
NASA
SCI

1
00:00:21,910 --> 00:00:19,429
throughout the history of flight every

2
00:00:24,470 --> 00:00:21,920
time any pilot has landed a vehicle of

3
00:00:25,509 --> 00:00:24,480
any kind any place on the face of our

4
00:00:27,509 --> 00:00:25,519
planet

5
00:00:29,109 --> 00:00:27,519
there are two factors he's always had to

6
00:00:30,390 --> 00:00:29,119
contend with

7
00:00:33,270 --> 00:00:30,400
the atmosphere

8
00:00:35,830 --> 00:00:33,280
which imposes aerodynamic forces

9
00:00:43,590 --> 00:00:35,840
and earth gravitational attraction which

10
00:00:49,110 --> 00:00:46,389
by contrast when an apollo astronaut

11
00:00:51,670 --> 00:00:49,120
lands a lunar module on the moon

12
00:00:52,869 --> 00:00:51,680
altitude 1600 there is virtually no

13
00:00:55,110 --> 00:00:52,879

atmosphere

14
00:00:57,430 --> 00:00:55,120
and hence no appreciable aerodynamic

15
00:01:00,069 --> 00:00:57,440
forces

16
00:01:02,709 --> 00:01:00,079
there is but one-sixth the gravitational

17
00:01:05,270 --> 00:01:02,719
attraction of the earth

18
00:01:07,429 --> 00:01:05,280
consequently the lunar module takes on

19
00:01:09,429 --> 00:01:07,439
handling characteristics which differ

20
00:01:15,140 --> 00:01:09,439
greatly from those of any previous

21
00:01:15,150 --> 00:01:18,230
[Music]

22
00:01:22,870 --> 00:01:20,310
the astronaut could scarcely wait until

23
00:01:24,390 --> 00:01:22,880
he was 300 feet above the lunar surface

24
00:01:26,469 --> 00:01:24,400
to get familiar with the handling

25
00:01:30,070 --> 00:01:26,479
characteristics of his vehicle during

26
00:01:36,020 --> 00:01:32,390
clear for landing simulation he had to

27
00:01:50,469 --> 00:01:36,030
learn before he ever left the earth

28
00:01:53,350 --> 00:01:51,990
it was this requirement that brought

29
00:01:55,910 --> 00:01:53,360
about the development of the

30
00:01:58,630 --> 00:01:55,920
strange-looking flying machine called

31
00:02:01,109 --> 00:01:58,640
the lunar landing training vehicle

32
00:02:03,830 --> 00:02:01,119
is approaching

33
00:02:06,149 --> 00:02:03,840
one minute to 50

34
00:02:20,710 --> 00:02:06,159
decent rates

35
00:02:20,720 --> 00:02:25,030
i

36
00:02:25,040 --> 00:02:30,550
touchdown

37
00:02:36,630 --> 00:02:32,790
to be worthy of its name the lunar

38
00:02:38,790 --> 00:02:36,640

landing training vehicle or lltv

39
00:02:40,710 --> 00:02:38,800
had to have virtually the same handling

40
00:02:43,190 --> 00:02:40,720
characteristics as the lunar module

41
00:02:47,910 --> 00:02:45,110
when studies first began in the late

42
00:02:49,910 --> 00:02:47,920
1950s and early 1960s

43
00:02:53,110 --> 00:02:49,920
it was by no means certain that a pilot

44
00:02:54,550 --> 00:02:53,120
could even control such vehicles

45
00:02:56,390 --> 00:02:54,560
they were so different

46
00:02:58,630 --> 00:02:56,400
that much of the basic engineering

47
00:03:00,390 --> 00:02:58,640
design data developed from the time of

48
00:03:02,830 --> 00:03:00,400
the wright brothers flight at kitty hawk

49
00:03:07,830 --> 00:03:05,509
1903 until the experimental aircraft

50
00:03:12,070 --> 00:03:07,840
flight of our own era simply did not

51
00:03:19,110 --> 00:03:14,390
even in the case of vertical takeoff and

52
00:03:24,790 --> 00:03:21,350
a special lunar landing research vehicle

53
00:03:26,630 --> 00:03:24,800
was built then flown 286 times during

54
00:03:28,949 --> 00:03:26,640
the mid-1960s

55
00:03:31,690 --> 00:03:28,959
to evaluate lunar module handling

56
00:03:33,350 --> 00:03:31,700
qualities during the landing phase

57
00:03:35,270 --> 00:03:33,360
[Music]

58
00:03:46,650 --> 00:03:35,280
procedures had been developed with fixed

59
00:03:57,350 --> 00:03:54,949
[Music]

60
00:03:59,589 --> 00:03:57,360
while the research vehicle was also used

61
00:04:01,910 --> 00:03:59,599
as an interim trainer the vehicle

62
00:04:03,270 --> 00:04:01,920
designed explicitly for training the

63
00:04:05,270 --> 00:04:03,280

lltv

64
00:04:07,910 --> 00:04:05,280
became available for initial test

65
00:04:10,070 --> 00:04:07,920
flights in late 1968

66
00:04:12,070 --> 00:04:10,080
and for lunar landing training several

67
00:04:15,350 --> 00:04:12,080
months later

68
00:04:17,349 --> 00:04:15,360
like the lunar module itself the lltv is

69
00:04:24,070 --> 00:04:17,359
totally different from any conventional

70
00:04:29,189 --> 00:04:26,870
the primary reason for flying the ll-tv

71
00:04:32,390 --> 00:04:29,199
is to crane pilots to maneuver in a less

72
00:04:34,629 --> 00:04:32,400
than 1g gravity field

73
00:04:36,790 --> 00:04:34,639
while this is a novel task the pilot is

74
00:04:37,590 --> 00:04:36,800
not very difficult

75
00:04:39,670 --> 00:04:37,600
but

76
00:04:42,070 --> 00:04:39,680
i would like to make the analogy of

77
00:04:44,230 --> 00:04:42,080
learning to ride a bicycle the first

78
00:04:47,270 --> 00:04:44,240
time you tried it's very hard but after

79
00:04:48,950 --> 00:04:47,280
a little exposure it is quite manageable

80
00:04:50,710 --> 00:04:48,960
to relate this to

81
00:04:52,870 --> 00:04:50,720
layman's terms

82
00:04:55,189 --> 00:04:52,880
we'll use the conventional helicopter

83
00:04:56,550 --> 00:04:55,199
that the pilot is used to flying in a 1g

84
00:04:59,350 --> 00:04:56,560
gravity field

85
00:05:01,270 --> 00:04:59,360
here to get significant acceleration and

86
00:05:03,749 --> 00:05:01,280
deceleration rates

87
00:05:05,830 --> 00:05:03,759
only small degrees of pitch attitude

88
00:05:08,550 --> 00:05:05,840

changes are necessary

89
00:05:10,550 --> 00:05:08,560
for convenience we'll say 3 degrees 3

90
00:05:12,870 --> 00:05:10,560
degrees pitched down in a helicopter

91
00:05:15,029 --> 00:05:12,880
will give you significant acceleration

92
00:05:17,590 --> 00:05:15,039
rates likewise if you have a rate and

93
00:05:19,510 --> 00:05:17,600
want to stop three degrees pitch up will

94
00:05:21,990 --> 00:05:19,520
stop it quite quickly

95
00:05:25,189 --> 00:05:22,000
however the pilot on the lunar surface

96
00:05:27,110 --> 00:05:25,199
is faced with a quite different task

97
00:05:29,350 --> 00:05:27,120
here his vehicle

98
00:05:31,830 --> 00:05:29,360
with essentially the same inertia as it

99
00:05:33,590 --> 00:05:31,840
would have on the earth is supported by

100
00:05:36,310 --> 00:05:33,600
only one-sixth

101
00:05:39,189 --> 00:05:36,320
as much lift vector

102
00:05:42,629 --> 00:05:39,199
to get the same rates of acceleration or

103
00:05:44,310 --> 00:05:42,639
deceleration he has to tilt the vehicle

104
00:05:47,510 --> 00:05:44,320
instead of the three degrees we talked

105
00:05:50,230 --> 00:05:47,520
about previously 18 degrees 18 degrees

106
00:05:51,670 --> 00:05:50,240
pitch up to stop an acceleration or

107
00:05:54,390 --> 00:05:51,680
translation

108
00:05:56,070 --> 00:05:54,400
or 18 degrees pitch down look quite

109
00:05:58,790 --> 00:05:56,080
different to the pilot

110
00:06:01,510 --> 00:05:58,800
from the cockpit standpoint

111
00:06:03,990 --> 00:06:01,520
to give him familiarization with these

112
00:06:06,870 --> 00:06:04,000
extreme attitudes required for

113
00:06:09,350 --> 00:06:06,880

acceleration and deceleration is the

114
00:06:17,830 --> 00:06:09,360
primary reason for learning to fly the

115
00:06:22,710 --> 00:06:20,309
to expand on these larger pitch angles

116
00:06:24,309 --> 00:06:22,720
required in landing the lunar module

117
00:06:27,350 --> 00:06:24,319
here we have a cross section of the

118
00:06:29,830 --> 00:06:27,360
apollo 15 trajectory as you can see at

119
00:06:32,230 --> 00:06:29,840
400 feet the lunar module is pitched up

120
00:06:34,950 --> 00:06:32,240
approximately 17 degrees

121
00:06:36,469 --> 00:06:34,960
this reduces to about 10 degrees pitch

122
00:06:38,790 --> 00:06:36,479
at 200 feet

123
00:06:45,510 --> 00:06:38,800
then to essentially zero at a hundred

124
00:06:50,629 --> 00:06:48,629
the lltv was built not for beauty but

125
00:06:53,830 --> 00:06:50,639
rather for completion of a specific

126
00:06:56,469 --> 00:06:53,840
dynamic training routine

127
00:06:59,110 --> 00:06:56,479
the basic airframe shaped much like a

128
00:07:00,230 --> 00:06:59,120
pyramid is a tubular aluminum alloy

129
00:07:02,309 --> 00:07:00,240
structure

130
00:07:04,150 --> 00:07:02,319
it has a number of structural mounts for

131
00:07:05,350 --> 00:07:04,160
systems and equipment

132
00:07:09,670 --> 00:07:05,360
[Music]

133
00:07:11,909 --> 00:07:09,680
the lltv has three lift engines

134
00:07:15,189 --> 00:07:11,919
a gimbaled turbojet engine with a thrust

135
00:07:19,029 --> 00:07:15,199
of 4200 pounds is the key to simulating

136
00:07:21,589 --> 00:07:19,039
a lunar module landing on the moon

137
00:07:24,790 --> 00:07:21,599
electronically controlled the engine

138
00:07:26,870 --> 00:07:24,800

during lunar simulation supports 5 6 of

139
00:07:29,749 --> 00:07:26,880
the weight of the lltv

140
00:07:32,469 --> 00:07:29,759
and nullifies aerodynamic forces caused

141
00:07:35,110 --> 00:07:32,479
by the atmosphere

142
00:07:37,350 --> 00:07:35,120
thus in flight the vehicle handles as if

143
00:07:38,710 --> 00:07:37,360
it weighed only one six as much as it

144
00:07:41,749 --> 00:07:38,720
actually does

145
00:07:43,990 --> 00:07:41,759
and as if it were in a near vacuum

146
00:07:48,070 --> 00:07:44,000
in short as if it were functioning under

147
00:07:53,189 --> 00:07:50,790
two rocket engines provide the one six g

148
00:07:55,830 --> 00:07:53,199
lift vector used for maneuvering during

149
00:07:58,469 --> 00:07:55,840
lunar landing simulations

150
00:08:00,469 --> 00:07:58,479
these engines which can be throttled

151
00:08:02,390 --> 00:08:00,479
fulfill the role of the lunar module

152
00:08:04,230 --> 00:08:02,400
descent engine

153
00:08:06,230 --> 00:08:04,240
and the pilot uses them in simulating

154
00:08:10,070 --> 00:08:06,240
the lunar landing phase including

155
00:08:15,350 --> 00:08:12,230
clusters of small rockets are used to

156
00:08:16,950 --> 00:08:15,360
control the attitude or orientation of

157
00:08:18,869 --> 00:08:16,960
the lltv

158
00:08:22,710 --> 00:08:18,879
the same technique used for controlling

159
00:08:27,830 --> 00:08:25,110
both the rocket engines used for lift

160
00:08:29,589 --> 00:08:27,840
and translations and the clusters used

161
00:08:32,070 --> 00:08:29,599
for attitude control

162
00:08:35,509 --> 00:08:32,080
are fueled with hydrogen peroxide which

163
00:08:39,750 --> 00:08:37,269

much of the electrical and electronic

164
00:08:41,430 --> 00:08:39,760
equipment is located on a platform

165
00:08:45,030 --> 00:08:41,440
mounted at the rear of the vehicle

166
00:08:49,750 --> 00:08:47,350
the landing gear located at the end of

167
00:08:51,269 --> 00:08:49,760
each leg are basically conventional

168
00:08:52,949 --> 00:08:51,279
landing struts

169
00:08:54,870 --> 00:08:52,959
they are designed to absorb both

170
00:08:57,910 --> 00:08:54,880
horizontal and vertical shocks of

171
00:09:02,150 --> 00:09:00,230
the pilot's cockpit is located on a

172
00:09:04,389 --> 00:09:02,160
platform at the front of the vehicle

173
00:09:06,790 --> 00:09:04,399
structure

174
00:09:09,190 --> 00:09:06,800
the cockpit is equipped with an ejection

175
00:09:11,190 --> 00:09:09,200
seat unlike the lunar module in which

176
00:09:13,509 --> 00:09:11,200
the pilots stand during the landing

177
00:09:16,310 --> 00:09:13,519
phase

178
00:09:19,990 --> 00:09:16,320
on one side flight controls and displays

179
00:09:22,790 --> 00:09:20,000
are peculiar to the lltv

180
00:09:24,710 --> 00:09:22,800
on the other side controls and displays

181
00:09:26,870 --> 00:09:24,720
are near duplicates of those in the

182
00:09:28,870 --> 00:09:26,880
lunar module

183
00:09:31,670 --> 00:09:28,880
the hand controller for instance is

184
00:09:34,550 --> 00:09:31,680
actual flight hardware adapted for use

185
00:09:36,389 --> 00:09:34,560
in the lltv

186
00:09:39,110 --> 00:09:36,399
the pilot instrument panel

187
00:09:43,350 --> 00:09:39,120
also has many of the same displays as

188
00:09:49,269 --> 00:09:45,750

even for men as skilled as astronauts in

189
00:09:53,509 --> 00:09:49,279
engineering and piloting the lltv is not

190
00:09:57,670 --> 00:09:55,829
before an astronaut ever actually flies

191
00:09:59,670 --> 00:09:57,680
a lltv

192
00:10:03,670 --> 00:09:59,680
he has trained in a helicopter for at

193
00:10:08,870 --> 00:10:06,630
he has trained in an ll tv simulator

194
00:10:13,030 --> 00:10:08,880
completing a detailed program or

195
00:10:17,170 --> 00:10:14,949
he has trained in a vehicle tethered to

196
00:10:19,030 --> 00:10:17,180
a large overhead frame

197
00:10:21,430 --> 00:10:19,040
[Music]

198
00:10:23,350 --> 00:10:21,440
he has handled the lltv mounted in a

199
00:10:25,990 --> 00:10:23,360
fixture where the vehicle will respond

200
00:10:29,190 --> 00:10:26,000
to certain flight commands

201
00:10:31,590 --> 00:10:29,200
and he has powered up the lltv engines

202
00:10:33,509 --> 00:10:31,600
with the vehicle itself tied down

203
00:10:36,790 --> 00:10:33,519
to become accustomed to the operation of

204
00:10:41,910 --> 00:10:39,430
only after the considerable training

205
00:10:43,590 --> 00:10:41,920
plus many briefings is he ready to fly

206
00:10:45,990 --> 00:10:43,600
the lltv

207
00:10:48,230 --> 00:10:46,000
and in the total picture this is but a

208
00:10:57,190 --> 00:10:48,240
small part of the training necessary to

209
00:11:03,910 --> 00:11:00,470
similarly getting the lltv ready to fly

210
00:11:08,310 --> 00:11:05,829
in the hangar before the flight

211
00:11:15,030 --> 00:11:08,320
technicians check out systems electrical

212
00:11:19,990 --> 00:11:17,590
further they set the control gyroscopes

213
00:11:26,630 --> 00:11:20,000

a task which in itself requires several

214
00:11:33,030 --> 00:11:28,550
during the flight several men will be

215
00:11:37,350 --> 00:11:35,269
the flight director who has command of

216
00:11:39,350 --> 00:11:37,360
the mission

217
00:11:41,269 --> 00:11:39,360
the avionics flight controller who

218
00:11:44,470 --> 00:11:41,279
monitors the equipment which controls

219
00:11:46,550 --> 00:11:44,480
the orientation of the vehicle

220
00:11:50,710 --> 00:11:46,560
the dynamics flight controller who

221
00:11:53,030 --> 00:11:50,720
monitors the lltv flight trajectory

222
00:11:54,790 --> 00:11:53,040
the jet engine flight controller who

223
00:11:58,710 --> 00:11:54,800
keeps watch over the operation of the

224
00:12:02,870 --> 00:12:01,110
the rocket engine flight controller who

225
00:12:05,590 --> 00:12:02,880
keeps check on the operations of the

226
00:12:07,829 --> 00:12:05,600
rocket engines

227
00:12:09,910 --> 00:12:07,839
two telemetry technicians who monitor

228
00:12:11,430 --> 00:12:09,920
the telemetry signals received from the

229
00:12:14,310 --> 00:12:11,440
vehicle

230
00:12:16,550 --> 00:12:14,320
and an operations and procedures officer

231
00:12:21,590 --> 00:12:16,560
who handles flight clearance and support

232
00:12:26,069 --> 00:12:23,750
normally the missions are set for soon

233
00:12:28,150 --> 00:12:26,079
after sunrise when there is adequate

234
00:12:33,269 --> 00:12:28,160
light and wind velocities are not

235
00:12:37,910 --> 00:12:36,150
during the pre-dawn hours the lltv is

236
00:12:41,190 --> 00:12:37,920
rolled out of the hangar and to the

237
00:12:46,480 --> 00:12:41,200
liftoff point

238
00:13:13,430 --> 00:13:03,710

[Music]

239
00:13:17,910 --> 00:13:15,509
the flight controllers along with the

240
00:13:20,310 --> 00:13:17,920
pilot have all been briefed earlier by

241
00:13:22,470 --> 00:13:20,320
the flight director on the mission plan

242
00:13:24,310 --> 00:13:22,480
and objectives okay gentlemen if i can

243
00:13:26,470 --> 00:13:24,320
have your attention

244
00:13:27,590 --> 00:13:26,480
this is a lunar simulation flight for mr

245
00:13:30,230 --> 00:13:27,600
rheem

246
00:13:32,150 --> 00:13:30,240
the altitude is 300 feet

247
00:13:34,550 --> 00:13:32,160
and bill for your information the winds

248
00:13:39,269 --> 00:13:34,560
20 25 feet per second basically out of

249
00:13:43,509 --> 00:13:41,590
dave the vehicle is sitting on this

250
00:13:44,550 --> 00:13:43,519
runway right now

251
00:13:46,230 --> 00:13:44,560
and it looks like we're probably going

252
00:13:47,910 --> 00:13:46,240
to have the entire field closed so when

253
00:13:51,030 --> 00:13:47,920
we get ready for takeoff we may switch

254
00:13:52,550 --> 00:13:51,040
over to runway 107. wow

255
00:13:55,110 --> 00:13:52,560
the winds i said are the east and

256
00:13:56,710 --> 00:13:55,120
northeast mile's been brief to take off

257
00:13:58,629 --> 00:13:56,720
and hover into the wind about 50 feet

258
00:14:00,470 --> 00:13:58,639
probably we'll need a balanced check

259
00:14:02,230 --> 00:14:00,480
at that time

260
00:14:03,990 --> 00:14:02,240
we'll move the vehicle down towards the

261
00:14:06,870 --> 00:14:04,000
100 foot marker and this ring will begin

262
00:14:08,870 --> 00:14:06,880
to climb to about 300 feet okay you'll

263
00:14:10,790 --> 00:14:08,880

check the winds at that point

264
00:14:12,790 --> 00:14:10,800
we'll give them the same clearance we'll

265
00:14:15,350 --> 00:14:12,800
turn around downwind turn the lunar sim

266
00:14:17,590 --> 00:14:15,360
switch on movement comp on and beginning

267
00:14:19,030 --> 00:14:17,600
sim down the wrong way this way

268
00:14:20,470 --> 00:14:19,040
to terminate the action down in this

269
00:14:22,470 --> 00:14:20,480
area

270
00:14:29,990 --> 00:14:22,480
any questions on the mission goal

271
00:14:35,110 --> 00:14:32,310
engines of service the jet engine with

272
00:14:38,310 --> 00:14:35,120
conventional jp4 jet fuel

273
00:14:40,870 --> 00:14:38,320
the rocket engines with peroxide fuel

274
00:14:42,710 --> 00:14:40,880
the peroxide fuel is toxic and the

275
00:14:45,110 --> 00:14:42,720
technicians must wear protective

276
00:14:47,189 --> 00:14:45,120
garments

277
00:14:48,870 --> 00:14:47,199
the flight director in the meantime

278
00:14:51,590 --> 00:14:48,880
stays in communication with the

279
00:14:54,069 --> 00:14:51,600
ellington air force base control tower

280
00:14:58,110 --> 00:14:54,079
to coordinate ll tv flights with other

281
00:14:58,120 --> 00:15:07,670
[Music]

282
00:15:11,670 --> 00:15:09,590
the flight director stays in touch with

283
00:15:15,829 --> 00:15:11,680
nasa weather personnel to check on

284
00:15:18,710 --> 00:15:17,269
okay

285
00:15:21,509 --> 00:15:18,720
we've got the latest wind plot showing

286
00:15:22,949 --> 00:15:21,519
maximum winds 25 feet per second up to

287
00:15:24,629 --> 00:15:22,959
400 feet

288
00:15:26,870 --> 00:15:24,639

he makes certain that flight support

289
00:15:28,790 --> 00:15:26,880
personnel are on station

290
00:15:30,230 --> 00:15:28,800
white bird flight radio check flight

291
00:15:32,870 --> 00:15:30,240
this is white bird read you loud and

292
00:15:34,389 --> 00:15:32,880
clear pedro flight radio check read you

293
00:15:38,389 --> 00:15:34,399
loud and clear

294
00:15:42,870 --> 00:15:38,399
okay nine five one you proceed with the

295
00:15:46,310 --> 00:15:44,470
cockpit is secure loose articles have

296
00:15:49,189 --> 00:15:46,320
been removed and have the oxygen system

297
00:15:50,710 --> 00:15:49,199
checked and the two pins are out

298
00:15:52,550 --> 00:15:50,720
emergency throttle is in the normal

299
00:15:55,430 --> 00:15:52,560
position

300
00:15:58,230 --> 00:15:55,440
a circuit breaker 28 up correction half

301
00:15:59,590 --> 00:15:58,240
circuit breaker 20 up 28 is down and i'm

302
00:16:03,990 --> 00:15:59,600
setting the d handle friction at this

303
00:16:08,470 --> 00:16:05,990
the handle friction has been set all

304
00:16:09,990 --> 00:16:08,480
breakers are in except 28.

305
00:16:11,430 --> 00:16:10,000
instrument lights will be off for this

306
00:16:13,590 --> 00:16:11,440
flight i have the doppler on and the

307
00:16:15,030 --> 00:16:13,600
altimeter is on

308
00:16:19,030 --> 00:16:15,040
setting the peroxide computer at this

309
00:16:23,189 --> 00:16:21,670
battery is on dc is off and i have the

310
00:16:25,189 --> 00:16:23,199
ac on

311
00:16:29,350 --> 00:16:25,199
acs is going safe

312
00:16:43,749 --> 00:16:29,360
throttle is verified off and we're ready

313
00:16:47,990 --> 00:16:46,629

okay the dc is going on

314
00:16:51,110 --> 00:16:48,000
external power and air have been

315
00:16:52,389 --> 00:16:51,120
disconnected the egt is 532 and rising

316
00:16:54,629 --> 00:16:52,399
slowly

317
00:16:56,629 --> 00:16:54,639
all pressure light just came on the rpm

318
00:16:58,870 --> 00:16:56,639
is uh 46

319
00:17:08,480 --> 00:16:58,880
the oil pressure

320
00:17:08,490 --> 00:17:15,429
[Music]

321
00:17:15,439 --> 00:17:24,069
check

322
00:17:24,079 --> 00:17:28,630
and what comp is on

323
00:17:28,640 --> 00:17:45,590
red

324
00:17:45,600 --> 00:18:26,390
you

325
00:18:26,400 --> 00:18:31,390
climbing

326
00:18:31,400 --> 00:18:37,510
[Music]

327
00:19:07,750 --> 00:18:38,560
is

328
00:19:07,760 --> 00:19:18,950
magnitude

329
00:19:32,789 --> 00:19:21,430
okay everything looks good

330
00:19:32,799 --> 00:19:59,029
200.

331
00:19:59,039 --> 00:20:14,789
five

332
00:20:14,799 --> 00:20:17,870
touchdown

333
00:20:22,310 --> 00:20:20,470
[Music]

334
00:20:24,630 --> 00:20:22,320
following the flight the mission will be

335
00:20:26,390 --> 00:20:24,640
reviewed by the pilot

336
00:20:29,110 --> 00:20:26,400
the flight director

337
00:20:31,350 --> 00:20:29,120
and flight controllers

338
00:20:36,230 --> 00:20:31,360

problems will be discussed comments will

339
00:20:40,870 --> 00:20:38,230
not until the pilot has flown at least

340
00:20:43,270 --> 00:20:40,880
22 missions in the lltv

341
00:20:45,350 --> 00:20:43,280
plus those required to maintain flight

342
00:20:47,750 --> 00:20:45,360
readiness and to perfect specialized

343
00:20:51,270 --> 00:20:47,760
landing techniques will he be ready to

344
00:20:55,909 --> 00:20:53,590
only then is he ready to deal with the

345
00:20:58,230 --> 00:20:55,919
strange handling characteristics of the

346
00:21:00,149 --> 00:20:58,240
greatly differing lunar module in an

347
00:21:02,950 --> 00:21:00,159
unfamiliar situation

348
00:21:07,300 --> 00:21:02,960
the last 300 feet to the surface of the