1
00:00:02,639 --> 00:00:09,100
CAPCOM 11, we're really amazed at the quality
of the picture up in the tunnel.

2
00:00:09,100 --> 00:00:10,389
It's really superb.

3
00:00:10,389 --> 00:00:11,389
Over.

4
00:00:11,389 --> 00:00:14,700
SC Hey, we're about to open our hatch now.

5
00:00:14,700 --> 00:00:15,700
CAPCOM Rog.

6
00:00:15,700 --> 00:00:19,460
PAO Buzz Aldrin reporting that he's halfway
into the LM.

7
00:00:19,460 --> 00:00:21,730
His view is inside the LM cabin.

8
00:00:21,730 --> 00:00:28,130
CAPCOM Hey, that's a great shot right there.

9
00:00:28,130 --> 00:00:34,090
We see you in there.

10
00:00:34,090 --> 00:00:41,239
Guess that's just Neil and Mike.

11
00:00:41,239 --> 00:00:44,820
Better be anyway.

12
00:00:44,820 --> 00:00:47,520
CAPCOM We see you waving.

13
00:00:47,520 --> 00:00:51,890
PAO Aldrin has apparently carried the camera
into the LM with him and showing us Neil Armstrong

14
00:00:51,890 --> 00:00:56,030
and Mike Collins back in the CSM.

15
00:00:56,030 --> 00:00:58,399
CAPCOM Hello, Apollo11, Houston.

16
00:00:58,399 --> 00:01:03,519
We’re standing by to watch your set up on
the PTC at any time.

17
00:01:03,519 --> 00:01:06,480
You can start off at the VERB 49.

18
00:01:06,480 --> 00:01:07,480
Over.

19
00:01:07,480 --> 00:01:09,009
SC Wilco.

20
00:01:09,009 --> 00:01:15,659
We’re just finishing up the probe and about
to close up the hatch here.

21
00:01:15,659 --> 00:01:24,660
We’re going to be a couple minutes late
probably starting on the PTC.

22
00:01:24,660 --> 00:01:30,260
CAPCOM Roger, no sweat, 11.

23
00:01:30,260 --> 00:01:33,620
We’re standing by.

24
00:01:33,620 --> 00:01:34,740

Over.

25
00:01:34,740 --> 00:01:36,869
PAO This is Apollo Control.

26
00:01:36,869 --> 00:01:43,770
That was Nell Armstrong reporting that they
are now reinstalling the probe and drogue,

27
00:01:43,770 --> 00:01:52,289
which is Just about on the flight plan schedule,
and they reported that they would be putting

28
00:01:52,289 --> 00:01:57,039
the spacecraft in a slow roll shortly to maintain
passive thermal control.

29
00:01:57,039 --> 00:02:02,630
In that mode the spacecraft rotates at the
rate of about 3 revolutions per hour to maintain

30
00:02:02,630 --> 00:02:06,200
even heating.

31
00:02:06,200 --> 00:02:12,180
We have a precise time on that sphere of influence
change, the point of which the moon - for

32
00:02:12,180 --> 00:02:13,760
calculation purposes here.

33
00:02:13,760 --> 00:02:18,920
Mission Control, comes under the predominate
influence – the spacecraft comes under the

34
00:02:18,920 --> 00:02:24,810
predominate influence of the moon's gravitational
field, and we now calculate that that will

35

00:02:24,810 --> 00:02:32,670
occur at 61 hours, 39 minutes, 55 seconds,
ground elapsed time.

36
00:02:32,670 --> 00:02:41,180
CAPCOM Hello, Apollo 11, Houston.

37
00:02:41,180 --> 00:02:45,940
Mike, there's no wait required where REG's
are steady you can proceed on.

38
00:02:45,940 --> 00:02:46,940
Over.

39
00:02:46,940 --> 00:02:48,580
SC I'm doing it, Charlie.

40
00:02:48,580 --> 00:02:50,090
CAPCOM Roger.

41
00:02:50,090 --> 00:03:00,269
SC The tunnel's all taken care of and drogue,
probe and hatch are all back in.

42
00:03:00,269 --> 00:03:02,150
CAPCOM Roger.

43
00:03:02,150 --> 00:03:04,030
Copy · Out.

44
00:03:04,030 --> 00:03:07,360
CAPCOM Hello, Apollo 11, Houston.

45
00:03:07,360 --> 00:03:11,560
We have some new additions to your alternate
contingency checklist, if you would break

46
00:03:11,560 --> 00:03:13,150
that out.

47
00:03:13,150 --> 00:03:14,159
Over.

48
00:03:14,159 --> 00:03:17,190
SC Stand by.

49
00:03:17,190 --> 00:03:20,220
SC Okay, Houston.

50
00:03:20,220 --> 00:03:24,260
It’s ready to copy.

51
00:03:24,260 --> 00:03:27,290
CAPCOM Roger, 11.

52
00:03:27,290 --> 00:03:29,849
If you'll turn to page F/2-22.

53
00:03:29,849 --> 00:03:31,260
Over.

54
00:03:31,260 --> 00:03:36,989
SC Okay, I have F/2-22.

55
00:03:36,989 --> 00:03:40,439
CAPCOM Roger, Nell.

56
00:03:40,439 --> 00:03:45,430
Under column L - that's column Lema, line
06.

57
00:03:45,430 --> 00:03:53,520
The new data is 00001.

58
00:03:53,520 --> 00:04:00,030
Line 07, the new data is 02134.

59
00:04:00,030 --> 00:04:02,900
Over.

60
00:04:02,900 --> 00:04:24,160
SC Okay, I have in F/2-22, column Lema, item
6, 00001.

61
00:04:24,160 --> 00:04:26,770
Item 7, 02134.

62
00:04:26,770 --> 00:04:32,000
CAPCOM Roger, that's correct.

63
00:04:32,000 --> 00:04:35,930
Thank you much.

64
00:04:35,930 --> 00:04:37,240
Out.

65
00:04:37,240 --> 00:04:41,160
CAPCOM 11, Houston.

66
00:04:41,160 --> 00:04:51,060
For your information, those 2 entries are
an update to your Delta-H that we have already

67
00:04:51,060 --> 00:04:53,590
uplinked into the CMC.

68
00:04:53,590 --> 00:04:55,150
Over.

69
00:04:55,150 --> 00:04:58,260
SC Roger.

70
00:04:58,260 --> 00:05:01,370
Thank you.

71
00:05:01,370 --> 00:05:16,740
SC Well, what was I marking on, Charlie, about an 18 parameter line or what?

72
00:05:16,740 --> 00:05:35,060
CAPCOM Our update puts you to the Delta-H to 35 parameters, Mike.

73
00:05:35,060 --> 00:05:38,730
Over.

74
00:05:38,730 --> 00:05:46,060
SC Okay.

75
00:05:46,060 --> 00:05:54,450
CAPCOM Hello Apollo 11, Houston.

76
00:05:54,450 --> 00:05:59,400
We've got some switch positions for you for the high gain, over.

77
00:05:59,400 --> 00:06:03,320
SC Okay, go ahead.

78
00:06:03,320 --> 00:06:06,260
CAPCOM Roger, Buzz.

79
00:06:06,260 --> 00:06:14,000
Select BRAVO, OMNI, high-gain track to manual beam wide, over.

80
00:06:14,000 --> 00:06:21,480
SC Okay, Bravo, OMNI track manual and beam Y.

81
00:06:21,480 --> 00:06:31,430
CAPCOM Roger, and your high-gain angles are minus 50 on the pitch, 270 on the yaw, over.

82
00:06:31,430 --> 00:06:41,370
SC Okay, going there now.

83
00:06:41,370 --> 00:06:47,620
CAPCOM We have some updates and some things
we'd like to talk to you about, if you aren't

84
00:06:47,620 --> 00:06:49,460
in the middle of your meal.

85
00:06:49,460 --> 00:06:55,270
If it's convenient any time for you, we're
ready with some updates.

86
00:06:55,270 --> 00:06:57,920
Over.

87
00:06:57,920 --> 00:07:09,370
SC What are the updates going to apply to?

88
00:07:09,370 --> 00:07:11,120
CAPCOM Roger.

89
00:07:11,120 --> 00:07:19,570
We have a couple of changes on the LM mission
rules NO/GO for your NO/GO card, Neil.

90
00:07:19,570 --> 00:07:26,660
One slight change on the APS DPS fuel and
temp pressure

91
00:07:26,660 --> 00:07:32,360
cards, and we have a change to the procedure
for the secondary radiator leak check, which

92
00:07:32,360 --> 00:07:41,210
is to be formed at - performed at 71 hours
tomorrow, and also some indications that we

93
00:07:41,210 --> 00:07:47,240
have a couple of landing site obliques stowed
in the wrong place.

94
00:07:47,240 --> 00:07:48,840
Over.

95
00:07:48,840 --> 00:07:58,370
SC Okay, if any of those in the flight plan.

96
00:07:58,370 --> 00:08:00,950
The secondary radiator, for example.

97
00:08:00,950 --> 00:08:03,050
CAPCOM That's affirmative.

98
00:08:03,050 --> 00:08:09,760
The secondary radiator leak check is called
out in the flight plan at 71:20.

99
00:08:09,760 --> 00:08:19,680
That procedure is listed in your launch operations
book on page 2-9, L2-9.

100
00:08:19,680 --> 00:08:23,020
We'd like to change that procedure.

101
00:08:23,020 --> 00:08:25,470
Over.

102
00:08:25,470 --> 00:08:30,380
SC Okay.

103
00:08:30,380 --> 00:08:35,289
Stand by.

104
00:08:35,289 --> 00:08:48,140
SC Charlie, on the secondary leak check, just

read us verbatim like you want, and I'll copy

105
00:08:48,140 --> 00:08:51,090
directly into the flight plan and not fool
around with the checklist.

106
00:08:51,090 --> 00:08:52,090
CAPCOM Roger.

107
00:08:52,090 --> 00:08:54,530
That's fine if you're ready to copy, stand
by.

108
00:08:54,530 --> 00:08:58,590
SC Ready to copy on the leak check.

109
00:08:58,590 --> 00:09:00,270
CAPCOM Roger.

110
00:09:00,270 --> 00:09:07,890
It's monitor the secondary accumulator quantity.

111
00:09:07,890 --> 00:09:27,360
Step 2 is secondary glycol to radiator valve
normal for 30 seconds then bypass.

112
00:09:27,360 --> 00:09:33,130
If no decrease in
secondary accumulator quantity, - Are you

113
00:09:33,130 --> 00:09:35,050
with me?

114
00:09:35,050 --> 00:09:39,840
SC Yah, I'm with you.

115
00:09:39,840 --> 00:09:41,750
CAPCOM Okay.

116
00:09:41,750 --> 00:09:46,900
If no decrease in secondary accumulator quantity.

117
00:09:46,900 --> 00:09:52,770
Secondary glycol to radiator valve to normal.

118
00:09:52,770 --> 00:10:04,980
Next step, secondary coolant loop pump AC1
or AC2.

119
00:10:04,980 --> 00:10:24,450
After 3 minutes, verify glycol discharge secondary
pressure 39 to 51 psig.

120
00:10:24,450 --> 00:10:38,020
Also verify secondary EVAP APS TEMP has changed.

121
00:10:38,020 --> 00:10:51,050
Next step, secondary coolant loop pump, off.

122
00:10:51,050 --> 00:10:57,300
Secondary glycol radiator valve to bypass.

123
00:10:57,300 --> 00:11:00,620
That ends the procedure.

124
00:11:00,620 --> 00:11:03,320
Over.

125
00:11:03,320 --> 00:11:08,730
SC Okay.

126
00:11:08,730 --> 00:11:15,940
I read back monitor secondary accumulator
quantity, secondary glycol radiator valve,

127
00:11:15,940 --> 00:11:19,100
normal for 30 seconds then to bypass.

128
00:11:19,100 --> 00:11:25,590
If no decrease in secondary accumulator quantity, secondary glycol to radiator valve to normal.

129
00:11:25,590 --> 00:11:28,580
Secondary coolant loop pump AC1 or 2.

130
00:11:28,580 --> 00:11:35,800
After 3 minutes, verify glycol secondary discharge pressure 39 to 51 psig.

131
00:11:35,800 --> 00:11:39,490
Verify secondary evaporator outlet temp has changed.

132
00:11:39,490 --> 00:11:41,120
Secondary coolant
loop, off.

133
00:11:41,120 --> 00:11:43,750
Secondary glycol radiator valve to bypass.

134
00:11:43,750 --> 00:11:47,750
And what's the reason for the change, Charlie?

135
00:11:47,750 --> 00:11:48,750
CAPCOM Roger.

136
00:11:48,750 --> 00:11:53,180
Stan is concerned that our present procedure as shown in the checklist does not really

137
00:11:53,180 --> 00:11:57,590
flow a glycol through the radiator and they want to

138
00:11:57,590 --> 00:12:01,950
verify that we do not have a plugged secondary

radiator.

139
00:12:01,950 --> 00:12:03,580
Over.

140
00:12:03,580 --> 00:12:06,840
SC Okay.

141
00:12:06,840 --> 00:12:11,980
They didn't have any abnormal indications
in that system, so far?

142
00:12:11,980 --> 00:12:12,980
CAPCOM Negative.

143
00:12:12,980 --> 00:12:14,170
This is the procedure that came up with.

144
00:12:14,170 --> 00:12:15,810
It's just a check, Mike.

145
00:12:15,810 --> 00:12:21,710
Everything's looking great to us.

146
00:12:21,710 --> 00:12:23,920
Over.

147
00:12:23,920 --> 00:12:30,550
SC Okay, Charlie.

148
00:12:30,550 --> 00:12:56,240
SC Charlie, we'll get back with you on these
other changes in a few minutes.

149
00:12:56,240 --> 00:12:57,240
Okay?

150
00:12:57,240 --> 00:12:58,240

CAPCOM Roger, Nell.

151
00:12:58,240 --> 00:13:10,050
No hurry.

152
00:13:10,050 --> 00:13:21,860
Over.

153
00:13:21,860 --> 00:13:37,610
PAO This is Apollo Control at 59 hours, 9 minutes.

154
00:13:37,610 --> 00:13:45,339
Apollo 11 now 182 000 nautical miles from Earth, and the velocity down to 3072 feet

155
00:13:45,339 --> 00:13:46,710
per second.

156
00:13:46,710 --> 00:13:51,300
We've had
very little conversation from the spacecraft

157
00:13:51,300 --> 00:13:55,630
in the past 40 minutes or so.

158
00:13:55,630 --> 00:14:02,050
At this time the flight plan calls for the crew to be getting ready to begin their eat

159
00:14:09,710 --> 00:14:03,050
period.

160
00:14:09,710 --> 00:14:12,870
We have one change to the flight plan to pass along.

161
00:14:12,870 --> 00:14:20,200
The television transmission which had been

scheduled at 100 hours, 20 minutes to I00

162
00:14:20,200 --> 00:14:25,920
hours, 50 minutes in the flight plan has been
deleted.

163
00:14:25,920 --> 00:14:31,630
This transmission was to have occurred during
the formation flying prior to the powered

164
00:14:31,630 --> 00:14:34,570
descent to the lunar surface.

165
00:14:34,570 --> 00:14:42,589
The decision to delete the TV transmission
from the flight plan was made due to a lack

166
00:14:42,589 --> 00:14:49,430
of available satellite channels to relay the
signal from the tracking site at Madrid to

167
00:14:49,430 --> 00:14:59,440
Houston for conversion.

168
00:14:59,440 --> 00:15:11,130
The intermittent music that we're getting
is apparently coming

169
00:15:11,130 --> 00:15:12,250
from the spacecraft.

170
00:15:12,250 --> 00:15:19,500
The crew has onboard portable tape recorders
with music on the tapes.

171
00:15:19,500 --> 00:15:27,490
As they store their own comments on the tape,
the music, of course, is erased and apparently

172

00:15:27,490 --> 00:15:33,830
the music is triggering the VOX operated microphones
and we're getting intermittent music down

173
00:15:33,830 --> 00:15:35,740
from the spacecraft.

174
00:15:35,740 --> 00:15:40,930
CAPCOM 11, Houston.

175
00:15:40,930 --> 00:15:41,930
We were wondering who's on horns?

176
00:15:41,930 --> 00:15:51,460
SC Back in Houston?

177
00:15:51,460 --> 00:15:55,200
CAPCOM We just had a little music there.

178
00:15:55,200 --> 00:16:04,029
SC Just to keep you entertained.

179
00:16:04,029 --> 00:16:11,420
CAPCOM Rog.

180
00:16:11,420 --> 00:16:17,960
That was good.

181
00:16:17,960 --> 00:16:40,710
You can keep it coming down, 11.

182
00:16:40,710 --> 00:16:47,210
SC Okay.

183
00:16:47,210 --> 00:17:13,209
SC Because it's a special occasion today,
Houston.

184

00:17:13,209 --> 00:17:21,679
This is the third anniversary of Gemini 10.

185
00:17:21,679 --> 00:17:22,679
CAPCOM Roger.

186
00:17:22,679 --> 00:17:23,679
Happy anniversary.

187
00:17:23,679 --> 00:17:24,679
SC Stay there.

188
00:17:24,679 --> 00:17:25,679
PAO This is Apollo Control.

189
00:17:25,679 --> 00:17:34,260
That comment a moment ago about the tenth anniversary of - about the third anniversary

190
00:17:34,260 --> 00:18:39,680
of Gemini 10 came from Mike Collins, who along with John Young flew the Gemini 10 mission,

191
00:18:39,680 --> 00:19:36,920
July 18 through July 21, 1966.

192
00:19:36,920 --> 00:19:38,450
PAO This is Apollo Control.

193
00:19:38,450 --> 00:19:43,600
That comment a moment ago about the tenth anniversary of - about the third anniversary

194
00:19:43,600 --> 00:19:50,850
of Gemini 10 came from Mike Collins, who along with John Young flew the Gemini 10 mission,

195
00:19:50,850 --> 00:19:58,660
July 18 through July 21, 1966.

196
00:19:58,660 --> 00:20:03,270
The brief bit of music that we got from the spacecraft was coming to us from a distance

197
00:20:03,270 --> 00:20:05,270
of 182 thousand 190 nautical miles.

198
00:20:05,270 --> 00:20:08,620
SC Houston, Apollo 11, ready to copy your updates.

199
00:20:08,620 --> 00:20:16,720
CAPCOM Roger, stand by.

200
00:20:16,720 --> 00:20:46,580
CAPCOM Okay Buzz, the first item, is that we have indications that your landing sight

201
00:20:46,580 --> 00:20:49,830
obliques are not in the proper position.

202
00:20:49,830 --> 00:20:57,610
If you will check we think that the intermediate scale landing sight oblique is stowed in the

203
00:20:57,610 --> 00:21:00,130
CSM lunar land mark book.

204
00:21:00,130 --> 00:21:08,210
We think that the large scale, landing sight oblique is stowed in the back of the LM lunar

205
00:21:08,210 --> 00:21:12,490
surface map book, over.

206
00:21:12,490 --> 00:21:34,200
SC I think I heard you Charlie, but I'm not sure that I understand.

207
00:21:34,200 --> 00:21:38,720
CAPCOM Roger, according to our storage list
the landing sight oblique should be in the

208
00:21:38,720 --> 00:21:40,460
transfer bag.

209
00:21:40,460 --> 00:21:49,679
In the back up set of data, the intermediate
scale oblique is in the CSM lunar landmark

210
00:21:49,679 --> 00:21:56,720
book and the large scale oblique is in the
back of the LM lunar surface map book, and

211
00:21:56,720 --> 00:22:01,710
that's the reason we think that they might
be, not where you think they

212
00:22:01,710 --> 00:22:02,780
are, over.

213
00:22:02,780 --> 00:22:04,790
SC Okay, we've got three obliques.

214
00:22:04,790 --> 00:22:08,120
The last one is one I asked for recently.

215
00:22:08,120 --> 00:22:11,540
It's just a blow up of the second one.

216
00:22:11,540 --> 00:22:14,070
The first one is one that's got dotted lines
on

217
00:22:14,070 --> 00:22:19,520
it, indicating hidden view and 50 degree LPD,
and all three of those are in the transfer

218
00:22:19,520 --> 00:22:21,179
book, over.

219
00:22:21,179 --> 00:22:23,670
CAPCOM Roger, fine.

220
00:22:23,670 --> 00:22:27,240
We were wrong in our back up set.

221
00:22:27,240 --> 00:22:29,679
We had those out of place.

222
00:22:29,679 --> 00:22:31,160
Looks like the on board data is good.

223
00:22:31,160 --> 00:22:34,230
We just wanted to let you check on that one.

224
00:22:34,230 --> 00:22:42,799
We have an update on the APS DIPS fuel cord
that you place on the panel.

225
00:22:42,799 --> 00:22:45,309
It's a typo error.

226
00:22:45,309 --> 00:22:52,610
If you'll break out that little card, we've
got to correct that typo error, over.

227
00:22:52,610 --> 00:22:56,010
SC Rog.

228
00:22:56,010 --> 00:23:04,530
SC Okay, I got it.

229
00:23:04,530 --> 00:23:09,630
CAPCOM Rog, Buzz.

230
00:23:09,630 --> 00:23:13,332
Under the DIPS column, on the pressure side.

231
00:23:13,332 --> 00:23:21,880
You go down to the fourth item to the pressure
greater than 150 PTCA should be greater than

232
00:23:21,880 --> 00:23:24,880
65 percent, over.

233
00:23:24,880 --> 00:23:36,120
SC Okay, it's greater than 1.8 but less than
65 and greater than 150 for greater than 65.

234
00:23:36,120 --> 00:23:38,160
CAPCOM That's affirmative.

235
00:23:38,160 --> 00:23:39,160
Out.

236
00:23:39,160 --> 00:23:53,320
CAPCOM And we have three items on the mission
rules no go card, if you are ready to copy

237
00:23:53,320 --> 00:23:58,650
those, over.

238
00:23:58,650 --> 00:24:22,660
SC Okay, I've got the mission rules no go.

239
00:24:22,660 --> 00:24:30,660
CAPCOM Roger, Buzz.

240
00:24:30,660 --> 00:24:44,620
First entry is on the EPS, under AC bus A.

241
00:24:44,620 --> 00:24:49,100

The line extends all the way to high gate.

242
00:24:49,100 --> 00:24:56,670
Actually, the line should read at DOI it would be no go

243
00:24:56,670 --> 00:25:01,130
AC bus A. After that the no go would be both buses.

244
00:25:01,130 --> 00:25:08,910
So if you will just pencil in both buses from TDI through high gate.

245
00:25:08,910 --> 00:25:15,130
It will be correct for that line, over.

246
00:25:15,130 --> 00:25:28,320
SC Okay, I got that AC buss A for DOI and both busses no go for PDI on.

247
00:25:28,320 --> 00:25:31,230
CAPCOM That's affirmative up until high gate.

248
00:25:31,230 --> 00:25:37,080
You can stop at - the line in front of the column 5 minutes to low gate.

249
00:25:37,080 --> 00:25:42,910
Now the next line is under the G&C exchange, pitch and roll GDA.

250
00:25:42,910 --> 00:25:56,740
You can scratch that line completely, over.

251
00:25:56,740 --> 00:25:58,030
SC Roger, got it.

252
00:25:58,030 --> 00:25:59,030

CAPCOM Okay, Buzz.

253
00:25:59,030 --> 00:26:06,620
Last entry is down under RCS and it is a typo
error under the three - in the line three

254
00:26:06,620 --> 00:26:08,450
axis attitude control.

255
00:26:08,450 --> 00:26:12,960
We proceed to the right at PDI plus 05 you'll
see one axis.

256
00:26:12,960 --> 00:26:16,610
The line goes all the way to low gate to touchdown.

257
00:26:16,610 --> 00:26:17,610
That's incorrect.

258
00:26:17,610 --> 00:26:24,100
The line should stop under 5 minutes to low
gate, over.

259
00:26:24,100 --> 00:26:41,210
SC Okay, we are stopping at it 5 minutes to
low gate.

260
00:26:41,210 --> 00:26:42,860
CAPCOM That's affirm.

261
00:26:42,860 --> 00:26:45,559
That completes that card.

262
00:26:45,559 --> 00:26:52,149
The rest of the update are just really for
your information based on our 58 hour platform

263
00:26:52,149 --> 00:26:53,350
- look at the platform.

264
00:26:53,350 --> 00:26:57,560
We are
really in good shape.

265
00:26:57,560 --> 00:27:06,450
Your gyros have almost no drift in them since
the plotted update we were looking at X of

266
00:27:06,450 --> 00:27:14,730
a minus 2.24 MERU, Y of plus .87 Z of minus
.11.

267
00:27:14,730 --> 00:27:24,910
Since the update, which was based on the 52
hour P52, I believe.

268
00:27:24,910 --> 00:27:33,780
We gave you
an X drift of plus .79, yaw of plus 1.06,

269
00:27:33,780 --> 00:27:38,910
Z of plus .02 MERU.

270
00:27:38,910 --> 00:27:44,799
The difference we see between the 52 hour
and the 57 hour alignments work did not really

271
00:27:44,799 --> 00:27:51,590
give us enough time to get a real good, completely
valid update on the drift check.

272
00:27:51,590 --> 00:27:54,740
So we're real satisfied with the way the gyros
are looking.

273
00:27:54,740 --> 00:27:56,860
The PIPA'S are looking great
also.

274
00:27:56,860 --> 00:28:42,450
We are in real good shape with those also,
over.

275
00:28:42,450 --> 00:31:16,840
SC This is Apollo 11, radio check.

276
00:31:16,840 --> 00:32:25,559
CAPCOM Roger, reading you fly by OMNI, over.

277
00:32:25,559 --> 00:32:28,030
SC Okay, that’s clear.

278
00:32:28,030 --> 00:32:34,850
You cut out when you were talking about the
platform at something about 52 hours and.after

279
00:32:34,850 --> 00:32:36,870
that we never heard you again.

280
00:32:36,870 --> 00:32:41,049
CAPCOM Roger, guess we were changing antennas.

281
00:32:41,049 --> 00:32:42,240
Stand by.

282
00:32:42,240 --> 00:32:44,039
That's affirmative, 11.

283
00:32:44,039 --> 00:32:47,690
We were swapping antennas on you down here.

284
00:32:47,690 --> 00:32:51,970
Basically the word here is that we have a
real good platform, very small drift on the

285
00:32:51,970 --> 00:32:56,549
gyros and very small drift in our PIPA'S,

over.

286
00:32:56,549 --> 00:32:58,900
SC Roger, thank you.

287
00:32:58,900 --> 00:33:08,390
And I would like to have a few words of clarification
if you will give them to me on the RCS reel,

288
00:33:08,390 --> 00:33:13,020
what that change of pitch may mean.

289
00:33:13,020 --> 00:33:22,000
CAPCOM Copy, a few words of clarification
on the RCS, oh roger.

290
00:33:22,000 --> 00:33:26,740
The update there, Neil, you are speaking of
about the one axis down to 5 minutes of low

291
00:33:26,740 --> 00:33:27,740
gate?

292
00:33:27,740 --> 00:33:29,510
SC Yah, that's right.

293
00:33:29,510 --> 00:33:34,470
I'm not quite sure what that really means
(garbled).

294
00:33:34,470 --> 00:33:47,980
CAPCOM Standby, I'll make sure I got my story
straight with Control.

295
00:33:47,980 --> 00:33:55,580
Standby.

296
00:33:55,580 --> 00:34:10,780
SC Okay .

297
00:34:10,780 --> 00:34:33,579
CAPCOM 11, Houston.

298
00:34:33,579 --> 00:34:46,279
On the RCS, what we about one axis prior to
low gate, we would recommend an abort.

299
00:34:46,279 --> 00:34:54,890
This would require a- a loss of - of two distinct
jets which is not very probable but that is

300
00:34:54,890 --> 00:34:56,389
what we are recommending.

301
00:34:56,389 --> 00:35:00,710
After low gate we would - continue on.

302
00:35:00,710 --> 00:35:07,400
We would recommend that we continue on to
attempt a landing, over.

303
00:35:07,400 --> 00:35:11,410
SC Roger.

304
00:35:11,410 --> 00:35:13,420
Okay.

305
00:35:13,420 --> 00:35:25,450
I think I owed him that.

306
00:35:25,450 --> 00:35:29,460
CAPCO Rog.

307
00:35:29,460 --> 00:35:48,180
SC Charlie, did you say you had some updates
for me from the lunar surface book?

308

00:35:48,180 --> 00:35:49,719
CAPCOM Apollo 11, say again.

309
00:35:49,719 --> 00:35:51,509
You were cutting out.

310
00:35:51,509 --> 00:35:52,509
Over.

311
00:35:52,509 --> 00:35:53,509
SC Roger.

312
00:35:53,509 --> 00:35:58,269
Did you say you had some updates for us in
the lunar surface book?

313
00:35:58,269 --> 00:35:59,269
Over.

314
00:35:59,269 --> 00:36:00,269
CAPCOM Negative.

315
00:36:00,269 --> 00:36:03,999
At this time, we do not have any updates for
the lunar surface book.

316
00:36:03,999 --> 00:36:07,279
We wanted you to have it just in case.

317
00:36:07,279 --> 00:36:08,279
Over.

318
00:36:08,279 --> 00:36:09,279
SC Rog.

319
00:36:09,279 --> 00:36:12,319
You were cut out that time.

320

00:36:12,319 --> 00:36:13,440
CAPCOM Roger.

321
00:36:13,440 --> 00:36:18,839
At the present time, we do not have any updates
for you on the lunar surface book.

322
00:36:18,839 --> 00:36:21,890
We are thinking about some, and kick him around,
but they're

323
00:36:21,890 --> 00:36:26,890
very minor changes.

324
00:36:26,890 --> 00:36:31,059
Over.

325
00:36:31,059 --> 00:36:43,569
CAPCOM I1, Houston.

326
00:36:43,569 --> 00:37:04,420
Did you copy that transmission?

327
00:37:04,420 --> 00:37:09,749
CAPCOM Apollo ll, Houston.

328
00:37:09,749 --> 00:37:11,749
We swapped antennas on you again.

329
00:37:11,749 --> 00:37:18,619
I say again that we do not have any lunar
surface update - book updates at this time.

330
00:37:18,619 --> 00:38:20,969
We're considering a few minor ones, but we're
... around

331
00:38:20,969 --> 00:39:03,829
the MOCR.

332
00:39:03,829 --> 00:39:46,690
Over.

333
00:39:46,690 --> 00:41:55,280
SC Apollo 11.

334
00:41:55,280 --> 00:43:21,010
I understand.

335
00:43:21,010 --> 00:45:29,599
SC Houston, 11.

336
00:45:29,599 --> 00:45:32,319
We have a crew status report for you.

337
00:45:32,319 --> 00:45:33,729
CAPCOM Roger.

338
00:45:33,729 --> 00:45:35,849
Go ahead, 11.

339
00:45:35,849 --> 00:45:45,869
SC Okay, radiation CDR 11009, CMP 10010, LMP
09011.

340
00:45:45,869 --> 00:45:48,980
No medication.

341
00:45:48,980 --> 00:45:53,640
CAPCOM Roger, 11.

342
00:45:53,640 --> 00:46:03,150
We copy for the radiations and we're considering
this PTC looks sort of weird to us so we're

343
00:46:03,150 --> 00:46:12,109
considering stopping and starting over

again and we'll be with you in a couple of

344
00:46:12,109 --> 00:46:17,539
minutes.

345
00:46:17,539 --> 00:46:22,979
Over.

346
00:46:22,979 --> 00:46:33,849
SC Okay.

347
00:46:33,849 --> 00:47:44,619
CAPCOM Apollo 11, Houston.

348
00:47:44,619 --> 00:48:18,359
Would you give us the LM CM Delta-P as reading?

349
00:48:18,359 --> 00:48:26,480
Over.

350
00:48:26,480 --> 00:48:43,819
CAPCOM Hello Apollo i1, Houston.

351
00:48:43,819 --> 00:48:45,670
We switched the antennas on you again.

352
00:48:45,670 --> 00:48:52,029
Would you please give us the LM CM Delta-P
reading?

353
00:48:52,029 --> 00:48:55,969
Over.

354
00:48:55,969 --> 00:49:15,660
CAPCOM Hello Apollo 11, Houston.

355
00:49:15,660 --> 00:49:19,599
Over.

356
00:49:19,599 --> 00:49:31,410
SC Go ahead.

357
00:49:31,410 --> 00:49:39,289
11 here.

358
00:49:39,289 --> 00:49:47,170
CAPCOM Rog.

359
00:49:47,170 --> 00:49:49,900
We switched antennas on you there moments ago, Neil.

360
00:49:49,900 --> 00:49:55,039
Will you please give us the LM CM Delta-P reading?

361
00:49:55,039 --> 00:49:56,039
Over.

362
00:49:56,039 --> 00:50:00,859
SC It's less than 21.

363
00:50:00,859 --> 00:50:02,799
CAPCOM Roger.

364
00:50:02,799 --> 00:50:08,619
SC 21.5 now Neil says, Charlie.

365
00:50:08,619 --> 00:50:14,910
CAPCOM Roger, thank you Mike, could you give us some help?

366
00:50:14,910 --> 00:50:19,289
This PTC is strange, it's not like anything we've seen before.

367

00:50:19,289 --> 00:50:28,349
We were wondering if you all have had any
events of any odd data that could help us

368
00:50:28,349 --> 00:50:29,589
out, over.

369
00:50:29,589 --> 00:50:32,690
SC I didn't understand that.

370
00:50:32,690 --> 00:50:33,930
Say again.

371
00:50:33,930 --> 00:50:39,329
CAPCOM Roger, we're looking at a, sort of
a funny looking PTC.

372
00:50:39,329 --> 00:50:46,109
We've already drifted out to 70 degrees in
pitch and we're wondering if you all had any

373
00:50:46,109 --> 00:50:51,140
vents or any
such thing as that, that could have caused

374
00:50:51,140 --> 00:50:57,910
us to pick up these rates to drive us off,
over.

375
00:50:57,910 --> 00:51:02,160
SC Negative, Charlie.

376
00:51:02,160 --> 00:51:06,890
We don't know of anything.

377
00:51:06,890 --> 00:51:07,940
CAP COM Roger.

378
00:51:07,940 --> 00:51:13,809

SC Unless it’s got something to do with
that entry from the position that we want

379
00:51:13,809 --> 00:51:14,900
to be in.

380
00:51:14,900 --> 00:51:16,319
I don't know.

381
00:51:16,319 --> 00:51:22,319
CAPCOM Roger, when we started off it looked
real fine to us, now it's drifting off with

382
00:51:22,319 --> 00:51:27,529
a funny pattern that we haven't seen previously
on a flight, and we're just trying to figure

383
00:51:27,529 --> 00:51:29,619
out, I think we'll probably start it over
again.

384
00:51:29,619 --> 00:53:34,569
We'll be with you momentarily, over.

385
00:53:34,569 --> 00:54:36,780
SC Okay.

386
00:54:36,780 --> 00:55:09,020
CAPCOM Apollo 11, Houston.

387
00:55:09,020 --> 00:55:13,380
We hate to say it, but we'd like to terminate
this PTC and start over again.

388
00:55:13,380 --> 00:55:16,989
We bare no assurance that we're going to get
it through the

389
00:55:16,989 --> 00:55:17,989

sleep period.

390
00:55:17,989 --> 00:55:21,680
With this funny configuration, or funny pattern.

391
00:55:21,680 --> 00:55:29,160
We'd like you to stop it now and go back to
pitch 090 yaw 0 and roll, whatever you stop

392
00:55:29,160 --> 00:56:07,680
on, over.

393
00:56:07,680 --> 00:56:46,209
SC Roger.

394
00:56:46,209 --> 00:57:08,539
PAO This is Apollo Control at 59 hours 57
minutes.

395
00:57:08,539 --> 00:57:14,769
A few moments ago you heard Capcom Charlie
Duke advise the crew to terminate the passive

396
00:57:14,769 --> 00:57:19,459
thermal control
mode that they are presently in and reestablish

397
00:57:19,459 --> 00:57:26,160
the three revolutions per hour roll rate about
the spacecraft longitudinal axis that is used

398
00:57:26,160 --> 00:57:31,309
for thermal control.

399
00:57:31,309 --> 00:57:40,109
We had noticed a
unexplained deviation from the attitude that

400
00:57:40,109 --> 00:57:42,760

the spacecraft was set up in.

401
00:57:42,760 --> 00:57:48,499
In this roll mode ideally it would roll about
the longitudinal axis with very little wobble

402
00:57:48,499 --> 00:57:58,799
and if wobble
is introduced for one reason or another, the

403
00:57:58,799 --> 00:58:07,729
reaction control system jets would come on
as soon as the motion out of the prescribed

404
00:58:07,729 --> 00:58:15,049
plane had occurred and gone beyond prescribed
limits, in this case 30 degrees to correct.

405
00:58:15,049 --> 00:58:21,109
The jet firings on past missions do tend to
disturb the crew's sleep.

406
00:58:21,109 --> 00:58:26,680
Rather than have the reaction control system
jets come on during the night and perhaps

407
00:58:26,680 --> 00:58:31,349
have to awaken the crew to reestablish the
passive thermal control mode at that time

408
00:58:31,349 --> 00:58:33,650
we elected to correct it now.

409
00:58:33,650 --> 00:59:06,689
CAPCOM You disabled Bravo and Charlie select
quads ALPHA and DELTA, over.

410
00:59:06,689 --> 01:00:35,140
CAPCOM Apollo 11, Houston, over.

411
01:00:35,140 --> 01:00:36,140
PAO This is Apollo Control.

412
01:00:36,140 --> 01:00:40,180
We're getting quite a bit of noise on the
air to ground circuit at this time as the

413
01:00:40,180 --> 01:00:48,089
spacecraft rotates from one OMNI antenna around
to the next and we momentarily- lose lock-on.

414
01:00:48,089 --> 01:00:59,140
At this time, Apollo i1 is 183,544 nautical
miles from Earth and the velocity, holding

415
01:00:59,140 --> 01:01:04,099
fairly constant now, at about 3042 feet per
second.

416
01:01:04,099 --> 01:02:17,219
It's been moving down towards 3000 feet per
second and seems to be leveling off somewhat.

417
01:02:17,219 --> 01:02:18,660
PAO This is Apollo Control.

418
01:02:18,660 --> 01:02:25,380
We're going to take the air to ground circuit
down temporarily until a stronger antenna

419
01:02:25,380 --> 01:02:27,309
lock is - . Here's a call to the crew.

420
01:02:27,309 --> 01:02:57,450
We'll stand by for that.

421
01:02:57,450 --> 01:02:58,539
PAO This is Apollo Control.

422
01:02:58,539 --> 01:03:03,179
We will take down the air to ground circuit
down at this time until we reestablish sufficient

423
01:03:03,179 --> 01:03:17,390
signal strength to eliminate the noise on
the circuit.

424
01:03:17,390 --> 01:03:32,239
PAO This is Apollo Control at 60 hours, 10
minutes.

425
01:03:32,239 --> 01:03:39,869
We've reestablished good antenna lock-on this
time, and we'll continue to monitor for any

426
01:03:39,869 --> 01:03:41,779
conversation from
the spacecraft.

427
01:03:41,779 --> 01:03:50,369
The crew is presently reestablishing the passive
thermal control rotation rate of 3 revolutions

428
01:03:50,369 --> 01:03:52,400
per hour.

429
01:03:52,400 --> 01:03:58,059
Following that we expect they will begin their
rest period.

430
01:03:58,059 --> 01:04:18,430
At the present time Apollo I1 is 183 821 nautical
miles from Earth at a velocity 3037 feet per

431
01:04:18,430 --> 01:04:22,219
second.

432
01:04:22,219 --> 01:04:37,380

CAPCOM Hello, Apollo 11.

433
01:04:37,380 --> 01:04:43,949
Hello, Apollo 11.

434
01:04:43,949 --> 01:04:46,130
Over

435
01:04:46,130 --> 01:04:52,650
SC Hello, Houston.

436
01:04:52,650 --> 01:04:59,179
You call us?

437
01:04:59,179 --> 01:05:03,529
CAPCOM Roger.

438
01:05:03,529 --> 01:05:09,150
Reading you about 1 by.

439
01:05:09,150 --> 01:05:14,430
Looks like we picked a super attitude here
for PTC stabilization.

440
01:05:14,430 --> 01:05:20,530
We're reading you in backup voice now.

441
01:05:20,530 --> 01:05:21,530
Over.

442
01:05:21,530 --> 01:05:27,500
SC You're reading me loud and clear?

443
01:05:27,500 --> 01:05:29,240
CAPCOM Rog.

444
01:05:29,240 --> 01:05:37,079
SC Would you like us to take another antenna?

445
01:05:37,079 --> 01:05:40,940
CAPCOM I think we've got about the best configuration.

446
01:05:40,940 --> 01:06:00,209
We have been doing it off the ground here,
11.

447
01:06:00,209 --> 01:07:02,369
We'll just keep it as it is.

448
01:07:02,369 --> 01:07:11,249
Over.

449
01:07:11,249 --> 01:07:29,009
SC Roger.

450
01:07:29,009 --> 01:08:04,539
CAPCOM Apollo 11, Houston.

451
01:08:04,539 --> 01:08:12,259
Would you select COMMAND RESET and OMNI ALPHA?

452
01:08:12,259 --> 01:08:14,819
Over.

453
01:08:14,819 --> 01:08:22,480
SC Houston, 11.

454
01:08:22,480 --> 01:08:32,690
We're in OMNI ALPHA.

455
01:08:32,690 --> 01:08:37,799
CAPCOM Roger.

456
01:08:37,799 --> 01:08:41,089
We read you about 3 by now.

457
01:08:41,089 --> 01:08:42,089
Over.

458
01:08:42,089 --> 01:08:43,370
SC Roger.

459
01:08:43,370 --> 01:09:47,819
CAPCOM Apollo 11, Houston.

460
01:09:47,819 --> 01:10:52,100
We is stable.

461
01:10:52,100 --> 01:11:17,190
You can start the PTC.

462
01:11:17,190 --> 01:11:41,040
Over.

463
01:11:41,040 --> 01:13:40,290
SC Roll left, don't you?

464
01:13:40,290 --> 01:14:29,930
SC Houston, Apollo 11.

465
01:14:29,930 --> 01:14:33,930
Check this page S-9-7.

466
01:14:33,930 --> 01:14:40,530
I've completed step 8 and I'd like to know
what you think is ideal timing between step

467
01:14:40,530 --> 01:14:52,880
8 and step 9 and step 10 on that page?

468
01:14:52,880 --> 01:15:02,240
Over.

469

01:15:02,240 --> 01:15:20,960
CAPCOM Roger.

470
01:15:20,960 --> 01:15:39,690
Stand by.

471
01:15:39,690 --> 01:16:17,140
CAPCOM Apollo 11, Houston.

472
01:16:17,140 --> 01:16:18,870
We don't see any time constraint.

473
01:16:18,870 --> 01:16:23,540
We'd like you to go ahead and set up the wide deadband, then go through step 10 and 11.

474
01:16:23,540 --> 01:16:24,540
Over.

475
01:16:24,540 --> 01:16:25,540
SC Okay.

476
01:16:25,540 --> 01:16:26,540
Will do.

477
01:16:26,540 --> 01:16:28,260
I don't see any constraint here, Charlie.

478
01:16:28,260 --> 01:16:34,530
I was just checking to make sure because last time, I went from 8 to 9 to 10 to 11 a little

479
01:16:34,530 --> 01:16:41,450
bit more swiftly than I'd been doing in the past.

480
01:16:41,450 --> 01:16:51,590
CAPC0M Roger.

481
01:16:51,590 --> 01:17:11,870
SC Step 11 complete.

482
01:17:11,870 --> 01:17:22,010
CAPCOM Roger.

483
01:17:22,010 --> 01:17:32,150
We copy.

484
01:17:32,150 --> 01:17:52,440
CAPCOM Apollo 11, Houston.

485
01:17:52,440 --> 01:17:55,490
Would you please select OMNI BRAVO?

486
01:17:55,490 --> 01:17:57,240
Over.

487
01:17:57,240 --> 01:18:00,740
SC Roger.

488
01:18:00,740 --> 01:18:02,500
BRAVO.

489
01:18:02,500 --> 01:18:09,510
SC Houston, Apollo 11.

490
01:18:09,510 --> 01:18:20,020
How do you read on BRAVO?

491
01:18:20,020 --> 01:18:21,720
CAPCOM Roger.

492
01:18:21,720 --> 01:18:27,110
Reading you 5 by.

493
01:18:27,110 --> 01:18:31,160

SC Same here.

494
01:18:31,160 --> 01:18:36,550
CAPCOM Apollo 11, Houston.

495
01:18:36,550 --> 01:18:39,950
Looks like we've got a good PTC going.

496
01:18:39,950 --> 01:18:41,460
It's good night from the white team.

497
01:18:41,460 --> 01:18:42,460
Over.

498
01:18:42,460 --> 01:18:43,460
SC Okay.

499
01:18:43,460 --> 01:18:44,460
See you tomorrow.

500
01:18:44,460 --> 01:18:58,480
Thank you for everything.

501
01:18:58,480 --> 01:19:18,840
PAO This is Apollo Control at 60 hours 37 minutes.

502
01:19:18,840 --> 01:19:22,000
We said good bye - goodnight to the crew about 10 minutes ago.

503
01:19:22,000 --> 01:19:26,500
We expect that they will be settling down their rest period shortly.

504
01:19:26,500 --> 01:19:33,500
And at the present time, Apollo 11 is 184,600 nautical miles from earth.

505
01:19:33,500 --> 01:19:38,000
The spacecraft velocity is presently 3,023
feet per second.

506
01:19:38,000 --> 01:19:44,440
I understand there has been some interest
in a comment made by Nell Armstrong during

507
01:19:44,440 --> 01:19:51,630
the television transmission about the EVA
floodlight.

508
01:19:51,630 --> 01:19:59,200
Armstrong's remark was that the mast which
the light is mounted on, appeared charred.

509
01:19:59,200 --> 01:20:06,600
He reported that the light works but had apparently
the mast that supported it had apparently

510
01:20:06,600 --> 01:20:10,290
been damaged during the launch phase.

511
01:20:10,290 --> 01:20:16,870
This light would be used in the event of a
contingency EVA.

512
01:20:16,870 --> 01:20:25,120
It would have to function in a normal mission
such as we are presently flying.

513
01:20:25,120 --> 01:20:32,630
And in the event that a extravehicular activity
was necessary for transfer of the crew from

514
01:20:32,630 --> 01:20:38,560
the LM into the command service module, the
light would be an aid in providing exterior

515

01:20:38,560 --> 01:20:45,710
lighting of the hand rails, but would- repeat,
that it would have no function in a normal

516
01:20:45,710 --> 01:20:55,510
mission and the charring which Armstrong reported
is not considered significant at this time.

517
01:20:55,510 --> 01:20:59,350
We don't expect to have any further conversation
with the crew.

518
01:20:59,350 --> 01:21:12,510
We will continue to record any remarks that
we get and play those back.

519
01:21:12,510 --> 01:21:17,230
The passive thermal control mode, which was
reestablished, appears to be functioning well

520
01:21:17,230 --> 01:21:20,900
at this time and all spacecraft systems are
functioning normally.

521
01:21:20,900 --> 01:21:38,720
At 100 - rather 60 hours 39 minutes, this
is Apollo Control, Houston.

522
01:21:38,720 --> 01:21:48,690
PAO This is Apollo Control an 60 hours 47
minutes.

523
01:21:48,690 --> 01:21:54,620
We just got a call from the spacecraft requesting
that we give them the position of the S-IVB

524
01:21:54,620 --> 01:21:59,290
in respect to the
spacecraft and we're currently coming up with

525

01:21:59,290 --> 01:22:02,110
that bit of information, so we'll stand by.

526
01:22:02,110 --> 01:22:07,150
SC Houston, Apollo 11.

527
01:22:07,150 --> 01:22:13,450
CAPCOM Go ahead, 11, over.

528
01:22:13,450 --> 01:22:29,480
SC Do you have any idea where the S-IVB is
with respect to us?

529
01:22:29,480 --> 01:22:48,840
CAPCOM Stand by.

530
01:22:48,840 --> 01:24:30,760
CAPCOM Apollo 11, Houston, the S-IVB is about
6000 nautical miles from you now, over.

531
01:24:30,760 --> 01:24:59,490
SC Okay, thank you.

532
01:24:59,490 --> 01:25:43,120
SC Houston, Apollo 11, how is the PTC looking?

533
01:25:43,120 --> 01:25:44,120
CAPCOM Stand by.

534
01:25:44,120 --> 01:25:45,120
CAPCOM 11, Houston.

535
01:25:45,120 --> 01:25:48,460
The PTC looks great to us, over.

536
01:25:48,460 --> 01:26:02,800
SC Hey, do you have any idea what happened
to the previous one?

537
01:26:02,800 --> 01:26:04,260
CAPCOM We have absolutely no idea, over.

538
01:26:04,260 --> 01:26:05,260
SC Okay.

539
01:26:05,260 --> 01:26:07,350
Did it look like it was all right and just
all of a sudden start diverting?

540
01:26:07,350 --> 01:26:12,780
CAPCOM Negative, if you look at the plot which
we'll save for you and let you see it post

541
01:26:12,780 --> 01:26:13,780
flight.

542
01:26:13,780 --> 01:26:22,130
It started off immediately on the first rev
and just spiraled out to about oh, 20 to 20

543
01:26:22,130 --> 01:26:30,270
degrees in pitch, and then it seemed to be
setting up a spiral around an offset pitch

544
01:26:30,270 --> 01:26:38,780
point of about 20 degrees off from 90 degrees,
but we didn't want to take a chance that it

545
01:26:38,780 --> 01:26:41,040
would become stable at that point.

546
01:26:41,040 --> 01:26:45,280
We thought it might diverge so we told you
and started over again, over.

547
01:26:45,280 --> 01:26:48,540
SC Okay, no complaints.