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EFFECTS OF HUMAN FACTORS ON APOLLO SYSTEM PERFORMANCE FOR LUNAR ORBIT RENDEZVOUS AND TWO-MAN DIRECT FLIGHT MODES [U]

APPENDICES

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FOREWORD

This report has been prepared by the Martin Company's Space Systems Division and is submitted as supplementary information to the data presented in Martin Engineering Report No. ER 12725 which was prepared in compliance with NASA Contract NASw-534.

INTRODUCTION

These appendices include a crew task analysis for both the LOR and DF modes and an analysis of various malfunctions for each of these modes. These analyses do not include a complete delineation of all individual tasks but for various categories of tasks. The tasks considered, however are representative of major crew performance factors important for a comparative evaluation of each mode.

APPENDIX A

DF AND LOR TASK ANALYSES

DF TASK ANALYSIS

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
	PARKING ORBIT					
T+0:12	Verify insertion	Communications:				
		(a) Voice communication with ground	1	3	-3	0
T+0:13	Systems check	Systems Check:				
		(a) Systematic checking of over-all system performance	2	266	-1	0
T+1:00	Preparation for trans-lunar trajectory inser-tion	Navigation:				
		(a) Alignment of inertial plat-form (IMU)	1	14	1	-1
	TRANSLUNAR TRAJEC-TORY					
T+1:03	Re-ignition of 3rd stage	Flight Control:				
		(a) Setting systems to maneuver mode	2	3	0	-1
		(b) Control maneuver--firing initiation	2	24	1	-1
		(c) Returning systems to auto-matic mode	2	4	0	+1
T+1:10	Verify insertion and flight path parameters	Communications:				
		(a) Voice communications be-tween crew and ground	1	3	-3	0
T+1:15	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+1:20	Systems and log checks	Systems and Log Checks:				
		(a) Systematic checking of over-all system performance	1	266	-3	0
		(b) Recording readings on all instruments and counters	1	206	-2	+1
T+1:45	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+2:15	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
		(b) Entry of data into computer	1	1	-3	-1
T+2:45	Star fix 4	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+3:15	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+3:45	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+3:50	Trajectory and correction determination 1	Navigation:				
		(a) Obtaining trajectory and correction data	1	28	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Aligning inertial platform (IMU)	1	14	1	-1
T+4:20	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	266	-1	0
T+4:40	Preparation for and initiation of correction 1	Flight Control:				
		(a) Setting systems to maneuver mode	2	15	0	0
		(b) Control maneuver--enabling	2	34	1	-1
		(c) Returning systems to automatic mode	2	3	0	+1
T+4:55	Verify correction	Communications:				
		(a) Voice communications between crew and ground	1	3	-3	0
T+5:00	Systems and log checks	Systems and Log Checks:				
		(a) Systematic checking of overall system performance	1	266	-1	0
		(b) Recording readings on all instruments and counters	1	206	-2	+1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T6:00	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+7:00	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+8:00	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+9:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
	Star fix 4	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+10:00	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+11:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+12:00	Star fix 7	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+13:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
	Star fix 8	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+14:00	Star fix 9	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+15:00	Star fix 10	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+16:00	Trajectory and correction determination 2	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Aligning of inertial platform (IMU)	1	14	1	-1
T+16:30	Systems check	Systems Check:				
		(a) A systematic checking of overall system performance	2	266	-1	0
T+16:50	Preparation for and initiation of correction 2	Flight Control:				
		(a) Setting systems to maneuver mode	2	7	0	0
		(b) Control maneuver--enabling	2	34	0	-1
		(c) Returning systems to automatic mode	2	3	0	+1
T+17:10	Verify correction	Communications:				
		(a) Voice communications between crew and ground	1	3	-3	0
T+17:15	Systems and log checks	Systems and log checks:				
		(a) Systematic checking of over all system performance	1	266	-1	0
		(b) Recording readings on all instruments and counters.	1	206	-2	+1
T+19:00	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+21:00	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+21:15	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1

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DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+23:00	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+25:00	Star fix 4	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+25:15	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+27:00	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+29:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+29:15	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+31:00	Star fix 7	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+33:00	Star fix 8	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+33:15	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+34:00	Trajectory and correction determination 3	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Aligning inertial platform (IMU)	1	14	1	-1

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DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+34:30	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	266	-1	0
T+34:50	Preparation for and initiation of correction 3	Flight Control:				
		(a) Setting systems to maneuver mode	2	7	0	0
		(b) Control maneuver--enabling	2	34	0	-1
		(c) Returning systems to automatic mode	2	3	0	+1
T+35:10	Verify correction	Communications:				
		(a) Voice communications between crew and ground	1	3	-3	0
T+35:15	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	1	266	-1	0
T+36:00	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+37:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+38:00	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+40:00	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+41:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+42:00	Star fix 4	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Enter data into computer	1	1	-3	-1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+44:00	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+45:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+46:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+48:00	Star fix 7	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+48:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+48:30	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+49:15	Trajectory and correction determination 4	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Aligning inertial platform (IMU)	1	14	1	-1
T+49:45	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	266	-1	0
T+50:05	Preparation for and initiation of correction 4	Flight Control:				
		(a) Setting systems to maneuver mode	2	7	0	0
		(b) Control maneuver--enabling	2	34	0	-1
		(c) Returning systems to automatic mode	2	1	0	+1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+50:20	Verify correction	Communications:				
		(a) Voice communications between crew and ground	1	3	-3	0
T+50:30	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	1	266	-1	0
T+51:00	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+52:15	Log check	Log check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+55:00	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+56:00	Log check	Log Check:				
		(a) Recording reading on all instruments and counters	1	206	-2	+1
T+61:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+63:00	Star fix 7	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+64:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+64:40	Trajectory and correction determination 5	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Aligning inertial platform (IMU)	1	14	1	-1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+65:10	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	266	-1	0
T+65:30	Prepare for and initiate approach correction	Flight Control:				
		(a) Setting systems to maneuver mode	2	7	0	0
		(b) Control maneuver--enabling	2	34	0	-1
		(c) Returning systems to automatic mode	2	3	0	+1
T+65:45	Verify correction	Communications:				
		(a) Voice communications between crew and ground	1	3	-3	0
T+65:55	Systems check	Systems Check:				
		(a) Systematic check of overall system performance	1	266	-1	0
	LUNAR ORBIT					
T+66:30	Preparation for and insertion into lunar orbit	Flight Control:				
		(a) Setting systems to maneuver mode	2	7	0	0
		(b) Control maneuver--enabling	2	38	0	-1
		(c) Returning systems to automatic mode	2	3	0	+1
T+67:00	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	266	-1	0
T+67:30	Orbital determination	Navigation:				
		(a) Star and landmark fixes	1	140	00000	-1
		(b) Entry of data into computer	1	5	-3	-1
		(c) Comparison of ground and onboard data	1	65	0	-1
		(d) Align inertial platform	1	14	1	-1
T+68:00	Systems and log checks	Systems and Log Checks:				
		(a) Systematic checking of overall system performance	1	266	-1	0
		(b) Recording readings on all instruments and counters	1	206	-2	+1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+69:15	Deorbit thrust	Flight Control:				
		(a) Setting systems to maneuver mode	2	7	0	0
		(b) Control maneuver--enabling	2	41	0	-1
		(c) Returning systems to automatic mode	2	3	0	+1
T+69:20	Deorbit coast	Navigation:				
		Determination of trajectory	1	16	-1	-1
T+69:30	Deorbit verification	Communication:				
		(a) Voice communication between crew and ground	1	3	-3	0
T+70:00	Braking	Flight Control:				
		(a) Setting systems to maneuver mode	2	4	0	0
		(b) Control maneuver--enabling	2	29	0	-1
		Navigation:				
		(a) Landmark fixes	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
	Braking verification	Communications:				
		(a) Voice communications between crew and ground	1	3	-3	0
T+70:10	Hover, descent, landing	Flight Control:				
		(a) Setting systems to manual mode	2	7	0	0
		(b) Control maneuver--attitude and thrust	2	49	3	-1
T+70:12	Touchdown verification	Communication:				
		(a) Voice communications between crew and ground	1	3	-3	0
T+70:25	Post-touchdown check	Systems and Log Checks:				
		(a) Systematic checking of overall system performance	2	239	3	0
		(b) Recording of readings on all instruments and counters	2	206	3	+1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+71:00	Scientific mission	Scientific:				
		(a) Observation	2	(Cannot specify)	3	0
		(b) Collection of samples	2		3	0
		(c) Inplanting instruments	2		3	0
		Communication:				
		(a) Voice communication between crew and ground	1	(Cannot specify)	2	0
T+116:00	Prelaunch	Navigation:				
		(a) Star and landmark fixes	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
		(c) Obtaining trajectory and correction data	1	22	-1	-1
		(d) Comparison of ground and onboard data	1	13	0	-1
		(e) Alignment of IMU	1	14	1	-1
T+116:45	Systems and log checks	Systems and Log Checks:				
		(a) Systematic checking of overall system performance	2	239	-1	0
		(b) Recording readings on all instruments and counters	2	206	-2	+1
T+118:12	LAUNCH Liftoff	Flight Control:				
		(a) Setting systems to maneuver mode	2	17	0	0
		(b) Control maneuver--enabling	2	31	0	-1
		(c) Returning systems to automatic mode	2	3	0	+1
		Communication:				
		Voice communication between crew and ground	1	3	-3	0
T+118:18	Ascent coast	Navigation:				
		(a) Star and landmark fixes	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
		(c) Obtaining trajectory and correction data	1	22	-1	-1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+118:48	Systems check	Systems Check: (a) Systematic checking of overall system performance	1	239	-1	0
T+119:12	Lunar orbit insertion	Flight Control (a) Setting systems to maneuver mode	2	6	0	0
		(b) Control maneuver--enabling	2	31	0	-1
		(c) Returning systems to automatic mode	2	3	0	+1
T+119:15	Lunar orbit verification	Communication: Voice communication between crew and ground	1	3	-3	0
T+119:20	Determine TE insertion data	Navigation: (a) Star and landmark fixes	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
		(c) Obtaining trajectory and correction data	1	22	-1	-1
		(d) Alignment of inertial platform (IMU)	1	14	1	+1
T+119:30	Systems check	Systems Check: (a) Systematic checking of overall system performance	1	239	-1	0
T+119:48	Insertion into TE trajectory	Flight Control: (a) Setting systems to maneuver mode	2	7	0	0
		(b) Control maneuver--enabling	2	38	0	-1
		(c) Returning systems to automatic mode	2	3	0	+1
T+119:55	Verification of TE insertion	Communication: (a) Voice communication between crew and ground	1	3	-3	0
T+120:00	Systems and log checks	Systems and Log Checks: (a) Systematic checking of overall system performance	1	266	-1	0
		(b) Recording readings on all instruments and counters	1	206	-2	+1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
	TRANSEARTH TRAJECTORY					
T+121:00	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+121:48	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+122:36	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+123:24	Star fix 4	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+123:30	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+124:12	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+125:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+125:30	Trajectory and course correction determination 1	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Alignment of inertial platform (IMU)	1	14	1	-1
T+125:55	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	1	266	-1	0
T+126:15	Preparation for and initiation of correction 1	Flight Control:				
		(a) Setting systems to maneuver mode	2	7	0	0

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
		(b) Control maneuver--enabling	2	34	0	-1
		(c) Returning systems to automatic mode	2	3	0	+1
T+126:30	Verify correction	Communications: (a) Voice communications between crew and ground	1	3	-3	0
T + 126:40	Systems check	Systems check: (a) Systematic checking of over system performance	1	266	-1	0
T+127:10	Star fix 1	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+127:30	Log check	Log Check: (a) Recording readings on all instruments and counters	1	206	-2	+1
T+128:30	Star fix 2	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer				
T+129:30	Star fix 3	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+131:00	Star fix 4	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+132:30	Star fix 5	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+134:00	Log check	Log Check: (a) Recording readings on all instruments and counters	1	206	-2	+1
T+134:30	Star fix 6	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+135:00	Trajectory and correction determination 2	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Aligning of inertial platform (IMU)	1	14	1	-1
T+135:30	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	266	-1	0
T+135:50	Preparation for and initiation of correction 2	Flight Control:				
		(a) Setting systems to maneuver mode	2	7	0	0
		(b) Control maneuver--enabling	2	34	0	-1
		(c) Returning systems to automatic mode	2	3	0	+1
T+136:00	Verify correction	Communications:				
		(a) Voice communication between crew and ground	1	3	-3	0
T+136:10	Systems check	Systems Check:				
		(a) Systematic check of overall system performance	1	266	-1	0
T+137:00	Star fix 1	Navigation				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+138:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+139:00	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+141:00	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+142:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+143:00	Star fix 4	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+146:00	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+146:30	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+149:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+150:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+151:30	Trajectory and correction determination 3	Navigation:				
		(a) Obtaining trajectory and correction parameters	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Alignment of inertial platform (IMU)	1	14	1	-1
T+152:00	Systems check	Systems Check:				
		(a) Recording readings on all instruments and counters	2	266	-1	0
T+152:20	Preparation for and initiation of correction 3	Flight Control:				
		(a) Setting systems to maneuver mode	2	7	0	0
		(b) Control maneuver--enabling	2	34	0	-1
		(c) Return systems to automatic mode	2	3	0	+1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+152:35	Verify correction	Communications:				
		(a) Voice communications between crew and ground	1	3	-3	0
T+152:45	Systems check	Systems Check:				
		(a) Systematic check of overall system performance	1	266	-1	0
T+154:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+155:00	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+157:30	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+158:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+159:00	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+162:00	Star fix 4	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+162:30	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+165:00	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+166:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+167:30	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+168:00	Trajectory and correction determination 4	Navigation:				
		(a) Obtaining trajectory and correction parameters	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Alignment of inertial platform	1	14	1	-1
T+168:30	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	266	-1	0
T+168:50	Preparation for and initiation of correction 4	Flight Control:				
		(a) Setting systems to maneuver mode	2	7	0	0
		(b) Control maneuver--enabling	2	34	0	-1
		(c) Return systems to automatic mode	2	3	0	+1
T+169:05	Verify correction	Communication:				
		(a) Voice communication between crew and ground	1	3	-3	0
T+169:15	Systems and log checks	Systems and Log Checks:				
		(a) Systematic checking of overall system performance	1	266	-1	0
		(b) Recording readings on all instruments and counters	1	206	-2	+1
T+170:30	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+172:00	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+173:30	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+174:00	Log check	Log Check:				
		(a) Recording readings of all instruments and counters	1	206	-2	+1
T+175:00	Star fix 4	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+176:30	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+178:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+178:10	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	206	-2	+1
T+178:30	Re-entry correction determination	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Alignment of inertial platform	1	14	1	-1
T+179:00	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	266	-1	0
T+179:20	Re-entry correction	Flight Control:				
		(a) Set system to maneuver mode	2	7	0	0
		(b) Control maneuver--enabling	2	34	0	-1
		(c) Returning systems to automatic mode	2	3	0	+1
T+179:35	Verify correction	Communications:				
		(a) Voice communications between crew and ground	1	3	-3	0

DF TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+179:45	Systems and log checks	Systems and Log Checks:				
		(a) Systematic checking of overall system performance	1	266	-1	0
		(b) Recording readings on all instruments and counters	1	206	-2	+1
	RE-ENTRY					
T+181:45	Preparation for re-entry--separate SM	Flight Control:				
		(a) Set systems to manual mode	2	31	0	0
		(b) Control maneuver--enabling	2	18	0	-1
T+182:00	Reorientation for and initiation of re-entry	Flight Control:				
		(a) Control maneuver--attitude	2	41	2	-1
	LANDING					
T+182:24	Deploy drogue and main chutes	Flight Control:				
		(a) Control maneuver--enabling	2	8	0	-1
T+182:30	Landing	Flight Control:				
		(a) Control maneuver--translation	2	8	3	-1
		Communications:				
		(a) Voice communications between crew and ground control	1	3	-3	0
	TOUCHDOWN AND RECOVERY					
		Communications:				
		(a) Voice communications between crew and recovery crew	1	3	-3	0
T+183:00	Systems and log checks	Systems and Log Checks:				
		(a) Systematic checking of overall system performance	2	80	-1	0
		(b) Recording readings on all instruments and counters	2	206	-2	+1

LOR TASK ANALYSIS

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
	PARKING ORBIT					
T+0:12	Verify insertion	Communications:				
		(a) Voice communication with ground	1	3	-3	0
T+0:13	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	3	399	-1	0
		(b) Operational inst	3		-2	1
T+1:00	Preparation for translunar trajectory insertion	Navigation:				
		(a) Alignment of inertial platform	2	14	1	-1
	TRANSLUNAR TRAJECTORY					
T+1:03	Re-ignition of 3rd stage	Flight Control:				
		(a) Setting systems to manual mode	2	26	0	0
		(b) Control maneuver--firing initiation	2	23	1	-1
		(c) Returning systems to automatic mode	2	20	0	1
T+1:10	Verify insertion and flight path parameters	Communications:				
		(a) Voice communication between crew and ground	1	3	-3	0
T+1:15	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+1:20	Systems and log checks	Systems and Log Checks:				
		(a) Systematic checking of overall system performance	2	399	-1	0
		(b) Recording readings on all instruments and counters	2	309	-2	+1
T+1:45	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
	CSM/LEM DOCKING					
T+2:00	Separation and docking maneuvers	Flight Control:				
		(a) Setting systems to manual mode	2	36	0	0
		(b) Control maneuver--attitude and translation	2	27	2	-1
		(c) Returning systems to automatic mode	2	31	0	1
T+2:15	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+2:45	Star fix 4	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+3:15	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+3:45	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+3:50	Trajectory and correction determination 1	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Aligning inertial platform	1	14	1	-1
T+4:20	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	399	-1	0
T+4:40	Prepare for and initiate correction 1	Flight Control:				
		(a) Setting systems to manual mode	2	26	0	0
		(b) Control maneuver--firing initiation	2	21	1	-1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
		(c) Returning systems to automatic mode	2	20	0	1
T+4:55	Verify correction	Communications: (a) Voice communication between crew and ground	1	3	-3	0
T+5:00	Transfer to LEM	Crew Transfer: (a) Transfer of crew member into LEM	2	9	1	-1
T+5:10	Systems and log checks	Systems and Log Checks: (a) Systematic checking of overall system performance (CM and LEM)	2	525	-1	0
		(b) Recording readings on all instruments and counters (CM and LEM)	2	540	-2	1
T+5:55	Transfer to CM	Crew Transfer: (a) Transfer of crew member into CM	2	9	1	-1
T+6:00	Star fix 1	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+7:00	Star fix 2	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+8:00	Star fix 3	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+9:00	Log check	Log Check: (a) Recording readings on all instruments and counters	1	309	-2	1
	Star fix 4	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+10:00	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+11:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+12:00	Star fix 7	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+13:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	309	-2	1
	Star fix 8	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	3	-1
T+14:00	Star fix 9	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+15:00	Star fix 10	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+16:00	Trajectory and correction determination 2	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Aligning of inertial platform	1	14	1	-1
T+16:30	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	399	-1	0
T+16:50	Prepare for and initiate correction 2	Flight Control:				
		(a) Setting systems to manual mode	2	26	0	0

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
		(b) Control maneuver--firing initiation	2	21	1	-1
		(c) Returning systems to automatic mode	2	20	0	1
T+17:10	Verify correction	Communications:				
		(a) Voice communication between crew and ground	1	3	-3	0
T+17:15	Systems and log checks	Systems and Log Checks:				
		(a) Systematic checking of overall system performance	1	399	-1	0
		(b) Recording readings on all instruments and counters	1	309	-2	1
T+19:00	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+21:00	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+21:15	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	309	-2	1
T+23:00	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+25:00	Star fix 4	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+25:15	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	309	-2	1
T+27:00	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+29:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+29:15	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	309	-2	1
T+31:00	Star fix 7	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+33:00	Star fix 8	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+33:15	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	309	-2	1
T+34:00	Trajectory and correction determination 3	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Aligning inertial platform	1	14	1	-1
T+34:30	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	399	-1	0
T+34:50	Prepare for and initiate correction 3	Flight Control:				
		(a) Setting systems to manual mode	2	26	0	0
		(b) Control maneuver--firing initiation	2	21	1	-1
		(c) Returning systems to automatic mode	2	20	0	1
T+35:10	Verify correction	Communications:				
		(a) Voice communication between crew and ground	1	3	-3	0

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+35:15	Systems check	Systems Check: (a) Systematic checking of overall system performance	2	399	-1	0
T+36:00	Star fix 1	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+37:00	Log check	Log Check: (a) Recording readings on all instruments and counters	1	309	-2	1
T+38:00	Star fix 2	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+40:00	Star fix 3	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+41:00	Log check	Log Check: (a) Recording readings on all instruments and counters	1	309	-2	1
T+42:00	Star fix 4	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+44:00	Star fix 5	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+45:00	Log check	Log Check: (a) Recording readings on all instruments and counters	1	309	-2	1
T+46:00	Star fix 6	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+48:00	Star fix 7	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry or data into computer	1	1	-3	-1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+48:00	Log check	Log Check: (a) Recording readings on all instruments and counters	1	309	-2	1
T+48:30	Log check	Log Check: (a) Recording readings on all instruments and counters	1	309	-2	1
T+49:15	Trajectory and correction determination 4	Navigation: (a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Aligning of inertial platform	1	14	1	-1
T+49:45	Systems check	Systems Check: (a) Systematic checking of overall system performance	2	399	-1	0
T+50:05	Preparation for and initiation of correction 4	Flight Control: (a) Setting systems to manual mode	2	26	0	0
		(b) Control maneuver--firing initiation	2	21	1	-1
		(c) Returning systems to automatic mode	2	20	0	1
T+50:20	Verify correction	Communications: (a) Voice communication between crew and ground	1	3	-3	0
T+50:30	Systems check	Systems Check: (a) Systematic checking of overall system performance	1	399	-1	0
T+51:00	Star fix 1	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+52:15	Log check	Log Check: (a) Recording readings on all instruments and counters	1	309	-2	1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+55:00	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+56:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	309	-2	1
T+61:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+63:00	Star fix 7	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+64:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	309	-2	1
T+64:40	Trajectory and correction determination 5	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Aligning inertial platform	1	14	1	-1
T+65:10	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	1	399	-1	0
T+65:30	Preparation for and initiation of approach correction	Flight Control:				
		(a) Setting systems to manual mode	2	26	0	0
		(b) Control maneuver--firing initiation	2	21	1	-1
		(c) Returning systems to automatic mode	2	20	0	1
T+65:45	Verify correction	Communications:				
		(a) Voice communication between crew and ground	1	3	-3	0

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
	Transfer to LEM	Crew Transfer:				
		(a) Transfer of crew member to LEM	2	9	1	-1
T+65:55	Systems check	Systems Check:				
		(a) Systematic check of overall system performance (LEM)	1	126	-1	0
	Transfer to CM	Crew Transfer:				
		(a) Transfer of crew member to CM	2	9	1	-1
	LUNAR ORBIT					
T+66:30	Preparation for and insertion into LO	Navigation and Flight Control:				
		(a) Aligning inertial platform	1	14	1	-1
		(b) Setting systems to manual mode	2	25	0	0
		(c) Control maneuver--firing initiation	2	23	1	-1
		(d) Returning systems to automatic mode	2	21	0	1
T+67:00	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	399	-1	0
T+67:24	Orbital determination	Navigation:				
		(a) Star and landmark fixes (5)	1	140	00000	-1
		(b) Entry of data into computer	1	5	-3	-1
		(c) Comparison of ground and onboard data	1	65	0	-1
T+67:48	Transfer to LEM	Crew Transfer:				
		(a) Transfer of crew member to LEM	2	9	1	-1
		Systems and Log Checks:				
		(a) Systematic checking of overall system performance (LEM)	1	126	-1	0

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
		(b) Recording readings on all instruments and counters (LEM)	1	231	-2	1
T+68:24	Preseparation-transfer to LEM	Crew Transfer: (a) Transfer of crew member to LEM	2	9	1	-1
		Navigation: (a) Alignment of IMU	2	14	1	-1
		(b) Entry of data into computer (LEM) (transfer of spacecraft ephemeris)	1	1	-1	-1
T+68:48	Separation of LEM from CSM	Flight Control: (a) Control maneuver--attitude	2	5	1	-1
T+68:54	Preparation for deorbit --attitude orientation	Flight Control: (a) Set systems to manual mode	2	11	0	0
		(b) Control maneuver--attitude	2	7	2	-1
		(c) Return systems to automatic mode	2	7	0	1
T+68:54	Log check	Log Check: (a) Recording readings on all instruments and counters	2	231	-2	0
T+69:18	Deorbit thrust	Flight Control: (a) Control maneuver--firing initiation	2	30	1	-1
T+69:19	Deorbit coast	Navigation: (a) Determination of trajectory	1	16	-1	-1
T+69:48	Deorbit coast	Communications: Crew may communicate with Apollo or earth simultaneously while performing flight and monitoring	1	3	-3	0

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+70:00	Braking	Flight Control:				
		(a) Setting systems to maneuver mode	2	4	0	0
		(b) Control maneuver--enabling	2	29	0	-1
		Navigation:				
		(a) Landmark fixes	1	1	-1	-1
		(b) Entry of data into computer				
T+70:04	Deorbit terminal phase	Communications:				
		(a) Selection of appropriate antennas for the communication systems used	1	5	-2	0
		(b) Voice communication between crew and ground	1	3	-3	0
T+70:10	Hover, descent	Flight Control:				
		(a) Setting systems to manual mode	2	7	0	0
		(b) Control maneuver--attitude, translation, thrust	2	27	2	-1
T+70:12	Landing	Flight Control				
		(a) Control maneuver--attitude translation, thrust	2	22	2	-1
		Communications:				
		(a) Voice communication between crew and ground	1	3	-3	0
T+70:25	Post-touchdown check	Systems and Log Checks:				
		(a) Systematic checking of overall system performance	2	359	-1	2
		(b) Recording readings on all instruments and counters	2	309	3	3
T+71:00	Scientific mission	Scientific:				
		(a) Observation	2		3	2
		(b) Collection of samples	2		3	2
		(c) Implanting instruments	2		3	2

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
		Communications:				
		(a) Voice communication between crew and ground	1		2	2
	LAUNCH					
T+116:00	Prelaunch	Navigation:				
		(a) Apollo star and landmark fixes	2	31	0	-1
		(b) Entry of data into computer	1	1	-3	-1
		(c) Obtaining (ascent) trajectory data	1	22	-1	-1
		(d) Comparison of CM and onboard data	1	13	0	-1
		(e) Aligning inertial platform (IMU)	1	14	1	-1
T+116:30	Systems and log checks	Systems and Log Checks:				
		(a) Systematic checking of overall system performance (LEM)	2	126	-1	0
		(b) Recording readings on all instruments and counters (LEM)	2	231	-2	1
T+118:12	Launch	Flight Control:				
		(a) Setting systems to maneuver mode	2	17	0	0
		(b) Control maneuver--firing initiation	2	2	1	-1
		(c) Return systems to automatic mode	2	3	0	1
		Communications:				
		(a) Voice communication between crew, Apollo or ground	1	3	-3	0
T+118:27	Orbit transfer	Flight Controls:				
		(a) Setting systems to maneuver mode	2	17	0	0
		(b) Control maneuver--enabling	2	2	0	-1
		(c) Returning systems to automatic mode	2	3	0	1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+118:30	Ascent coast	Navigation:				
		(a) Apollo fixes (rendezvous radar)	1	3	0	-1
		(b) Entry of data into computer	1	1	-3	-1
		(c) Determine trajectory corrections.	1	16	-2	-1
T+118:48	Systems check	Systems Check:				
		(a) Systematic check of overall system performance	2	126	-1	0
T+119:12	Rendezvous	Flight Control:				
		(a) Setting systems to manual mode	2	7	0	0
		(b) Control maneuver--attitude, translation, thrust	2	25	2	-1
T+119:18	Docking	Flight Control:				
		(a) Control maneuver--attitude, translation, thrust	2	25	2	-1
		(b) Returning systems to automatic mode	2	3	0	0
	LUNAR PARKING ORBIT	Communications:				
		(a) Voice communication between crew and Apollo	1	3	-3	0
T+119:24	Transfer to CM	Crew Transfer:				
		(a) Transfer of crew members to CM	3	14	1	-1
T+119:40	LEM separation	Flight Control:				
		(a) Control maneuver--firing initiation, thrust	2	4	1	-1
T+119:45	Determine TE insertion data	Navigation:				
		(a) Obtaining trajectory data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Alignment of inertial platform	1	14	1	-1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
		System Checks: (a) Systematic checking of overall system performance	2	399	-1	0
T+120:15	Insertion into TE trajectory	Flight Control (a) Setting system to manual mode	2	26	0	0
		(b) Control maneuver--firing initiation	2	21	1	-1
		(c) Returning systems to automatic mode	2	20	0	1
	Verify insertion	Communications: (a) Voice communications between crew members and ground	1	3	-3	0
T+120:30	Systems check	Systems and Log Checks: (a) Systematic checking of overall system performance	1	399	-1	0
		(b) Recording readings on all instruments and counters	1	309	-2	0
	TRANSEARTH TRAJECTORY					
T+121:00	Star fix 1	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+121:48	Star fix 2	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+122:36	Star fix 3	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+123:24	Star fix 4	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+124:12	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+124:30	Log check	Log Check:				
		(a) Recording reading on all instruments and counters	1	309	0 -2	1
T+125:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+125:30	Trajectory and course correction determination 1	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Alignment of inertial platform	1	14	1	-1
T+125:55	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	399	-1	0
T+126:15	Prepare for and initiate correction 1	Flight Control:				
		(a) Setting systems to manual mode	2	26	0	0
		(b) Control maneuver initiate firing	2	21	1	-1
		(c) Returning systems to automatic mode	2	20	0	1
T+126:30	Verify correction	Communications:				
		(a) Voice communication between crew and ground	1	3	-3	0
T+126:40	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	1	399	-1	0
T+127:10	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+128:40	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+129:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	309	-2	1
T+130:00	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+131:00	Star fix 4	Navigation				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+132:30	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+134:00	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	309	-2	1
T+134:30	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+135:00	Trajectory and correction determination 2	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Aligning of inertial platform	1	14	1	-1
T+135:30	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	1	399	-1	0

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+135:50	Preparation for and initiation of correction 2	Flight Control:				
		(a) Setting systems to manual mode	2	26	0	0
		(b) Control maneuver (attitude and thrust)	2	21	1	-1
		(c) Returning systems to automatic mode	2	20	0	1
T+136:00	Verify correction	Communications:				
		(a) Voice communication between crew and ground	1	3	-3	0
T+136:10	Systems check	Systems Check:				
		(a) Systematic check of over-all system performance	2	399	-1	0
T+137:00	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+138:00	Log check	Log Check:				
		(a) Record readings on all instruments and counters	1	309	-2	1
T+139:00	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+141:00	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+142:00	Log check	Log Check:				
		(a) Record readings on all instruments and counters	1	309	-2	1
T+143:00	Star fix 4	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+146:00	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+146:30	Log check	Log Check:				
		(a) Record readings on all instruments and counters	1	309	-2	1
T+149:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+150:00	Log check	Log Check:				
		(a) Record readings on all instruments and counters	1	309	-2	1
T+151:30	Trajectory and correction determination 3	Navigation:				
		(a) Obtaining trajectory and correction parameters	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Alignment of inertial platform	1	14	1	-1
T+152:00	Systems check	Systems Check:				
		(a) Recording readings on all instruments and counters	1	399	-1	0
T+152:20	Prepare for and initiate correction 3	Flight Control:				
		(a) Set system to manual mode	2	26	0	0
		(b) Control maneuver firing initiation	2	21	1	-1
		(c) Return systems to automatic mode	2	20	0	1
T+152:35	Verify correction	Communications:				
		(a) Voice communication between crew and ground	1	3	-3	0

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+152:45	Systems check	Systems Check: (a) Systematic check of overall system performance	1	399	-1	0
T+154:00	Log check	Log Check: (a) Recording readings on all instruments and counters	1	309	-2	1
T+155:00	Star fix 1	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+157:30	Star fix 2	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+158:00	Log check	Log Check: (a) Recording readings on all instruments and counters	1	309	-2	1
T+159:00	Star fix 3	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+162:00	Star fix 4	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+162:30	Log check	Log Check: (a) Recording readings on all instruments and counters	1	309	-2	1
T+165:00	Star fix 5	Navigation: (a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+166:00	Log check	Log Check: (a) Recording readings on all instruments and counters	1	309	-2	1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+167:30	Star fix	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+168:00	Trajectory and correction determination	Navigation:				
		(a) Obtaining trajectory and correction parameters	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Alignment of inertial platform	1	14	1	-1
T+168:30	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	399	-1	0
T+168:50	Prepare for and initiate correction	Flight Control:				
		(a) Setting systems to manual mode	2	26	0	0
		(b) Control maneuver--initiate firing	2	21	1	-1
		(c) Return system to automatic mode	2	20	0	1
T+169:05	Verify correction	Communications:				
		(a) Voice communication between crew and ground	1	3	-3	0
T+169:15	Systems and log checks	Systems and Log Checks:				
		(a) Systematic checking of overall system performance	1	399	-1	0
		(b) Recording readings on all instruments and counters	1	309	-2	1
T+170:30	Star fix 1	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+172:00	Star fix 2	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+173:30	Star fix 3	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+174:00	Log check	Log Check:				
		(a) Recording readings of all instruments and counters	1	309	-2	1
T+175:00	Star fix 4	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+176:30	Star fix 5	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+178:00	Star fix 6	Navigation:				
		(a) Star fix	1	28	0	-1
		(b) Entry of data into computer	1	1	-3	-1
T+178:10	Log check	Log Check:				
		(a) Recording readings on all instruments and counters	1	309	-2	1
T+178:30	Re-entry correction determination	Navigation:				
		(a) Obtaining trajectory and correction data	1	22	-1	-1
		(b) Comparison of ground and onboard data	1	13	0	-1
		(c) Alignment of inertial platform	1	14	1	-1
T+179:00	Systems check	Systems Check:				
		(a) Systematic checking of overall system performance	2	399	-1	0
T+179:20	Re-entry correction	Flight Control:				
		(a) Set system to manual mode	2	26	0	0
		(b) Control maneuver--initiate firing	2	21	1	-1
		(c) Returning systems to automatic mode	2	20	0	1

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
T+179:35	Verify correction	Communications: (a) Voice communication between crew and ground	1	3	-3	0
T+179:45	Systems and log checks	Systems and Log Checks: (a) Systematic checking of overall system performance	1	399	-1	0
		(b) Recording readings on all instruments and counters	1	309	-2	1
	RE-ENTRY					
T+181:45	Preparation for re-entry--separate SM	Flight Control: (a) Set systems to manual mode	2	31	0	0
		(b) Control maneuver--enabling	2	18	0	-1
T+182:00	Reorientation for, and initiation of re-entry	Flight Control: (a) Control maneuver--attitude	2	41	2	-1
	LANDING					
T+182:24	Deploy drogue and main chutes	Flight Control: (a) Control maneuver--enabling	2	8	0	-1
T+182:30	Landing	Flight Control: (a) Control maneuver--translation	2	8	2	-1
		Communications: (a) Voice communication between crew and ground control	1	3	-3	0
	Touchdown and recovery	Communications: (a) Voice communication between crew and recovery crew	1	3	-3	0
T+183:00	Systems and log checks	Systems and Log Checks: (a) Systematic checking of overall system performance	3	120	-1	0

LOR TASK ANALYSIS (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
		Log Check: (a) Recording readings on all instruments and counters	3	309	-2	1

APPENDIX B

SEVEN MALFUNCTION SITUATIONS

FOR

LOR AND DF MODES

DF MALFUNCTION--LUNAR ORBIT INSERTION ENGINE FAILURE

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
119:12	LO insertion engine failure	Communications:				
		(a) Voice communication between crew and ground	1	3	-3	2
		Flight Control:				
		(a) Switch to another mode	1	3	0	1
		(b) Firing enable	1	3	0	1
		(c) Switch to automatic	1	3	0	1
		Follow DF transearth plan as presented in Appendix A.				
		DF MALFUNCTION--PARTIAL POWER FAILURE AFTER LANDING				
74:12	Part landing power failure	Communication:				
		(a) Voice communication between lunar crew	2	3	-3	2
74:13	Cut off unessential power	Switch power off unessential items	1	5	0	1
74:15	Prelaunch	Go to DF Schedule T+116:00 hr presented in Appendix A				
		DF MALFUNCTION--LANDING ENGINE FAILURE				
70:10	Landing engine failure	Flight Control:				
		(a) Setting systems to abort mode	2	5	0	1
		(b) Control maneuver attitude and thrust	2	34	2	1
		(c) Returning system to appropriate mode	2	2	0	2
70:16	Ascent coast	Navigation:				
		(a) Star and landmark fixes	1	28	0	1
		(b) Entry of data into computer	1	1	-3	1
		(c) Obtaining trajectory and correction data	1	22	-1	1

DF MALFUNCTION--LANDING ENGINE FAILURE (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
71:00	Lunar verification	Communication: (a) Voice communication between crew and ground	1	3	-3	2
		The abort maneuver lasts until the craft is in lunar orbit, then returns to DF tasks presented in Appendix A.				
		DF MALFUNCTION--LUNAR EXPLORATION ONE MAN INCAPACITATED				
90:12	Lunar exploration one man injured	Communication: (a) Voice communication between crew on lunar surface	2	3	-3	2
90:13	Prepare to secure injured man	Rescue Injured Man: (a) Secure and activate back pack	1	5	Cannot specify	
		(b) Decompress cabin	1	1	Cannot specify	
		(c) Go to man	1	Cannot specify	Cannot specify	
		(d) Assist man back to craft	2	Cannot specify	Cannot specify	
		(e) Enter craft and injured man aided	2	Cannot specify	Cannot specify	
91:00	Prelaunch	See DF for ascent and return. All entries in the number of "Crew Members Involved" column are 1 from this point. Other columns remain the same as presented in Appendix A.				
		DF MALFUNCTION--METEOROID FAILURE				
92:12	Meteoroid penetration	Communication: (a) Voice communication between crew and ground	2	3	-3	2
92:12:10	Initiate suit operation	(a) Secure suit and helmet, and activate backpack.	2	5	0	1

DF MALFUNCTION--METEOROID FAILURE (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
		(b) Secure cabin pressurization system	1	one	0	1
92:15	Prelaunch	From this normal flight schedule, is put into operation				
		DF MALFUNCTION--LUNAR ORBIT INSERTION PARTIAL ECS FAILURE				
66:30	Lunar orbit insertion partial ECS failure	Flight Control:				
		(a) Setting systems to maneuver mode	2	7	0	1
		(b) Controlling maneuver (enabling)	2	38	0	1
		(c) Secure backpack and activate same	2	5	0	1
		(d) Turn off suit and cabin circulation system	2	2	0	1
		(e) Return system to auto mode	2	3	0	3
		(f) Decompress and recompress to remove atmosphere contamination	1	2	0	1
		(g) Jettison landing stage	1	2	+1	1
		Continue regular DF plan to 68:00 hr, then resume at t+119:20 hr, as presented in Appendix A				
		DF MALFUNCTION--GUIDANCE SYSTEM FAILURE				
34:50	Trajectory and correction determination guidance system failure	Flight Control:				
		(a) Control maneuver enabling and manual cutoff of engine	2	36	0	1
		(b) Returning system to automatic mode	2	3	0	3
		Continue with DF plan and increase number of job elements for control maneuver by 2 (watch time, switch engine off) for each correction thereafter				
65:55		See DF after this system check				

DF MALFUNCTION--GUIDANCE SYSTEM FAILURE (continued)

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
66:00		Jettison lander during circum-navigation	1	2	0	1
		Bypass lunar orbit insertion, etc., deorbit landing ascent, etc., and resume flight plan at log check 120				
67:00	Log check	Log Check: (a) Recording readings on all instruments and dials	1	206	-2	3
		Continue DF				

LOR MALFUNCTION--METEOROID PENETRATION

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
92:12:00	Meteoroid penetration	Communication: (a) Voice communication between crew and ground	2	3	-3	2
92:12:10	Initiate suit operation	(a) Secure suit and helmet, and activate suit supply system	2	5	0	1
		(b) Secure cabin pressurization system	1	1	0	1
92:15	Prelaunch preparation	From this point, normal flight schedule is put into operation for LOR as presented in Appendix A				
		LOR MALFUNCTION--LANDING ENGINE FAILURE				
70:10	Landing engine failure	Flight Control: (a) Setting systems to abort mode	2	5	0	1
		(b) Control maneuver	2	34	+2	1
		(c) Returning system to appropriate mode	2	2	0	3
71:50	Rendezvous	Flight Control: (a) Controlling maneuver, altitude, thrust, and translation	2	25	2	1
		Continue LOR at 119:18 hr as presented in Appendix A				
		LOR MALFUNCTION--PARTIAL POWER FAILURE				
74:12	Postlanding power failure	Communication: (a) Voice communication between lunar crew	2	3	-3	2
74:13	Cut off unessential power	Switch power off unessential systems	1	5	0	1
74:15	Prelaunch	Go to LOR prelaunch schedule, 116 hr as presented in Appendix A				

LOR MALFUNCTION--ONE CREW MEMBER DISABLED

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
90:12	Lunar exploration, one man injured	Communication:				
		(a) Voice communication between lunar crew	2	3	-3	2
90:13	Prepare to rescue injured man	Rescue Injured Man:				
		(a) Secure and activate backpack	1	5	Cannot specify	
		(b) Decompress cabin	1	1	Cannot specify	
		(c) Go to man	1	Cannot specify	Cannot specify	
		(d) Assist man back to craft	2	Cannot specify	Cannot specify	
		(e) Enter craft and aid injured man	2	Cannot specify	Cannot specify	
91:00	Prelaunch.	See DF in Appendix A for lunar ascent and return. All entries in "Crew Members Involved" column are 1 from this point. Other columns remain the same				

LOR MALFUNCTION--LUNAR ORBIT INSERTION PARTIAL ECS FAILURE

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
66:30	Lunar orbit insertion Partial ECS failure	Flight Control:				
		(a) Setting system to maneuver mode	2	7	0	2
		(b) Controlling maneuver (enabling)	2	38	0	1
		(c) Secure backpack and activate same	2	5	0	1
		(d) Turn off suit and cabin circulation system	2	2	0	1
		(e) Return system to automatic mode	2	3	2	3
		(f) Decompress and recompress to remove atmosphere contamination	1	2	+1	1
		(g) Jettison				
		Continue regular LOR flight plan to 68:00 hr, then resume at 119:20 as presented in Appendix A				

LOR MALFUNCTION--GUIDANCE SYSTEM FAILURE

Mission Time	Mission Phase and System Function	Task	Crew Member(s) Involved	No. of Job Elements	Task Complexity	Performance Level Required
34:50	Third trajectory and correction determination of guidance system failure	Flight Control:	2			
		(a) Control maneuver enabling and manual cutoff engine	2	36	0	1
		(b) Return system to automatic mode	2	3	0	3
		Continue with DF plan and increase "No. of Job Elements" for control maneuver during subsequent corrections by 2				
65:55		See DF, page A- after this system check				
66:00		Jettison lander during circumnavigation	1	2	1	1
		Bypass lunar orbit insertion, deorbit, landing ascent, etc., and resume DF plan at 120:00				
67:00	Log check	Log Check:				
		(a) Recording readings on all instruments and dials	1	206	-2	3
		Continue DF. See page A- to landing and increase control maneuvers during all corrections by 2				
		LOR MALFUNCTION--LUNAR ORBIT INSERTION ENGINE FAILURE				
119:12	LO insertion engine failure	Communication:				
		(a) Voice communication between crew and Apollo	2	3	-3	2
119:13	CSM prepare	Flight Control:				
		(a) Setting systems to read mode	2	3	0	1
		(b) Controlling maneuver altitude thrust translation	2	4	+2	
		Resume normal operation from this point as presented in Appendix A				