Missile Launch/Missile Officer (SM65F) Atlas Branch Department of Missile Training 22 January 1962 Sheppard Air Force Base, Texas

OZR1821B/3121B-4-IV Student Notebook

STUDENT ASSIGNMENT BOOK FOR LAUNCH CONTROL

INSTRUCTIONS TO STUDENT: Almost all of the questions are True or False; several questions require short answers, and the last question concerns a sequence of events. Indicate your answer along the left-hand margin. Questions whose answer is "false", indicate in the space below the question the correct answer.

16. The "Test Reset" pushbutton resets the system counter.

1. Major commands are electrical signals from one sequencer to another.

- 2. Minor incoming commands are called responders.
- The logic units generate minor incoming commands. 3.

19. The system counter will step when the advance relay is energised (and 4. "Missile Away" is a major command to the countdown sequencer.

- "Missile Away" is a major incoming command to the hydraulics sequencer. 5.
- "Pneumatics ready for chilldown" is a major outgoing command from the 6. pneumatics sequencer.
- "Commit lockup" is a major command incoming to the pneumatics sequencer. 7.

"Pod air conditioning on" is a major incoming command to the pneumatics 8. sequencer.

24. "Missile lift commit start" is a major outgoing command from the countdown

- "NOT STOP RAPID LOAD" is a minor incoming command to the PLCU. 9.
- "NOT STOP RAPID LOAD" is a major incoming command to the LOX sequencer. 10.
- 11. The "rapid LOX Load" light on the LCOC becomes green when the 95% sensor becomes wet.

FOR INSTRUCTIONAL PURPOSES ONLY

Student Notebook

- 12. "Fuel level" once red in countdown (during the check) remains red.
- 13. "Helium load" light is controlled by P.S. 322.
- 14. The A/P gyro motors are synchronous motors.
- 15. SMRD is enabled 4 minutes 2 seconds after start of countdown.
- 16. The "Test Reset" pushbutton resets the system counter.
- 17. The "STOP RESET" pushbutton de-energizes the advance relay.
- 18. "Missile power internal" is a major outgoing command of the LOX sequencer.
 - 3. The logic units generate minor incoming commands.

Massile Launch/Missile Officer (SM657)

question the correct answer.

- 19. The system counter will step when the advance relay is energized (and the homing relay energized).
- 20. Relay Alk4 is in the PLCU sequencer.
- 21. The "LOX level sensing" light is not enabled to illuminate until 2 minutes after the start of LOX rapid load.
- 22. "LOX LOAD" is a major incoming command to the PLCU.
- 23. "A/P ON" command indicates 400 CPS to the A/P gyros.
- 24. "Missile lift commit start" is a major outgoing command from the countdown sequencer.
- 25. The Countdown responder is used for the countdown sequencer simulation in the responder mode.

11. The "rapid LOX Load" light on the LCCC becomes green when the 95% sensor

YOR INSTRUCTIONAL PURPOSES ONLY

"generate look-up" disables "look out".

26. Why must all LSR transfer switches and respective cables be re-positioned for a responder mode simulated countdown?

27. In what 2 ways may the advance relay be energized?

- 28. How is homing of the stepping switch wiper arms accomplished?
- 29. How is the tddo relay associated with the present command section kept energized when the wiper arm is on the zero position?

30. What is the function of the following pushbuttons?

- a. step b. stop reset of and encourse dismos sit it bernance "Jucical" 11 c. itest reset "of chi-und bud bis redue of muter block idgif
- 31. What is the function of the following toggle switches?
 - a. major outgoing command the application of the second second second second second second second second second
 - b. responder power
 - c. test power

32. What conditions enabled the following relays to be energized?

- a. stepping coil
- b. homing relay
- c. minor (& major incoming command) fault relay
 - d. stop relay oled begyoth enusering , inst leut elieste edt al 189 [?
- 33. If the system status light were red, and the system counter readout was 0000. you would suspect a ______outgoing command fault.

Periode the planetics system in emergency.

15. Instrument air less than 50 PSI after preumatics internal would not place the proumatics system in emergency.

Greater than 67 PSI in the missile fuel tank would place the preumatics system in emergency anytime. E

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- 34. If the fuel lower and raise button were depressed simultaneously, the bern fuel pressure would raise.
- 35. "Commit lock-up" disables "lock out".
- 36. "Internal memory" is associated with "lock out".
- 37. The "Launcher platform down and locked" in the abort sequence returns the PCU to phase II. means and div betalooss value obt add at well . 23
- 38. The "launcher platform down and locked" in the abort sequence commands the return to pneumatics external. would and to maid only and all defined as defined.
- 39. If "lockout" occurred in the commit sequence, the "Pneumatics Internal" light would return to amber, and the "Hyd-Pneu-LN2/He" light would go red.

I. What is the function of the following toggle switches

- 40. Going to "emergency" after "pneumatics-internal" would be a mandatory abort.
- 41. If LOX tank pressure became less than 23.5 PSI after pneumatics-internal, it would be a mandatory abort situation.

a. stepping coil b. howing relay

- 5

- 42. The emergency relay would energize if 2 SEC after reaching greater than 53 PSI in the missile fuel tank, pressure dropped below 53 PSI.
- 43. Differential pressure low after pneumatics internal would place the operation system on emergency.
- 44. Less than 53 PSI in the missile fuel tank after pneumatics internal would not place the pneumatics system in emergency.
- 45. Instrument air less than 50 PSI after pneumatics internal would not a place the pneumatics system in emergency.
- 46. Greater than 67 PSI in the missile fuel tank would place the pneumatics system in emergency anytime.

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47. The meters on the LCOC are actuated by the PCU.

48. A8K8 is in the pneumatics sequencer.

49. "Pressure Mode" green always means automatic pressurization mode.

50. #1 bottle less than 4000 PSI would cause the emergency relay to energize.

51. #2 bottle less than 4000 PSI would cause the emergency relay to energize.

52. It is not possible to start countdown in emergency pressurization.

53. V107, 108 close if emergency relay is energized. It would no establish . To

54. GN2 in standby is monitored for being less than 1450 PSI. some the set

TARGET PATCH

If the target selection is changed in countdown, it would conceivably delay 55. 56. The target selector relay is a magnetic latching relay. "Target lockout" is disabled after the start of the commit sequence. 57. 58. The R/V sequencer monitors that burst is selected. Re-selecting target in standby would cause the "F/C & R/V" light to Burst altitude is selected at the Prelaunch Monitor. 59. Guidance goes on memory at "missile lift commit start". 60. "Start commit" places guidance on memory. 75. "Start Countdown" causes guidance to begin their countdown. 61. "Guidance on Memory" prevents reselection of target.

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- 62. The burst select command goes to the Prelaunch Monitor via A25.
- 63. A green Target "A" selected light involves an acknowledgment from the guidance sequencer only.
- 64. If a nuclear blast occurs, the guidance system is commanded to go on memory.
- 65. If a nuclear blast occurs, the "Guidance Commit" light will illuminate amber.
- 66. After 1800 SEC of a nuclear blast, the guidance fail light will illuminate amber.
- 67. Guidance on Memory will null the A/P gyros.
- 68. The A/P gyros nulled will place guidance on memory.
- 69. The "Target Select" lights do not require coarse alignment for the green illumination.
- 70. If the target selection is changed in countdown, it would conceivably delay the total countdown time.
- 71. Guidance failing to go on memory will light the "ABORT" light red.
- 72. The inverter shutting off will cause guidance to re-run a second target selection check.
- 73. Re-selecting target in standby would cause the "F/C & R/V" light to illuminate red.
- 74. Guidance goes on memory at "missile lift commit start".
- 75. "Start Countdown" causes guidance to begin their countdown.

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	OZR1821B/3121B-4-IV	
76.	The normal guidance countdown is about 5 minutes.	.02
77.	"R/V Burst Selected" is required for the "Ready for Commit" indicator.	
āby.	MALFUNCTION PATCH QUIZ " JIGHT "Sbor rebrogeed"	
78.	The malfunction patch monitors all of the logic unit sequencers.	93.
79.	There are indicators which could conceivably illuminate amber and red simultaneously.	, <i>4</i> Q
80.	The motor generator is monitored by the "400 cycle power"light.	95.
81.	The emergency battery is monitored by the "28V DC power" light.	.ðę
82.	The "missile inverter" light requires the countdown bus energized for illumination.	97.
83.	"Guidance Fail" red indicates a major malfunction in the guidance system.	.80
84.	"R/V Safe" is red when the R/V has discontinuity.	
85.	.ber galtanimili mort "show rebroques" streverg "avoidance) trate" "A/P Fail" amber indicates a fine heater malfunction.	.99
86.	"A/P Fail" red would cause "F/C & R/V" to illuminate red.	100.
87.	"Pod Air Conditioning On" is required for the missile ground power sequence to be 'ready in standby'.	er
88.	An amber "Inflight Helium Supply Low" light indicator infers #1 or #2 bott less than 4000 PSI in standby.	le
89.	An amber "Inflight Helium Supply Low" light in countdown indicates both inflight helium bottles are less than 4000 PSI.	
	7	

- 90. "Nuclear blast" illuminates either red or out.
- 91. A "M/L NO-GO" in countdown would illuminate "M/L FAIL" red.
- 92. "Responder Mode" light will not illuminate red (for malfunction) in standby.
- 93. The "400 cycle power" light is monitoring the missile ground power sequencer.
- 94. "28V DC power" red indicates the rectifier bus has failed.
- 95. The Inverter not being on in countdown, would disable the "missile inverter light.
- 96. A marginal malfunction would cause "Guidance Fail" to illuminate amber.
- 97. "R/V Safe" monitors the R/V sequencer.
- 98. An amber "responder mode" light indicates all LSR transfer switches placed a in to the responder mode position and cables changes made for the simulated countdown (NOT COUNTING LAMP TEST).
- 99. "Start Countdown" prevents "Responder Mode" from illuminating red.
- - 87. "Fod Air Conditioning On' is required for the missile ground power sequencer to be 'ready in standby'.
 - 88. An amber "Inflight Helium Supply Low" light indicator infers #1 or #2 bottle less than 4000 FSI in standby.
 - 89. An amber "Inflight Felium Supply Low" light in countdown indicates both inflight helium bottles are less than 4000 PSI.

STANDBY STATUS PATCH

101.	The	'Engines & Ground Power" light m	onitors the:	
		alve	Fuel A/B Fill & Drain V	
	8	SPGG Heaters	LOX A/B FILL & Resta Va	
1	b.	Guidance Power On	L-1 (fine) valve	
	c.	S/P Fine Heaters	svlav (bigar) S-I	
	d.	Emerg. Batt. Connected	L-16 (drain) valve	
	e.	Rectifier Bus	N-60	
	ŕ.	Missile Inverter Voltage		
	g.	Missile Inverter Frequency	LOX mizsile tank sensor	- 1
	h.	Ground Voltages	Remote switches of fuel	
	1.	Ground Frequencies (M.G.)		
].	MGP Seq. Power Un	and a second second	- 201
		ent atoli	non addr. The s Astribus	SET .CMA
102.	The	'F/C & R/V" light monitors the:	"WO HEST"	. 8
		A/P Fine Hesters	ingine valve Hatters O	- d
	h.	A/P P/V Rate Heaters (Vill	"System Power on" (Fact	
	0.	R/I I/I Nave neavers	AMF Logic Racks	
	d.	Guidance System	Pod Air Conditioning On	.9 (
	e.	R/V System in Tactical		and and
on patch,	f.	R/V Branch Power On	youme a red light (due to)	Tevr . corr
	g.	A/P Sequencer in Remote	TTLA TOTAL BRIERS BRIER AUDINE	9DJ
	h.	Guidance Sequencer in Remote	the standard has a selfa	307 2012
ready	i.	R/V Sequencer in Remote	antion of the Parchiter	
	j.	Failure at F/P to arm in comm	it sequence.	245.7
103. 	The	"HYD-PNEU-LN2/He" light monitors	the a red indication	
	8.	Inflight Helium Pressure> 295	0 in Countdown	.79V
	Ъ.	PDU valves V-50. V-52		
	c.	PDU Valves V-26, V-37	in it if the board of the	- state over r
EI7	d.	AC available for the HPU	1828 aus Fairtelance staral	MIL STUR
	e.	Valve position of the HPU		ntee
	f.	Inflight Helium Bottles above	1450 PSI	
	g.	Inflight Helium Bottles Above	4000 PSI	110. At A
	h.	Pneu. in Phase I, and "Not Lo	cked Out"	indra
	1.	Mass Controller 9-A		
	j.	HCU Valves Ready in Standby		
		NOTTONS EIFFATS	COUNTROOM	
		the de file de la serie de la serie de la serie de la		
	nt a	infore that the missile AC & RC	en "Missile Power" light f	III.TA ZD
	at e.	nfers that the missile AC & DC	sen "Missile Power" light i	111.7 A gra
	ai a.	afers that the missile AC & DC	sen "Missile Power" light i mance, /// -A+-₽	111. TA gr
	at e.	nfers that the missile AC & DC :	een "Missile Power" light i rance, // - <i>A4-E</i> >	111.7 Å gr tole
i avis	at a. v ea	nfers that the missile AC & DC : rg that both the TSHE & the engi	sen "Missile Power" light i rance, /// .AA-Dower" light infe	111. TA gra tole

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104. "LOX & Fuel" light monitors the

8.0	PLCU in Standby (only)	orit
b.	Fuel A/B Fill & Drain Valve	
C.	LOX A/B Fill & Drain Valve	1 - 201
d.	L-1 (fine) valve	
e.	L-2 (rapid) valve	0.
f	L-16 (drain) valve	
Ø.,	N-60	+ 13
h.	Fuel level egatiov retreval alisatM	
4	INY missile tank sensors vonesperi retreval elissik	.8
4	Demote switches of fuel (IOV DICII Besselov Baboro	· · d
90	Nemore swreenes or ruer (HOV' LTCO setonensers punct)	.1

The "Facility & M/L" light monitors the 105.

a .	"TSHB ON"	The "F/C & R/V" Light monitors
b.	"Engine valve Heaters On"	anational and the a
C.	"System Power on" (Facility)	
d.	AMF Logic Racks	o bit Li Mate Managers
e.	Pod Air Conditioning On	remerguri ongiri vo

106. Everytime a red light (due to malfunction) occurs in the malfunction patch, the standby status patch will also have a red indicator.

Guidance System

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- 107. Normally, a red indicator in the Standby Status Patch causes the "Ready For Countdown" light to extinguish.
- 108. There could be a red indication in the Standby Status patch in Countdown, yet the countdown would not be effected. 1 B
- 109. The relays controlling the Standby Status Patch are in the countdown sequencer. Valve position of the HPU

At the start of the Abort Sequence, the "F/C & R/V" light would 110. extinguish.

COUNTDOWN STATUS SECTION

HOU Valves Ready in Standby

- 111.] A green "Missile Power" light infers that the missile AC & DC is in tolerance. AT AA-D
- 112. T A green "Heaters ON" light infers that both the TSHB & the engine valve heaters are on.

- 113. F The "Missile Battery Activated" light goes amber at start of countdown.
- 114. The "Missile Battery Activated" light normally goes green 2 minutes after it went amber.
- 115. "Eng Missile Power On" is required for "Eng. & Missile Power Ready".
- 116. "A/P ON" normally illuminates amber for 90 seconds.
- 117.7 A/P Test" normally illuminates amber 4 minutes after the start of countdown.
- 118. Hydraulic pressure at 2000 PSI (+250), is a requirement to initiate the A/P Drift Test.
 - 134. "Pneumatics Ready for Commit" requires>2950 in the Inflight Halium
- 119.7 "Guidance Ready" normally illuminates amber 2 SEC after the start of countdown.

135. F "Helium Ready for Commit" requires greater than 4500 PSI in the HCU.

120.7 Engine position is monitored during autopilot warmup.

136.7 "LA LOAD Complete" requires initially head pressure of the LE storage tank above 75 PSI gummawa A/A MIM 4 the end of the 4 MIM A/P warmup.

122. SMRD is disabled after the A/P Drift Test.

123. Guidance Ready requires a satisfactory check of the selected target with pre-arm being generated.

139. "ION Line Filled" amber requires M-5 closed.

124. R/V Burst Selected is required for "F/C & R/V Ready".

125.7 A/P Ready for Commit requires that relay A32K6 is de-energized.

126. "R/V Tactical" is also required for R/V Ready for Commit.

127. / If "A/P Fail" and "F/C & R/V" went red during countdown due to an engine position failure, you would abort.

- 128. F If "A/P Fail" went amber during a countdown, you would abort. AMSER - MARGINAL
- 129. f P/Y Rate Heaters out of tolerance during countdown would prevent "F/C & R/V Ready" from illuminating green.
- 130. The "Pneumatics in phase II" indication requires 'stop check fuel' for the amber illumination.

131. 7 "Hydraulic Pressure" normally illuminates amber at the start of Countdown.

- 132. T"LN2 Load" illuminates amber at the start of countdown.
- 133. F "Helium load" illuminates amber at the start of countdown. 2MIN AFTER
- 134. F "Pneumatics Ready for Commit" requires>2950 in the Inflight Helium bottles. 4500 HCV
- 135. F"Helium Ready for Commit" requires greater than 4500 PSI in the HCU.
- 136.7 "LN₂ LOAD Complete" requires initially head pressure of the LN₂ storage tank above 75 PSI.
- 137. T"Helium Load" green depends on P.S. 321 in the HCU.
- 138. F"LOX Line Filled" goes amber at "stop check fuel". PNEU IN PHASE IT GREEN and state of the stop of the stop
- 139.7 "LOX Line Filled" amber requires N-5 closed. VENT VALVE ONT TO berluper at betteled tarua VA 1.491
- 140.7 "LOX Rapid Load" amber normally indicates rapid load of LOX in progress with no double sensor failure.
- 141. TA double sensor failure at the 95% level during countdown would cause the LOX Rapid Load light to illuminate green after chilldown is complete.
- 142. T If a double sensor failure occurred at the 99% level just after LOX chilldown was complete, "LOX Rapid Load" and "Fine LOX Load" would illuminate green.

143. At 99.25%, a 40 SEC commit delay timer is started.

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144. FA 15 second timer is started when the LOX level drops below 99.25%. AFTER ABOVE 99.25%

145 - Two 50 SEC timers are started when the 99% sensor becomes wet.

146. The blowdown value N-80 is opened for 40 SEC at the end of line drain.

147. - "LN2 Load Complete" requires a 6 MIN TDDO relay to "drop out". 3MIN dals "Logard to be a factor of the second second to be a factor of the second second to be a factor of the second se

148.7 Valve V-213, the LN2 medium load valve, closes at "start commit".

149. F"Inflight Helium Supply Low" amber in countdown infers a mandatory abort. MARGINAL

150. Fuel tank pressure less than 67 PSI is one of the requirements of "Pneumatics Ready for Chilldown."

151. A satisfactory fuel level is required for the signal "Stop Check Fuel" to be generated.

152. / The engines cannot be monitored in countdown if the HPU output pressure is less than 1750 PSI.

153. "Fuel Level Okay" is required for the LOX & Fuel Ready" light, but fuel level monitoring is disabled after "Stop Check Fuel".

154. F The Flight Programmer is signaled to reset to zero at "Start Countdown" and "Start Commit". Start Countdown CHECKED START C/P DNLY

The set SEC stants lift delay timer is started at the start of the commit

The "Programmer Armad" light illuminates amber at "commit internal." 13

COMMIT PATCH

- 155. The launch enable signal is not required after the start of the commit sequence.
- 156. F"LOX & Fuel Ready" is required during the commit sequence.
- 157.7 The launch enable light illuminates after the start of the commit sequence if launch is enabled.
- 158. 7 An Amber "Power Internal" light suggests missile power being transferred to internal within two SEC.
- 159. *T*A Green "Power Internal" light indicates the missile inverter is within tolerances.
- 160. T If the inverter has shut off due to failure to start commit, it is restarted with the "Start Commit" commanded by depressing; the start commit pushbutton.
- 161. 7 The "Pneumatics Internal" light illuminates amber after missile power internal.

152. / The engines cannot be monitored in countdown if the HPU output pressure

.is less than 1750 PST.

- 162. The "Pneumatics Internal" light illuminates green when phase III is complete.
- 163. T The"LOX Commit" light illuminates amber after missile power internal.
- 164.7 "Commit Internal" is a summary condition required for the LOX Commit light 'green'.
- 165. F The SEC missile lift delay timer is started at the start of the commit sequence.

166. T The "Programmer Armed" light illuminates amber at "commit internal."

- 167. The programmer may be arming while the missile is being lifted up.
- 168. T A SEC TDPU relay energized, and commit internal is required for "LOX Commit"green.
- 169. TThe Missile power internal signal turns off the non-essential power bus.

the "INVERSE NOLD CUPON" 300 SHC TOPU relay.

- 170. T "Site Soft" is one of the requirements for an amber "M/L Up & Locked" light.
- 171. T"Guidance Commit" illuminates amber at "missile power internal."

ferman after receiving the engine start command.

- 172. The Flight Programmer must arm within 25 seconds after "Commit Internal".
- 173. "Commit Lockup" but not "Engine Start" would cause the "Engine Start" light to illuminate amber.
- 174. The 5 second engine shutoff timer is started when the "Engine Start" illuminates amber.
- 175. The 'missile away' signal operates from the 'missile on stand' microswitch on the launcher platform.
- 176. F There are 3 conditions that would cause the abort light to illuminate red.

177. F The abort light would illuminate amber if the missile is not up and locked minutes after the start of the commit sequence. 165000 LOX COMMIT GREEN

178. The missile power internal signal causes guidance to go on memory.

179. The missile power internal signal causes the non-essential power to be turned off.

180. The missile power internal signal closes the boiloff valve.

- 181. The missile power internal signal initiates phase III pressurization.
- 182. F The missile power internal indicator would go from green back to amber if the inverter fails after phase III.

OUT

183. 7 The commit sequence is delayed 60 SEC if the inverter is shut off due to the "INVERTER HOLD CUTOFF" 300 SEC TDPU relay.

"Site Soft" is one of the requirements for an amber "M/L Un & Koehed"

184. 7 Guidance not inertial illuminates the abort light red.

- 185. The abort light illuminates red if an engine does not start within 5 seconds after receiving the engine start command.
- 186. T"F/C & R/V Ready" is one of the commands required for "Commit Internal".

The Fitzbi Froarsesser must arm within 25 seconds after "Commit Inte

187. Time-wise, pneumatics-internal is the last event to occur before "Commit Internal."

174. The 5 second engine shutoff timer is started when the "Engine Star

188. F The commit internal signals cause the flight programmer to remain at zero time.

189. The flight programmer is caused to arm by the commit lockup signal.

- 190. T Non-essential power off is a requirement for "M/L Commit Start."
- 191. J"Commit Internal" is a requirement for "Commit Lockup."
- 192. ["Commit Lockup" commands guidance to go inertial.
- 193. Guidance must be on inertial within one SEC after commit lockup to enable engine start.
- 194. An inverter failure after commit lockup will not necessarily stop the commit sequence.

- 195. The start commit relay A45K7 is de-energized by starting the abort sequence.
- 196. The "START ABORT" command causes 'power internal' to revert to 'power external'.
- 197. After missile power internal the inverter may fail, but power will remain internal until the start of the abort sequence.
- 198. (Missile battery in tolerance (A45K1) is a requirement for commit internal.
- 199. The Flight programmer 'armed' is a requirement for "Commit lockup."
- 200. "Guidance On Inertial" signal unnulls the A/P displacement gyros.
- 201. An A/P displacement gyro spin motor failure in the commit sequence prior to commit-lockup would prevent launch.
- 202. The A/P fine heaters out of tolerance after the programmer is armed in the commit sequence would not stop the launch.
- 203. F If the SPGG heaters were out of tolerance in the commit sequence, commit lockup would be disabled.
 - The "Rydraulic System Off" light would illuminate green immediately after LOX alsoile tank drain is complete providing 'missile away' had
- 204. HPU Oil Evacuate normally occurs at commit internal, but if it failed to occur, the commit sequence would be disabled.

sequence when the launcher platform is down and locked. ABORT PATCH

205. The "site hard" light goes amber immediately after the "start abort" pushbutton is depressed.

The KOK drain valve L-16 will open in the abort sequence provided abort is external, the LOX missile tank is less than 8 FGI (FS 326), and the LOX

206. The "site hard" light goes green when the launcher platform is down and locked during the abort sequence.

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- 207.7 The "Abort External" light illuminates amber when the launcher platform is down and locked in the abort sequence.
- 208. T Four summary conditions are required for the command "Abort External."
- 209. The "Abort Complete" light would illuminate amber if the abort pushbutton is depressed in countdown after stop check fuel, but prior to commit lockup.
- 210. T LOX missile tank drain command is dependent upon "abort external."
- 212. I LOX missile tank drain requires a minimum of \$5 minutes.
- 213. 7 "Helium Vent Complete" depends on a pressure switch (322) and a 10 minute timer.
- 214.7 "LOX drain complete" command signals the PCU to return to phase I.
- 215. T"LOX drain complete" command would turn off the HPU.
- 216. The "Hydraulic System Off" light would illuminate green immediately after LOX missile tank drain is complete providing 'missile away' had occurred.
- 217. The "Pneumatics in Phase I" light normally illuminstes amber in the abort sequence when the launcher platform is down and locked.

218. The "ABORT COMPLETE" light green infers that countdown start is disabled.

219. / The LOX drain valve L-16 will open in the abort sequence provided abort is external, the LOX missile tank is less than 8 PSI (PS 326), and the LOX storage tank is less than 25 PSI, and the drain relay (A15K3) is energized.

18

S.L.

220.5 PCU in phase I is accomplished by positioning valves 118 and 120 via the "S/B ON" button on the pneumatics sequencer. 235. Cone of the conditions required to de-emergize the start countdown relays is the venting of the ambient helium bottle. Phase III pressure is initiated by "stop check fuel" command. 221. 222. All logic unit sequencers have "system in standby" lights. 237. An abort situation is present if the 95% LOX sensors fail. The "System in Standby" light illuminate green only (not counting 223. lamp test). 224. The "System Status" light are on the responders. 225. F LSR self test is performed in responder mode. 240. / Commit Locian occurs at T-1 SEC. 226. The HPU is started when the A/P gyros are started. 227. The HPU is turned off at Missile Away. 228.7 The A/P gyros are unnulled at two times in the countdown. 229. F The "fuel level" light is directly associated with the "LOX & Fuel" lights. V-213, 214, 215 open at start of countdown. 230. / The SPGG heaters are monitored by the AC Power Distribution Box. 231. F One of the conditions required to turn off the non-essential power bus is commit internal. POWER INTERNAL to and and and and and and and and Missile power internal causes guidance to go on Memory. 232. "Heaters On" light on the LCOC is directly associated with the facility 233. sequencer. 234. The LOX level sensors are directly associated with the "LOX & Fuel" 250. 7 7-26 is in the PUU, and is opened 2 minutes after start of . tigilown. 19

220. FOU in phase I is accouplished by posibioning valves 118 and 120 via
the "S/B GH" button on the preumstics sequencer.
235. F One of the conditions required to de-energize the start countdown relays is the venting of the ambient helium bottle.
221. F Phase III pressure is initiated by "stop check fuel" command.
236. F Phase II is initiated by "Pneumatics ready for chilldown."
237. LAn abort situation is present if the 95% LOX sensors fail
223. The "System in Standby" light illuminate green only (not counting
238. Vio2 is on the missile.
239. Joil evacuate occurs at commit internal.
225. 1 ISR self test is performed in responder mode.
240. Commit lockup occurs at T-1 SEC.
226. The HFU is started when the A/P gyros are started.
241. F The Abort light is in the abort patch.
242. "NOT STOP FINE LOAD" command controls rapid topping.
228. T The A/P gyros are unmilled at two bimes in the countdown.
243. Rapid topping stops at 99.25%.
229. F The "fuel level" light is directly associated with the "LOX & Fuel"
244. Tv-213, 214, 215 open at start of countdown.
LN2 LOAD
245. T V-215 closes at commit internal. V betoting and aretsed D098 and 1.088
FINE LOAD
246. TLOX drain complete shuts off the HPU if it is running.
21.7 Keton shock fiel more the hold off water
ENABLES assues landing rayon sites MABLES assues landing rayon sites MABLES assues
248. F Emergency pressurization always closes the boil-off valve.
sequencer.
249. / There are 11 ways to enable emergency pressurization.
234. The LOX level sensors are directly associated with the LOX & Fuel
250. V V-20 is in the PDU, and is opened 2 minutes after start of countdown.
He LOAD es
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0ZR1821B/3121B-4-IV 251. TP.S. 321 monitors> 2950 PSI and is in the HCU. If the oil evacuation of the HPU did not occur in the commit sequence, 252-7 it would not stop the commit sequence. 253. 7 Relay A32K6 is in the autopilot sequencer. 254. F Normally closed relay contacts are labeled A1, A2. 255. The launch enable light could illuminate after the start commit button is depressed. 256. F The LSR's contain 14 responders. 13 reap. 257. TL-7 is a summary for LOX in standby. "Rapid 10 258. Topping tank pressure during chilldown is 135 PSI. 259. The hydraulic sequencer is not in relay logic #1.

- 260. The prime purpose of the LSR's is checkout of the logic units and LCOC.
- 261. F The P.U. system is reset at start of countdown.

262. The stop reset pushbutton is on the LSR's.

263. 7 The emergency battery is required to be connected before a countdown can be started.

264. FAll logic unit sequencers have remote-local switches. 265. T Guidance power may be turned on at the missile ground power sequencer.

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266. FAll sequencers are used in countdown. 25 0805 < another 195 . 8.9 185

267. All relay contacts are drawn in their normally de-energized position.

- 268. List the following LCOC lights in the order they illuminate from start of countdown for the color stated: Assume Satisfactory Countdown. "Hydraulic Pressure" Green a. "LN2 Load" Amber ledel one stostage yeley beed yeley of the stostage with the store of the store b. "Heaters On" Green C. "A/P On" d. "LOX Line Filled" Amber e. f. "Pneumatics in Phase II" L-7 is a summery for LON in standby. "A/P Test" g. "Rapid LOX Load" Amber h. i. "Missile Battery Activate" Green "Engine/Missile Power Ready" Green J. "Engine Start" Green k. 1. "Power Internal" Green "LOX Commit" Green m. "Guidance Commit" Amber n. "Guidance Commit" Green to al notivinaug teaer gots ad 1.808 0.. "Ready for Commit" Green p. "Launch Enabled" Green q. "Pneumatics Internal" Green r. "Programmer Armed" Amber s. Teonet
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u. "Site Hard" Amber

alle.

- v. "Abort External" Amber
- w. "Pneumatics in Phase I" Amber
- x. "Abort Complete" Amber
- y. "Abort" Red
- z. "Pressure Mode" Red