

JCSMTH



SATURN V

BOOSTER SYSTEMS ENGINEER FLIGHT CONTROL TIMELINE

**MARSHALL SPACE FLIGHT CENTER
FLIGHT CONTROL OFFICE
HOUSTON, TEXAS**

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MARCH 25, 1970



SATURN V
BOOSTER SYSTEMS ENGINEER
FLIGHT CONTROL
TIMELINE

AS-508 and Subsequent Missions

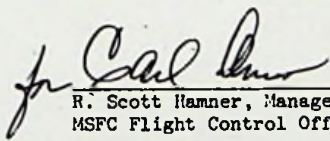
PREFACE

This document contains the Booster Systems Engineer Flight Control Timeline for AS-508 and subsequent missions as of March 27, 1970. It is requested that any organization having comments, questions, or suggestions concerning this timeline contact W. F. Huning, PM-MO-F/MDAC, Building 45, Room 231, phone 483-5811.

Prepared by: McDonnell Douglas Astronautics Co.
Western Division
Houston Mission Operations

Approved:


Frank L. Van Rensselaer
Booster Systems Engineer No. 1


R. Scott Hamner, Manager
MSFC Flight Control Office



MARSHALL FLIGHT CONTROL OFFICE
BOOSTER FLIGHT CONTROLLER MISSION TIMELINE

1.0 SCOPE

This document provides a coordinated Saturn Launch Vehicle Flight Controller Activities Timeline which integrates each position's work plan into a team effort. This document, which presents all SLV flight controller reports and activities during nominal and alternate time bases, will be used as an operational timeline. Included as appendices are flight controller pads which will be used for documentation of real-time calculations performed during the mission and a mission failure contingency checklist which will be used in the event of an impending mission failure and/or a declared mission failure.

2.0 REQUIREMENTS

2.1 PROCEDURAL DEFINITION

This procedure was formulated based on the mission timeline as defined by the Interface Control Document definition of the Flight Sequence Program and the Mission Flight Plan. The MSC Flight Mission Rule Document and the MSFC Booster Flight Control Mission Rule Procedures provide the definition and implementation of corrective procedures for those system malfunctions which have been identified. Those remaining events which require reporting to maintain the flight control team in constant awareness of the progress of the Apollo mission and those nominal functions performed by the flight control team in support of the Apollo mission are included in the following timeline.

2.2 RESPONSIBILITY

Responsibilities of those flight controllers involved in this document are as outlined below:

A. ACS (Attitude Control Specialist) (ATTITUDE)

Monitors and evaluates that data necessary to determine the Attitude Control System is functioning correctly; monitors and evaluates data on those stage systems which affect the attitude control of the vehicle.

B. PSS-ENG (Propulsion Systems Specialist - Engine Systems)
(ENGINE)

Monitors and evaluates S-IVB J-2 engine performance and O2/H2 burner operation to determine propulsion system status during boost, orbital, and mainstage operations.

C. PSS-STG (Propulsion Systems Specialist - Stage Systems)
(STAGE)

Monitors and evaluates S-IVB stage propulsion system functions and operations including pressurization, venting, chilldown, pneumatic supply, and LOX-LH2 ullage pressure status during boost, orbital, and mainstage operations.

D. LSS (Lower Stage Systems) (S-TWO)

Monitors S-II stage and propulsion systems during boost and provides support during orbital phases on all vehicle systems.

E. GND (Guidance, Navigation, and Digital Systems)(NAV)

Evaluates flight program operations and LVDC/LVDA hardware functions and verifies switch selector functioning on all stages.

F. ENS (Electrical Networks Systems Specialist)(NET COM)

Evaluates electrical systems for entire vehicle, including telemetry systems, range safety systems, and S-IVB/IU environmental control system.

G. CONS (Consumables Engineer)

The Consumables Engineer is responsible for monitoring the S-IVB Consumables during the coast phase of the mission and determining the S-IVB stage's ability to support all mission objectives. The Consumables Engineer acts as the team support analyst.

H. CID (Command System Specialist)(COMMAND)

Monitors onboard and ground command systems, generates and transmits all SLV command loads to remoted sites, verifies proper command responses and determines the antenna configuration required for proper communications. Evaluates ground coverage and determines command and telemetry system site handover plans.

- I. BSE 3 (Booster Systems Engineer No. 3)(BOOSTER THREE)
Acts as the integrator for all inputs relating to IU systems including Attitude Control and Guidance, and is responsible for recommending appropriate mission rule action to BSE 1.
- J. BSE 2 (Booster Systems Engineer No. 2)(BOOSTER TWO)
Acts as the integrator for all S-IVB systems and is responsible for recommending appropriate mission rule action to BSE 1.
- K. BSE 1 (Booster Systems Engineer No. 1)(BOOSTER ONE)
Acts as the integrator for all SLV oriented activities, executes command action as necessary and reports anomalies and system status to the Flight Director.

2.3 OPERATING CRITERIA

- A. All references to time-base-time and GET times for systems functions taken from the Flight Sequence ICD or Flight Program are as given in the control documents.
- B. The Consumables Engineer will utilize the provided worksheets to predict propellant levels for second burn and to predict lunar impact Delta "V".
- C. All contingencies and their supporting computations will be documented and identified on provided malfunction computation worksheets.
- D. Each nominal report, especially during high density reporting periods, will be spaced so as to remove the possibility of interference over the voice loop. Priority will be given to those mission critical events necessary to evaluate mission rule conditions.
- E. The prescribed acceptable comm practices are to be utilized at all times (See SOP's 6.3, 6.8 FCOH).
- F. The SSR and MOCR positions will normally interface as follows:
 - CMD and LSS - BSE 1
 - STAGE, ENGINE, and CONS - BSE 2
 - ENS, GND, and ACS - BSE 3

It will not be necessary for an SSR position to identify the MOCR position called unless there is a specific reason to interface other than nominal.

- G. Status reports, as enumerated in the timeline, will be made to the HOCR positions in the following sequence:
1. BSE 2 - a. ENG, b. STG, c. CONS
 2. BSE 3 - a. GND, b. ACS, c. ENS
 3. BSE 1 - a. LSS, b. CMD, c. BSE 2, d. BSE 3
- H. Responses to all communications and status checks are as follows:
- Communications check between two (2) positions -
- "Loud and Clear"
- Team communications check - "(Position) Ready"
- Team status check - "(Position) GO"
- I. Vehicle Systems #3 voice loop is to be utilized as the prime loop for normal mission activities including malfunctions reports and nominal mission related activities. Extended conversations may be conducted on either Vehicle Systems #2 or SSR Conference voice loops at the discretion of the cognizant BSE.
- J. All positions will monitor Vehicle Systems #3 at all times, and will be responsive to a call on this loop.
- K. The above does not preclude the nominal passing of information via the airpath between nearby flight controllers.
- L. Console status lights are to be utilized as follows:
- Red: Position NO-GO, mission termination type failure
- Amber: Apparent failure which could affect mission objectives
- Green: Position is GO - Operator on station
- All lights extinguished - Operator off station
- M. Prior to leaving station, operator will obtain clearance from the BSE and extinguish status lights. Upon return, operator will report "(Position) On Station" and will configure status lights as applicable.
- N. SSR flight controllers may utilize the Consumables Engineer for analysis purposes following coordination with BSE #2.
- O. Consumables Engineer will monitor the HOSC Propulsion voice loop throughout the mission and will handle all HOSC/OSC Propulsion coordination.

- P. All malfunctions are to be correlated to GET time and so recorded in the timeline.
- Q. Measurement losses will be reported by measurement number and title. All reports will be withheld from high density nominal reporting or problem periods unless mission critical.
- R. The MOCR positions will report over the Flight Director voice loop items which will provide the Flight Director and the Flight Control team an assessment of the nominal progress of the vehicle throughout the mission. The BSE #1 will normally make the reports to the Flight Director; however, items which are time critical or which occur during periods of high density activity may be reported by the BSE #2 or BSE #3 as applicable.



AS-508 APOLLO 13

27 MARCH 1970
FLIGHT CONTROL TIMELINE

PAGE-1

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
-09-00-00		PICKUP COUNT			PRELAUNCH FLIGHT CONTROL TEAM REPORT ON STATION
-08-59-00		S-IVB PU POWER ON			
-08-50-00		S-II RECIRC BOTTLE PRESS			
-08-45-00		S-II START BOTTLE PRESS			
-08-22-00		S-IVB/J-2 ENG PURGE			
-08-05-00		START S-IVB LOX LOADING			
-08-01-00		S-II ENGINES PURGE			
-07-36-00		S-IVB LOX LOADING COMPLETE- START S-II LOX LOADING			
-07-13-00		HOUSTON COMMAND CHECKS			
-06-54-00		S-II LOX LOADING COMPLETE- START S-IC LOX LOADING			
-06-47-00		APS GAIN TEST			
-06-10-00		S-IVB COLD HE PRESS TO 1500			

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
-05-48-00		FCC COMPARATOR TEST			
-05-29-00		S-IC LOX LOADING COMPLETE LOAD S-IVB HEAT EXCHANGER			
-05-15-00		START S-II LH2 LOADING			
-04-35-00		FLIGHT CONTROL SYSTEM GAIN TEST			
-04-19-00		S-II LH2 LOADING COMPLETE - START S-IVB LH2 LOADING			
-03-45-00		RANGE SAFETY CHECKS			
-03-40-00		S-IVB LH2 LOADING COMPLETE			
-03-38-00		S-IVB VENT TESTS S-IVB PU CHECKS			
-03-20-00		S-IVB ENGINE/ BURNER CHECKS			
-03-00-00		S/C CONTROL OF SAT TEST			PRIME FLIGHT CONTROL TEAM STATION
-02-40-00		CREW INGRESS			

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
-02-20-00		S-IVB/J-2 ENG C/O CHECKS			
-01-51-00		EDS CHECKS			
-01-19-00		HOUSTON COMMAND TEST			
-01-00-00		S-IVB COLD HE AND ENG CONTROL PRESS TO 3100, PU CHECKS			
-00-42-00		ATTITUDE COMMAND TEST (FT-10)			
-00-30-00		POWER TRANSFER			
					HOLD CONSTRAINTS---
					T-22 MIN TO T-14 MIN 30 SEC
					HOLD. THERE IS NO DEFINITE 'LIMITATION ON HOLD CAPABILITY OTHER 'THAN THE STORAGE CAPACITY OF GH2 'PROVIDED S-II START BOTTLE CHILLDOWN 'OPERATIONS CONTINUE UNINTERRUPTED. '17 MINUTES OF UNINTERRUPTED S-II 'START BOTTLE CHILLDOWN IS REQUIRED.
					T-14 MIN 30 SEC TO T-8 MIN
					HOLD. THERE IS NO DEFINITE 'LIMITATION ON HOLD CAPABILITY OTHER 'THAN THE STORAGE CAPACITY OF GH2 'PROVIDED S-II/S-IVB START BOTTLE 'CHILLDOWN OPERATIONS CONTINUE 'UNINTERRUPTED. 9 MINUTES OF 'UNINTERRUPTED S-IVB START BOTTLE 'CHILLDOWN AND 17 MINUTES OF

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
					UNINTERRUPTED S-II START. BOTTLE CHILLDOWN IS REQUIRED.
					T-8 MIN TO T-3 MIN 7 SEC
					HOLD. AN ACCUMULATED HOLD OF 2 MINUTES MAXIMUM CAN BE TOLERATED WITHOUT RECYCLING IF THRUST CHAMBER CHILLDOWN OPERATIONS CONTINUE. S-II AND S-IVB THRUST CHAMBER CHILLDOWN MAY BE TERMINATED IF A HOLD IS CALLED FROM T-8 MIN TO T-6 MIN, AND RESUMED PRIOR TO PICKING UP THE COUNT IN ORDER TO PROVIDE UNINTERRUPTED CHILLDOWN OF 8 MINUTES. TOTAL ACCUMULATED THRUST CHAMBER CHILLDOWN WILL NOT EXCEED 10 MINUTES (S-II) OR 20 MINUTES (S-IVB). 9 MINUTES OF UNINTERRUPTED S-IVB START BOTTLE CHILLDOWN AND 17 MINUTES OF UNINTERRUPTED S-II START BOTTLE CHILLDOWN IS REQUIRED. IF ADDITIONAL HOLD TIME IS REQUIRED, RECYCLE TO T-22 MIN AN HOLD.
					T-3 MIN 7 SEC TO T-19 SEC
					CUTOFF. RECYCLE TO T-22 MIN
					T-19 SEC TO T-11 SEC
					CUTOFF. RECYCLE TO T-22 MIN
					T-11 SEC TO T-0 SEC
					NONE. NO HOLDS WILL BE CALLED

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
-00-22-00		S-II START TANK CHILLDOWN INITIATED		'LSS REPORT 'S-II 'START TANK CHILLDOWN 'IN PROGRESS''	
-00+21+00				'CONS REPORT ESTIMATED 'INSERTION WTGS TO 'BSE 2.	
-00-20-00		OPEN START TANK VENT & BEGIN AMBIENT PURGE		'ENG REPORT 'START 'TANK VENT OPEN AND 'PURGE IN PROGRESS''	
-00-18-40		AUX HYDRAULIC PUMP ON		'ACS REPORT 'AUX 'PUMP ON''	
-00-15-00		BEGIN THRUST CHAMBER PURGE			
-00-14-30		BEGIN START BOTTLE CHILLDOWN		'ENG REPORT 'S-IVB 'START BOTTLE 'CHILLDOWN''	
-00-14-25		LOX AND LH2 TANK VENT CYCLES		'STG 'S-IVB VENT 'CYCLES COMPLETE''	
-00-13-00				'BSE 2 STATUS REPORT	
-00-12-30				'BSE 3 STATUS REPORT	
-00-11-00				'BSE 1 STATUS 'REPORT	
-00-10-00		S-II LH2 RECIRCULATION PUMPS ARE STARTED		'LSS REPORT 'S-II 'FUEL PREVALVES CLOSED 'AND RECIRC IN 'PROGRESS''	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
-00-08-00				'BSE 3 CHECK SCALE 'SWITCH IS IN TBS	
-00-06-39,		EDS READY		'ACS REPORT ''EDS 'READY''	
-00-06-00				'BSE 2 STATUS REPORT 'BSE 3 STATUS REPORT 'BSE 1 STATUS REPORT	
-00-05-30		SIVB START TANK PRESSURIZATION		'ENG REPORT ''SIVB 'START TANK 'PRESSURIZATION''	
-00-04-45		SIVB PREVALVES CLOSED		'STG REPORT '''PREVALVES CLOSED, 'SIVB CHILLDOWN IN 'PROGRESS''	
-00-04-37		S-II START TANK PRESSURIZATION		'LSS REPORT ''S-II 'START TANK 'PRESSURIZED''	
-00-03-07		AUTO SEQUENCE		'BSE 1 REPORT ''AUTO 'SEQUENCE INITIATED'' 'ON FLIGHT LOOP	
-00-03-06		S-II LOX TANK PRESSURIZATION		'LSS REPORT ''S-II 'LOX PREPRESS 'INITIATIVE''	
-00-03-00				'BSE 3 INITIATE 'TCO AND TOI COMPS	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
-00-02-47		SIVB LOX TANK PREPRESSURIZATION		'STG REPORT 'S-IVB 'LOX PREPRESS 'INITIATE''	
-00-20-10		SIVB LOX PREPRESS COMPLETE		'STG REPORT 'S-IVB 'LOX PREPRESS 'COMPLETE''	
-00-02-00		S-II LOX TANK PRESSURIZATION COMPLETED		'LSS REPORT 'S-II 'LOX PREPRESS 'COMPLETE''	
-00-01-37		S-IC & S-II & S-IVB FUEL TANK PRESSURIZATION		'STG REPORT- 'S-IVB 'FUEL PREPRESS 'INITIATE-SIVB 'PREPRESS COMPLETE''	
				'LSS REPORT 'S-IC AND 'S-II FUEL PREPRESS 'INITIATE''	
-00-01-12		S-II PREPRESS COMPLETE		'LSS REPORT 'S-II 'FUEL REPRESS 'COMPLETE''	
-00-01-10		S-IVB PREPRESS COMPLETE		'BSE 2 REPORT 'S-IVB 'PREPRESSURIZATION 'IS COMPLETE'' 'ON FLIGHT LOOP	
-00-01-00				'BSE 1 - REPORT 'S-II 'PREPRESS COMPLETE'' 'ON FLIGHT LOOP	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
-00-00-50		POWER TRANSFER (ALL STAGES)		'ENS REPORT ''POWER 'TRANSFER, INTERNAL 'POWER IS GO''	
				'BSE 1 REPORT '''SATURN IS ON 'INTERNAL POWER AND 'GO'' ON FLIGHT LOOP	
-00-00-30		S-IC PREPRESS COMPLETE		'LSS REPORT ''S-IC 'PREPRESS COMPLETE''	
-00-00-25				'BSE 1 REPORT ''S-IC 'PREPRESS COMPLETE'' 'ON FLIGHT LOOP	
-00-00-17.0		'GUIDANCE REFERENCE' 'RELEASE		'BSE 3 REPORT ''GRR'' 'ON FLIGHT LOOP	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-00-00	T1 + 0.0	LIFTOFF (START OF TB1)		'BSE 3 AND GND CONFIRM 'THAT LVDC HAS 'RECOGNIZED LIFTOFF	
		S-IC FUEL PRESS VALVE NO. 1 IS OPEN AND VALVE NO. 5 IS ENABLED IN REGULATING MODE		'BSE 3 INITIATE SMEK 'NO. 58 AND 52	
00-00-01	T1 + 1.0	YAW MANEUVER TO INSURE NO TOWER COLLISION		'ACS CONFIRM YAW 'MANEUVER INITIATED	
00-00-03		ACCELERATION S-IC STAGE		'ENS REPORT 'ACCELERATION GO'	
00-00-05				'BSE 1 REPORT 'IGNITION, THRUST 'IS GO - ALL ENGINES' 'ON FLIGHT LOOP	
00-00-09		END YAW MANEUVER		'ACS CONFIRM YAW 'MANEUVER COMPLETE	
00-00-11		S-IC STAGE CLEARS TOWER			
00-00-12	T1 + 12.0	PITCH AND ROLL PROGRAMS ARE INITIATED		'BSE 3 AND ACS 'CONFIRM PITCH AND 'ROLL INITIATE	
00-00-14	T1 + 14.0	S-IC MULTIPLE ENGINE CUTOFF ENABLE		'GND REPORT 'MULTIPLE 'ENGINE SHUTDOWN 'ENABLE'	ENABLES THE SHUTDOWN OF ANY ONE ENGINE IF THE THRUST CHAMBER PRESSURE IS LESS THAN 89 PERCENT. TWO ENGINES OUT CAUSES AUTO-ABORT

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-00-20	T1 + 20.0	S-IC OUTBOARD ENGINES CANT ON		'ACS REPORT ''S-IC 'ENGINES CANT''	
00-00-24	T1 + 24.0	S-IC TM CALIBRATE		'ENS REPORT ''S-IC 'CAL''	
00-00-27	T1 + 27.0	IU TM CALIBRATE		'ENS REPORT ''IU CAL''	
00-00-30	T1 + 30.0	LAUNCH VEHICLE ENGINES EDS CUTOFF ENABLE		'GND REPORT ''EDS 'SHUTDOWN ENABLE''	IF AN EDS ABORT OR A GROUND CMD 'ABORT IS INITIATED AFTER THIS TIME 'ALL ENGINES WILL BE CUTOFF
00-00-50	T1 + 49.5	S-IC FUEL PRESS VALVE NO. 2 OPEN		'LSS REPORT STATUS	
00-01-25		MAXIMUM DYNAMIC PRESSURE (MAX Q)			
00-01-30	T1+00-01-30	IU TM CALIBRATE		'ENS REPORT ''IU CAL''	
00-01-35	T1+00-01-35.3	S-IC FUEL PRESS VALVE NO. 3 OPEN			
00-01-45	T1+00-01-45	FCC SWITCH POINT NO. 1		'GND CONFIRM FCC 'SWITCH POINT	
00-01-55	T1+00-01-55.1	S-IC TM CALIBRATE		'ENS REPORT ''S-IC 'CAL''	
00-01-56				'FD STAGING STATUS	
00+02+00	T1+00-01-59.8	S-IC EXCESS RATE (P, Y, & R) AUTO-ABORT INHIBIT ENABLE			

REV. C

27 MARCH 1970

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-02-00	T1+00-02-00	EXCESS RATE (P, Y, & R) AUTO-ABORT INHIBIT AND SWITCH RATE GYRO SC INDICATION 'A'			
00-02-10	T1+00-02-10.0	FCC SWITCH POINT NO. 2			
00-02-12	T1+00-02-12.4	S-IC FUEL PRESS VALVE NO. 4 OPEN			
00-02-14	T1+00-02-13.6	S-IC TWO ENGINES OUT AUTO-ABORT INHIBIT ENABLE			
00-02-14	T1+00-02-13.8	S-IC TWO ENGINES OUT AUTO-ABORT INHIBIT		ACS CONFIRM EDS DISABLED	AUTOMATIC ABORT SIGNALS INHIBITED IN THE EDS CIRCUITRY
00-02-15	T1+00-02-14.6	INBOARD ENGINE C/O		LSS REPORT 'INBOARD OUT'	TIMED FUNCTION

GET	TIME IN TIME BASE			EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-02-15	T2	+	0.0	TB2 START			SUFFICIENT DOWNRANGE VELOCITY 'MUST EXIST BEFORE THE LVDC WILL 'START TB2 UNLESS GUID REF FAILURE 'HAS OCCURED
00-02-15	T2	+	0.4	S-II TM CALIBRATE		'ENS REPORT ''S-II 'CAL''	
00-02-15	T2	+	0.6	AUTO-ABORT ENABLE RELAYS RESET			RESETS AUTO ABORT AND LIFTOFF 'LIGHT IN CSM
00-02-18						'LSS REPORT ''S-II 'GO FOR STAGING''	
00-02-30	T2	+	14.5	CMD S-II ORDUANCE ARM			
00-02-30	T2	+	14.7	CMD S-IC SEP AND RETRO NO. 1 EBW FIRING UNITS ARM			
00-02-30	T2	+	14.9	CMDS S-IC SEP AND RETRO NO. 2 EBW FIRING UNITS ARM		'ENS REPORT ''EBW'S 'ARMED''	
00-02-32	T2	+	16.8	Q-BALL POWER OFF			
00-02-32	T2	+	17.0	S-IC OUTBOARD ENGINES CUTOFF ENABLE		'GND REPORT ''LEVEL 'SENSE ARM''	
00-02-42				BEGIN TILT ARREST		'BSE 3 CONFIRM TILT 'ARREST	

GET	TIME IN TIME BASE			EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-02-44	T3	+	0.0	S-IC OUTBOARD ENGINE CUTOFF		LSS REPORT "SHUTDOWN"	
00-02-44	T3	+	0.2	S-II RECIRCULATION PUMPS OFF			
00-02-44	T3	+	0.7	S-IC/S-II SEP		ENS CONFIRM SEP	
00-02-45	T3	+	1.0	S-II ENGINES READY BYPASS			
00-02-45	T3	+	1.2	SWITCH ENGINE CONTROL TO S-II AND S-IC CANT OFF		ACS CONFIRM ATTITUDE CONTROL RECONFIGURED AND GO FOR S-II BURN	
00-02-45	T3	+	1.4	S-II ENGINES START			S-II/S-IVB EARLY-STAGING CAPABILITY ENABLED- TB 4A IS INHIBITED PRIOR TO THIS TIME
00-02-45	T3	+	1.5	S-II ENGINE OUT INDICATION ENABLE/ S-II AFT INTERSTAGE SEP INDICATION ENABLE			ENABLES S/C INDICATION OF S-II TOK'S & SECOND PLANE SEPARATION
00-02-47	T3	+	3.0	S-II HYDRAULIC ACCUMULATORS UNLOCK			
00-02-48				S-II ENGINES PC INCREASE		ENS REPORT "ACCELERATION GO"	THIS OCCURS AT APPROXIMATELY TB3+4 SECONDS
00-02-49						LSS REPORT "S-II IGNITION"	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-02-51	T3 + 6.9	S-II PU SHIFT		'LSS REPORT ''PU 'SHIFT AND THRUST OK'' 'BSE 1 REPORT 'IGNITION, THRUST 'IS GO - ALL ENGINES'' 'ON FLIGHT LOOP	
00-03-03	T3 + 19.4	WATER COOL. VLV OP			
00-03-15	T3 + 30.7	S-II SECOND PLANE SEPARATION		'ENS REPORT ''SECOND 'PLANE SEP'' 'BSE 1 REPORT ''SECOND 'PLANE SEP'' ON FLIGHT 'LOOP	
00-03-20		LET JETTISON			INITIATED BY FLIGHT CREW
00-03-24	T3 + 41.0	ITERATIVE GUIDANCE MODE INITIATED		'BSE 3 REPORT ''IGM 'START''	
00-03-40				'LSS REPORT STATUS 'TO BSE 1	
00-03-45	T3+00-01-01.4	FCC SWITCH POINT NO. 3			
00-03-45				'BSE 3 REPORT DELTA 'BURN TIME OF S-IC	
00-04-24	T3+00-01-40	S-II LOX STEP PRESSURIZATION		'GND REPORT ''LOX 'STEP PRESS CMD'' 'LSS REPORT ''LOX 'STEP PRESS VERIFIED''	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-04-40				LSS REPORT STATUS	
00-04-49	T3+00-02-05	S-II TM CALIBRATE		ENS REPORT 'S-II 'CAL''	
00-05-00				GND REPORT TIME OF INBD C/O, PU SHIFT, LSA AND S-II C/O TO BSE 1	HOSC (HTV PROP) GIVES LIFTOFF WEIGHTS TO CONS BY VOICE AND MAGNAFAX
00+05+25		COI CAPABILITY			
00-05-40				LSS REPORT STATUS	
00-05-55	T3+00-03-11.4	FCC SWITCH POINT NO. 4			
00-06-00				BSE 1 REPORT LSA AND S-II C/O TIMES ON FLIGHT LOOP	
00-06-06	T3+00-03-22.7	IU TM CALIBRATE		ENS REPORT 'IU CAL'	
00-06-29	T3+00-03-45	S-II TM CALIBRATE		ENS REPORT 'S-II 'CAL''	
00-06-40				LSS REPORT STATUS	
00-07-35	T3+00-04-50.9	IU TM CALIBRATE		ENS REPORT 'IU CAL'	
00-07-43	T3+00-04-59	S-II CENTER ENGINE CUTOFF		LSS REPORT 'INBOARD OUT'	
00-07-24	T3+00-04-40			LSS REPORT 'TCM'	REF MR 6-7, TIME TO CONT. MISSION

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-07-44	T3+00-05-00	S-II LM2 STEP PRESSURIZATION		'GND REPORT ''FUEL 'STEP PRESS CMD'' 'LSS REPORT ''FUEL STEP' 'PRESS VERIFIED, S-II 'IS GO''	
00-07-50				'GND REPORT ''10 SEC 'TO PU SHIFT''	
00-08-15	T3+00-05-31.4	S-II/S-IVB ORDNANCE ARM		'ENS REPORT ''EBW'S 'ARMED''	
00-08-23	T3+00-05-39	PU SHIFT TO 4.5		'LSS REPORT ''PU 'SHIFT, THRUST OK''	
00-08-23				'BSE 2 REPORT ''S-IVB 'GO FOR STAGING''	
00+08+30				'FD STAGING STATUS	
00-08-39	T3+00-05-55	S-II LOX DEPLETION SENSOR CUTOFF ARM		'GND REPORT ''LEVEL 'SENSOR ARM''	
00-08-39	T3+00-05-55.2	S-II LM2 DEPLETION SENSOR CUTOFF ARM		'BSE 1 REPORT ''LEVEL 'SENSE ARM' ON FLIGHT 'LOOP 'LSS REPORT STATUS	
00-08-40					
00-08-48				'GND REPORT ''30 SEC 'TO S-II SHUTDOWN''	GND OBTAIN S-II CUTOFF VELOCITY AND REPORT TO ENG AFTER INSERTION

GET	TIME IN TIME BASE			EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-09-18	T4	+	0.0	CUTOFF OF S-II ENGINES		'LSS REPORT 'S-II 'SHUTDOWN''	
00-09-18	T4	+	0.2	S-IVB PREVALVES CLOSE OFF		'BSE 3 INITIATE 'SMEK NO. 58	
00-09-18	T4	+	0.3	LOX TANK PRESS SHUTOFF VALVES OP			
00-09-18	T4	+	0.5	LOX TANK FLIGHT PRESSURE SYSTEM ON			
00-09-19	T4	+	0.7	S-IVB LOX CHILLDOWN PUMP OFF			
00-09-19	T4	+	0.9	S-II/S-IVB SEP		'ENS CONFIRM SEP	
00-09-19	T4	+	1.0	S-IVB ENGINE START			FUEL LEAD BEGINS AT THIS TIME
00-09-19	T4	+	1.2	FCC S-IVB BURN MODE ON		'ACS CONFIRM ATTITUDE 'CONTROL RECONFIGURED	
00-09-20	T4	+	2.2	S-IVB FUEL CHILLDOWN PUMP OFF		'STG CONFIRM CHILLDOWN 'PUMPS OFF	
00-09-20	T4	+	2.5	S-IVB ENGINE OUT INDICATION ENABLE			ENABLE S-IVB TOK INDICATORS IN 'CSM
00-09-22	T4	+	4.0	S-IVB FUEL INJECT TEMP OK BYPASS		'ENS REPORT 'ACCELERATION GO''	STDV (SIVB IGNITION)

GET	TIME IN TIME BASE			EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-09-24				S-IVB ENGINE PC INCREASE		'ENG REPORT ''S-IVB 'IGNITION, THRUST OK'' 'BSE 2 REPORT '''THRUST OK'' 'ON FLIGHT LOOP	
00-09-25	T4	+	6.5	INTERACTIVE GUID MODE INITIATED		'BSE 3 REPORT ''IGM 'START''	
00-09-35	T4	+	16.8	IU TM CALIBRATE		'ENS REPORT ''IU CAL''	
00-09-42	T4	+	24.0	S-IVB HEAT EXCHANGER BYPASS VALVE ENABLE ON		'STG CONFIRM	
00-09-44	T4	+	26.2	S-IVB TM CALIBRATE		'ENS REPORT ''S-IVB 'CAL''	S/C SEPARATION RECONTACT REGION 'IS REACHED AT TB4+4+31. IF THE S-IVB 'TB4 BURN IS EXTENDED PAST THIS TIME 'STAGE WILL REPORT ''SEPARATION 'RECONTACT REGION''.
00-09-50						'BSE 3 REPORT DELTA 'BURNTIME OF S-II	
00-11-11	C/O	-35.0		CHI TILDE INITIATE			
	C/O	- 10				'GND COUNT DOWN TO C/O	
00-11-37	C/O	- 9.0		S-IVB ENGINE PUMP PURGE ENABLE ON		'STAGE REPORT ''PUMP 'PURGE ON''	
00-11-38	C/O	-8.0		CHI FREEZE			
	C/O	- .2		VELOCITY OR S/C INITIATED C/O		'BSE 2 REPORT '''SHUTDOWN''	

REV. C

27 MARCH 1970

GET	TIME IN TIME BASE		EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-11-46	T5	+	0.0	START OF TIME BASE 5 (T5)	'BSE 1 REPORT 'S-IVB 'SHUTDOWN - TB5 'INITIATE' 'ON FLIGHT LOOP 'ENG CONFIRM SHUTDOWN 'NORMAL	CMD WILL REPORT AOS -1 MIN AND LOS -1 MIN FOR EACH ORBITAL SITE
				COMMAND WINDOW OPEN	'BSE 3 INITIATE 'SMEK NO. 58	LVDC SOFTWARE
00-11-46	T5	+	0.3	S-IVB ULLAGE ENGINE 1 ON		BSE 3 SHOULD INITIATE SMEK NO. 58 'AT EACH AOS AND LOS AND SMEK NO. 52 'AT EACH LOS.
00-11-46	T5	+	0.4	S-IVB ULLAGE ENGINE 2 ON	'ACS REPORT 'ULLAGE 'ON''	
00-11-47	T5	+	1.4	LOX TANK PRESSURIZATION SHUTOFF VALVES CLOSE	'BSE 2 REPORT 'LOX 'PRESS DISABLE' 'STG CONFIRM LOX 'PRESS DISABLE	
00-11-49	T5	+	3.5	FCC S-IVB BURN MODE OFF	'ACS CONFIRM FCC BURN 'MODE OFF	
00-11-50	T5	+	4.1	AUX HYDRAULIC PUMP FLIGHT MODE OFF	'ACS CONFIRM AUX PUMP 'OFF	
00-11-50	T5	+	4.2	IU TM CALIBRATE		

GET	TIME IN TIME BASE			EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-11-51	T5	+	5.0	S/C CONTROL OF SATURN ENABLE			ENABLES MANUAL CONTROL OF SLV CONTROL SYSTEM BY FLIGHT CREW
00-11-53	T5	+	7.0	S-IVB TM CALIBRATE			
00-11-56	T5	+	10.0	S-IVB ENGINE OUT INDICATION 'A' ENABLE RESET			
00-11-56	T5	+	10.2	S-IVB ENGINE OUT INDICATION 'B' ENABLE RESET			BOTH ENGINE OUT RESETS ARE REQUIRED TO REMOVE THE SIC ENG OUT INDICATION
00-12-06	T5	+	20.0	BEGIN MANEUVER TO LOCAL HORIZONTAL		'BSE 3 REPORT 'MANEUVER TO LOCAL 'HORIZONTAL INITIATE''	
00-12-16	T5	+	30.0	S-IVB SINGLE SIDE SYSTEM DISABLE		'ENS CONFIRM	
00-12-45	T5	+	59.0	LH2 TANK CVS ORIFICE SHUTOFF VALVE OPEN ON			
00-12-45	T5	+	59.1	LH2 VENT CVS RELIEF OVERRIDE SHUTOFF VALVE OPEN ON		'BSE 2 REPORT 'CVS 'OPEN''	
00-12-45						'BSE 3 CONFIRM VEHICLE 'STABILIZED AT LOCAL 'HORIZONTAL	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00+13+00				GND REPORT PAD ENTRIES	TIMEBASE TIME INITIATE TIMES WILL BE REPORTED FOR CONS USE AND WILL BE ENTERED ON GND PAD IN APPENDIX A
00+13+13	T5+00-01-27	S-IVB ULLAGE ENGINE 1 OFF			
	T5+00-01-27.1	S-IVB ULLAGE ENGINE 2 OFF		BSE 2 REPORT 'ULLAGE 'OFF'	
				BSE 2 REPORT 'S-IVB 'CONFIGURED FOR ORBIT 'AND GO'	REPORT CONFIRMS NORMAL OPERATION OF APS ULLAGE ENGINES, CVS, AUX HYD PUMP, AND LOX PRESSURIZATION SYSTEM
00-13-26	T5+00-01-40	COMMAND WINDOW		BSE 3 REPORT 'IU 'CONFIGURED FOR ORBIT 'AND GO'	OPEN SOFTWARE COMMAND WINDOW FOR NAV UPDATE, SINGLE WORD DUMP AND SECTOR DUMP
				BSE 1 REPORT 'SATURN CONFIGURED 'FOR ORBIT' ON 'FLIGHT LOOP	
00-13-30				GUIDO GIVES TB TIMES TO IFIT/GND	
00-15-00				HTV PROP GIVES INSERTION WEIGHTS TO BSE	HTV PROP SENDS INSERTION WEIGHTS VIA MAGNAFAX
00-16-30		VEHICLE INSERTION WEIGHT REPORT		CONS REPORT INSERTION WEIGHTS BSE 2 INFORM RETRO OF INSERTION WEIGHTS	THE VEHICLE INSERTION WEIGHTS WILL BE ENTERED ON THE CONS PAD PRESENTED IN APPENDIX A

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
00-18-00				'GUIDO SEND VECTOR 'TO IFTT	'GUIDO SENDS TM-IU VECTOR TO IFTT 'VIA TTY
00+20+06	T5+00-08-20	PU INVERTER AND DC POWER OFF		'ENS REPORT ''PU 'POWER OFF''	
00-21-48	T5+00-10-02.6	ENGINE PUMP PURGE CONTROL VALVE ENABLE OFF		'STAGE REPORT ''PUMP 'PURGE OFF''	
00-25-00				'GUIDO SEND VECTOR 'TO IFTT	'GUIDO SENDS CYI MSFN VECTOR TO 'IFTT VIA TTY.
00-40-00				'GUIDO/IFTT/BSE COMM 'CHECK	
00+41+30				'CONS REPORT STATUS 'FOR TLI	'THE TLI STATUS WILL BE ENTERED ON 'THE CONS PAD
00-45-00				'IFTT SEND PERF 'DATA TO CONS	'IFTT GIVES 1ST BURN OBSERVED AND '2ND BURN PRED PROP DATA BY VOICE AND 'MAGNAFAX
00-55-06	T5+00-43-20	AUX HYD PUMP FLIGHT MODE ON		'ACS CONFIRM AUX 'PUMP ON	'HYDRAULIC THERMAL CYCLE IS 'CONDUCTED
00+55+54	T5+00-44-08	AUX HYD PUMP FLIGHT MODE OFF		'ACS REPORT ''AUX 'PUMP CYCLE COMPLETE''	
00-56-00				'GUIDO SEND VECTOR 'TO IFTT	'GUIDO SENDS THE IU VECTOR AS WELL 'AS THE BEST VECTOR AS PROVIDED BY 'FIDO VIA TTY

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
01-11-46	T5+01-00-00			'CONS COMPARE DATA 'WITH HOSC/LIPS	THE VEHICLE MASSES FOR TB7 AND 'TB8 WILL BE COMPARED
01-22-00				'IFTT SEND PRED 'DATA TO GUIDO	IFTT SEND PRED TB6 INITIATE AND 'TLI DATA TO GUIDO
01-29-00				'LCR GIVES GO/NO-GO 'FOR TLI TO BSE	
01-30-00				'BSE 1 REPORT ''HOSC 'AND BOOSTER GO FOR 'TLI'' ON FLIGHT LOOP	
01-34-55				'STAGE REPORT '''THE FUEL TANK IS 'BEING MAINTAINED 'AT PSIA''	
01-35-06	T5+01-23-20	PU INVERTER AND DC POWER ON		'ENS REPORT ''PU 'POWER ON ''	
01-40-00				'GUIDO SEND VECTOR 'TO IFTT	GUIDO SENDS TEXAS MSFN VECTOR TO 'IFTT VIA TTY
01-41-46	T5+01-30-00	AUX HYD PUMP FLIGHT MODE ON		'ACS CONFIRM AUX 'PUMP ON	HYDRAULIC THERMAL CYCLE IS 'CONDUCTED
01-42+34	T5+01-30-48	AUX HYD PUMP FLIGHT MODE OFF		'ACS REPORT ''AUX 'PUMP CYCLE COMPLETE''	
02-00-00				'GUIDO SEND VECTOR 'TO IFTT	GUIDO SENDS TOTAL STATES PASS 'MSFN VECTOR TO IFTT VIA TTY
02+00+00		COMMAND BRIEFING		'CMD BRIEFS TEAM ON 'RESTART TIME AND 'TLM/CMD COVERAGE	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
02+10+00				'BOOSTER TEAM 'BRIEFING FOR TB6	
02-50-00				'GUIDO REQUEST FOR '2ND OPP DATA	IFTT WILL TRANSFER ON REQUEST 'DATA TO BE USED FOR 2ND OPP TLI
03-06-46	T5+02-55-00	'AUX HYDRAULIC PUMP' 'FLIGHT MODE ON		'ACS CONFIRM AUX 'PUMP ON	2ND OPP
03-14-46	T5+03-03-00	'AUX HYDRAULIC PUMP' 'FLIGHT MODE OFF		'ACS REPORT ''AUX 'PUMP CYCLE COMPLETE''	

REV. C

27 MARCH 1970

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
02+25+50	T6 + .0	BEGIN RESTART PREPARATIONS		GND REPORT 'TB6 'INITIATE'	2ND OPP - 03+34+22
	T6 + .1	S-IVB RESTART ALERT ON			CSM INDICATION (2ND PLANE SEP 'LITE ON)
	T6 + .3	S/C CONTROL OF SATURN DISABLE			MANUAL CONTROL BY CREW DISABLED
	T6 + 1.2	IU TM CALIBRATE			
	T6 + 1.4	S-IVB TM CALIBRATE			
	T6 + 37.3	S-IVB RESTART ALERT OFF			CSM INDICATION OFF
	T6 + 41.0	CHECK FOR TLI INHIBIT		GND REPORT 'TB6C' 'IF INHIBIT PRESENT	TB6C MAY BE INITIATED AT THIS 'TIME
	T6 + 41.3	BURNER LH2 PROPELLANT VALVE OPEN ON	*	ENG CONFIRM	* THESE FUNCTIONS WILL NOT BE 'REPEATED IN THE EVENT OF A TB6C TYPE 'RECYCLE AFTER T6+8+17.3
	T6 + 42.0	BURNER LOX SHUTDOWN VALVE OPEN ON	*	ENG. REPORT 'BURNER 'IGNITION'	
	T6 + 42.2	LH2 TANK CVS VALVE CLOSE ON	*	STAGE REPORT 'CONTINUOUS VENT 'CLOSED'	
	T6 + 48.0	BURNER AUTOMATIC CUTOFF SYSTEM ARM	*		TB 6A IS ENABLED IF 02/H2 BURNER 'SHUTS DOWN

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T6 + 48.1	LH2 TANK REPRESS * CONTROL VALVE OPEN ON		'STAGE REPORT ''LH2 'REPRESS IN PROGRESS''	
	T6 + 48.3	LOX TANK REPRESS * CONTROL VALVE OPEN ON		'BSE 2 REPORT ''SIVB 'CVS CLOSED, BURNER 'IGNITION, AND REPRESS 'IN PROGRESS''	
				'BSE 1 REPORT ''BURNER 'REPRESS INITIATED'' 'ON FLIGHT LOOP	
	T6+00-03-39	AUX HYD PUMP FLIGHT MODE ON		'ACS REPORT ''AUX 'PUMP ON''	
	T6+00-03-45			'STAGE REPORT ''TANKS 'REPRESSURIZED''	
				'BSE 2 REPORT 'SIVB PROPELLANT 'TANKS ARE 'PREPRESSURIZED ''	
	T6+00-04-00			'BSE 1 REPORT 'REPRESSURIZATION 'COMPLETE'' ON FLIGHT 'LOOP	
	T6+00-04-09	LOX CHILLDOWN PUMP ON		'STAGE CONFIRM LOX 'CHILLDOWN PUMP ON	
	T6+00-04-14	FUEL CHILLDOWN PUMP ON		'STAGE CONFIRM LH2 'CHILLDOWN PUMP ON	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T6+00-04-19	PREVALVES CLOSE		'STAGE REPORT 'PREVALVES CLSD, 'CHILLDOWN IN 'PROGRESS''	
	T6+00-05-10			'BSE 2 REPORT 'SIVB CHILLDOWN 'IN PROGRESS ''	
	T6+00-05-15			'BSE 1 REPORT 'CHILLDOWN IN 'PROGRESS'' ON FLIGHT 'LOOP	
	T6+00-05-41			'ENG REPORT ''TIME 'BASE 6B CAPABILITY - 'MARK ''	TB 6B IS ENABLED IF 02/H2 BURNER SHUTS DOWN
	T6+00-06-40.2	IU TM CALIBRATE			
	T6+00-06-40.4	S-IVB TM CALIBRATE			
	T6+00-07-30.1	P. U. MIXTURE RATIO 4.5 ON		'ENG REPORT ''PU 'AT 4.5 '' 'BSE 2 REPORT ''PU 'IS AT 4.5''	
	T6+00-08-13.6	S-IVB RESTART ALERT ON			CSM INDICATION (2ND PLANE SEP LITE ON)
	T6+00-08-16.3	S-IVB ULLAGE ENGINE NO. 1 ON			

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T6+00-08-16.4	S-IVB ULLAGE ENGINE NO. 2 ON		'ACS REPORT ''ULLAGE 'ON''	
	T6+00-08-16.6	LOX TANK REPRESS * CONTROL VALVE OPEN OFF			
	T6+00-08-16.7	LH2 TANK REPRESS * CONTROL VALVE OPEN OFF			
	T6+00-08-16.8	BURNER LH2 * PROPELLANT VALVE CLOSE ON		'ENG CONFIRM	
	T6+00-08-17.2	LH2 TANK CVS VALVE CLOSE ON			BACKUP COMMAND STAGE VERIFY IF 'NECESSARY
	T6+00-08-17.3	CHECK FOR TLI INHIBIT UNTIL 9+20		'GND REPORT ''TB6C'' 'IF INHIBIT PRESENT	TB6C MAY BE INITIATED DURING THIS TIME PERIOD
	T6+00-08-17.6	AMBIENT REPRESS SYSTEM MODE SELECTOR ON AND CRYO OFF		'STG REPORT ''AMBIENT 'MODE ON''	
	T6+00-08-20	LOX TANK REPRESS CONTROL VALVE OPEN ON		'STG REPORT ''LOX 'AMBIENT REPRESS'', IF 'REQUIRED	BACKUP COMMAND-STAGE VERIFY IF 'NECESSARY
	T6+00-08-21.3	BURNER LOX * SHUTDOWN VALVE CLOSE ON		'ENG REPORT ''BURNER 'SHUTDOWN NORMAL 'BSE NO. 2. REPORT '''BURNER SHUTDOWN''	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T6+00-08-40	LH2 TANK REPRESSURIZATION CONTROL VALVE OPEN ON		'STG REPORT 'FUEL 'AMBIENT REPRESS'', IF 'REQUIRED	BACKUP COMMAND - STAGE VERIFY IF NECESSARY
				'BSE 2 REPORT 'SIVB 'GO FOR TLI''	
				'BSE 3 REPORT IU 'GO FOR TLI''	
	T6+00-09-00			'BSE 1 REPORT 'BOOSTER IS 'GO FOR TLI'' ON FLIGHT 'LOOP	
	T6+00-09-00	S-IVB ENG CUTOFF OFF			
	T6+00-09-13.0	START TANK RECHAR VLV OPEN COMMAND			RECHARGE WILL NOT OCCUR UNLESS GROUND COMMAND ARM
	T6+00-09-19.4	PREVALVES CLOSE OFF		'STAGE CONFIRM 'PREVALVES OPEN	
	T6+00-09-20	S-IVB RESTART ALERT OFF			CSM INDICATION OFF (2ND PLANE 'SEP)
	T6+00-09-28.6	ENGINE READY BYPASS			
	T6+00-09-29.4	FUEL CHILLDOWN PUMP OFF			

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T6+00-09-29.6	LOX CHILLDOWN PUMP OFF			
	T6+00-09-30	S-IVB ENGINE START ON		'ENG REPORT 'FUEL 'LEAD''	COMMAND WINDOW CLOSED
				'BSE 1 REPORT 'FUEL 'LEAD'' ON FLIGHT LOOP	
				'BSE 3 INITIATE SMEK 'NO. 58	
	T6+00-09-33	S-IVB ULLAGE ENGINE NO. 1 OFF			
	T6+00-09-33.1	S-IVB ULLAGE ENGINE NO. 2 OFF		'ACS CONFIRM ULLAGE 'OFF	
	T6+00-09-36.8	S-IVB ENGINE OUT INDICATION ENABLE			S/C INDICATION
	T6+00-09-37.2	LOX TANK REPRESS CONTROL VALVE OPEN OFF			
	T6+00-09-37.4	LH2 TANK REPRESS CONTROL VALVE OPEN OFF			
	T6+00-09-37.6	FCC S-IVB BURN MODE ON		'ACS CONFIRM FCC 'BURN MODE ON	
	T6+00-09-38	FUEL INJECTION TEMP OK BYPASS			STDV (IGNITION)

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T6+00-09-38.2	LOX TANK FLIGHT PRESSURE SYSTEM ON			
	T6+00-09-38.4	LOX TANK PRESSURIZATION SHUTOFF VALVES OPEN ON			
	T6+00-09-38.8	START TANK RECHAR VLV CLOSE AND DISARM			
	T6+00-09-39	S-IVB ENGINE PC INCREASE		'ENS REPORT ' 'ACCELERATION GO' ' 'BSE 2 REPORT ' 'IGNITION, THRUST ' 'OK' ' 'ENG CONFIRM THRUST OK	
	T6+00-09-43.5	P. U. PROGRAMMED MIXTURE RATIO OFF		'BSE 2 REPORT ' 'PU SHIFT' 'ENG CONFIRM PU SHIFT ' 'BSE 1 REPORT ' 'IGNITION CONFIRMED, ' (PU SHIFT), THRUST IS ' 'GO' ON FLIGHT LOOP	SECOND OPPORTUNITY
	T6+00-09-44	ITERATIVE GUIDANCE MODE		'BSE 3 REPORT 'IGM ' 'START'	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T6+00-11-20.5	P. U. PROGRAMMED MIXTURE RATIO OFF		'BSE 2 REPORT 'PU 'SHIFT' 'ENG CONFIRM PU SHIFT 'BSE 1 REPORT 'PU 'SHIFT THRUST IS GO' 'ON FLIGHT LOOP	
	T6+00-13-58	FCC SWITCH POINT NO. 6			
	T6+00-14-10	SECOND BURN RELAY OFF		'BSE 2 REPORT 'FUEL STEP PRESS ' 'STAGE CONFIRM FUEL 'STEP PRESS 'BSE 1 REPORT 'FUEL 'STEP PRESS' ON 'FLIGHT LOOP	
	T6+00-14-45	POINT LEVEL SENSOR ARMING		'GND REPORT 'LEVEL 'SENSOR ARM'	SECOND OPPORTUNITY
	T6+00-15-00	POINT LEVEL SENSOR ARMING		'GND REPORT 'LEVEL 'SENSORS ARM '	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
02+41+24	T7 - 0.2	VELOCITY OR S/C INITIATED CUTOFF		'BSE 2 REPORT 'SHUTDOWN'	
				'BSE 1 REPORT 'SHUTDOWN' ON 'FLIGHT LOOP	
	T7 + 0.0	START OF TB7		'ENG CONFIRM SHUTDOWN	2ND OPP (4+09+40)
		COMMAND WINDOW OP		'BSE 3 INITIATE SMEK 58 'AND 52	LVDC SOFTWARE
	T7 + 0.3	AMB REPRESS MODE OFF AND CRYO ON		'STG CONFIRM	
	T7 + 0.5	LH2 TANK CVS ORIFICE SHUTOFF VALVE OPEN ON		'STG CONFIRM	
	T7 + 0.6	LH2 TANK CVS REL OVERRIDE SHUTOFF VALVE OPEN ON		'STG CONFIRM	
	T7 + 0.7	LOX TANK NPV VALVE OPEN ON		'STG CONFIRM	
	T7 + 0.8	LH2 TANK LATCHING REL VALVE OPEN ON		'STG CONFIRM	
	T7 + 1.0	LOX TANK PRESS SHUTOFF VALVES CLOSE ON		'STG CONFIRM	
	T7 + 1.3	LH2 TANK REPRESS CONT VLV OPEN ON		'STG CONFIRM	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T7 + 2.8	LH2 TANK LATCHING REL VALVE LATCH ON			
	T7 + 3.6	FCC S-IVB BURN MODE OFF		ACS CONFIRM BURN MODE OFF	
	T7 + 4.0	LH2 TANK LATCHING REL VALVE OP OFF		BSE 2 REPORT 'EVENTS 'OPEN''	
				BSE 1 REPORT 'EVENTS 'OPEN'' ON FLIGHT LOOP	
	T7 + 4.2	AUX HYD PUMP FLIGHT MODE OFF		ACS REPORT 'ATTITUDE 'RECONFIGURED''	IF REQUIRED DELAY REPORT UNTIL 'AFTER BSE 1 REPORT TO FLIGHT
	T7 + 5.0	S/C CONTROL OF SATURN ENABLE			MANUAL CONTROL OF SATURN CONTROL 'SYSTEM IS ENABLED
	T7 + 5.2	LH2 TANK LATCHING REL VLV LATCH OFF		STG CONFIRM	
	T7 + 10.0	S-IVB ENG OUT INDICATION ENABLE RESET			S/C INDICATION
	T7 + 30.0			STG REPORT 'EVENTS 'OPEN, LOX PRESS 'DISABLED AND COLD 'HE DUMP IN PROGRESS''	STG SYSTEM STATUS
	T7 + 35.0			BSE 2 REPORT 'S-IVB 'RECONFIGURED AND GO''	REPORT CONFIRMS AUX HYD PUMP OFF, 'COLD HELIUM DUMP IN PROGRESS, LOX 'PRESS DISABLED, AND VENTS OPEN

SET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
02+42+00				'GUIDO SENDS VECTOR 'TO IFTT	'GUIDO SENDS MSFN VECTOR FOR LUNAR 'IMPACT OR 2ND OPP PLANNING
	T7+00-02-30.7	LOX TANK NPV VALVE OPEN OFF		'STAGE REPORT '' LOX 'NPV CLOSED''	
				'BSE 2 CONFIRM LOX 'NPV CLOSED	
	T7+00+02+30.9	MANEUVER TO LOCAL HORIZONTAL INITIATED		'BSE 3 REPORT 'MANEUVER TO LOCAL 'HORIZONTAL INITIATED''	'GND OBTAIN DATA FOR INITIAL LUNAR 'IMPACT PAD
				'BSE 1 REPORT 'MANEUVER TO LOCAL 'HORIZONTAL INITIATED'' 'ON FLIGHT LOOP	
	T7+00-02-30.9	LH2 TANK CVS CLOSE ON		'STAGE REPORT 'CVS CLOSED''	
	T7+00+02+35	LVDC SCALE CHANGE		'BSE 3 PUT SCALE 'SWITCH TO T87 AND 'CLEAR - INFORM GND	
	T7+00-03-30			'BSE 3 REPORT 'LOCAL HORIZONTAL 'AND IU IS GO''	
				'BSE 1 REPORT ''LOCAL 'HORIZONTAL AND GO'' 'ON FLIGHT LOOP	
	T7+00-04-00			'BSE 3 REPORT 'PREDICTED GET OF 'INITIATION AND	

REV. C

27 MARCH 1970

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
				'COMPLETION OF SC SEP 'MANEUVER AND PRED 'SC SEP TIME ' 'BSE 1 TRANSMIT SAME 'INFO TO FLIGHT	
	T7+00-14-39	LH2 TANK LATCHING RELIEF VALVE OPEN ON			
	T7+00-14-59.6	LH2 TANK REPRESS CONTROL VALVE OPEN OFF		'STAGE REPORT ''COLD 'HE DUMP COMPLETE''	
(02+56+24)	T7+00-15-00	LH2 TANK LATCHING RELIEF VALVE OPEN OFF		'STAGE REPORT LH2 'LATCHING VENT CLOSED''	2ND OPP (4+24+40)
		'MANEUVER TO SEP 'ATTITUDE		'BSE 2 REPORT ''VENTS 'AND DUMPS COMPLETE'' ' 'ACS REPORT '''MANEUVER TO SEP 'ATTITUDE INITIATED'' ' 'BSE 1 REPORT ''VENTS 'CLOSED AND DUMPS 'COMPLETE, MANEUVERING 'TO TD & E ATTITUDE'' 'ON FLIGHT LOOP	
	T7+00-15-00.4	AMB REPRESS SYSTEM MODE SELECTOR ON AND CYRO OFF		'STG CONFIRM	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T7+00-19-00			'ACS REPORT 'MANEUVER TO SEP 'ATTITUDE COMPLETE' 'BSE 1 REPORT 'MANEUVER COMPLETE' 'ON FLIGHT LOOP	
	T7+00-20-00.4	IU COMMAND SYSTEM ENABLE		'GND REPORT 'COMMAND SYSTEM 'ENABLE'	
	T7+00-21-00			'BSE 2 STATUS REPORT 'BSE 3 STATUS REPORT 'BSE 1 STATUS REPORT 'BSE 1 REPORT 'BOOSTER IS GO FOR 'SEPARATION AND 'DOCKING' ON FLIGHT 'LOOP	SYSTEM STATUS FOR S/C SEP
	T7+00-22-00			'BSE 1 COMMAND 'SECTOR DUMP FOR 'STORED STATE VECTOR 'GND CONFIRM RECEIPT 'OF STATE VECTOR AND 'PASS THE DATA TO 'IFTT	
(03+06+24)	T7+00-25-00	SPACECRAFT SEPARATION		'ACS REPORT 'SPACECRAFT SEP ' 'STG REPORT PREDICTED 'LOX TANK ULLAGE 'PRESSURE FOR LOX	NOMINAL CSM SEPARATION BSE 1 COMMANDS ANTENNAS TO LOW GAIN IF REQUIRED. CMD WILL BE OBTAINING SIGNAL STRENGTH READOUTS

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
				DUMP TO CONS	FROM THE GROUND STATION
	T7+00-30-00			GUIDO SENDS VECTOR TO IFTT	GUIDO SENDS THE IU VECTOR AS WELL AS THE BEST VECTOR (NORMALLY IS IU VECTOR) TO IFTT VIA TTY
(03+16+24)	T7+00-35-00				NOMINAL DOCKING
	T7+00+35+00			CONS COMPARE DATA WITH MOSC/LIPS	THE PREDICTED DELTA V'S FOR APS EVASIVE BURN AND LOX DUMP WILL BE COMPARED
	T7+00-40-00			IFTT SENDS SIM TLI VECTOR TO GUIDO	IFTT SENDS BEST SIMULATED TLI C/O VECTOR INCLUDING POST C/O CVS
	T7+00-45-00			BSE/IFTT DATA EXCHANGE	BSE WILL PROVIDE IFTT WITH PRED TB8 INITIATE TIME AND LOX ULL PRESS FOR LOX DUMP. IFTT GIVES PRELIMINARY ASSESSMENT OF APS LUNAR IMPACT BURN
	T7+00-50-00			BSE GIVES EVASIVE AND DUMP DATA TO GUIDO	BSE WILL GIVE PRED DELTA V, MASS, TIMES AND GIMBAL ANGLES FOR EVASIVE BURN AND LOX DUMP TO GUIDO
	T7+00-53-20	AUX HYD PUMP FLIGHT MODE ON		ACS CONFIRM AUX PUMP ON	
	T7+00-54-08	AUX HYD PUMP FLIGHT MODE OFF		ACS REPORT 'AUX PUMP CYCLE COMPLETE'	
	T7+01-00-00	EVASIVE MANEUVER TIME GUARD OFF			S-IVB EVASIVE MANEUVER CAN BE INITIATED FROM THIS TIME ON
	T7+01-00-00.4	LH2 TANK LATCHING RELIEF VALVE OPEN ON			

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T7+01-00-00.6	LH2 TANK REPRESS CONTROL VALVE OPEN ON			
	T7+01-00-01	START TANK VENT CONT VALVE OPEN ON		'ENG REPORT ''START 'BOTTLE DUMP''	
	T7+01-00-02.4	LH2 TANK LATCHING RELIEF VALVE LATCH ON			
	T7+01-00-03.4	LH2 TANK LATCHING RELIEF VALVE OPEN OFF		'STAGE REPORT ''LH2 'VENT LATCHED OPEN AND 'AMB HELIUM DUMP 'INITIATED'	
				'BSE 2 REPORT ''LH2 'RELIEF LATCHED OPEN 'AND DUMP IN 'PROGRESS''	
				'BSE 1 REPORT ''LH2 'VENT OPEN'' ON FLIGHT 'LOOP	
	T7+01-01-02	AMB REPRESS SYSTEM MODE SELECTOR OFF AND CYRO ON		'STG CONFIRM	
	T7+01-02-31	START TANK VENT CONT VALVE OPEN OFF		'ENG REPORT ''START 'BOTTLE DUMP 'COMPLETE''	
	T7+01-14-59	LH2 TANK LATCHING RELIEF VALVE OPEN ON			

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T7+01-14-59.2	LM2 TANK CONTROL VALVE REPRESSURIZATION OPEN OFF			
	T7+01-15-00	LM2 TANK LATCHING RELIEF VALVE OPEN OFF		'STAGE REPORT 'VENT 'CLOSED AND DUMP 'COMPLETE'' 'BSE 2 REPORT 'FUEL 'VENT CLOSED AND DUMP 'COMPLETE'' 'BSE 1 REPORT 'LM2 'VENT CLOSED' ON 'FLIGHT LOOP 'BSE 3 INITIATE SMEK 'NO. 58	
	T7+01-16-00			'BSE 2 STATUS REPORT 'BSE 3 STATUS REPORT 'BSE 1 STATUS REPORT	SYSTEM STATUS FOR EJECTION
(04+01+00)	T7+01-19-36				NOMINAL LM EJECTION
(04+04+00)	T7+01-22-36	INITIATE YAW MANEUVER		'BSE 3 REPORT 'MANEUVER 'INITIATED'' 'BSE 1 REPORT 'EVASIVE MANEUVER 'INITIATED'' ON 'FLIGHT LOOP	TB8 CAN BE INITIATED 8 MIN AFTER 'EVASIVE MANEUVER INITIATE

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T7+01-34-00	MANEUVER COMPLETE		'BSE 3 REPORT 'MANEUVER COMPLETE''	
				'BSE 1 REPORT 'MANEUVER COMPLETE''	
				'ON FLIGHT LOOP	
	T7+01-35-00			'BSE 2 STATUS REPORT 'BSE 3 STATUS REPORT 'BSE 1 STATUS REPORT	SYSTEM STATUS FOR TB8
	T7+01-37-00			'GND RECORD ACCEL DATA'	GND OBTAIN MEASURED VEL DATA JUST 'PRIOR TO TB8 COMMAND
(04+14+00)	T7+01+32+36	TB8 START		'BSE 1 COMMAND 'TB8 ENABLE	TB8 WILL START WHEN ENABLED BY 'COMMAND.

GET	TIME IN TIME BASE			EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
(04+14+00)	T8	+	0.0	START OF TIME BASE NO. 8 (T8)		'BSE 3 INITIATE SMEK 'NO. 58 AND 52	2ND OPP (5+42+16)
	T8	+	0.2	S-IVB ENGINE EDS CUTOFF NO. 2 DISABLE		'ENS REPORT ''ENGINE 'CONTROL POWER ON''	
	T8	+	0.8	ENGINE PUMP PURGE CONTROL VALVE ENABLE ON		'STG REPORT '''PNEUMATIC HE DUMP ''	
	T8	+	1.2	S-IVB ULLAGE ENGINE NO. 1 ON			
	T8	+	1.4	S-IVB ULLAGE ENGINE NO. 2 ON		'ACS REPORT ''ULLAGE 'ON''	
	T8+		01-21.2	S-IVB ULLAGE ENGINE NO. 1 OFF			
	T8+		01-21.4	S-IVB ULLAGE ENGINE NO. 2 OFF		'ACS REPORT ''ULLAGE 'OFF''	GND OBTAIN MEASURED VEL AFTER APS 'BURN
	T8+00-08-00					'CONS COMPARES DATA 'WITH HOSC/LIPS	THE UPDATED VEHICLE MASS PER THE 'APS EVASIVE BURN WILL BE COMPARED
	T8+00+09+40			SLINGSHOT ATTITUDE MANEUVER		'ACS REPORT '''MANEUVER INITIATE''	
	T8+00+11+40			SLINGSHOT MANEUVER COMPLETE		'ACS REPORT '''MANEUVER COMPLETE''	
	T8+00-12-00					'BSE GIVES EVAS 'UPDATE TO GUIDO	BSE UPDATES APS EVASIVE BURN DATA

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T8+00-15-00			'CONS COMPARE DATA 'WITH HOSC/LIPS	THE UPDATED DELTA V'S FOR CVS AND 'LOX DUMP WILL BE COMPARED
	T8+00-16-40.0	LH2 TANK CVS ORIFICE SHUTOFF VALVE OPEN ON			
	T8+00-16-40.2	LH2 TANK CVS RELIEF OVERRIDE SHUTOFF VALVE OPEN ON		'STG REPORT ''CVS 'OPEN''	
	T8+00-20-50	AUX HYD PUMP FLIGHT MODE ON		'ACS REPORT ''AUX 'PUMP ON''	
	T8+00-21-10	PASSIVATION ENABLE		'BSE 3 INITIATE SMEK 'NO. 58	
	T8+00-21-20	ENGINE MAINSTAGE CONTROL VALVE OPEN ON			
	T8+00-21-20.2	ENGINE HE CONTROL VALVE OPEN ON		'ENG REPORT ''LOX 'DUMP IN PROGRESS''	
				'BSE 2 REPORT ''LOX 'DUMP HAS INITIATED''	
	T8+00-21-40.0	LH2 TANK CVS CLOSE ON		'STG REPORT ''CVS 'CLOSED''	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T8+00-22-08.0	ENGINE MAINSTAGE CONTROL VALVE OPEN OFF		'ENG REPORT ''LOX 'DUMP TERMINATED''	GND OBTAIN MEASURED VEL AFTER LOX DUMP
				'BSE 2 REPORT ''LOX 'DUMP TERMINATED, 'ENGINE CONTROL 'BOTTLE DUMP 'CONTINUING''	
				'BSE 3 INITIATE SMEK 'NO. 58	
	T8+00-23-23.2	LOX TANK NPV VALVE LATCHED OPEN		'STAGE REPORT ''LOX 'NPV OPEN AND LATCHED''	
	T8+00-23-24.2	LOX TANK NPV VALVE OPEN OFF		'STAGE CONFIRM	
	T8+00-23-25	LH2 TANK LATCH RELIEF VALVE OPEN ON			
	T8+00-23-25.2	AUX HYD PUMP FLIGHT MODE OFF		'ACS REPORT ''AUX 'PUMP OFF''	
	T8+00-23-28	LH2 TANK VENT LATCHED OPEN		'STAGE REPORT ''FUEL 'VENT LATCHED OPEN''	
				'BSE 2 REPORT 'TANK VENTS LATCHED 'OPEN''	
	T8+00-23-25.4	LH2 TANK REPRESS CONTROL VLV OPEN ON		'STAGE REPORT'' COLD 'HE DUMP INITIATE	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T8+00-27-00			'BSE GIVES DUMP 'UPDATE TO GUIDO	
	T8+00-28-00			'CONS COMPARE DATA 'WITH HOSC/LIPS	THE ACTUAL CVS AND LOX DUMP DATA 'WILL BE COMPARED. THE 6 HR PARTIAL 'OF APS BURNTIME VS DELTA V WILL BE 'ESTABLISHED AT THIS TIME
	T8+00-30-00			'BSE SEND DATA 'TO IFTT	BSE WILL PROVIDE IFTT WITH ACTUAL 'INITIATE TIMES, DURATION, DELTA V, 'AND GIMBAL ANGLES FOR EACH 'PROPULSIVE EVENT. BSE WILL ALSO GIVE 'ACTUAL T88 INITIATE TIME AND LOX 'ULLAGE PRESS AT DUMP INITIATE.
	T8+00-36-00			'IFTT SENDS BEST POST 'LOX DUMP VECTOR	
	T8+00-38-50	ENG HE CONTROL VALVE OPEN OFF		'ENG REPORT 'ENGINE BOTTLE DUMP 'TERMINATED''	
	T8+00-38-50.2	PASSIVATION DISABLE		'BSE 2 REPORT 'ENGINE CONTROL 'BOTTLE DUMP 'COMPLETE'' 'BSE 3 INITIATE SMEK 'NO. 58	

REV. C

27 MARCH 1970

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T8+00-53-25.0	LH2 TANK REPRESS CONTROL VALVE OPEN OFF		'STG REPORT 'COLD 'HELIUM DUMP 'COMPLETE''	
	T8+01-00-00.4	ENGINE PUMP PURGE CONTROL VALVE ENABLE OFF		'STG REPORT 'PNEUMATIC SPHERE 'DUMP COMPLETE'' 'BSE 2 REPORT 'SIVB SAFING 'COMPLETE''	
05+00+00				'IFTT SENDS APS 'BURN DATA TO BSE 'VIA MAGNAFAX	'IFTT SENDS APS BURN DATA BASED ON 'BEST TLI VECTOR AND ACTUAL DELTA V'S 'IN OCTAL AND ENGINEERING UNIT FORMS. 'BSE/GND/CMD WILL VERIFY, TRANSFER 'LOAD TO SITE, AND UPLINK.
05+30+00				'BSE UPLINK APS 'BURN DATA - GND 'CONFIRM UPLINK 'ACS REPORT WHEN 'ATTITUDE MANEUVER IS 'INITIATED AND/OR WHEN 'DESIRED ATTITUDE IS 'OBTAINED	'VEHICLE MAY BE AT THE DESIRED 'ATTITUDE BEFORE UPLINK AND THEREFORE 'REQUIRE NO ATTITUDE CHANGE
05+31+00				'BSE COMMAND SWD 'OF UPLINK 'GND CONFIRM RECEIPT	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
06-00-00	T8+01+46+00	LUNAR IMPACT APS BURN		'ACS REPORT 'APS 'ULLAGE ON-OFF''	2ND OPP (APPROX 7+30 GET)
06-30-00				'BSE 3 INITIATE 'SMEK NO. 52	
07-00-00				'IFTT GIVES BEST 'VECTOR TO GUIDO	'IFTT GIVES BEST ESTIMATE OF STATE 'VECTOR TO GUIDO.
07-45-00				'GUIDO SENDS MSFN 'VECTOR TO IFTT	DOES NOT INCLUDE HSK GEOMETRY
08-30-00				'IFTT SENDS APS 'BURN NO. 2 DATA TO 'BSE VIA MAGNAFAX 'BSE 3 INITIATE 'SMEK NO. 52	'IFTT SENDS APS BURN NO. 2 DATA 'BASED ON 8 HR TRACK DATA. THE DATA 'WILL BE GIVEN IN E. U. (PRIME) AND 'OCTAL COMMAND FORM (INFO). BSE WILL 'VERIFY OCTAL, TRANSFER LOAD TO SITE, 'AND UPLINK. BSE WILL COMMAND SWD OF 'UPLINK.
08-50-00				'GUIDO SENDS MSFN 'VECTOR TO IFTT 'VIA TTY	
09+00+00		LUNAR IMPACT APS VERNIER BURN		'ACS REPORT 'APS 'ULLAGE ON-OFF''	NOMINAL TIME FOR SECOND LUNAR IMPACT APS BURN. IF THE 6 HOUR BURN YIELDS THE DESIRED IMPACT ACCURACY THIS BURN WILL NOT BE REQUIRED
09+20+00				'IFTT GIVES BEST 'VECTOR TO GUIDO	'IFTT SENDS BEST SIMULATED POST 'APS BURN NO. 2 VECTOR BASED ON BOTH 'MSFN VECTORS (7+45 AND 8+50) TO 'GUIDO
10+30+00				'BSE 3 INITIATE 'SMEK NO. 52	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T4A + 0.0	ALTERNATE SEQUENCE START OF TIME BASE NO. 4A (T4A)		GND REPORT 'TB4A 'INITIATE' 'BSE 1 REPORT 'EARLY 'STAGING CONFIRMED' 'ON FLIGHT LOOP 'BSE 3 INITIATE 'SMEK NO. 58	
	T4A + 0.3	S-II/S-IVB ORDNANCE ARM		ENS CONFIRM	
	T4A + 0.9	LOX TANK PRESS SHUTOFF VALVES OPEN			
	T4A + 1.4	S-IVB PREVALVES OP			
	T4A + 1.8	S-II/S-IVB SEP		ENS CONFIRM SEP	
	T4A + 5.0	LOX TANK FLIGHT PRESSURE SYSTEM ON			
	T4A + 5.2	S-IVB LOX CHILLDOWN PUMP OFF			
	T4A + 5.8	S-IVB ENGINE START			FUEL LEAD BEGINS AT THIS TIME
	T4A + 6.0	FCC S-IVB BURN MODE ON		ACS CONFIRM ATTITUDE CONTROL RECONFIGURED	
	T4A + 6.5	S-IVB ENGINE OUT INDICATION ENABLE			ENABLES S-IVB TOK INDICATORS IN 'CSM

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T4A + 6.9	S-IVB FUEL CHILLDOWN PUMP OFF		'STG CONFIRM CHILLDOWN 'PUMPS OFF	
	T4A + 8.8	FUEL INJECTION TEMP OK BYPASS			STDV (IGNITION)
	T4A + 11.0	SIVB ENGINE PC INCREASE		'ENS REPORT 'ACCELERATION GO''	
				'ENG REPORT 'SIVB 'IGNITION, THRUST OK''	
				'BSE 2 REPORT 'SIVB 'IGNITION, THRUST OK''	
				'ON FLIGHT LOOP	
	T4A + 13.5	ITERATIVE GUIDANCE MODE INITIATED		'BSE 3 REPORT 'IGM 'START''	
	T4A + 19.2	WATER COOLANT VALVE OPEN			
	T4A + 23.2	IU TM CALIBRATE		'ENS REPORT 'IU CAL''	
	T4A + 23.4	S-IVB TM CALIBRATE		'ENS REPORT 'SIVB CAL''	
	T4A + 28.7	HEAT - EXCHANGER BYPASS VALVE CONTROL ENABLE		'STG CONFIRM	
	T4A + 30.0			'GND REPORT T4A 'INITIATE TIME	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T4A + 50.0			'CONS REPORT PRED PROP. 'DEPLETION TIME	
	T4A +03-20	IU TM CALIBRATE		'ENS REPORT ''IU CAL''	
	T4A +03-20.2	S-IVB TM CALIBRATE		'ENS REPORT 'SIVB CAL''	
	T4A +04-36			'STAGE REPORT 'SEPARATION RECONTACT 'REGION'' TO BSE 2	SEPARATION RECONTACT REGION
	T4A +05-05.7	FIRST BURN RELAY OFF		'STG REPORT ''STEP 'PRESS VERIFIED ''	
				'BSE 2 REPORT 'FUEL STEP PRESS ''	
	T4A +06-48.7	FCC SWITCH POINT NO. 6			
	T4A +07-50	POINT LEVEL SENSOR ARMING		'GND REPORT ''LEVEL 'SENSORS ARM''	
	C/O -35	CHI TILDE INITIATE			
	C/O -10			'GND COUNT DOWN TO 'SIVB C/O	
	C/O -9.0	ENGINE PUMP PURGE CONTROL ENABLE ON		'STG REPORT ''PUMP 'PURGE ON''	
	C/O -8	CHI FREEZE		'RETURN TO TB-5	

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T6A + 0.0	O2-H2 BURNER MALFUNCTION START OF TIME BASE NO. 6A (T6A)			
	T6A + 0.2	LH2 TANK CVS ORIFICE SHUTOFF VALVE OPEN ON			
	T6A + 0.4	LH2 TANK CVS RELIEF OVERRIDE SHUTOFF VALVE OPEN ON		'STG REPORT ''CVS 'OPEN '' 'BSE 2 REPORT ''BURNER 'SECURED AND CVS 'OPEN''	
	T6A + 2.2	LH2 TANK CVS ORIFICE SHUTOFF VALVE OPEN OFF			
	T6A + 2.4	LH2 TANK CVS RELIEF OVERRIDE SHUTOFF VALVE OPEN OFF			

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T6B + 0.0	O2-H2 BURNER MALFUNCTION START OF TIME BASE NO. 6B (T6B)			
	T6B + 0.2	S-IVB ULLAGE ENGINE NO. 1 ON			
	T6B + 0.3	S-IVB ULLAGE ENGINE NO. 2 ON		'BSE 2 REPORT 'BURNER SECURED AND 'ULLAGE ON'	
	T6B + 0.5	S-IVB ULLAGE THRUST PRESENT INDICATION ON			

GET	TIME IN TIME BASE		EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T6C	+	0.0	TLI INHIBIT START OF T86		
	T6C	+	0.1	LOX TANK REPRESS CONTROL VALVE OPEN OFF		
	T6C	+	0.2	LH2 TANK REPRESS CONTROL VALVE OPEN OFF		
	T6C	+	0.3	START TANK RECHAR CLOSE AND DISARM		
	T6C	+	0.4	S-IVB RESTART ALERT OFF		
	T6C	+	0.6	LH2 TANK CVS VALVE CLOSE OFF		
	T6C	+	0.8	FUEL CHILLDOWN PUMP OFF		
	T6C	+	1.0	LOX CHILLDOWN PUMP OFF		
	T6C	+	1.2	PREVALVES CLOSE OFF		
	T6C	+	1.4	AUX HYD PUMP FLIGHT MODE OFF	'ACS REPORT 'AUX 'PUMP OFF''	
	T6C	+	1.6	LH2 TANK CVS ORIFICE SHUTOFF VALVE OPEN ON		

REV. C

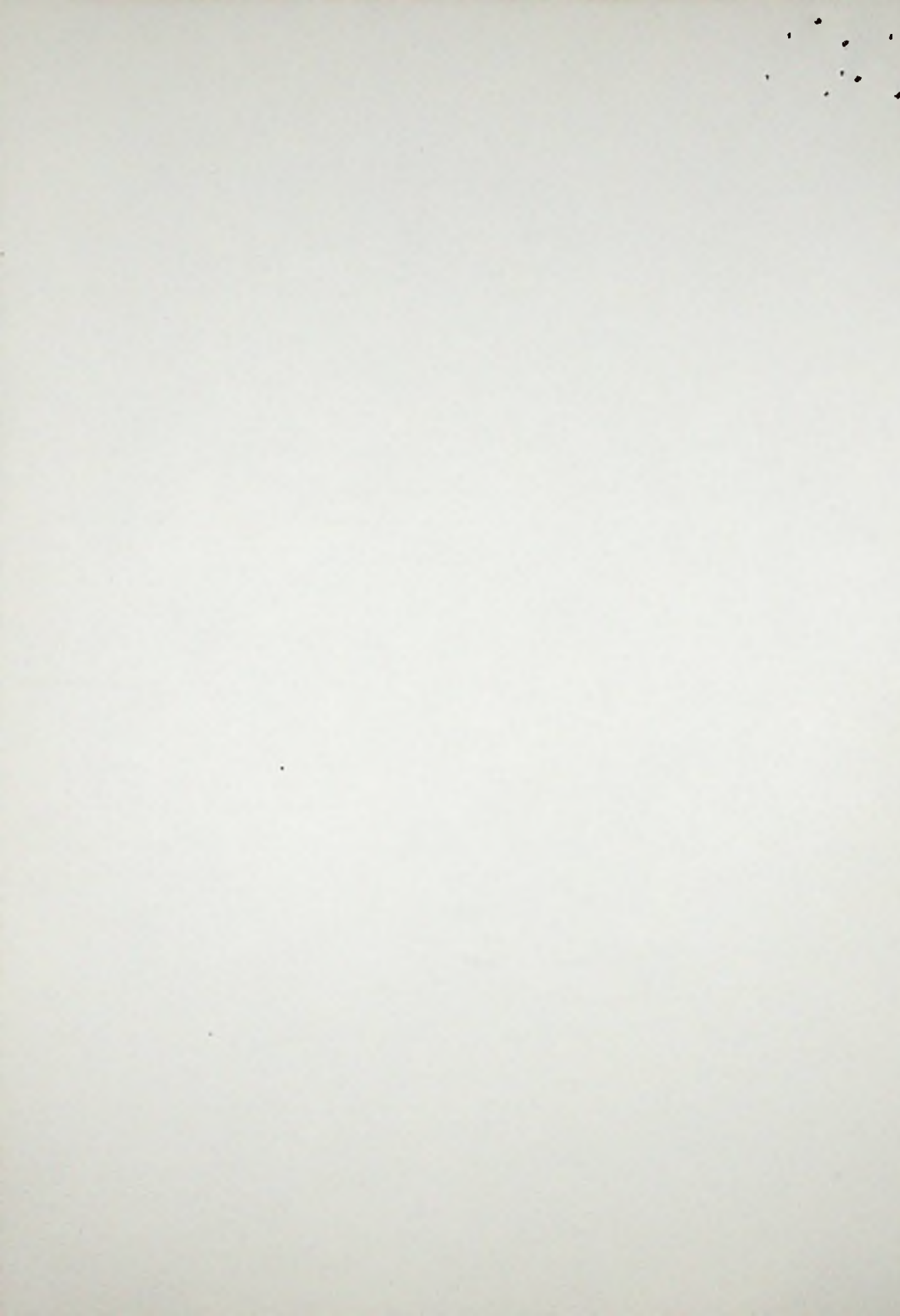
27 MARCH 1970

GET	TIME IN TIME BASE	EVENT	X	FLIGHT CONTROLLER ACTION	NOTES
	T6C + 1.7	LH2 TANK CVS RELIEF OVERRIDE SHUTOFF VLV OP ON		STG REPORT "CVS OPEN"	
	T6C + 1.8	S-IVB ULLAGE ENGINE NO. 1 OFF			
	T6C + 1.9	S-IVB ULLAGE ENGINE NO. 2 OFF		ACS REPORT "ULLAGE OFF"	
	T6C + 2.0	S-IVB ULLAGE THRUST PRESENT INDICATION OFF			
	T6C + 2.4	BURNER LH2 PROPELLANT VALVE CLOSE OFF			
	T6C + 2.6	BURNER LOX SHUTDOWN VALVE CLOSE ON		ENG REPORT "BURNER SHUTDOWN" BSE 2 REPORT "SIVB CONFIGURED FOR COAST"	
	T6C + 3.3	S/C CONTROL OF SATURN ENABLE			
	T6C + 3.6	LH2 TANK CVS ORIFICE SHUTOFF VALVE OPEN OFF			
	T6C + 3.7	LH2 TANK CVS RELIEF OVERRIDE SHUTOFF VALVE OPEN OFF			



APPENDIX A

BOOSTER TEAM PADS



BSC 1 PAD 1

Launch Azimuth _____

L/O Time _____ GMT

S-IC TIMES

S-IC Engine Out

1. CHI Freeze Term _____

2. Engine # _____ Out Time _____

3. S-IC Cutoff Time _____ GET

S-II TIMES

1. S-II Engine # _____ Out at _____ GET

2. S-II Engine # _____ Out at _____ GET

	No Engine Out	One Engine Out	Two Engines Out
S-II CECO	_____	_____	_____
S-II PU SHIFT	_____	_____	_____
S-II LLS ARM	_____	_____	_____
S-II CO	_____	_____	_____

BURN SUMMARY

S-IC Δ Burn Time _____

S-II Δ Burn Time _____

S-IVB First Burn Time _____

TB5 Initiate Time _____



BSE 1 PAD 2

TLI SUMMARY

	1st OPP		2nd OPP	
	CONS	HOSC	CONS	HOSC
Burn Time STDV-ECC	_____	_____	_____	_____
Required to 65K Apogee	_____	_____	_____	_____
Available Burn to Depletion	_____	_____	_____	_____
Type of Cutoff	_____	_____	_____	_____
Probability of Guidance C/O	_____	_____	_____	_____
Probability of 65K	_____	_____	_____	_____

TB6 SUMMARY

AOS CRO _____
LOS CRO _____
TB6 Start _____
Engine Start _____
Std V _____
Δ Burn _____
AOS MAW _____
S-IVB C/O _____

TLI SUMMARY

TB7 Initiate _____
Begin Maneuver (TB7+15 Min) _____
Estimated Maneuver Completion _____
Nominal CS4 Sep (TB7+25 Min) _____
Evasive Maneuver Init _____
TB8 Initiate _____
CONS HOSC
APS Burn for Sling-
shot _____



BSF 3 PAD

LAUNCH AZIMUTH _____

DATE _____

TIME BASE INITIATE (GRR)

	<u>Nom</u>	<u>Act</u>		<u>Nom</u>	<u>Act</u>
TB1	_____	_____	TB5	_____	_____
TB2	_____	_____	TB6	_____	_____
TB3	_____	_____	TB7	_____	_____
TB4	_____	_____	TB8	_____	_____
OTHER	_____	_____			

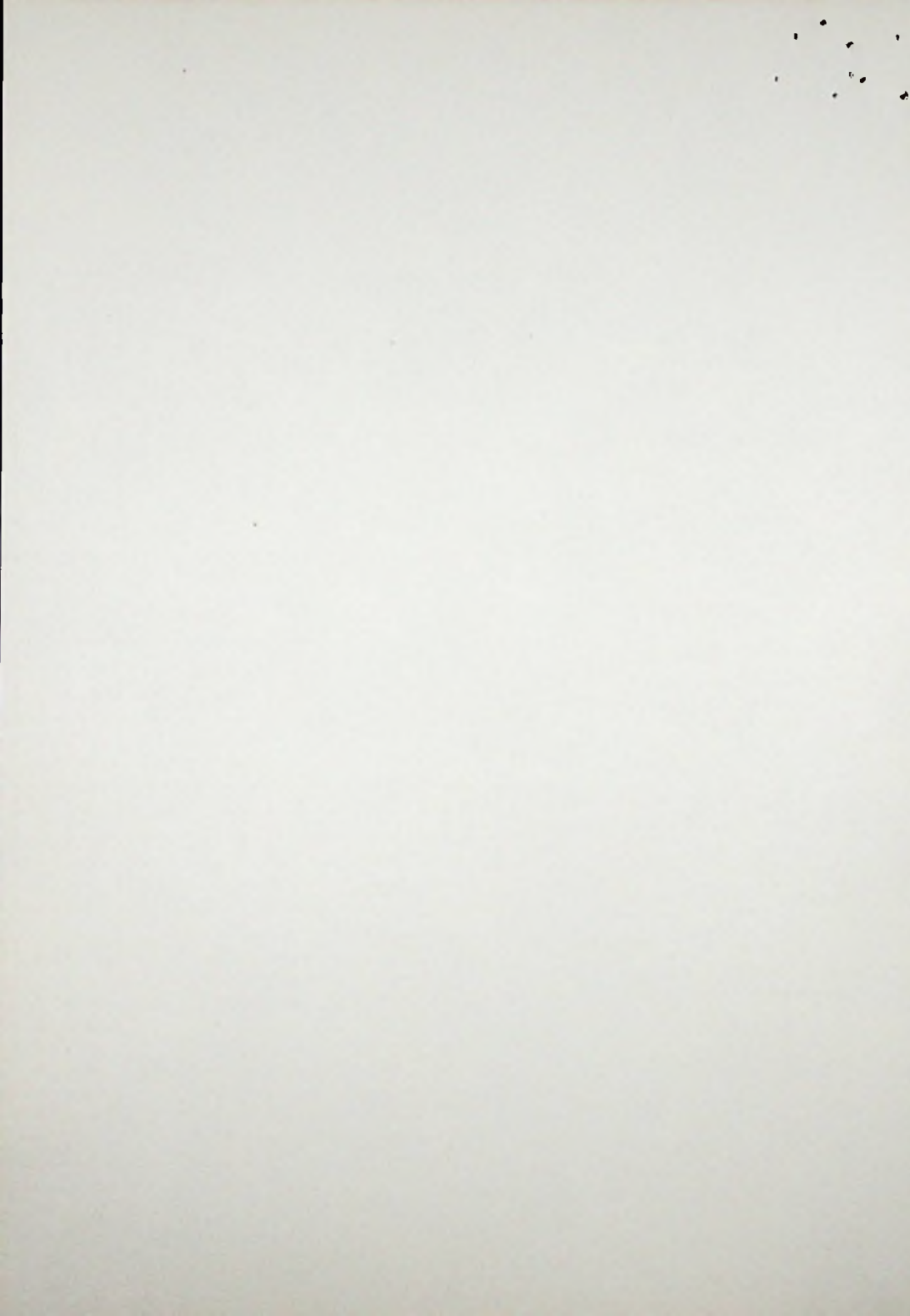
	<u>Nom</u>	<u>Act</u>	<u>Delta</u>
TB3 (GRR)	_____	_____	_____
TB1 (GRR)	_____	_____	_____
S-IC BURN TIME	_____	_____	_____
TB4 (GRR)	_____	_____	_____
TB3 (GRR)	_____	_____	_____
S-II BURN TIME	_____	_____	_____
TB5 (GRR)	_____	_____	_____
TB4 (GRR)	_____	_____	_____
S-IVB BURN TIME	_____	_____	_____

TB7 Initiate Time (GET) _____

Begin Maneuver to TD&E Att. (TB7 + 15 Min) _____

Estimated Maneuver Completion Time _____

Nominal CS4 Separation (TB7 + 25 Min) _____



BSE/CONSUMABLES/ROSC PROPULSION
PAD

(AS-503 April 11 Launch Data)

NOMINAL

1. Liftoff Load, LOX
2. Liftoff Load, LH2
3. Total LV Liftoff Mass

1	9	1	5	3	2
	4	3	5	0	0
2	7	0	1	5	0

4. TB5 Initiate (GRR)
5. TB4/TB4A Initiate (GRR)
6. TB4/TB4A Duration
7. TB4/TB4A Duration (in seconds)

	1	1	4	6
		9	1	8
		2	2	3
	1	4	8	0

8. First Burn Duration
(STDV₁ to ECC₁)
(TB4 Less 4.2 Sec)
(TB4A Less 9.0 Sec)

1	4	3	6
---	---	---	---

--	--	--	--

--	--	--	--

9. Insertion Mass, LOX Usable
10. Insertion Mass, LH2 Usable
11. Insertion Mass, Usable
Propellants (-789)
12. Total Insertion, Mass

1	3	5	3	6	2
	3	1	5	2	4
1	6	6	0	7	7

13. TB6 Initiate Mass, LOX Usable
14. TB6 Initiate Mass, LH2 Usable
15. TB6 Initiate Mass, Usable
Propellants (-789)
16. Total TB6 Initiate Mass

1	3	5	1	9	7
	2	9	1	1	5
1	6	3	5	2	3

2	0	0	9	4	8
---	---	---	---	---	---

--	--	--	--	--	--

--	--	--	--	--	--

17. Predicted 1st Opp Guid C/O,
STDV₂ to ECC₂
18. Probability of Guid C/O
19. Required Burn Time to 65K
n.mi., STDV
20. Probability of 65K n.mi.
Apogee Alt
21. Available Burn Time to
Depletion, STDV
22. Type of Depletion

3	5	5	7
---	---	---	---

--	--	--	--

--	--	--	--

	9	9	9
3	4	1	2

	9	9	9
--	---	---	---

--	--	--	--

--	--	--	--

3	6	7	4
---	---	---	---

--	--	--	--

--	--	--	--

L	O	X
---	---	---

--	--	--

--	--	--



23. Predicted 2nd Opp Guid C/O,
STDV₂ to FCC₂

3 4 0 0

□ □ □ □

□ □ □ □

24. Probability of Guid C/O

9 9 0

□ □ □

□ □ □

25. Required Burn Time to 65K n.m.,
STW

3 2 5 5

□ □ □ □

□ □ □ □

26. Probability of 65K n.m. Apogee Alt

9 9 9

□ □ □

□ □ □

27. Available Burn Time to
Depletion, STDV

3 5 0 5

□ □ □ □

□ □ □ □

28. Type of Depletion

L 0 X

□ □ □

□ □ □

29. TB7 Initiate (GRR)

2 4 1 2 4

□ □ □ □ □

□ □ □ □ □

30. TB6 Initiate (GRP)

2 2 5 5 0

□ □ □ □ □

□ □ □ □ □

31. TB6 Duration
TB6 Duration (In Secs)

1 5 3 4
9 3 3 2

□ □ □ □ □

□ □ □ □ □

32. Second Burn Duration
(TB6 - 578.2 Sec)

3 5 5 7

□ □ □ □

□ □ □ □



HOCH/INTEGRAL'S PAD

	Nominal	Predicted	Observed
1. First Burn Flowrate, LOX	3 2 0 5		
2. First Burn Flowrate, LH2	7 7 8		
3. First Burn Thrust	1 9 9 5 0 5		
	Nominal	Predicted Pre L/O	Based On First Burn
4. Second Burn 4.5 Flowrate, LOX	3 2 1 6		
5. Second Burn 4.5 Flowrate, LH2	7 3 2		
6. Second Burn 4.5 Thrust	1 6 9 6 7 0		
7. Second Burn 5.0 Flowrate, LOX	3 8 7 7		
8. Second Burn 5.0 Flowrate, LH2	7 8 2		
9. Second Burn 5.0 Thrust	1 9 8 9 0 5		



NAV PAD

Nominal Times (GET)

SIC CECO	2:15	SII PU Shift	8:24
SIC C/O (TB3)	2:44	SII LLS Arm	8:39
SII CECO	7:43	SII C/O (TB4)	9:18

S-IC ENGINE OUT

1. CHI Freeze Term _____
2. Time of Eng Out (_____)
3. S-IC C/O Pred Update

A) Inboard Eng Out

$$\frac{2:15}{4} - (\quad) + 2:44 = \underline{\hspace{2cm}}$$

B) Outboard Eng Out

$$\frac{2:42}{3} - (\quad) + 2:44 = \underline{\hspace{2cm}}$$

S-II ENGINE OUT

1. Time of Eng Out _____
2. TB3 Initiate _____
3. S-II C/O Pred Update
from Tabular Data _____

S-II Event Updates

TB3 Initiate Time (_____)

1. S-II CECO = (_____) + 4:59 = _____
2. S-II PU Shift = (_____) + 5:40 = _____
3. S-II LLS Arm = (_____) + 5:55 = _____
4. S-II C/O = (_____) + 6:36 = _____



COMMAND PAD

FUNCTION	PREDICTED OT	45 MIN GET UPDATE	2 HR GET UPDATE	TELEMETRY COVERAGE
TB6 Start	2+25+50			
CRO AOS	2+25+50			
CRO LOS	2+32+00			
ESC (TB6 + 9:30)	2+35+20			
STDV (ESC + 8 Sec)	2+35+28			
Δ Burn (From STDV)	5+55.7			
S-IVB C/O	2+41+23			
HAW AOS				



ENS PAD

ENS CONSUMABLES: BATTERIES AND GN2

LIFETIME REMAINING:

PREDICTION TIME IN GET:

IU #1

IU #2

IU #3

IU #4

S-IVB FWD 1

FWD 2

AFT 1

AFT 2

GN2 LIFETIME REMAINING:

PREDICTION TIME IN GET:

AIR BEARING SUPPLY

ESC SUPPLY



MANEUVER _____

PREDICTED

ACTUAL

START	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">: :</div>	GET		<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">: :</div>	GET
COMP	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">: :</div>	GET		<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">: :</div>	GET
WEIGHT					
START	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">, </div>	LBS		<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">, </div>	LBS
COMP	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">, </div>	LBS		<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">, </div>	LBS
ULL PR	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div>	PSIA		<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div>	PSIA
Δt	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">:</div>			<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">:</div>	
				ΔV_x	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div> FT/SEC
				ΔV_y	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div> FT/SEC
				ΔV_z	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div> FT/SEC
ΔV	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div>	FT/SEC		<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div>	FT/SEC
PITCH	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div>	DEG		<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div>	DEG
YAW	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div>	DEG		<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div>	DEG
ROLL	<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div>	DEG		<div style="border: 1px solid black; padding: 2px 10px; display: inline-block;">. </div>	DEG



APS LUNAR IMPACT MANEUVER

Burn Start Time	_____ Min. from TBg	SCODE WORD _____
		DATA COMMAND 1 _____
		DATA COMMAND 2 _____
Burn Duration	_____ Sec.	DATA COMMAND 3 _____
		DATA COMMAND 4 _____
Delta Pitch	_____ Deg.	DATA COMMAND 5 _____
Delta Yaw	_____ Deg.	DATA COMMAND 6 _____



GND LUNAR IMPACT PAD

TB7 INITIATE: _____ GRR _____ GET _____ GMT

TB8 INITIATE: _____ GRR _____ GET _____ GMT

TIME OF DATA:

XDM	M/S	_____	_____	_____	_____	_____	_____
YDM	M/S	_____	_____	_____	_____	_____	_____
ZDM	M/S	_____	_____	_____	_____	_____	_____
CHI PIT	DEG	_____	_____	_____	_____	_____	_____
CHI YAW	DEG	_____	_____	_____	_____	_____	_____
DCS TIME START	SEC	_____	_____	_____	_____	_____	_____
DCS BURN TIME	SEC	_____	_____	_____	_____	_____	_____
DCS DELTA PIT	DEG	_____	_____	_____	_____	_____	_____
DCS DELTA YAW	DEG	_____	_____	_____	_____	_____	_____
S.S. START APS1	SEC	_____	_____	_____	_____	_____	_____
S.S. START APS2	SEC	_____	_____	_____	_____	_____	_____
S.S. STOP APS1	SEC	_____	_____	_____	_____	_____	_____
S.S. STOP APS2	SEC	_____	_____	_____	_____	_____	_____
TM CHI PIT	DEG	_____	_____	_____	_____	_____	_____
TM CHI YAW	DEG	_____	_____	_____	_____	_____	_____



APPENDIX B

MISSION FAILURE CONTINGENCY
PLAN CHECKLIST



APPENDIX B

MISSION FAILURE CONTINGENCY
PLAN CHECKLIST

The following checklist will be utilized in the event of an impending mission failure and/or a declared mission failure as announced by the Flight Director.

A. Terminate all telephone conversations and unofficial conversations over the communications loop and remain in this status until officially notified otherwise by BSE.

B. Public statements are not to be made.

C. Console _____ Position _____

D. Position Title _____ Office Phone _____

E. Operator _____

F. Contractor _____

G. Mission _____

H. Date _____

I. Time Log Started: (Two Minimum)

GMT _____

GET _____

TBT _____

Local Time _____

J. Time of Mission Failure: (Two Minimum)

GMT _____

GET _____

TBT _____

Local Time _____



K. Communications Panel Illuminated Voice Loops:

MONITOR

TALK

- L. Record below applicable strip chart data values, meter module values, and event light indications at time of failure; the applicable time correlation and source (e.g. event light) of data.

MEASUREMENT

VALUE

TIME

SOURCE



11. Describe below all observations and actions prior to and at the time of mission failure, including any active voice communication that operator is part of and any communication overheard.



- H. Collect applicable summary messages as processed by the TTY and assemble in a time sequential order.
- O. Collect applicable hard copies and assemble in a time sequential order.
- F. Collect all Consumables Plot-sheets utilized.
- Q. Collect applicable chart recorder records.
- R. Attach summary messages, hard copies, Consumables Plot-sheets and chart recorder data to this procedure.
- S. Turn in any material containing any information that may be useful.
- T. Hold applicable data and this checklist for collection by RSC.
- U. Time log terminated: (Complete one to correlate to I & J)

GMT _____

GMT _____

GMT _____

Local Time _____

Signature _____

Date _____





