

K-V-05.10/7



**JOHN F. KENNEDY
SPACE CENTER**

LAUNCH MISSION RULES

APOLLO 12

(SA-507/CSM-108/LM-6)


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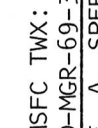
REV	ITEM	DESCRIPTION
	K-V-05.10/7	<p style="text-align: center;"><u>LAUNCH MISSION RULES</u></p> <p style="text-align: center;">APOLLO 12</p> <p style="text-align: center;">(SA-507/CSM-108/LM-6)</p> <p>THIS DOCUMENT CONSTITUTES THE BASIC ISSUANCE OF THE LAUNCH MISSION RULES FOR THE APOLLO 12 MISSION. REVISIONS TO THIS DOCUMENT, INCLUDING SHORT-CYCLE CHANGES, WILL BE ACCOMPLISHED IN ACCORDANCE WITH THE PROVISIONS OF THE KSC APOLLO/SATURN LAUNCH MISSION RULES HANDBOOK.</p> <p>FOR MATTERS PERTAINING TO TECHNICAL MANAGEMENT, CONTENT, PROCEDURES, COORDINATION, AND ASSOCIATED DISCUSSION RELATIVE TO THE LAUNCH MISSION RULES, CONTACT MR. G. W. KNIGHT, TEST PLANNING OFFICE (LO-PLN), KENNEDY SPACE CENTER, 867-5512.</p> <p>WRITTEN JUSTIFICATION FOR ADDITIONAL COPIES OR FOR CHANGES IN DISTRIBUTION OF THIS DOCUMENT SHOULD BE DIRECTED THROUGH THE PROPER CHANNELS TO THE DIRECTOR OF LAUNCH OPERATIONS (LO), KENNEDY SPACE CENTER.</p> <p>THIS DOCUMENT WILL NOT BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE WRITTEN APPROVAL OF THE DIRECTOR OF LAUNCH OPERATIONS (LO), KENNEDY SPACE CENTER.</p> <p style="text-align: right;">APPROVED BY: <u>W. J. Kapryan</u> W. J. KAPRYAN DIRECTOR OF LAUNCH OPERATIONS (LO) JOHN F. KENNEDY SPACE CENTER, NASA</p>

MISSION APOLLO 12	SECTION APPROVAL PAGE	STAGE SUBSECTION APPROVAL PAGE	SYSTEM	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 1
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JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV ITEM	DESCRIPTION				
	<p>K-V-05.10/7</p> <p><u>LAUNCH MISSION RULES</u></p> <p>APOLLO 12</p> <p>(SA-507/CSM-108/LM-6)</p> <p><u>REVISION A</u></p> <p>THIS PACKAGE CONSTITUTES REVISION A TO THE BASIC ISSUANCE OF THE LAUNCH MISSION RULES FOR THE APOLLO 12 MISSION. REVISION A IS A PAGE-REPLACEMENT FULL-DISTRIBUTION REVISION. SPECIFIC REVISION INSTRUCTIONS ARE CONTAINED ON PAGE 1c.</p> <p>CONCURRENCE: <u>C. M. Lee</u> C. M. LEE APOLLO MISSION DIRECTOR OFFICE OF MANNED SPACE FLIGHT</p> <p>APPROVED BY: <u>W. J. Kapryan</u> W. J. KAPRYAN DIRECTOR OF LAUNCH OPERATIONS (LO) JOHN F. KENNEDY SPACE CENTER, NASA</p> 				
MISSION APOLLO 12	SECTION APPROVAL PAGE	STAGE SUBSECTION APPROVAL PAGE	SYSTEM	DATE CHANGE NO. REVISION A OCTOBER 17, 1969	PAGE 1a

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	DESCRIPTION	MISSION	STAGE SUBSECTION	SECTION	SYSTEM	DATE CHANGE NO. REVISION A OCTOBER 17, 1969	PAGE 1b
K-V-05.10/7	<p style="text-align: center;"><u>LAUNCH MISSION RULES</u></p> <p style="text-align: center;">APOLLO 12</p> <p style="text-align: center;">(SA-507/CSM-108/LM-6)</p> <p>CONCURRENCE:  CHRISTOPHER C. KRAFT, JR. DIRECTOR OF FLIGHT OPERATIONS (FA) MANNED SPACECRAFT CENTER</p> <p>VIA MSFC TWX: CONCURRENCE: PM-MO-MGR-69-3, 13/1922Z OCT 69 DR. F. A. SPEER MANAGER, MISSION OPERATIONS (PM-MO-MGR) MARSHALL SPACE FLIGHT CENTER</p> <p>CONCURRENCE:  E. R. MATHEWS APOLLO PROGRAM MANAGER (AP) JOHN F. KENNEDY SPACE CENTER, NASA</p>	APOLLO 12	CONCURRENCE PAGE				

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
<u>REVISION INSTRUCTIONS</u>		
<u>REPLACE CORRESPONDING BASIC PAGES WITH FOLLOWING REVISION A PAGES:</u>		
ii	1-13	3-6 THRU 3-7 4-4 B-1 THRU B-2
	2-20	3-18
	2-23 THRU 2-27	3-23
	2-33 THRU 2-34	3-38 THRU 3-39
	2-52 THRU 2-53	3-48
	2-62	3-51 THRU 3-53
		3-55
		3-57 THRU 3-59
		3-61 THRU 3-62
		3-66 THRU 3-67
		3-72
		3-74
		3-78
		3-84
		3B-4 THRU 3B-5
<u>ADD FOLLOWING NEW REVISION A PAGES:</u>		
ia, ib, ic		

MISSION APOLLO 12	SECTION	STAGE SUBSECTION REVISION INSTRUCTIONS	SYSTEM	PAGE CHANGE NO. REVISION A OCTOBER 17, 1969	PAGE ic
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JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION																																																																																																																																																																																								
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TOTAL NUMBER OF PAGES IN LMRD (INCLUDING REVISION A): 265																																																																																																																																																																																										
		<table border="1"> <thead> <tr> <th><u>PAGE NO.</u></th> <th><u>ISSUANCE</u></th> <th><u>PAGE NO.</u></th> <th><u>ISSUANCE</u></th> </tr> </thead> <tbody> <tr><td>1</td><td>BASIC</td><td>3-8</td><td>THRU 3-17</td><td>BASIC</td></tr> <tr><td>1a</td><td>REV A</td><td>3-18</td><td>THRU 3-17</td><td>REV A</td></tr> <tr><td>1ia</td><td>BASIC</td><td>3-19</td><td>THRU 3-22</td><td>BASIC</td></tr> <tr><td>1-13</td><td>REV A</td><td>3-23</td><td>THRU 3-22</td><td>REV A</td></tr> <tr><td>1-14</td><td>BASIC</td><td>3-24</td><td>THRU 3-37</td><td>BASIC</td></tr> <tr><td>2-1</td><td>BASIC</td><td>3-38</td><td>THRU 3-39</td><td>REV A</td></tr> <tr><td>2-20</td><td>REV A</td><td>3-40</td><td>THRU 3-47</td><td>BASIC</td></tr> <tr><td>2-21</td><td>BASIC</td><td>3-48</td><td>THRU 3-50</td><td>REV A</td></tr> <tr><td>2-23</td><td>REV A</td><td>3-49</td><td>THRU 3-50</td><td>BASIC</td></tr> <tr><td>2-28</td><td>BASIC</td><td>3-51</td><td>THRU 3-53</td><td>REV A</td></tr> <tr><td>2-33</td><td>REV A</td><td>3-54</td><td>THRU 3-53</td><td>BASIC</td></tr> <tr><td>2-35</td><td>BASIC</td><td>3-55</td><td>THRU 3-59</td><td>REV A</td></tr> <tr><td>2-52</td><td>REV A</td><td>3-56</td><td>THRU 3-59</td><td>BASIC</td></tr> <tr><td>2-54</td><td>BASIC</td><td>3-57</td><td>THRU 3-59</td><td>REV A</td></tr> <tr><td>2-62</td><td>REV A</td><td>3-60</td><td>THRU 3-62</td><td>BASIC</td></tr> <tr><td>2-63</td><td>BASIC</td><td>3-61</td><td>THRU 3-62</td><td>REV A</td></tr> <tr><td>3-1</td><td>BASIC</td><td>3-63</td><td>THRU 3-65</td><td>BASIC</td></tr> <tr><td>3-6</td><td>REV A</td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td>3-66</td><td>THRU 3-67</td><td>REV A</td></tr> <tr><td></td><td></td><td>3-68</td><td>THRU 3-71</td><td>BASIC</td></tr> <tr><td></td><td></td><td>3-72</td><td></td><td>REV A</td></tr> <tr><td></td><td></td><td>3-73</td><td></td><td>BASIC</td></tr> <tr><td></td><td></td><td>3-74</td><td></td><td>REV A</td></tr> <tr><td></td><td></td><td>3-75</td><td>THRU 3-77</td><td>BASIC</td></tr> <tr><td></td><td></td><td>3-78</td><td></td><td>REV A</td></tr> <tr><td></td><td></td><td>3-79</td><td>THRU 3-83</td><td>BASIC</td></tr> <tr><td></td><td></td><td>3-84</td><td></td><td>REV A</td></tr> <tr><td></td><td></td><td>3B-1</td><td>THRU 3B-3</td><td>BASIC</td></tr> <tr><td></td><td></td><td>3B-4</td><td>THRU 3B-5</td><td>REV A</td></tr> <tr><td></td><td></td><td>3B-6</td><td></td><td>BASIC</td></tr> <tr><td></td><td></td><td>4-1</td><td>THRU 4-3</td><td>BASIC</td></tr> <tr><td></td><td></td><td>4-4</td><td></td><td>REV A</td></tr> <tr><td></td><td></td><td>4-5</td><td>THRU 4-13</td><td>BASIC</td></tr> <tr><td></td><td></td><td>A-1</td><td>THRU A-2</td><td>BASIC</td></tr> <tr><td></td><td></td><td>B-1</td><td>THRU B-2</td><td>REV A</td></tr> <tr><td></td><td></td><td>C-1</td><td>THRU C-5</td><td>BASIC</td></tr> </tbody> </table>	<u>PAGE NO.</u>	<u>ISSUANCE</u>	<u>PAGE NO.</u>	<u>ISSUANCE</u>	1	BASIC	3-8	THRU 3-17	BASIC	1a	REV A	3-18	THRU 3-17	REV A	1ia	BASIC	3-19	THRU 3-22	BASIC	1-13	REV A	3-23	THRU 3-22	REV A	1-14	BASIC	3-24	THRU 3-37	BASIC	2-1	BASIC	3-38	THRU 3-39	REV A	2-20	REV A	3-40	THRU 3-47	BASIC	2-21	BASIC	3-48	THRU 3-50	REV A	2-23	REV A	3-49	THRU 3-50	BASIC	2-28	BASIC	3-51	THRU 3-53	REV A	2-33	REV A	3-54	THRU 3-53	BASIC	2-35	BASIC	3-55	THRU 3-59	REV A	2-52	REV A	3-56	THRU 3-59	BASIC	2-54	BASIC	3-57	THRU 3-59	REV A	2-62	REV A	3-60	THRU 3-62	BASIC	2-63	BASIC	3-61	THRU 3-62	REV A	3-1	BASIC	3-63	THRU 3-65	BASIC	3-6	REV A						3-66	THRU 3-67	REV A			3-68	THRU 3-71	BASIC			3-72		REV A			3-73		BASIC			3-74		REV A			3-75	THRU 3-77	BASIC			3-78		REV A			3-79	THRU 3-83	BASIC			3-84		REV A			3B-1	THRU 3B-3	BASIC			3B-4	THRU 3B-5	REV A			3B-6		BASIC			4-1	THRU 4-3	BASIC			4-4		REV A			4-5	THRU 4-13	BASIC			A-1	THRU A-2	BASIC			B-1	THRU B-2	REV A			C-1	THRU C-5	BASIC
<u>PAGE NO.</u>	<u>ISSUANCE</u>	<u>PAGE NO.</u>	<u>ISSUANCE</u>																																																																																																																																																																																							
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		C-1	THRU C-5	BASIC																																																																																																																																																																																						
MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE																																																																																																																																																																																					
APOLLO 12		LIST OF EFFECTIVE PAGES		REVISION A	ii																																																																																																																																																																																					
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JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
<u>LIST OF EFFECTIVE PAGES (CONTINUED)</u>		
THE FOLLOWING LMRD ITEM NUMBERS HAVE BEEN INTENTIONALLY DELETED AND DO NOT APPEAR IN THIS DOCUMENT:		
<u>SECTION 1</u>		
1-517 Δ1-909		
<u>SECTION 2</u>		
2-102 THRU 2-110 2-113, 2-114 2-129 2-149 2-150 2-153 2-302 THRU 2-310 2-312 2-333, 2-334 Δ2-365 2-394 THRU 2-409 2-421, 2-422 2-424 THRU 2-430 2-438 2-445 THRU 2-447 2-501 2-503 2-506 2-516 2-520 2-549 2-552A 2-557 2-570, 2-571 2-701 2-704 Δ2-718, 2-719 2-764 THRU 2-766 2-910 2-917 THRU 2-921		
<u>SECTION 3</u>		
Δ3-602 Δ3-829 THRU 3-831 Δ3-809 THRU 3-824 Δ3-1211 Δ3-1212 3-1510 3-2304 Δ3-2309 3-2528 3-2529 3-2915 3-3901 3-3902 ΔREF 007A ΔREF 007B		
REF 035 THRU REF 037 REF 052 THRU REF 055		
<u>SECTION 4</u>		
4-115, 4-128 4-131 4-216 4-401 4-406 4-407		
MISSION APOLLO 12	SECTION	STAGE SUBSECTION LIST OF EFFECTIVE PAGES
SYSTEM	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE iia

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	PAGE
		<u>TABLE OF CONTENTS</u>	
		<u>SUBSECTION I: SPACE VEHICLE OPERATIONS</u>	
		INTRODUCTION	1-1
		MISSION RULES GUIDELINES	1-2 THRU 1-4
		GENERAL LAUNCH RULES	1-5 THRU 1-6
		LAUNCH WINDOW RESTRICTIONS	1-7
		WEATHER RESTRICTIONS	1-8 THRU 1-16
		RANGE SAFETY RULES AND AGREEMENTS	1-17 THRU 1-20
		FLIGHT CREW SAFETY RULES	1-21 THRU 1-33
		COMPLEX SAFETY RULES	1-34
		HOLD/CUTOFF GUIDELINES	1-35
		FUNCTIONAL SEQUENCE	1-36 THRU 1-40
		<u>SUBSECTION II: LAUNCH VEHICLE OPERATIONS</u>	
		GENERAL NOTES	2-1 THRU 2-2
		S-IC STAGE SYSTEMS	2-3
		S-IC REDLINES AND CATEGORIES	2-4 THRU 2-12
		S-II STAGE SYSTEMS	2-13
		S-II REDLINES AND CATEGORIES	2-14 THRU 2-37
		S-IVB STAGE SYSTEMS	2-38
		S-IVB REDLINES AND CATEGORIES	2-39 THRU 2-58
		IU STAGE SYSTEMS	2-59
		IU REDLINES AND CATEGORIES	2-60 THRU 2-75
		L/V GSE/ESE	2-76 THRU 2-90

KSC FORM 4-47A (REV. 1-78)

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	PAGE
		<u>TABLE OF CONTENTS (CONTINUED)</u>	
	<u>SUBSECTION TITLE</u>		
	<u>SECTION III: SPACECRAFT OPERATIONS</u>		
	GENERAL NOTES		3-1 THRU 3-2
	COMMAND AND SERVICE MODULE:		
	ELECTRICAL POWER SYSTEM		3-3 THRU 3-10, 3-49 THRU 3-50
	SEQUENTIAL CONTROL SYSTEM		3-11 THRU 3-14
	EARTH LANDING CONTROL SYSTEM		3-15 THRU 3-16
	ENVIRONMENTAL CONTROL SYSTEM		3-17 THRU 3-20
	GUIDANCE AND NAVIGATION SYSTEM		3-21 THRU 3-23
	STABILIZATION AND CONTROL SYSTEM		3-24 THRU 3-27
	CREW EQUIPMENT		3-28 THRU 3-29
	FLIGHT TECHNOLOGY		3-30 THRU 3-31
	SERVICE PROPULSION SYSTEM		3-32 THRU 3-34, 3-51, 3-52
	REACTION CONTROL SYSTEM		3-35 THRU 3-39, 3-53 THRU 3-55
	CREW SAFETY		3-40 THRU 3-41
	COMMUNICATIONS AND INSTRUMENTATION		3-42 THRU 3-44
	OPERATIONAL SUPPORT		3-45 THRU 3-48
	LUNAR MODULE:		
	ELECTRICAL POWER SYSTEM		3-56 THRU 3-59
	ENVIRONMENTAL CONTROL SYSTEM		3-60 THRU 3-62
	PRIMARY GUIDANCE NAVIGATION & CONTROL SYSTEM		3-63 THRU 3-64
	CONTROL ELECTRONICS		3-65 THRU 3-68
	ABORT GUIDANCE		3-69 THRU 3-70
	INSTRUMENTATION AND SCIENTIFIC EQUIPMENT		3-71 THRU 3-72
	RADAR NAVIGATION AND GUIDANCE SYSTEM		3-73 THRU 3-74
	ASCENT PROPULSION SYSTEM		3-75 THRU 3-76
	DESCENT PROPULSION SYSTEM		3-77 THRU 3-78
	REACTION CONTROL SYSTEM		3-79 THRU 3-82
	COMMUNICATIONS		3-83 THRU 3-84
	OPERATIONAL SUPPORT		3-85 THRU 3-86
	LM/SECTION A CURVES		3-87 THRU 3-99
	LM/SECTION B		3B-1 THRU 3B-6

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	PAGE
		<u>TABLE OF CONTENTS (CONTINUED)</u>	
		<u>SUBSECTION TITLE</u>	<u>PAGE</u>
		<u>SECTION IV: TECHNICAL SUPPORT OPERATIONS</u>	
		GENERAL NOTES	4-1
		LAUNCH SUPPORT	4-2 THRU 4-5
		INSTRUMENTATION SUPPORT	4-6 THRU 4-9
		INSTALLATION SUPPORT	4-10
		NON-KSC LAUNCH SUPPORT	4-11 THRU 4-13
		<u>APPENDICES</u>	
		DEFINITIONS	A-1 THRU A-2
		RELATED AND REFERENCE DOCUMENTATION	B-1
		ABBREVIATIONS AND ACRONYMS	C-1 THRU C-5
MISSION	SECTION	STAGE SUBSECTION	SYSTEM
APOLLO 12		TABLE OF CONTENTS	
			DATE CHANGE NO
			BASIC
			OCTOBER 2, 1969
			PAGE
			V

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE / CHANGE NO.	PAGE
		<p>SECTION I</p> <p>SPACE VEHICLE OPERATIONS</p>		SPACE VEHICLE				1-0

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<p><u>INTRODUCTION:</u></p> <p><u>PURPOSE:</u> LAUNCH MISSION RULES ARE DEVELOPED TO PROVIDE GUIDANCE TO THE LAUNCH DIRECTOR AND LAUNCH TEAM ORGANIZATION BY SPECIFYING PREPLANNED DECISIONS WHICH ARE DESIGNED TO MINIMIZE REAL TIME RATIONALIZATION REQUIRED WHEN NON-NOMINAL SITUATIONS OCCUR DURING THE LAUNCH COUNTDOWN AND APPLICABLE PRELAUNCH TESTS.</p> <p><u>AUTHORITY:</u> LAUNCH MISSION RULES ARE REQUIRED BY (OMSF) APOLLO PROGRAM DIRECTIVE NO. 46A, "APOLLO MISSION RULES," AND ARE DEVELOPED IN ACCORDANCE WITH KSC PROGRAM DIRECTIVE 8020.1, "APOLLO LAUNCH MISSION RULES," AND THE KSC APOLLO/SATURN LAUNCH MISSION RULES HANDBOOK.</p> <p><u>SCOPE:</u> LAUNCH MISSION RULES ARE BASED UPON THE PRIMARY OBJECTIVES SET FORTH IN THE APOLLO FLIGHT MISSION ASSIGNMENTS DOCUMENT (M-D MA 500-11), THE DETAILED TEST OBJECTIVES SET FORTH IN APPLICABLE MANNED SPACE FLIGHT (MSF) CENTER DIRECTIVES, AND THE OBJECTIVE OF MAINTAINING A HIGH DEGREE OF CONFIDENCE IN CREW SAFETY AND IN CONDUCT OF PRELAUNCH AND LAUNCH OPERATIONS. LAUNCH MISSION RULES APPLY TO ALL OPERATIONAL ELEMENTS INVOLVED IN THE COUNTDOWN AND LAUNCH OF APOLLO/SATURN SPACE VEHICLES.</p> <p><u>EFFECTIVITY PERIOD:</u> THE LAUNCH MISSION RULES EFFECTIVITY PERIOD FOR THE LAUNCH COUNTDOWN BEGINS AT LAUNCH VEHICLE POWER UP (APPROXIMATELY T-24 HOURS). FOR MANUAL CUTOFF ACTIONS PRIOR TO IGNITION, THE EFFECTIVITY PERIOD ENDS AT T-11 SECONDS (2.1 SECONDS PRIOR TO S-IC TIME FOR IGNITION, THEREBY ALLOWING SUFFICIENT OBSERVER/MONITOR/PANEL OPERATOR REACTION TIME TO EFFECT A MANUAL CUTOFF). FOR ABORT ACTIONS, THE EFFECTIVITY PERIOD ENDS WHEN THE SPACE VEHICLE REACHES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER. SPACE VEHICLE ELEMENTS OR OPERATIONAL SUPPORT ELEMENTS THAT ARE VERIFIED PRIOR TO THE ABOVE EFFECTIVITY PERIOD DO NOT REQUIRE LAUNCH MISSION RULES DEVELOPMENT BECAUSE OF THE NON-CRITICAL TIME ELEMENT INVOLVED IN MAKING DECISIONS PRIOR TO THIS PHASE OF OPERATIONS.</p> <p>THE LAUNCH MISSION RULES EFFECTIVITY PERIOD FOR THE COUNTDOWN DEMONSTRATION TEST (CDDT) IS THE SAME AS THAT SPECIFIED ABOVE. HOWEVER, ABNORMAL CONDITIONS OR MALFUNCTIONS COVERED BY LAUNCH MISSION RULES WILL BE REPORTED AND NOTED, AND HOLDS MAY BE CALLED, BUT SCRUB DECISIONS WILL NOT BE IMPLEMENTED UNLESS REQUIRED TO ASSURE CREW AND/OR EQUIPMENT SAFETY.</p> <p><u>DEFINITIONS:</u> SEE APPENDIX A.</p> <p><u>RELATED AND REFERENCE DOCUMENTATION:</u> SEE APPENDIX B.</p>
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MISSION APOLLO 12	SECTION SPACE VEHICLE	STAGE SUBSECTION INTRODUCTION	SYSTEM	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 1-1
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JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
Δ		<p><u>MISSION RULES GUIDELINES:</u></p> <p>THE FOLLOWING MISSION RULES GUIDELINES ARE ESTABLISHED BY THE NASA HEADQUARTERS IN (OMSF) APOLLO PROGRAM DIRECTIVE NO. 46A, "APOLLO MISSION RULES," TO INSURE COMPATIBILITY BETWEEN THE LAUNCH MISSION RULES AND FLIGHT MISSION RULES:</p>
Δ	1-100	MISSION RULES ARE EFFECTIVE DURING THE LAUNCH COUNTDOWN, FLIGHT, RECOVERY, AND DURING PRELAUNCH TESTS WHEN APPLICABLE. FOR A LUNAR LANDING MISSION, RULES WILL BE APPLICABLE UNTIL RELEASE OF THE FLIGHT CREW, FLIGHT HARDWARE, AND LUNAR SAMPLES, WHICHEVER OCCURS LATER.
	1-101	THE DIRECTOR OF FLIGHT OPERATIONS AND THE DIRECTOR OF LAUNCH OPERATIONS OR THEIR DESIGNATED REPRESENTATIVES WILL INSURE COORDINATION OF THEIR RESPECTIVE MISSION RULES CHANGES WITH THE MISSION DIRECTOR AND OTHER APPROPRIATE ORGANIZATIONS.
	1-102	FOLLOWING THE CDDT OR FRT, WHICHEVER OCCURS FIRST, MISSION DIRECTOR APPROVAL AND CONCURRENCE WILL BE REQUIRED ON ALL RULES CHANGES AFFECTING SAFETY, ACCOMPLISHMENT OF TEST OBJECTIVES, DEVIATIONS FROM THE NOMINAL MISSION, AND PRELAUNCH CONSTRAINTS. CONCURRENCE MAY BE OBTAINED VERBALLY IF TIME CONSIDERATIONS SO DICTATE.
	1-103	DURING THE CONDUCT OF THE MISSION, THE MISSION DIRECTOR WILL BE ADVISED OF ALL RECOMMENDATIONS THAT INVOLVE CHANGES TO PRIMARY OBJECTIVES, MISSION RULES, FLIGHT PLAN CONTENT, OR LAUNCH/FLIGHT SAFETY.
	1-104	WITHIN THEIR RESPECTIVE AREAS OF RESPONSIBILITY, THE SPACECRAFT COMMANDER, LAUNCH DIRECTOR, FLIGHT DIRECTOR, DOD MANAGER FOR MSF SUPPORT OPERATIONS, AND MISSION DIRECTOR MAY TAKE OR RECOMMEND ANY ACTION REQUIRED FOR OPTIMUM CONDUCT OF THE MISSION.
	1-105	THE SPACECRAFT COMMANDER, SPACECRAFT TEST CONDUCTOR, LAUNCH VEHICLE TEST CONDUCTOR, SPACE VEHICLE TEST SUPERVISOR, LAUNCH OPERATIONS MANAGER, LAUNCH DIRECTOR, FLIGHT DIRECTOR, DOD MANAGER FOR MSF SUPPORT OPERATIONS, OR THE MISSION DIRECTOR MAY REQUEST A HOLD FOR CONDITIONS WITHIN THEIR RESPECTIVE AREAS OF RESPONSIBILITY.
	1-106	DURING THE COUNTDOWN, THE LAUNCH VEHICLE AND SPACECRAFT PROGRAM MANAGERS AND RESPECTIVE CENTER OPERATIONS MANAGERS WILL PROVIDE TECHNICAL ADVICE AND SUPPORT DIRECTLY TO THE LAUNCH OPERATIONS MANAGER AND LAUNCH DIRECTOR. THE LATTER TWO WILL KEEP THE MISSION DIRECTOR FULLY INFORMED OF PROBLEMS AND PROPOSED SOLUTIONS. DURING THE FLIGHT PHASE OF OPERATIONS, SIMILAR SUPPORT AS REQUIRED WILL BE PROVIDED TO THE FLIGHT DIRECTOR AND THE MSC DIRECTOR OF FLIGHT OPERATIONS. THE MISSION DIRECTOR WILL BE KEPT FULLY INFORMED BY THESE INDIVIDUALS OF PROBLEMS AND PROPOSED SOLUTIONS DURING THE APPLICABLE PHASES OF THE MISSION.

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		MISSION RULES GUIDELINES (CONTINUED):
1-107		WHEN TIME PERMITS, THE FAILURE OF A MANDATORY OR HIGHLY DESIRABLE ITEM WILL BE REPORTED TO THE MISSION DIRECTOR BY THE LAUNCH DIRECTOR OR THE FLIGHT DIRECTOR. THE INITIAL REPORT WILL INCLUDE THE POSITION OR FACILITY THAT DETECTED THE MALFUNCTION. SUBSEQUENTLY, THE MISSION DIRECTOR WILL BE INFORMED OF ESTIMATED TIME TO REPAIR AND RECOMMENDED PROCEED, HOLD, RECYCLE, OR SCRUB ACTION AS IT DEVELOPS.
1-108		IF A MANDATORY ITEM FAILS DURING THE COUNTDOWN, IT WILL BE CORRECTED PRIOR TO LAUNCH, HOLDING OR RECYCLING THE COUNTDOWN AS NECESSARY. IF A MANDATORY ITEM CANNOT BE CORRECTED TO PERMIT LIFTOFF WITHIN THE LAUNCH WINDOW, THE MISSION DIRECTOR MAY PROCEED WITH THE LAUNCH AFTER APPROPRIATE COORDINATION WITH THE APPROPRIATE OPERATIONS AND PROGRAM MANAGERS. GENERALLY, THE LOSS OF A MANDATORY ITEM WILL RESULT IN A SCRUB.
1-109		AS THE DESIGNATED REPRESENTATIVE OF THE PROGRAM DIRECTOR, ONLY THE MISSION DIRECTOR MAY SCRUB THE MISSION. FURTHER, THE MISSION DIRECTOR RETAINS THE PRIMARY AUTHORITY TO DOWNGRADE A MANDATORY CATEGORY. THIS AUTHORITY WILL BE EXERCISED AS CIRCUMSTANCES DICTATE AND AFTER APPROPRIATE RECOMMENDATIONS FROM THE PROGRAM MANAGERS, LAUNCH DIRECTOR, AND FLIGHT DIRECTOR.
1-110		CONSIDERATION WILL BE GIVEN TO THE REPAIR OF ANY HIGHLY DESIRABLE ITEM, BUT IN NO CASE WILL THE LAUNCH BE SCRUBBED FOR ANY SINGLE HIGHLY DESIRABLE ITEM. IF TWO OR MORE HIGHLY DESIRABLE ITEMS FAIL AND/OR OTHER AGGRAVATING CIRCUMSTANCES OCCUR, THE MISSION DIRECTOR MAY SCRUB THE MISSION AFTER COORDINATION WITH THE APPROPRIATE OPERATIONS AND PROGRAM MANAGERS.
1-111		THE COUNTDOWN WILL NOT BE HELD NOR THE LAUNCH SCRUBBED FOR FAILURE OF DESIRABLE ITEMS.
1-112		WHENEVER POSSIBLE, THE LAUNCH SITE AND THE MCC WILL VERIFY TELEMETRY READOUT DISCREPANCIES OCCURRING PRIOR TO LIFTOFF. IF THE MCC LOSES A PARAMETER BUT THE LAUNCH SITE HAS A VALID READOUT, THE MCC WILL CONTINUE ON THE LAUNCH SITE READOUT. THIS IS TRUE EXCEPT FOR THOSE MANDATORY PARAMETERS (LISTED IN THE FLIGHT MISSION RULES) UPON WHICH MISSION RULES ACTION IS TAKEN. IN THIS CASE, A HOLD MAY BE CALLED TO EVALUATE THE PROBLEM.
1-113		THE COUNTDOWN WILL CONTINUE WHERE POSSIBLE CONCURRENTLY WITH CORRECTION OF AN EXISTING PROBLEM.
1-114		PRIOR TO LIFTOFF, THE LAUNCH DIRECTOR WILL BE RESPONSIBLE FOR ALL ACTIONS IN THE EVENT OF LAUNCH SITE EMERGENCIES, EXCEPT FOR RECOVERY OPERATIONS OF THE FLIGHT CREW AND SPACECRAFT RESULTING FROM A PAD ABORT.
1-115		THE LAUNCH OPERATIONS MANAGER MAY SEND AN ABORT REQUEST FROM THE TIME THE LAUNCH ESCAPE SYSTEM IS ARMED UNTIL THE SPACE VEHICLE REACHES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER. THE CRITERIA FOR SENDING AN ABORT REQUEST WILL BE ESTABLISHED IN THE LAUNCH MISSION RULES.

MISSION APOLLO 12	SECTION SPACE VEHICLE	STAGE SUBSECTION MISSION RULES GUIDELINES	SYSTEM	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 1-3
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JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<p><u>MISSION RULES GUIDELINES (CONTINUED):</u></p> <p>FROM LIFTOFF TO UMBILICAL TOWER CLEARANCE, THE LAUNCH DIRECTOR AND FLIGHT DIRECTOR WILL HAVE CONCURRENT RESPONSIBILITY FOR SENDING AN ABORT REQUEST. THE CRITERIA FOR SENDING AN ABORT REQUEST DURING THIS PERIOD WILL BE ESTABLISHED IN THE LAUNCH AND FLIGHT MISSION RULES RESPECTIVELY.</p> <p>WHERE POSSIBLE, ALL MANUAL ABORT COMMAND/REQUESTS FROM THE GROUND DURING FLIGHT WILL BE BASED ON TWO INDEPENDENT INDICATIONS OF THE FAILURE. CREW ABORT ACTION WILL NORMALLY BE BASED UPON TWO CUES.</p> <p>THE LAUNCH OPERATIONS MANAGER WILL INFORM THE MCC WHEN THE SPACE VEHICLE REACHES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER BY STATING "CLEAR TOWER" OVER ONE OF THE LOOPS FROM KSC TO MCC.</p> <p>IN THE EVENT OF NON-CATASTROPHIC SPACE VEHICLE COLLISION WITH THE UMBILICAL TOWER OR OTHER CONTINGENCIES WHICH DO NOT REQUIRE IMMEDIATE ACTION, THE LAUNCH OPERATIONS MANAGER WILL CONTINUE TO EVALUATE THE EXTENT OF DAMAGE AND WILL PROVIDE INFORMATION TO THE FLIGHT DIRECTOR FOR ANY ACTION NECESSARY AFTER UMBILICAL TOWER CLEARANCE.</p> <p>COMPLETE GROUND CONTROL OF THE SPACE VEHICLE PASSES FROM THE LAUNCH DIRECTOR TO THE FLIGHT DIRECTOR WHEN THE SPACE VEHICLE REACHES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER.</p> <p>IN THE MCC, THE FLIGHT DIRECTOR, FLIGHT DYNAMICS OFFICER, AND BOOSTER SYSTEMS ENGINEER WILL HAVE THE CAPABILITY TO SEND AN ABORT REQUEST. THE CRITERIA FOR SENDING AN ABORT REQUEST WILL BE ESTABLISHED IN THE FLIGHT MISSION RULES.</p> <p>THE SPACECRAFT COMMANDER MAY INITIATE SUCH INFLIGHT ACTION AS HE DEEMS ESSENTIAL FOR CREW SAFETY.</p> <p>FLIGHT CREW SAFETY WILL TAKE PRECEDENCE OVER THE ACCOMPLISHMENT OF MISSION OBJECTIVES.</p> <p>IN THE EVENT OF COMMUNICATIONS LOSS BETWEEN THE MANNED SPACE FLIGHT NETWORK AND THE SPACECRAFT, THE SPACECRAFT COMMANDER WILL ASSUME RESPONSIBILITY FOR MISSION CONDUCT AS DESCRIBED WITHIN THE FLIGHT MISSION RULES.</p> <p>THE FLIGHT DIRECTOR, THROUGH THE RECOVERY COORDINATOR, WILL PROVIDE THE DOD MANAGER FOR MSF SUPPORT OPERATIONS THE PREDICTED LOCATION AND TIME OF SPLASHDOWN.</p> <p>THE DOD MANAGER FOR MSF SUPPORT OPERATIONS IS RESPONSIBLE FOR RECOVERY, AND FOR COMMAND AND CONTROL OF DOD RECOVERY FORCES. RECOMMENDATIONS, GUIDELINES, AND REQUIREMENTS AS SET FORTH BY NASA WILL BE CONSIDERED TO EFFECT SAFE AND EXPEDITIOUS RECOVERY OF THE FLIGHT CREW AND SPACECRAFT.</p> <p>THE APOLLO MISSION DIRECTOR IS RESPONSIBLE FOR THE BIOCONTAINMENT OF ALL LUNAR EXPOSED MATERIALS, LUNAR SAMPLES, AND LUNAR CREWS FROM THE COMPLETION OF PRELAUNCH MICROBIAL SAMPLING UNTIL RELEASE OF ASTRONAUTS, SAMPLES, AND MISSION-RELATED EQUIPMENT.</p>
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MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
APOLLO 12	SPACE VEHICLE	MISSION RULES GUIDELINES		BASIC OCTOBER 2, 1969	1-4

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<p><u>GENERAL LAUNCH RULES:</u></p> <p>DETAILED GUIDELINES AND PROCEDURES FOR THE DEVELOPMENT AND UTILIZATION OF LAUNCH MISSION RULES BY RESPONSIBLE ORGANIZATIONS ARE ESTABLISHED IN THE KSC APOLLO/SATURN LAUNCH MISSION RULES HANDBOOK. THE FOLLOWING GENERAL LAUNCH RULES ARE CONTAINED WITHIN THE HANDBOOK, AND ARE REITERATED HERE FOR CONVENIENCE AND EMPHASIS:</p> <p><u>APPLICABLE TIME PERIODS:</u> THE APPLICABLE TIME PERIOD FOR ALL MANDATORY ITEMS WILL BE SPECIFIED IN THE TIME PERIOD/ACTION/NOTES COLUMN FOR EACH SUCH ITEM. THIS TIME PERIOD WILL START AT LAUNCH VEHICLE POWER UP UNLESS OTHERWISE SPECIFIED AND WILL TERMINATE AT THE SPECIFIED TIME (NO LATER THAN T-11 SECONDS FOR MANUAL CUTOFF ACTIONS). THE APPLICABLE TIME PERIOD FOR HIGHLY DESIRABLE ITEMS WILL START AT LAUNCH VEHICLE POWER UP AND WILL TERMINATE AT T-3 MINUTES 7 SECONDS (AUTOMATIC SEQUENCE START) UNLESS OTHERWISE SPECIFIED IN THE TIME PERIOD/ACTION/NOTES COLUMN.</p> <p><u>INTERLOCKS:</u> ANY FUNCTION THAT IS INTERLOCKED ON AN AUTOMATIC SEQUENCING DEVICE AND WILL EFFECT AN AUTOMATIC SHUTDOWN OR WILL PREVENT LIFTOFF IN THE EVENT OF A MALFUNCTION IS DEFINED HEREIN AS MANDATORY AND IS NOT RE-ITERATED WITHIN THIS DOCUMENT. A HOLD OR CUTOFF (IF REQUIRED) WILL BE CALLED FOR REPAIR OF ANY INTERLOCKED FUNCTION THAT FAILS PRIOR TO T-11 SECONDS.</p> <p><u>UNVERIFIABLE ITEMS:</u> ITEMS WHICH WERE RECEIVED AS LAUNCH MISSION RULES INPUTS BUT WHICH CANNOT BE MONITORED OR VERIFIED DURING THE LAUNCH MISSION RULES EFFECTIVITY PERIOD DO NOT APPEAR IN THIS DOCUMENT. THESE ITEMS WILL BE VERIFIED PRIOR TO ENTERING THE EFFECTIVITY PERIOD, AND APPROPRIATE ORGANIZATIONS WILL BE NOTIFIED OF MALFUNCTIONS. (FOR EXCEPTION TO THE ABOVE WITH REGARD TO EARLY LUNAR MODULE SYSTEMS CLOSEOUT, REFERENCE ITEM 3-012.)</p> <p><u>MEASUREMENT SYSTEM TOLERANCES:</u> THE REDLINE VALUES ESTABLISHED IN THIS DOCUMENT INCLUDE MEASUREMENT SYSTEM TOLERANCES UNLESS OTHERWISE SPECIFIED, AND ARE THE ACTUAL VALUES TO BE MONITORED BY THOSE PERSONNEL RESPONSIBLE FOR THE IMPLEMENTATION OF THE LAUNCH MISSION RULES. THESE REDLINE VALUES REPRESENT THE LIMITS OF ACCEPTABLE OPERATION OF THE ASSOCIATED LAUNCH VEHICLE, SPACECRAFT, OR GSE/ESE SYSTEM.</p> <p><u>COUNTDOWN CLOCK DISPLAYS:</u> THE APPLICABLE TIME PERIOD FOR MANDATORY COUNTDOWN CLOCK DISPLAYS WILL START AT LAUNCH VEHICLE POWER UP AND WILL TERMINATE AT AUTOMATIC SEQUENCE START. A MANUAL TIMER IS ACTIVATED AT AUTOMATIC SEQUENCE START BY THE TEST SUPERVISOR (CVTS). (REFERENCE ITEM 2-902.)</p> <p><u>MSC AND MSFC REPRESENTATIVES:</u> MSC AND MSFC WILL DESIGNATE A SINGLE POINT OF CONTACT WITHIN THE LAUNCH CONTROL CENTER (LCC) TO CONSULT WITH THE DIRECTOR, SPACECRAFT OPERATIONS, AND THE DIRECTOR, LAUNCH VEHICLE OPERATIONS, AND WITH WHOM THE LAUNCH DIRECTOR AND LAUNCH OPERATIONS MANAGER MAY DISCUSS INSTRUMENTATION OR HARDWARE DISCREPANCIES AND/OR MALFUNCTIONS THAT OCCUR DURING THE LAUNCH COUNTDOWN. THE MSC AND MSFC REPRESENTATIVES WILL BE NOTIFIED OF LMRD DISCREPANCIES WHEN TIME PERMITS.</p>
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MISSION APOLLO 12	SECTION SPACE VEHICLE	STAGE SUBSECTION GENERAL LAUNCH RULES	SYSTEM	CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 1-5
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JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
	1-206	<p><u>GENERAL LAUNCH RULES (CONTINUED):</u></p> <p><u>LMR/FMR INTERFACE:</u> FOR CERTAIN OPERATIONAL SUPPORT ELEMENTS (REQUIRED TO BE OPERATIONAL AT LIFTOFF) FOR WHICH KSC, ETR, OR GSFC ARE OPERATIONALLY RESPONSIBLE, REDUNDANT ENTRIES MAY BE CONTAINED IN BOTH THE LAUNCH MISSION RULES AND FLIGHT MISSION RULES. THE LMRD WILL CONTAIN RULES CONCERNING ONLY THOSE OPERATIONAL SUPPORT ELEMENTS FOR WHICH THE LAUNCH DIRECTOR OR APPROPRIATE ELEMENTS OF THE LAUNCH TEAM ORGANIZATION WOULD CALL A HOLD OR WOULD CALL FOR CUTOFF IN THE EVENT OF MALFUNCTIONS.</p>
	1-207	<p><u>HOLD/RECYCLE:</u> PRIOR TO RESUMING THE COUNTDOWN FOLLOWING A PROLONGED HOLD OR RECYCLE, ALL ITEMS WHICH FAILED OR EXCEEDED REDLINE VALUES AFTER THEIR SPECIFIED EFFECTIVITY PERIOD OR WHICH WERE WAIVED OR DOWNGRADED DURING THE PREVIOUS COUNTDOWN ATTEMPT WILL BE REASSESSED IN LIGHT OF THE NEW COUNTDOWN ATTEMPT.</p>
Δ	1-208	<p><u>USE OF Δ SYMBOL:</u> FOR THE BASIC ISSUANCE OF THE LAUNCH MISSION RULES FOR EACH MISSION, A Δ SYMBOL WILL BE USED IN THE REVISION COLUMN TO DENOTE THAT A TECHNICAL CHANGE TO THE DESIGNATED ITEM(S) HAS BEEN MADE SINCE THE PREVIOUS MISSION. IN GENERAL, A Δ SYMBOL WILL NOT BE USED TO DENOTE A NON-TECHNICAL CHANGE.</p>
MISSION	SECTION	DATE CHANGE NO
APOLLO 12	SPACE VEHICLE	BASIC OCTOBER 2, 1969
	STAGE SUBSECTION	PAGE
	GENERAL LAUNCH RULES	1-6
	SYSTEM	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION																					
Δ	1-300	<p><u>LAUNCH WINDOW RESTRICTIONS:</u></p> <p>THE FOLLOWING LAUNCH WINDOW RESTRICTIONS FOR THE SPECIFIED LAUNCH DATES ARE ESTABLISHED:</p> <table border="1"> <thead> <tr> <th>LAUNCH DATE</th> <th>LANDING SITE</th> <th>OPENING OF WINDOW (GMT)</th> <th>EST</th> <th>CLOSING OF WINDOW (GMT)</th> <th>EST</th> <th>DURATION OF WINDOW</th> </tr> </thead> <tbody> <tr> <td>NOV 14, 1969</td> <td>7 (SURVEYOR 3)</td> <td>1622</td> <td>1122</td> <td>1928</td> <td>1428</td> <td>3 HRS 06 MIN</td> </tr> <tr> <td>NOV 16, 1969</td> <td>5</td> <td>1909</td> <td>1409</td> <td>2227</td> <td>1727</td> <td>3 HRS 18 MIN</td> </tr> </tbody> </table> <p>OPENING AND CLOSING OF THE LAUNCH WINDOW ARE BASED UPON THE FOLLOWING:</p> <ol style="list-style-type: none"> LAUNCH AZIMUTH FROM 72° TO 96° (MAXIMUM PERMISSIBLE LAUNCH AZIMUTH OF 96° DUE TO INSERTION SHIP COVERAGE LIMITATIONS). LUNAR LIGHTING CONSTRAINTS (SUN ELEVATION REFERENCED TO LOCAL HORIZONTAL AT THE LUNAR LANDING SITE AT TIME OF LANDING). <p><u>TURNAROUND CAPABILITY:</u> CRITICAL PATH ACTIVITIES FOR TURNAROUND OF THE SPACE VEHICLE IN PREPARATION FOR A SECOND LAUNCH (OR SIMULATED LAUNCH) ATTEMPT FOLLOWING A COUNTDOWN (OR CDDT) SCRUB ARE DEFINED IN THE "APOLLO/SATURN V SPACE VEHICLE SCRUB/TURNAROUND PLAN". DETAILED PROCEDURES FOR PERFORMANCE OF SCRUB/TURNAROUND OPERATIONS ARE CONTAINED IN THE "SPACE VEHICLE TURNAROUND FROM SCRUB" TEST AND CHECKOUT PROCEDURE, TCP V-40300, VOLUME II.</p>	LAUNCH DATE	LANDING SITE	OPENING OF WINDOW (GMT)	EST	CLOSING OF WINDOW (GMT)	EST	DURATION OF WINDOW	NOV 14, 1969	7 (SURVEYOR 3)	1622	1122	1928	1428	3 HRS 06 MIN	NOV 16, 1969	5	1909	1409	2227	1727	3 HRS 18 MIN
LAUNCH DATE	LANDING SITE	OPENING OF WINDOW (GMT)	EST	CLOSING OF WINDOW (GMT)	EST	DURATION OF WINDOW																	
NOV 14, 1969	7 (SURVEYOR 3)	1622	1122	1928	1428	3 HRS 06 MIN																	
NOV 16, 1969	5	1909	1409	2227	1727	3 HRS 18 MIN																	
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JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
Δ	1-400	<p><u>WEATHER RESTRICTIONS:</u> <u>CEILING AND VISIBILITY RESTRICTIONS:</u></p> <p>1. <u>MANDATORY CONDITIONS:</u></p> <p>A. <u>KSC FORWARD OBSERVER RESTRICTIONS:</u></p> <p>VISUAL MONITORING OF ABORT CONDITIONS BY FORWARD OBSERVERS AT SITES NO. 1, 2, AND 3, IS MANDATORY, REFERENCE "FLIGHT CREW SAFETY RULES" SUBSECTION, ITEMS 1-642 THRU 1-646 AND 1-652 THRU 1-654. THE FOLLOWING RESTRICTIONS ARE IMPOSED:</p> <p>CEILING: 500 FT** VISIBILITY: 3 NM**</p> <p>** FROM 225° TO 360° AZIMUTH FROM THE SPACE VEHICLE.</p> <p>B. <u>RANGE SAFETY RESTRICTIONS:</u></p> <p>NO CEILING OR VISIBILITY RESTRICTIONS WILL BE IMPOSED PROVIDING 1.16 (CAPE FPS-16) AND 19.18 (MERRITT ISLAND TPQ-18) RADARS AND IU C-BAND BEACON NO. 1 ARE OPERATIONAL.</p> <p>2. <u>HIGHLY DESIRABLE CONDITIONS:</u></p> <p>PHOTOGRAPHIC COVERAGE OF MAX Q AND LET JETTISON FROM THE ALOTS AIRCRAFT IS <u>HIGHLY DESIRABLE.</u> (FOR HARDWARE ENTRY, SEE SECTION 4, "TECHNICAL SUPPORT OPERATIONS," ITEM 4-408.)</p>

MISSION APOLLO 12	SECTION SPACE VEHICLE	STAGE SUBSECTION WEATHER RESTRICTIONS	SYSTEM	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 1-8
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JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
	1-401	<p><u>WEATHER RESTRICTIONS (CONTINUED):</u></p> <p><u>SURFACE WIND RESTRICTIONS PRIOR TO LIFTOFF (SPACE VEHICLE STRUCTURAL AND GSE INTERACTION LIMITS):</u></p> <p>1. <u>GENERAL:</u></p> <p>A. THE LAUNCH DIRECTOR WILL ASSESS WIND CONDITIONS RELATIVE TO SPACE VEHICLE STRUCTURAL AND GSE INTERACTION LIMITS PRIOR TO START OF THE FOLLOWING COUNTDOWN ACTIVITIES, AND WILL CONTINUE OR HOLD THE COUNTDOWN ACCORDINGLY:</p> <p>(1) LAUNCH VEHICLE CRYOGENIC LOADING (APPROX. T-8 HOURS 15 MINUTES).</p> <p>(2) FLIGHT CREW INGRESS (APPROX. T-2 HOURS 40 MINUTES).</p> <p>(3) ACCESS ARM RETRACTED TO PARK POSITION (APPROX. T-43 MINUTES).</p> <p>(4) ACCESS ARM FULLY RETRACTED (APPROX. T-5 MINUTES).</p> <p>B. THE SPACE VEHICLE SHOULD NOT BE EXPOSED TO WINDS THAT RESULT IN EXCEEDING THE SPECIFIED PEAK BENDING MOMENTS. THE APOLLO ACCESS ARM SHOULD BE DISCONNECTED BEFORE EXCEEDING THE SPECIFIED PEAK BENDING MOMENTS IN ORDER TO PREVENT DAMAGE TO THE SPACE VEHICLE. THE BENDING MOMENT LIMITS WILL NOT BE EXCEEDED IF THE SPECIFIED WIND VALUES AT THE 60-FOOT LEVEL ARE OBSERVED. IF THE BENDING MOMENT LIMITS ARE EXCEEDED, AN ASSESSMENT OF POSSIBLE DAMAGE IS REQUIRED BEFORE PROCEEDING.</p> <p>C. DAMPER TRANSITION WILL NOT BE ATTEMPTED IF THE MEASURED BENDING MOMENT IS UNAVAILABLE OR THE PEAK WIND VELOCITY AT THE 60-FOOT LEVEL IS PREDICTED TO EXCEED 30 KNOTS. HOWEVER, IF THE WIND IS PREDICTED TO EXCEED 30 KNOTS AND THE BENDING MOMENT IS AVAILABLE, A REAL TIME ASSESSMENT OF OBSERVED AND PREDICTED CONDITIONS WILL BE MADE BEFORE PROCEEDING WITH DAMPER TRANSITION.</p> <p>D. IN THE EVENT THAT SURFACE WINDS APPROACH THE SPECIFIED MARGINAL WIND VALUES, THE MSFC/MSC WIND MONITORING TEAM AT THE HOSC WILL EVALUATE THE ACTUAL WIND PROFILE AND EXPECTED SPACE VEHICLE RESPONSE, AND WILL PROVIDE RECOMMENDATIONS TO THE LAUNCH DIRECTOR IF REQUIRED.</p> <p>E. ALL SPECIFIED WIND VALUES ARE REFERENCED TO 60 FEET ABOVE NATURAL GRADE AND ARE FOR THE WORST WIND DIRECTION; ALL BENDING MOMENTS ARE REFERENCED TO STATION 790 (S-1C INTERTANK AREA).</p> <p>F. WINDS IN EXCESS OF 64 KNOTS ARE DEFINED AS OF HURRICANE FORCE, AND ARE NOT SPECIFIED IN THIS DOCUMENT.</p>

MISSION APOLLO 12	SECTION SPACE VEHICLE	STAGE SUBSECTION WEATHER RESTRICTIONS	SYSTEM	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 1-9
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REV	ITEM	DESCRIPTION	MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
	1-401 (CTD)	<p><u>WEATHER RESTRICTIONS (CONTINUED):</u></p> <p>G. THE CONDITION IDENTIFIED AS 'MSS AT VEHICLE' IS DEFINED AS A DISTANCE \leq 35 FEET BETWEEN THE MSS AND THE VEHICLE. ('MSS REMOVED' IS $>$ 35 FEET.)</p> <p>H. A SAFETY FACTOR (S/F) OF 1.40 MUST BE UTILIZED AFTER FLIGHT CREW INGRESS (EXCEPT THAT A SAFETY FACTOR OF 1.30 IS UTILIZED WHEN THE LIMITING STATION IS ON THE S-II STAGE). PRIOR TO FLIGHT CREW INGRESS, A SAFETY FACTOR OF 1.25 IS UTILIZED.</p> <p>I. FOR HARDWARE ENTRIES, SEE SECTION 4, "TECHNICAL SUPPORT OPERATIONS," ITEMS 4-208 AND 4-210.</p>	APOLLO 12	SPACE VEHICLE	WEATHER RESTRICTIONS		BASIC OCTOBER 2, 1969	1-10

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

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	1-401 (CTD)	<p><u>WEATHER RESTRICTIONS (CONTINUED):</u></p> <p style="text-align: center;"><u>L/V PROPELLANT LOADING (%)</u></p> <table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">S-IC</td> <td style="text-align: center;">S-II</td> <td style="text-align: center;">S-II</td> <td style="text-align: center;">S-IVB</td> <td style="text-align: center;">S-IVB</td> <td style="text-align: center;">DAMPER</td> <td style="text-align: center;">S/V</td> <td style="text-align: center;">STRUCTURAL LIMITS</td> <td style="text-align: center;">AAA</td> <td style="text-align: center;">TRACKING LIMITS</td> </tr> <tr> <td style="text-align: center;">LOX</td> <td style="text-align: center;">LOX</td> <td style="text-align: center;">LH2</td> <td style="text-align: center;">LOX</td> <td style="text-align: center;">LH2</td> <td style="text-align: center;">POSIT.</td> <td style="text-align: center;">S/F</td> <td style="text-align: center;">PEAK WIND VELOCITY (KNOTS)**</td> <td style="text-align: center;">PEAK WIND VELOCITY (KNOTS)**</td> <td style="text-align: center;">PEAK BENDING MOMENT (10⁶ IN-LB)</td> </tr> </table> <p>2. <u>WET CDDT:</u> (S-IC RP-1, CSM/LM HYPERGOLICS, AND LM SHE FULLY LOADED; CSM CRYOGENICS FULLY LOADED BUT DRAINED PRIOR TO START OF LAUNCH MISSION RULES EFFECTIVITY PERIOD EXCEPT FOR 2 LOX TANKS WHICH ARE EACH 50% LOADED FOR FLIGHT CREW SUIT LOOP UTILIZATION):</p> <table border="0" style="width: 100%;"> <tr> <td>MSS AT VEHICLE</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1.25</td> <td>64</td> <td>204</td> <td>64</td> <td>177</td> </tr> <tr> <td>MSS AT VEHICLE</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1.25</td> <td>30***</td> <td>177</td> <td>28***</td> <td>128***</td> </tr> <tr> <td>MSS REMOVED</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1.25</td> <td>30***</td> <td>177</td> <td>28***</td> <td>128***</td> </tr> <tr> <td>MSS REMOVED</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1.25</td> <td>64</td> <td>240</td> <td>64</td> <td>177</td> </tr> <tr> <td>S-IVB LOX LOADED</td> <td>0</td> <td>0</td> <td>0</td> <td>100</td> <td>0</td> <td>1.25</td> <td>64</td> <td>162</td> <td>64</td> <td>162</td> </tr> <tr> <td>S-II LOX LOADED</td> <td>0</td> <td>100</td> <td>0</td> <td>100</td> <td>0</td> <td>1.25</td> <td>64</td> <td>183</td> <td>64</td> <td>183</td> </tr> <tr> <td>S-IC LOX LOADED</td> <td>100</td> <td>100</td> <td>0</td> <td>100</td> <td>0</td> <td>1.25</td> <td>64</td> <td>183</td> <td>64</td> <td>183</td> </tr> <tr> <td>S-II LH2 LOADED</td> <td>100</td> <td>100</td> <td>100</td> <td>0</td> <td>0</td> <td>1.25</td> <td>64</td> <td>183</td> <td>64</td> <td>183</td> </tr> <tr> <td>S-IVB LH2 LOADED</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>1.25</td> <td>60</td> <td>172</td> <td>60</td> <td>172</td> </tr> <tr> <td>S/V FULLY LOADED</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> <td>1.25</td> <td>60</td> <td>172</td> <td>60</td> <td>172</td> </tr> </table> <p>3. <u>DRY CDDT:</u> (S-IC RP-1, CSM/LM HYPERGOLICS, AND LM SHE FULLY LOADED; CSM CRYOGENICS DRAINED EXCEPT FOR 2 LOX TANKS WHICH ARE EACH 50% LOADED FOR FLIGHT CREW SUIT LOOP UTILIZATION):</p> <table border="0" style="width: 100%;"> <tr> <td>MSS REMOVED</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1.25</td> <td>64</td> <td>200</td> <td>64</td> <td>177</td> </tr> <tr> <td>MSS REMOVED</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1.30</td> <td>64</td> <td>200</td> <td>64</td> <td>177</td> </tr> <tr> <td>MSS REMOVED</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1.25</td> <td>30***</td> <td>177</td> <td>28***</td> <td>128***</td> </tr> <tr> <td>MSS AT VEHICLE</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1.25</td> <td>30***</td> <td>177</td> <td>28***</td> <td>128***</td> </tr> <tr> <td>MSS AT VEHICLE</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1.25</td> <td>64</td> <td>204</td> <td>64</td> <td>177</td> </tr> </table> <p><u>NOTES:</u> (1) ** THE SPECIFIED PEAK WIND VELOCITY VALUES ARE REPRESENTATIVE, AND DO NOT NECESSARILY REFLECT TRUE SPACE VEHICLE STRUCTURAL LIMITS. 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S/F	PEAK WIND VELOCITY (KNOTS)**	PEAK WIND VELOCITY (KNOTS)**	PEAK BENDING MOMENT (10 ⁶ IN-LB)	MSS AT VEHICLE	0	0	0	0	0	1.25	64	204	64	177	MSS AT VEHICLE	0	0	0	0	0	1.25	30***	177	28***	128***	MSS REMOVED	0	0	0	0	0	1.25	30***	177	28***	128***	MSS REMOVED	0	0	0	0	0	1.25	64	240	64	177	S-IVB LOX LOADED	0	0	0	100	0	1.25	64	162	64	162	S-II LOX LOADED	0	100	0	100	0	1.25	64	183	64	183	S-IC LOX LOADED	100	100	0	100	0	1.25	64	183	64	183	S-II LH2 LOADED	100	100	100	0	0	1.25	64	183	64	183	S-IVB LH2 LOADED	100	100	100	100	100	1.25	60	172	60	172	S/V FULLY LOADED	100	100	100	100	100	1.25	60	172	60	172	MSS REMOVED	0	0	0	0	0	1.25	64	200	64	177	MSS REMOVED	0	0	0	0	0	1.30	64	200	64	177	MSS REMOVED	0	0	0	0	0	1.25	30***	177	28***	128***	MSS AT VEHICLE	0	0	0	0	0	1.25	30***	177	28***	128***	MSS AT VEHICLE	0	0	0	0	0	1.25	64	204	64	177
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A	1-402	<p><u>WEATHER RESTRICTIONS (CONTINUED):</u></p> <p><u>SURFACE WIND RESTRICTIONS FOR LIFTOFF (SPACE VEHICLE LAUNCH RELEASE LIMITS):</u></p> <p>THE SPACE VEHICLE WILL NOT BE LAUNCHED FOR ANY OF THE FOLLOWING CONDITIONS PREDICTED TO OCCUR AT TIME OF LAUNCH:</p> <ol style="list-style-type: none"> 1. <u>SPACE VEHICLE STRUCTURE:</u> <p>BENDING MOMENT AT STATION 790 (S-IC INTERTANK AREA) EXCEEDING 81.5 MILLION INCH-POUNDS. (IF THE MEASURED BENDING MOMENT IS UNAVAILABLE, THE SPACE VEHICLE WILL NOT BE LAUNCHED WITH A PEAK WIND SPEED EXCEEDING 30 KNOTS AT THE 60-FOOT LEVEL, HOWEVER, IF THE 30 KNOT WIND SPEED LIMIT IS VIOLATED BUT THE MEASURED BENDING MOMENT WAS VERIFIED AS ACCEPTABLE AFTER PRIMARY DAMPER RELEASE, A REAL TIME ASSESSMENT OF OBSERVED WIND CONDITIONS WILL BE MADE TO DETERMINE ACCEPTABILITY FOR LAUNCH.)</p> <p><u>NOTE:</u> LAUNCH RELEASE IS PERMISSIBLE AT ANY 60-FOOT LEVEL WIND SPEED BELOW 30 KNOTS AND MAY BE PERMISSIBLE AT WIND VALUES BETWEEN 30 KNOTS AND 47 KNOTS DEPENDING ON WIND DIRECTION, PROFILE, AND DYNAMIC EFFECT ON THE SPACE VEHICLE. IN THE EVENT THAT SURFACE WINDS ARE FORECAST BETWEEN THESE LIMITS, THE MSFC/MSC WIND MONITORING TEAM AT THE HOSC WILL EVALUATE THE ACTUAL WIND PROFILE AND EXPECTED SPACE VEHICLE RESPONSE, AND WILL PROVIDE RECOMMENDATIONS TO THE LAUNCH DIRECTOR IF REQUIRED.</p> 2. <u>TOWER AND PLATFORM CLEARANCE:</u> <p>THE FOLLOWING ARE NOMINAL WIND LIMITS DIRECTLY CORRESPONDING TO THE S-IC ACTUATOR (BETA) REDLINES:</p> <ol style="list-style-type: none"> A. PEAK WIND SPEED EXCEEDING 33 KNOTS FROM THE SOUTH AT THE 60-FOOT LEVEL. B. PEAK WIND SPEED EXCEEDING 50 KNOTS FROM ALL OTHER DIRECTIONS AT THE 60-FOOT LEVEL. <p>IF EITHER FACTOR (WIND LIMIT OR BETA REDLINE) IS EXCEEDED, ADJUSTMENTS AS DESCRIBED IN SECTION 2, "LAUNCH VEHICLE OPERATIONS", IU FIGURES 2, 3, AND 4, WILL BE NECESSARY FOR A LAUNCH DECISION. ALSO, REFERENCE ITEMS 2-720 THROUGH 2-727.</p> <p><u>NOTE:</u> FOR HARDWARE ENTRIES, SEE SECTION 4, "TECHNICAL SUPPORT OPERATIONS," ITEMS 4-208 AND 4-210.</p>
MISSION APOLLO 12	SECTION SPACE VEHICLE	STAGE SUBSECTION WEATHER RESTRICTIONS
SYSTEM		REVISION A OCTOBER 17, 1969
		PAGE 1-13

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
	1-403	<p><u>WEATHER RESTRICTIONS (CONTINUED):</u></p> <p><u>SURFACE WIND RESTRICTIONS FOR LIFTOFF (COMMAND MODULE LAND LANDING LIMITS):</u></p> <ol style="list-style-type: none"> 1. THE FLIGHT DIRECTOR WILL EVALUATE THE MODE 1 (TOWER) ABORT IP TRACK WIND SIMULATIONS AND WILL ADVISE THE LAUNCH DIRECTOR OF ANY PREDICTED PERIODS OF LAND LANDING PRIOR TO START OF CRITICAL COUNTDOWN ACTIVITIES (REFERENCE ITEM 1-403 (7) BELOW). IF THE FLIGHT DIRECTOR IS UNABLE TO PROVIDE THIS EVALUATION, A LAND LANDING WILL BE ASSUMED, AND THE SURFACE WIND RESTRICTIONS SPECIFIED IN ITEMS 1-403 (2) AND 1-403 (3) BELOW WILL BE APPLIED. 2. THE LAUNCH WILL NOT BE ATTEMPTED IF A MODE 1 (TOWER) ABORT WOULD RESULT IN A LAND LANDING WITH A SPACE-CRAFT HORIZONTAL VELOCITY COMPONENT OF GREATER THAN 54 FEET PER SECOND AT IMPACT. 3. THE SPACECRAFT WILL NOT REMAIN IN A TOWER ABORT MODE ON THE PAD IF A MODE 1 (TOWER) ABORT WOULD RESULT IN A LAND LANDING WITH A SPACECRAFT HORIZONTAL VELOCITY COMPONENT OF GREATER THAN 54 FEET PER SECOND AT IMPACT. 4. THE (LAND LANDING) WIND MONITORING TEAM WILL ANALYZE THE EFFECTS OF SURFACE WINDS ON THE SPACECRAFT VELOCITY AT IMPACT, AND WILL ADVISE THE LAUNCH DIRECTOR AND FLIGHT DIRECTOR PRIOR TO START OF CRITICAL COUNTDOWN ACTIVITIES (REFERENCE ITEM 1-403 (7) BELOW). 5. IF THE PEAK WINDS (FROM ANY DIRECTION AND REFERENCED TO 162 FEET ABOVE NATURAL GRADE) DO NOT EXCEED 25 KNOTS, THE SPACECRAFT HORIZONTAL VELOCITY COMPONENT AT IMPACT WILL NOT EXCEED 54 FEET PER SECOND. 6. IF THE PEAK WINDS (FROM ANY DIRECTION AND REFERENCED TO 162 FEET ABOVE NATURAL GRADE) EXCEED 25 KNOTS, OR IF THIS DATA IS UNAVAILABLE, THE WIND MONITORING TEAM WILL EVALUATE THE ACTUAL SURFACE WIND PROFILE TO DETERMINE THE PREDICTED SPACECRAFT HORIZONTAL VELOCITY COMPONENT AT IMPACT. 7. THE LAUNCH DIRECTOR WILL ASSESS THE LAND LANDING PROBABILITIES AND THE SURFACE WIND EFFECTS FOR MODE 1 (TOWER) ABORTS TO DETERMINE THEIR ACCEPTABILITY PRIOR TO START OF THE FOLLOWING COUNTDOWN ACTIVITIES, AND WILL CONTINUE OR HOLD THE COUNTDOWN ACCORDINGLY: <ol style="list-style-type: none"> A. LAUNCH VEHICLE CRYOGENIC LOADING (APPROX. T-8 HOURS 15 MINUTES). B. FLIGHT CREW INGRESS (APPROX. T-2 HOURS 40 MINUTES). C. ACCESS ARM RETRACTED TO PARK POSITION (APPROX. T-43 MINUTES). D. ACCESS ARM FULLY RETRACTED (APPROX. T-5 MINUTES). <p><u>NOTE:</u> THE FLIGHT DIRECTOR WILL PROVIDE A LAND LANDING PROBABILITY ASSESSMENT TO THE LAUNCH DIRECTOR IN SUPPORT OF THE ABOVE ON A SCHEDULE AGREED TO BY KSC AND MSC, AND AS SPECIFIED IN THE "SPACE VEHICLE COUNTDOWN" TEST AND CHECKOUT PROCEDURE, TCP V-40300, VOLUME I.</p>
MISSION APOLLO 12	SECTION SPACE VEHICLE	STAGE SUBSECTION WEATHER RESTRICTIONS
		SYSTEM DATE CHANGE NO. BASIC OCTOBER 2, 1969
		PAGE 1-14

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO	PAGE
1-403 (CTD)	<u>WEATHER RESTRICTIONS (CONTINUED):</u>	<p>8. FOR HARDWARE ENTRIES RELATIVE TO MODE I (TOWER) ABORT IP TRACK WIND SIMULATIONS, SEE SECTION 4, "TECHNICAL SUPPORT OPERATIONS," ITEMS 4-209, 4-211, 4-212, AND 4-402.</p> <p>9. FOR HARDWARE ENTRIES RELATIVE TO SURFACE WIND EFFECTS FOR MODE I (TOWER) ABORTS, SEE SECTION 4, "TECHNICAL SUPPORT OPERATIONS," ITEMS 4-104, 4-105, 4-106, 4-107, 4-206, 4-207, 4-403, 4-404, AND 4-405.</p>	APOLLO 12	SPACE VEHICLE	WEATHER RESTRICTIONS	BASIC	OCTOBER 2, 1969	1-15

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE	
		<p><u>WEATHER RESTRICTIONS (CONTINUED):</u></p> <p><u>SPACE VEHICLE UPPER AIR WIND RESTRICTIONS:</u></p> <p>1. PRELAUNCH SIMULATIONS OF THE SPACE VEHICLE RESPONSE TO UPPER AIR WINDS AT TIME OF LAUNCH WILL BE PERFORMED AT MSFC BY AN MSFC/MSC WIND MONITORING TEAM USING WIND DATA PROVIDED BY KSC. A C-BAND RADAR WILL BE UTILIZED TO TRACK JIMSPHERE BALLOONS RELEASED FROM THE LAUNCH AREA TO OBTAIN UPPER AIR WIND DATA FROM T-48 HOURS TO T+10 MINUTES ON A SCHEDULE AGREED TO BY KSC, MSFC, AND MSC. RESULTS OF THE WIND SIMULATIONS WILL BE TRANSMITTED VIA DATAFAX TO THE LAUNCH OPERATIONS MANAGER (OR TEST SUPERVISOR IN HIS ABSENCE) AT THE LAUNCH CONTROL CENTER. REPORTS WILL BE AVAILABLE AND PROVIDED AS CONSIDERED APPROPRIATE STARTING AT T-24 HOURS WITH A GO/NO-GO RECOMMENDATION TRANSMITTED PRIOR TO START OF CRYOGENIC LOADING. IF THE WIND SIMULATIONS INDICATE THAT WIND CONDITIONS ARE MARGINAL FOR LAUNCH, THE WIND MONITORING TEAM WILL REPORT THAT "LAUNCH WINDS ARE MARGINAL FOR LAUNCH". UPON RECEIPT OF THIS REPORT, THE LAUNCH OPERATIONS MANAGER WILL PLACE A CONTINGENCY PLAN INTO EFFECT WHICH WILL PROVIDE FOR A NEW JIMSPHERE RELEASE EACH HOUR. THE CONTINGENCY PLAN WILL REMAIN IN EFFECT UNTIL LIFTOFF HAS OCCURRED, THE LAUNCH IS SCRUBBED, OR A SUBSEQUENT REPORT STATES THAT "LAUNCH WINDS ARE NO LONGER MARGINAL FOR LAUNCH". THE WIND MONITORING TEAM WILL PROVIDE A REPORT TO THE LAUNCH OPERATIONS MANAGER FOR EACH JIMSPHERE RELEASE UNDER THE CONTINGENCY PLAN. (FOR HARDWARE ENTRIES, SEE SECTION 4, "TECHNICAL SUPPORT OPERATIONS," ITEMS 4-402, 4-213, AND 4-103.)</p> <p>2. THE SPACE VEHICLE WILL NOT BE LAUNCHED WHEN ITS NOMINAL FLIGHT PATH WILL CARRY IT THROUGH A CUMULO-NIMBUS (THUNDERSTORM) CLOUD FORMATION.</p> <p><u>RANGE SAFETY WIND RESTRICTIONS:</u></p> <p>AN ANNUAL PROFILE WIND RESTRICTION OF 1.25 σ (11%) WILL BE IN EFFECT FOR LAUNCH.</p> <p><u>WEATHER CONDITIONS REQUIRING FLIGHT CREW EGRESS:</u></p> <p>FOR SEVERE WEATHER CONDITIONS REQUIRING FLIGHT CREW EGRESS, SEE "FLIGHT CREW SAFETY RULES" SUBSECTION, ITEMS 1-609 (9) AND 1-610 (6).</p> <p><u>PAD OR LAUNCH ABORT RECOVERY WEATHER CONDITIONS:</u></p> <p>THE LAUNCH OPERATIONS MANAGER WILL OBTAIN A GO/NO-GO DECISION ON PAD OR LAUNCH ABORT RECOVERY WEATHER CONDITIONS FROM THE FLIGHT DIRECTOR.</p>	APOLLO 12	SPACE VEHICLE	WEATHER RESTRICTIONS		BASIC	OCTOBER 2, 1969	1-16
Δ	1-404								
	1-405								
	1-406								
	1-407								

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<p><u>RANGE SAFETY RULES AND AGREEMENTS:</u></p> <p><u>GENERAL:</u></p> <p>RANGE SAFETY POLICIES AND CRITERIA ARE SPECIFIED IN AFETRM MANUAL (AFETRM) 127-1 DATED 1 JANUARY 1969. THE FOLLOWING MISSION RULES CONCERNING SPECIFIC ETR/NASA INTERFACE SUPPLEMENT AFETRM 127-1.</p> <p>THE RSO WILL ACCOMPLISH THE PAD EMERGENCY RANGE CUTOFF PROCEDURE IF THE SPACE VEHICLE WILL NOT LIFT OFF AFTER IGNITION AND NASA IS UNABLE TO ACCOMPLISH CUTOFF. THE RSO WILL SEND "ARM/MFCO" ONLY IN RESPONSE TO A CODED VERBAL REQUEST FROM THE NASA LAUNCH VEHICLE TEST CONDUCTOR (CLTC). THE CLTC WILL CALL THE RSO ON THE CLTC-RSO DIRECT LINE TO TRANSMIT THIS REQUEST. THE RSO WILL NOT EXECUTE THIS PROCEDURE IF HE HAS A LIFTOFF INDICATION.</p> <p>THE FLIGHT DIRECTOR (FD) WILL INITIATE ABORT IN RESPONSE TO A CODED VERBAL REQUEST FROM THE RSO. THIS PROCEDURE WILL BE EXECUTED IF RANGE SAFETY FLIGHT TERMINATION CRITERIA HAVE BEEN VIOLATED AND RSO EFFORTS TO TERMINATE THRUST HAVE FAILED. THE REQUEST FROM RSO TO FD WILL BE TRANSMITTED ON THE FLIGHT DIRECTOR LOOP WITH THE FIDO-RSO PRIVATE LINE AS BACKUP.</p> <p>THE RSO WILL SEND "ARM/MFCO" IN RESPONSE TO A CODED VERBAL REQUEST FROM THE FLIGHT DIRECTOR (FD) OR THE FLIGHT DYNAMICS OFFICER (FIDO). THIS PROCEDURE WILL BE EXECUTED IF ABORT LIMITS HAVE BEEN EXCEEDED AND ABORT ACTION HAS BEEN UNSUCCESSFUL. THE REQUEST FROM FD/FIDO TO THE RSO WILL BE TRANSMITTED ON THE RSO LOOP (CAPE 111) WITH THE FIDO-RSO PRIVATE LINE AS BACKUP.</p> <p>THE FD/FIDO WILL INFORM THE RSO IMMEDIATELY UPON DETERMINATION OF A SPACECRAFT SEPARATION. THIS NOTIFICATION WILL BE TRANSMITTED ON THE RSO LOOP (CAPE 111) WITH THE FIDO-RSO PRIVATE LINE AS BACKUP.</p> <p>THE FD WILL INFORM THE RSO WHEN THE S-IC #3 (OR #4) ENGINE HAS SHUT DOWN BY STATING, "RSO, #3 (OR #4) OUT" ON THE RSO LOOP (CAPE 111) AND/OR ACTIVATE THE ENGINE OUT LIGHT ON THE RSO CONSOLE. THE #3 ENGINE OUT LIGHT CIRCUIT FROM MCC-FIDO TO RSO IS <u>HIGHLY DESIRABLE</u>.</p> <p>IF RANGE SAFETY DESTRUCT LINES ARE VIOLATED, THE RSO WILL SEND "ARM/MFCO" AND NOTIFY THE FD/FIDO. NO SPS THRUSTING WILL BE INITIATED FOLLOWING SUCH RANGE SAFETY ACTION.</p> <p>IF AN ESTABLISHED IMPACT PREDICTION (IP) POINT IS ON THE CAPE KENNEDY LAND AREA, "DESTRUCT/PD" WILL BE TRANSMITTED.</p> <p>IF AN ATTEMPT TO TERMINATE THRUST BY "ARM/MFCO" IS UNSUCCESSFUL WHILE THE IP IS ON THE CAPE KENNEDY LAND AREA, "DESTRUCT/PD" WILL BE SENT.</p>
1-500		
1-501		
1-502		
1-503		
1-503A		
1-504		
1-505		
1-506		
1-507		
MISSION	SECTION	STAGE SUBSECTION
APOLLO 12	SPACE VEHICLE	RANGE SAFETY RULES AND AGREEMENTS
		SYSTEM
		DATE CHANGE NO.
		BASIC
		OCTOBER 2, 1969
		PAGE
		1-17

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<p><u>RANGE SAFETY RULES AND AGREEMENTS (CONTINUED):</u></p>
1-508		<p>WHEN THE IP HAS MOVED OFF THE CAPE, FLIGHT TERMINATION ACTION WILL BE LIMITED TO "ARM/MFCO" OR CREW INITIATED ABORT. THE "DESTRUCT/PD" FUNCTION WILL BE SENT ONLY AFTER FD/FIDO CONFIRMATION OF SATISFACTORY SPACECRAFT SEPARATION, AND ONLY IF FUEL DISPERSION IS NECESSARY.</p>
1-509		<p>IF AN IP POINT IS ESTABLISHED AND "DESTRUCT/PD" IS DEEMED UNNECESSARY, THE RSO WILL NOTIFY FD/FIDO. SAFE WILL BE SENT UPON FD/FIDO'S REQUEST: "RSO SEND SAFE".</p>
1-510		<p>FD/FIDO WILL DECLARE TO THE RSO WHEN THERE IS NO POSSIBILITY OF INSERTING THE SPACECRAFT INTO AN ORBIT, AND THE RSO WILL NOT ALLOW THE AFRICAN GATE TO BE OVERFLOWN.</p>
1-511		<p>AN ETR RANGE SAFETY OFFICER (BRSO) IS REQUIRED AT BERMUDA TO MONITOR PRESENT POSITION AND IMPACT PREDICTION CHARTS, TO OBSERVE TELEMETRY DISPLAYS, AND TO TRANSMIT THE RANGE SAFETY FUNCTIONS WHEN COMMANDED TO DO SO BY THE RSO. FOR FLIGHT AZIMUTHS LESS THAN 90°, THE BRSO WILL ASSUME PRIMARY RANGE SAFETY RESPONSIBILITY IN THE EVENT OF LOSS OF COMMUNICATIONS BETWEEN THE BRSO AND THE RSO.</p>
1-512		<p>SAFING BY THE RSO WILL BE TRANSMITTED AFTER GATE PENETRATION AND FIRST S-IVB CUTOFF WHEN THE FD/FIDO REQUESTS: "RSO SEND SAFE". WHEN SAFING IS CONFIRMED, THE RSO WILL STATE, "SAFING CONFIRMED". IN THE EVENT OF LOSS OF COMMUNICATIONS WITH FD/FIDO, THE RSO WILL SEND SAFE ONLY IF HE CAN CONFIRM S-IVB CUTOFF.</p>
1-513		<p>IF SAFING CANNOT BE CONFIRMED BY THE RSO, ANOTHER SAFING ATTEMPT WILL BE MADE BY THE RSO ON THE FIRST ORBITAL PASS OVER THE CAPE. COORDINATION WILL BE EFFECTED WITH THE SUPERINTENDENT OF RANGE OPERATIONS (SRO) AND FIDO TO INSURE COMMAND COVERAGE AND TELEMETRY DISPLAY AVAILABILITY. AT THE AGREED TIME, FIDO WILL STATE, "RSO SEND SAFE". UPON CONFIRMATION, THE RSO WILL STATE, "SAFING CONFIRMED".</p>
		<p><u>TRACKING SOURCES:</u></p>
1-514		<p>AT LEAST TWO (2) VEHICLE POSITION DATA SOURCES ARE MANDATORY TO L/O FOR EACH PHASE OF POWERED FLIGHT PRIOR TO THE AFRICAN GATE TO ENABLE THE RANGE SAFETY OFFICER TO DETERMINE IF THE SPACE VEHICLE IS NORMAL OR VIOLATES ESTABLISHED INFLIGHT SAFETY CRITERIA.</p>
1-515		<p>DATA FROM TWO (2) OF THE FOLLOWING THREE (3) RADARS ARE MANDATORY TO L/O (OTHER HIGHLY DESIRABLE): BERMUDA FPS-16, BERMUDA FPQ-6, AND GRAND TURK TPQ-18 (7.18).</p>
1-516		<p>PRESENT POSITION AND IP PLOTS AT BERMUDA (BDA) USING INPUTS FROM EITHER THE BDA FPS-16 OR BDA FPQ-6 RADAR ARE HIGHLY DESIRABLE FOR LAUNCH.</p>
MISSION	SECTION	SYSTEM
APOLLO 12	SPACE VEHICLE	BASIC
		OCTOBER 2, 1969
		PAGE
		1-18

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<p><u>RANGE SAFETY RULES AND AGREEMENTS (CONTINUED):</u></p> <p><u>AIRBORNE SYSTEMS:</u></p> <p>TWO (2) OPERATIONAL RANGE SAFETY COMMAND RECEIVERS ON EACH LAUNCH VEHICLE STAGE (S-IC, S-II, S-IVB) ARE MANDATORY TO L/O. THE RANGE SAFETY SUPERVISOR (CRSS) AT THE LAUNCH CONTROL CENTER WILL DETERMINE IF THE RECEIVERS ARE OPERATING PROPERLY. (FOR HARDWARE ENTRIES, SEE SECTION 2, "LAUNCH VEHICLE OPERATIONS," ITEMS 2-115, 2-154, 2-155, 2-315, 2-436, 2-437, 2-507, 2-579, 2-580.)</p> <p>IU C-BAND BEACON NO. 1 OR NO. 2 IS <u>HIGHLY DESIRABLE</u> FOR LAUNCH. (REFERENCE ITEM 1-529.) (FOR HARDWARE ENTRY, SEE SECTION 2, "LAUNCH VEHICLE OPERATIONS," ITEM 2-710.)</p> <p><u>COMMAND/CONTROL:</u></p> <p>A FOUR (4) SECOND TIME DELAY BETWEEN "ARM/MFCO" AND "DESTRUCT/PD" WILL BE PROVIDED BY TIMERS IN THE RSO CONSOLE IN THE RANGE CONTROL CENTER (RCC).</p> <p>NASA BERMUDA DRS COMMAND/CONTROL CAPABILITY IS <u>MANDATORY TO L/O</u> FOR FLIGHT AZIMUTHS LESS THAN 90°.</p> <p><u>COMMUNICATIONS:</u></p> <p>ONE (1) OF TWO (2) PRIVATE, INDEPENDENT, GEOGRAPHICALLY DIVERSIFIED COMMUNICATIONS LINKS BETWEEN THE RSO AND BRSO IS <u>MANDATORY</u> (OTHER <u>HIGHLY DESIRABLE</u>).</p> <p>ONE (1) OF THE FOLLOWING THREE (3) COMMUNICATIONS LINKS IS <u>MANDATORY</u> BETWEEN THE RSO AND FD/FIDO (OTHERS <u>HIGHLY DESIRABLE</u>):</p> <ul style="list-style-type: none"> (1) RSO LOOP (CAPE 111). (2) RSO PRIVATE LINE. (3) FLIGHT DIRECTOR LOOP. <p>A COMMUNICATIONS LINK BETWEEN THE RSO AND THE RANGE SAFETY SUPERVISOR (CRSS) AT THE LAUNCH CONTROL CENTER IS <u>MANDATORY</u> FOR 1-40 MINUTE DESTRUCT CHECKS. (FOR HARDWARE ENTRIES, SEE SECTION 4, "TECHNICAL SUPPORT OPERATIONS," ITEMS 4-113 AND 4-411.)</p> <p>A DIRECT LINE COMMUNICATIONS LINK BETWEEN THE RSO AND THE LAUNCH VEHICLE TEST CONDUCTOR (CLTC) IS <u>HIGHLY DESIRABLE</u>. (FOR HARDWARE ENTRIES, SEE SECTION 4, "TECHNICAL SUPPORT OPERATIONS," ITEMS 4-112 AND 4-410.)</p>

MISSION	SECTION	SYSTEM	DATE CHANGE NO.	PAGE
APOLLO 12	SPACE VEHICLE	RANGE SAFETY RULES AND AGREEMENTS	BASIC OCTOBER 2, 1969	1-19

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<p><u>RANGE SAFETY RULES AND AGREEMENTS (CONTINUED):</u></p> <p><u>TELEMETRY:</u></p> <p>IU TELEMETRY DATA (ONBOARD GUIDANCE PARAMETERS) TO THE RTCS ARE <u>HIGHLY DESIRABLE</u> UNTIL S-IVB CUTOFF FOR IP COMPUTATION AND RSO DISPLAY.</p> <p>TELEMETRY REQUIREMENTS TO BE DISPLAYED FOR THE RSO AND BRSO ARE <u>HIGHLY DESIRABLE</u>. FOR LAUNCH VEHICLE AND SPACECRAFT HARDWARE ENTRIES, REFERENCE THE FOLLOWING ITEMS:</p> <p>(1) <u>FOR RSO DISPLAY:</u> 2-131, 2-132, 2-133, 2-134, 2-135, 2-147, 2-148, 2-151, 2-152, 2-154, 2-155, 2-344, 2-345, 2-346, 2-347, 2-348, 2-436, 2-437, 2-518, 2-561, 2-564, 2-579, 2-580, 2-761, 2-762, 2-763, 3-403, 3-404.</p> <p>(2) <u>FOR BRSO DISPLAY:</u> 2-344, 2-345, 2-346, 2-347, 2-348, 2-420, 2-423, 2-433, 2-436, 2-437, 2-518, 2-561, 2-562, 2-563, 2-564, 2-579, 2-580, 2-754, 2-755, 2-761, 2-762, 2-763, 3-403, 3-404.</p> <p><u>RANGE SAFETY WEATHER RESTRICTIONS:</u></p> <p><u>WIND RESTRICTIONS:</u></p> <p>AN ANNUAL PROFILE WIND RESTRICTION OF 1.25 σ (11%) WILL BE IN EFFECT FOR LAUNCH.</p> <p><u>CEILING AND VISIBILITY RESTRICTIONS:</u></p> <p>NO CEILING OR VISIBILITY RESTRICTIONS WILL BE IMPOSED PROVIDING 1.16 AND 19.18 RADARS AND IU C-BAND BEACON NO. 1 ARE OPERATIONAL.</p>
1-526		
1-527		
1-528		
1-529		

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION		MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
		<p><u>FLIGHT CREW SAFETY RULES:</u></p> <p><u>GENERAL:</u></p> <p><u>EMERGENCY CONDITION:</u> A CONDITION THAT REQUIRES IMMEDIATE ACTION BE TAKEN TO PREVENT LOSS OF LIFE OR DESTRUCTION OF VEHICLE OR COMPLEX EQUIPMENT.</p> <p><u>HAZARDOUS CONDITION:</u> A CONDITION IN OR AROUND THE SPACE VEHICLE OR LAUNCH COMPLEX POSING A THREAT TO OPERATIONAL PERSONNEL HEALTH OR SAFETY. A HAZARDOUS CONDITION MAY DETERIORATE INTO AN EMERGENCY CONDITION. SPACE VEHICLE TESTING IS FREQUENTLY CONDUCTED UNDER HAZARDOUS CONDITIONS WITH CAREFUL ATTENTION TO SAFETY PRACTICES.</p> <p><u>EMERGENCY EGRESS:</u> EGRESS OF THE FLIGHT CREW AND SUPPORTING PERSONNEL CROSSING THE APOLLO ACCESS ARM AND DESCENDING TO SAFETY VIA THE LUT ELEVATORS OR SLIDEWIRE IN THE EVENT OF A POTENTIAL CATASTROPHE. EMERGENCY EGRESS MODES ARE DESCRIBED IN ITEM 1-606.</p> <p><u>NORMAL EGRESS:</u> AN EGRESS PERFORMED IN THE EVENT OF A SUSTAINED HOLD OR SCRUB. THE SPACECRAFT CLOSEOUT CREW MAY RETURN TO THE LAUNCH COMPLEX, OPEN THE COMMAND MODULE HATCH, AND ASSIST THE FLIGHT CREW IN EGRESS OR THE CREW MAY EXIT THE SPACECRAFT UNASSISTED.</p> <p><u>ABORT:</u> ACTIVATION OF THE LAUNCH ESCAPE SYSTEM.</p>		APOLLO 12	SPACE VEHICLE	FLIGHT CREW SAFETY RULES		BASIC OCTOBER 2, 1969	1-21
	1-600								
	1-601								
	1-602								
	1-603								
	1-604								

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	MISSION	SECTION	STAGE	SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
		<p><u>FLIGHT CREW SAFETY RULES (CONTINUED):</u></p> <p><u>FLIGHT CREW EMERGENCY EGRESS:</u></p> <p><u>EMERGENCY EGRESS RESPONSIBILITIES:</u></p> <ol style="list-style-type: none"> 1. THE LAUNCH OPERATIONS MANAGER IS RESPONSIBLE FOR DETERMINING WHEN FLIGHT CREW EGRESS IS REQUIRED AND FOR INITIATING APPROPRIATE ACTION. FOR EMERGENCY CONDITIONS INTERNAL TO THE COMMAND MODULE WHERE TIME DOES NOT PERMIT PRIOR COORDINATION WITH THE TEST SUPERVISOR, THE SPACECRAFT TEST CONDUCTOR WILL INITIATE FLIGHT CREW EGRESS, REFERENCE ITEM 1-609 (6). 2. THE TEST SUPERVISOR IS RESPONSIBLE FOR DIRECTING ALL OPERATIONS IN THE EVENT OF AN EMERGENCY CONDITION, INCLUDING SPECIFICATION OF EGRESS MODE. <p><u>EMERGENCY EGRESS MODES:</u> THE LAUNCH COMPLEX 39 EGRESS SYSTEM CONSISTS BASICALLY OF THE APOLLO ACCESS ARM, THE LUT ELEVATORS, THE SLIDEWIRE, AND THE SLIDETUBE/BLAST ROOM WHICH PROVIDE ESCAPE ROUTES FROM THE COMMAND MODULE TO GROUND LEVEL. SUPPORT IS PROVIDED BY THE PAD EGRESS TEAM EQUIPPED WITH M-113 ARMORED PERSONNEL CARRIERS FOR SURFACE TRANSPORTATION. THE FOLLOWING TWO EMERGENCY EGRESS MODES ARE AVAILABLE:</p> <ol style="list-style-type: none"> 1. <u>INCAPACITATED FLIGHT CREW EGRESS:</u> AN AIDED EGRESS OPERATION WHEREBY, FOR MEDICAL REASONS, THE FLIGHT CREW, OR ANY MEMBER THEREOF, IS PHYSICALLY REMOVED FROM THE COMMAND MODULE BY THE PAD EGRESS TEAM OR SPACECRAFT CLOSEOUT CREW. 2. <u>UNAIDED EGRESS:</u> AN EGRESS OPERATION IN WHICH THE FLIGHT CREW OPENS AND LEAVES THE COMMAND MODULE AND DESCENDS TO SAFETY WITHOUT ASSISTANCE FROM THE PAD EGRESS TEAM. ARMORED PERSONNEL CARRIERS OPERATED BY THE EGRESS TEAM MAY PROVIDE SURFACE TRANSPORTATION FROM THE BLAST DANGER AREA IF THE SLIDEWIRE OR PAD SURFACE EGRESS ROUTE IS USED. 	APOLLO 12	SPACE VEHICLE	FLIGHT CREW SAFETY RULES			BASIC OCTOBER 2, 1969	1-22

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION																		
1-607	<p><u>FLIGHT CREW EMERGENCY EGRESS (CONTINUED):</u></p> <p><u>MINIMUM TIME REQUIRED FOR EMERGENCY EGRESS OPERATIONS:</u></p> <table border="0"> <thead> <tr> <th data-bbox="446 1648 479 1816"><u>EGRESS MODE</u></th> <th data-bbox="446 955 479 1144"><u>EGRESS ROUTE</u></th> <th data-bbox="446 262 479 598"><u>MINIMUM TIME REQUIRED</u></th> </tr> </thead> <tbody> <tr> <td data-bbox="511 1648 544 1816">UNAIDED</td> <td data-bbox="511 955 544 1144">SLIDEWIRE</td> <td data-bbox="511 262 544 598">3 MINUTES (SEE NOTE 1)</td> </tr> <tr> <td data-bbox="544 1648 576 1816">UNAIDED (TO BLAST ROOM)</td> <td data-bbox="544 955 576 1144">ELEVATOR</td> <td data-bbox="544 262 576 598">3-1/2 MINUTES</td> </tr> <tr> <td data-bbox="576 1648 609 1816">UNAIDED (TO PAD SURFACE)</td> <td data-bbox="576 955 609 1144">ELEVATOR</td> <td data-bbox="576 262 609 598">5-1/4 MINUTES</td> </tr> <tr> <td data-bbox="609 1648 641 1816">INCAPACITATED (1 OR 2 CREWMEN)</td> <td data-bbox="609 955 641 1144">SLIDEWIRE OR ELEVATOR</td> <td data-bbox="609 262 641 598">10 MINUTES</td> </tr> <tr> <td data-bbox="641 1648 673 1816">INCAPACITATED (3 CREWMEN)</td> <td data-bbox="641 955 673 1144">SLIDEWIRE OR ELEVATOR</td> <td data-bbox="641 262 673 598">15 MINUTES</td> </tr> </tbody> </table> <p><u>NOTES:</u> (1) THE MINIMUM TIME OF 3 MINUTES REQUIRED FOR AN UNAIDED EGRESS VIA THE SLIDEWIRE IS FOR 3 CREWMEN ONLY. ADDITIONAL TIME MAY BE REQUIRED IF THE SPACECRAFT CLOSEOUT CREW IS AT THE COMMAND MODULE LEVEL.</p> <p>(2) IF EGRESS IS VIA SLIDEWIRE, THE MINIMUM TIME REQUIRED IS FOR PERSONNEL TO DESCEND TO GROUND LEVEL AND ENTER THE SLIDEWIRE BUNKER.</p> <p>(3) IF EGRESS IS TO BLAST ROOM VIA ELEVATOR, THE MINIMUM TIME REQUIRED IS FOR PERSONNEL TO DESCEND TO LEVEL 'A' OF THE LUT, ENTER THE SLIDETUBE, AND DESCEND TO THE BLAST ROOM.</p> <p>(4) IF EGRESS IS TO PAD SURFACE VIA ELEVATOR, THE MINIMUM TIME REQUIRED IS FOR PERSONNEL TO DESCEND TO THE PAD SURFACE AND ENTER THE M-113 VEHICLES.</p>	<u>EGRESS MODE</u>	<u>EGRESS ROUTE</u>	<u>MINIMUM TIME REQUIRED</u>	UNAIDED	SLIDEWIRE	3 MINUTES (SEE NOTE 1)	UNAIDED (TO BLAST ROOM)	ELEVATOR	3-1/2 MINUTES	UNAIDED (TO PAD SURFACE)	ELEVATOR	5-1/4 MINUTES	INCAPACITATED (1 OR 2 CREWMEN)	SLIDEWIRE OR ELEVATOR	10 MINUTES	INCAPACITATED (3 CREWMEN)	SLIDEWIRE OR ELEVATOR	15 MINUTES	
<u>EGRESS MODE</u>	<u>EGRESS ROUTE</u>	<u>MINIMUM TIME REQUIRED</u>																		
UNAIDED	SLIDEWIRE	3 MINUTES (SEE NOTE 1)																		
UNAIDED (TO BLAST ROOM)	ELEVATOR	3-1/2 MINUTES																		
UNAIDED (TO PAD SURFACE)	ELEVATOR	5-1/4 MINUTES																		
INCAPACITATED (1 OR 2 CREWMEN)	SLIDEWIRE OR ELEVATOR	10 MINUTES																		
INCAPACITATED (3 CREWMEN)	SLIDEWIRE OR ELEVATOR	15 MINUTES																		
1-608		<p>DETAILED PROCEDURES FOR PERFORMANCE OF FLIGHT CREW EMERGENCY EGRESS ARE CONTAINED IN THE "APOLLO FLIGHT CREW EMERGENCY EGRESS PROCEDURES", TCP V-46002. EVACUATION ROUTES FOR PERSONNEL AT THE LAUNCH COMPLEX ARE CONTAINED IN THE APPROPRIATE APPENDIX TO THE "APOLLO/SATURN PAD ACCESS POLICY AFTER LAUNCH VEHICLE CRYOGENIC TANKING", 630-39-0031.</p>																		

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	DESCRIPTION				
1-609	<p><u>FLIGHT CREW EMERGENCY EGRESS (CONTINUED):</u> <u>EGRESS GROUND RULES (FLIGHT CREW INGRESS TO ACCESS ARM RETRACT):</u></p> <ol style="list-style-type: none"> 1. <u>NORMAL EGRESS:</u> IF NO ABNORMAL DANGER TO PERSONNEL EXISTS, A NORMAL EGRESS WILL BE ACCOMPLISHED IN THE EVENT OF A LAUNCH SCRUB. 2. <u>EMERGENCY EGRESS TO BLAST ROOM VIA LUT ELEVATORS AND SLIDETUBE:</u> AN EMERGENCY EGRESS TO THE BLAST ROOM VIA THE LUT ELEVATORS AND THE SLIDETUBE WILL BE ACCOMPLISHED IN THE EVENT OF THE FOLLOWING CONDITIONS: <ol style="list-style-type: none"> (A) THREAT EXISTS TO FLIGHT CREW SAFETY. (B) SUFFICIENT TIME AVAILABLE (MINIMUM OF 3-1/2 MINUTES). (C) ELEVATOR ROUTE NOT ENDANGERED. (D) PROBLEM IS ON OR ABOVE THE COMMAND MODULE. 3. <u>EMERGENCY EGRESS TO PAD SURFACE VIA LUT ELEVATORS:</u> AN EMERGENCY EGRESS TO THE PAD SURFACE VIA THE LUT ELEVATORS WILL BE ACCOMPLISHED IN THE EVENT OF THE FOLLOWING CONDITIONS: <ol style="list-style-type: none"> (A) THREAT EXISTS TO FLIGHT CREW SAFETY. (B) SUFFICIENT TIME AVAILABLE (MINIMUM OF 5-1/4 MINUTES). (C) ELEVATOR ROUTE NOT ENDANGERED. (D) PROBLEM IS ON OR ABOVE THE COMMAND MODULE. 4. <u>EMERGENCY EGRESS VIA SLIDEWIRE:</u> AN EMERGENCY EGRESS VIA THE SLIDEWIRE WILL BE ACCOMPLISHED IN THE EVENT OF THE FOLLOWING CONDITIONS: <ol style="list-style-type: none"> (A) THREAT EXISTS TO FLIGHT CREW SAFETY. (B) SUFFICIENT TIME AVAILABLE (MINIMUM OF 3 MINUTES). (C) ELEVATOR EGRESS IS IMPOSSIBLE. (D) PROBLEM IS BELOW THE COMMAND MODULE. 5. <u>COMMUNICATIONS WITH THE FLIGHT CREW RELATIVE TO EMERGENCY CONDITIONS OCCURRING DURING THIS TIME PERIOD WILL BE ACCOMPLISHED BY THE TEST SUPERVISOR OR THE SPACECRAFT TEST CONDUCTOR, REFERENCE ITEM 1-609 (6).</u> 				
MISSION APOLLO 12	SECTION SPACE VEHICLE	STAGE SUBSECTION FLIGHT CREW SAFETY RULES	SYSTEM	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 1-24

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES.

REV	ITEM	DESCRIPTION
	1-609 (CTD)	<p><u>FLIGHT CREW EMERGENCY EGRESS (CONTINUED):</u></p> <p>6. IF TIME PERMITS, AND FOR EMERGENCIES RESULTING IN A CHOICE OF ACTION ON THE PART OF THE FLIGHT CREW, THE TEST SUPERVISOR WILL DEFINE THE RECOMMENDED COURSE OF ACTION TO THE FLIGHT CREW, BUT THE FLIGHT CREW WILL MAKE THE FINAL DECISION AS TO WHICH COURSE OF ACTION TO IMPLEMENT. IF TIME DOES NOT PERMIT, THE TEST SUPERVISOR (OR THE SPACECRAFT TEST CONDUCTOR) WILL INITIATE FLIGHT CREW EGRESS AND THE FLIGHT CREW WILL IMMEDIATELY TAKE THE DEFINED ACTION. IN ALL CASES WHERE THE SPACECRAFT TEST CONDUCTOR INITIATES THE ABOVE ACTION, HE WILL INFORM THE TEST SUPERVISOR IN PARALLEL FOR SUBSEQUENT SPECIFICATION OF EGRESS MODE.</p> <p>7. FOR ALL EMERGENCIES REQUIRING FLIGHT CREW EGRESS, INCLUDING LOSS OF VOICE COMMUNICATIONS WITH THE FLIGHT CREW AS COVERED IN ITEM 1-609 (8) BELOW, THE FLIGHT CREW WILL TAKE UNAIDED EGRESS ACTION (IF POSSIBLE), BUT THE SPACECRAFT CLOSEOUT CREW (IF PRESENT) WILL TAKE NECESSARY ACTION TO ASSIST AND THE PAD EGRESS TEAM WILL PROCEED TO THE BASE OF THE LUT (STAIRS BESIDE WEST ELEVATOR), TO THE SLIDEWIRE BUNKER, OR AS OTHERWISE DIRECTED BY THE TEST SUPERVISOR.</p> <p>8. FOR LOSS OF ALL THREE (3) COMMUNICATIONS LINKS WITH THE FLIGHT CREW DURING THIS TIME PERIOD (REFERENCE ITEM 1-611), IT WILL BE ASSUMED THAT THE FLIGHT CREW IS INCAPACITATED, AND AN INCAPACITATED EGRESS WILL BE IMMEDIATELY INITIATED. THE TEST SUPERVISOR WILL INITIATE FLIGHT CREW EGRESS AND WILL SPECIFY THE EGRESS MODE.</p> <p>9. A METEOROLOGICAL FORECAST OF THUNDERSTORM ACTIVITY IS REQUIRED WHEN THUNDERSTORMS ARE PREDICTED TO OCCUR WITHIN A 20 STATUTE MILE RADIUS OF THE SPACE VEHICLE. WHEN THUNDERSTORMS ARE IN PROGRESS WITHIN A 20 STATUTE MILE RADIUS OF THE VEHICLE AND THE FORMATION OR MOVEMENT OF A THUNDERSTORM IS PREDICTED TO OCCUR WITHIN A 5 STATUTE MILE RADIUS OF THE VEHICLE, CONSIDERATION WILL BE GIVEN BY THE LAUNCH DIRECTOR TO FLIGHT CREW EGRESS.</p> <p><u>EGRESS GROUND RULES (ACCESS ARM RETRACT TO LIFTOFF):</u></p> <p>1. COMMUNICATIONS WITH THE FLIGHT CREW RELATIVE TO EMERGENCY CONDITIONS OCCURRING DURING THIS TIME PERIOD WILL BE ACCOMPLISHED BY THE LAUNCH OPERATIONS MANAGER. FOR EMERGENCY CONDITIONS INTERNAL TO THE COMMAND MODULE DURING THIS TIME PERIOD, THE SPACECRAFT TEST CONDUCTOR WILL COORDINATE ALL ACTIONS AFFECTING THE FLIGHT CREW WITH THE LAUNCH OPERATIONS MANAGER.</p> <p>2. IF TIME PERMITS, AND FOR EMERGENCIES RESULTING IN A CHOICE OF ACTION ON THE PART OF THE FLIGHT CREW, THE LAUNCH OPERATIONS MANAGER WILL DEFINE THE RECOMMENDED COURSE OF ACTION TO THE FLIGHT CREW, BUT THE FLIGHT CREW WILL MAKE THE FINAL DECISION AS TO WHICH COURSE OF ACTION TO IMPLEMENT. IF TIME DOES NOT PERMIT, THE LAUNCH OPERATIONS MANAGER WILL INITIATE RETURN OF THE ACCESS ARM TO THE SPACECRAFT AND FLIGHT CREW EGRESS, AND THE FLIGHT CREW WILL IMMEDIATELY TAKE THE DEFINED ACTION.</p>
	1-610	

MISSION APOLLO 12	SECTION SPACE VEHICLE	STAGE SUBSECTION FLIGHT CREW SAFETY RULES	SYSTEM	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 1-25
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JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	SYSTEM	DATE CHANGE NO.	PAGE
	1-610 (CTD)	<p><u>FLIGHT CREW EMERGENCY EGRESS (CONTINUED):</u></p> <p>3. FOR EMERGENCY CONDITIONS EXTERNAL TO THE COMMAND MODULE, THE LAUNCH ESCAPE SYSTEM WILL REMAIN ARMED UNTIL THE SITUATION HAS STABILIZED AND CONDITIONS ARE SUCH THAT AN UNAIDED FLIGHT CREW EGRESS IS POSSIBLE.</p> <p>4. FOR EMERGENCY CONDITIONS INTERNAL TO THE COMMAND MODULE, INCLUDING LOSS OF VOICE COMMUNICATIONS WITH THE FLIGHT CREW AS COVERED IN ITEM 1-610 (5) BELOW, THE LAUNCH OPERATIONS MANAGER WILL INITIATE RETURN OF THE ACCESS ARM TO THE SPACECRAFT AND FLIGHT CREW EGRESS, AND THE PAD EGRESS TEAM WILL INITIATE APPROPRIATE ACTION.</p> <p>5. FOR LOSS OF ALL THREE (3) COMMUNICATIONS LINKS WITH THE FLIGHT CREW DURING THIS TIME PERIOD (REFERENCE ITEM 1-611), IT WILL BE ASSUMED THAT THE FLIGHT CREW IS INCAPACITATED, AND AN INCAPACITATED EGRESS WILL BE IMMEDIATELY INITIATED. THE LAUNCH OPERATIONS MANAGER WILL INITIATE RETURN OF THE ACCESS ARM TO THE SPACECRAFT AND FLIGHT CREW EGRESS, AND WILL SPECIFY THE EGRESS MODE.</p> <p>6. A METEOROLOGICAL FORECAST OF THUNDERSTORM ACTIVITY IS REQUIRED WHEN THUNDERSTORMS ARE PREDICTED TO OCCUR WITHIN A 20 STATUTE MILE RADIUS OF THE SPACE VEHICLE. WHEN THUNDERSTORMS ARE IN PROGRESS WITHIN A 20 STATUTE MILE RADIUS OF THE VEHICLE AND THE FORMATION OR MOVEMENT OF A THUNDERSTORM IS PREDICTED TO OCCUR WITHIN A 5 STATUTE MILE RADIUS OF THE VEHICLE, CONSIDERATION WILL BE GIVEN BY THE LAUNCH DIRECTOR TO FLIGHT CREW EGRESS.</p>	SYSTEM	BASIC OCTOBER 2, 1969	1-26
MISSION	APOLLO 12	SECTION	SPACE VEHICLE	STAGE SUBSECTION	FLIGHT CREW SAFETY RULES

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD	ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
			<u>FLIGHT CREW EMERGENCY EGRESS (CONTINUED):</u>							
			<u>COMMUNICATIONS REQUIRED FOR FLIGHT CREW INGRESS:</u>							
			COMMUNICATIONS LINKS WITH FLIGHT CREW, CONSISTING OF: HARDLINE (THRU UMBILICAL) VHF (DUPLEX B) USB			ALL				
						3 M				
	1-611					HD			PRIOR TO INITIATION OF FLIGHT CREW INGRESS.	
	1-612		CHANNEL 121 - (CLTC)			HD				
	1-613		CHANNEL 111 - (CVTS)			HD				
	1-614		CHANNEL 212 - (MSTC)			HD				
	1-615		CHANNEL 222 - (MTPE)			HD				
	1-616		CHANNEL 181 - (C1TC)			HD				
	1-617		CHANNEL 171 - (C2TC)			HD				
	1-618		CHANNEL 161 - (C4TC)			HD				
	1-619		CHANNEL 151 - (CUTC)			HD				
	1-620		CHANNEL 112 - (CTSC)			HD				
	1-621		CHANNEL 221 - (SPAD)			HD				
	1-622		AEROMED NET (HARDLINE)			HD				
	1-623		LAUNCH SITE RECOVERY NET (HARDLINE)			HD				
	1-624		LAUNCH SITE RECOVERY NET (UHF)			HD				
MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE					
APOLLO 12	SPACE VEHICLE	FLIGHT CREW SAFETY RULES		BASIC OCTOBER 2, 1969	1-27					

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
			<p><u>FLIGHT CREW EMERGENCY EGRESS (CONTINUED):</u></p> <p>EMERGENCY EGRESS SYSTEM EQUIPMENT REQUIRED FOR FLIGHT CREW INGRESS:</p>						
	1-625		ACCESS ARM OPERATIONAL			M			PRIOR TO INITIATION OF FLIGHT CREW INGRESS.
	1-626		SLIDEWIRE SYSTEM OPERATIONAL			M			PRIOR TO INITIATION OF FLIGHT CREW INGRESS.
	1-627		LUT ELEVATORS OPERATIONAL IN EMERGENCY EGRESS MODE AT 320-FOOT LEVEL OF LUT			1 OF 2 M			PRIOR TO INITIATION OF FLIGHT CREW INGRESS.
	1-628		PAD EGRESS TEAM READINESS REQUIRED FOR FLIGHT CREW INGRESS: M-113 ARMORED PERSONNEL CARRIERS WITH CREW			2 OF 3 M			PRIOR TO INITIATION OF FLIGHT CREW INGRESS.
	1-629		FIRE SUPPRESSION SYSTEMS REQUIRED FOR FLIGHT CREW INGRESS: LES COOLING AND EGRESS ROUTE SPRAY			M			PRIOR TO INITIATION OF FLIGHT CREW INGRESS.
	1-630		UMBILICAL TOWER FOGGING			HD			
	1-631		PROPELLANT STORAGE AREAS (RP-1, LOX, LH ₂)			HD			
	1-632		OTHER SUPPORT SYSTEMS REQUIRED FOR FLIGHT CREW INGRESS: WATER SHOWER SYSTEM AT SLIDETUBE			HD			
	1-633		LAUNCH COMPLEX OPERATIONAL TELEVISION			HD			
	1-634		EGRESS ROUTE DIRECTIONAL SIGNAL (320-FOOT LEVEL OF LUT)			HD			

KSC FORM 4-47 (REV. 1 68)

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES.

REV	ITEM	DESCRIPTION
		<p><u>FLIGHT CREW SAFETY RULES (CONTINUED):</u></p> <p><u>ABORT:</u></p> <p><u>ABORT REQUEST RESPONSIBILITIES:</u></p> <ol style="list-style-type: none"> 1. THE LAUNCH OPERATIONS MANAGER IS RESPONSIBLE FOR MAKING THE DECISION WHETHER OR NOT TO RECOMMEND AN ABORT TO THE FLIGHT CREW AND FOR INITIATING ACTION WHEN AN ABORT IS DESIRED. HIS RESPONSIBILITY COMMENCES AT LES ARM AND ENDS WHEN THE SPACE VEHICLE REACHES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER. 2. THE FORWARD OBSERVERS ARE RESPONSIBLE TO THE LAUNCH OPERATIONS MANAGER FOR REPORTING ALL ABORT REQUEST CONDITIONS. <p><u>INITIATION OF ABORT REQUEST SIGNAL:</u> THE LAUNCH OPERATIONS MANAGER HAS THE CAPABILITY TO INITIATE AN ABORT REQUEST SIGNAL TO THE FLIGHT CREW. THE ABORT FUNCTION IS ACTIVATED BY THE FLIGHT CREW. PRIOR TO IU UMBILICAL DISCONNECT, UPLINK TRANSMISSION OF THE ABORT REQUEST SIGNAL IS VIA BOTH USB MODE AND HARDWARE THROUGH THE IU UMBILICAL. AFTER IU UMBILICAL DISCONNECT, TRANSMISSION IS VIA USB MODE ONLY.</p> <p><u>CRITERIA FOR ARMING THE LAUNCH ESCAPE SYSTEM:</u> ALL OF THE FOLLOWING CRITERIA MUST BE MET PRIOR TO ARMING THE LAUNCH ESCAPE SYSTEM:</p> <ol style="list-style-type: none"> 1. ALL PERSONNEL MUST HAVE EVACUATED THE BLAST DANGER AREA. 2. THE PRIMARY DAMPER MUST BE RETRACTED. 3. THE ACCESS ARM MUST BE NO CLOSER TO THE COMMAND MODULE THAN THE PARK POSITION (12° RETRACTED). 4. COMMAND MODULE LAND LANDING PROBABILITIES AND SURFACE WIND EFFECTS FOR MODE I (TOWER) ABORTS MUST BE ACCEPTABLE (REFERENCE ITEM 1-403). <p><u>CONDITIONS FOR TRANSMITTING AN ABORT REQUEST BY THE LAUNCH OPERATIONS MANAGER:</u> ALL OF THE FOLLOWING CONDITIONS MUST EXIST PRIOR TO INITIATING AN ABORT REQUEST:</p> <ol style="list-style-type: none"> 1. THE SAFETY OF THE FLIGHT CREW MUST BE ENDANGERED. 2. A CATASTROPHIC CONDITION MUST BE OBSERVED AND REPORTED BY A FORWARD OBSERVER AND MUST BE CONFIRMED BY ANOTHER FORWARD OBSERVER OR BY THE LAUNCH OPERATIONS MANAGER VIA TELEVISION. 3. THE SPACE VEHICLE HAS NOT REACHED SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER.
MISSION	APOLLO 12	SECTION SPACE VEHICLE
		STAGE SUBSECTION FLIGHT CREW SAFETY RULES
		SYSTEM
		DATE CHANGE NO BASIC OCTOBER 2, 1969
		PAGE 1-29

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	MISSION	SECTION	STAGE SUBSECTION	SYSTEM	BASIC CHANGE NO.	PAGE	
	1-639	<p><u>ABORT (CONTINUED):</u></p> <p><u>REPORTING RESPONSIBILITIES:</u></p> <p>1. THE LAUNCH OPERATIONS MANAGER WILL INFORM THE FLIGHT DIRECTOR WHEN THE SPACE VEHICLE REACHES SUFFICIENT ALTITUDE TO CLEAR THE TOP OF THE UMBILICAL TOWER BY STATING "CLEAR TOWER" VIA CHANNEL 111 (OR VIA ANOTHER CHANNEL AS SPECIFIED BY THE LAUNCH OPERATIONS MANAGER IF NOT OPERATIONAL).</p> <p>2. IN THE EVENT OF NON-CATASTROPHIC SPACE VEHICLE COLLISION WITH THE UMBILICAL TOWER OR OTHER CONTINGENCIES WHICH DO NOT REQUIRE IMMEDIATE ACTION, THE LAUNCH OPERATIONS MANAGER WILL CONTINUE TO EVALUATE THE EXTENT OF DAMAGE AND WILL PROVIDE INFORMATION TO THE FLIGHT DIRECTOR FOR ANY ACTION NECESSARY AFTER UMBILICAL TOWER CLEARANCE.</p> <p>GROUND RULES AND PROCEDURES FOR INITIATING AN ABORT REQUEST, AS WELL AS A FUNCTIONAL DESCRIPTION OF THE ABORT ADVISORY SYSTEM, ARE CONTAINED IN THE "APOLLO/SATURN V ABORT COMMAND/REQUEST GROUND RULES, PROCEDURES, AND SYSTEM DESCRIPTION".</p> <p><u>ABORT GROUND RULES (LES ARM TO UMBILICAL TOWER CLEARANCE):</u></p> <p>1. COMMUNICATIONS WITH THE FLIGHT CREW RELATIVE TO EMERGENCY CONDITIONS OCCURRING DURING THIS TIME PERIOD WILL BE ACCOMPLISHED BY THE LAUNCH OPERATIONS MANAGER.</p> <p>2. FOR EMERGENCY CONDITIONS EXTERNAL TO THE COMMAND MODULE OCCURRING PRIOR TO LIFTOFF, THE LAUNCH ESCAPE SYSTEM WILL REMAIN ARMED UNTIL THE SITUATION HAS STABILIZED AND CONDITIONS ARE SUCH THAT AN UNAIDED FLIGHT CREW EGRESS IS POSSIBLE.</p> <p>3. THE LAUNCH OPERATIONS MANAGER WILL INITIATE AN ABORT REQUEST SIGNAL TO THE FLIGHT CREW BASED UPON THE ABORT CONDITIONS SPECIFIED IN ITEMS 1-642 THROUGH 1-646.</p> <p>4. AT THE SAME TIME THE ABORT REQUEST SIGNAL IS INITIATED, THE LAUNCH OPERATIONS MANAGER WILL VERBALLY CONFIRM TO THE FLIGHT CREW THAT AN ABORT IS RECOMMENDED. THE LAUNCH SITE RECOVERY FORCES WILL BE ADVISED THAT AN ABORT HAS BEEN INITIATED.</p>	APOLLO 12	SPACE VEHICLE	FLIGHT CREW SAFETY RULES			OCTOBER 2, 1969	1-30
	1-640								
	1-641								

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<p><u>ABORT (CONTINUED):</u></p> <p><u>ABORT CONDITIONS:</u></p> <p><u>CONDITION</u> <u>TIME APPLICABLE</u> <u>OBSERVER TO LOM</u> <u>LOM TO FLIGHT CREW</u> <u>DESCRIPTION</u></p>
	1-642	<p>UNCONTROLLABLE FIRE</p> <p>LES ARM TO LIFTOFF</p> <p>"FIRE-ABORT"</p> <p>"ABORT-ABORT"</p> <p>OBSERVERS WILL SEND REPORT IF IT IS CLEAR THAT THE FIRE IS ENDANGERING THE SAFETY OF THE FLIGHT CREW.</p>
	1-643	<p>S/V EXPLOSION</p> <p>LES ARM TO TOWER CLEARANCE</p> <p>"EXPLOSION-ABORT"</p> <p>"ABORT-ABORT"</p> <p>OBSERVERS WILL SEND REPORT IF IT IS CLEAR THAT THE EXPLOSION IS ENDANGERING THE SAFETY OF THE FLIGHT CREW.</p>
	1-644	<p>S/V STRUCTURAL FAILURE</p> <p>LES ARM TO TOWER CLEARANCE</p> <p>"BREAKUP-ABORT"</p> <p>"ABORT-ABORT"</p> <p>OBSERVERS WILL SEND REPORT IF IT IS CLEAR THAT THE STRUCTURAL FAILURE WILL RESULT IN THE LOSS OF THE SPACE VEHICLE.</p>
	1-645	<p>S/V TIPOVER</p> <p>LIFTOFF TO TOWER CLEARANCE</p> <p>"TIPOVER-ABORT"</p> <p>"ABORT-ABORT"</p> <p>OBSERVERS WILL SEND REPORT IF IT IS CLEAR THAT THE TIPOVER IS OF A DISASTROUS NATURE.</p>
	1-646	<p>S/V FALLBACK</p> <p>LIFTOFF TO TOWER CLEARANCE</p> <p>"FALLBACK-ABORT"</p> <p>"ABORT-ABORT"</p> <p>OBSERVERS WILL SEND REPORT IF IT IS CLEAR THAT THE VEHICLE IS FALLING BACK TOWARD THE PAD.</p>
		<p><u>NOTE:</u> NO REPORT WILL BE SENT IF THE VIEW OF THE OBSERVER IS OBSTRUCTED.</p>

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
	1-647		<u>ABORT (CONTINUED):</u> ABORT ADVISORY SYSTEM POWER			M			FROM LES ARM TO T-19 SEC.	
	1-648		ABORT REQUEST COMMAND LINK (USB MODE)			M			FROM LES ARM TO T-19 SEC.	
	1-649		ABORT EVENT AND TV RECORDERS <u>COMMUNICATIONS:</u>			HD				
	1-650		COMMUNICATIONS LINKS WITH FLIGHT CREW, CONSISTING OF: VHF (DUPLEX B) USB			1 OF 2 M			FROM LES ARM TO T-19 SEC.	
	1-651		HARDLINE (THRU UMBILICAL) ABORT LOOP CHANNEL 121 - (CLTC) CHANNEL 111 - (CVTS) CHANNEL 212 - (MSTC)			HD 1 OF 4 M			FROM LES ARM TO T-19 SEC.	
	1-652		<u>FORWARD OBSERVERS:</u> FORWARD OBSERVER SITE NO. 1			M			FROM LES ARM TO U/T CLEARANCE.	
	1-653		FORWARD OBSERVER SITE NO. 2			M			FROM LES ARM TO U/T CLEARANCE.	
	1-654		FORWARD OBSERVER SITE NO. 3			M			FROM LES ARM TO U/T CLEARANCE.	
MISSION	APOLLO 12	SECTION	SPACE VEHICLE	STAGE SUBSECTION			SYSTEM		BASIC CHANGE NO.	PAGE
				FLIGHT CREW SAFETY RULES					OCTOBER 2, 1969	1-32

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS/TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD / ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
			<u>ABORT (CONTINUED):</u>							
			<u>OPERATIONAL TELEVISION:</u>							
	1-655		TRACKING TELEVISION CAMERA			HD				
	1-656		PROFILE CAMERA NO. 1			HD				
	1-657		PROFILE CAMERA NO. 2			HD				
	1-658		UMBILICAL TOWER CAMERA NO. 1			1 OF 2 HD				
			UMBILICAL TOWER CAMERA NO. 2			2 HD				
	1-659		CONSOLE TV MONITOR NO. 1			1 OF 2 HD				
			CONSOLE TV MONITOR NO. 2			2 HD				
MISSION	APOLLO 12	SECTION	SPACE VEHICLE	STAGE SUBSECTION			SYSTEM		DATE CHANGE NO.	PAGE
				FLIGHT CREW SAFETY RULES					BASIC	1-33
									OCTOBER 2, 1969	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION																																										
		<p><u>COMPLEX SAFETY RULES:</u></p> <p><u>MOBILE SERVICE STRUCTURE (MSS) POSITION REQUIREMENTS:</u></p> <p>TO ASSURE SAFETY OF PERSONNEL IN THE MSS AREA DURING PROPELLANT LOADING OPERATIONS, THE FOLLOWING <u>MANDATORY</u> MINIMUM DISTANCES BETWEEN THE MSS AND THE SPACE VEHICLE ARE ESTABLISHED FOR THE SPECIFIED EVENTS:</p> <table border="1"> <thead> <tr> <th>EVENT</th> <th>RADIAL DISTANCE</th> <th>TRAVEL DISTANCE</th> </tr> </thead> <tbody> <tr><td>START REPLENISH LINE CHILLDOWN</td><td>850 FEET</td><td>850 FEET</td></tr> <tr><td>START S-IVB LOX LOADING</td><td>850 FEET</td><td>850 FEET</td></tr> <tr><td>START S-II LOX LOADING</td><td>850 FEET</td><td>850 FEET</td></tr> <tr><td>START S-IC LOX LOADING</td><td>850 FEET</td><td>850 FEET</td></tr> <tr><td>33% S-IC LOX LOAD</td><td>2650 FEET</td><td>2900 FEET</td></tr> <tr><td>66% S-IC LOX LOAD</td><td>3200 FEET</td><td>3659 FEET</td></tr> <tr><td>100% S-IC LOX LOAD</td><td>3600 FEET</td><td>4130 FEET</td></tr> <tr><td>START S-II LH₂ LOADING</td><td>3600 FEET</td><td>4130 FEET</td></tr> <tr><td>50% S-II LH₂ LOAD</td><td>4200 FEET</td><td>4800 FEET</td></tr> <tr><td>100% S-II LH₂ LOAD</td><td>4600 FEET</td><td>5250 FEET</td></tr> <tr><td>START S-IVB LH₂ LOADING</td><td>4600 FEET</td><td>5250 FEET</td></tr> <tr><td>50% S-IVB LH₂ LOAD</td><td>4700 FEET</td><td>5370 FEET</td></tr> <tr><td>100% S-IVB LH₂ LOAD</td><td>4800 FEET</td><td>5490 FEET</td></tr> </tbody> </table> <p>TO PRECLUDE THE POSSIBILITY OF MAJOR BLAST DAMAGE TO THE MSS FROM A CATASTROPHIC CONDITION, THE <u>MANDATORY</u> MINIMUM RADIAL DISTANCE BETWEEN THE MSS AND THE SPACE VEHICLE FOR LAUNCH IS <u>2470 FEET</u>. IT IS <u>HIGHLY DESIRABLE</u> THAT THE MSS BE LOCATED AT THE PARK SITE PRIOR TO LAUNCH.</p> <p><u>LUT ELEVATOR REQUIREMENTS:</u></p> <p>LUT ELEVATOR REQUIREMENTS FOR EMERGENCY EGRESS OF THE FLIGHT CREW, SPACECRAFT CLOSEOUT CREW, AND PAD EGRESS TEAM FROM THE 320-FOOT LEVEL OF THE LUT ARE SPECIFIED IN THE "FLIGHT CREW SAFETY RULES" SUBSECTION, ITEM 1-627.</p>	EVENT	RADIAL DISTANCE	TRAVEL DISTANCE	START REPLENISH LINE CHILLDOWN	850 FEET	850 FEET	START S-IVB LOX LOADING	850 FEET	850 FEET	START S-II LOX LOADING	850 FEET	850 FEET	START S-IC LOX LOADING	850 FEET	850 FEET	33% S-IC LOX LOAD	2650 FEET	2900 FEET	66% S-IC LOX LOAD	3200 FEET	3659 FEET	100% S-IC LOX LOAD	3600 FEET	4130 FEET	START S-II LH ₂ LOADING	3600 FEET	4130 FEET	50% S-II LH ₂ LOAD	4200 FEET	4800 FEET	100% S-II LH ₂ LOAD	4600 FEET	5250 FEET	START S-IVB LH ₂ LOADING	4600 FEET	5250 FEET	50% S-IVB LH ₂ LOAD	4700 FEET	5370 FEET	100% S-IVB LH ₂ LOAD	4800 FEET	5490 FEET
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		OCTOBER 2, 1969																																										
		PAGE																																										
		1-34																																										

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<u>HOLD/CUTOFF GUIDELINES:</u>
1-800		<u>HOLDS (STOPPING THE COUNTDOWN CLOCK PRIOR TO T-3 MINUTES 7 SECONDS):</u> A HOLD MAY BE REQUESTED BY THE LAUNCH VEHICLE TEST CONDUCTOR, THE SPACECRAFT TEST CONDUCTOR(S), THE LAUNCH OPERATIONS MANAGER, THE TEST SUPPORT CONTROLLER, THE SUPERINTENDENT OF RANGE OPERATIONS, THE GSFC USB STATION (GMIL), OR THE FLIGHT DIRECTOR. THE REQUEST FOR HOLD WILL BE MADE TO THE TEST SUPERVISOR (CVTS) OVER CHANNEL 111, WHO WILL STOP THE COUNTDOWN CLOCK AT THE MOST ADVANTAGEOUS TIME.
1-801		<u>CUTOFF (T-3 MINUTES 7 SECONDS TO T-45 SECONDS):</u> PERSONNEL UNDER THE DIRECTION OF THE LAUNCH VEHICLE TEST CONDUCTOR WHO ARE IMPLEMENTING LAUNCH MISSION RULES WILL REPORT MISSION RULE VIOLATIONS THROUGH THE LAUNCH VEHICLE TEST CONDUCTOR WHO WILL RELAY THE REQUEST FOR "C1FR GIVE CUTOFF" OVER CHANNEL 121. IN AN EMERGENCY CONDITION, LAUNCH VEHICLE PERSONNEL WILL REQUEST CUTOFF BY DIRECTLY CALLING "C1FR GIVE CUTOFF" OVER CHANNEL 121. PERSONNEL UNDER THE DIRECTION OF THE SPACECRAFT TEST CONDUCTOR(S), THE TEST SUPPORT CONTROLLER, THE SUPERINTENDENT OF RANGE OPERATIONS, THE GSFC USB STATION (GMIL), AND THE FLIGHT DIRECTOR WHO ARE IMPLEMENTING LAUNCH MISSION RULES WILL REQUEST CUTOFF THROUGH ONE OF THE ABOVE (AS APPROPRIATE FOR THEIR RESPECTIVE AREA) WHO WILL RELAY THE REQUEST TO THE LAUNCH OPERATIONS MANAGER OVER CHANNEL 111. THE LAUNCH OPERATIONS MANAGER WILL DIRECT THE LAUNCH VEHICLE TEST CONDUCTOR TO IMPLEMENT THE CUTOFF, WHO WILL RELAY THE REQUEST FOR "C1FR GIVE CUTOFF" OVER CHANNEL 121.
1-802		<u>CUTOFF (T-45 SECONDS TO T-11 SECONDS):</u> ALL PERSONNEL, WITH THE EXCEPTION OF PERSONNEL UNDER THE DIRECTION OF THE SPACECRAFT TEST CONDUCTOR(S), WHO ARE IMPLEMENTING LAUNCH MISSION RULES WILL REQUEST CUTOFF BY DIRECTLY CALLING "C1FR GIVE CUTOFF" OVER CHANNEL 121. PERSONNEL UNDER THE DIRECTION OF THE SPACECRAFT TEST CONDUCTOR(S) WHO ARE IMPLEMENTING LAUNCH MISSION RULES WILL REQUEST CUTOFF THROUGH THE SPACECRAFT TEST CONDUCTOR(S) WHO WILL RELAY THE REQUEST FOR "C1FR GIVE CUTOFF" OVER CHANNEL 121. (LAUNCH VEHICLE REDLINE MONITORS LOCATED IN THE CIF REFERENCE ITEMS 2-007 AND 4-111.)
1-803		<u>CUTOFF (AFTER T-11 SECONDS):</u> NO REQUESTS FOR CUTOFF WILL BE MADE AFTER T-11 SECONDS EXCEPT IF IGNITION DOES NOT OCCUR OR IF IGNITION OCCURS BUT THE VEHICLE FAILS TO LIFT OFF AND FAILS TO RECEIVE AUTOMATIC CUTOFF FROM THE ESE. AT IGNITION, THE SENIOR BOEING MECHANICAL ENGINEER WILL START A STOP WATCH. IF LIFTOFF DOES NOT OCCUR, THE SENIOR BOEING MECHANICAL ENGINEER WILL DIRECT C1FR TO GIVE CUTOFF AT IGNITION + 17 SECONDS. IF CUTOFF CANNOT BE ACCOMPLISHED THROUGH THE ESE, THE LAUNCH VEHICLE TEST CONDUCTOR (CLTC) WILL CALL THE CAPE KENNEDY RANGE SAFETY OFFICER (RSO) VIA POINT-TO-POINT PHONE AND BY CODE WILL REQUEST ENGINE SHUTDOWN. (REFERENCE "RANGE SAFETY RULES AND AGREEMENTS" SUBSECTION, ITEMS 1-501 AND 1-525.)
1-804		IN ALL CASES AFTER INITIATING CUTOFF, C1FR WILL VERIFY CUTOFF GIVEN OVER CHANNEL 121.
1-805		FOR CRITICAL EVENTS DURING THE FINAL 45 SECONDS OF THE COUNTDOWN, A 2 TO 3 SECOND TIME DELAY IS REQUIRED TO ALLOW SUFFICIENT OBSERVER/MONITOR/PANEL OPERATOR REACTION TIME BETWEEN A REQUEST FOR "C1FR GIVE CUTOFF" AND OBTAINING A MANUAL CUTOFF. E.G., T-19 SECONDS: 2.8 SECONDS PRIOR TO S-IC FORWARD UMBILICAL DISCONNECT; T-11 SECONDS: 2.1 SECONDS PRIOR TO S-IC TIME FOR IGNITION.

MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
APOLLO 12	SPACE VEHICLE	HOLD/CUTOFF GUIDELINES		BASIC OCTOBER 2, 1969	1-35

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION												
		<p><u>SPACE VEHICLE FUNCTIONAL SEQUENCE:</u></p> <p>THE SPACE VEHICLE FUNCTIONAL SEQUENCE DETAILS ACTIONS TO BE FOLLOWED IN THE EVENT MALFUNCTIONS OR OTHER PROBLEMS ARE ENCOUNTERED DURING THE COUNTDOWN. SPECIFIED TIMES REPRESENT RECOMMENDED HOLD-POINTS IF REQUIRED.</p>												
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MISSION	SECTION	STAGE SUBSECTION	SYSTEM	BASIC CHANGE NO.	PAGE
APOLLO 12	SPACE VEHICLE	FUNCTIONAL SEQUENCE		OCTOBER 2, 1969	1-36

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	TIME PERIOD	CONDITION	ACTION/COMMENT	
		<u>SPACE VEHICLE FUNCTIONAL SEQUENCE (CONTINUED):</u>				
	1-903	T-11 HRS (DISCONNECT AUXILIARY DAMPER) TO T-8 HRS 15 MIN (START OF L/V CRYOGENIC LOADING).	MALFUNCTION OF ANY REPAIRABLE SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT.		PROCEED OR HOLD. PROCEED IF CORRECTION OF MALFUNCTION CAN BE ACCOMPLISHED IN PARALLEL WITH OTHER OPERATIONS; OTHERWISE HOLD FOR REPAIR OF MANDATORY OR HIGHLY DESIRABLE ITEMS PRIOR TO REMOVING ACCESS TO THE SYSTEM OR WHEN THE SYSTEM IS NECESSARY FOR COUNTDOWN CONTINUATION. HOLD AT T-8 HRS 15 MIN IF REPAIR CANNOT CONTINUE IN PARALLEL WITH OR AFTER COMPLETION OF L/V CRYOGENIC LOADING.	
	1-904	T-8 HRS 15 MIN (START OF L/V CRYOGENIC LOADING) TO T-3 HRS 10 MIN (S/C, START OF CM CABIN CLOSEOUT); TO T-43 MIN (L/V).	MALFUNCTION OF ANY REPAIRABLE SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT.		PROCEED OR HOLD. PROCEED IF CORRECTION OF MALFUNCTION CAN BE ACCOMPLISHED IN PARALLEL WITH OTHER OPERATIONS; OTHERWISE HOLD FOR REPAIR OF MANDATORY OR HIGHLY DESIRABLE ITEMS. IF REPAIR IS NOT POSSIBLE, REVIEW CRITICALITY, EVALUATE PERFORMANCE DEGRADATION, AND MAKE THE DECISION TO PROCEED, HOLD, OR SCRUB. HOLD AT T-3 HRS 10 MIN FOR COMPLETION OF INTERNAL CM WORK IF REQUIRED.	
	1-905	T-3 HRS 10 MIN (START OF CM CABIN CLOSEOUT) TO T-43 MIN (RETRACT ACCESS ARM TO PARK POSITION).	PROBLEM IN CM CABIN CLOSEOUT.		HOLD AT T-43 MIN FOR COMPLETION OF CM CABIN CLOSEOUT.	
	1-906	T-43 MIN (RETRACT ACCESS ARM TO PARK POSITION) TO T-22 MIN (S-II START BOTTLE CHILLDOWN).	MALFUNCTION OF ANY REPAIRABLE SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT.		PROCEED OR HOLD. PROCEED IF CORRECTION OF MALFUNCTION CAN BE ACCOMPLISHED IN PARALLEL WITH OTHER OPERATIONS; OTHERWISE HOLD FOR REPAIR OF MANDATORY OR HIGHLY DESIRABLE ITEMS. IF REPAIR IS NOT POSSIBLE, REVIEW CRITICALITY, EVALUATE PERFORMANCE DEGRADATION, AND MAKE THE DECISION TO PROCEED, HOLD, OR SCRUB.	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

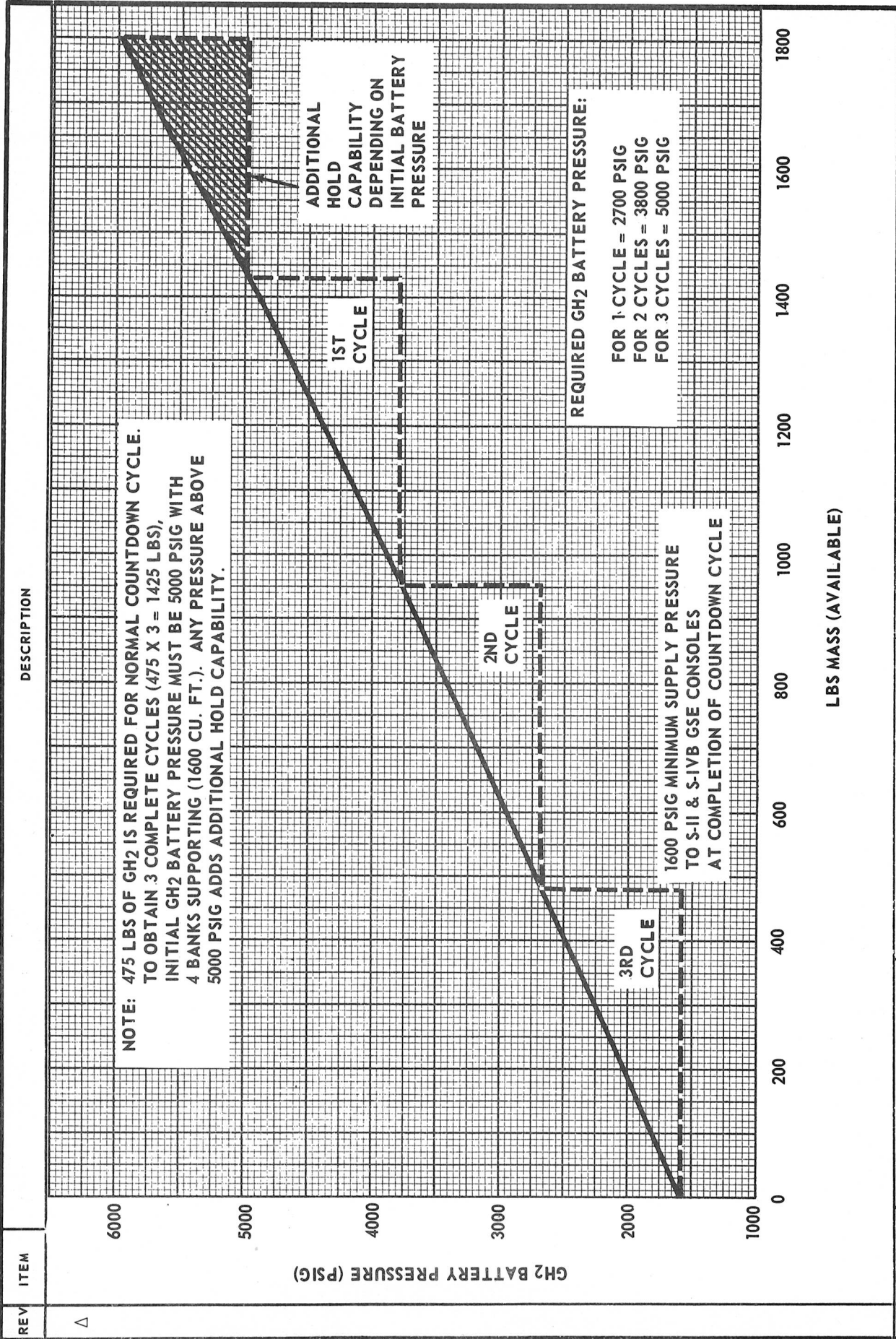
REV	ITEM	DESCRIPTION	ACTION/COMMENT
		<u>SPACE VEHICLE FUNCTIONAL SEQUENCE (CONTINUED):</u>	
		<u>TIME PERIOD</u>	<u>CONDITION</u>
Δ	1-907	T-22 MIN (S-II START BOTTLE CHILLDOWN) TO T-14 MIN 30 SEC (S-IVB START BOTTLE CHILLDOWN).	MALFUNCTION OF ANY <u>MANDATORY</u> OR <u>HIGHLY DESIRABLE</u> SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT APPLICABLE TO THIS TIME PERIOD. HOLD. THERE IS NO DEFINITE LIMITATION ON HOLD CAPABILITY OTHER THAN THE STORAGE CAPACITY OF THE GH ₂ FACILITY PROVIDED S-II START BOTTLE CHILLDOWN OPERATIONS CONTINUE UNINTERRUPTED. (SEE FIGURE ON PAGE 1-40 FOR RECYCLE CAPABILITY.) 17 MINUTES OF UNINTERRUPTED S-II START BOTTLE CHILLDOWN IS REQUIRED. EACH 10 MINUTES OF HOLD DELETES 1/2 RECYCLE CAPABILITY.
Δ	1-908	T-14 MIN 30 SEC (S-IVB START BOTTLE CHILLDOWN) TO T-8 MIN (S-II/S-IVB THRUST CHAMBER CHILLDOWN).	MALFUNCTION OF ANY <u>MANDATORY</u> OR <u>HIGHLY DESIRABLE</u> SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT APPLICABLE TO THIS TIME PERIOD. HOLD. THERE IS NO DEFINITE LIMITATION ON HOLD CAPABILITY OTHER THAN THE STORAGE CAPACITY OF THE GH ₂ FACILITY PROVIDED S-II/S-IVB START BOTTLE CHILLDOWN OPERATIONS CONTINUE UNINTERRUPTED. (SEE FIGURE ON PAGE 1-40 FOR RECYCLE CAPABILITY.) 9 MINUTES OF UNINTERRUPTED S-IVB START BOTTLE CHILLDOWN AND 17 MINUTES OF UNINTERRUPTED S-II START BOTTLE CHILLDOWN IS REQUIRED. EACH 15 MINUTES OF HOLD DELETES ONE (1) RECYCLE CAPABILITY.
Δ	1-910	T-8 MIN (S-II/S-IVB THRUST CHAMBER CHILLDOWN) TO T-3 MIN 7 SEC (AUTOMATIC SEQUENCE START).	MALFUNCTION OF ANY <u>MANDATORY</u> OR <u>HIGHLY DESIRABLE</u> SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT APPLICABLE TO THIS TIME PERIOD. 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. EACH 15 MINUTES OF HOLD DELETES ONE (1) RECYCLE CAPABILITY.

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APOLLO 12	SPACE VEHICLE	FUNCTIONAL SEQUENCE		BASIC OCTOBER 2, 1969	1-38

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION															
		<p><u>SPACE VEHICLE FUNCTIONAL SEQUENCE (CONTINUED):</u></p> <table border="1"> <thead> <tr> <th><u>TIME PERIOD</u></th> <th><u>CONDITION</u></th> <th><u>ACTION/COMMENT</u></th> </tr> </thead> <tbody> <tr> <td>Δ 1-910 (CTD)</td> <td></td> <td>IF ADDITIONAL HOLD TIME IS REQUIRED, RECYCLE TO T-22 MIN AND HOLD. AT LEAST AN 8-MINUTE HOLD IS REQUIRED AFTER RECYCLING TO T-22 MIN IN ORDER TO ALLOW A WARMUP PERIOD OF 22 MINUTES PRIOR TO REINITIATING S-II THRUST CHAMBER CHILLDOWN AT T-8 MIN.</td> </tr> <tr> <td>1-911</td> <td>MALFUNCTION OF ANY MANDATORY SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT APPLICABLE AFTER START OF THE AUTOMATIC SEQUENCE.</td> <td>CUTOFF. RECYCLE TO T-22 MIN. MAKE THE DECISION TO HOLD AND REPAIR OR SCRUB. AN 8-MINUTE HOLD IS REQUIRED AFTER RECYCLING TO T-22 MIN IN ORDER TO ALLOW A WARMUP PERIOD OF 22 MINUTES PRIOR TO REINITIATING S-II THRUST CHAMBER CHILLDOWN AT T-8 MIN.</td> </tr> <tr> <td>1-912</td> <td>MALFUNCTION OF ANY MANDATORY SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT APPLICABLE AFTER S-IC FORWARD UMBILICAL DISCONNECT.</td> <td>CUTOFF. RECYCLE TO T-22 MIN. MAKE THE DECISION TO HOLD AND REPAIR OR SCRUB. NOTE: S-IC TM LINKS F1 AND P1 WILL BE TURNED OFF DURING THE HOLD PERIOD AND TURNED ON 15 MINUTES PRIOR TO PICKING UP THE COUNT AT T-22 MIN; RANGE SAFETY COMMAND RECEIVERS WILL NOT BE TURNED OFF; PROCEED WITH SERVICE ARM 2 IN LATCHED BACK POSITION.</td> </tr> <tr> <td>1-913</td> <td>T-11 SEC (2.1 SEC PRIOR TO S-IC TIME FOR IGNITION) TO T-0 (LIFTOFF).</td> <td>NONE. NO HOLDS WILL BE CALLED. NO MANUAL CUTOFF WILL BE GIVEN EXCEPT IF IGNITION DOES NOT OCCUR OR IF IGNITION OCCURS BUT THE VEHICLE FAILS TO LIFT OFF AND FAILS TO RECEIVE AUTOMATIC CUTOFF FROM THE ESE. AN AUTOMATIC CUTOFF PRIOR TO IGNITION WILL REQUIRE THE DECISION TO RECYCLE TO T-22 MIN, HOLD AND REPAIR, OR SCRUB. AN AUTOMATIC OR MANUAL CUTOFF AFTER IGNITION WILL RESULT IN A SCRUB.</td> </tr> </tbody> </table>	<u>TIME PERIOD</u>	<u>CONDITION</u>	<u>ACTION/COMMENT</u>	Δ 1-910 (CTD)		IF ADDITIONAL HOLD TIME IS REQUIRED, RECYCLE TO T-22 MIN AND HOLD. AT LEAST AN 8-MINUTE HOLD IS REQUIRED AFTER RECYCLING TO T-22 MIN IN ORDER TO ALLOW A WARMUP PERIOD OF 22 MINUTES PRIOR TO REINITIATING S-II THRUST CHAMBER CHILLDOWN AT T-8 MIN.	1-911	MALFUNCTION OF ANY MANDATORY SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT APPLICABLE AFTER START OF THE AUTOMATIC SEQUENCE.	CUTOFF. RECYCLE TO T-22 MIN. MAKE THE DECISION TO HOLD AND REPAIR OR SCRUB. AN 8-MINUTE HOLD IS REQUIRED AFTER RECYCLING TO T-22 MIN IN ORDER TO ALLOW A WARMUP PERIOD OF 22 MINUTES PRIOR TO REINITIATING S-II THRUST CHAMBER CHILLDOWN AT T-8 MIN.	1-912	MALFUNCTION OF ANY MANDATORY SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT APPLICABLE AFTER S-IC FORWARD UMBILICAL DISCONNECT.	CUTOFF. RECYCLE TO T-22 MIN. MAKE THE DECISION TO HOLD AND REPAIR OR SCRUB. NOTE: S-IC TM LINKS F1 AND P1 WILL BE TURNED OFF DURING THE HOLD PERIOD AND TURNED ON 15 MINUTES PRIOR TO PICKING UP THE COUNT AT T-22 MIN; RANGE SAFETY COMMAND RECEIVERS WILL NOT BE TURNED OFF; PROCEED WITH SERVICE ARM 2 IN LATCHED BACK POSITION.	1-913	T-11 SEC (2.1 SEC PRIOR TO S-IC TIME FOR IGNITION) TO T-0 (LIFTOFF).	NONE. NO HOLDS WILL BE CALLED. NO MANUAL CUTOFF WILL BE GIVEN EXCEPT IF IGNITION DOES NOT OCCUR OR IF IGNITION OCCURS BUT THE VEHICLE FAILS TO LIFT OFF AND FAILS TO RECEIVE AUTOMATIC CUTOFF FROM THE ESE. AN AUTOMATIC CUTOFF PRIOR TO IGNITION WILL REQUIRE THE DECISION TO RECYCLE TO T-22 MIN, HOLD AND REPAIR, OR SCRUB. AN AUTOMATIC OR MANUAL CUTOFF AFTER IGNITION WILL RESULT IN A SCRUB.
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MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE												
APOLLO 12	SPACE VEHICLE	FUNCTIONAL SEQUENCE		BASIC OCTOBER 2, 1969	1-39												

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES



MISSION	SECTION	STAGE SUBSECTION	SYSTEM	BASIC CHANGE NO.	PAGE
APOLLO 12	SPACE VEHICLE	FUNCTIONAL SEQUENCE		OCTOBER 2, 1969	1-40

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
		<p>SECTION II</p> <p>LAUNCH VEHICLE OPERATIONS</p>		LAUNCH VEHICLE				2-0

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	MISSION APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION GENERAL NOTES	SYSTEM	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-1
	2-001	THE APPLICABLE TIME PERIOD FOR <u>MANDATORY</u> ITEMS IS SPECIFIED IN THE TIME PERIOD/ACTION/NOTES COLUMN.						
	2-002	THE APPLICABLE TIME PERIOD FOR HIGHLY DESIRABLE ITEMS IS FROM LAUNCH VEHICLE POWER UP (APPROXIMATELY T-24:00 HOURS) UNTIL INITIATION OF AUTO SEQUENCE (T-3 MINUTES 7 SECONDS) UNLESS OTHERWISE SPECIFIED IN THE TIME PERIOD/ACTION/NOTES COLUMN.						
	2-003	ALL REDLINES (MINIMUM AND/OR MAXIMUM VALUES OR CONDITIONS) ARE <u>MANDATORY</u> ITEMS.						
	2-004	VERIFICATION THAT THE VALUES OR CONDITIONS REMAIN WITHIN THE SPECIFIED LIMITS OF ACCEPTABLE OPERATION IS <u>MANDATORY</u> . THEREFORE, A CATEGORY ASSIGNED TO A MEASUREMENT ASSOCIATED WITH A REDLINE INDICATES THAT THE MEASUREMENT MUST REMAIN OPERATIONAL TO VERIFY THAT THE REDLINE IS WITHIN THE SPECIFIED LIMITS.						
	2-005	IN THE TIME PERIOD/ACTION/NOTES COLUMN, TIME PERIODS IN PARENTHESES ARE FOR REFERENCE ONLY AND REFLECT INFORMATION KNOWN AT THE TIME OF THE LATEST REVISION.						
	2-006	ALL MEAS LISTED AS FLT CONTROL ARE TRANSMITTED VIA PCM TELEMETRY UNLESS OTHERWISE NOTED. ALL FLT CONTROL DATA TRANSMITTED ON FM-FM TELEMETRY ONLY REQUIRE DIGITAL CONVERSION AT KSC FOR TRANSMISSION TO MCC-H.						
	2-007	LAUNCH VEHICLE PERSONNEL MONITORING LAUNCH MISSION RULES WILL REPORT VIOLATIONS PER THE HOLD CUTOFF GUIDELINES IN SECTION 1 OF THE LMRD.						
	2-008	FLIGHT CONTROL AND ENGINEERING DATA CATEGORY REQUIREMENTS ARE SATISFIED BY PROPER OPERATION OF THE MEASUREMENT (NO SPECIFIC SYSTEM LIMITS ARE REQUIRED). THE MEASUREMENT IS CONSIDERED TO BE OPERATING PROPERLY AT A GIVEN TIME IF THE TELEMETRY CHANNEL IS CONFIRMED AS OPERATING PROPERLY AND THE MEASUREMENT GIVES A READING CONSISTENT WITH SYSTEM STATUS.						
	2-009	ALTERNATE MEASUREMENTS TO MONITOR REDLINES, WHERE AVAILABLE, ARE IDENTIFIED AS SUCH IN PARENTHESES BELOW THE MEASUREMENT NUMBER. WHEN MORE THAN ONE ALTERNATE IS AVAILABLE, PRIORITIES ARE ASSIGNED BY USING NUMBERS, I.E., ALT #1, ALT #2, ETC.						

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	MISSION	SECTION	STAGE	SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
	2-010	ALTERNATE MEASUREMENTS WILL BE USED ONLY WHEN THE PRIMARY MEASUREMENT FAILS IN SUCH A WAY THAT IT CAN DEFINITELY BE DETERMINED THAT THE INSTRUMENTATION HAS FAILED. NO ALTERNATE MEASUREMENTS WILL REPLACE THE PRIMARY MEASUREMENTS AFTER T-45 SEC UNLESS THE PRIMARY MEASUREMENT FAILURE CAN DEFINITELY BE ESTABLISHED AS A HARD INSTRUMENTATION FAILURE AND THE ALTERNATE MEASUREMENTS CAN BE MONITORED BY THE SAME REDLINE OBSERVER.						BASIC	2-2
	2-011	WHEN VEHICLE BUS VOLTAGE REDLINE MEASUREMENTS ARE AVAILABLE ON BOTH HARDWARE AND DDAS, EITHER SOURCE MAY BE USED FOR MONITORING THE REDLINE AS LONG AS THE SOURCE USED IS PERMANENTLY RECORDED.							
	2-012	WHEN MEASUREMENTS ARE LISTED IN COMBINATION (I.E. 1 OF 2 M), AND ONE IS NOT LISTED AS AN ALTERNATE TO THE OTHER, EITHER MEASUREMENT MAY BE USED TO SATISFY THE RULE.							
	2-013	THE DEE-6 AND RCA-110A OPERATOR WILL NOTIFY THE LAUNCH VEHICLE TEST CONDUCTOR IF EITHER OF THESE SYSTEMS FAIL TO SUPPORT FROM INITIATION OF AUTO SEQ TO T-11 SEC.							
	2-014	IF THE DEE-6 OR RCA-110A IS REQUIRED TO MONITOR AN ALTERNATE BEYOND THE APPLICABLE TIME PERIOD FOR THE DEE-6 AND RCA-110A, THE ALTERNATE OBSERVER IS REQUIRED TO INFORM THE DEE-6 OR RCA-110A OPERATOR, THROUGH CLTC, THAT THEIR SYSTEMS ARE NOW MANDATORY FOR SUPPORT.	APOLLO	12	LAUNCH VEHICLE	GENERAL NOTES			

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES		
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM			
	2-101		TM LINK AP1		HD				<p>SEE ITEM 4-217</p> <p>FROM START OF LMRD UNTIL T-11 SEC. * RANGE SAFETY REQUIREMENT SEE ITEM 1-518</p> <p>NOTE: THE RANGE SAFETY SUPERVISOR (CRSS) AT THE LCC WILL DETERMINE IF THE RECEIVERS ARE OPERATING PROPERLY FOR LAUNCH.</p>		
	2-110A		MULTIPLIER A0		HD						
	2-111		MULTIPLIER B0		HD						
	2-112		REMOTE DIGITAL SUBMULTIPLIER		HD						
	2-115		DIGITAL RANGE SAFETY COMMAND RECEIVERS (2)			*M					
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	S-IC	SYSTEM	STAGE SYSTEMS	DATE CHANGE NO.	BASIC OCTOBER 2, 1969	PAGE	2-3

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD	ACTION NOTES
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
Δ	2-116	XC6-101	TEMP, OXID PUMP BEARING NO. 1 (ENG NO. 1)				-17.8°C	NONE		
		NONE (ALTERNATE)	S-IC ENGINE HEATER PANEL 601-106A3, TEMP OK AND TEMP HIGH LIGHT INDICATIONS (ENG NO. 1)			1 OF 2 M	*	NONE		
Δ	2-117	XC6-102	TEMP, OXID PUMP BEARING NO. 1 (ENG NO. 2)				-17.8°C	NONE		
		NONE (ALTERNATE)	S-IC ENGINE HEATER PANEL 601-106A3, TEMP OK AND TEMP HIGH LIGHT INDICATIONS (ENG NO. 2)			1 OF 2 M	*	NONE		FROM START OF LOX LOADING UNTIL INITIATION OF AUTO SEQ.
Δ	2-118	XC6-103	TEMP, OXID PUMP BEARING NO. 1 (ENG NO. 3)				-17.8°C	NONE		
		NONE (ALTERNATE)	S-IC ENGINE HEATER PANEL 601-106A3, TEMP OK AND TEMP HIGH LIGHT INDICATIONS (ENG NO. 3)			1 OF 2 M	*	NONE		**SYSTEM IS OUT OF TOLERANCE IF TEMP OK LIGHT AND TEMP HIGH LIGHT ARE OFF.
Δ	2-119	XC6-104	TEMP, OXID PUMP BEARING NO. 1 (ENG NO. 4)				-17.8°C	NONE		
		NONE (ALTERNATE)	S-IC ENGINE HEATER PANEL 601-106A3, TEMP OK AND TEMP HIGH LIGHT INDICATIONS (ENG NO. 4)			1 OF 2 M	*	NONE		
Δ	2-120	XC6-105	TEMP, OXID PUMP BEARING NO. 1 (ENG NO. 5)				-17.8°C	NONE		
		NONE (ALTERNATE)	S-IC ENGINE HEATER PANEL 601-106A3, TEMP OK AND TEMP HIGH LIGHT INDICATIONS (ENG NO. 5)			1 OF 2 M	*	NONE		

MISSION APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-IC	SYSTEM REDLINES AND CATEGORIES	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-4
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JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
Δ	2-121	VXC20-323	TEMP, HYDRAULIC FLUID SUP (F-1 ENGINES)				+60°F	+130°F	FROM ADMITTANCE OF LOX TO MAIN LOX VALVES UNTIL T-10 MIN.
		VC21-323 (ALT #1)	TEMP, RETURN HYDRAULIC FLUID (F-1 ENGINES)			1 OF 3 M	+65°F	+135°F	
		C9-101 (ALT #2)	TEMP, ENG GIMBAL SYS RETURN PITCH ACTUATOR				+65°F	+135°F	
	2-122	VXC197-115	TEMP, LOX SUCTION LINE, ENG NO. 1				NONE	-172°C	FROM TEMP STABILIZATION AFTER INITIATION OF BUBBLING UNTIL INITIATION OF AUTO SEQ.
		VXC198-115 (ALTERNATE)	TEMP, LOX SUCTION LINE, ENG NO. 2			1 OF 2 M	NONE	-172°C	
	2-123	VXC199-115	TEMP, LOX SUCTION LINE, ENG NO. 3				NONE	-172°C	
VXC200-115 (ALTERNATE)		TEMP, LOX SUCTION LINE, ENG NO. 4			1 OF 2 M	NONE	-172°C		

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	
	2-124	XC242-101 XC242-102 (ALT #1) XC242-103 (ALT #2) XC242-104 (ALT #3) XC242-105 (ALT #4)	TEMP, ENVIRONMENT, ENG NO. 1 TEMP, ENVIRONMENT, ENG NO. 2 TEMP, ENVIRONMENT, ENG NO. 3 TEMP, ENVIRONMENT, ENG NO. 4 TEMP, ENVIRONMENT, ENG NO. 5		1 OF 5 M	-18°C	+54°C	FROM START OF LOX LOADING UNTIL INITIATION OF AUTO SEQ.
Δ	2-125	C326-115 (ALTERNATE) XC327-115	TEMP NO. 1, LOX PREVALVE, ENG NO. 2 TEMP NO. 2, LOX PREVALVE, ENG NO. 2		1 OF 2 M	*	*	
Δ	2-126	C330-115 (ALTERNATE) XC331-115	TEMP NO. 1, LOX PREVALVE, ENG NO. 4 TEMP NO. 2, LOX PREVALVE, ENG NO. 4		1 OF 2 M	*	*	*WITHIN TWO MIN FOLLOWING INITIATION OF PRE-VALVE PRESSURIZATION (BOTH FIRST AND SECOND CYCLES), EACH OF THE FOUR PREVALVES SHALL BE WARMER THAN -165°C.
Δ	2-127	C334-115 (ALTERNATE) XC335-115	TEMP NO. 1, LOX PREVALVE, ENG NO. 1 TEMP NO. 2, LOX PREVALVE, ENG NO. 1		1 OF 2 M	*	*	
Δ	2-128	C338-115 (ALTERNATE) XC339-115	TEMP NO. 1, LOX PREVALVE, ENG NO. 3 TEMP NO. 2, LOX PREVALVE, ENG NO. 3		1 OF 2 M	*	*	
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-IC	SYSTEM	REDLINES AND CATEGORIES		DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-6

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM. NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD	ACTION NOTES
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
	2-130	VXD6-322 VXD5-322 (ALTERNATE)	HIGH PRESSURE PURGE STAGE HIGH PRESSURE CONTROL			1 OF 2 M	2700 PSIA	3300 PSIA	FROM SPHERE PRESSURIZATION COMPLETE UNTIL INITIATION OF AUTO SEQ. NOTE: ALTERNATE MEASURE- MENT MAY BE USED ONLY AFTER PRIMARY MEASURE- MENT HAS SHOWN SATISFAC- TORY REDLINE VALUE SUB- SEQUENT TO SPHERE PRES- SURIZATION.	
	2-131	D8-101	PRESS, COMBUSTION CHAMBER			*HD			* RANGE SAFETY REQUIREMENT SEE ITEM 1-527	
	2-132	D8-102	PRESS, COMBUSTION CHAMBER			*HD				
	2-133	D8-103	PRESS, COMBUSTION CHAMBER			*HD				
	2-134	D8-104	PRESS, COMBUSTION CHAMBER			*HD				
	2-135	D8-105	PRESS, COMBUSTION CHAMBER			*HD				
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-1C	SYSTEM			REDLINES AND CATEGORIES		DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-7

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
Δ	2-136	D16-101 (ALT #1)	PRESS, ENG GIMBAL SYS SUPPLY (ENG NO. 1)				1465 PSIA **	1865 PSIA **	*FROM JUST BEFORE FUEL IS ADMITTED TO MAIN FUEL VALVES TO START OF LOX LOADING. *(1) FROM START OF LOX LOADING UNTIL INITIATION OF AUTO SEQ. *(2) FROM INITIATION OF AUTO SEQ UNTIL T-19 SEC. *(3) MINOR FLUCTUATIONS IN HYDRAULIC PRESS MAY OCCUR. FLUCTUATIONS NO LOWER THAN 465 PSIA ARE NOT TO BE CONSIDERED AS EXCEEDING REDLINE VALUES.
		D16-102 (ALT #2)	PRESS, ENG GIMBAL SYS SUPPLY (ENG NO. 2)				1465 PSIA *(1) & *(3)	1865 PSIA *(1)	
		D16-103 (ALT #3)	PRESS, ENG GIMBAL SYS SUPPLY (ENG NO. 3)				1465 PSIA *(2) & *(3)	1665 PSIA *(2)	
		D16-104 (ALT #4)	PRESS, ENG GIMBAL SYS SUPPLY (ENG NO. 4)				500 PSIA **	1870 PSIA **	
		VXD30-323	PRESS, SUPPLY HYDRAULIC			1 OF 5 M	1510 PSIA *(1) & *(4)	1870 PSIA *(1)	*(4) MINOR FLUCTUATIONS IN HYDRAULIC PRESS MAY OCCUR. FLUCTUATIONS NO LOWER THAN 500 PSIA ARE NOT TO BE CONSIDERED AS EXCEEDING REDLINE VALUES.
	2-137	VXD31-323	PRESS, LOX DOME AND GAS GENERATOR INJECTOR PURGE (F-1 ENGINES)			M	200 PSIG **	1080 PSIG	FROM INITIATION OF HIGH LOX DOME PURGE (APPROX T-50 SEC) TO T-33 SEC. *ALLOW FOR NORMAL RISE TIME OF SYSTEM TO 200 PSIG.

MISSION	SECTION	STAGE SUBSECTION	SYSTEM	REDLINES AND CATEGORIES	DATE CHANGE NO.	PAGE
APOLLO 12	LAUNCH VEHICLE	S-IC			BASIC OCTOBER 2, 1969	2-8

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD	ACTION NOTES								
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM										
2-138	WXD90-117 (HARDWARE)	D152-117 (ALTERNATE)	PRESS, FUEL TK ULLAGE			1 OF 2 M	27.0 PSIA	30.2 PSIA	FROM PREPRESSURIZATION COMPLETE UNTIL T-19 SEC.									
										2-139	WXD94-119 (HARDWARE)	PRESS, LOX TK ULLAGE			1 OF 2 M	NONE	20.0 PSIA	FROM INITIATION OF LOX FAST FILL UNTIL INITIATION OF REPLENISH PLUS 5 MIN.
2-141	VXD124-115	PRESS, HE STORAGE TK PRESS, HE CONTROL VALVE INLET FUEL TANK PRESS, REGULATOR PURGE SYSTEM			M	2800 PSIA	3200 PSIA	FROM HE FILL AFTER BOTTLES COVERED WITH LOX UNTIL INITIATION OF AUTO SEQ.										
									APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-IC	SYSTEM REDLINES AND CATEGORIES	BASIC CHANGE NO. OCTOBER 2, 1969	PAGE 2-9				

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
Δ	2-142	TV CAMERA**	LEAKAGE, F-1 ENGINE LOX DRAIN LINES, VISUAL OBSERVATION (BY TV CAMERA)			M	NONE	NO LIQUID LEAKAGE ALLOWABLE	FROM 90 MINUTES AFTER START OF S-IC LOX LOADING UNTIL ALL F-1 ENGINES LOX DRAIN LINES HAVE BEEN OBSERVED. IF LIQUID LEAKAGE OCCURS IT IS M THAT A HOLD BE CALLED TO EVALUATE CORRECTIVE ACTION TO STOP THE LEAK. SEE ITEM 4-129.
	2-143	D144-119	PRESS, HE STORAGE TK			**			** RECORD VIDEO IF LEAKAGE OCCURS.
	2-144	D152-117	PRESS, FUEL TK ULLAGE			**			** SEE ITEM 2-140
	2-145	D153-119	PRESS, LOX TK ULLAGE			**			** SEE ITEM 2-138
	2-146	VK11-118	LOX LEVEL CUTOFF NO. 1			**M			** SEE ITEM 2-139
		VK12-118	LOX LEVEL CUTOFF NO. 2						** FROM START OF LMRD UNTIL START OF S-IC LOX LOAD.
		VK13-118	LOX LEVEL CUTOFF NO. 3						SYSTEM IN TOLERANCE IF NO MORE THAN (1) SENSOR INDICATES "WET."
		VK14-118	LOX LEVEL CUTOFF NO. 4						
	2-147	VK39-115	THRUST OK PRESS SW NO. 1, ENG NO. 3			**HD			
	2-148	VK42-115	THRUST OK PRESS SW NO. 1, ENG NO. 4			**HD			
	2-151	K54-115	FINAL THRUST OK CUTOFF, ENG NO. 3			**HD			RANGE SAFETY REQUIREMENTS SEE ITEM 1-527
	2-152	K55-115	FINAL THRUST OK CUTOFF, ENG NO. 4			**HD			

KSC FORM 4-47 (REV. 1 68)

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
2-154		VK120-120	RSCR NO. 2, SIGNAL STRENGTH, LOW LEVEL			**M			FROM START OF LMRD UNTIL T-11 SEC. ** RANGE SAFETY REQUIREMENT SEE ITEM 1-518 AND 1-527
2-155		VK125-120	RSCR NO. 1, SIGNAL STRENGTH, LOW LEVEL			**M			NOTE: THESE MEAS. ARE MONITORED BY RANGE SAFETY SUPERVISOR'S REPRESENTATIVE AT THE LCC.
2-156		VM98-340	VOLTAGE, 1D11 ESE VEHICLE BUS			1 OF 2 M	26 VDC	32 VDC	WHILE BUSES ARE ENERGIZED EITHER BY GROUND OR INTERNAL ELECTRICAL POWER UNTIL T-33 SEC.
		**XM8-115 (ALTERNATE)	VOLTAGE, BUS NO. 1			1 OF 2 M	26 VDC	32 VDC	STAGE BATTERY OPEN CIRCUIT VOLTAGES WILL BE MONITORED AFTER BATTERY CONNECTION TO T-50 SEC AS PER STAGE PROCEDURE V-21204.
2-157		VM107-340	VOLTAGE, 1D21 ESE VEHICLE BUS			1 OF 2 M	26 VDC	32 VDC	TRANSIENTS THAT OCCUR WHEN VARIOUS LOADS ARE SWITCHED, DURING POWER TRANSFER TESTS AND AT POWER TRANSFER ARE NOT CONSIDERED AS DEVIATIONS FROM THE REDLINE LIMITS.
		**XM9-115 (ALTERNATE)	VOLTAGE, BUS NO. 2						** APPLICABLE ONLY AFTER POWER TRANSFER (T-50 SEC). ALTERNATE MEAS IS ON THE BATTERY SIDE OF THE POWER TRANSFER SWITCH.

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-158	PTCS READOUT	LOX FLIGHT MASS			M	99.8%	100.2%	<p>COMMIT AT INITIATION OF AUTO SEQ.</p> <p>NOTE: MAX AND MIN LIMITS ARE INDICATED PERCENTAGES OF PROPELLANT LOAD SPECIFIED IN PROPELLANT LOADING TABLES.</p>
	2-159	PTCS READOUT	RP-1 FLIGHT MASS			M	99.8%	100.2%	<p>COMMIT AT COMPLETION OF FINAL RP-1 LEVEL ADJUST.</p> <p>NOTE: MAX AND MIN LIMITS ARE INDICATED PERCENTAGES OF PROPELLANT LOAD SPECIFIED IN PROPELLANT LOADING TABLES.</p>

PSC FORM 4-47 REV. 1 (61)

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS/TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES		
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM			
	2-301		TM LINK BP1	HD	HD						
	2-310A		MULTIPLIER A0	HD	HD				SEE ITEM 4-217		
	2-311		MULTIPLIER B0	HD	HD						
	2-313		RDSM NO. 1 (B0-24)	HD	HD						
	2-314		RDSM NO. 2 (B0-25)	HD	HD						
	2-315		DIGITAL RANGE SAFETY CMD RECEIVERS (2)			SM			FROM START OF LMRD UNTIL T-11 SEC. * RANGE SAFETY REQUIREMENT SEE ITEM 1-518 NOTE: THE RANGE SAFETY SUPERVISOR (CRSS) AT THE LCC WILL DETERMINE IF THE RECEIVERS ARE OPERATING PROPERLY FOR LAUNCH.		
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	S-II	SYSTEM	STAGE SYSTEMS	DATE CHANGE NO.	BASIC OCTOBER 2, 1969	PAGE	2-13

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM. NO.	DESCRIPTION	CATEGORY		PRE LAUNCH	REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA		MINIMUM	MAXIMUM	
2-316	VXC2-201 C9-201 (ALTERNATE)	VXC2-201 C9-201 (ALTERNATE)	TEMP, LOX PUMP DISCHARGE, ENG NO. 1			1 OF 2 M	NONE	-280°F	
			TEMP, GAS GENERATOR LOX VLV INLET, ENG NO. 1						
			TEMP, LOX PUMP DISCHARGE, ENG NO. 2						
			TEMP, GAS GENERATOR LOX VLV INLET, ENG NO. 2						
			TEMP, LOX PUMP DISCHARGE, ENG NO. 3						
2-317	VXC2-202 C9-202 (ALTERNATE)	VXC2-202 C9-202 (ALTERNATE)	TEMP, GAS GENERATOR LOX VLV INLET, ENG NO. 2			1 OF 2 M	NONE	-280°F	
			TEMP, LOX PUMP DISCHARGE, ENG NO. 2						
			TEMP, GAS GENERATOR LOX VLV INLET, ENG NO. 2						
			TEMP, LOX PUMP DISCHARGE, ENG NO. 3						
			TEMP, GAS GENERATOR LOX INLET, ENG NO. 3						
2-318	VXC2-203 C9-203 (ALTERNATE)	VXC2-203 C9-203 (ALTERNATE)	TEMP, LOX PUMP DISCHARGE, ENG NO. 3			1 OF 2 M	NONE	-280°F	- COMMIT AT T-22 SEC.
			TEMP, GAS GENERATOR LOX INLET, ENG NO. 3						
			TEMP, LOX PUMP DISCHARGE, ENG NO. 4						
			TEMP, GAS GENERATOR LOX INLET, ENG NO. 4						
			TEMP, LOX PUMP DISCHARGE, ENG NO. 5						
2-319	VXC2-204 C9-204 (ALTERNATE)	VXC2-204 C9-204 (ALTERNATE)	TEMP, LOX PUMP DISCHARGE, ENG NO. 4			1 OF 2 M	NONE	-280°F	
			TEMP, GAS GENERATOR LOX INLET, ENG NO. 4						
			TEMP, LOX PUMP DISCHARGE, ENG NO. 5						
			TEMP, GAS GENERATOR LOX VLV INLET, ENG NO. 5						
			TEMP, LOX PUMP DISCHARGE, ENG NO. 5						
2-320	VXC2-205 C9-205 (ALTERNATE)	VXC2-205 C9-205 (ALTERNATE)	TEMP, LOX PUMP DISCHARGE, ENG NO. 5			1 OF 2 M	NONE	-280°F	
			TEMP, GAS GENERATOR LOX VLV INLET, ENG NO. 5						
			TEMP, LOX PUMP DISCHARGE, ENG NO. 5						
			TEMP, GAS GENERATOR LOX VLV INLET, ENG NO. 5						
			TEMP, LOX PUMP DISCHARGE, ENG NO. 5						

KSC FORM 4-47 (REV. 1 68)

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD	ACTION NOTES		
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM				
Δ	2-321	VXC11-201	TEMP, START TK GAS, ENG NO. 1			1 OF 2 M						
		C12-201 (ALTERNATE)	TEMP, HE TANK GAS, ENG NO. 1									
Δ	2-322	VXC11-202	TEMP, START TK GAS, ENG NO. 2			1 OF 2 M						
		C12-202 (ALTERNATE)	TEMP, HE TANK GAS, ENG NO. 2									
Δ	2-323	VXC11-203	TEMP, START TK GAS, ENG NO. 3			1 OF 2 M	SEE S-II FIG 1			-SEE S-II FIG 1		
		C12-203 (ALTERNATE)	TEMP, HE TANK GAS, ENG NO. 3									
Δ	2-324	VXC11-204	TEMP, START TK GAS, ENG NO. 4			1 OF 2 M						
		C12-204 (ALTERNATE)	TEMP, HE TANK GAS, ENG NO. 4									
Δ	2-325	VXC11-205	TEMP, START TK GAS, ENG NO. 5			1 OF 2 M						
		C12-205 (ALTERNATE)	TEMP, HE TANK GAS, ENG NO. 5									
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE	SUBSECTION	S-II	SYSTEM	REDLINES AND CATEGORIES	BASIC CHANGE NO.	OCTOBER 2, 1969	PAGE	2-15

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
	2-326	VXC48-327	TEMP, LOX TANK PRECONDITION, STATION 315				NONE	-50°F	MUST BE SATISFIED BEFORE LOADING LOX ABOVE THE 40 PERCENT LEVEL.	
						1 OF 2 M	NONE	-160°F	MAXIMUM PERMISSIBLE FOR INITIATION OF FUEL LOADING.	
		VXC49-327 (ALTERNATE)	TEMP, LH2 TANK PRECONDITION, STATION 350				**	NONE	** FROM INITIATION OF AUTO SEQ., TEMP MUST INCREASE TO A MINIMUM OF -250°F AT T-33 SEC.	
	2-327	VXC50-327	TEMP, LOX DRAIN LINE				NONE	**	** FROM INITIATION OF AUTO SEQ., TEMP MUST INCREASE TO A MINIMUM OF -250°F AT T-33 SEC.	
		XD72-327 (ALTERNATE)	PRESS, LOX DRAIN LINE			1 OF 2 M	NONE	**	** FROM INITIATION OF AUTO SEQ., PRESS MUST DECREASE TO BELOW 40 PSIG BY T-33 SEC.	
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-II	SYSTEM	REDLINES AND CATEGORIES				BASIC CHANGE NO. OCTOBER 2, 1969	PAGE 2-16

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	MINIMUM	MAXIMUM	
	2-328	VXC329-201	TEMP, THRUST CHAMBER JACKET, ENG NO. 1			NONE	-200°F	
	2-329	C14-201 (ALTERNATE)	TEMP, MAIN FUEL INJECTION, ENG NO. 1			NONE	-200°F	
	2-330	VXC329-203	TEMP, THRUST CHAMBER JACKET, ENG NO. 3			NONE	-200°F	COMMIT AT T-19 SEC.
	2-331	C14-203 (ALTERNATE)	TEMP, MAIN FUEL INJECTION, ENG NO. 3			NONE	-200°F	
	2-332	VXC329-205	TEMP, THRUST CHAMBER JACKET, ENG NO. 5			NONE	-200°F	
		C14-205 (ALTERNATE)	TEMP, MAIN FUEL INJECTION, ENG NO. 5			NONE	-200°F	
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-II	SYSTEM	REDLINES AND CATEGORIES	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-17	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
Δ	2-335	XC664-201	TEMP, ENG INLET LH ₂ , ENG NO. 1			M	NONE	-420.5°F	COMMIT AT T-22 SEC. TEMP ABOVE MAX VALUE PRIOR TO T-22 SEC ARE ACCEPTABLE. THE MARGIN BETWEEN THE MEASURED ENG INLET LH ₂ TEMP AND THE OPERATIONAL LIMIT MAY BE LESS THAN THE INSTRUMENTATION ERROR; THEREFORE, AN ON-LINE CORRECTION OF THE INSTRUMENT READING OR REDLINE IS REQUIRED. DURING CDDT PERFORM THE FOLLOWING CORRECTION PROCEDURE AND RECORD ALL DATA FOR USE DURING LAUNCH COUNT-DOWN.
Δ	2-336	XC664-202	TEMP, ENG INLET LH ₂ , ENG NO. 2			M	NONE	-420.5°F	A. USE S-II FIG 4 TO DETERMINE THE LH ₂ PUMP INLET SATURATION TEMP, BASED ON THE PRESS OF FUEL TANK ULLAGE (WXD62-219).
Δ	2-337	XC664-203	TEMP, ENG INLET LH ₂ , ENG NO. 3			M	NONE	-420.5°F	B. MODIFY THE REDLINE REORDER SCALE FOR EACH ENG. BY THE DIFFERENCE BETWEEN THE MEASURED TEMP AND THE SATURATION TEMP.
Δ	2-338	XC664-204	TEMP, ENG INLET LH ₂ , ENG NO. 4			M	NONE	-420.5°F	C. THIS CURVE SHOULD BE USED AFTER S-IVB AND S-II LH ₂ ULLAGE PRESS AND REPLENISH RATE STABILIZE AND PRIOR TO RECIRCULATION PUMPS ON (APPR. T-30 MINUTES).
Δ	2-339	XC664-205	TEMP, ENG INLET LH ₂ , ENG NO. 5			M	NONE	-420.5°F	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-340	VXC700-201	TEMP, RESERVOIR OUTLET FLUID, ENG NO. 1			M			
	2-341	VXC700-202	TEMP, RESERVOIR OUTLET FLUID, ENG NO. 2			M	SEE S-II FIG 2 & FIG 3	SEE S-II FIG 2 & FIG 3	
	2-342	VXC700-203	TEMP, RESERVOIR OUTLET FLUID, ENG NO. 3			M	SEE S-II FIG 2 & FIG 3	SEE S-II FIG 2 AND FIG 3	
	2-343	VXC700-204	TEMP, RESERVOIR OUTLET FLUID, ENG NO. 4			M			
	2-344	D13-201	PRESS, THRUST CHAMBER, ENG NO. 1			::HD			
	2-345	D13-202	PRESS, THRUST CHAMBER, ENG NO. 2			::HD			
	2-346	D13-203	PRESS, THRUST CHAMBER, ENG NO. 3			::HD			:: RANGE SAFETY REQUIREMENT SEE ITEM 1-527
	2-347	D13-204	PRESS, THRUST CHAMBER, ENG NO. 4			::HD			
	2-348	D13-205	PRESS, THRUST CHAMBER, ENG NO. 5			::HD			

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD	ACTION NOTES
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM		
A 2-349	VXD15-201 D21-201 (ALTERNATE)	PRESS, HE TK, ENG NO. 1			1 OF 2 M	2800 PSIA	3450 PSIA		
A 2-350	VXD15-202 D21-202 (ALTERNATE)	PRESS, HE TK, ENG NO. 2			1 OF 2 M	2800 PSIA	3450 PSIA		
A 2-351	VXD15-203 D21-203 (ALTERNATE)	PRESS, HE TK, ENG NO. 3			1 OF 2 M	2800 PSIA	3450 PSIA		FROM START OF SUPPLY LINE VENT (T-4 MIN 37 SEC) TO T-19 SEC.
A 2-352	VXD15-204 D21-204 (ALTERNATE)	PRESS, HE TK, ENG NO. 4			1 OF 2 M	2800 PSIA	3450 PSIA		NOTE: SUBSEQUENT TO T-200 SEC HOLD/CUTOFF FOR ANY CONTINUOUS DECAY IN THE ENGINE HE TANK PRESSURE.
A 2-353	VXD15-205 D21-205 (ALTERNATE)	PRESS, HE TK, ENG NO. 5			1 OF 2 M	2800 PSIA	3450 PSIA		

MISSION APOLLO 12
SECTION LAUNCH VEHICLE
STAGE SUBSECTION S-II
SYSTEM REDLINES AND CATEGORIES
DATE CHANGE NO REVISION A
OCTOBER 17, 1969
PAGE 2-20

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM. NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM		MAXIMUM
	2-354	VXD16-201 D22-201 (ALTERNATE)	PRESS, START TK, ENG NO. 1 PRESS, START TK, ENG NO. 1			1 OF 2 M			
	2-355	VXD16-202 D22-202 (ALTERNATE)	PRESS, START TK, ENG NO. 2 PRESS, START TK, ENG NO. 2			1 OF 2 M			
	2-356	VXD16-203 D22-203 (ALTERNATE)	PRESS, START TK, ENG NO. 3 PRESS, START TK, ENG NO. 3			1 OF 2 M	SEE S-II FIG 1	SEE S-II FIG 1	
	2-357	VXD16-204 D22-204 (ALTERNATE)	PRESS, START TK, ENG NO. 4 PRESS, START TK, ENG NO. 4			1 OF 2 M			
	2-358	VXD16-205 D22-205 (ALTERNATE)	PRESS, START TK, ENG NO. 5 PRESS, START TK, ENG NO. 5			1 OF 2 M			
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-II	SYSTEM	REDLINES AND CATEGORIES			DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-21

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS/TM NO.	DESCRIPTION	CATEGORY		PRE LAUNCH	REDLINE VALUES		TIME PERIOD / ACTION / NOTES
				FLT CONT	ENG DATA		MINIMUM	MAXIMUM	
Δ	2-358A	VXD50-327	PRESS, HYDRAULIC ACCUM GAS, ENG NO. 1			1 OF 2 M	3000 PSIA *	NONE	
		VD103-201 (ALTERNATE)	PRESS, HYDRAULIC ACCUM, ENG NO. 1						
Δ	2-358B	VXD51-327	PRESS, HYDRAULIC ACCUM GAS, ENG NO. 2			1 OF 2 M	3000 PSIA *	NONE	FROM ACCUM LOCKUP (APPROX T-4 MIN) UNTIL 1 MIN AFTER ACCUM LOCKUP. * 3 OF 4 ENGINE ACCUM GAS SYSTEMS ARE MANDATORY.
		VD103-202 (ALTERNATE)	PRESS, HYDRAULIC ACCUM, ENG NO. 2						
Δ	2-358C	VXD52-327	PRESS, HYDRAULIC ACCUM GAS, ENG NO. 3			1 OF 2 M	3000 PSIA *	NONE	
		VD103-203 (ALTERNATE)	PRESS, HYDRAULIC ACCUM, ENG NO. 3						
Δ	2-358D	VXD53-327	PRESS, HYDRAULIC ACCUM GAS, ENG NO. 4			1 OF 2 M	3000 PSIA *	NONE	
		VD103-204 (ALTERNATE)	PRESS, HYDRAULIC ACCUM, ENG NO. 4						
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-II	SYSTEM		REDLINES AND CATEGORIES		DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-22

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM. NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
	2-359	WXD61-206 (HARDWIRE)	PRESS, LOX TK ULLAGE				AMBIENT	43 PSIA	DURING PROPELLANT LOADING	
		VD257-206 (ALT #1)	PRESS, LOX TK ULLAGE (EDS 1)			1 OF 3 M	36.5 PSIA	43 PSIA	FROM INITIATION TO COMPLETION OF LOX TK PRESSURIZATION	
		VD258-206 (ALT #2)	PRESS, LOX TK ULLAGE (EDS 2)						FROM LOX TANK PRESSURIZATION COMPLETE UNTIL T-33 SEC.	
A	2-360	WXD62-219 (HARDWIRE)	PRESS, LH2 TK ULLAGE				AMBIENT	38 PSIA	DURING PROPELLANT LOADING	
		VD252-219 (ALT #1)	PRESS, LH2 TK ULLAGE; EDS 1				AMBIENT	38 PSIA	FROM INITIATION TO COMPLETION OF LH2 TK PRESSURIZATION	
		VD253-219 (ALT #2)	PRESS, LH2 TK ULLAGE, EDS 2			1 OF 3 M	33 PSIA	38 PSIA	FROM LH2 TK PRESSURIZATION COMPLETE UNTIL T-33 SEC.	
	2-361	XD72-327	PRESS, LOX DRAIN LINE			**			** SEE ITEM 2-327	
	2-362	VXD80-206	PRESS, VLV ACTUATION HE BOTTLE			M	2800 PSIA	NONE	FROM BOTTLE PRESSURIZATION COMPLETE UNTIL T-19 SEC.	
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-II	SYSTEM			REDLINES AND CATEGORIES		DATE CHANGE NO. REVISION A OCTOBER 17, 1969	PAGE 2-23

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS/TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
2-363	VXD81-206		PRESS, VLV ACTUATION REGULATOR OUTLET			M	690 PSIA	815 PSIA	FROM BOTTLE PRESSURIZATION COMPLETE UNTIL INITIATION OF AUTO SEQ. VIOLATION OF THE MIN REDLINE FOR A PERIOD NOT GREATER THAN 20 SEC IS EXPECTED AND ALLOWABLE AT TIMES OF VLV ACTUATION.	
2-363A	VXD81-327		PRESS, LOX VENT VLV ACTUATION				NONE	350 PSIA	COMMIT AT T-22 SEC.	
	DS-35 PNL 206A9 (ALTERNATE)		ACT PRESS VENTING			1 OF 2 M	*	*		
2-363B	VXD82-327		PRESS, LH ₂ VENT VLV ACTUATION				NONE	350 PSIA	* SYSTEM IS IN TOLERANCE IF INDICATION IS ON AT T-22 SEC.	
	DS-31 PNL 206A9 (ALTERNATE)		ACT PRESS VENTING			1 OF 2 M	*	*		
A 2-364	VXD89-329		DELETED							
	VD102-329 (ALT #2)									
	XN20-329 (ALT #1)									
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	S-II	SYSTEM	REDLINES AND CATEGORIES		DATE CHANGE NO. REVISION A OCTOBER 17, 1969	PAGE 2-24

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES			TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-366	VXD92-201	PRESS, ENG INLET LH2 (FUEL PUMP INLET), ENG NO. 1			M	41 PSIA	NONE	
	2-367	VXD92-202	PRESS, ENG INLET LH2 (FUEL PUMP INLET), ENG NO. 2			M	41 PSIA	NONE	
	2-368	VXD92-203	PRESS, ENG INLET LH2 (FUEL PUMP INLET), ENG NO. 3			M	41 PSIA	NONE	
	2-369	VXD92-204	PRESS, ENG INLET LH2 (FUEL PUMP INLET), ENG NO. 4			M	41 PSIA	NONE	
	2-370	VXD92-205	PRESS, ENG INLET LH2 (FUEL PUMP INLET), ENG NO. 5			M	41 PSIA	NONE	
A	2-371	VXD96-329	DELETED						FROM LH2 PRESSURIZATION COMPLETE UNTIL T-33 SEC.
	2-372	VXD98-329	PRESS, SIDEWALL INSULATED OUTLET			1 OF 2 M	NONE	0.5 PSIG DROP OCCURRING WITHIN A 1 MIN PERIOD	FROM INITIATION OF PURGE FLOW UNTIL INITIATION OF AUTO SEQ.
		NONE (ALTERNATE)	TV CAMERA*(1)				NONE	*	** CLOSED CIRCUIT TV SCANS THE INSULATION SURFACE FOR COLD HE VAPOR CLOUDS, THUS INDICATING AN INSULATION SURFACE FAILURE. *(1) SEE ITEM 4-130

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM. NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES		
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM			
A 2-373	VD101-329 (ALTERNATE)		PRESS, COMMON BLKHD VACUUM			1 OF 2 M	NONE	5 PSIA	COMMIT AT INITIATION OF AUTO SEQ.		
	XD207-206		PRESS, COMMON BLKHD INT								
A 2-373A	VD102-329		DELETED			*			* SEE ITEM 2-358A		
2-374	VD103-201		PRESS, HYDRAULIC ACCUM, ENG NO. 1			*			* SEE ITEM 2-358B		
2-375	VD103-202		PRESS, HYDRAULIC ACCUM, ENG NO. 2			*			* SEE ITEM 2-358C		
2-376	VD103-203		PRESS, HYDRAULIC ACCUM, ENG NO. 3			*			* SEE ITEM 2-358D		
2-377	VD103-204		PRESS, HYDRAULIC ACCUM, ENG NO. 4			*			* SEE ITEM 2-358D		
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	S-II	SYSTEM	REDLINES AND CATEGORIES	DATE CHANGE NO	REVISION A	PAGE	2-26
									OCTOBER 17, 1969		

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
A	2-378	XD127-206	PRESS, HE INJECTION SUP			M	2800 PSIA	NONE	FROM START OF HE INJECTION (APPROX T-30 MIN) UNTIL T-33 SEC. * SEE ITEM 2-373
A	2-379	XD207-206	PRESS, COMMON BLKHD INT			*			
A	2-380	XD209-206	PRESS, HE INJECTION PRI ORIFICE OUTLET			M	175 PSIA	300 PSIA	FROM START OF HE INJECTION (APPROX T-30 MIN) UNTIL T-15 MIN. * SEE ITEM 2-360
	2-381	VD252-219	PRESS, LH2 TK ULLAGE, EDS 1			*			
	2-382	VD253-219	PRESS, LH2 TK ULLAGE, EDS 2			*			
	2-383	VD257-206	PRESS, LOX TK ULLAGE (EDS 1)			*			
	2-384	VD258-206	PRESS, LOX TK ULLAGE (EDS 2)			*			
	2-385	VXG6-201	POSITION, PU VLV, ENG NO. 1			M	NULL -0.15 VDC	NULL +0.15 VDC	
	2-386	VXG6-202	POSITION, PU VLV, ENG NO. 2			M	NULL -0.15 VDC	NULL +0.15 VDC	
	2-387	VXG6-203	POSITION, PU VLV, ENG NO. 3			M	NULL -0.15 VDC	NULL +0.15 VDC	FROM T-10 MIN UNTIL INITIATION OF AUTO SEQ. NOTE: MAXIMUM AND MINIMUM REDLINE VALUES CORRESPOND TO VALVE POSITION OF +2° AND -2°.
	2-388	VXG6-204	POSITION, PU VLV, ENG NO. 4			M	NULL -0.15 VDC	NULL +0.15 VDC	
	2-389	VXG6-205	POSITION, PU VLV, ENG NO. 5			M	NULL -0.15 VDC	NULL +0.15 VDC	

MISSION
APOLLO 12

SECTION
LAUNCH VEHICLE

STAGE SUBSECTION
S-II

SYSTEM
REDLINES AND CATEGORIES

DATE CHANGE NO.
REVISION A
OCTOBER 17, 1969

PAGE
2-27

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM. NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT. CONT.	ENG. DATA	MINIMUM	MAXIMUM	
	2-390	XG7-201	POSITION, HYDRAULIC RESERVOIR PISTON, ENG NO. 1		M			
	2-391	XG7-202	POSITION, HYDRAULIC RESERVOIR PISTON, ENG NO. 2		M	SEE S-II FIG 2 & FIG 3		SEE S-II FIG 2 AND FIG 3
	2-392	XG7-203	POSITION, HYDRAULIC RESERVOIR PISTON, ENG NO. 3		M			
	2-393	XG7-204	POSITION, HYDRAULIC RESERVOIR PISTON, ENG NO. 4		M			
	2-410	VK3-201	EVENT, CUTOFF (SIGNAL, LOCK-IN), ENG NO. 1		1 OF 2 M	**	**	
	2-411	DEE-6-3180 (ALTERNATE) VK3-202	EVENT, CUTOFF (SIGNAL, LOCK-IN), ENG NO. 1		1 OF 2 M	**	**	
	2-412	DEE-6-3183 (ALTERNATE) VK3-203	EVENT, CUTOFF (SIGNAL, LOCK-IN), ENG NO. 2		1 OF 2 M	**	**	**VERIFY THAT INDICATION IS OFF FROM STAGE POWER ON TO T-33 SEC (EXCEPT DURING EDS TEST)
	2-413	DEE-6-3186 (ALTERNATE) VK3-204	EVENT, CUTOFF (SIGNAL, LOCK-IN), ENG NO. 3		1 OF 2 M	**	**	
	2-414	DEE-6-3189 (ALTERNATE) VK3-205	EVENT, CUTOFF (SIGNAL, LOCK-IN), ENG NO. 4		1 OF 2 M	**	**	
	2-414	DEE-6-3192 (ALTERNATE) VK3-205	EVENT, CUTOFF (SIGNAL, LOCK-IN), ENG NO. 5		1 OF 2 M	**	**	

YSC FORM 4-47 (REV. 1-65)

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
2-415	VK7-201		EVENT, IGNITION DETECTED, ENG NO. 1			M	*	*	** VERIFY THAT ON INDICATION IS PRESENT IMMEDIATELY AFTER ENGINE POWER ON (PRIOR TO PROPELLANT LOADING) TO INITIATION OF AUTO SEQ. ** RANGE SAFETY REQUIREMENT SEE ITEM 1-527
2-416	VK7-202		EVENT, IGNITION DETECTED, ENG NO. 2			M	*	*	
2-417	VK7-203		EVENT, IGNITION DETECTED, ENG NO. 3			M	*	*	
2-418	VK7-204		EVENT, IGNITION DETECTED, ENG NO. 4			M	*	*	
2-419	VK7-205		EVENT, IGNITION DETECTED, ENG NO. 5			M	*	*	
2-420	VK231-203		PRESS, MAINSTAGE OK SW A, ENG NO. 3			**HD			
2-423	K285-203		DEPRESS, MAINSTAGE OK SW A, ENG NO. 3			**HD			
MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE				
APOLLO 12	LAUNCH VEHICLE	S-II	REDLINES AND CATEGORIES	BASIC OCTOBER 2, 1969	2-29				

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD	ACTION NOTES													
				FLT CONT	ENG DATA	MINIMUM	MAXIMUM															
2-431	WK368-214 WK369-214 WK370-214 WK371-214 WK372-214 WK373-214 WK374-214 WK375-214 WK376-214 WK377-214	LOX DEPLETION SENSOR NO. 1, OPEN (WET) LOX DEPLETION SENSOR NO. 2, OPEN (WET) LOX DEPLETION SENSOR NO. 3, OPEN (WET) LOX DEPLETION SENSOR NO. 4, OPEN (WET) LOX DEPLETION SENSOR NO. 5, OPEN (WET) FUEL DEPLETION SENSOR NO. 1, OPEN (WET) FUEL DEPLETION SENSOR NO. 2, OPEN (WET) FUEL DEPLETION SENSOR NO. 3, OPEN (WET) FUEL DEPLETION SENSOR NO. 4, OPEN (WET) FUEL DEPLETION SENSOR NO. 5, OPEN (WET)	PRE LAUNCH	M *				* FROM START OF LMRD UNTIL INITIATION OF AUTO SEQ. SYSTEM IN TOLERANCE IF NO MORE THAN 2 OF 5 SENSOR INDICATIONS ARE "OPEN" (WET).														
									2-432	VK421-207	EDS ALL ENGINES CUTOFF 2	*HD				* FROM START OF LMRD UNTIL INITIATION OF AUTO SEQ. SYS IN TOLERANCE IF NO MORE THAN 2 OF 5 SENSOR INDICATIONS ARE "OPEN" (WET). * RANGE SAFETY REQUIREMENT SEE ITEM 1-527						
																	2-433	LAUNCH VEHICLE	S-II	REDLINES AND CATEGORIES	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-30

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM. NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES		
				FELT CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM			
2-434	WXM20-207 (HARDWARE)	VOLT, MAIN DC BUS (2D11)							WHILE BUSES ARE ENERGIZED, EITHER BY GROUND OR INT ELECTRICAL POWER TO T-33 SEC.		
	VXM109-340 (ALT #1)	VOLT, ESE VEHICLE BUS, 2D11			1 OF 3 M	26 VDC	32 VDC		STAGE BATT OPEN CIRCUIT VOLTAGES WILL BE MONITORED FROM BATT CONNECTION UNTIL T-50 SEC AS PER PROCEDURE V-30029.		
	M20-207 (ALT #2)	VOLT, MAIN DC BUS (2D11)							TRANSIENTS THAT OCCUR WHEN VARIOUS LOADS ARE SWITCHED, DURING POWER TRANSFER TESTS AND AT POWER TRANSFER, ARE NOT CONSIDERED AS DEVIATIONS FROM REDLINE LIMITS.		
2-435	WXM23-207 (HARDWARE)	VOLT, INSTRUMENTATION DC BUS (2D21)			1 OF 3 M	26 VDC	32 VDC				
	VXM110-340 (ALT #1)	VOLT, ESE VEHICLE BUS, 2D21									
	M23-207 (ALT #2)	VOLT, INSTRUMENTATION DC BUS (2D21)									
2-436	VM55-221	RSCR NO. 1, SIGNAL STRENGTH LOW			**M				FROM START OF LMRD UNTIL T-11 SEC.		
2-437	VM56-221	RSCR NO. 2, SIGNAL STRENGTH LOW			**M				** RANGE SAFETY REQUIREMENTS SEE ITEM 1-518 AND 1-527 NOTE: THESE MEAS. ARE MONITORED BY RANGE SAFETY SUPERVISOR'S REPRESENTATIVE AT THE LCC.		
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	S-II	SYSTEM	REDLINES AND CATEGORIES	DATE CHANGE NO.	BASIC OCTOBER 2, 1969	PAGE	2-31

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

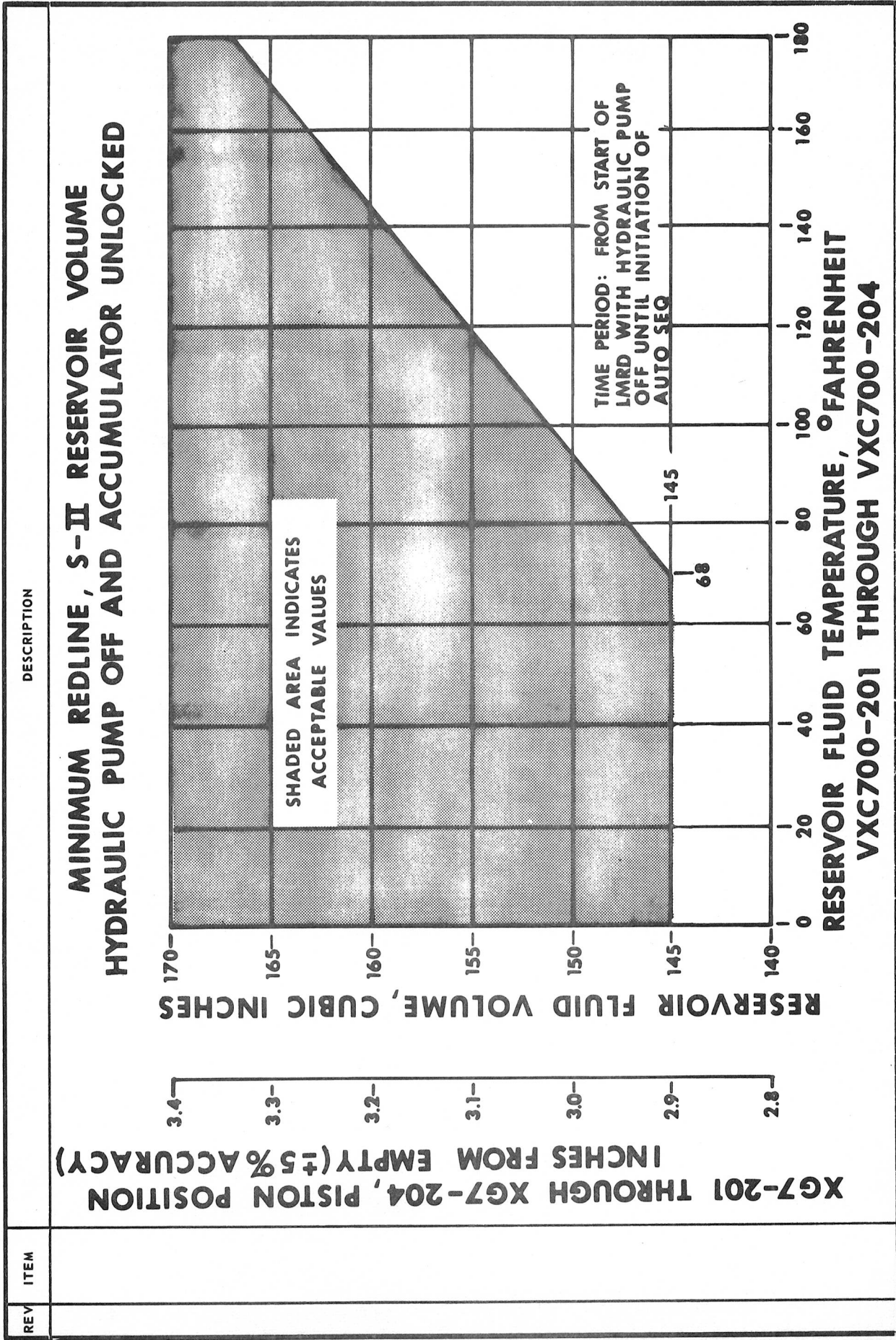
REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
2-439	WXM111-207 (HARDWARE)		VOLT, RECIRCULATION DC BUS (2D51)						WHILE BUSES ARE ENERGIZED, EITHER BY GROUND OR INT ELECTRICAL POWER TO T-33 SEC. STAGE BATTERY OPEN CIRCUIT VOLTAGE WILL BE MONITORED FROM BATTERY CONNECTION TO T-50 SEC PER PROCEDURE V-30029.
	VXM113-340 (ALT #1)		VOLT, ESE VEHICLE BUS (2D51)			1 OF 3 M	51 VDC	60 VDC	
	M111-207 (ALT #2)		VOLT, RECIRCULATION DC BUS (2D51)						
2-440	WXM125-207 (HARDWARE)		VOLT, IGNITION DC BUS (2D61)			1 OF 2 M	25 VDC	31 VDC	TRANSIENTS THAT OCCUR WHEN VARIOUS LOADS ARE SWITCHED, DURING POWER TRANSFER TESTS AND AT POWER TRANSFER, ARE NOT CONSIDERED AS DEVI- ATIONS FROM REDLINE LIMITS.
	M125-207 (ALTERNATE)		VOLT, IGNITION DC BUS (2D61)						
2-441	VXM132-214		VOLT, PU PKG, 115 VAC			M	109 VAC	121 VAC	FROM START OF PROPELLANT MANAGEMENT (PM) POWER ON TO T-33 SEC. VARIATION FROM THE INITIAL LEVEL MUST NOT BE GREATER THAN ±2.5 VAC. MAXIMUM AND MINIMUM VALUES WILL NOT BE VIOLATED EXCEPT WHEN VARIOUS LOADS ARE SWITCH- ED DURING POWER TRANSFER.

MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
APOLLO 12	LAUNCH VEHICLE	S-II	REDLINES AND CATEGORIES	BASIC OCTOBER 2, 1969	2-32

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
2-442		XN20-329	HYDROGEN CONCENTRATION, COMMON BULKHEAD CIRCUIT			1 OF 2 M	NONE	1.0% (10,000 PPM)	FROM T-8 HRS UNTIL START OF THE COMMON BLKHD EVACUATION.	
		XN21-329 (ALTERNATE)	HYDROGEN CONCENTRATION, COMMON BULKHEAD CIRCUIT			1 OF 2 M	NONE	0.045% (450 PPM)	FROM T-8 HRS UNTIL START OF THE COMMON BLKHD EVACUATION.	
A 2-444		XN20-329	OXYGEN CONCENTRATION, COMMON BULKHEAD CIRCUIT			1 OF 2 M	NONE	10% (100,000 PPM)	FROM T-8 HRS UNTIL INITIATION OF AUTO SEQUENCE	
		XN21-329 (ALTERNATE)	OXYGEN CONCENTRATION, COMMON BULKHEAD CIRCUIT			1 OF 2 M	NONE	10% (100,000 PPM)	FROM T-8 HRS UNTIL INITIATION OF AUTO SEQUENCE	
2-448		PTCS READOUT	LOX FLIGHT MASS			M	99.8%	100.2%	COMMIT AT INITIATION OF AUTO SEQ.	
		PTCS READOUT	LH ₂ FLIGHT MASS			M	99.8%	100.2%	NOTE: MAX AND MIN LIMITS ARE INDICATED PERCENTAGES OF PROPELLANT LOAD SPECIFIED IN PROPELLANT LOADING TABLES.	
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-II	SYSTEM			REDLINES AND CATEGORIES		DATE CHANGE NO. REVISION A OCTOBER 17, 1969	PAGE 2-33

REV A	<div style="text-align: center;"> <p>S-II PRELAUNCH ENGINE START BOX COMMIT AT T-33 SEC</p> </div> <div style="text-align: center;"> <p>DESCRIPTION</p> </div> <p style="text-align: center;"> TEMPERATURE, START TANK GAS (°F) (VXC11-201 THROUGH VXC11-205) (C12-201 THROUGH C12-205, ALTERNATES #) </p> <p style="text-align: center;"> PRESSURE, START TANK (PSIA) (VXC11-201 THROUGH VXC11-205) (D22-201 THROUGH D22-205, ALTERNATE) </p> <p style="text-align: center;"> SHADED AREA INDICATES ACCEPTABLE VALUES </p> <p style="text-align: center;"> POUND - MASS LINES ARE FOR REFERENCE ONLY </p> <p style="text-align: center;"> *NOTE:(ALTERNATE) HELIUM TANK GAS TEMPERATURE, C12-201 THRU C12-205, LIMITS ARE 10°F WARMER THAN START TANK TEMPERATURE </p> <p style="text-align: center;"> SUBSEQUENT TO T-200 SECONDS, AT WHICH TIME THE START TANK SUPPLY LINE WILL BE VENTED. THE START TANK PRESSURE MUST BE RISING FOR START TANK PRESSURES LESS THAN 1250 PSIA. IF THE PRESSURE RISES ABOVE 1250 PSIA THERE MUST BE NO DECAY </p>
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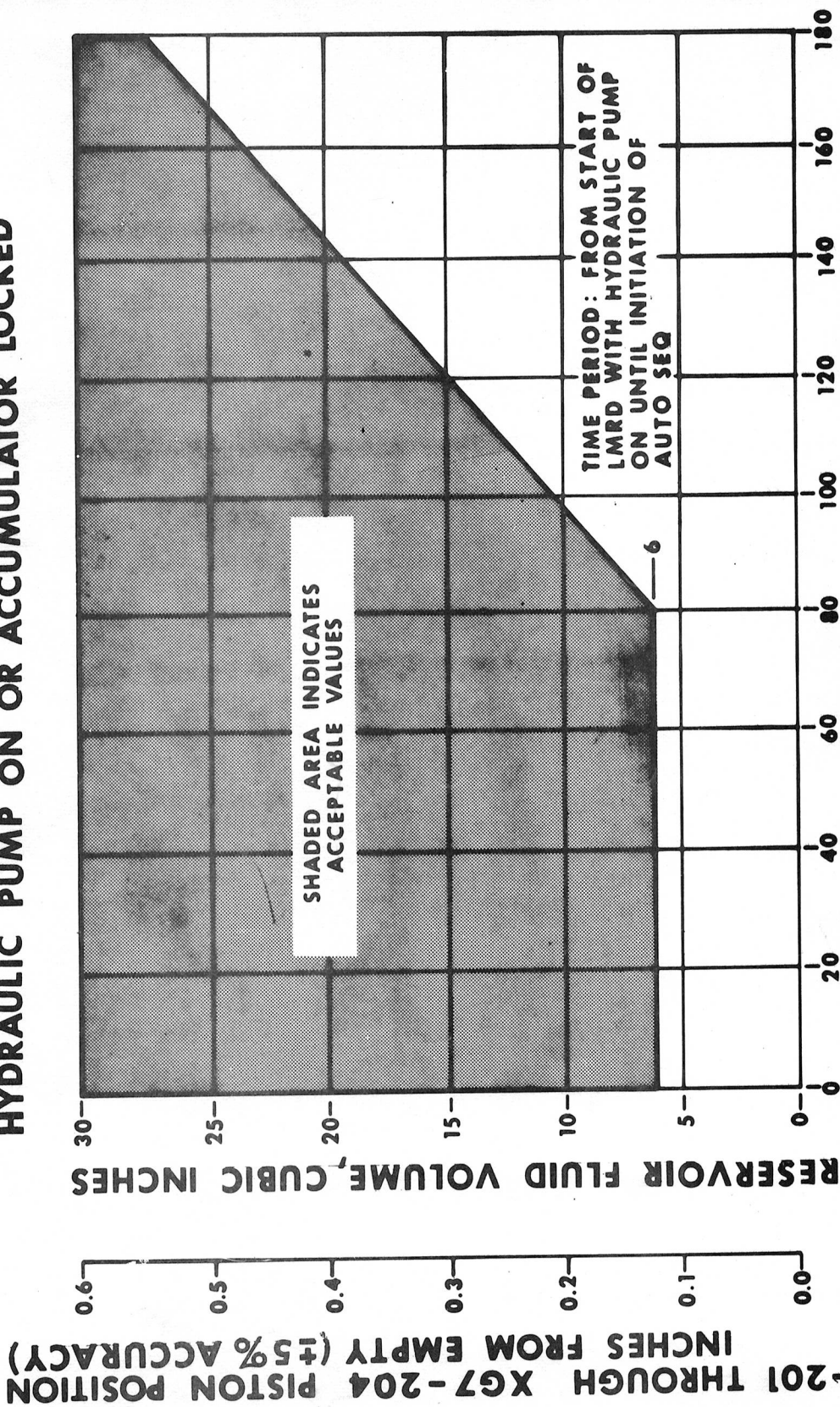


**XG7-201 THROUGH XG7-204, PISTON POSITION
INCHES FROM EMPTY (±5% ACCURACY)**

REV	ITEM		MISSION APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-II	SYSTEM FIG 2	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-35
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DESCRIPTION

**MINIMUM REDLINE, S-II RESERVOIR VOLUME
HYDRAULIC PUMP ON OR ACCUMULATOR LOCKED**



**RESERVOIR FLUID TEMPERATURE, ° FAHRENHEIT
VXC700-201 THROUGH VXC700-204**

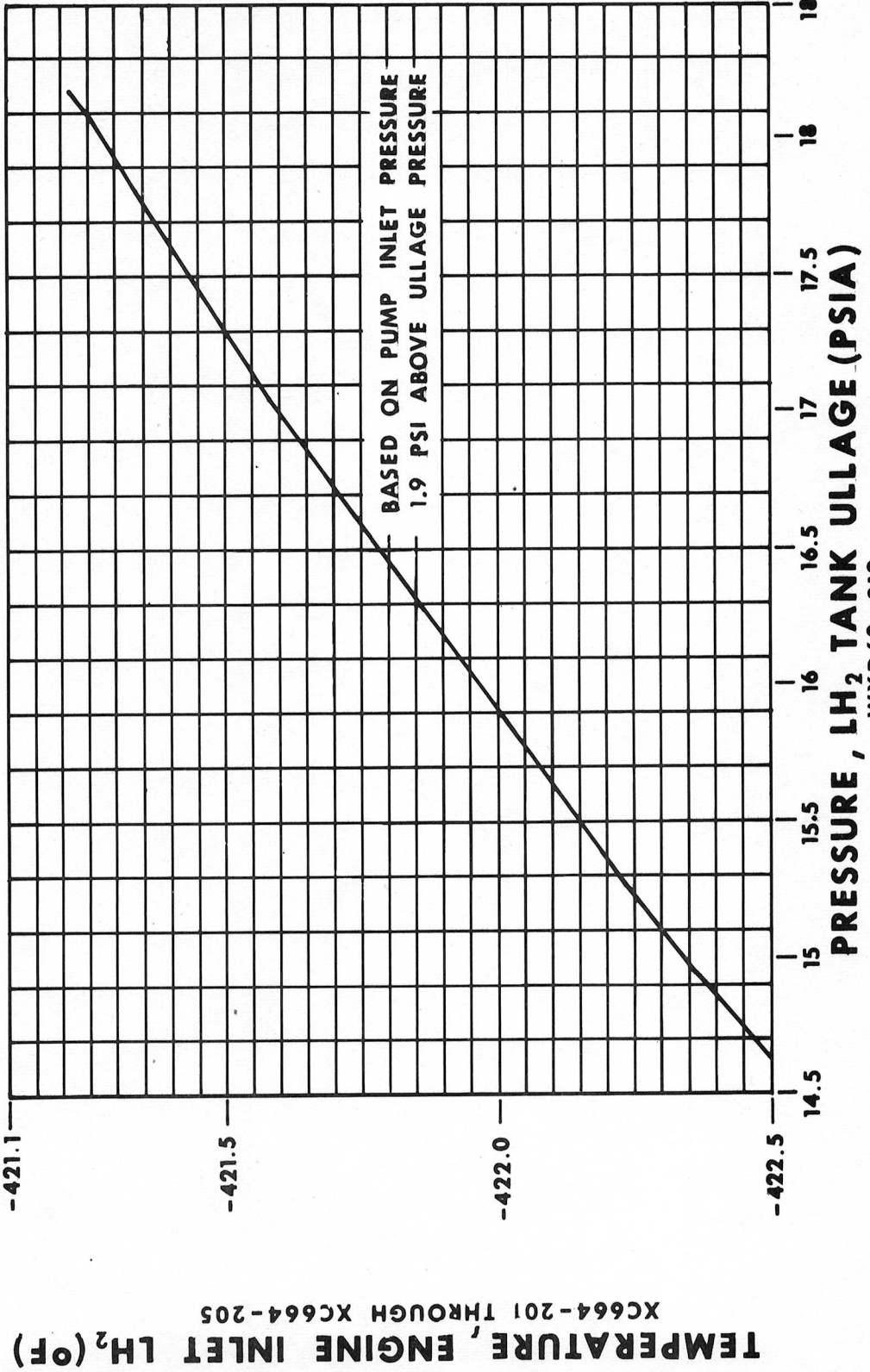
REV	ITEM	MISSION	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	SYSTEM	FIG 3	DATE CHANGE NO.	PAGE
		APOLLO 12	LAUNCH VEHICLE	S-II				BASIC OCTOBER 2, 1969	2-36

REV

ITEM

DESCRIPTION

LH₂ PUMP INLET SATURATION TEMPERATURE CORRECTION CURVE



MISSION
APOLLO 12

SECTION
LAUNCH VEHICLE

STAGE SUBSECTION

S-II

SYSTEM

FIG 4

DATE CHANGE NO.
BASIC

OCTOBER 2, 1969

PAGE

2-37

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
	2-502		TM LINK CP1	HD	HD				SEE ITEM 4-217	
Δ	2-504		MULTIPLIER DP1B0 (VIA IU)	*M	HD				** FROM START OF LMRD UNTIL T-33 SEC.	
Δ	2-505		MULTIPLIER CP1B0 (VIA S-IVB)	HD	HD	*M			SEE ITEM 4-217	
	2-507		RANGE SAFETY COMMAND RECEIVERS (2)						FROM START OF LMRD UNTIL T-11 SEC. * RANGE SAFETY REQUIREMENT SEE ITEM 1-518	
	2-508		REMOTE DIGITAL SUBMULTIPLIER		HD				NOTE: THE RANGE SAFETY SUPERVISOR (CRSS) AT THE LCC WILL DETERMINE IF THE RECEIVERS ARE OPERATING PROPERLY FOR LAUNCH.	
	2-509		REMOTE ANALOG SUBMULTIPLIER		HD				SEE ITEM 4-217	
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	SYSTEM			STAGE SYSTEMS		DATE CHANGE NO.	PAGE
									BASIC OCTOBER 2, 1969	2-38

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	FLT CONT	CATEGORY	REDLINE VALUES		TIME PERIOD ACTION NOTES
						MINIMUM	MAXIMUM	
Δ	2-510	XC3-403	TEMP, FUEL PUMP INLET		PRE LAUNCH 1 OF 2 M	SEE S-IVB FIG 1	SEE S-IVB FIG 1	SEE S-IVB FIG 1
		XC12-401 (ALTERNATE)	TEMP, GAS GENERATOR FUEL BLEED VLV		**	SEE S-IVB FIG 1A	SEE S-IVB FIG 1A	SEE S-IVB FIG 1A
	2-510A	XC4-403	TEMP, OXID PUMP INLET		**			** SEE ITEM 2-553
	2-511	VXC6-401	TEMP, GH ₂ START BOTTLE		1 OF 2 M	SEE S-IVB FIG 3	SEE S-IVB FIG 3	SEE S-IVB FIG 3
		VXC7-401 (ALTERNATE)	TEMP, ENG CONTROL HELIUM		1 OF 2 M	SEE S-IVB FIG 3A	SEE S-IVB FIG 3A	SEE S-IVB FIG 3A
	2-512	XC21-415 (ALTERNATE)	TEMP, ATTITUDE CONTROL FUEL MODULE 2 (S-IVB APS)		1 OF 2 M	+535°R	+560°R	COMMIT AT T-15 MIN.
		XC22-415	TEMP, ATTITUDE CONTROL OXID MODULE 2 (S-IVB APS)					
	2-513	VXC50-401	TEMP, HYDRAULIC PUMP INLET OIL		1 OF 2 M	+435°R	NONE	FROM INITIATION OF PROPELLANT LOADING TO FLIGHT MODE ON
		VXC51-403 (ALTERNATE)	TEMP, RESERVOIR OIL			+495°R	NONE	
	2-514	VXC51-403	TEMP, RESERVOIR OIL					SEE S-IVB FIG 2
		VXC50-401 (ALTERNATE)	TEMP, HYDRAULIC PUMP INLET OIL		1 OF 2 M	SEE S-IVB FIG 2	SEE S-IVB FIG 2	SEE S-IVB FIG 2

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FILT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
Δ	2-514A	XC104-404	TEMP, AFT BATT NO. 1, UNIT 1			M	520°R	NONE	FROM 30 MIN AFTER BATT CONNECTION UNTIL INITIATION OF AUTO SEQ.	
Δ	2-514B	XC105-404	TEMP, AFT BATT NO. 2, UNIT 1			M	525°R	NONE		
Δ	2-514C	XC131-404	TEMP, AFT BATT NO. 1, UNIT 2			M	520°R	NONE		
	2-515	XC132-414	TEMP, ATTITUDE CONTROL OXID MODULE 1 (S-IVB APS)			1 OF 2 M	535°R	560°R	COMMIT AT T-15 MIN.	
	2-517	VXC199-401	TEMP, THRUST CHAMBER JACKET							
		XC200-401 (ALTERNATE)	TEMP, FUEL INJECTION			1 OF 2 M	NONE	+330°R	COMMIT AT T-19 SEC.	
		XC212-404	TEMP, AFT BATT NO. 2, UNIT 2				NONE	+340°R		
Δ	2-517A	XC212-404	TEMP, AFT BATT NO. 2, UNIT 2			M	525°R	NONE	FROM 30 MIN AFTER BATT CONNECTION UNTIL INITIATION OF AUTO SEQ.	
	2-518	D1-401	PRESS, THRUST CHAMBER			**HD			** RANGE SAFETY REQUIREMENT. SEE ITEM 1-527.	
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-IVB	SYSTEM			REDLINES AND CATEGORIES		DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-40

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
2-518A	XD2-403		PRESS, FUEL PUMP INLET	2 OF 3 M					FROM START OF LMRD UNTIL T-33 SEC
	VXD177-408		PRESS, FUEL TK ULLAGE EDS 1						
	VD178-408		PRESS, FUEL TK ULLAGE EDS 2						
2-518B	XD3-403		PRESS, OXID PUMP INLET	2 OF 3 M					
	VXD179-406		PRESS, OXID TK ULLAGE EDS 1						
2-519	VD180-406		PRESS, OXID TK ULLAGE EDS 2				455 PSIA	585 PSIA **	FROM SPHERE PRESSURIZATION COMPLETE UNTIL INITIATION OF AUTO SEQ (NOTE: VIOLA- TION OF THE MIN REDLINE FOR A PERIOD NOT GREATER THAN 2 SEC IS EXPECTED AND ALLOWABLE AT TIMES OF VLV ACTUATION.)
	VXD14-403		PRESS, CONTROL HE REG DISCHARGE						
2-521	VXD17-401		PRESS, GH ₂ START BOTTLE	1 OF 2 M			SEE S-IVB FIG 3 OR FIG 3A	SEE S-IVB FIG 3 OR FIG 3A	SEE S-IVB FIG 3 OR FIG 3A
	D241-401 (ALTERNATE)		PRESS, GH ₂ START BOTTLE BACKUP MEAS						

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-522	VXD19-401	PRESS, ENG CONTROL HE SPHERE			1 OF 2 M	2800 PSIA	3200 PSIA	
		D242-401 (ALTERNATE)	PRESS, ENG CONTROL HE SPHERE BACKUP MEAS			1 OF 2 M	2800 PSIA	3200 PSIA	
	2-523	VXD20-403	PRESS, FUEL TK HE BOTTLE REPRESSURIZATION			1 OF 2 M	2800 PSIA	3200 PSIA	
		D249-403 (ALTERNATE)	PRESS, FUEL TK HE BOTTLE REPRESSURIZATION			1 OF 2 M	2800 PSIA	3200 PSIA	
	2-524	VXD35-414	PRESS, ATTITUDE CONTROL HE PRESS TK 1 (S-IVB APS)			1 OF 2 M	2800 PSIA	3200 PSIA	FROM SPHERE PRESSURIZATION COMPLETE UNTIL INITIATION OF AUTO SEQ.
		D250-414 (ALTERNATE)	PRESS, ATTITUDE CONTROL HE PRESS TK 1 (S-IVB APS)			1 OF 2 M	2800 PSIA	3200 PSIA	
	2-525	VXD36-415	PRESS, ATTITUDE CONTROL HE PRESS TK 2 (S-IVB APS)			1 OF 2 M	2800 PSIA	3200 PSIA	
		D251-415 (ALTERNATE)	PRESS, ATTITUDE CONTROL HE PRESS TK 2 (S-IVB APS)			1 OF 2 M	2800 PSIA	3200 PSIA	
Δ	2-526	VXD41-403	PRESS, HYDRAULIC SYS (AUX PUMP ON)			1 OF 2 M	3400 PSIA	3750 PSIA	FROM FLIGHT MODE "ON" UNTIL INITIATION OF AUTO SEQ. **SEE ITEM 2-565
		VD43-403 (ALTERNATE)	PRESS, GN ₂ ACCUMULATOR			1 OF 2 M	3400 PSIA	3750 PSIA	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD	ACTION NOTES
				FLT CONT	ENG DATA	MINIMUM	MAXIMUM		
Δ	2-527	VXD42-403	PRESS, RESERVOIR OIL (AUX PUMP OFF)				NONE		FROM INITIATION OF PROPELLANT LOADING TO FLIGHT MODE ON. **SEE ITEM 2-565
		VXD43-403 (ALTERNATE)	PRESS, GN ₂ ACCUMULATOR			1 OF 2 M	NONE		
		VXD71-414	PRESS, OXID SUP MANIFOLD MODULE 1 (CAPS)				219 PSIA		
		VXD98-414 (ALT #1)	PRESS, OXID TK ULLAGE VOLUME MODULE 1 (CAPS)			1 OF 4 M	216 PSIA		
		VXD70-414 (ALT #2)	PRESS, FUEL SUP MANIFOLD MODULE 1 (CAPS)				218 PSIA		
		VXD97-414 (ALT #3)	PRESS, FUEL TK ULLAGE VOLUME MODULE 1 (CAPS)				216 PSIA		
		VXD73-415	PRESS, OXID SUP MANIFOLD MODULE 2 (CAPS)				219 PSIA		
		VXD99-415 (ALT #1)	PRESS, OXID TK ULLAGE VOLUME MOD 2 (CAPS)				216 PSIA		
		VXD72-415 (ALT #2)	PRESS, FUEL SUP MANIFOLD MODULE 2 (CAPS)			1 OF 4 M	218 PSIA		
		VXD100-415 (ALT #3)	PRESS, FUEL TK ULLAGE VOLUME MOD 2 (CAPS)				216 PSIA		
2-529	2-529	VXD88-403	PRESS, LOX TK REPRESSURIZATION HE SPHERES			1 OF 2 M	3200 PSIA		FROM T-15 MIN UNTIL INITIATION OF AUTOMATIC SEQ. SUBTRACTING THE FLUID HEAD AND IN A STATIC CONDITION, THE PRIMARY AND ALTERNATE PRESSURE WILL BE EQUAL.
		D254-403 (ALTERNATE)	PRESS, LOX TK REPRESSURIZATION HE SPHERES				2800 PSIA		
2-530	2-530	VXD88-403	PRESS, LOX TK REPRESSURIZATION HE SPHERES			1 OF 2 M	3200 PSIA		FROM SPHERE PRESSURIZATION COMPLETE UNTIL INITIATION OF AUTO SEQ.
		D254-403 (ALTERNATE)	PRESS, LOX TK REPRESSURIZATION HE SPHERES				2800 PSIA		

PSC FORM 4-47 REV. 1-68

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS/TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	MINIMUM	MAXIMUM	
	2-531	VXD97-414	PRESS, FUEL TK ULLAGE VOLUME MOD 1 (APS)					* SEE ITEM 2-528
	2-532	VXD98-414	PRESS, OXID TK ULLAGE VOLUME MOD 1 (APS)					* SEE ITEM 2-529
	2-533	VXD99-415	PRESS, OXID TK ULLAGE VOLUME MOD 2 (APS)					* SEE ITEM 2-518A
	2-534	VXD100-415	PRESS, FUEL TK ULLAGE VOLUME MOD 2 (APS)					* SEE ITEM 2-518B *(1) SEE ITEM 2-551
	2-535	VXD177-408	PRESS, FUEL TK ULLAGE EDS 1	*				
	2-536	VD178-408	PRESS, FUEL TK ULLAGE EDS 2	*				
	2-537	VXD179-406	PRESS, OXID TK ULLAGE EDS 1	*				
	2-538	VD180-406	PRESS, OXID TK ULLAGE EDS 2	*				
Δ	2-539	VXD236-403	PRESS, AMBIENT HELIUM PNEUMATIC SPHERE				2800 PSIA	FROM SPHERE PRESSURIZATION COMPLETE TO START OF AUTO SEQ.
		D256-403 (ALTERNATE)	PRESS, AMBIENT HELIUM PNEUMATIC SPHERE				3200 PSIA	

KSC FORM 4-47 (REV. 1 68)

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD / ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
2-540		D241-401	PRESS, GH ₂ START BOTTLE BACKUP MEAS			*			** SEE ITEM 2-521
2-541		D242-401	PRESS, ENG CONTROL HE SPHERE BACKUP MEAS			*			** SEE ITEM 2-522
2-542		D247-403	PRESS, CONTROL HE REG DISCHARGE			*			** SEE ITEM 2-519
2-543		D249-403	PRESS, FUEL TK HE BOTTLE REPRESSURIZATION			*			** SEE ITEM 2-523
2-544		D250-414	PRESS, ATTITUDE CONTROL HE PRESS TK 1 (S-IVB APS)			*			** SEE ITEM 2-524
2-545		D251-415	PRESS, ATTITUDE CONTROL HE PRESS TK 2 (S-IVB APS)			*			** SEE ITEM 2-525
2-546		D254-403	PRESS, LOX TK REPRESSURIZATION HE SPHERES			*			** SEE ITEM 2-530
2-547		D256-403	PRESS, AMBIENT HE PNEUMATIC SPHERE			*			** SEE ITEM 2-539
2-548		VXD261-403	PRESS, MANIFOLD COLD HE SPHERE			1 OF 2 M		2800 PSIA 3200 PSIA	FROM SPHERE PRESSURIZATION COMPLETE UNTIL T-19 SEC.
		D263-403 (ALTERNATE)	PRESS, MANIFOLD COLD HE SPHERE, BACKUP						

MISSION APOLLO 12
SECTION LAUNCH VEHICLE
SYSTEM S-IVB
DATE CHANGE NO. BASIC
OCTOBER 2, 1969
PAGE 2-45

REDLINES AND CATEGORIES

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM		MAXIMUM
	2-550	WXD576-408 (HARDWIRE)	PRESS, FUEL TK ULLAGE UMBILICAL			M	AMBIENT	17.4 PSIA	FROM T-30 MIN TO INITIA- TION OF TANK PRESSURIZA- TION.
	2-551	WXD577-406 (HARDWIRE)	PRESS, OXID TK ULLAGE UMBILICAL				28 PSIA	34 PSIA	FROM COMPLETION OF TANK PRESSURIZATION TO T-19 SEC (SEE FIG 1 FOR TEMP LIMITS USE WITH MEAS NO. XC3-403)
		VXD179-406 (ALT #1)	PRESS, OXID TK ULLAGE, EDS 1			1 OF 3 M	38 PSIA	43.5 PSIA	FROM COMPLETION OF TANK PRESSURIZATION TO T-19 SEC
		VD180-406 (ALT #2)	PRESS, OXID TK ULLAGE, EDS 2						
	2-552	DEE-6-3662 DS 66 *	PROPELLANT DEPLETION LH2 WET INDICATION NO. 1			2 OF 3 M			FROM START OF LMRD TO START OF S-IVB LH2 LOAD. SYSTEM IS IN TOLERANCE IF NO MORE THAN 1 OF 3 SENSOR INDICATIONS ARE "WET."
		DEE-6-3663 DS 67 *	PROPELLANT DEPLETION LH2 WET INDICATION NO. 2						** ENG TEST PANEL
		DEE-6-3664 DS 68 *	PROPELLANT DEPLETION LH2 WET INDICATION NO. 3						
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-IVB	SYSTEM REDLINES AND CATEGORIES	DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-46			

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
2-553		VXF4-424	FLOW RATE, OXID CIRCULATION PUMP				30 GPM	NONE	FROM START OF RECIRCULATION UNTIL T-19 SEC. * IF THIS MEASUREMENT FAILS SUBSTITUTE MEAS. VXD179-406 OR VD180-406. * (1) THE TEMP. REQ. MUST BE MET FROM INIT. OF AUTO SEQ UNTIL T-19 SEC IF ALT IS USED.
		XD3-403 MINUS * WXD577-406 WITH XC4-403 *(1) (ALTERNATE)	PRESS, OXID PUMP INLET PRESS, OXID TK ULLAGE UMBILICAL TEMP, OXID PUMP INLET			1 OF 2 M	+ 13 PSID	+ 18 PSID	
Δ 2-554		VXF5-404	FLOW RATE, FUEL CIRCULATION PUMP				*120 GPM	NONE	FROM START OF FUEL TANK PRESSURIZATION TO T-19 SEC. * WHILE IN THE UNPRESSURIZED CONDITION, AND WITH THE RECIRCULATION SYSTEM OPERATING, THE FLOW RATE OF THE FUEL WILL BE IN A BAND BETWEEN 80 AND 110 GPM. IT SHOULD BE NOTED THAT WHEN PREPRESS IS INITIATED, SHARP FLUCTUATIONS IN THE FLOW RATE MAY RESULT. THESE FLUCTUATIONS HAVE LASTED UP TO 60 SEC ON PREVIOUS FIRINGS. THIS IS A NORMAL CONDITION AND MONITORING OF THIS PARAMETER SHOULD NOT BE STARTED UNTIL THE FLOW RATE HAS ATTAINED A STEADY STATE VALUE.
		XD2-403 MINUS WXD576-408 (ALTERNATE)	PRESS, FUEL PUMP INLET PRESS, FUEL TK ULLAGE UMBILICAL			1 OF 2 M	+6 PSID	+10 PSID	

MISSION	SECTION	STAGE SUBSECTION	SYSTEM	REDLINES AND CATEGORIES	DATE CHANGE NO.	PAGE
APOLLO 12	LAUNCH VEHICLE	S-IVB			BASIC OCTOBER 2, 1969	2-47

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
2-555	VXG1-403		POSITION, ACT PISTON POTENTIOMETER PITCH			M	** -1.5°	** +1.5°	FROM FLIGHT MODE ON UNTIL INITIATION OF AUTO SEQ. * CONTINUOUS FROM S-IVB; NOT CHANNEL SHARED. DOES NOT APPLY WHEN ACTUATORS ARE BEING COMMANDED TO MOVE.
2-556	VXG2-403		POSITION, ACT PISTON POTENTIOMETER YAW			M	** -1.5°	** +1.5°	
2-558	VXG10-401		POSITION, PU SYS RATIO VLV			1 OF 2 M	NULL -2°	NULL +2°	FROM T-5 MIN UNTIL INITIATION OF AUTO SEQ.
	M61-411 (ALTERNATE)		VOLTAGE, PU VALVE POSITION FEEDBACK				NULL -1.526 VDC	NULL +1.526 VDC	
Δ 2-559	VK8-401		EVENT, IGNITION DETECTED			M	*	*	* VERIFY THAT ON INDICATION IS PRESENT IMMEDIATELY AFTER ENGINE POWER ON TO INITIATION OF AUTO SEQ.
2-560	XK13-401		EVENT, CUTOFF SIGNAL (LOCK IN)			M	*	*	* OBSERVE DROP FROM "ON" INDICATION AT ENGINE IGNITION POWER ON AND MONITOR THAT INDICATION REMAINS "OFF" UNTIL T-33 SEC.

Y SC FORM 4-47 (REV. 1-58)

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-561	VK14-401	EVENT, MAINSTAGE OK PRESS SW 1			∞HD			∞ RANGE SAFETY REQUIREMENT SEE ITEM 1-527 FROM INITIATION OF PRO- PELLANT LOADING TO T-19 SEC (AUX PUMP ON). SEE S-IVB FIG. 2 (AUX PUMP OFF) ∞ WHEN USING THESE REDLINES, RESERVOIR LOW LEVEL WARN- ING LIGHT, PANEL 407A1, OR DEE-6 INDICATION MDI - 1701 MUST INDICATE OFF (AUX PUMP ON). NOTE: IF ALTERNATE IS NEEDED WITH PUMP OFF, TURN PUMP ON AND VERIFY REDLINE.
	2-562	VK157-401	EVENT, MAINSTAGE OK PRESS SW 2			∞HD			
	2-563	K158-401	EVENT, MAINSTAGE OK PRESS SW 1 DEPRESS			∞HD			
	2-564	K159-401	EVENT, MAINSTAGE OK PRESS SW 2 DEPRESS			∞HD			
Δ	2-565	VXL7-403	LEVEL, RESERVOIR OIL				6%	NONE	
		VXD41-403 (ALT #1)	PRESS, HYDRAULIC SYS (AUX PUMP ON)			1 OF 3 M	SEE S-IVB FIG 2	NONE	
		VXD42-403 (ALT #2)	PRESS, RESERVOIR OIL (AUX PUMP ON)				3400 PSIA ∞	3750 PSIA ∞	
							135 PSIA ∞	185 PSIA ∞	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	
2-566		M14-404 (ALT #3) *(1)	VOLTAGE, OUTPUT AFT BATT NO. 1					<p>WHILE BUSES ARE ENERGIZED EITHER BY GROUND OR INTERNAL ELECTRICAL POWER TO T-33 SECONDS.</p> <p>STAGE BATTERY OPEN CIRCUIT VOLTAGES WILL BE MONITORED FROM BATTERY CONNECTION TO T-50 SECONDS PER PROCEDURE V-21413.</p> <p>TRANSIENTS THAT OCCUR WHEN VARIOUS LOADS ARE SWITCHED, DURING POWER TRANSFER TESTS AND AT POWER TRANSFER ARE NOT CONSIDERED AS DEVIATIONS FROM THE REDLINE LIMITS.</p> <p>*(1) APPLICABLE ONLY AFTER POWER TRANSFER (T-50 SEC). ALTERNATE MEAS IS ON BATTERY SIDE OF THE POWER TRANSFER SWITCH.</p> <p>*(2) DURING THE INITIAL APPLICATION OF VOLTAGE TO THE ENGINE BUSES THE MAX ALLOWABLE VOLTAGE MAY BE 32 VDC MAX FOR A PERIOD NOT TO EXCEED 60 SECONDS.</p>
		VXM151-340	VOLTAGE, ESE VEHICLE BUS 4D11 (AFT NO. 1)			26 VDC	31 VDC *(2)	
		WXM556-404 (HARDWIRE) (ALT #1)**(1)	VOLTAGE, BUS 4D10			1 OF 4 M		
2-567		M1 PNL 405A1 (ALT #2) *	VOLTAGE, BUS 4D11/4D10					<p>*(1) APPLICABLE ONLY UNTIL POWER TRANSFER. ALT #1 SHOULD BE USED AFTER POWER TRANSFER.</p>
		M15-404 (ALT #3) *(1)	VOLTAGE, OUTPUT AFT BATT NO. 2					
		VXM153-340	VOLTAGE, ESE VEHICLE BUS 4D41 (AFT NO. 2)			51 VDC	61 VDC	
		WXM555-404 (HARDWIRE) (ALT #1)**(1)	VOLTAGE, BUS 4D40			1 OF 4 M		<p>*(1) APPLICABLE ONLY AFTER POWER TRANSFER (T-50 SEC). ALTERNATE MEAS IS ON BATTERY SIDE OF THE POWER TRANSFER SWITCH.</p>
		M8 PNL 405A1 (ALT #2) *	VOLTAGE, BUS 4D41/4D40					

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
	2-568	M16-411 (ALT #3) *(1)	VOLTAGE, OUTPUT FORWARD BATT NO. 1						WHILE BUSES ARE ENERGIZED EITHER BY GROUND OR INTERNAL ELECTRICAL POWER TO T-33 SECONDS.	
		VXM154-340	VOLTAGE, ESE VEHICLE BUS 4D31 (FORWARD NO. 1)			1 OF 4 M	26 VDC	32 VDC	STAGE BATTERY OPEN CIRCUIT VOLTAGES WILL BE MONITORED FROM BATTERY CONNECTION TO T-50 SECONDS PER PROCEDURE V-21413.	
		WXM557-411 (HARDWIRE) (ALT #1)**(1)	VOLTAGE, BUS 4D30							
		M7 PNL 405A1 (ALT #2)**	VOLTAGE, BUS 4D31/4D30						TRANSIENTS THAT OCCUR WHEN VARIOUS LOADS ARE SWITCHED, DURING POWER TRANSFER TESTS AND AT POWER TRANSFER ARE NOT CONSIDERED AS DEVIATIONS FROM THE REDLINE LIMITS.	
	2-569	M18-411 (ALT #3) *(1)	VOLTAGE, OUTPUT FORWARD BATT NO. 2							
		VXM152-340	VOLTAGE, ESE VEHICLE BUS 4D21 (FORWARD NO. 2)			1 OF 4 M	24.5 VDC	32 VDC *(2)	** APPLICABLE ONLY UNTIL POWER TRANSFER. ALT #1 SHOULD BE USED AFTER POWER TRANSFER.	
		WXM554-411 (HARDWIRE) (ALT #1)**(1)	VOLTAGE, BUS 4D20						** (1) APPLICABLE ONLY AFTER POWER TRANSFER (T-50 SEC). ALTERNATE MEAS IS ON BATTERY SIDE OF THE POWER TRANSFER SWITCH.	
		M2 PNL 405A1 (ALT #2)**	VOLTAGE, BUS 4D21/4D20						** (2) 30 VDC WHEN ON EXTERNAL POWER AND REMOTE AUTOMATIC CALIBRATION SYSTEM (RACS) IS BEING USED.	
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	S-IVB	SYSTEM	REDLINES AND CATEGORIES		DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-51

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-572	M61-411	VOLTAGE, PU VALVE POSITION FEEDBACK			*			* SEE ITEM 2-558
	2-573	VXM151-340	VOLTAGE, ESE VEHICLE BUS 4D11 (AFT NO. 1)			*			* SEE ITEM 2-566
	2-574	VXM152-340	VOLTAGE, ESE VEHICLE BUS 4D21 (FORWARD NO. 2)			*			* SEE ITEM 2-569
	2-575	VXM153-340	VOLTAGE, ESE VEHICLE BUS 4D41 (AFT NO. 2)			*			* SEE ITEM 2-567
	2-576	VXM154-340	VOLTAGE, ESE VEHICLE BUS 4D31 (FORWARD NO. 1)			*			* SEE ITEM 2-568
	2-576A	WXM554-411	VOLTAGE, BUS 4D20			*			* SEE ITEM 2-569
	2-576B	WXM555-404	VOLTAGE, BUS 4D40			*			* SEE ITEM 2-567
	2-576C	WXM556-404	VOLTAGE, BUS 4D10			*			* SEE ITEM 2-566
	2-576D	WXM557-411	VOLTAGE, BUS 4D30			*			* SEE ITEM 2-568
A	2-577	VXN2-411	VOLTAGE, PU SYS LH2 FINE MASS				18.695 LEGS	18.846 LEGS	COMMIT AT INITIATION OF AUTO SEQ.
		PTCS READOUT (ALTERNATE)	LH2 FLIGHT MASS				99.4%	100.6%	NOTE 1: MAX AND MIN LIMITS ARE INDICATED PERCENTAGES OF PROPELLANT LOAD SPECI- FIED IN PROPELLANT LOAD- ING TABLES. NOTE 2: DISREGARD PU PROBE EXCURSIONS WHICH CAN BE JUDGED AS NOT AN OUT-OF- TOLERANCE MASS CHANGE.
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION S-IVB	SYSTEM REDLINES AND CATEGORIES			DATE CHANGE NO. REVISION A	PAGE 2-52	OCTOBER 17, 1969

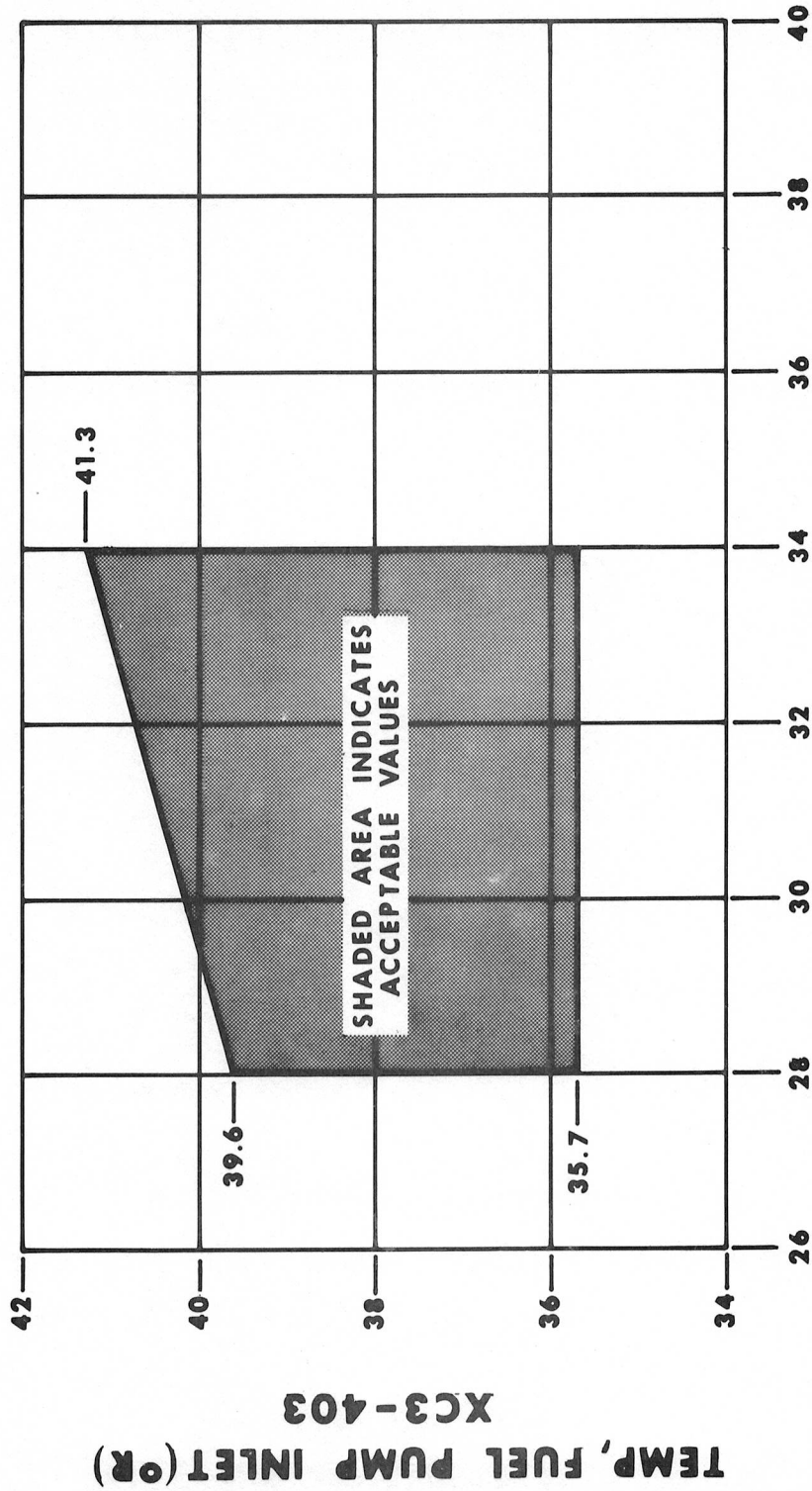
JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES				
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM					
A	2-578	VXN4-411 (ALTERNATE)	VOLTAGE, PU SYS LOX FINE MASS				17.729 LEGS	17.866 LEGS	COMMIT AT INITIATION OF AUTO SEQ. NOTE: MAX AND MIN LIMITS ARE INDICATED PER- CENTAGES OF PROPEL- LANT LOAD SPECIFIED IN PROPELLANT LOAD- ING TABLES. ** FROM START OF LMRD UNTIL T-11 SEC. RANGE SAFETY REQUIREMENTS SEE ITEM 1-518 AND 1-527. THESE MEAS. ARE MONITOR- ED BY RANGE SAFETY SUPERVISOR'S REPRESENTA- TIVE AT THE LCC. FROM 45 MIN AFTER PROPEL- LANT UTILIZATION OVEN ON TO INITIATION OF AUTO SEQ. ** REDLINE BECOMES EFFECT- IVE WHEN MEASUREMENT HAS COME ON SCALE AND STABI- LIZED.				
		PTCS READOUT	LOX FLIGHT MASS			1 OF 2 M	99.6%	100.4%					
	2-579	VN57-411	RSCR NO. 1, SIGNAL STRENGTH, LOW LEVEL			**M							
	2-580	VN62-411	RSCR NO. 2, SIGNAL STRENGTH, LOW LEVEL			**M							
	2-581	XN63-411	PROPELLANT UTILIZATION OVEN STABILITY MONITOR			M	**-.3 VDC BELOW STABI- LIZED STRIP CHART LEVEL OBTAINED DURING PU CALIBRA- TION	**+.3 VDC ABOVE STABI- LIZED STRIP CHART LEVEL OBTAINED DURING PU CALIBRA- TION					
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE	SUBSECTION	S-IVB	SYSTEM		REDLINES AND CATEGORIES	DATE CHANGE NO. REVISION A	PAGE	OCTOBER 17, 1969	2-53

REV ITEM

DESCRIPTION

**LH₂ CRITICAL LIMITS
COMMIT AT T-19 SEC**



**PRESS, FUEL TANK ULLAGE UMBILICAL (PSIA)
WXD576-408**

MISSION
APOLLO 12

SECTION
LAUNCH VEHICLE

STAGE SUBSECTION
S-IVB

SYSTEM

FIG 1

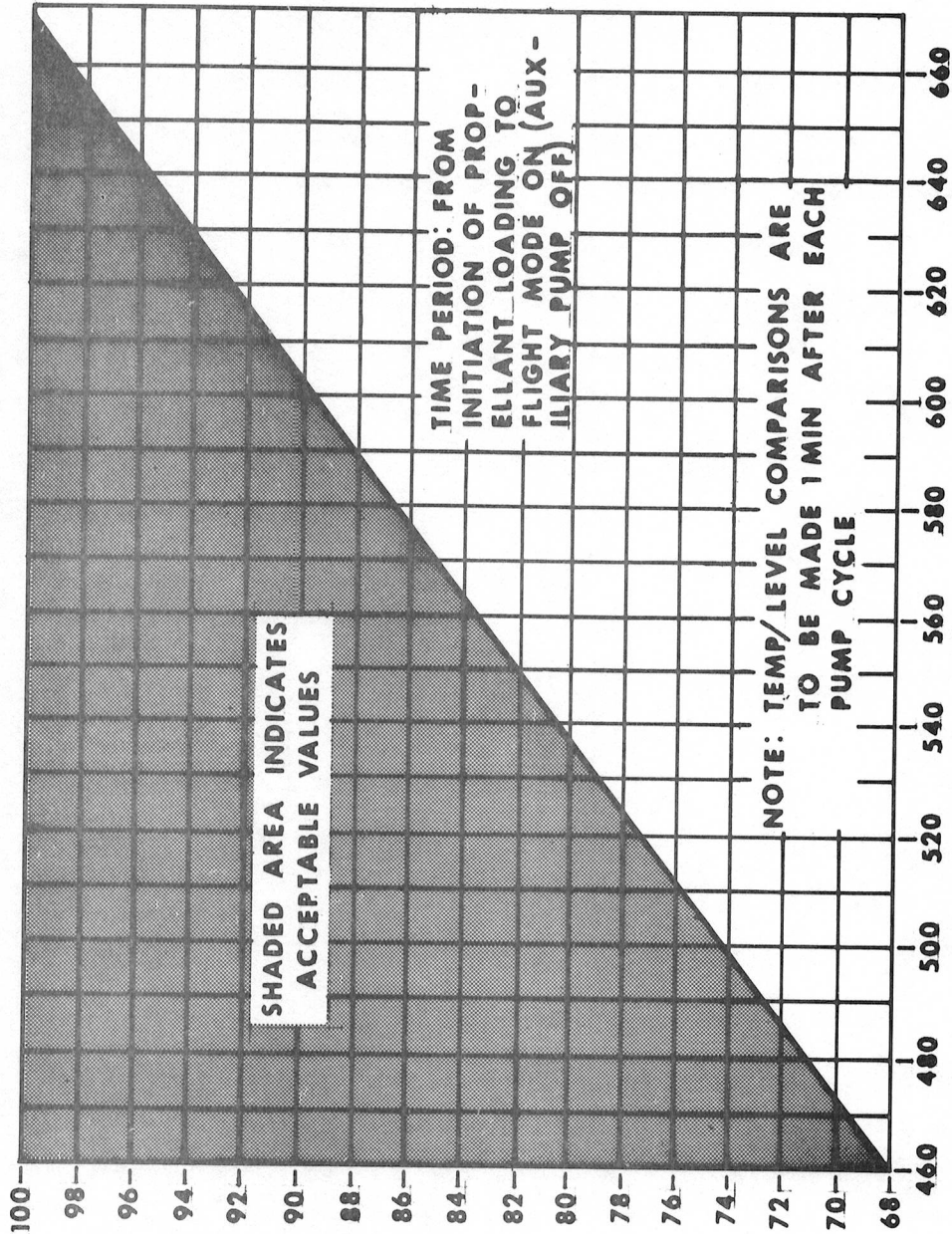
DATE CHANGE NO.
BASIC
OCTOBER 2, 1969

PAGE
2-54

REV	ITEM	DESCRIPTION
		<p style="text-align: center;">TEMP, GAS GENERATOR FUEL BLEED VALVE (R) C12-401</p> <div style="text-align: center;"> <p>LH₂ CRITICAL LIMITS COMMIT AT T-19 SEC</p> </div> <p style="text-align: center;">PRESS, FUEL TANK ULLAGE UMBILICAL (PSIA) WXD576-408</p>
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE
		STAGE SUBSECTION S-IVB
		SYSTEM FIG 1A
		DATE CHANGE NO. BASIC
		OCTOBER 2, 1969
		PAGE 2-55

DESCRIPTION

HYDRAULIC RESERVOIR LEVEL CRITICAL LIMITS



**TEMP, RESERVOIR OIL (°RANKINE)
 VXC51-403 OR VXC50-401**

REV ITEM

MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE/CHANGE NO.	PAGE
APOLLO 12	LAUNCH VEHICLE	S-IVB		BASIC OCTOBER 2, 1969	2-56

FIG 2

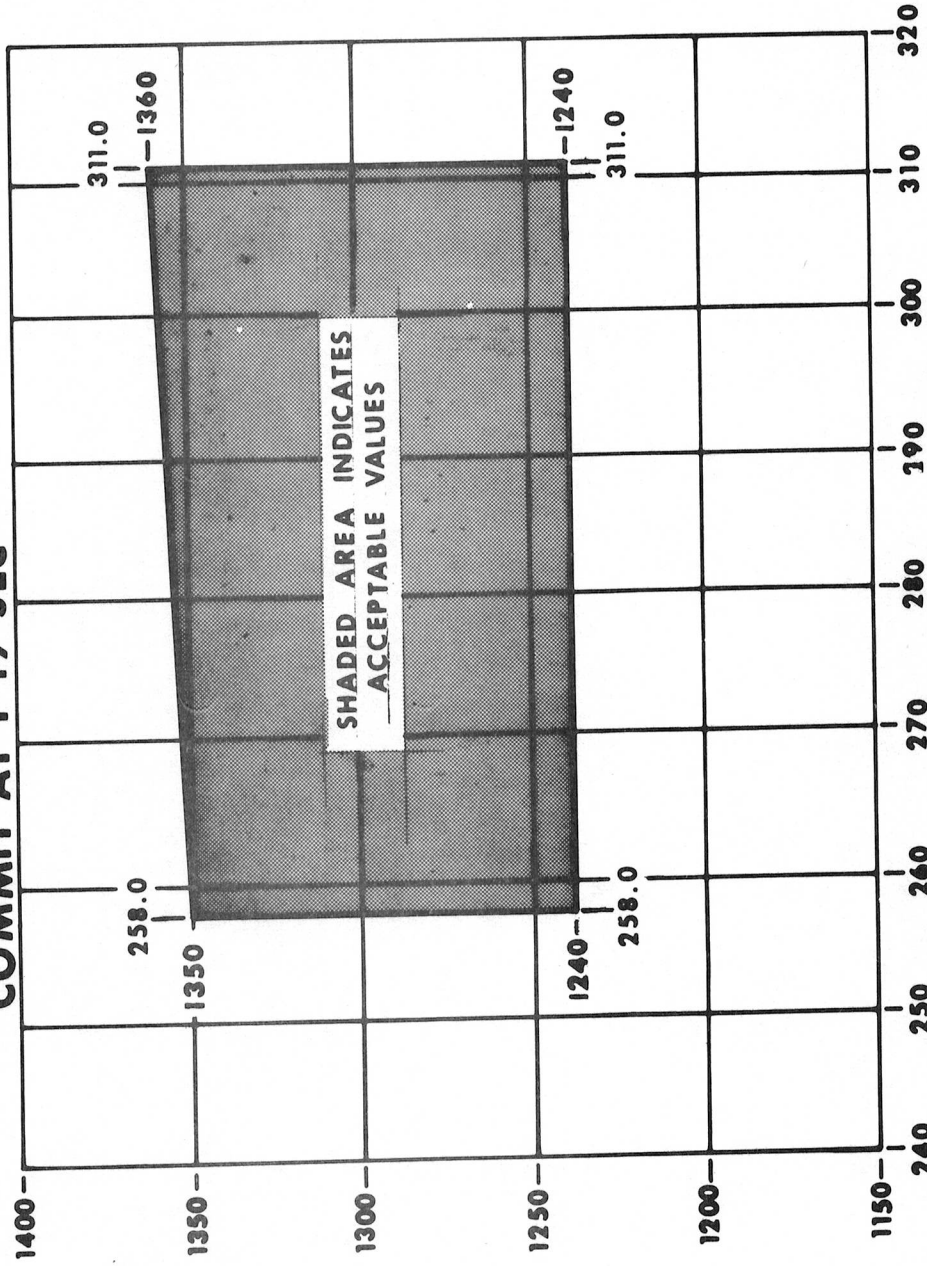
JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV ITEM

DESCRIPTION

**GH₂ START BOTTLE BOX
COMMIT AT T-19 SEC**

**PRESSURE, GH₂ START BOTTLE, (PSIA)
VXD17-401 OR D241-401**



**TEMP, GH₂ START BOTTLE (OR)
VXC6-401**

MISSION
APOLLO 12

SECTION
LAUNCH VEHICLE

STAGE SUBSECTION
S-IVB

SYSTEM

FIG 3

DATE/CHANGE NO.
BASIC

OCTOBER 2, 1969

PAGE

2-57

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<p style="text-align: center;">GH₂ START BOTTLE BOX COMMIT AT T-19 SEC</p> <p style="text-align: center;">TEMP, ENGINE CONTROL HELIUM (° RANKINE) VXC7-401</p> <p style="text-align: center;">PRESSURE, GH₂ START BOTTLE (PSIA) VXD17-401 OR D241-401</p>

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
Δ	2-702		TM LINK DPI	HD	HD				SEE ITEM 4-217
Δ	2-703		TM LINK DPIB	M	HD				** FROM START OF LMRD UNTIL T-25 SEC.
	2-705		MULTIPLIER DP1A0 (VIA IU)	HD	HD				
	2-706		MULTIPLIER CP1A0 (VIA S-IVB)	HD	HD				SEE ITEM 4-217
	2-707		MULTIPLIER J (RDM)		HD				
	2-708		COMMAND AND COMMUNICATIONS SYSTEM (CCS)**	M					FROM START OF LMRD UNTIL T-25 SEC.
	2-709		EMERGENCY DETECTION SYSTEM (EDS)	M					** THE COMMAND AND T/M CAPABILITY ARE MANDATORY. SEE ITEM 4-416
Δ	2-710		LAUNCH VEHICLE C-BAND BEACON SYSTEM (2 BEACONS)						FROM START OF LMRD UNTIL INITIATION OF AUTO SEQ. SEE ITEM 2-757 ** RANGE SAFETY REQUIREMENT. SEE ITEM 1-519 FOR CATEGORY.

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES			TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM			
Δ	2-711	VCX15-601	TEMP, METHANOL/WATER CONTROL			1 OF 2 M	SEE IU FIG 1	SEE IU FIG 1	SEE IU FIG 1		
		VG3-601 AND C11-601 (ALTERNATE)	POSITION, METH/WATER CONTROL VALVE TEMP, SUBLIMATOR INLET METH/WATER			1 OF 2 M	SEE IU FIG 1	SEE IU FIG 1			
		VC53-603 (ALTERNATE)	TEMP, GUIDANCE COMPUTER (LOGIC PAGE)			1 OF 2 M	10°C	47°C			
	2-713	VC54-603	TEMP, GUIDANCE COMPUTER (MEMORY)			1 OF 2 M	0°C	75°C	FROM START OF LMRD UNTIL INITIATION OF AUTO SEO (RECORDED ON KSC FLIGHT COMPUTER RECORDERS)		
		VC55-603	TEMP, DATA ADAPTER (2A10A5)			1 OF 2 M	0°C	75°C			
			VC56-603 (ALTERNATE)	TEMP, DATA ADAPTER (2A10A11)							
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	IU	SYSTEM	REDLINES AND CATEGORIES			DATE CHANGE NO.	PAGE
										BASIC	2-60
										OCTOBER 2, 1969	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-714	WXC136-601 (HARDWIRE)	TEMP, IU COMPARTMENT			M	SEE IU FIG 1	SEE IU FIG 1	<p>SEE IU FIG 1</p> <p>DURING SWITCHOVER FROM AIR TO GN₂ PURGE, THE PRE-LAUNCH MAX VALUE MAY BE EXCEEDED. THIS CONDITION IS TEMPORARY BUT CONSTANT MONITORING DURING SWITCH-OVER IS REQUIRED TO ENSURE RE-ESTABLISHMENT OF TEMP STABILIZATION.</p> <p>DURING THE PERIOD, ESTIMATED AT 10 TO 15 MINUTES IMMEDIATELY FOLLOWING INITIATION OF LH₂ LOADING OF THE S-IVB STAGE, THE REDLINE VALUES MAY BE EXCEEDED DUE TO TRANSIENT THERMAL CONDITIONS WHILE ADJUSTING GROUND EQUIPMENT HEATERS. THIS CONDITION, ALTHOUGH NOT DESIRABLE, MUST NOT BE CONSIDERED ACUTE OR AS A LAUNCH CONSTRAINT, PROVIDED THE TEMP IS STABILIZED WITHIN THE REDLINE LIMITS NO LATER THAN T-30 MINUTES.</p>
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION IU	SYSTEM REDLINES AND CATEGORIES			DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-61	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT. CONT.	ENG. DATA	PRE LAUNCH	MINIMUM		MAXIMUM
Δ	2-715	XD10-603	PRESS, GN ₂ REGULATOR INLET (AIR BEARING)			1 OF 3 M	2815 PSIA	3215 PSIA	FROM SPHERES PRESSURIZED UNTIL INITIATION OF AUTO SEQ. NOTE: PRIOR TO USE OF ALT, VERIFY FILL SOLENOID VALVES OPEN AND SUPPLY SYS PRESSURIZED.
		XD25-601 (ALT #1)	PRESS, GN ₂ REGULATOR INLET (T.C. SYS)			1 OF 3 M	*7.1 GPM	NONE	
		VXD192-336 (ALT #2)	PRESS, STAGE INLET			3 M *	*5.8 GPM	NONE	
	2-716	VF9-602	FLOWRATE, IU EXIT COOLANT				*32 PSIA	NONE	FROM SYS STABILIZATION TO T-33 SEC. REDLINES DO NOT APPLY FROM START OF POWER TRANSFER UNTIL 3 SEC LATER.
		VF10-601 (ALT #1)	FLOWRATE, S-IVB INLET COOLANT				*(1) 9.0 GPM	NONE	*APPLIES WITH PUMP REDUNDANCY. WHILE ON PUMP #1-PRIOR TO PRESSURE SWITCH ACTIVATION (APPROX. T-6 MIN) IF REDLINE IS VIOLATED MANUALLY SWITCH TO PUMP #2.
		XD17-601 (ALT #2)	PRESS, COOLANT MANIFOLD INLET			1 OF 3 M	*(1) 7.3 GPM	NONE	SUBSEQUENT TO PRESSURE SWITCH ACTIVATION, IF REDLINE IS VIOLATED FOR 2 SEC GIVE CUTOFF.
		VF9-602	FLOWRATE, IU EXIT COOLANT			*(1)	*(1) 39 PSIA	NONE	*(1) APPLIES WITHOUT PUMP REDUNDANCY. THESE VALUES APPLY WHILE OPERATING ON PUMP #2 OR WHILE OPERATING ON PUMP #1 WITH PUMP #2 INOPERABLE. HOLD OR CUTOFF IF REDLINE IS VIOLATED.
	2-717	VXD24-601	PRESS, COOLANT PUMP INLET (WATER/METHANOL)			M	15.2 PSIA	20 PSIA	FROM SYSTEM STABILIZATION UNTIL INITIATION OF AUTO SEQ.
		XD68-603	PRESS, RTG CASK DIFFUSER INLET NO. 1						FROM FUEL ELEMENT INSTALLATION TO START OF PROPELLANT LOADING.
	A	2-717A	XD193-336 (ALTERNATE)	PRESS, RTG CASK DIFFUSER INLET NO. 2			1 OF 2 HD		
MISSION	SECTION	STAGE SUBSECTION	SYSTEM	REDLINES AND CATEGORIES		DATE CHANGE NO.	PAGE		
APOLLO 12	LAUNCH VEHICLE	IU				REVISION A	2-62		

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
Δ	2-720	VG1-101	POSITION, PITCH ACT, (1P S-IC) ENG NO. 1			M			FROM T-2 HRS TO T-33 SEC (WHILE IN S-IC MODE WITH GROUND HYDRAULIC SYSTEM ACTIVE AND CONTROL ON). REDLINES DO NOT APPLY WHEN ACTUATORS ARE BEING COMMANDED TO MOVE.
Δ	2-721	VG1-102	POSITION, PITCH ACT, (2P S-IC) ENG NO. 2			M			
Δ	2-722	VG1-103	POSITION, PITCH ACT, (3P S-IC) ENG NO. 3			M			
Δ	2-723	VG1-104	POSITION, PITCH ACT, (4P S-IC) ENG NO. 4			M	SEE IU FIG 2, FIG 3 & FIG 4	SEE IU FIG 2, FIG 3 & FIG 4	RECORDED ON FLT CONT RECORDER IN THE EVENT THAT ACTUATOR POSITION MEASUREMENTS DEMONSTRATE ERRATIC TENDENCIES, THE FOLLOWING STEPS ARE TO BE TAKEN:
Δ	2-724	VG2-101	POSITION, YAW ACT, (1Y S-IC) ENG NO. 1			M			1. VERIFY ACTUATOR INTERLOCK (3°) HAS NOT BEEN ACTIVATED.
Δ	2-725	VG2-102	POSITION, YAW ACT, (2Y S-IC) ENG NO. 2			M			2. VERIFY FLT CONT COMPUTER (FCC) INPUT TO ACTUATOR IS NORMAL.
Δ	2-726	VG2-103	POSITION, YAW ACT, (3Y S-IC) ENG NO. 3			M			3. COMMAND ACTUATORS TO EXTEND & RETRACT (RAMP SIGNAL).
Δ	2-727	VG2-104	POSITION, YAW ACT, (4Y S-IC) ENG NO. 4			M			4. VERIFY ACTUATOR POSITION MEASUREMENTS INDICATE ACTUATOR IS FOLLOWING CMD. IN EVENT THIS CANNOT BE VERIFIED, IT IS MANDATORY THAT ACTUATOR OPERATION BE VERIFIED BY CORRELATION BETWEEN SYSTEM PRESSURE AND COMMAND.
Δ	2-727A	VG3-601	POSITION, METH/WATER CONTROL VALVE			**			IF MEASUREMENTS SHOW RE-OCCURRING ERRATIC TENDENCIES THAT HAVE PREVIOUSLY BEEN DEMONSTRATED NOT TO BE ACTUAL ACTUATOR MOVEMENTS THEY CAN BE DISREGARDED AFTER T-10 MIN. ** SEE ITEM 2-711
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION IU	SYSTEM	REDLINES AND CATEGORIES			DATE CHANGE NO. BASIC	PAGE
								OCTOBER 2, 1969	2-63

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY		PRE LAUNCH	REDLINE VALUES		TIME PERIOD ACTION NOTES			
				FLT CONT	ENG DATA		MINIMUM	MAXIMUM				
Δ	2-728	VG5-601	CLOSED POSITION, WATER CONTROL VALVE			1 OF 2 M	**	**	FROM WATER/METHANOL SYS TEMP STABILIZATION THRU LAST POWER TRANSFER (T-50 SEC)			
		G6-601 (ALTERNATE)	OPEN POSITION, WATER CONTROL VALVE				** (1)	** (1)	** SYSTEM IS IN TOLERANCE IF INDICATION IS ON			
	2-729	VH54-603	ATTITUDE PITCH, LADDER OUTPUT GUIDANCE COMPUTER			1 OF 2 M	-0.5°	+0.5°	NOTE: CYCLING OF THE VALVE IS REQUIRED PRIOR TO USE OF G6-601.			
	2-730	VH71-602 (ALTERNATE)	ATTITUDE ERROR SIGNAL, ANGULAR POSITION PITCH			1 OF 2 M	-0.5°	+0.5°	** (1) SYSTEM IS IN TOLERANCE IF INDICATION IS OFF			
Δ	2-731	VH55-603	ATTITUDE YAW, LADDER OUTPUT GUIDANCE COMPUTER			1 OF 2 M	-0.5°	+0.5°	FROM T-2 HOURS TO T-33 SEC. RECORDED ON KSC FLIGHT COMPUTER RECORDERS			
		VH70-602 (ALTERNATE)	ATTITUDE ERROR SIGNAL, ANGULAR POSITION YAW			1 OF 2 M	-0.5°	+0.5°				
		VH56-603	ATTITUDE ROLL, LADDER OUTPUT GUIDANCE COMPUTER			1 OF 2 M	-0.5°	+0.5°				
		VH69-602 (ALTERNATE)	ATTITUDE ERROR SIGNAL, ANGULAR POSITION ROLL									
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	IU	SYSTEM	REDLINES AND CATEGORIES	DATE CHANGE NO.	BASIC	PAGE	OCTOBER 2, 1969	2-64

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-732	H60-603**	GUIDANCE COMPUTER OPERATION	M	M	M			<p>FROM START OF LMRD UNTIL T-33 SEC.</p> <p>ERRORS ASSOCIATED WITH TEST WORDS WILL NOT EXCEED 1%. ANY LVDC TM WORDS WITH VALIDITY BIT SET SHALL NOT BE COUNTED.</p> <p>IN PREPARE TO LAUNCH, THE FOLLOWING BIT PATTERNS ARE TELEMETERED ALTERNATELY - P10 061 TAG 614 PATTERN 2525 - - P10 714 TAG 363 PATTERN 5252. THE TIME INTERVAL BETWEEN CONSECUTIVE ERRORS IN LVDC TM MUST BE IN EXCESS OF 1 MIN. ANY LVDC TM WORDS WITH VALIDITY BIT SET SHALL NOT BE COUNTED.</p> <p>** THE PROPER OPERATION OF THIS MEASUREMENT REQUIRES RDM-K.</p> <p>SEE ITEM 4-205</p>
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	IU	SYSTEM	REDLINES AND CATEGORIES	DATE CHANGE NO	PAGE
								BASIC	2-65
								OCTOBER 2, 1969	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLI CONT	ENG DATA	PRE LAUNCH	MINIMUM	
	2-740	VK5-603	SWITCH SELECTOR STAGE SELECT (S-1C)			1 OF 2 M	*	
	2-741	DEE-6-2304 (ALTERNATE)	SWITCH SELECTOR STAGE SELECT (S-1C)			1 OF 2 M	*	
	2-742	VK5-603	SWITCH SELECTOR STAGE SELECT (S-1VB)			1 OF 2 M	*	FROM LVDA SWITCH TO LVDA (T-4 MIN 30 SEC) TO T-33 SEC.
	2-743	DEE-6-2305 (ALTERNATE)	SWITCH SELECTOR STAGE SELECT (S-1VB)			1 OF 2 M	*	** SYSTEM IN TOLERANCE IF INDICATION IS "OFF"
	2-744	VK6-603	SWITCH SELECTOR READ COMMAND			1 OF 2 M	*	
	2-745	DEE-6-2307 (ALTERNATE)	SWITCH SELECTOR RESET			1 OF 2 M	*	

KSC FORM 4-47 (REV. 1-65)

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY		PRE LAUNCH	REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA		MINIMUM	MAXIMUM		
	2-746	VK22-602	SERVO AMP COMPARATOR PITCH			M	*	*	** FROM SYSTEM ACTIVATION UNTIL T-33 SEC. DISCRETE MEASUREMENTS. SYSTEM IS IN TOLERANCE IF INDICATION IS OFF. ** FROM SYSTEM ACTIVATION UNTIL T-33 SEC. DISCRETE MEASUREMENTS. SYSTEM IS IN TOLERANCE IF INDICATION IS ON. ** RANGE SAFETY REQUIREMENT SEE ITEM 1-527 ** RANGE SAFETY REQUIREMENT SEE ITEM 1-527	
	2-747	VK23-602	SERVO AMP COMPARATOR YAW			M	*	*		
	2-748	VK24-602	SPATIAL AMP COMPARATOR ROLL, YAW I			M	*	*		
	2-749	VK25-602	SPATIAL AMP COMPARATOR PITCH			M	*	*		
	2-750	VK26-602	SPATIAL AMP COMPARATOR ROLL, YAW II			M	*	*		
	2-751	VK33-603	CONTROL COMPUTER ON INDICATION BUS 6D11			M	*	*		
	2-752	VK34-603	CONTROL COMPUTER ON INDICATION BUS 6D31			1 OF 2 M	*	*		
	2-753	VK35-603 (ALTERNATE)	CONTROL COMPUTER ON INDICATION BUS 6D31			M	*	*		
	2-754	VK36-602	CONTROL SIGNAL PROCESSOR ON INDICATION			M	*	*		
	2-755	VK75-602	EDS OR MANUAL CUTOFF OF L/V ENGINES FROM SC			*HD				
		VK84-602	EDS EXCESSIVE PITCH OR YAW RATE			*HD				
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	IU	SYSTEM	REDLINES AND CATEGORIES		DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-68

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-756	VK89-602	S-IC BURN MODE			**M			SYSTEM IN TOLERANCE IF INDICATION IS ON FROM COMPLETION OF FLIGHT CONTROL CHECKS TO T-33 SEC.
	2-757	WVK533-602 (HARDWIRE) ** DEE-6-0636 (ALTERNATE)	EDS DISTRIBUTOR, LATCHING RELAYS, RESET (SEQUENCE LOGIC ZERO) SEQUENCE LOGIC ZERO			1 OF 2 M	** (1)	** (1)	** THIS MEASUREMENT REQUIRES RCA-110A SUPPORT AND WILL BE MONITORED TO T-33 SEC PROVIDED THE RCA-110A IS SUPPORTING. IF THE RCA-110A STOPS SUPPORTING AFTER INITIATION OF AUTOMATIC SEQUENCE, THIS MEASUREMENT WILL NO LONGER BE MONITORED. **(1) SYSTEM IS IN TOLERANCE IF INDICATION IS ON FROM LAST EDS TEST TO T-33 SEC.
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	IU	SYSTEM	REDLINES AND CATEGORIES		DATE CHANGE NO. BASIC OCTOBER 2, 1969
									PAGE 2-69

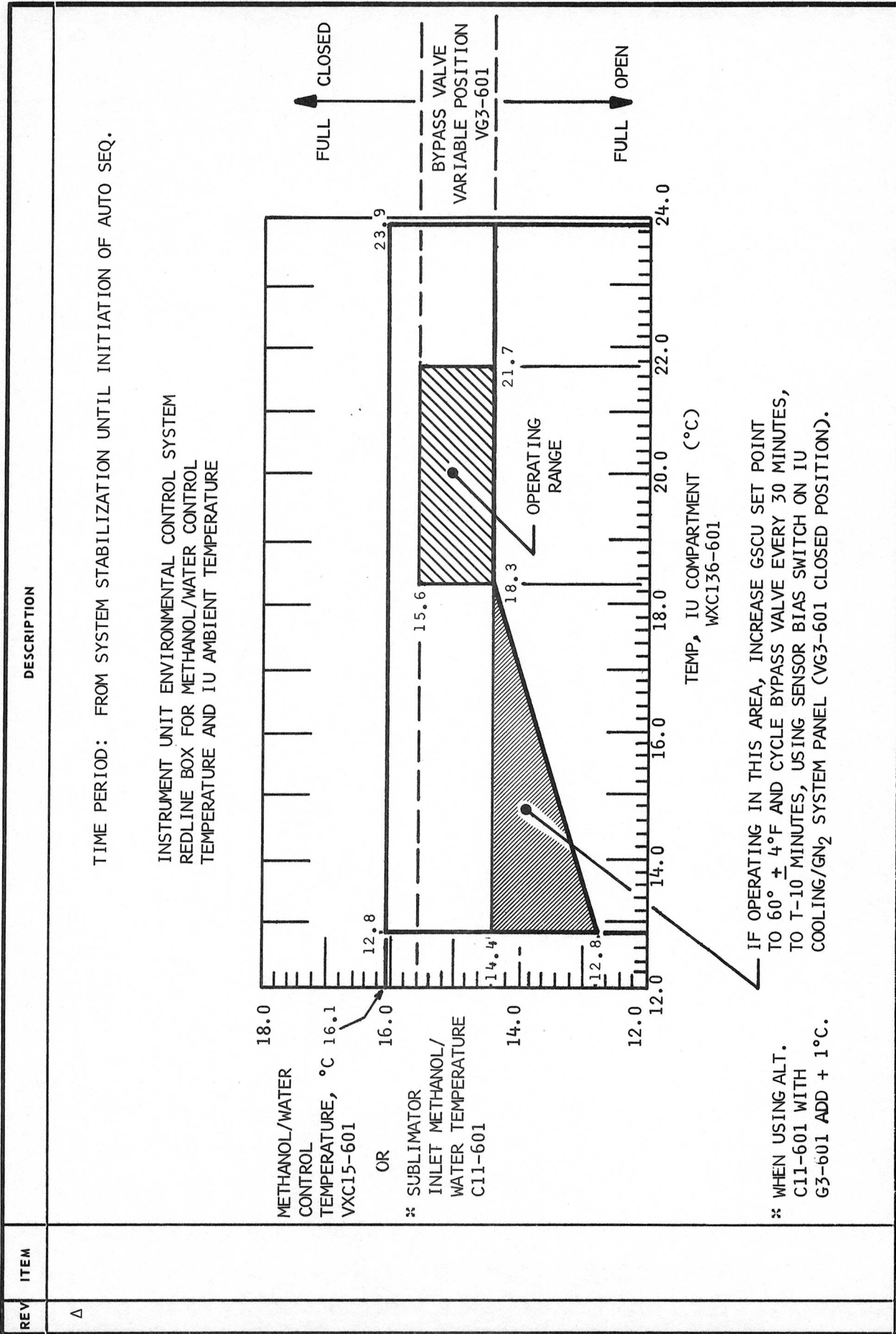
JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
2-758	M12-601 (ALTERNATE)	VXM155-340	VOLTAGE, 6D11 BUS			1 OF 2 M	26.5 VDC	29.5 VDC	WHILE BUSES ARE ENERGIZED EITHER BY GROUND OR INTERNAL ELECTRICAL POWER TO T-33 SEC. STAGE BATTERY OPEN CIRCUIT VOLTAGES WILL BE MONITORED FROM BATT CONNECTION TO T-50 SEC PER PROCEDURE I-V-21254. TRANSIENTS THAT OCCUR WHEN VARIOUS LOADS ARE SWITCHED DURING POWER TRANSFER TESTS AND AT POWER TRANSFER ARE NOT TO BE CONSIDERED AS DEVIATIONS FROM THE REDLINE VALUES	
2-759	M14-601 (ALTERNATE)	VXM507-601	VOLTAGE, 6D31 BUS			1 OF 2 M	26.5 VDC	29.5 VDC		
2-760	M19-601 (ALTERNATE)	VXM156-340	VOLTAGE, 6D41 BUS			1 OF 2 M	26.5 VDC	29.5 VDC		
2-761	VR4-602		ANG VEL, PITCH CONTROL			M**	-0.75°/SEC	+0.75°/SEC	FROM T-2 HOURS UNTIL T-33 SEC (VARYING SIGNAL). RECORDED ON FLIGHT CONTROL RECORDERS ** ALSO HD AS A RANGE SAFETY REQUIREMENT SEE ITEM 1-527	
2-762	VR5-602		ANG VEL, YAW CONTROL			M**	-0.75°/SEC	+0.75°/SEC		
2-763	VR6-602		ANG VEL, ROLL CONTROL			M**	-0.75°/SEC	+0.75°/SEC		
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION IU	SYSTEM			REDLINES AND CATEGORIES		DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-70

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLI CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-767	VR25-602	EDS COMPARATOR RELAY (CSP REDUNDANCY MALFUNCTION) MONITOR 1 (ROLL)			M	**	**	<p>FROM SYSTEMS ACTIVATION TO T-33 SEC. * SYS IS IN TOLERANCE IF INDICATION IS OFF.</p> <p>FROM SYSTEMS ACTIVATION TO T-33 SEC. * SYS IS IN TOLERANCE IF INDICATION IS ON.</p> <p>NOTE: DISREGARD INTERMITTANT ON-OFF INDICATIONS WHEN GYROS ARE BEING TORQUED.</p>
	2-768	VR26-602	EDS COMPARATOR RELAY (CSP REDUNDANCY MALFUNCTION) MONITOR 2 (YAW)			M	**	**	
	2-769	VR27-602	EDS COMPARATOR RELAY (CSP REDUNDANCY MALFUNCTION) MONITOR 3 (PITCH)			M	**	**	
	2-770	VR28-602	EDS WHEEL SPEED (CONTROL/EDS RATE GYRO), GROUP 1			M	**	**	
	2-771	VR29-602	EDS WHEEL SPEED (CONTROL/EDS RATE GYRO), GROUP 2			M	**	**	
	2-772	VR30-602	EDS WHEEL SPEED (CONTROL/EDS RATE GYRO), GROUP 3			M	**	**	
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION IU	SYSTEM REDLINES AND CATEGORIES			DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-71	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES



JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV ITEM

Δ

S-IC ACTUATOR POSITION REDLINE GUIDELINES FOR CONTROL SYSTEM EVALUATION

1. THE FOLLOWING EQUATIONS DEFINE THE THRUST VECTOR (β) ABOUT EACH AXIS:

$$\beta \text{ PITCH} = \frac{1}{4}(-\beta_{p1} + \beta_{p2} + \beta_{p3} - \beta_{p4})$$

$$\beta \text{ YAW} = \frac{1}{4}(-\beta_{y1} - \beta_{y2} + \beta_{y3} + \beta_{y4})$$

$$\beta \text{ ROLL} = \frac{1}{2}(\beta_{r1} - \beta_{r2} + \beta_{r3} - \beta_{r4})$$

EQUATION VALUES

PITCH ACTUATOR POSITION	YAW ACTUATOR POSITION
VG1-101 = β _{p1}	VG2-101 = β _{y1}
VG1-102 = β _{p2}	VG2-102 = β _{y2}
VG1-103 = β _{p3}	VG2-103 = β _{y3}
VG1-104 = β _{p4}	VG2-104 = β _{y4}

THE SIGN CONVENTION IS: + ACTUATOR EXTEND
- ACTUATOR RETRACT

2. THE SOLUTION TO THESE EQUATIONS FOR THE S-IC STAGE THRUST VECTOR OFFSET SHOULD BE WITHIN THE FOLLOWING RANGES TO PROVIDE SATISFACTORY LIFTOFF CONDITIONS:

3. REDLINE VALUES:

$$\beta \text{ PITCH} = \pm 0.29^\circ$$

$$\beta \text{ YAW} = \pm 0.29^\circ$$

$$\beta \text{ ROLL} = \pm 0.30^\circ$$

**THE ±β PITCH AND YAW VALUES OF ±0.29° IS BASED ON A PEAK WIND LIMIT OF 50 KNOTS. SHOULD EITHER FACTOR, THE 50 KNOT PEAK WIND OR ±β PITCH OR YAW OF 0.29°, BE EXCEEDED WHILE THE OTHER REMAINS SATISFACTORY, FIGURE 3 WILL BE USED TO DETERMINE THE REDLINE.

** (1) FOR POSITIVE β YAW WITH A SOUTHERLY WIND BETWEEN 123° AND 233°, DETERMINE ADDITIONAL REDLINE LIMIT BASED ON TOWER CLEARANCE (IU FIG. 4).

MOST RESTRICTIVE SIGN OF β

WIND DIRECTION	SIGN OF β _p	SIGN OF β _y
0 TO 180	+	
180 TO 360	-	
90 TO 270		-
270 TO 90		+

REDLINE LIMITS FOR HOLD DOWN POST CLEARANCE

MISSION APOLLO 12

SECTION LAUNCH VEHICLE

STAGE SUBSECTION

IU

SYSTEM

FIGURE 2

BASIC CHANGE NO.

OCTOBER 2, 1969

PAGE

2-73

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV ITEM	DESCRIPTION
Δ	<p style="text-align: center;"><u>EFFECTIVE β LIMIT FOR LIFTOFF</u></p> <p>TO USE GRAPH FOR COMPUTING PLATFORM LIMITS:</p> <ol style="list-style-type: none"> 1. DETERMINE MOST RESTRICTIVE SIGN FOR β_p FROM TABLE. 2. PLOT MEASURED WIND MAGNITUDE AND DIRECTION ON β_p SCALE, POINT ① 3. POINT ② IS THE MAXIMUM ALLOWABLE MAGNITUDE OF β_p CORRESPONDING TO THE MOST RESTRICTIVE SIGN DETERMINED IN STEP 1. 4. IF THE SIGN OF MEASURED β_p (DETERMINED FROM EQUATIONS IN FIGURE 2) IS THE SAME AS THE MOST RESTRICTIVE SIGN THEN MEASURED β_p MUST BE LESS IN MAGNITUDE THAN POINT ②. IF THE SIGN OF MEASURED β_p DIFFERS WITH THE MOST RESTRICTIVE SIGN THEN THE MEASURED MAGNITUDE MUST BE LESS THAN 0.65. 5. REPEAT STEPS 1 THROUGH 4 FOR β_y. <div style="text-align: center;"> <p style="text-align: center;">REDLINE LIMITS FOR HOLD DOWN POST CLEARANCE</p> </div>

KSC FORM 4-47A (REV. 1 68)

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

S-IC ACTUATOR POSITION REDLINE

GUIDELINES FOR CONTROL SYSTEM EVALUATION

1. THE FOLLOWING EQUATION DEFINES THE THRUST VECTOR (B) ABOUT THE YAW AXIS:

$$\beta \text{ YAW} = \frac{1}{4} (-\beta Y_1 - \beta Y_2 + \beta Y_3 + \beta Y_4)$$

EQUATION VALUES

· YAW ACTUATOR POSITION

$$\begin{aligned} \text{VG2-101} &= \beta Y_1 \\ \text{VG2-102} &= \beta Y_2 \\ \text{VG2-103} &= \beta Y_3 \\ \text{VG2-104} &= \beta Y_4 \end{aligned}$$

THE SIGN CONVENTION IS: + ACTUATOR EXTEND
- ACTUATOR RETRACT

2. THE SOLUTION TO THIS EQUATION FOR THE S-IC STAGE THRUST VECTOR OFFSET SHOULD BE WITHIN THE RANGE SHOWN ON THE GRAPH TO PROVIDE SATISFACTORY LIFTOFF CONDITIONS FOR TOWER CLEARANCE.

3. REDLINE VALUES: $\beta \text{ YAW} = +0.09^\circ$ *

* THE POSITIVE $\beta \text{ YAW}$ VALUE OF $+0.09^\circ$ IS BASED ON A PEAK SOUTH WIND LIMIT OF 33 KNOTS. SHOULD EITHER FACTOR, THE 33 KNOT PEAK WIND OR $\beta \text{ YAW}$ OF $+0.09^\circ$, BE EXCEEDED WHILE THE OTHER REMAINS SATISFACTORY, THE GRAPH AT RIGHT WILL BE USED TO DETERMINE THE REDLINE.

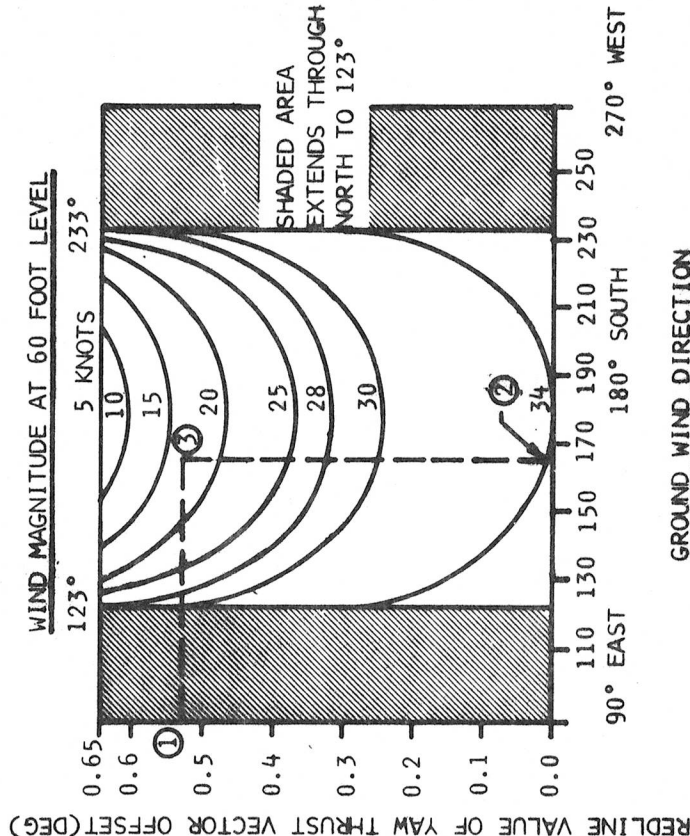
4. IN ADDITION, REDLINE LIMITS BASED ON HOLDDOWN POST CLEARANCE (IU FIG. 2) MUST BE USED TO DETERMINE IF LIFTOFF CONDITIONS ARE SATISFACTORY.

REDLINE LIMITS FOR TOWER CLEARANCE

EFFECTIVE $\beta \text{ YAW}$ LIMIT FOR LIFTOFF

TO USE GRAPH FOR POSITIVE $\beta \text{ YAW}$ LIMIT:

1. SOLVE EQUATION FOR $\beta \text{ YAW}$ AND PLOT, POINT ①
2. PLOT GROUND WIND DIRECTION, POINT ②
3. WHEN ACTUAL WIND MAGNITUDE IS THE SAME OR LESS THAN POINT ③, THE REDLINE VALUE IS WITHIN LIMITS. IF THE WIND MAGNITUDE IS GREATER THAN POINT ③, THE REDLINE VALUE IS EXCEEDED.
4. WHEN POINT ③ FALLS WITHIN THE SHADED AREA, THE REDLINE VALUE IS WITHIN LIMITS.



JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES		
				FLT. CONT.	ENG. DATA	PRE-LAUNCH	MINIMUM	MAXIMUM			
	2-901		COUNTDOWN CLOCK REAL TIME (GMT)			M			FROM START OF LMRD UNTIL INIT OF AUTO SEQ. DETECTED BY RCA 110A COMPUTER PRINT-OUT "GMT NOT INCREMENTED"		
	2-902		COUNTDOWN CLOCK COUNT TIME DISPLAYS			M			FROM START OF LMRD UNTIL INITIATION OF AUTO SEQ. CA MANUAL TIMER IS ACTIVATED AT INITIATION OF AUTO SEQ. BY THE TEST SUPERVISOR)		
	2-903		RCA 110A SYSTEM SERVICE			M			*SEE ITEM 1-204 FROM START OF LMRD UNTIL INIT OF AUTO SEQ (IN THE EVENT A HOLD IS CALLED WITHIN THE TIME PERIOD FROM 30 SEC PRIOR TO INIT OF AUTO SEQ UNTIL INIT OF AUTO SEQ, THE RCA-110A IS REQUIRED UNTIL FINAL AZIMUTH IS VERIFIED). SYSTEM SERVICE IS DEFINED AS THAT PORTION OF GROUND COMPUTER SYSTEM REQUIRED TO EXECUTE THE COUNTDOWN PROCEDURE THROUGH INIT OF AUTO SEQ.		
									THE LMR ITEM REQUIRING 110A WILL BE MONITORED TO ITS EFFECTIVE TIME PERIODS, PROVIDING THE 110A IS SUPPORTING. IF THE 110A STOPS SUPPORTING AFTER INIT OF AUTO SEQ, THESE ITEMS WILL NO LONGER BE MONITORED.		
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	LV/GSE/ESE	SYSTEM	ESE	DATE CHANGE NO.	BASIC OCTOBER 2, 1969	PAGE	2-76

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-904		DEE-6C DATA ACQUISITION AND EVALUATION SYSTEM			M			FROM START OF LMRD TO T-22 MIN.
	2-905		DEE-3F DATA ACQUISITION AND EVALUATION SYSTEM			HD			FROM T-22 MIN UNTIL INITIATION OF AUTO SEQ.
	2-906		PROPELLANT DATA TRANSMISSION SYSTEM			HD			FROM START OF LMRD UNTIL REPLENISH COMPLETE.
Δ	2-907	(ALTERNATE)	AUTOMATIC AZIMUTH LAYING THEODOLITE (AALT) SYSTEM SECONDARY SYSTEM, PHI MODE (CMR/IDB BACKUP SYSTEM)			1 OF 2 M			THE AZIMUTH ALIGNMENT SYSTEM WILL BE ALLOWED TO FUNCTION AUTOMATICALLY FROM GT-16 (T-57 MIN) THROUGH GRR (T-17 SEC) FOR LOSS OF PRISM ACQUISITION. HOWEVER, IF AN IRREPARABLE FAILURE OCCURS PRIOR TO T-187 SEC, OR A NON RECOVERY OF ACQUISITION COUPLED WITH A REQUIRED AZIMUTH CHANGE BETWEEN T-10 MIN AND T-187 SEC, SWITCH MANUALLY TO CMR/IDB BACKUP SYSTEM.
MISSION APOLLO 12				SECTION LAUNCH VEHICLE	STAGE SUBSECTION LV/GSE/ESE	SYSTEM ESE	DATE CHANGE NO. BASIC		PAGE 2-77

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-908		TERMINAL COUNT SEQUENCER			M			ANY MALFUNCTION OF SYS FROM INITIATION OF AUTO SEQ UNTIL T-11 SEC IS CAUSE FOR MANUAL CUTOFF. IF IGNITION DOES NOT OCCUR, A MANUAL CUTOFF IS REQUIRED.
	2-909		ML/DDAS GROUND TRANSMITTER			M			FROM START OF LMRD UNTIL T-19 SEC.
			LCC/DDAS CIT2 **			M			FROM START OF LMRD UNTIL COMPLETION OF TERMINAL EDS TEST, T-1 HR, 21 MIN (SUPPORT OF VAED). ** IF SYSTEM FAILS, SWITCH OVER TO ALTERNATE FIRING ROOM EQUIPMENT AND CONTINUE OPERATION. SUPPORT OF BE01 AND BE02
			S-1C DRS2 SYNCHRONIZATION *** S-II DRS2 SYNCHRONIZATION *** S-IVB DRS2 SYNCHRONIZATION *** IU DRS2 SYNCHRONIZATION *** ESE DRS2 SYNCHRONIZATION ***			HD M M M M M			FROM START OF LMRD UNTIL T-19 SEC. *** AFTER INITIATION OF AUTO SEQ., LOSS OF SYNCHRONIZATION FOR LESS THAN 2 SEC SHOULD BE DISREGARDED.
MISSION	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	SYSTEM			ESE	DATE CHANGE NO.	PAGE
APOLLO 12	LAUNCH VEHICLE	LV/GSE/ESE						BASIC OCTOBER 2, 1969	2-78

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES		
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM			
	2-911		OPERATIONAL DISPLAY SYS CONSOLES			5 HD			FROM START OF LMRD UNTIL INITIATION OF AUTO SEQ. IF THE SYSTEM FAILS, THE OPERATION WILL BE CONTINUED USING THE RCA-110A SENSE CONTROL PANEL OR BY SWITCHING TO ALTERNATE FIRING ROOM DISPLAY EQUIPMENT.		
	2-912		VEHICLE COMMAND & COMMUNICATIONS SYSTEM (CCS) CHECKOUT EQUIPMENT			HD			DURING VEHICLE CCS CHECKOUT		
	2-913		DIGITAL RANGE SAFETY COMMAND CHECKOUT EQUIPMENT (2)			1 OF 2 M			DURING VEHICLE RANGE SAFETY COMMAND CHECKOUT		
	2-914		MSS CCS/C-BAND RADIATION SYS			HD			FROM START OF LMRD UNTIL COMPLETION OF RF TESTS (APPROX. T-20 HRS)		
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	L/V GSE/ESE	SYSTEM	ESE	DATE CHANGE NO.	BASIC OCTOBER 2, 1969	PAGE	2-79

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-915	TV CAMERA					**	**	ARM MUST BE FULLY RETRACTED IMMEDIATELY PRIOR TO INITIATION OF AUTO SEQ.
		DS-81 PNL 5418 (ALTERNATE)	SERVICE ARM 9 RETRACTED			1 OF 4 M	** (1)	** (1)	** RETRACTION OF SERVICE ARM 9 MUST BE OBSERVED BY OTV
		DEE-6-4070 (ALTERNATE)	SERVICE ARM 9 RETRACTED				** (1)	** (1)	** (1) SYSTEM IS IN TOLERANCE IF INDICATION IS ON.
		M7 PNL 5418 (ALTERNATE)	SERVICE ARM 9 POSITION, PERCENT RETRACTED				97%	100%	
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION L/V GSE/ESE	SYSTEM SERVICE ARM 9			BASIC CHANGE NO.		PAGE OCTOBER 2, 1969 2-80

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
2-916	DS-62 PNL 5418 OR DS-25 PNL 5409	DEE 6-4073 (ALTERNATE)	ALL LEVELS AND PSI OK				*	*	FROM SYSTEM ACTIVATION UNTIL ARM DISCONNECT FROM SPACECRAFT. * SYSTEM IN TOLERANCE IF IND "ON."	
			ALL LEVELS AND PSI OK			1 OF 2 M	*	*	NOTE: PERIODIC LOSS OF IN- DICATIONS WILL OCCUR DURING SYS CHARGING.	
	DS-103 PNL 5418	SERVICE ARM 9, HYD ACCUM 1 OF 2	SERVICE ARM 9, HYD ACCUM HYD LEVEL LOW				*(1)	*(1)		
	DEE 6-1454 (ALTERNATE)	SERVICE ARM 9, HYD ACCUM 1 OF 2	SERVICE ARM 9, HYD ACCUM HYD LEVEL LOW				*(1)	*(1)		
	DS-100 PNL 5418	SERVICE ARM 9, RETRACT GN2 PRESSURE LOW	SERVICE ARM 9, RETRACT GN2 PRESSURE LOW				*(1)	*(1)		
	DEE 6-1453 (ALTERNATE)	SERVICE ARM 9 RETRACT 1 OF 3	SERVICE ARM 9 RETRACT GN2 PRESSURE LOW				*(1)	*(1)	* (1) SYSTEM IN TOLERANCE IF INDICATION "OFF."	
	M-1 PNL 5418 (ALTERNATE)	SERVICE ARM 9 RETRACT GN2 PRESSURE	SERVICE ARM 9 RETRACT GN2 PRESSURE				1980 PSIG	NONE		
	DS-101 PNL 5418	SERVICE ARM 9 CHAMBER SUPPLY GN2 PSI LOW	SERVICE ARM 9 CHAMBER SUPPLY GN2 PSI LOW				*(1)	*(1)		
	DEE 6-3736 (ALTERNATE)	SERVICE ARM 9 CHAMBER 1 OF 3	SERVICE ARM 9 CHAMBER SUPPLY GN2 PSI LOW				*(1)	*(1)		
	M-2 PNL 5418 (ALTERNATE)	SERVICE ARM 9 EC CONTROL GN2 PRESSURE	SERVICE ARM 9 EC CONTROL GN2 PRESSURE				588 PSIG	NONE		
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	L/V GSE/ESE	SYSTEM	SERVICE ARM 9		DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-81

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES		
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM			
Δ	2-922		HYDRAULIC CHARGING UNIT			1 OF 2 PUMPS *M			<p>FROM HYDRAULIC CHARGING UNIT POWER ON TO INITIATION OF AUTO SEQ.</p> <p>** PUMP NO. 1 DS-9 ON PANEL 5419. PUMP NO. 2 DS-12 ON PANEL 5419.</p> <p>NOTE: ALTERNATE INDICATIONS ARE DS105 ON PANEL 5409 AND DEE-6 4212 AND M1 AND M2 ON PANEL 5419.</p> <p>PERIODIC LOSS OF INDICATION MAY OCCUR DURING SYSTEM CHARGING.</p>		
MISSION				SECTION		STAGE SUBSECTION		SYSTEM		DATE CHANGE NO.	PAGE
APOLLO 12				LAUNCH VEHICLE		L/V GSE/ESE		SERVICE ARMS		BASIC OCTOBER 2, 1969	2-82

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM. NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD	ACTION NOTES
				FLT. CONT.	ENG. DATA	PRE-LAUNCH	MINIMUM		
	2-923	DS-41 PNL 5423	VALVE PANEL 11, 750 PSI, GN ₂ LAUNCHER SUPPLY, PRESSURE OK				**		FROM START OF LMRD TO T-19 SEC
		DEE-6-4175 (ALTERNATE)	VALVE PANEL 11, 750 PSI, GN ₂ LAUNCHER SUPPLY, PRESSURE OK			1 OF 4 M	**		** SYSTEM IN TOLERANCE IF INDICATION IS ON.
		DS-49 PNL 5423	VALVE PANEL 12, 750 PSI, GN ₂ SERVICE ARM SUPPLY, PRESSURE OK				**		
		DEE-6-4179 (ALTERNATE)	VALVE PANEL 12, 750 PSI, GN ₂ SERVICE ARM SUPPLY, PRESSURE OK				**		
	2-924	VXM240-349	FIRING NETWORKS DC POWER SYSTEM NO. 1 (+43D110)			M	28.5V	33.5V	MONITOR FROM POWER SUPPLY NO. 1 POWER ON THROUGH T-11 SEC.
	2-925	VXM241-349	FIRING NETWORKS DC POWER SYSTEM NO. 2 (+43D210)			M	28.5V	33.5V	MONITOR FROM POWER SUPPLY NO. 2 POWER ON THROUGH T-11 SEC.
	2-926	XM242-349	FIRING NETWORKS DC POWER SYSTEMS NO. 1 AND NO. 2 BACKUP BATTERY NO. 1			1 OF 2 M	28.5V	33.5V	MONITOR FROM POWER SUPPLY NO. 1 AND NO. 2 POWER ON THROUGH T-11 SEC.
		XM243-349	FIRING NETWORKS DC POWER SYSTEMS NO. 1 AND NO. 2 BACKUP BATTERY NO. 2						
MISSION	APOLLO 12	SECTION LAUNCH VEHICLE	STAGE SUBSECTION L/V GSE/ESE	SYSTEM		SERVICE ARMS		DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-83

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES		
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM			
	2-927		ECS OPERATION (AIR OR GN ₂ TO SPACE VEHICLE)			M			START OF LMRD UNTIL T-19 SECONDS. CONDITIONED GN ₂ IS SUPPLIED TO THE VEHICLE COMPARTMENT FOR A MINIMUM OF 30 MIN PRIOR TO START OF CRYOGENIC LOADING. FLOW RATES AND TEMPERATURE AS SPECIFIED IN THE SATURN V STAGE SPECIFICATIONS AND CRITERIA DOCUMENT ARE TO BE USED AS LMR GUIDELINES BUT NOT AS REDLINES.		
	2-928		EQUIPMENT AIR CONDITIONING (LCC AND ML)			M			FROM START OF LMRD UNTIL T-10 MIN. * AIR CONDITIONING IS M FOR THE FOLLOWING LCC SYSTEMS: 1. RCA 110A COMPUTER 2. BROWN DISC CONT EQ 3. SANDERS OP DISPLAY EQUIPMENT AND THE FOLLOWING ML SYSTEMS: 1. RCA 110A COMPUTER 2. BROWN DISC CONT EQUIPMENT SEE ITEMS 4-116, 4-117, AND 4-301.		
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	L/V GSE/ESE	SYSTEM	ENVIRONMENTAL CONTROL SYSTEM	DATE CHANGE NO.	BASIC OCTOBER 2, 1969	PAGE	2-84

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT. CONT.	ENG. DATA	MINIMUM	MAXIMUM		
	2-929	XD201-343 VK485-346 VK487-346	HAZARDOUS GAS DETECTION SYSTEM NOTE: THE FOLLOWING MEAS ARE USED IN COMBINATION WITH LMR ITEMS 2-929 THRU 2-944 FOR REDLINE DETERMINATION: XD201-343, XD203-343, VK492-346 VK498-346, VK499-346, VK500-346 VK501-346		PRE LAUNCH			FROM AIR GN2 SWITCHOVER UNTIL INITIATION OF AUTO SEQ. * EQUIPMENT FAILURE AFTER LV POWER TRANSFER (T-30 MIN) WILL NOT REQUIRE HOLD AND REPAIR OR SCRUB IF GAS CONCENTRATION IS NOT APPROACHING MAX LIMITS. NO INCREASING TREND IS NOTICED, AND THE VEHICLE GN2 PURGES ARE NOMINAL.	
	2-930		S-IVB/IU/SPACECRAFT OXYGEN CONCENTRATION		**M	NONE	4% **(2)	FROM AIR/GN2 SWITCHOVER UNTIL INITIATION OF AUTO SEQ.	
	2-931		S-II/S-IVB OXYGEN CONCENTRATION		**M	NONE	4% **(2)	PRESENCE OF BOTH O ₂ AND H ₂ CONCENTRATION TO MAXIMUM VALUES IS AN ON PAD HAZARD AND IMMEDIATE PROCEDURE TO SAFE VEHICLE SHALL BE INITIATED.	
	2-932	SEE NOTE ITEM 2-929	S-IC AFT OXYGEN CONCENTRATION		**M	NONE	2% **(2)		
	2-933		S-IC/S-II OXYGEN CONCENTRATION		**M	NONE	3% **(2)		
	2-934		S-IVB/IU/SPACECRAFT HYDROGEN CONCENTRATION		M **(1)	NONE	4% **(2)	* IF LIMITS ARE EXCEEDED HOLD AND DETERMINE OXIDIZER LEAK. EXERCISE APPROPRIATE ACTION TO SAFE VEHICLE.	
	2-935		S-II/S-IVB HYDROGEN CONCENTRATION		M **(1)	NONE	4% **(2)	** (1) IF LIMITS ARE EXCEEDED HOLD AND DETERMINE SOURCE. PROBABLE FUEL LEAK. EXERCISE APPROPRIATE ACTION TO SAFE VEHICLE	
	2-936		S-IC/S-II HYDROGEN CONCENTRATION		M **(1)	NONE	3% **(2)	** (2) PERCENT BY VOLUME ABOVE BASELINE CONCENTRATION.	
MISSION	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	SYSTEM		HAZARDOUS GAS DETECTION SYSTEM		STATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-85

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	MINIMUM	MAXIMUM	
	2-937		S-IVB/IU/SPACECRAFT HYDROGEN OR OXYGEN CONCENTRATION, UNPRESSURIZED MODE OXYGEN HYDROGEN					
	2-938	SEE NOTE ITEM 2-929	S-II/S-IVB HYDROGEN OR OXYGEN CONCENTRATION, UNPRESSURIZED MODE OXYGEN HYDROGEN		M	NONE	0.5% * 0.5% **	FROM AIR/GN2 SWITCHOVER UNTIL INITIATION OF AUTO SEQ WHEN VEHICLE PROPELLANT TANKS ARE NOT PRESSURIZED. * PERCENT BY VOLUME ABOVE BACKGROUND BASELINE CONCENTRATION. THE PRESENCE OF "BOTH" O ₂ AND H ₂ CONCENTRATIONS IN EXCESS OF REDLINE VALUE IS NOT ACCEPTABLE FOR FLIGHT.
	2-939		S-IC/S-II HYDROGEN OR OXYGEN CONCENTRATION, UNPRESSURIZED MODE OXYGEN HYDROGEN		M	NONE	0.2% * 0.2% **	
	2-940		S-IC AFT OXYGEN CONCENTRATION, UNPRESSURIZED MODE OXYGEN		M	NONE	2.0% **	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-941		S-IVB/IU/SPACECRAFT HYDROGEN OR OXYGEN CONCENTRATION, PRESSURIZED MODE OXYGEN HYDROGEN			M	NONE 0.5% * 0.5% *	FROM AIR/GN ₂ SWITCHOVER UNTIL INITIATION OF AUTO SEQ WHEN VEHICLE PROPELLANT TANKS ARE PRESSURIZED. THESE REDLINES TAKE PRECEDENCE OVER ITEMS 2-937 THROUGH 2-940 (UNPRESSURIZED MODE) WHEN THE VEHICLE PROPELLANT TANKS ARE PRESSURIZED. PRESSURIZE TO FLIGHT PRESSURIZATION LIMIT AND HOLD 10 MIN FOR STABILIZED READINGS. * PERCENT BY VOLUME ABOVE BACKGROUND BASELINE CONCENTRATION. THE PRESENCE OF "BOTH" O ₂ AND H ₂ CONCENTRATIONS IN EXCESS OF REDLINE VALUE IS NOT ACCEPTABLE FOR FLIGHT.	
	2-942	SEE NOTE ITEM 2-929	S-II/S-IVB HYDROGEN OR OXYGEN CONCENTRATION, PRESSURIZED MODE OXYGEN HYDROGEN			M	NONE 0.3% * 0.25% *		
	2-943		S-IC/S-II HYDROGEN OR OXYGEN CONCENTRATION, PRESSURIZED MODE OXYGEN HYDROGEN			M	NONE 0.4% * 0.35% *		
	2-944		S-IC AFT OXYGEN CONCENTRATION, PRESSURIZED MODE OXYGEN			M	NONE 2.0% *		

MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
APOLLO 12	LAUNCH VEHICLE	L/V GSE/ESE	HAZARDOUS GAS DETECTION SYSTEM	BASIC OCTOBER 2, 1969	2-87

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
2-945	5310A1	5310A1	OPERATION, INDUSTRIAL WATER DIESEL PUMPS (3) OR OPERATION, INDUSTRIAL WATER DIESEL PUMPS (3)							
		3K12	AND INDUSTRIAL WATER HYDRO-PNEUMATIC TANK T-2			1 OF 2 M	110 PSIG	NONE	FROM START OF LMRD UNTIL T-45 SEC. SEE ITEM 4-125	
2-946	5309A1 DS-14	5309A1 DS-14	T-2 TANK "PRESSURIZED" LIGHT			1 OF 2 M	150 PSIG	NONE	FROM START OF LMRD UNTIL T-60 SEC. DISREGARD MOMENTARY DROP IN PRESS	
		3K04**	PRESS, PAD MAINLINE				150 PSIG	NONE	WITH BOOST PUMP OFF. DISREGARD MOMENTARY DROP IN PRESS	
		4K01 (ALTERNATE)	INDUSTRIAL WATER BOOSTER PUMP P-1 PRESS				350 PSIG	NONE	WITH BOOST PUMP ON. DISREGARD MOMENTARY DROP IN PRESS	
2-947			INDUSTRIAL WATER HYDRO-PNEUMATIC TANK T-1			HD			* ALTERNATE DISPLAY OF 3K04 IS 5309A1, M2	
2-948			INDUSTRIAL WATER HYDRO-PNEUMATIC TANK T-2			HD				
2-949			INDUSTRIAL WATER BOOSTER PUMP P-1			HD				
MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.						PAGE
APOLLO 12	LAUNCH VEHICLE	LV/GSE/ESE	FACILITIES	BASIC						2-88
				OCTOBER 2, 1969						

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLI CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
	2-950	6K06	900 PSIG TRANSDUCER				600 PSIG	NONE	FROM START OF LMRD UNTIL T-45 SEC. IGNORE MOMEN- TARY DROP IN PRESS FOR PERIODS OF LESS THAN 5 SEC. * SYS IN TOLERANCE IF INDICATION IS "ON"	
		5309A1 DS4L (ALTERNATE)	INDUSTRIAL WATER 900 PSI GN2 REDUCING STATION			1 OF 2 M	*	*		
MISSION	APOLLO 12	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	LV/GSE/ESE	SYSTEM	FACILITIES		DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 2-89

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS. TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	2-951	601-1106A1 DS-10	DAMPER RETRACT AND RECONNECT SYSTEM				*	*	** "ON" INDICATION AFTER SYSTEMS RETRACT COMMAND IS ACCOMPLISHED SATISFIES REDLINE REQUIREMENTS.
		DEE-6-425 (ALTERNATE)				1 OF 4 M	*	*	
		DEE-6-446 (ALTERNATE)					*	*	
		NONE (ALTERNATE)	VISUAL CHECK OF LATCHING MECHANISM				** (1)	** (1)	** (1) VISUAL OBSERVATION WILL BE PERFORMED BY THE SPACECRAFT CLOSE-OUT CREW IF PRIMARY INDICATION DOES NOT VERIFY DAMPER ARM LATCHING.
MISSION	SECTION	LAUNCH VEHICLE	STAGE SUBSECTION	LV/GSE/ESE	SYSTEM	GSE	DATE CHANGE NO.	BASIC	PAGE
APOLLO 12							OCTOBER 2, 1969		2-90

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	MISSION	SECTION TECHNICAL SUPPORT	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO	PAGE 4-0
<p>SECTION IV</p> <p>TECHNICAL SUPPORT OPERATIONS</p>								

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
		<p><u>GENERAL NOTES</u></p> <p>THE APPLICABLE TIME PERIOD FOR <u>MANDATORY</u> ITEMS IN THIS SECTION WILL START AT LAUNCH VEHICLE POWER UP UNLESS OTHERWISE SPECIFIED IN THE TIME PERIOD/ACTION/NOTES COLUMN AND WILL TERMINATE AT THE SPECIFIED TIME (NO LATER THAN T-11 SECONDS FOR MANUAL CUTOFF ACTIONS).</p> <p>THE APPLICABLE TIME PERIOD FOR <u>HIGHLY DESIRABLE</u> ITEMS IN THIS SECTION WILL START AT LAUNCH VEHICLE POWER UP AND WILL TERMINATE AT T-3 MINUTES 7 SECONDS (AUTOMATIC SEQUENCE START) UNLESS OTHERWISE SPECIFIED IN THE TIME PERIOD/ACTION/NOTES COLUMN.</p> <p>ALL REDLINES (MINIMUM AND/OR MAXIMUM VALUES OR CONDITIONS) ARE <u>MANDATORY</u> ITEMS.</p> <p>VERIFICATION THAT THE VALUES OR CONDITIONS REMAIN WITHIN THE LIMITS OF ACCEPTABLE OPERATION IS <u>MANDATORY</u>. THEREFORE, A CATEGORY ASSIGNED TO A MEASUREMENT ASSOCIATED WITH A REDLINE INDICATES THAT THE MEASUREMENT MUST REMAIN OPERATIONAL TO VERIFY THAT THE REDLINE IS WITHIN THE SPECIFIED LIMITS.</p>	TECHNICAL SUPPORT	GENERAL NOTES		BASIC OCTOBER 2, 1969	4-1

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	4-101		VOICE COMM BETWEEN FLIGHT DIRECTOR/LAUNCH DIRECTOR/ LAUNCH OPERATIONS MANAGER/ MISSION DIRECTOR	M		M			ANY VOICE CIRCUIT; TO T-3 MIN 7 SEC.
	4-102		VOICE COMM BETWEEN KSC AND FLIGHT DIRECTOR: CHANNEL 111 - (CVTS) CHANNEL 121 - (CLTC) CHANNEL 212 - (MSTC)	1 OF 3 M					TO T-3 MIN 7 SEC.
	4-103		VOICE COMM BETWEEN KSC AND HOSC			M*			** MSFC REQUIREMENT IN EVENT OF MARGINAL WINDS; TO LAST GO/NO-GO RECOMMUNICATION; REF ITEM 1-404 (1).
	4-104		VOICE COMM BETWEEN KSC AND MCC			HD**(1)			** (1) MSC REQUIREMENT IN EVENT OF MARGINAL WINDS, REF ITEM 1-403 (9).
	4-105		VOICE COMM BETWEEN MSOB WEATHER STATION AND LAUNCH DIRECTOR (LCC)			M			IN EVENT OF MARGINAL WINDS; REF ITEM 1-403 (9).
	4-106		WIND INFORMATION AND DISPLAY (WIND) SYSTEM			** (2)			** (2) MANDATORY IN EVENT OF MARGINAL WINDS FOR XMSN OF ANEMOMETER DATA FROM MET. TOWER NO. 703 TO MSOB WX STATION, REF ITEMS 4-206, 4-403, 4-405, AND 1-403 (9); HIGHLY DESIRABLE FOR XMSN OF ANEMOMETER DATA FROM MET. TOWER NO. 702 TO MSOB WX STATION, REF ITEMS 4-404, 4-405, AND 1-403 (9).
	4-107		DATA TRANSMISSION SYSTEM FROM 535' LEVEL OF LUT TO MSOB WEATHER STATION			HD			FOR XMSN OF ANEMOMETER DATA; REF ITEMS 4-207 AND 1-403 (9).

MISSION APOLLO 12

SECTION TECHNICAL SUPPORT

STAGE SUBSECTION LAUNCH SUPPORT

SYSTEM

DATE CHANGE NO. BASIC OCTOBER 2, 1969

PAGE 4-2

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS/TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD/ACTION/NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
	4-108		A/G COMMUNICATIONS REQUIRED FOR LAUNCH			*			* REF ITEM 4-414.	
	4-109		COMMUNICATIONS REQUIRED FOR FLIGHT CREW INGRESS			*(1)			*(1) REF ITEMS 1-611 THRU 1-624.	
	4-110		ABORT COMMUNICATIONS			*(2)			*(2) REF ITEMS 1-650 AND 1-651.	
	4-111		COMMUNICATIONS FROM CIF ROOM 307, MSOB ACE CONTROL ROOM, SRO, & GMIL TO S/C TEST CONDUCTOR, L/V TEST CONDUCTOR, AND CIFR			M			CIRCUIT FOR REQUESTING HOLD/CUTOFF; PRIMARY OIS CH 121, BACKUP OIS CH 111; TO T-11 SEC.	
	4-112		COMMUNICATIONS FROM L/V TEST CONDUCTOR (CLTC) TO CAPE KENNEDY RANGE SAFETY OFFICER (RSO)			HD*(3)			*(3) CIRCUIT FOR ACCOMPLISHING PAD EMERGENCY RANGE CUTOFF PROCEDURE; REF ITEM 1-525.	
	4-113		COMMUNICATIONS FROM CAPE KENNEDY RANGE SAFETY OFFICER (RSO) TO RANGE SAFETY SUPERVISOR (CRSS) AT LCC			M			CIRCUIT FOR ADVISING RSO ON L/V RANGE SAFETY COMMAND RECEIVER OPERATION; MANDATORY FOR T-40 MIN DESTRUCT CHECKS; REF ITEM 1-524.	
	4-114		DIGITAL RANGE SAFETY COMMAND SYSTEM CLOSED CIRCUIT CHECK-OUT SYSTEM FROM ETR COMMAND TRANSMITTER TO LUT			1 OF 2 M			TO T-30 MIN.	
MISSION	APOLLO 12	SECTION	TECHNICAL SUPPORT	STAGE/SUBSECTION			SYSTEM	BASIC CHANGE NO.		PAGE
			LAUNCH SUPPORT	LAUNCH SUPPORT				OCTOBER 2, 1969		4-3

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS./TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
	4-116	CONTROL PANEL 5476	EQUIPMENT AIR CONDITIONING SYSTEM, LUT			*	59°F	85°F	AIR CONDITIONING IS MANDATORY TO T-10 MIN. * REF ITEM 2-928	
Δ	4-117	12B40	EQUIPMENT AIR RCA-110A CABINET TEMPERATURE			*(1)			AIR CONDITIONING IS MANDATORY TO T-10 MIN FOR RCA-110A COMPUTERS AND BROWN DISCRETE CONTROL EQUIPMENT; CONTINUOUS READOUTS TO BGCC (OIS CH 151) FOR TEMPERATURES ABOVE 88°F. *(1) REF ITEM 2-928.	
	4-118	CONTROL PANEL 5477 DS3, 4	PTCR PRESSURIZATION			HD			NORMAL RANGE 0.5 TO 2.5 INCHES OF WATER.	
	4-119	CONTROL PANEL 5477 DS15	ECS EQUIPMENT ROOM A/C SYSTEM			HD			NORMAL MAX VALUE 100°F.	
	4-120	CONTROL PANEL 5477 DS2	PTCR SECOND FLOOR A/C SYSTEM			HD			NORMAL MAX VALUE 80°F.	
	4-121		IN-LINE GN ₂ PRESSURE REDUCING STATIONS (3000/400 PSIG AND/OR 400/50 PSIG ON PAD)			HD				
	4-122	VDX-230-349	HELIUM SUPPLY, LUT			HD			NORMAL MIN VALUE 3800 PSIG.	
	4-123	VDX-231-349	HIGH PRESSURE GN ₂ , LUT			HD			NORMAL MIN VALUE 3800 PSIG.	
A	4-124	CCF RE-CORDER	GH ₂ PRESSURE TO S-II SERVICE PANEL AND S-IVB HEAT EXCHANGER			M	*(2)		TO START OF J-2 PRESSURIZATION (APPROX T-20 MIN); *(2) FOR MINIMUM REDLINE, REF ITEMS 1-907 AND 1-908.	
MISSION	APOLLO 12	SECTION	STAGE SUBSECTION	SYSTEM					DATE CHANGE NO. REVISION A OCTOBER 17, 1969	PAGE 4-4
		TECHNICAL SUPPORT	LAUNCH SUPPORT							

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
	4-125	CONTROL PANEL 5310A1	INDUSTRIAL WATER DIESEL PUMP OPERATION			*			* REF ITEM 2-945.
	4-126	CONTROL PANEL 5339A1 DS4	FIREX MAIN PRESSURIZATION			M			NORMAL MIN VALUE 110 PSIG; REQUIRED FOR OPERATION OF LES COOLING AND EGRESS ROUTE SPRAY; REF ITEM 1-629.
	4-127	CONTROL PANEL 5340M2	DIESEL ENGINE STARTING AIR			HD			NORMAL MIN VALUE 100 PSIG.
	4-129		OPERATIONAL TELEVISION CAMERAS (VIEWING F-1 ENGINES)			*(1)			*(1) REF ITEM 2-142.
	4-130		OPERATIONAL TELEVISION CAMERAS NOS. 9, 16, 34, 35, 36 (VIEWING S-II INSULATION SURFACE)			*(2)			*(2) REF ITEM 2-372.
Δ	4-132	BCCA CONTROL PANEL, CCC	LUT BASE COMPARTMENT STATIC PRESSURE			HD			FROM PAD CLOSEOUT; 0.5 INCHES OF WATER MINIMUM; NORMAL PRESSURIZATION 2.0 INCHES OF WATER; PANEL INDICATIONS 4AB, 13AB, ELE-VATOR MACHINERY ROOM, AND OTHER (I.E., COMPARTMENTS 1A, 2B, 9B, 14AB, 15A, 16A).

KSC FORM 4-47 (REV. 1 68)

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLY CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM	
4-201			CIF TELEMETRY MODULE 1 AND 2			1 OF 2 M			FOR MONITORING L/V REDLINES IN CIF ROOM 307 TO T-3 MIN 7 SEC AND FOR MONITORING OPERATION OF L/V TM LINKS TO T-25 SEC.
4-202			CIF TM RECORD AND REAL TIME; USB (GMIL) TM RECORD AND REAL TIME		1 OF 2 M	1 OF 2 M			FOR INPUT TO ALDS; MISSION SUPPORT ROOM 307; L/V TM LINKS VERIFICATION (CIF ONLY); TO T-25 SEC.
4-203			CIF ROOM 307 RECORDING SYSTEM CAPABILITY			M			CIF ROOM 307 RECORDING SYSTEM CAPABILITY FOR THOSE MANDATORY MEASUREMENTS WHICH ARE DISPLAYED ONLY IN CIF ROOM 307; L/V REDLINE DISPLAY TO T-3 MIN 7 SEC.
4-204			CRT DISPLAY SYSTEM IN CIF ROOM 307			HD			L/V REDLINE DISPLAY IN CIF ROOM 307.
4-205	H60-603		CIF REAL TIME PRINTOUT OF LVDC/LVDA TELEMETRY OUTPUT WITH SATURN GUIDANCE REDUCTION PROGRAM	::	::	::			:: REF ITEM 2-732.
4-206			WIND VECTOR SYSTEM (2 ANEMOMETERS) AT FOLLOWING LEVELS OF MET. TOWER NO. 703: 162', 197', 295', 394', 492' (ABOVE NATURAL GRADE)			::(1)			::(1) 1 OF 2 MANDATORY FOR MARGINAL WINDS; OTHERWISE BOTH HIGHLY DESIRABLE; REF ITEM 1-403 (9). NOTE: WIND VECTOR SYSTEM AT 162' LEVEL IS AN ETR RESPONSIBILITY, REF ITEM 4-403.
4-207			WIND VECTOR SYSTEM (1 ANEMOMETER) AT 535' LEVEL OF LUT			HD			REF ITEM 1-403 (9).

MISSION
APOLLO 12

SECTION
TECHNICAL SUPPORT

STAGE: SUBSECTION
INSTRUMENTATION SUPPORT

SYSTEM

BASIC CHANGE NO.
OCTOBER 2, 1969

PAGE
4-6

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
	4-208		WIND VECTOR SYSTEM (2 ANEMOMETERS) AT PAD 60' LEVEL (LIGHT-POLES)			**			**1 OF 2 MANDATORY FOR MARGINAL WINDS; OTHERWISE BOTH HIGHLY DESIRABLE; REF ITEMS 1-401 AND 1-402.	
	4-209		CIF GE-635 COMPUTER			1 OF 2 HD**(1)			** (1) MSC REQUIREMENT FOR ALL JIMSPHERE BALLOON RELEASES FOR WHICH MSC RECEIVES DATA; REF ITEM 1-403 (8).	
	4-210		BENDING MOMENT DISPLAY IN CIF			1 OF 2 M			IN EVENT OF MARGINAL WINDS; REF ITEMS 1-401 AND 1-402.	
	4-211		CIF METEOROLOGICAL RECORDING SYSTEM			1 OF 2 HD**(2)			** (2) MSC REQUIREMENT FOR ALL JIMSPHERE BALLOON RELEASES FOR WHICH MSC RECEIVES DATA; REF ITEM 1-403 (8).	
	4-212		IBM 7702 TRANSMISSION SYSTEM/ IBM 066/068 TRANSMISSION SYSTEM			1 OF 2 HD**(3)			** (3) MSC REQUIREMENT FOR ALL JIMSPHERE BALLOON RELEASES FOR WHICH MSC RECEIVES DATA; REF ITEM 1-403 (8).	
	4-213		UNIVAC 1004 TRANSCEIVER AND LIEF DATA TRANSMISSION SYSTEM			1 OF 2 HD**(4)			** (4) MSFC REQUIREMENT IN EVENT OF MARGINAL WINDS; REF ITEM 1-404 (1).	
	4-214		HYDROGEN HAZARD MONITORING SYSTEM			HD			FROM START OF L/V LH ₂ LOADING.	
	4-215		LIGHTNING WARNING SYSTEM			HD				
MISSION	APOLLO 12	SECTION	TECHNICAL SUPPORT	STAGE SUBSECTION	INSTRUMENTATION SUPPORT	SYSTEM			DATE CHANGE NO. BASIC OCTOBER 2, 1969	PAGE 4-7

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES		
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM			
	4-217		<p>TELEMETRY MONITORING IN CIF OF FOLLOWING:</p> <p>A. <u>S-IC STAGE</u>::</p> <ol style="list-style-type: none"> 1. TM LINK API 2. MULTIPLEXER A0 3. MULTIPLEXER B0 4. RDSM <p>B. <u>S-II STAGE</u>::</p> <ol style="list-style-type: none"> 1. TM LINK BP1 2. MULTIPLEXER A0 3. MULTIPLEXER B0 4. RDSM NO. 1 (B0-24) 5. RDSM NO. 2 (B0-25) <p>C. <u>S-IVB STAGE</u>::</p> <ol style="list-style-type: none"> 1. TM LINK CPI 2. MULTIPLEXER DP1B0 (VIA IU) 3. MULTIPLEXER CP1B0 (VIA S-IVB) 4. RDSM 5. RASM <p>D. <u>INSTRUMENT UNIT</u>::</p> <ol style="list-style-type: none"> 1. TM LINK DPI 2. TM LINK DP1B 3. MULTIPLEXER DP1A0 (VIA IU) 4. MULTIPLEXER CP1A0 (VIA S-IVB) 5. MULTIPLEXER J (RDM) 					<p>:: FOR APPROPRIATE CATEGORY, REFERENCE SECTION 2 ITEMS LISTED BELOW.</p> <p>REF ITEM 2-101. REF ITEM 2-110A. REF ITEM 2-111. REF ITEM 2-112.</p> <p>REF ITEM 2-301. REF ITEM 2-310A. REF ITEM 2-311. REF ITEM 2-313. REF ITEM 2-314.</p> <p>REF ITEM 2-502. REF ITEM 2-504.</p> <p>REF ITEM 2-505.</p> <p>REF ITEM 2-508. REF ITEM 2-509.</p> <p>REF ITEM 2-702. REF ITEM 2-703. REF ITEM 2-705.</p> <p>REF ITEM 2-706.</p> <p>REF ITEM 2-707.</p>			
MISSION	APOLLO 12	SECTION	TECHNICAL SUPPORT	STAGE SUBSECTION			INSTRUMENTATION SUPPORT		SYSTEM	DATE CHANGE NO.	PAGE
										BASIC	4-8
										OCTOBER 2, 1969	

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES			
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM				
	4-218		USB TM (CIF ANTENNA SITE); USB TM (GMIL)			1 OF 2 M			CSM S-BAND TM TO MSOB ACE STATION; FROM LES ARM TO T-11 SEC.			
MISSION				SECTION		STAGE SUBSECTION		SYSTEM		LATE CHANGE NO.		PAGE
APOLLO 12				TECHNICAL SUPPORT		INSTRUMENTATION SUPPORT				BASIC		4-9
										OCTOBER 2, 1969		

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES			
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM				
	4-301		EQUIPMENT AIR CONDITIONING SYSTEM, LCC			::			AIR CONDITIONING IS MANDATORY TO T-10 MIN FOR RCA-110A COMPUTERS, BROWN DISCRETE CONTROL EQUIPMENT, AND SANDERS OPERATIONS DISPLAY EQUIPMENT. ** REF ITEM 2-928.			
MISSION	APOLLO 12	SECTION	TECHNICAL SUPPORT	STAGE SUBSECTION			INSTALLATION SUPPORT	SYSTEM	DATE CHANGE NO	BASIC OCTOBER 2, 1969	PAGE	4-10

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FELT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
	4-402		<p><u>ETR SUPPORT:</u></p> <p>C-BAND RADAR REAL TIME TRACKING</p>			**			<p>** MSC REQUIREMENT: HIGHLY DESIRABLE FOR ALL JIMSPHERE BALLOON RELEASES FOR WHICH MSC RECEIVES DATA, REF ITEM 1-403 (8); <u>MSFC REQUIREMENT:</u> HIGHLY DESIRABLE IN EVENT OF MARGINAL WINDS UNTIL FINAL WIND RECOMMENDATION, REF ITEM 1-404 (1).</p>	
	4-403		<p>WIND VECTOR SYSTEM (2 ANEMOMETERS) AT 162' LEVEL OF MET. TOWER NO. 703</p>			** (1)			<p>** (1) 1 OF 2 MANDATORY FOR MARGINAL WINDS; OTHERWISE BOTH HIGHLY DESIRABLE; REF ITEMS 4-206 AND 1-403 (9).</p>	
	4-404		<p>WIND VECTOR SYSTEM (1 ANEMOMETER) AT FOLLOWING LEVELS OF MET. TOWER NO. 702: 162', 204' (ABOVE NATURAL GRADE)</p>			HD			<p>REF ITEM 1-403 (9).</p>	
	4-405		<p>WIND INFORMATION AND DISPLAY (WIND) SYSTEM</p>			** (2)			<p>** (2) MANDATORY IN EVENT OF MARGINAL WINDS FOR XMSN OF ANEMOMETER DATA FROM MET. TOWER NO. 703 TO MSOB WX STATION, REF ITEM 4-206, 4-403, 4-106, AND 1-403 (9); HIGHLY DESIRABLE FOR XMSN OF ANEMOMETER DATA FROM MET. TOWER NO. 702 TO MSOB WX STATION, REF ITEMS 4-404, 4-106, AND 1-403 (9).</p>	
MISSION	APOLLO 12	SECTION	TECHNICAL SUPPORT	STAGE SUBSELECTION			SYSTEM		<p>DATE CHANGE NO.</p> <p>BASIC</p> <p>OCTOBER 2, 1969</p>	<p>PAGE</p> <p>4-11</p>

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY		REDLINE VALUES		TIME PERIOD ACTION NOTES
				FLI CONT	ENG DATA	PRE LAUNCH	MINIMUM	
	4-408		<u>ETR SUPPORT (CONTINUED):</u>					
	4-409		ALOTS AIRCRAFT COMMUNICATIONS FROM CIF ROOM 307, MSOB ACE CONTROL ROOM, SRO, & GMIL TO S/C TEST CON- DUCTOR, L/V TEST CONDUCTOR, AND C1FR		HD	*		REF ITEM 1-400 (2). * REF ITEM 4-111.
	4-410		COMMUNICATIONS FROM L/V TEST CONDUCTOR (CLTC) TO CAPE KENNEDY RANGE SAFETY OFFICER (RSO)			*(1)		*(1) REF ITEM 4-112.
	4-411		COMMUNICATIONS FROM CAPE KENNEDY RANGE SAFETY OFFICER (RSO) TO RANGE SAFETY SUPER- VISOR (CRSS) AT LCC			*(2)		*(2) REF ITEM 4-113.
	4-412		DIGITAL RANGE SAFETY COMMAND SYSTEM CLOSED CIRCUIT CHECK- OUT SYSTEM FROM ETR COMMAND TRANSMITTER TO LUT			*(3)		*(3) REF ITEM 4-114.

MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
APOLLO 12	TECHNICAL SUPPORT	NON-KSC LAUNCH SUPPORT		BASIC OCTOBER 2, 1969	4-12

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	MEAS TM NO.	DESCRIPTION	CATEGORY			REDLINE VALUES		TIME PERIOD ACTION NOTES	
				FLT CONT	ENG DATA	PRE LAUNCH	MINIMUM	MAXIMUM		
	4-413		<u>GSFC SUPPORT:</u> USB COMMAND (GMIL)			*			* MANDATORY FROM LES ARM TO T-19 SEC FOR XMSN OF ABORT REQUEST; REF ITEM 1-648; <u>HIGHLY DESIRABLE FOR UPLINK TO CSM.</u>	
	4-414		A/G COMMUNICATIONS: VHF (DUPLEX B) USB			1 OF 2 M			FROM FLIGHT CREW INGRESS TO T-19 SEC.	
	4-415		USB TM (GMIL)			*(1)			*(1) REF ITEM 4-218.	
	4-416		COMMAND AND COMMUNICATIONS SYSTEM (CCS)	*(2)					*(2) REF ITEM 2-708.	
	4-417		USB (GMIL) TM RECORD AND REAL TIME		*(3)	*(3)			*(3) REF ITEM 4-202.	
MISSION	APOLLO 12	SECTION	TECHNICAL SUPPORT	STAGE SUBSECTION			SYSTEM		DATE CHANGE NO.	PAGE
				NON-KSC LAUNCH SUPPORT					BASIC OCTOBER 2, 1969	4-13

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO	PAGE
		<h1>APPENDICES</h1>		<h2>APPENDICES</h2>				

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<p><u>DEFINITIONS:</u></p> <p><u>PRIMARY OBJECTIVE:</u> A STATEMENT OF THE PRINCIPAL PURPOSE OF FLIGHT. WHEN USED IN CENTER CONTROL DOCUMENTATION, THE PRIMARY OBJECTIVE MAY BE AMPLIFIED BUT NOT MODIFIED. DETAILED TEST OBJECTIVES WILL BE GENERATED AND AMPLIFIED TO FULFILL EACH PRIMARY OBJECTIVE.</p> <p><u>PRINCIPAL DETAILED TEST OBJECTIVE:</u> A DETAILED TEST OBJECTIVE WHICH MUST BE ACCOMPLISHED PRIOR TO THE LUNAR LANDING MISSION. ANY PRINCIPAL DETAILED TEST OBJECTIVE NOT SATISFACTORILY COMPLETED ON THE ASSIGNED MISSION CAN BE ATTEMPTED ON A SUBSEQUENT MISSION WITHOUT MAJOR IMPACT.</p> <p><u>MANDATORY DETAILED TEST OBJECTIVE:</u> A PRINCIPAL DETAILED TEST OBJECTIVE WHICH MUST BE SATISFACTORILY COMPLETED ON THE ASSIGNED MISSION. FAILURE TO DO SO WOULD UNDULY COMPROMISE SUBSEQUENT FLIGHT SCHEDULES AND/OR REQUIRE SUBSEQUENT SPACE VEHICLE RECONFIGURATION.</p> <p><u>SECONDARY DETAILED TEST OBJECTIVE:</u> A DETAILED TEST OBJECTIVE WHICH WOULD PROVIDE SIGNIFICANT DATA OR EXPERIENCE BUT WHICH IS NOT A PREREQUISITE TO THE LUNAR LANDING MISSION.</p> <p><u>CATEGORY:</u> A CATEGORY IS A DEGREE OF IMPORTANCE ASSIGNED TO SPACE VEHICLE AND OPERATIONAL SUPPORT ELEMENTS. SPECIFIC CATEGORIES APPLICABLE TO MISSION RULES ARE MANDATORY, HIGHLY DESIRABLE, OR DESIRABLE.</p> <p><u>MANDATORY (M):</u> A MANDATORY ITEM IS A SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT THAT IS ESSENTIAL FOR ACCOMPLISHMENT OF THE PRIMARY MISSION, WHICH INCLUDES PRELAUNCH, FLIGHT, AND RECOVERY OPERATIONS THAT INSURE CREW SAFETY AND EFFECTIVE OPERATIONAL CONTROL AS WELL AS THE ATTAINMENT OF THE MANDATORY DETAILED TEST OBJECTIVES.</p> <p><u>HIGHLY DESIRABLE (HD):</u> A HIGHLY DESIRABLE ITEM IS A SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT THAT SUPPORTS AND ENHANCES THE ACCOMPLISHMENT OF THE PRIMARY MISSION AND IS ESSENTIAL FOR THE ACCOMPLISHMENT OF THE PRINCIPAL DETAILED TEST OBJECTIVES.</p> <p><u>DESIRABLE (D):</u> A DESIRABLE ITEM IS A SPACE VEHICLE ELEMENT OR OPERATIONAL SUPPORT ELEMENT THAT IS NOT ESSENTIAL FOR THE ACCOMPLISHMENT OF THE PRIMARY MISSION.</p> <p><u>SPACE VEHICLE ELEMENT:</u> A PART OF ANY LAUNCH VEHICLE OR SPACECRAFT SYSTEM.</p> <p><u>OPERATIONAL SUPPORT ELEMENT:</u> A PART OF ANY SYSTEM OR ACTIVITY THAT IS INVOLVED IN THE COUNTDOWN, LAUNCH, FLIGHT, OR RECOVERY OPERATIONS, OTHER THAN THOSE ELEMENTS WHICH ARE A PART OF THE SPACE VEHICLE ITSELF.</p> <p><u>REDLINE:</u> A REDLINE VALUE IS A MAXIMUM AND/OR MINIMUM LIMIT OF A CRITICAL PARAMETER NECESSARY TO IDENTIFY VEHICLE, SYSTEM, AND COMPONENT PERFORMANCE AND OPERATION. REDLINE VALUES WILL BE ESTABLISHED SUCH THAT FURTHER DEGRADATIONS OF THE SYSTEM OR COMPONENT COULD LEAD TO A FAILURE TO ACCOMPLISH THE PRIMARY MISSION.</p>
MISSION APOLLO 12	SECTION APPENDIX A	STAGE SUBSECTION DEFINITIONS
		SYSTEM
		DATE CHANGE NO BASIC OCTOBER 2, 1969
		PAGE A-1

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<p><u>DEFINITIONS (CONTINUED):</u></p> <p><u>REDLINE FUNCTION:</u> A REDLINE FUNCTION IS A PARAMETER THAT HAS BEEN IDENTIFIED TO MONITOR THE FUNCTIONING OF A UNIT TO INSURE THAT THE OPERATIONAL PERFORMANCE OF THAT UNIT IS ACCEPTABLE TO MEET THE PRIMARY MISSION. REDLINE FUNCTIONS ARE MANDATORY.</p> <p><u>MEASUREMENT:</u> A MEASUREMENT IS A SPECIFIC DATA CHANNEL OF INSTRUMENTATION MONITORING A SINGLE FUNCTION.</p> <p><u>INSTRUMENTATION:</u> INSTRUMENTATION IS THE EQUIPMENT THAT ACQUIRES, TRANSMITS, AND MONITORS DATA FOR PERFORMANCE EVALUATION OF SPACE VEHICLE AND OPERATIONAL SUPPORT ITEMS.</p> <p><u>COUNTDOWN:</u> THE PERIOD OF TIME COMMENCING WITH START OF THE OFFICIAL COUNTDOWN CLOCK. DURING THE INTERVAL OF TIME PRIOR TO THIS PERIOD, TASK ACCOMPLISHMENT IS NOT STRICTLY TIME RELATED AND A HOLD IS A MEANINGLESS TERM. THE OFFICIAL COUNTDOWN CLOCK STARTS AT T-28 HOURS (START OF LAUNCH VEHICLE BATTERY INSTALLATION).</p> <p><u>PROCEED:</u> CONTINUE IN ACCORDANCE WITH PRESCRIBED COUNTDOWN PROCEDURES.</p> <p><u>HOLD:</u> INTERRUPTION OR DELAY OF THE COUNTDOWN FOR ANY REASON, SUCH AS UNFAVORABLE WEATHER, REPAIR OF HARDWARE, OR CORRECTION OF CONDITIONS UNSATISFACTORY FOR LAUNCH OR FLIGHT.</p> <p><u>HOLD-POINT:</u> A PREDETERMINED POINT WHERE THE COUNTDOWN MAY BE CONVENIENTLY INTERRUPTED.</p> <p><u>SCRUB:</u> THE LAUNCH IS TERMINATED TO BE RESCHEDULED.</p> <p><u>RECYCLE:</u> THE COUNTDOWN IS STOPPED AND RETURNED TO A DESIGNATED POINT OR AS SPECIFIED IN THE LAUNCH MISSION RULES.</p> <p><u>TURNAROUND TIME:</u> TURNAROUND TIME IS THE TOTAL TIME REQUIRED FROM A SCRUB TO THE NEXT SCHEDULED LIFTOFF TIME (T-O) INCLUDING RECYCLE AND COUNTDOWN.</p> <p><u>CUTOFF:</u> THE AUTOMATIC OR MANUAL COMMAND TO STOP THE LAUNCH SEQUENCE AFTER INITIATION OF THE "AUTOMATIC LAUNCH SEQUENCE".</p> <p><u>LIFTOFF:</u> THE EVENT DETERMINED BY THE INSTRUMENT UNIT UMBILICAL DISCONNECT SIGNAL, AND IS THE POINT IN TIME WHEN PLUS TIME COMMENCES.</p> <p><u>ABORT:</u> MISSION TERMINATION BY UNSCHEDULED INTENTIONAL SEPARATION OF THE SPACECRAFT FROM THE LAUNCH VEHICLE PRIOR TO ORBITAL INSERTION.</p> <p><u>EARLY MISSION TERMINATION:</u> UNSCHEDULED INTENTIONAL MISSION TERMINATION AT OR AFTER ORBITAL INSERTION.</p> <p><u>MISSION PERIOD TERMINATION (LUNAR LANDING MISSION):</u> MISSION PERIOD TERMINATION OCCURS UPON THE RELEASE OF THE FLIGHT CREW, FLIGHT HARDWARE, OR RELEASE OF THE LUNAR SAMPLES TO APPROVED PRINCIPAL INVESTIGATORS, WHICHEVER OCCURS LATER.</p>
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MISSION APOLLO 12	SECTION APPENDIX A	STAGE SUBSECTION DEFINITIONS
	SYSTEM	DATE CHANGE NO. BASIC OCTOBER 2, 1969
		PAGE A-2

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION	DOCUMENT TITLE	RELATED AND REFERENCE DOCUMENTATION	DOCUMENT NUMBER
	A		KSC APOLLO/SATURN LAUNCH MISSION RULES HANDBOOK		630-23-0002
	B		APOLLO/SATURN V ABORT COMMAND/REQUEST GROUND RULES, PROCEDURES, AND SYSTEM DESCRIPTION		NONE
	C		APOLLO/SATURN PAD ACCESS POLICY AFTER LAUNCH VEHICLE CRYOGENIC TANKING		630-39-0031
	D		APOLLO/SATURN V SPACE VEHICLE SCRUB/TURNAROUND PLAN		630-39-0038
	E		TEST SUPERVISOR EMERGENCY PROCEDURES (TCP)		V-46001
	F		APOLLO FLIGHT CREW EMERGENCY EGRESS PROCEDURES (TCP)		V-46002
	G		SPACE VEHICLE COUNTDOWN DEMONSTRATION TEST (CDDT) (TCP)		V-40310
	H		SPACE VEHICLE COUNTDOWN (TCP) - VOLUME I		V-40300
	I		SPACE VEHICLE TURNAROUND FROM SCRUB (TCP) - VOLUME II		V-40300
	J		LAUNCH VEHICLE OPERATIONS FOR SPACE VEHICLE CDDT AND LAUNCH COUNTDOWN (TCP)		V-20060
	K		SPACECRAFT OPERATIONS (CSM) FOR SPACE VEHICLE CDDT AND LAUNCH COUNTDOWN (TCP)		K-0007
	L		SPACECRAFT OPERATIONS (LM) FOR SPACE VEHICLE CDDT AND LAUNCH COUNTDOWN (TCP)		KL-0007
	M		APOLLO/SATURN V GROUND SAFETY PLAN		K-V-053
	N		SAFETY OPERATING PROCEDURE: SNAP-27 FUEL CAPSULE INSTALLATION AND REMOVAL		SOP NO. 39-SC-9
	O		SAFETY OPERATING PROCEDURE: SNAP-27 RADIOLOGICAL CONTROL CENTER OPERATIONS		SOP NO. 39-SC-10
	P		KSC SNAP-27 RADIOLOGICAL CONTROL PLAN		SUP. II TO VOL. II OF K-V-053

MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO	PAGE
APOLLO 12	APPENDIX B	RELATED AND REFERENCE DOCUMENTATION		REVISION A OCTOBER 17, 1969	B-1

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<p><u>RELATED AND REFERENCE DOCUMENTATION (CONTINUED)</u></p>
		<p><u>DOCUMENT TITLE</u></p>
A	Q	<p>KSC SNAP-27 CONTINGENCY (EMERGENCY) PLAN</p>
		<p><u>DOCUMENT NUMBER</u></p>
		<p>APPEND. H TO SUP. II TO VOL. II OF K-V-053</p>
		<p>AFETRM 127-1</p>
		<p>AFETR MANUAL 127-1, "RANGE SAFETY MANUAL," DATED 1 JANUARY 1969</p>

MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
APOLLO 12	APPENDIX B	RELATED AND REFERENCE DOCUMENTATION		REVISION A OCTOBER 17, 1969	B-2

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<u>ABBREVIATIONS AND ACRONYMS</u>
AAA	APOLLO ACCESS ARM	BMAG
AALT	AUTOMATIC AZIMUTH LAYING THEODOLITE	BOT
AC	ALTERNATING CURRENT	BRSO
A/C	AIR CONDITIONING	C
ACA	ATTITUDE CONTROLLER ASSEMBLY	CCF
ACCEL	ACCELEROMETER	CCS
ACCUM	ACCUMULATOR	CCW
ACE	ACCEPTANCE CHECKOUT EQUIPMENT (S/C)	CDR
ACT	ACTUATOR	CDU
ACTR	ACTUATOR	CES
AE	ASCENT ENGINE (LM)	CG
A/G	AIR/GROUND	CH
AGC	AUTOMATIC GAIN CONTROL	CHM
AGCS	AUTOMATIC GROUND CONTROL STATION	CIF
AGS	ABORT GUIDANCE SYSTEM	CM
ALDS	APOLLO LAUNCH DATA SYSTEM	CMC
ALOTS	AIRBORNE LIGHTWEIGHT OPTICAL TRACKING SYSTEM	CMD
AM	AMPLITUDE MODULATION	COAS
AMP	AMPERES	COMM
AMP	AMPLIFIER	CON
ANG	ANGULAR	COND
ANT	ANTENNA	COS
APS	ASCENT PROPULSION SYSTEM (LM)	CP
APS	AUXILIARY PROPULSION SYSTEM (S-IVB)	CSM
ARS	ATMOSPHERIC REVITALIZATION SYSTEM	CTE
ASA	ABORT SENSOR ASSEMBLY	CTR
ASC	ASCENT	CURFCOE
ASI	AUGMENTED SPARK IGNITOR	CW
ATT	ATTITUDE	C&WE
AUTO	AUTOMATIC	DAC
AUTO SEQ	AUTOMATIC SEQUENCE	DAP
AUX	AUXILIARY	DB
BARO	BAROSTAT	DC
BATT	BATTERY	DCA
BDA	BERMUDA	DCS
BIPROP	BIPROPELLANT	DDAS
BLKHD	BULKHEAD	
		BODY MOUNTED ATTITUDE GYRO
		BOTTOM
		BERMUDA RANGE SAFETY OFFICER
		CELSIUS (CENTIGRADE)
		CONVERTER COMPRESSOR FACILITY
		COMMAND & COMMUNICATIONS SYSTEM
		COUNTERCLOCKWISE
		COMMAND DESTROY RECEIVER
		COUPLING DISPLAY UNIT
		CONTROL ELECTRONICS SYSTEM
		CENTER OF GRAVITY
		CHANNEL
		CHAMBER
		CENTRAL INSTRUMENTATION FACILITY
		COMMAND MODULE
		COMMAND MODULE COMPUTER
		COMMAND
		CREW OPTICAL ALIGNING SIGHT
		COMMUNICATIONS
		CONTROL
		CONDITIONER
		COSINE
		COLDPLATE
		COMMAND AND SERVICE MODULE
		CENTRAL TIMING EQUIPMENT
		CENTER
		COMMON USAGE RF CHECKOUT EQUIPMENT
		CLOCKWISE
		CAUTION & WARNING ELECTRONICS
		DIGITAL-TO-ANALOG CONVERTER
		DIGITAL AUTOPILOT
		DECIBELS
		DIRECT CURRENT
		DIGITAL COMMAND ASSEMBLY
		DIGITAL COMMAND SYSTEM
		DIGITAL DATA ACQUISITION SYSTEM

MISSION	SECTION	STAGE SUBSECTION	SYSTEM	DATE CHANGE NO.	PAGE
APOLLO 12	APPENDIX C	ABBREVIATIONS AND ACRONYMS		BASIC OCTOBER 2, 1969	C-1

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<u>ABBREVIATIONS AND ACRONYMS (CONTINUED)</u>
	IMU	INERTIAL MEASURING UNIT
	IND	INDICATOR
	INJ	INJECTOR
	INT	INTERNAL
	INV	INVERTER
	IP	IMPACT POINT
	IP	IMPACT PREDICTOR
	IRIG	INERTIAL RATE INTEGRATING GYRO
	ISOL	ISOLATION
	ISS	INERTIAL SUBSYSTEM
	IU	INSTRUMENT UNIT
	IWS	INDUSTRIAL WATER SYSTEM
	KHZ	KILOHERTZ
	KM	KILOMETERS
	LCC	LAUNCH CONTROL CENTER
	LEB	LOWER EQUIPMENT BAY (CM)
	LES	LAUNCH ESCAPE SYSTEM
	LET	LAUNCH ESCAPE TOWER
	LGC	LM GUIDANCE COMPUTER
	LH	LEFT-HAND
	LH ₂	LIQUID HYDROGEN
	LIEF	LAUNCH INFORMATION EXCHANGE FACILITY
	LL	LOW LEVEL
	LM	LUNAR MODULE
	LMC	LUNAR MODULE COMPUTER
	LOM	LAUNCH OPERATIONS MANAGER
	LOX	LIQUID OXYGEN
	L/O	LIFTOFF
	LR	LANDING RADAR (LM)
	LTA	LM TEST ARTICLE
	LUT	LAUNCH UMBILICAL TOWER
	LVDA	LAUNCH VEHICLE DATA ADAPTER
	LVDC	LAUNCH VEHICLE DIGITAL COMPUTER
	L/V	LAUNCH VEHICLE
	MCC	MISSION CONTROL CENTER (HOUSTON)
	MEAS	MEASUREMENT
	MESC	MASTER EVENTS SEQUENCE CONTROLLER
	MET	METEOROLOGICAL
	MFCO	MANUAL FUEL CUTOFF
	MG	MIDDLE GIMBAL
	MGA	MIDDLE GIMBAL ASSEMBLY
	MHZ	MEGAHERTZ
	MIN	MINUTES
	MIN	MINIMUM
	ML	MOBILE LAUNCHER (LUT)
	MWH	MONOMETHYL HYDRAZINE
	MNFD	MANIFOLD
	MON	MONITOR
	MSS	MOBILE SERVICE STRUCTURE
	MTR	MOTOR
	MTVC	MANUAL THRUST VECTOR CONTROL
	MWDC	MILLIVOLTS, D.C.
	N ₂	NITROGEN
	N ₂ O ₄	NITROGEN TETROXIDE
	NEG	NEGATIVE
	NM	NAUTICAL MILES
	O ₂	OXYGEN
	O/B	ONBOARD
	ODOP	OFFSET DOPPLER
	OG	OUTER GIMBAL
	OGA	OUTER GIMBAL ASSEMBLY
	OIS	OPERATIONAL INTERCOMMUNICATIONS SYSTEM
	OPS	OXYGEN PURGE SYSTEM
	ORDEAL	ORBITAL RATE DRIVE ELECTRONICS FOR APOLLO AND LM
	OX	OXIDIZER
	OXID	OXIDIZER

KSC FORM 4-474 REV. 1-68

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
		<u>ABBREVIATIONS AND ACRONYMS (CONTINUED)</u>
PAM		PULSE AMPLITUDE MODULATION
PCM		PULSE CODE MODULATION
PCMTE		PCM & TIMING ELECTRONICS
PCT		PERCENT
PD		PROPELLANT DISPERSION
PGNCS		PRIMARY GUIDANCE, NAVIGATION, & CONTROL SYSTEM
PH FACTOR		HYDROGEN ION CONCENTRATION
PIPA		PULSE INTEGRATING PENDULOUS ACCELEROMETER
PLSS		PORTABLE LIFE SUPPORT SYSTEM
PNL		PANEL
POS		POSITIVE
POS		POSITION
PPM		PARTS PER MILLION
PQMD		PROPELLANT QUANTITY MEASURING DEVICE
PRESS		PRESSURE
PRI		PRIMARY
PSI		POUNDS PER SQUARE INCH
PSIA		POUNDS PER SQUARE INCH ABSOLUTE
PSID		POUNDS PER SQUARE INCH DIFFERENTIAL
PSIG		POUNDS PER SQUARE INCH GAUGE
PT		POINT
PTCR		PAD TERMINAL CONNECTION ROOM
PTCS		PROPELLANT TANKING COMPUTER SYSTEM
PU		PROPELLANT UTILIZATION
PVT		PRESSURE, VOLUME, TEMPERATURE
PWR		POWER
QLDS		QUICK-LOOK DATA STATION
QTY		QUANTITY
QUAN		QUANTITY
R		RANKINE
RACS		REMOTE AUTOMATIC CALIBRATION SYSTEM
RASM		REMOTE ANALOG SUBMULTIPLEXER
RCS		REACTION CONTROL SYSTEM
RCVR		RECEIVER
		REMOTE DIGITAL SUBMULTIPLEXER
		RECEIVE
		REFERENCE
		REGULATOR
		RELEASE
		RESOLVER
		RADIO FREQUENCY
		RATE GYRO
		RATE GYRO ASSEMBLY
		RIGHT-HAND
		RELAY
		REDLINE
		RENDEZVOUS RADAR (LM)
		RANGE SAFETY COMMAND RECEIVER
		RANGE SAFETY OFFICER (CAPE)
		REAL TIME COMPUTER SYSTEM
		SAFE-AND-ARM
		STABILIZATION & CONTROL SYSTEM
		SPACECRAFT
		SECONDS
		SECONDARY
		SELECT
		SEPARATION
		SEQUENTIAL
		SUPERCRITICAL HELIUM (LM)
		SIGNAL
		SINE
		SPACECRAFT - LM ADAPTER
		SERVICE MODULE
		SERVICE MODULE JETTISON CONTROLLER
		SPIN MOTOR ROTATION DETECTOR
		SOLENOID
		SERVICE PROPULSION SYSTEM (SM)
		SUPERINTENDENT OF RANGE OPERATIONS
		SUPPLY
		RDSM
		REC
		REF
		REG
		REL
		RES
		RF
		RG
		RGA
		RH
		RLY
		R/L
		RR
		RSCR
		RSO
		RTCS
		S&A
		SCS
		S/C
		SEC
		SEL
		SE
		SEP
		SEQ
		SHE
		SIG
		SIN
		SLA
		SM
		SMJC
		SMRD
		SOL
		SPS
		SRO
		SUP

MISSION

SECTION

APOLLO 12

APPENDIX C

STAGE SUBSECTION

ABBREVIATIONS AND ACRONYMS

SYSTEM

DATE CHANGE NO.

BASIC
OCTOBER 2, 1969

PAGE

C-4

JOHN F. KENNEDY SPACE CENTER, NASA - LAUNCH MISSION RULES

REV	ITEM	DESCRIPTION
<u>ABBREVIATIONS AND ACRONYMS (CONTINUED)</u>		
SURF	SURFACE	CROSSFEED
S/V	SPACE VEHICLE	TRANSFER
SW	SWITCH	TRANSMISSION
SYNC	SYNCHRONIZATION	TRANSMITTER
SYS	SYSTEM	TRANSPONDER
TB	TIME BASE	YAW OR Y-AXIS
TBD	TO BE DETERMINED	YAW THRUST VECTOR
TCA	THRUST CHAMBER ASSEMBLY	Z
TE	TIMING ELECTRONICS	
TEMP	TEMPERATURE	
THR	THRUST	
TK	TANK	
TLM	TELEMETRY	
TM	TELEMETRY	
TOK	THRUST OK	
TVC	THRUST VECTOR CONTROL	
UDL	UPDATE LINK	
UHF	ULTRA HIGH FREQUENCY	
USB	UNIFIED S-BAND	
VAC	VOLTS, ALTERNATING CURRENT	
VAR	VARIABLE	
VATC	L/V TM CALIBRATION PROGRAM	
VDC	VOLTS, DIRECT CURRENT	
VEH	VEHICLE	
VEL	VELOCITY	
VHF	VERY HIGH FREQUENCY	
VIB	VIBRATION	
VLV	VALVE	
VPI	VALVE POSITION INDICATOR	
W/B	WATER BOILER	
W/G	WATER GLYCOL	
WQMD	WATER QUANTITY MEASURING DEVICE	

MISSION
APOLLO 12

SECTION
APPENDIX C

STAGE SUBSECTION
ABBREVIATIONS AND ACRONYMS

SYSTEM

DATE CHANGE NO.
BASIC
OCTOBER 2, 1969

PAGE
C-5