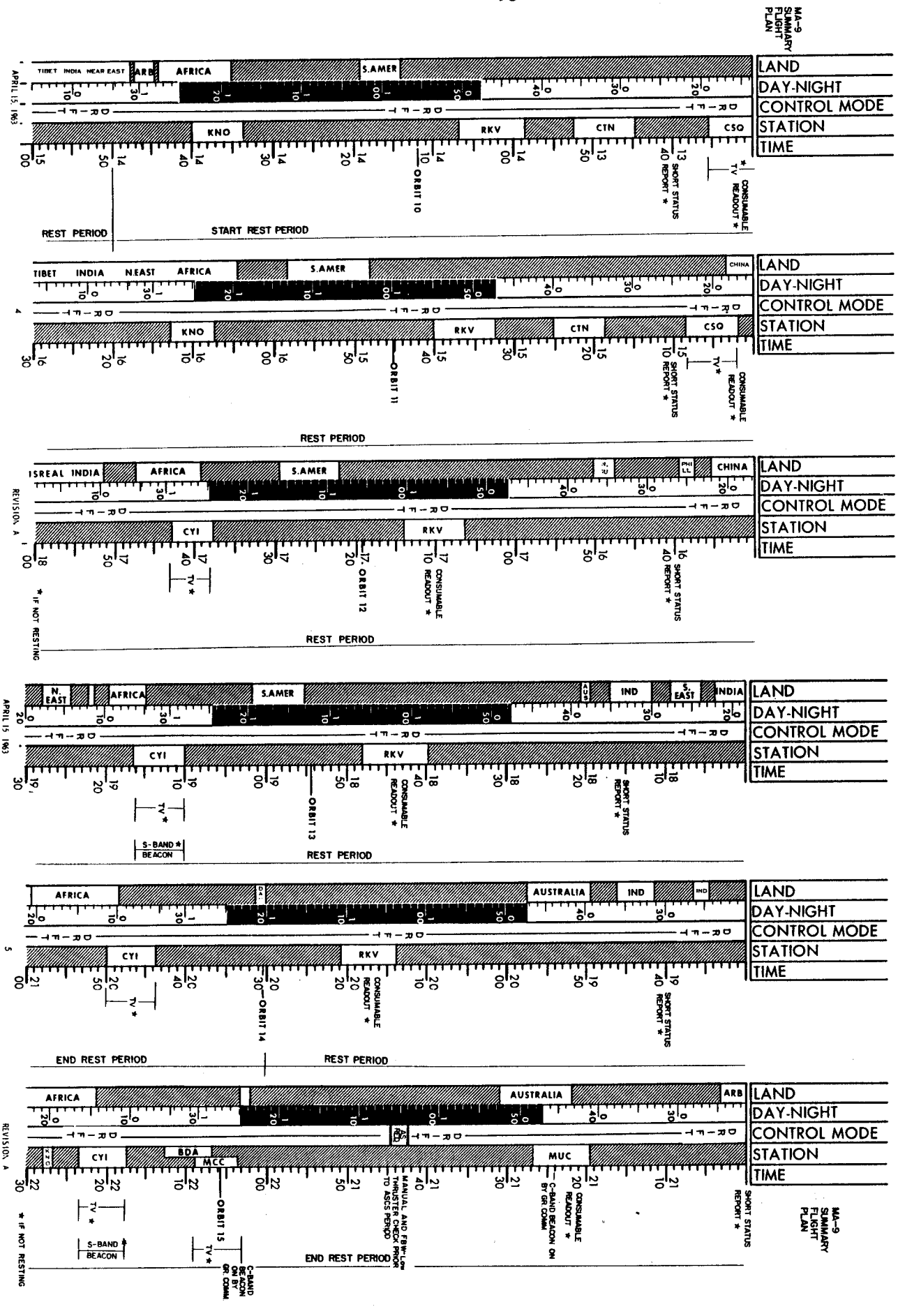
1. Ammeter Switch	NORM
2. Squib Switch	As Required
3. Fans AC Bus Switch	NORM
4. O_2 Handle	NORM
5. ASCS AC Bus Switch	NORM

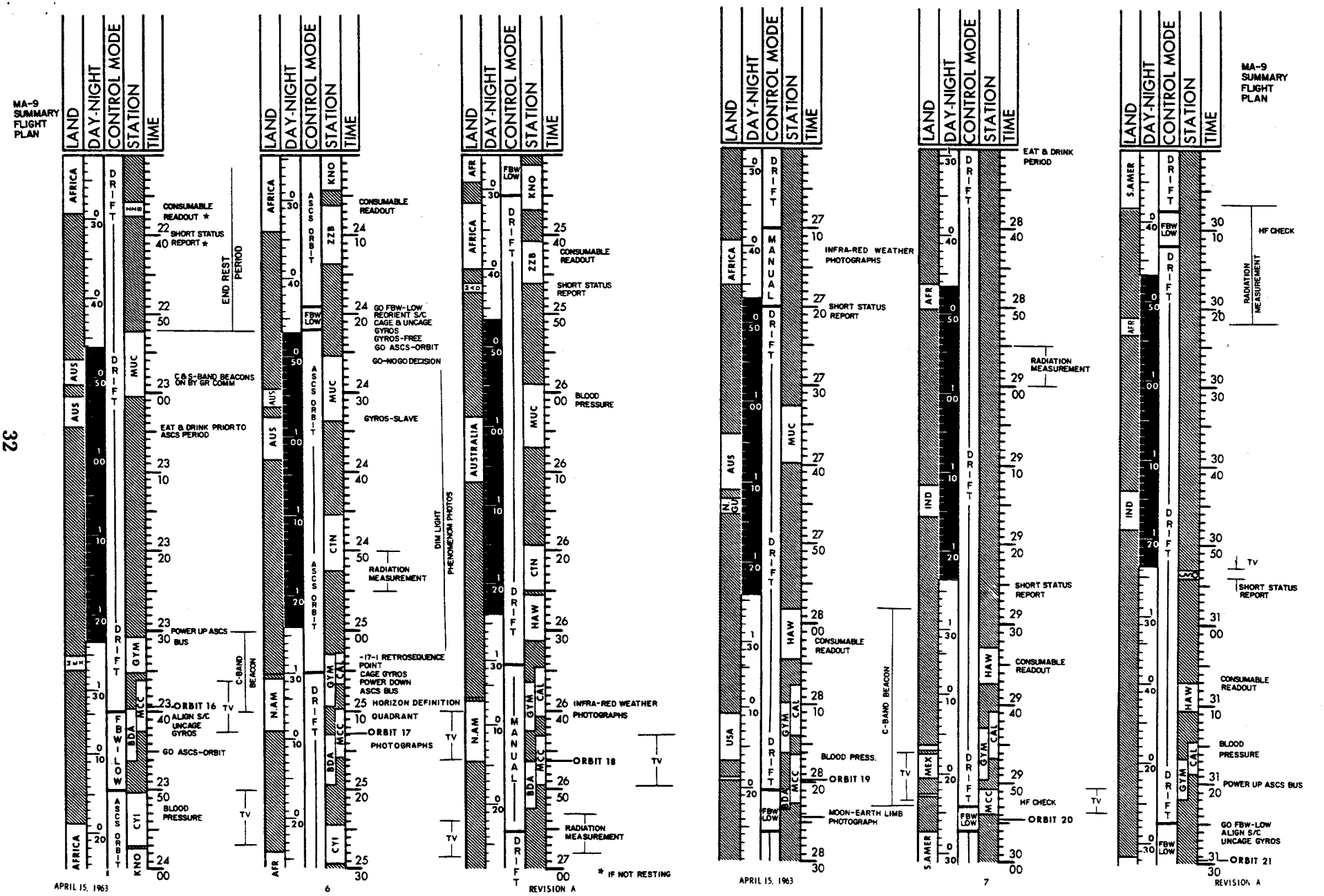
Retrofire if 1 Retrorocket Used as Posigrade

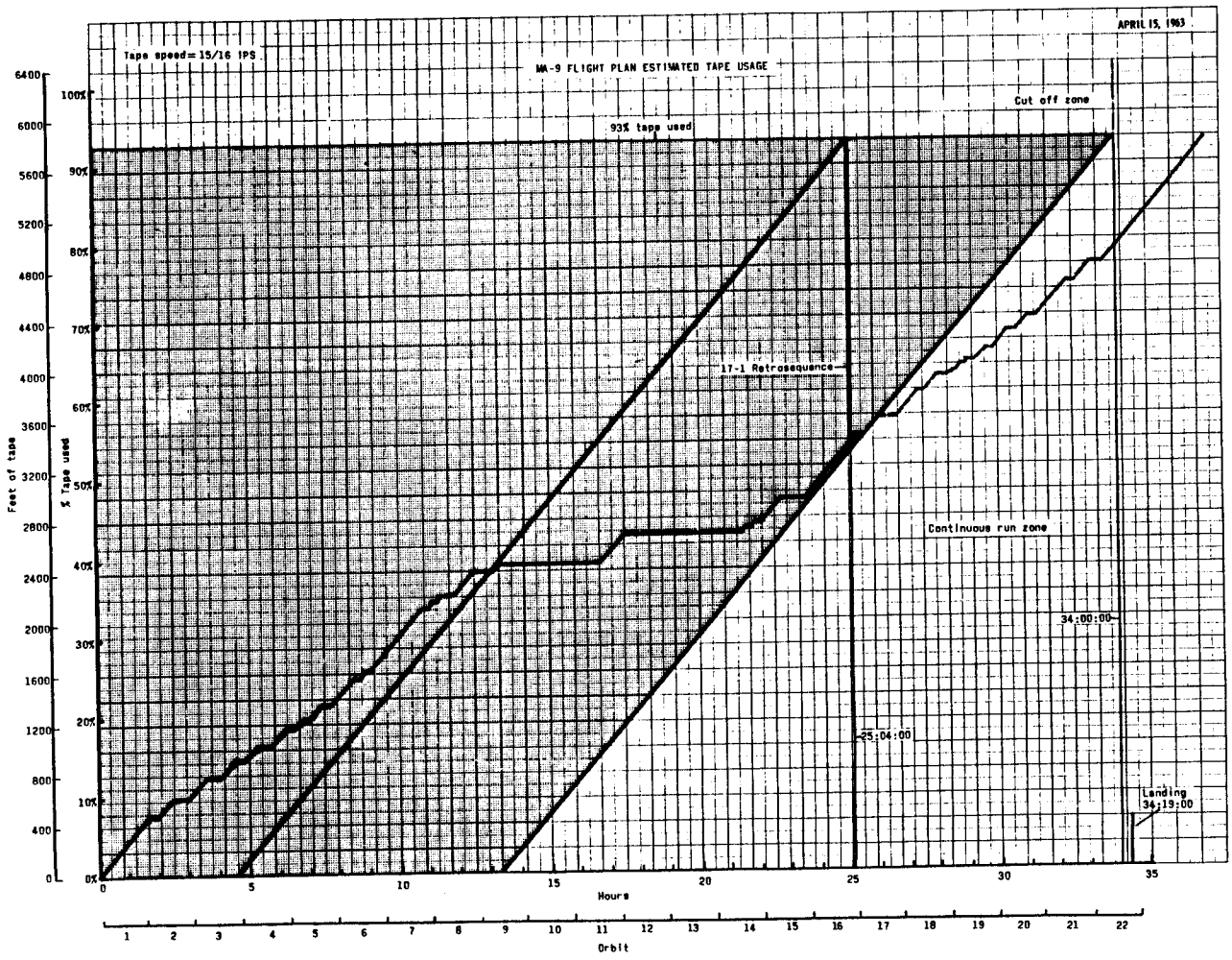
1. Retro Manual Fuse Switch	OFF
2. Preretrosequence Checklist EXCEPT Retro Manual FS	COMPLETE
3. Retro Delay Switch	INSTANT
4. Squib Switch	ARM WITHIN T_R MINUS 5 SEC
5. Retro Sequence Bottom	DEPRESS AT T_R

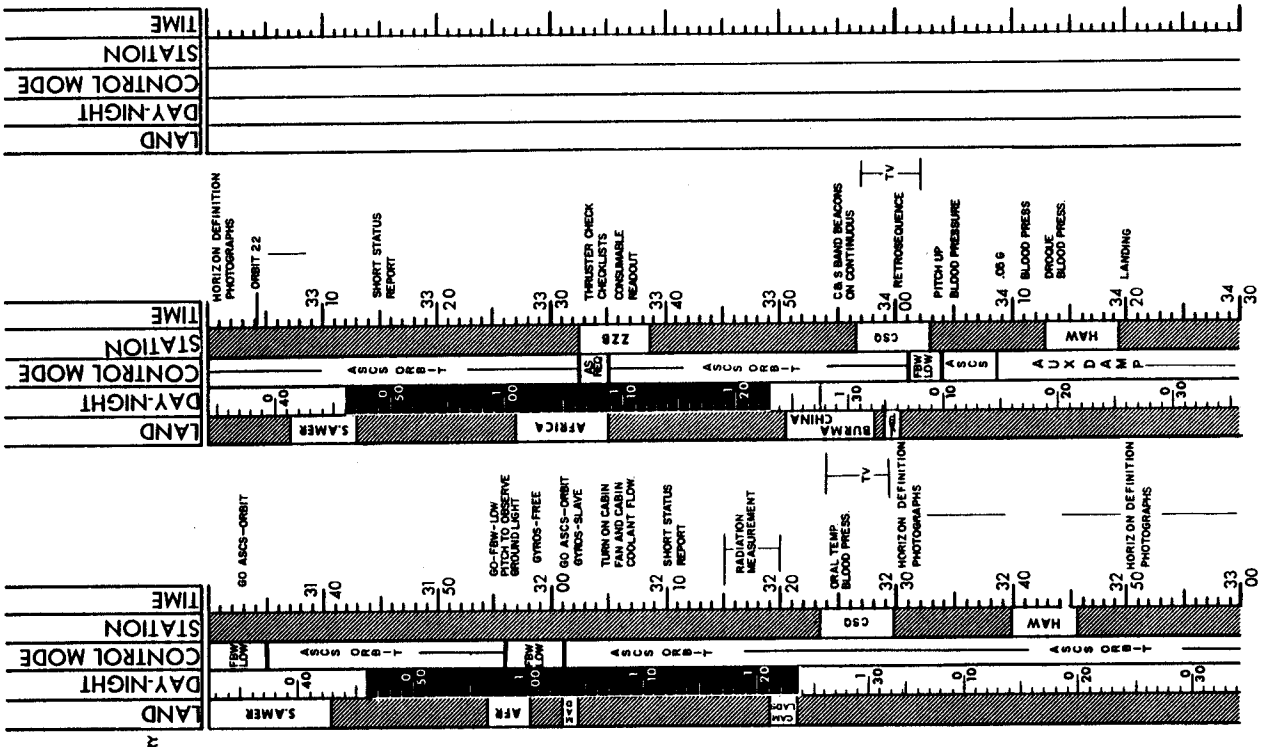



MA-9 SUMMARY FLIGHT PLAN
LAND
DAY-NIGHT
CONTROL MODE
STATION
TIME
USA
AFR
IND
BDA
MCC
GYM
CAL
HAW
S.AMER
MEX
AUS
AFRICA
ZZB
CSO
CHINA
INDIA
BURMA
TIBET
ARABIA
DRIFT
MANUAL
FBW-LOW
FBW-HIGH
ASCS REENTRY
ORBIT
RKV
SWITCH TM BACK TO NORMAL TRANSMITTER
TV
ORBIT 4
CW CODE CHECK
DAY OBSERVATION OF FLASHING BEACON
C-BAND BEACON
LONG STATUS REPORT
RADIATION MEASUREMENT
FLASHING BEACON EXPERIMENT OBSERVATION
ORAL TEMP.
CONSUMABLE READOUT
BLOOD PRESS.
EAT & DRINK
ORBIT 5
TURN OFF CABIN FAN AND CABIN COOLANT FLOW
SHORT STATUS REPORT
BLOOD PRESS EXERCISE BLOOD PRESS.
POWER UP ASCS BUS
ALIGN S/C
ORBIT 6
UNCAGE GYROS
GO ASCS-ORBIT
GO FBW-LOW PITCH TO OBSERV GROUND LIGHT GYROS-FREE
GO ASCS REENTRY GYROS-SLAVE
BLOOD PRESSURE
GO FBW-LOW DEPLOY BALLOON RETURN TO ASCS REENTRY
GO FBW-LOW MANEUVER TO OBSERVE BALLOON RETURN TO ASCS REENTRY
TETHERED BALLOON EXPERIMENT
GO- NO GO DECISION
DAY STAR OBSERVATIONS
-7-1 RETRO SEQUENCE POINT
BALLOON RELEASE
ORBIT 7
GO FBW-LOW TRACK BALLOON (16 MM CAMERA)
CAGE GYROS POWER DOWN ASCS BUS
BLOOD PRESSURE
ORBIT 8
ORBIT 9
START REST PERIOD
MANUAL AND FBW-Low THRUSTER CHECK PRIOR TO REST PERIOD
APRIL 15, 1963
2
REVISION A
APRIL 15, 1963
3
REVISION A

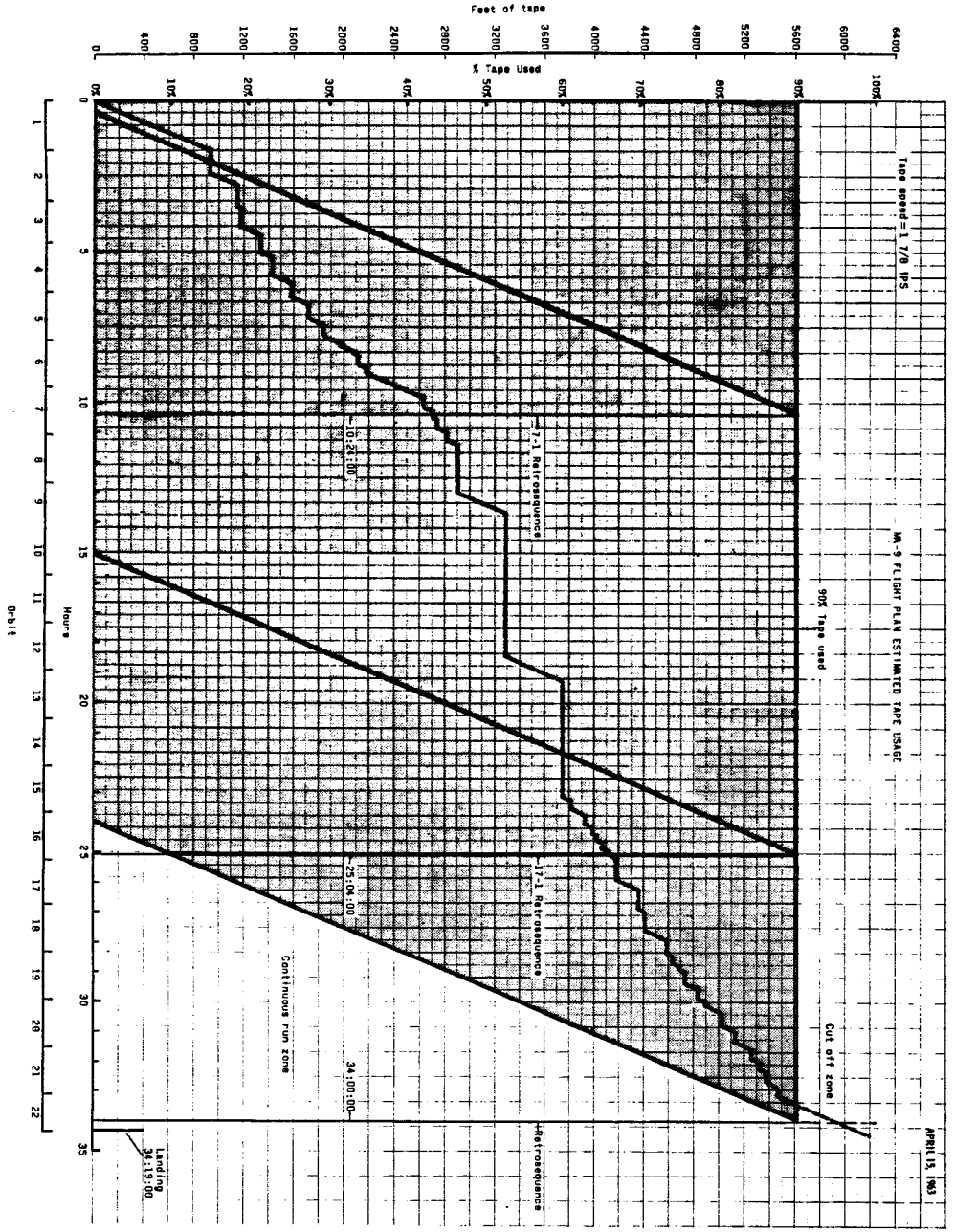

MA-9 SUMMARY FLIGHT PLAN
APRIL 15, 1963
TIBET INDIA NEAR EAST
ARB
AFRICA
S.AMER
KNO
RKV
CTN
CSQ
LAND
DAY-NIGHT
CONTROL MODE
STATION
TIME
ORBIT 10
SHORT STATUS REPORT *
TV *
CONSUMABLE READOUT *
REST PERIOD
START REST PERIOD
TIBET
INDIA
NEAST
AFRICA
S.AMER
CHINA
ORBIT 11
REST PERIOD
ISREAL INDIA
AFRICA
S.AMER
CHINA
CYI
RKV
ORBIT 12
REVISION A
* IF NOT RESTING
REST PERIOD
N. EAST
AFRICA
S.AMER
IND
S. EAST
INDIA
ORBIT 13
S-BAND * BEACON
REST PERIOD
AFRICA
AUSTRALIA
IND
ORBIT 14
END REST PERIOD
REST PERIOD
ARB
BDA
MCC
MUC
ORBIT 15
MANUAL AND FBW LOW THRUSTER CHECK PRIOR TO ASCS PERIOD
C-BAND BEACON ON BY GR COMM
END REST PERIOD


MA-9 SUMMARY FLIGHT PLAN
LAND
DAY-NIGHT
CONTROL MODE
STATION
TIME
AFRICA
AUS
MUC
GYM
BDA
MCC
CYI
KNO
ZZB
CTN
CAL
HAW
N.AM
AUSTRALIA
AFR
IND
S.AMER
USA
MEX
N.ZEALAND
DRIFT
ASCS ORBIT
FBW LOW
MANUAL
CONSUMABLE READOUT *
SHORT STATUS REPORT *
END REST PERIOD
C & S-BAND BEACONS ON BY GR COMM
EAT & DRINK PRIOR TO ASCS PERIOD
POWER UP ASCS BUS
C-BAND BEACON
ORBIT 16
ALIGN S/C UNCAGE GYROS
GO ASCS-ORBIT
BLOOD PRESSURE
TV
CONSUMABLE READOUT
GO FBW-LOW REORIENT S/C CAGE & UNCAGE GYROS GYROS-FREE GO ASCS-ORBIT
GO-NO GO DECISION
GYROS-SLAVE
RADIATION MEASUREMENT
DIM LIGHT PHENOMENON PHOTOS
-17-1 RETROSEQUENCE POINT CAGE GYROS POWER DOWN ASCS BUS
HORIZON DEFINITION
QUADRANT
ORBIT 17
PHOTOGRAPHS
CONSUMABLE READOUT
SHORT STATUS REPORT
BLOOD PRESSURE
INFRA-RED WEATHER PHOTOGRAPHS
ORBIT 18
RADIATION MEASUREMENT
* IF NOT RESTING
INFRA-RED WEATHER PHOTOGRAPHS
SHORT STATUS REPORT
CONSUMABLE READOUT
C-BAND BEACON
BLOOD PRESS.
ORBIT 19
MOON-EARTH LIMB PHOTOGRAPH
EAT & DRINK PERIOD
RADIATION MEASUREMENT
SHORT STATUS REPORT
CONSUMABLE READOUT
HF CHECK
ORBIT 20
CONSUMABLE READOUT
BLOOD PRESSURE
POWER UP ASCS BUS
GO FBW-LOW ALIGN S/C UNCAGE GYROS
ORBIT 21
HF CHECK
RADIATION MEASUREMENT
SHORT STATUS REPORT
APRIL 15, 1963
REVISION A
6
7





MA-9 SUMMARY FLIGHT PLAN



NASA Manned Spacecraft Center
Houston, Texas
In reply refer to: OFC (JBJ:mh)
OFC-55610-3M-60
April 15, 1963

MEMORANDUM for Those Concerned

Subject: MA-9/20 Flight Plan, 7 Orbit Alternate

Enclosed is the 7 orbit MA-9/20 Flight Plan that will replace the nominal MA-9/20 Flight Plan in the event the mission is terminated at the 7-1 Retrosequence Point by the Operations Director. This flight plan does assume that the decision is known by ZZB on the seventh orbit, however, it does not assume any low consumable quantities or system malfunctions.

This flight plan follows the nominal flight plan up to ZZB on the seventh orbit at which point the balloon is released and the necessary checklists completed.

Richard E. Day
Assistant Chief for Training, FCOD

Enc.
As stated

LAUNCH PHASE

Hr:Min:Sec		
0:00:00	Lift-off	A- Report clock operating
0:00:20	Start backup clock	MCC- Standby for 20 seconds 2, 1, MARK!
		A- Report backup clock operating
00:00:30	Report	A- Fuel and O_2 status Cabin pressure holding at _____
0:01:00	Report	A- Fuel and O_2 status Cabin pressure passing through _____
		MCC- Pitch angle _____ Report passing through max q
0:01:30	Report	A- Fuel and O_2 status Cabin pressure passing through _____
		MCC- Pitch angle _____
0:02:13	BECO	A- Report BECO Fuel and O_2 status Cabin pressure sealed and holding at _____
		MCC- Pitch angle _____ Confirm staging
0:02:30	Jett Tower	A- Jett Tower Ring - PULL Report Jett Tower - GREEN Observe tower separation Retro Jett Switch - OFF
		MCC- Count down to Jett Tower "Mark" Pitch angle _____

Hr:Min:Sec		
0:03:30	Report	A- Fuel and O_2 status Complete voltage check
0:03:35	MCC GO-NO GO	MCC- Give GO-NO GO
		A- Give astronaut GO-NO GO
		MCC- Confirm astronaut GO-NO GO Pitch angle _____
0:04:00	Report	A- Fuel and O_2 status
		MCC- Pitch angle _____
0:04:30	Report	A- Fuel and O_2 status
		MCC- Pitch angle _____ Report when V/VR is over .8
0:05:03	SECO and Sep Cap	A- Report SECO and Sep Cap GREEN
		MCC- Confirm SECO and Sep Cap
0:05:08	Turnaround (FBW-Low)	A- Report Aux Damp OK on ASCS Go to FBW-Low Report turnaround complete Orbit attitude
0:07	Orbit GO	A- Go to ASCS - Orbit
		MCC- Confirm events Give orbit GO
		A- Electrical systems check Confirm orbit GO TV camera - OFF 16 mm camera - OFF

First Orbit

Note: This orbit will primarily be devoted to systems checkout and monitoring. The prime control mode will be ASCS Orbit.

Hr:Min			
00:08	BDA/MCC (ASCS orbit)	MCC-	Give GET Mark Give V/VR
		A-	Blood pressure
00:10 to 00:15	Cap Sep + 330 Sec. Checklist Control Systems Check (As required)	A-	Complete Cap Sep + 330 Sec. Checklist Check MP and FBW-Normal Return to ASCS orbit
00:14	CYI AOS (ASCS orbit)	A-	TV camera - ON Report status of systems Gyro switch - FREE (T_s + 5 sec. check)
00:21	CYI LOS (ASCS orbit)	A-	TV camera - OFF
00:31	ZZB (ASCS orbit)	A-	Gyro switch - SLAVE Readout fuel and O_2 quantities
00:40	Short Status Report (ASCS orbit)	A-	Short status report
00:50	MUC AOS (ASCS orbit)	A-	Blood pressure
		MUC-	Emergency voice check Send end rest command for check
00:58	MUC LOS (ASCS orbit)	A-	S-band beacon - GROUND COMMAND
01:05	Long Status Report (ASCS orbit)	A-	Long status report
01:10	CTN AOS (ASCS orbit)	A-	Oral temperature
01:27	GYM AOS (ASCS orbit)	A-	Give status
		GYM-	Give GO-NO GO decision
1:28	2-1 Retrosequence Point (ASCS orbit)		

Hr:Min			
01:34	MCC AOS (ASCS orbit)	A-	TV camera - ON
Second Orbit			
01:40	Power Down (Drift)	A-	ASCS Control - SELECT Cage Gyros Power Down ASCS bus TV camera - OFF Tape recorder - PROGRAM
01:41	Twin Falls Victory LOS (Drift)	A-	C-band beacon - GROUND COMMAND
01:48	CYI AOS (Drift)	A-	TV camera - ON
01:54	CYI LOS (Drift)	A-	TV camera - OFF
02:05	ZZB (Drift)	A-	Readout fuel and O_2 quantities
02:15	Short Status Report (Drift)	A-	Short status report into tape recorder
02:25	MUC (Drift)	A -	Blood pressure Exercise Blood pressure
02:35	Long Status Report (Drift)	A-	Long status report into tape recorder
03:00	CAL (Drift)	A-	Tape recorder - CONTINUOUS Power up ASCS bus
3:07	MCC AOS (Drift)	A-	TV camera - ON
03:10	MCC (FBW-Low)	A-	Go FBW-Low Align spacecraft Uncage gyros Go ASCS orbit Gyros - SLAVE Blood pressure

Hr:Min			
03:14	MCC LOS (FBW-Low)	A-	TV camera - OFF

Third Orbit

Note: The night phases of the third, fourth, and fifth orbits will be devoted to the Flashing Beacon Experiment.

03:29	Flashing Beacon Experiment Deployment (FBW-Low)	A-	Go FBW-Low Orient spacecraft to beacon--deploy attitude (-20^{o} pitch) Deploy flashing beacon Cage gyros Power down ASCS bus Tape Recorder - PROGRAM
03:40	Short Status Report (Drift)	A-	Short status report into tape recorder
03:45 to 04:23	Flashing Beacon Experiment Observation (FBW-Low)	A-	Orient spacecraft to observe flashing beacon (Approximately 180^{o} yaw) Observe beacon during night phase Also extinct standard light at intervals during the night phase to establish dark adaption level
04:00	MUC (FBW-Low)	A-	Blood pressure
04:23	HAW AOS (FBW-Low)	A-	C-band beacon - CONTINUOUS
		HAW-	Give "Mark" to switch TM transmitters
		A-	On "Mark" from HAW switch TV Control switch-TM Readout fuel and O_2 quantities
04:38	CAL (Drift)	CAL-	Give "Mark" to switch TM transmitters
		A-	On CAL "Mark" switch TV Control switch - OFF

Hr:Min			
04:41	MCC AOS (Drift)	A-	TV camera - ON Send CW for operational check

Fourth Orbit

4:47	MCC LOS (Drift)	A-	TV Camera - OFF
04:53	Flashing Beacon Experiment Observation (Manual)	A-	Tape Recorder - CONTINUOUS Orient spacecraft, locate and observe beacon during the period of closest approach on the day light phase of the orbit.
05:03 to 05:13	Radiation Measurement (Manual)	A-	Radiation experiment ON for 10 minute period
05:07	Long Status Report (Drift)	A-	C-band beacon - GROUND COMMAND Long status report
05:13	Tape Recorder (Drift)	A-	Tape Recorder - PROGRAM
05:14 to 05:52	Flashing Beacon Experiment Observation (FBW-Low)	A-	Second night observation period Repeat same procedures for observations during night phase of the orbit.
05:58	HAW (Drift)	A-	Oral temperature Readout fuel and O_2 quantities
06:10	CAL (Drift)	A-	Blood pressure
06:15	MCC AOS (Drift)	A-	TV camera - ON Eat and drink period Turn off cabin fan and coolant flow

Fifth Orbit

06:19	MCC LOS (Drift)	A-	TV camera - OFF
06:32 to 06:47	Radiation Measurement (Drift and FBW-Low)	A-	Radiation experiment ON and tape recorder CONTINUOUS for 15 minute period

Hr:Min			
06:42 to 07:20	Flashing Beacon Experiment Observation (FBW-Low)	A-	Third night observation Repeat same procedures for observations during night phase of orbit
07:23	Radar Track (Drift)	A-	C-band beacon -CONTINUOUS
07:25	Short Status Report (Drift)	A-	Short status report into tape recorder
07:32	HAW (Drift)	A-	C-band beacon - GROUND COMM Readout fuel and O_2 quantit
07:40	CAL (Drift)	A-	Blood pressure Exercise Blood pressure Tape Recorder - CONTINUOUS
07:45	Power Up (Drift)	A-	Power up ASCS bus
07:50	Attitude Alignment (FBW-Low)	A-	Go FBW-Low Align spacecraft attitude Uncage gyros Go ASCS - Orbit
Sixth Orbit			
08:06 to 08:16	Radiation Measurement (ASCS orbit)	A-	Radiation experiment ON for 10 minute period
08:21	Ground Light Experiment (FBW-Low)	A-	Go FBW-Low Gyro Switch - FREE Orient spacecraft to obser ground light Comment on light acquisition Extinct ground light and standard light as possible and record readings (This experiment will be performed only once. If conditions on this orbit permit observation, the 21st orbit attempt will be omitted)

Hr:Min			
08:26	Completion of Ground Light Experiment (ASCS Reentry)	A-	Go to ASCS Reentry Gyro switch - SLAVE Tape Recorder - PROGRAM
08:48	CSQ AOS (ASCS Reentry	A-	TV camera - ON Blood pressure
08:55	CSQ LOS (ASCS Reentry)	A-	TV Camera - OFF
09:00 to 09:50	Balloon Experiment (ASCS Reentry)	A-	Go FBW-Low Stabilize spacecraft at 0°, 0°, 0° Tape recorder - CONTINUOUS 16 mm camera ON (in window mount) Deploy balloon (Actual time of deployment will be relayed from ground) After deployment pitch down slightly for observation and photographs Return to ASCS-Reentry 16 mm camera - OFF
Optional	Balloon Observation (FBW-Low)	A-	Go FBW-Low Maneuver to observe balloon and obtain more accurate drag measurements (16 mm camera photographing balloon during this period) Return to ASCS-Reentry
09:08	HAW (ASCS Reentry)	A-	Readout fuel and O_2 quantities
09:20	Short Status Report (ASCS Reentry)	A-	Short status report
Seventh Orbit			
09:39 to 09:49	Radiation Measurement (ASCS Reentry)	A-	Radiation experiment - ON for 10 minute period

Hr:Min		
09:58	ZZB (ASCS Orbit)	A- Give status ZZB-Give GO-NO GO decision A- Release balloon Complete stowage and preretrosequence checklists Check manual Proportional and FBW high thrusters, if required Pitch to ASCS - Orbit Go ASCS - Orbit Turn on cabin fan and coolant flow
10:22	CSQ AOS (ASCS Orbit)	A- TV camera - ON C and S band beacons - CONTINUOUS Report check lists complete CSQ- Confirm astronaut ready for retrosequence Confirm retrosequence time setting A- Squib switch - ARM at retrosequence minus 5 seconds
10:24	Retrosequence (ASCS Orbit)	CSQ-Countdown to retrosequence "Mark" A- Standby to backup with MP and control retrosequence events Report sequence light illuminations CSQ- Confirm retrosequence
10:24	Retrofire (ASCS Orbit)	CSQ- Countdown to retrofire "Mark" Confirm retrofire A- Mark each retrorocket firing
10:25	Retro Jettison (FBW)	A- Go FBW Execute pre-retro jett checklist Report Retro Jett
10:26	Pitch up to Reentry Attitude (FBW)	A- Pitch up to reentry attitude Go ASCS Reentry

Hr:Min		
10:28	CSQ LOS (ASCS Reentry)	A- TV camera - OFF
10:29	Blood Pressure (ASCS Reentry)	A- Blood pressure
10:34	.05 g (Aux Damp)	A - Mark .05 g
10:36	Blood Pressure (Aux Damp)	A- Blood pressure (At approximately 1 g)
10:39	Drogue Chute (Aux Damp)	A- Deploy drogue chute manually at 40,000 ft. Execute checklists as required
10:40	Blood Pressure	A- As possible, take blood pressure
10:41	Main Chute	A- Execute checklists
10:46	Landing	A- Execute checklist

NASA Manned Spacecraft Center
Houston, Texas
In reply refer to: OFC (JBJ:mh)
OFC-55610-3M-61

April 15, 1963

MEMORANDUM for Those Concerned

Subject: MA-9/20 Flight Plan, 17 Orbit Alternate

Enclosed is the 17 orbit MA-9/20 Flight Plan that will replace the nominal MA-9/20 Flight Plan in the event the mission is terminated at the 17-1 Retrosequence Point by the Operations Director. This flight plan does assume that the decision has been made prior to the start of the rest period, however, it does not assume any low consumable quantities or system malfunctions.

The major revision includes the reduction of the rest period from eight to six hours and the scheduling of the Dim Light Phenonmenon Photographs and Horizon Definition Photographs in an ASCS period prior to the 17-1 Retrosequence Point.

Richard E. Day
Assistant Chief for Training, FCOD

Enc.
As stated

LAUNCH PHASE

Hr:Min:Sec			
0:00:00	Lift-off	A-	Report clock operating
0:00:20	Start backup clock	MCC-	Standby for 20 seconds 2, 1, MARK!
		A-	Report backup clock operating
0:00:30	Report	A-	Fuel and O_2 status Cabin pressure holding at _____
0:01:00	Report	A-	Fuel and O_2 status Cabin pressure passing through _____
		MCC-	Pitch angle_____ Report passing through max q
0:01:30	Report	A-	Fuel and O_2 status Cabin pressure passing through_____
		MCC-	Pitch angle_____
0:02:13	BECO	A-	Report BECO Fuel and O_2 status Cabin pressure sealed and holding at _____
		MCC-	Pitch angle_____ Confirm staging
0:02:30	Jett Tower	A-	Jett Tower Ring - PULL Report Jett Tower - GREEN Observe tower separation Retro Jett Switch - OFF
		MCC-	Count down to Jett Tower "Mark" Pitch angle_____

Hr:Min:Sec

0:03:30	Report	A-	Fuel and O_2 status Complete voltage check
0:03:35	MCC GO-NO GO	MCC-	Give GO-NO GO
		A-	Give astronaut GO-NO GO
		MCC-	Confirm astronaut GO-NO GO Pitch angle_____
0:04:00	Report	A-	Fuel and O_2 status
		MCC-	Pitch angle_____
0:04:30	Report	A-	Fuel and O_2 status
		MCC-	Pitch angle_____ Report when V/VR is over .8
0:05:03	SECO and Sep Cap	A-	Report SECO and Sep Cap GREEN
		MCC-	Confirm SECO and Sep Cap
0:05:08	Turnaround (FBW-Low)	A-	Report Aux Damp OK ON ASCS Go to FBW-Low Report turnaround complete Orbit attitude
0:07:00	Orbit GO	A-	Go to ASCS - Orbit
		MCC-	Confirm events Give orbit GO
		A-	Electrical systems check Confirm orbit GO TV camera - OFF 16mm camera - OFF

First Orbit

Note: This orbit will primarily be devoted to systems checkout and monitoring. The prime control mode will be ASCS Orbit.

Hr:Min

00:08	BDA/MCC (ASCS Orbit)	MCC-	Give GET Mark Give V/VR
		A-	Blood pressure

Hr:Min

00:10 to 00:15	Cap Sep + 330 Sec. Checklist Control Systems Check (As required)	A-	Complete Cap Sep + 330 Sec. Checklist Check MP and FBW-Normal Return to ASCS Orbit
00:14	CYI AOS (ASCS Orbit)	A-	TV camera - ON Report status of systems Gyro switch - FREE (T_s + 5 sec. check)
00:21	CYI LOS (ASCS Orbit)	A-	TV camera - OFF.
00:31	ZZB (ASCS Orbit)	A-	Gyro switch - SLAVE Readout fuel and O_2 quantities
00:40	Short Status Report (ASCS Orbit)	A-	Short status report
00:50	MUC AOS (ASCS Orbit)	A-	Blood pressure
		MUC-	Emergency voice check Send end rest command for check
00:58	MUC LOS (ASCS Orbit)	A-	S-band beacon - GROUND COMMAND
01:05	Long Status Report (ASCS Orbit)	A-	Long status report
01:10	CTN AOS (ASCS Orbit)	A-	Oral temperature
01:27	GYM AOS (ASCS Orbit)	A-	Give status
		GYM-	Give GO-NO GO decision
01:28	2-1 Retrosequence Point (ASCS Orbit)		
01:34	MCC AOS (ASCS Orbit)	A-	TV camera - ON

Hr:Min			
Second Orbit			
01:40	Power Down (Drift)	A-	ASCS Control - SELECT Cage Gyros Power down ASCS bus TV camera - OFF Tape recorder - PROGRAM
01:41	Twin Fall Victory LOS (Drift)	A-	C-band beacon - GROUND COMMAND
01:48	CYI AOS (Drift)	A-	TV camera - ON
01:54	CYI LOS (Drift)	A-	TV camera - OFF
02:05	ZZB (Drift)	A-	Readout fuel and O_2 quantities
02:15	Short Status Report (Drift)	A-	Short status report into tape recorder
02:25	MUC (Drift)	A-	Blood pressure Exercise Blood pressure
02:35	Long Status Report (Drift)	A-	Long status report into tape recorder
03:00	CAL (Drift)	A-	Tape Recorder - CONTINUOUS Power up ASCS bus
03:07	MCC AOS (Drift)	A-	TV camera - ON
03:10	MCC (FBW-Low)	A-	Go FBW-Low Align spacecraft Uncage gyros Go ASCS Orbit Gyros - SLAVE Blood pressure
03:14	MCC LOS (FBW-Low)	A-	TV camera - OFF

Hr:Min			
Third Orbit			
	Note: The night phases of the third, fourth, and fifth orbits will be devoted to the Flashing Beacon Experiment.		
03:29	Flashing Beacon Experiment Deployment (FBW-Low)	A-	Go FBW-Low Orient spacecraft to beacon--deploy attitude (-20° pitch) Deploy flashing beacon Cage gyros Power down ASCS bus Tape Recorder - PROGRAM
03:40	Short Status Report (Drift)	A-	Short status report into tape recorder
03:45 to 04:23	Flashing Beacon Experiment Observation (FBW-Low)	A-	Orient spacecraft to observe flashing beacon (Approximately 180° yaw) Observe beacon during night phase Also extinct standard light at intervals during the night phase to establish dark adaption level
04:00	MUC (FBW-Low)	A-	Blood pressure
04:23	HAW AOS (FBW-Low)	A-	C-band beacon - CONTINUOUS
		HAW-	Give "Mark" to switch TM transmitters
		A-	On "Mark" from HAW, switch TV Control switch - TM Readout fuel and O_2 quantities
04:38	CAL (Drift)	CAL-	Give "Mark" to switch TM Transmitters
		A-	On CAL "Mark" switch TV Control switch - OFF
04:41	MCC AOS (Drift)	A-	TV camera - ON Send CW for operational check

Hr:Min			
Fourth Orbit			
04:47	MCC LOS (Drift)	A-	TV camera - OFF
04:53	Flashing Beacon Experiment Observation (Manual)	A-	Tape Recorder - CONTINUOUS Orient spacecraft, locate and observe beacon during the period of closest approach on the day light phase of the orbit
05:03 to 05:13	Radiation Measurement (Manual)	A-	Radiation experiment ON for 10-minute period
05:07	Long Status Report (Drift)	A-	C-band beacon - GROUND COMMAND Long status report
05:13	Tape Recorder (Drift)	A-	Tape Recorder - PROGRAM
05:14 to 05:52	Flashing Beacon Experiment Observation (FBW-Low)	A-	Second night observation period Repeat same procedures for observations during night phase of the orbit
05:58	HAW (Drift)	A-	Oral temperature Readout fuel and O_2 quantities
06:10	CAL (Drift)	A-	Blood pressure
06:15	MCC AOS (Drift)	A-	TV camera - ON Eat and drink period Turn off cabin fan and cabin coolant flow
Fifth Orbit			
06:19	MCC LOS (Drift)	A-	TV camera - OFF
06:32 to 06:47	Radiation Measurement (Drift and FBW-Low)	A-	Radiation experiment ON and tape recorder CONTINUOUS for 15 minute period

Hr:Min			
06:42 to 07:20	Flashing Beacon Experiment Observation (FBW-Low)	A-	Third night observation period Repeat same procedures for observations during night phase of orbit
07:23	Radar Track (Drift)	A-	C-band beacon - CONTINUOUS
07:25	Short Status Report (Drift)	A-	Short status report into tape recorder
07:32	HAW (Drift)	A-	C-band beacon - GROUND COMMAND Readout fuel and O_2 quantities
07:40	CAL (Drift)	A-	Blood pressure Exercise Blood pressure
07:45	Power Up (Drift)	A-	Tape recorder - CONTINUOUS Power up ASCS bus
07:50	Attitude Alignment (FBW-Low)	A-	Go FBW-Low Align spacecraft attitude Uncage gyros Go ASCS - Orbit
Sixth Orbit			
08:06	Radiation Measurement (ASCS Orbit)	A-	Radiation experiment ON for 10 minute period
08:21	Ground Light Experiment (FBW-Low)	A-	Go FBW-Low Gyro switch - FREE Orient spacecraft to observe ground light Comment on light acquisition Extinct ground light and standard light as possible and record photometer readings (This experiment will be performed only once. If conditions on this orbit permit, observation, the 21st orbit attempt will be omitted)
08:26	Completion of Ground Light Experiment (ASCS Reentry)	A-	Go to ASCS Reentry Gyro switch - SLAVE Tape Recorder - PROGRAM

Hr:Min			
08:48	CSQ AOS (ASCS Reentry)	A-	TV Camera - ON Blood pressure
08:55	CSQ LOS (ASCS Reentry)	A-	TV camera - OFF
09:00 to 10:30	Balloon Experiment (ASCS Reentry)	A-	Go FBW-Low Stabilize spacecraft at 0°, 0°, 0° Tape Recorder - CONTINUOUS 16 mm camera - ON (in window mount) Deploy balloon (Actual time of deployment will be relayed from ground) After deployment, pitch down slightly for observation and photographs Return to ASCS - Reentry 16 mm camera - OFF
Optional	Balloon Observation (FBW-Low)	A-	Go FBW-Low Maneuver to observe balloon and obtain more accurate drag measurements (16 mm camera photographing balloon during this period) Return to ASCS - Reentry
09:08	HAW (ASCS Reentry)	A-	Readout fuel and O_2 quantities
09:20	Short Status Report (ASCS Reentry)	A-	Short status report into tape recorder
Seventh Orbit			
09:39 to 09:49	Radiation Measurement (ASCS Reentry)	A-	Radiation experiment - ON for 10-minute period
09:39 to 10:19	Window Attenuation Evaluation (ASCS Reentry)	A-	As possible, extinct known stars with the photometer Record the star, the photometer reading and the position in the window Take a photometer reading on the standard light with each star reading

Hr:Min			
09:58	ZZB (ASCS Reentry)	A- ZZB-	Give status Give GO-NO GO decision
10:16	Sunrise (ASCS Reentry)	A-	Observe the stars under the known daylight conditions and report visibility. Also report spacecraft lighting conditions
10:22	CSQ AOS (ASCS Reentry)	A-	TV camera - ON
10:23	7-1 Retrosequence Point (ASCS Reentry)		
10:28	CSQ LOS (ASCS Reentry)	A-	TV camera - OFF
10:30	Balloon Release Tracking (FBW-Low)	A-	C-band beacon - CONTINUOUS Release balloon Track balloon for approximately one minute, holding it on the window orbit attitude horizon mark 16 mm camera on for entire tracking maneuver (in window mount) Cage gyros Power down ASCS bus
10:40	HAW (Drift)	A-	Blood pressure Readout fuel and O_2 quantities
10:45	HAW LOS (Drift)	A-	C-band beacon - GROUND COMMAND Tape Recorder - PROGRAM
10:50	Short Status Report (Drift)	A-	Short status report into tape recorder
11:00	Eat and Drink (Drift)	A-	Eat and drink
Eighth Orbit			
11:15 to 11:25	Radiation Measurement (Drift)	A-	Radiation experiment ON and tape recorder CONTINUOUS for 10-minute period

Hr:Min			
11:55	CSQ AOS (Drift)	A-	TV camera - ON
12:02	CSQ LOS (Drift)	A-	TV camera - OFF
12:13	HAW (Drift)	A-	Blood pressure Readout fuel and O_2 quantities
12:20	Short Status Report (Drift)	A-	Short status report into tape recorder
12:27	RKV (Drift)	A-	Oral temperature Blood pressure
Ninth Orbit			
12:40 to 14:00	Start Rest Period (Drift)	A-	Start rest period during this time interval (Actual time at astronaut option)
Optional	Thruster Check (MP and FBW-Low)	A-	Quick check of manual proportional and FBW-Low thrusters just prior to rest period (Tape Recorder - CONTINUOUS for thruster check) Rate indicator - AUTO
13:29	CSQ AOS (Drift)	A-	TV camera - ON Readout fuel and O_2 quantities (if not resting - astronaut's option)
13:35	CSQ LOS (Drift)	A-	TV camera - OFF
13:38	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting - astronaut's option)
Tenth Orbit			
14:00 to 20:00	Rest Period (Drift)	A-	Six hours are allotted to rest with the start during the above period with the time at the astronaut's option

Hr:Min			
			(TM switch - CONTINUOUS, radar beacons - GROUND COMMAND, HF and UHF volume at comfortable, but readable levels)
15:02	CSQ AOS (Drift)	A-	TV camera - ON Readout fuel and O_2 quantities (if not resting - astronaut's option)
15:08	CSQ LOS (Drift)	A-	TV camera - OFF
15:10	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting - astronaut's option)
Eleventh Orbit			
16:40	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting - astronaut's option)
17:07	RKV (Drift)	A-	Readout fuel and O_2 quantities (if not resting - astronaut's option)
Twelfth Orbit			
17:38	CYI AOS (Drift)	A-	TV camera - ON (if not resting - astronaut's option)
17:43	CYI LOS (Drift)	A-	TV camera - OFF
18:15	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting - astronaut's option)
18:40	RKV (Drift)	A-	Readout fuel and O_2 quantities (if not resting - astronaut's option)

Hr:Min			
Thirteenth Orbit			
19:10	CYI AOS (Drift)	A-	TV camera - ON S-band beacon - CONTINUOUS (if not resting - astronaut's option)
19:17	CYI LOS (Drift)	A-	TV camera - OFF S-band beacon - GROUND COMMAND
19:40	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting - astronaut's option)
20:15	RKV (Drift)	A-	Readout fuel and O_2 quantities (if not resting - astronaut's option)
Fourteenth Orbit			
20:00 to 21:20	End Rest Period (Drift)	A-	Station to send end rest signal will be determined by Flight Director. (MUC 14th orbit will be final station. Execute end rest checklist, TM - GROUND COMMAND)
Optional	Manual and FBW-Low Thruster Check (MP and FBW-Low)	A-	Quick check of manual proportional and FBW-Low thrusters following rest period (Tape Recorder - CONTINUOUS for thruster check)
20:44	CYI AOS (Drift)	A-	TV camera - ON (if not resting - astronaut's option)
20:50	CYI LOS (Drift)	A-	TV camera - OFF
21:00	Short Status Report (Drift)	A-	Short status report into tape recorder (if not resting - astronaut's option)
21:20	MUC AOS (Drift)	MUC-	Send end rest command if required
		A-	Readout fuel and O_2 quantities

Hr:Min			
21:24	MUC (Drift)	MUC-	Ground Command C-band beacon ON
Optional	Eat and Drink (Drift)	A-	Eat and drink prior to ASCS period
22:03	MCC AOS (Drift)	A-	TV camera - ON
		MCC-	Ground Command C-band beacon ON
22:09	MCC LOS (Drift)	A-	TV camera - OFF
22:17	CYI AOS (Drift)	A-	Tape Recorder - CONTINUOUS TV camera - ON S-band beacon - CONTINUOUS Power up ASCS bus
22:24	CYI LOS (Drift)	A-	TV camera - OFF S-band beacon - GROUND COMMAND
22:30	Attitude Alignment (FBW-Low)	A-	Go FBW-Low Align spacecraft Uncage gyros Go ASCS Orbit
22:36	ZZB (ASCS Orbit)	A-	Readout fuel and O_2 quantities
22:40	Short Status Report (ASCS Orbit)	A-	Short status report into tape recorder
22:52	Dim Light Phenomenon Photographs (ASCS Orbit)	A-	Turn on cabin fan and cabin coolant flow Go FBW-Low Orient spacecraft predetermined attitudes Stop all rates Cage and uncage gyros Go to ASCS Orbit Gyros switch - FREE
22:54	Sunset (ASCS Orbit)	A-	Using Robot camera, start taking photographs of zodiacal light and airglow layers Mark start and stop of each photograph on the on-board tape

Hr:Min			
22:58	MUC (ASCS Orbit)	MUC-	Ground Command C- and S-band beacons ON
23:04	Sunset + 10 Minutes (ASCS Orbit)	A-	Gyro switch - SLAVE Continue taking dim light photographs through entire night phase
23:30	Sunrise Horizon Definition Photographs (ASCS Orbit)	A-	C-band beacon - CONTINUOUS Using Hassleblad camera take Horizon Definition photographs at approximately 6-minute intervals over entire day phase
23:36	MCC AOS (ASCS Orbit)	A-	TV camera - ON
23:40	MCC (ASCS Orbit)	A-	C-band beacon - GROUND COMMAND
Sixteenth Orbit			
23:42	MCC LOS (ASCS Orbit)	A-	TV camera - OFF
23:51	CYI AOS (ASCS Orbit)	A-	TV camera - ON Blood pressure
23:57	CYI LOS (ASCS Orbit)	A-	TV camera - OFF
24:07	ZZB (ASCS Orbit)	A-	Readout fuel and O_2 quantities
24:26	MUC AOS (ASCS Orbit)	A-	Give status
		MUC-	Give GO-NO GO decision
24:40	Thruster Check (As required)	A-	Check manual proportional and FBW-Low thruster, if required
24:45	CTN (ASCS Orbit)	A-	Complete stowage and preretrosequence checklist
24:50 to 24:55	Radiation Measurement (ASCS Orbit)	A-	Radiation experiment ON for 5-minute period

Hr:Min			
25:03	GYM AOS (ASCS Orbit)	A-	C- and S-band beacons - CONTINUOUS Report checklists complete
		GYM-	Confirm astronaut ready for retrosequence Confirm retrosequence time setting
		A-	Squib switch - ARM at retrosequence minus 5 seconds
25:04	Retrosequence (ASCS Orbit)	GYM-	Count down to retrosequence "Mark"
		A-	Stand by to back up with MP and control retrosequence events Report sequence light illuminations
		GYM-	Confirm retrosequence
25:05	Retrofire (ASCS Orbit)	GYM-	Count down to retrofire "Mark" Confirm retrofire
		A-	Mark each retrorocket firing
25:06	Retro Jettison (FBW)	A-	Go FBW Execute preretro Jett checklist Report retro Jett
25:07	Pitch up to Reentry Attitude (FBW)	A-	Pitch up to reentry attitude Go ASCS Reentry
25:10	MCC AOS (ASCS Reentry)	A-	TV camera - ON Blood pressure
25:14	.05g (Aux Damp)	A-	Mark .05g TV camera - OFF
25:16	Blood pressure (Aux Damp)	A-	Blood pressure (At approximately 1 g)
25:19	Drogue Chute (Aux Damp)	A-	Deploy drogue chute manually at 40,000 feet Execute checklist (as required) Blood pressure (as possible)

Hr:Min			
25:20	Main Chute	A-	Execute checklist
25:25	Landing	A-	Execute checklist