1
00:00:24,240 --> 00:00:21,190
this is shuttle launch control at

2
00:00:26,500 --> 00:00:24,250
t-minus three hours and holding

3
00:00:31,630 --> 00:00:26,510
approximately one hour and 11 minutes

4
00:00:33,400 --> 00:00:31,640
remaining in this built-in hold the ice

5
00:00:37,840 --> 00:00:33,410
team is at the pad doing their

6
00:00:41,979 --> 00:00:37,850
inspections at this time and is

7
00:00:45,700 --> 00:00:41,989
reporting some limited ice found in need

8
00:00:50,799 --> 00:00:45,710
on the external tank but not of any

9
00:00:54,130 --> 00:00:50,809
consequence we are now in the breakfast

10
00:00:59,380 --> 00:00:54,140
room at the astronaut quarters where the

11
00:01:02,200 --> 00:00:59,390
STS 31 crew is having breakfast mission

12
00:01:04,390 --> 00:01:02,210
specialist dr. Steve Hawley who will be

13
00:01:05,820 --> 00:01:04,400

deploying the telescope from the moment

14
00:01:08,380 --> 00:01:05,830
if you later arm

15
00:01:08,920 --> 00:01:08,390
Colonel Charlie Bolden the pilot on this

16
00:01:13,960 --> 00:01:08,930
mission

17
00:01:18,340 --> 00:01:13,970
the commander Lauren Shriver or the

18
00:01:18,870 --> 00:01:18,350
space shuttle Discovery dr. Kathy

19
00:01:24,370 --> 00:01:18,880
Sullivan

20
00:01:27,190 --> 00:01:24,380
mission specialist and captain Navy

21
00:01:33,429 --> 00:01:27,200
captain Bruce McCandless mission

22
00:01:36,270 --> 00:01:33,439
specialist the mission emblem on the

23
00:01:38,260 --> 00:01:36,280
cake on breakfast table which is

24
00:01:41,469 --> 00:01:38,270
Discovery with the Hubble Space

25
00:01:44,859 --> 00:01:41,479
Telescope on a field of planets stars

26
00:01:46,840 --> 00:01:44,869
and galaxies after breakfast they will

27
00:01:49,690 --> 00:01:46,850
receive a weather briefing and then Don

28
00:01:56,139 --> 00:01:49,700
their flight suits and depart for the

29
00:01:58,300 --> 00:01:56,149
pad about 5:15 this morning this is

30
00:02:00,700 --> 00:01:58,310
shuttle launch control at t-minus three

31
00:02:02,730 --> 00:02:00,710
hours and holding approximately nine

32
00:02:06,849 --> 00:02:02,740
minutes remaining in this built-in hold

33
00:02:09,370 --> 00:02:06,859
we are watching the astronauts suit up

34
00:02:15,490 --> 00:02:09,380
this is commander Lawrence reiver

35
00:02:21,160 --> 00:02:18,220
driver is an Air Force colonel and is

36
00:02:23,860 --> 00:02:21,170
the mission commander there is Marine

37
00:02:27,010 --> 00:02:23,870
Colonel Charlie Bolden the pilot also

38
00:02:30,160 --> 00:02:27,020

having his helmet and communications

39
00:02:32,350 --> 00:02:30,170
attachments completed on the other side

40
00:02:34,780 --> 00:02:32,360
of the room is mission specialist dr.

41
00:02:36,550 --> 00:02:34,790
Katherine Sullivan awaiting the helmet

42
00:02:42,430 --> 00:02:36,560
attachment otherwise her suit up is

43
00:02:47,230 --> 00:02:42,440
essentially complete there is Navy

44
00:02:49,230 --> 00:02:47,240
captain Bruce McCandless McCandless and

45
00:02:51,910 --> 00:02:49,240
Kathy Sullivan will be doing the

46
00:02:57,010 --> 00:02:51,920
contingency VA on this flight should one

47
00:02:59,440 --> 00:02:57,020
be necessary and dr. Steve Holly ready

48
00:03:01,480 --> 00:02:59,450
to go he will be operated a operating

49
00:03:16,390 --> 00:03:01,490
the remote manipulator arm to deploy the

50
00:03:24,400 --> 00:03:20,530
the crew now headed for the elevator

51
00:03:27,430 --> 00:03:24,410
that will take them down to the first

52
00:03:30,600 --> 00:03:27,440
floor will they'll board the Astro van

53
00:03:34,000 --> 00:03:30,610
for the 20-minute ride out to pad B

54
00:03:40,030 --> 00:03:34,010
commander and the pilot commander

55
00:03:43,470 --> 00:03:40,040
Shriver and pilot Charlie Bolden Bruce

56
00:03:51,720 --> 00:03:45,630
and members of the support team will be

57
00:03:58,020 --> 00:03:51,730
going out there is the crew headed down

58
00:04:03,960 --> 00:03:58,030
the elevator and momentarily will see

59
00:04:09,180 --> 00:04:06,480
and numerous KSC employees usually wait

60
00:04:35,939 --> 00:04:09,190
by the walkway to greet them as they

61
00:04:41,199 --> 00:04:38,739
this is a view of the orbiter access arm

62
00:04:43,689 --> 00:04:41,209
and we can see our five member flight

63
00:04:46,989 --> 00:04:43,699

crew crossing from the fixed service

64
00:04:50,639 --> 00:04:46,999
structure into the white room where they

65
00:04:57,399 --> 00:04:50,649
will be assisted by the closeout team

66
00:05:04,229 --> 00:04:57,409
and other astronauts support crew

67
00:05:06,120 --> 00:05:04,239
members commander Lauren Shriver has

68
00:05:08,670 --> 00:05:06,130
just

69
00:05:11,760 --> 00:05:08,680
entered the access hatch of discovery

70
00:05:18,330 --> 00:05:11,770
assisted by closeout crew pilot charlie

71
00:05:19,350 --> 00:05:18,340
bolden will be next and as they enter

72
00:05:21,180 --> 00:05:19,360
their seats and begin their

73
00:05:31,950 --> 00:05:21,190
communications checks will be hearing

74
00:05:31,960 --> 00:05:48,770
OTC city are

75
00:05:48,780 --> 00:06:02,130
empty the CDR how do you read

76
00:06:08,760 --> 00:06:07,500
and houston city our city are you stand

77
00:06:28,540 --> 00:06:08,770
good morning Lauren you're loud and

78
00:06:38,140 --> 00:06:33,860
and that's why our ms wine houston

79
00:06:38,150 --> 00:06:43,000
looks like I'm gonna stay down here

80
00:07:04,400 --> 00:06:45,200
that's good we're working on other

81
00:07:12,710 --> 00:07:04,410
places t-minus seven minutes 30 seconds

82
00:07:14,540 --> 00:07:12,720
and counting this arm can be reacted in

83
00:07:28,260 --> 00:07:14,550
less than half a minute if that's

84
00:07:44,670 --> 00:07:31,060
I'm a upon t-minus five minutes and

85
00:07:58,760 --> 00:07:48,189
final purge sequence of the main engines

86
00:08:03,170 --> 00:08:01,490
we're now transferring to internal power

87
00:08:07,089 --> 00:08:03,180
and switching off the orbiters ground

88
00:08:11,350 --> 00:08:07,099

power supply at this point discovery is

89
00:08:13,909 --> 00:08:11,360
being powered by the onboard fuel cells

90
00:08:20,839 --> 00:08:13,919
standing by now here is the retraction

91
00:08:23,240 --> 00:08:20,849
of the gaseous oxygen vent hood the

92
00:08:26,540 --> 00:08:23,250
gambling of the main engines is complete

93
00:08:31,909 --> 00:08:26,550
and the aerosurfaces have been verified

94
00:08:33,649 --> 00:08:31,919
that they are positioned for launch the

95
00:08:48,050 --> 00:08:33,659
external tank now is reported to be at

96
00:08:50,019 --> 00:08:48,060
flight pressure standing by now for a go

97
00:08:58,340 --> 00:08:50,029
for autosequence start

98
00:09:00,019 --> 00:08:58,350
t-minus 33 has happened is the ground

99
00:09:02,660 --> 00:09:00,029
launch sequencer would not hand off to

100
00:09:05,750 --> 00:09:02,670
the orbiters computers to complete the

101
00:09:08,810 --> 00:09:05,760
count because the liquid oxygen fill and

102
00:09:18,829 --> 00:09:08,820
drain valve was showing off when it

103
00:09:32,389 --> 00:09:18,839
should be on confirmation that we have

104
00:09:38,090 --> 00:09:32,399
successfully recycling we are go for

105
00:09:41,540 --> 00:09:38,100
start booster hydraulic power units have

106
00:09:50,610 --> 00:09:43,769
sound suppression water system has

107
00:09:53,249 --> 00:09:50,620
started do you - 13 seconds t-minus 10

108
00:09:56,579 --> 00:09:53,259
go for main engine start we are go for

109
00:10:01,710 --> 00:09:56,589
main engine start t-minus six five four

110
00:10:03,449 --> 00:10:01,720
three two one and liftoff of the space

111
00:10:08,179 --> 00:10:03,459
shuttle Discovery with the Hubble Space

112
00:10:08,189 --> 00:10:14,420
Mission Control Houston

113
00:10:25,460 --> 00:10:18,509

discovery the roll maneuver puts the

114
00:10:36,480 --> 00:10:27,960
guidance officer confirms a good roll

115
00:10:38,189 --> 00:10:36,490
maneuver engines now throttling back the

116
00:10:39,990 --> 00:10:38,199
throttle down maneuver assists in

117
00:10:41,460 --> 00:10:40,000
reducing the aerodynamic loads on

118
00:10:54,720 --> 00:10:41,470
discovery as it passes through the area

119
00:11:06,530 --> 00:10:57,030
voici now 1,200 feet per second

120
00:11:15,330 --> 00:11:10,260
discovery go at throttle up all three

121
00:11:17,010 --> 00:11:15,340
engines now throttling up engines at 104

122
00:11:18,330 --> 00:11:17,020
percent the go at throttle up calls

123
00:11:20,040 --> 00:11:18,340
signifies that all systems are

124
00:11:21,980 --> 00:11:20,050
performing well all three auxiliary

125
00:11:24,930 --> 00:11:21,990
power units look good

126
00:11:27,870 --> 00:11:24,940
Discovery's velocity now 2,300 feet per

127
00:11:41,549 --> 00:11:27,880
second and it's downrange eight nautical

128
00:11:56,910 --> 00:11:51,100
standing by for SRB separation and both

129
00:12:03,069 --> 00:11:59,799
Discovery's velocity now 4,300 feet per

130
00:12:06,900 --> 00:12:03,079
second at a downrange distance of 35

131
00:12:12,179 --> 00:12:09,609
this drop stir reports all three engines

132
00:12:18,869 --> 00:12:12,189
stable at 104 percent performance

133
00:12:38,769 --> 00:12:21,549
discovery Houston you have a go to open

134
00:12:45,479 --> 00:12:38,779
the doors Charlie can't get noisy and

135
00:12:53,369 --> 00:12:47,499
after that stand by Charlie we're

136
00:13:01,239 --> 00:12:59,710
yes and discovery go ahead charlie yes

137
00:13:08,590 --> 00:13:01,249
we'd like to know if we can go ahead and

138
00:13:10,840 --> 00:13:08,600

get a jump on cube and deploy that's

139
00:13:20,720 --> 00:13:10,850
permanent Carol you have a go 4k u'b and

140
00:13:31,310 --> 00:13:25,680
and Houston probably seen all the IV

141
00:13:36,390 --> 00:13:33,810
Roger that Lorne we've been watching

142
00:13:52,540 --> 00:13:36,400
here the I amuse look good then we

143
00:13:56,990 --> 00:13:55,340
and this is Mission Control Houston at

144
00:14:00,200 --> 00:13:57,000
three hours two minutes into the flight

145
00:14:02,030 --> 00:14:00,210
of discovery we're now seeing payload

146
00:14:04,550 --> 00:14:02,040
bay views from camera a that's on the

147
00:14:08,180 --> 00:14:04,560
forward bulkhead of Discovery looking

148
00:14:10,579 --> 00:14:08,190
aft we're seeing the remote manipulator

149
00:14:13,670 --> 00:14:10,589
system arm as it is put through its

150
00:14:15,890 --> 00:14:13,680
paces being checked out for tomorrow's

151
00:14:24,260 --> 00:14:15,900
activities related to the hubble space

152
00:14:26,690 --> 00:14:24,270
telescope discovery Houston were getting

153
00:14:28,519 --> 00:14:26,700
some real good payload Bay television

154
00:14:35,980 --> 00:14:28,529
downlink and we see that Steve has been

155
00:15:11,410 --> 00:14:39,500
okay he's getting a good start check out

156
00:15:15,580 --> 00:15:13,450
this is Mission Control mission

157
00:15:18,580 --> 00:15:15,590
specialist Steve Hawley continuing to

158
00:15:21,160 --> 00:15:18,590
take the RMS through it checkout

159
00:15:23,470 --> 00:15:21,170
procedures we are looking at the end

160
00:15:28,600 --> 00:15:23,480
effector as it has run through the snare

161
00:15:31,060 --> 00:15:28,610
drive test the end effector will be used

162
00:15:34,540 --> 00:15:31,070
to grapple the Hubble Space Telescope

163
00:15:38,590 --> 00:15:34,550

tomorrow and will be used to release the

164
00:15:47,070 --> 00:15:38,600
telescope and the end effector is about

165
00:16:07,259 --> 00:15:59,800
go ahead discovery that sounds great

166
00:16:11,129 --> 00:16:09,179
discovery Houston just wanted to let you

167
00:16:14,519 --> 00:16:11,139
know that the ground is currently

168
00:16:25,129 --> 00:16:14,529
configured or HST main bus activation so

169
00:16:25,139 --> 00:16:36,010
Roger Lauren we copy

170
00:17:46,680 --> 00:16:39,260
good morning outer space from other

171
00:17:51,340 --> 00:17:49,480
good morning discovery your wake-up

172
00:17:53,289 --> 00:17:51,350
music today as compliments of your

173
00:18:07,310 --> 00:17:53,299
training team we want you to make them

174
00:18:13,880 --> 00:18:12,170
right good morning discovery good

175
00:18:16,130 --> 00:18:13,890
morning from bill Reeves in orbit one

176
00:18:30,250 --> 00:18:16,140
team when you got a go for HST deploy

177
00:18:35,060 --> 00:18:32,630
this is Mission Control Houston this

178
00:18:37,820 --> 00:18:35,070
digital animation being fed by live

179
00:18:39,890 --> 00:18:37,830
telemetry depicting the motion of the

180
00:18:42,320 --> 00:18:39,900
robot arm as mission specialist Steve

181
00:18:46,070 --> 00:18:42,330
Holly begins to put it through its paces

182
00:18:49,540 --> 00:18:46,080
this live view coming from the forward

183
00:18:52,010 --> 00:18:49,550
port bulkhead camera bore discovery

184
00:18:53,960 --> 00:18:52,020
gives us a look at the real thing yes

185
00:18:56,450 --> 00:18:53,970
Steve Hawley has on birthday arm and has

186
00:19:06,820 --> 00:18:56,460
begun to move it into position for

187
00:19:12,380 --> 00:19:10,940
this is Mission Control Houston our PDRs

188
00:19:17,090 --> 00:19:12,390

officer here in the flight control room

189
00:19:26,029 --> 00:19:17,100
confirms via telemetry that the Hubble

190
00:19:27,350 --> 00:19:26,039
Space Telescope has been grappled this

191
00:19:29,450 --> 00:19:27,360
is Mission Control Houston were

192
00:19:31,549 --> 00:19:29,460
continuing to take live television from

193
00:19:34,549 --> 00:19:31,559
the shuttle Discovery this from the aft

194
00:19:37,669 --> 00:19:34,559
flight deck of the vehicle as mission

195
00:19:41,169 --> 00:19:37,679
specialist Kathy Sullivan continues to

196
00:19:43,490 --> 00:19:41,179
prepare for deployments at this point

197
00:19:47,149 --> 00:19:43,500
beginning to set up photographic

198
00:19:56,019 --> 00:19:47,159
equipment on the flight deck to document

199
00:20:02,750 --> 00:20:00,139
alright you gotta go to release the

200
00:20:10,220 --> 00:20:02,760
furnish and go to transfer helpful to

201
00:20:12,669 --> 00:20:10,230
internal power on time release and go

202
00:20:27,020 --> 00:20:12,679
for transfer the internal power on time

203
00:20:34,940 --> 00:20:32,360
and here's the discovery the planet in

204
00:20:36,890 --> 00:20:34,950
terms of power complete the Oracle is

205
00:20:48,970 --> 00:20:36,900
debt based and will be standing by for

206
00:20:48,980 --> 00:20:56,590
discover your goal from umbilical

207
00:21:07,910 --> 00:21:06,470
disconnect it sperm in this solar array

208
00:21:10,580 --> 00:21:07,920
deploy at attune

209
00:21:13,970 --> 00:21:10,590
that discovery is and at the time which

210
00:21:18,070 --> 00:21:13,980
has the Sun constantly off the nose of

211
00:21:20,120 --> 00:21:18,080
the orbiter discovery the image and the

212
00:21:22,940 --> 00:21:20,130
majority of the field of view is

213
00:21:26,270 --> 00:21:22,950

reflection of the forward bulkhead in

214
00:21:30,220 --> 00:21:26,280
the metallic aperture door of the

215
00:21:39,590 --> 00:21:33,470
you know pitch is about four degrees off

216
00:21:42,710 --> 00:21:41,359
maybe that's what make let's making it

217
00:21:48,200 --> 00:21:42,720
look like that

218
00:21:48,210 --> 00:21:51,860
I see you coming up

219
00:21:55,910 --> 00:21:54,380
how does it look out your window as far

220
00:22:02,900 --> 00:21:55,920
as clearance because that's the only

221
00:22:14,460 --> 00:22:06,370
let's show us about two inches starboard

222
00:22:14,470 --> 00:22:18,700
and the

223
00:22:22,480 --> 00:22:20,650
it's about an inch forward but I think

224
00:22:41,010 --> 00:22:22,490
that maybe pitch pitch again kind of

225
00:22:45,000 --> 00:22:42,750
sure looks like I want to go to start

226
00:22:48,899 --> 00:22:45,010
starboard yeah I'd go ahead and do it

227
00:22:57,629 --> 00:22:48,909
did you get over here I can see lots of

228
00:23:04,530 --> 00:22:59,459
Charlie coming in over your shoulder a

229
00:23:09,070 --> 00:23:04,540
little bit more pink okay what's my

230
00:23:25,090 --> 00:23:09,080
okay Z is minus 538 and it's coming up

231
00:23:30,730 --> 00:23:27,249
and this is Hubble telescope control in

232
00:23:32,919 --> 00:23:30,740
Greenbelt we have been given the

233
00:23:35,919 --> 00:23:32,929
go-ahead to begin commanding a release

234
00:23:38,590 --> 00:23:35,929
of the forward latches which hold the

235
00:23:41,680 --> 00:23:38,600
solar arrays in place during launch

236
00:23:44,560 --> 00:23:41,690
along the side of the telescope the

237
00:23:46,149 --> 00:23:44,570
forward latches are on both sides both

238
00:24:07,500 --> 00:23:46,159

the port and starboard side of the

239
00:24:22,659 --> 00:24:09,840
discovery no need to acknowledge and

240
00:24:27,970 --> 00:24:24,820
discovery will take this attitude right

241
00:24:36,050 --> 00:24:27,980
here like you to go free drift or PDM

242
00:24:40,520 --> 00:24:38,180
the Hubble telescope control Greenbelt

243
00:24:42,530 --> 00:24:40,530
one day one hour 54 minutes mission

244
00:24:46,340 --> 00:24:42,540
elapsed I'm continuing to receive

245
00:24:49,880 --> 00:24:46,350
television through the Vandenburg

246
00:24:54,020 --> 00:24:49,890
tracking station and it is clearly

247
00:24:58,910 --> 00:24:54,030
showing the deployment of the solar

248
00:25:02,060 --> 00:24:58,920
array masts with the solar array package

249
00:25:06,350 --> 00:25:02,070
in the stowed position the arrays are

250
00:25:12,440 --> 00:25:06,360
wound much like a pair of window shades

251
00:25:15,880 --> 00:25:12,450
around a roller and kept in that

252
00:25:18,800 --> 00:25:15,890
configuration for launch and once the

253
00:25:23,890 --> 00:25:18,810
primary deployment activity has been

254
00:25:27,680 --> 00:25:23,900
completed the crew tweaks the attitude

255
00:25:31,150 --> 00:25:27,690
and replaces the vehicle and free drift

256
00:25:34,580 --> 00:25:31,160
the operations team here will begin

257
00:25:47,920 --> 00:25:34,590
commanding the solar array blankets to

258
00:25:58,490 --> 00:25:50,890
discovery in order to preserve an orbit

259
00:26:17,690 --> 00:26:03,740
okay we're proceeding with that thank

260
00:26:24,230 --> 00:26:17,700
you so we see both again moving Thank

261
00:26:28,460 --> 00:26:24,240
You Lauren and as commander Lawrence

262
00:26:30,409 --> 00:26:28,470
reiver just confirmed what our data

263
00:26:33,350 --> 00:26:30,419

screens are showing here in the control

264
00:26:36,169 --> 00:26:33,360
center that the motors are in operation

265
00:26:38,389 --> 00:26:36,179
and the two high gain antenna masts are

266
00:26:48,759 --> 00:26:38,399
in the process of swinging 90 degrees to

267
00:27:02,950 --> 00:26:52,119
discovery go free drift or plus SDM

268
00:27:14,590 --> 00:27:02,960
deploy a free dress toy every person

269
00:27:20,830 --> 00:27:17,499
and as the crew just confirmed we're

270
00:27:34,690 --> 00:27:20,840
seeing both blankets beginning to unfurl

271
00:27:53,789 --> 00:27:34,700
on the portside solar array we got TV

272
00:28:01,270 --> 00:27:57,220
the solar arrays are driven out of their

273
00:28:06,210 --> 00:28:01,280
cassettes by by stems which are at each

274
00:28:10,270 --> 00:28:06,220
side of the array the by stem is visible

275
00:28:11,710 --> 00:28:10,280
in the television being downlink from

276
00:28:14,080 --> 00:28:11,720
the spacecraft at this time it's

277
00:28:17,200 --> 00:28:14,090
attached at the end of the array to a

278
00:28:19,980 --> 00:28:17,210
spreader bar and the spreader bar is in

279
00:28:22,840 --> 00:28:19,990
turn attached to the array which

280
00:28:26,169 --> 00:28:22,850
literally pulls the array out of the

281
00:28:52,370 --> 00:28:26,179
cassette which held it packaged during

282
00:28:58,230 --> 00:28:55,020
when fully deployed both of the arrays

283
00:29:00,960 --> 00:28:58,240
together produce about 6,000 volts about

284
00:29:03,000 --> 00:29:00,970
half of which is required to operate

285
00:29:04,710 --> 00:29:03,010
telescope systems and during the

286
00:29:08,760 --> 00:29:04,720
daylight side of the past the other half

287
00:29:17,340 --> 00:29:08,770
is used to recharge the six nickel

288
00:29:22,410 --> 00:29:17,350

hydrogen batteries shift supervisor Pete

289
00:29:24,570 --> 00:29:22,420
potere oh just checking with his control

290
00:29:27,390 --> 00:29:24,580
team receiving a report that from the

291
00:29:30,330 --> 00:29:27,400
ground as confirmed by the crew from

292
00:29:33,390 --> 00:29:30,340
orbit the deploy activity so far is

293
00:29:40,100 --> 00:29:33,400
going very smoothly we see no

294
00:29:48,260 --> 00:29:42,810
discovery you can go out over we're

295
00:29:56,570 --> 00:29:48,270
setting up for the other array okay

296
00:30:02,970 --> 00:30:00,030
go ahead we're looking more and more

297
00:30:10,530 --> 00:30:02,980
like an ax or mid-20 release we'd like

298
00:30:24,330 --> 00:30:10,540
you to press on with the UVA press okay

299
00:30:44,539 --> 00:30:26,460
discover your amperage your door latch

300
00:30:50,299 --> 00:30:47,779
and that is for you used entirely

301
00:30:54,099 --> 00:30:50,309
downstairs in the process again Bruce

302
00:31:04,310 --> 00:30:56,930
evn copies and we're watching the fans

303
00:31:12,829 --> 00:31:04,320
come on discovery we like free drift

304
00:31:25,489 --> 00:31:12,839
from - SDM deploy okay we copy free

305
00:31:42,470 --> 00:31:25,499
drift experiment thank you we see about

306
00:31:49,220 --> 00:31:47,170
as the blankets begin deploying the

307
00:31:52,160 --> 00:31:49,230
orbital verification team is watching

308
00:32:06,810 --> 00:31:52,170
very closely the attention being placed

309
00:32:12,240 --> 00:32:09,270
Houston discovery it looks like most

310
00:32:16,830 --> 00:32:12,250
it's topped with just about one panel

311
00:32:25,190 --> 00:32:16,840
showing and we see that to Lorne that DC

312
00:32:27,420 --> 00:32:25,200
is off this is Mission Control Houston

313
00:32:30,480 --> 00:32:27,430

flight controllers here in Mission

314
00:32:33,420 --> 00:32:30,490
Control Center discussing an impending

315
00:32:35,490 --> 00:32:33,430
deadline within about thirteen minutes

316
00:32:37,560 --> 00:32:35,500
we will reach a point of having

317
00:32:40,560 --> 00:32:37,570
concluded the pre-breathe and in order

318
00:32:43,920 --> 00:32:40,570
to provide enough rapid response time to

319
00:32:47,880 --> 00:32:43,930
support an e VA we would need to begin

320
00:32:53,190 --> 00:32:47,890
be pressurizing the airlock in about 12

321
00:32:56,100 --> 00:32:53,200
to 13 minutes from now the other thing I

322
00:32:58,770 --> 00:32:56,110
need an answer to is if I can go ahead

323
00:33:00,960 --> 00:32:58,780
and commit the e VA with a thought of

324
00:33:02,940 --> 00:33:00,970
going out and cranking it out yesterday

325
00:33:04,860 --> 00:33:02,950
if whatever they're about to do fails

326
00:33:09,590 --> 00:33:04,870
but they want us to just press on to

327
00:33:16,410 --> 00:33:15,210
the answer I need answers now plan to

328
00:33:17,880 --> 00:33:16,420
fail do it

329
00:33:20,820 --> 00:33:17,890
yeah I don't feel comfortable waiting

330
00:33:23,160 --> 00:33:20,830
until I don't want the answers now yeah

331
00:33:26,130 --> 00:33:23,170
6:20 is the might drop dead time from

332
00:33:29,640 --> 00:33:26,140
adding up all the times okay I'm gonna

333
00:33:31,320 --> 00:33:29,650
have them press oh all right Capcom tell

334
00:33:34,620 --> 00:33:31,330
the crew we want them to press on in to

335
00:33:37,080 --> 00:33:34,630
e VA and like will stop them whenever we

336
00:33:41,300 --> 00:33:37,090
have to as quickly we got four minutes

337
00:33:53,480 --> 00:33:51,810
discovery Houston okay with the panels

338
00:33:55,830 --> 00:33:53,490

that you've got out there right now

339
00:33:58,170 --> 00:33:55,840
that's not satisfactory to stay

340
00:34:09,480 --> 00:33:58,180
overnight so we're gonna have to move

341
00:34:17,070 --> 00:34:09,490
out on the EBA okay so I discovery

342
00:34:20,220 --> 00:34:17,080
Houston go ahead we think there may be

343
00:34:23,070 --> 00:34:20,230
some problem with the tension monitoring

344
00:34:24,720 --> 00:34:23,080
software they've got the DCE back on

345
00:34:27,300 --> 00:34:24,730
we're going to disable the tension

346
00:34:43,859 --> 00:34:27,310
monitoring and resend the products that

347
00:34:55,950 --> 00:34:47,889
okay yes we see motion we've gotten the

348
00:35:05,600 --> 00:35:01,470
that is food that could stop it's fully

349
00:35:10,500 --> 00:35:05,610
deployed the microswitch is confirming

350
00:35:12,690 --> 00:35:10,510
okay in for Bruce and Kathy we'd like

351
00:35:20,520 --> 00:35:12,700
you to stop the airline depress and five

352
00:35:38,370 --> 00:35:20,530
please okay they copy for you where I

353
00:35:40,320 --> 00:35:38,380
live right now okay Charlie you can

354
00:35:42,330 --> 00:35:40,330
maneuver right to the release attitude

355
00:35:48,920 --> 00:35:42,340
right now that's in the camp page three

356
00:35:58,110 --> 00:35:48,930
dash 2021 over to the released attitude

357
00:36:03,060 --> 00:35:58,120
it's firm Ryan booth we're go Pato go

358
00:36:08,010 --> 00:36:03,070
hey go oh he can't go pink oh we're go

359
00:36:11,750 --> 00:36:08,020
FAO go max go P your ass go fight

360
00:36:18,470 --> 00:36:11,760
EBA we're go sergeant here still go go

361
00:36:20,940 --> 00:36:18,480
GC go Network go payloads waiting on you

362
00:36:23,360 --> 00:36:20,950
flight pelos we are yeah

363
00:36:29,460 --> 00:36:23,370

Capcom we have a go for release

364
00:36:35,510 --> 00:36:29,470
discovery go for Hubble release we're

365
00:36:43,370 --> 00:36:40,190
discovery go ahead charlie

366
00:36:46,380 --> 00:36:43,380
okay story uh we've been taking part

367
00:36:52,610 --> 00:36:46,390
little the ratios look good and we'd

368
00:37:00,060 --> 00:36:57,990
we concur Charlie I'm sorry how is

369
00:37:03,000 --> 00:37:00,070
taking pictures your I made this your

370
00:37:04,530 --> 00:37:03,010
car you want where I go ahead and do our

371
00:37:07,620 --> 00:37:04,540
best are down so we get the guys out

372
00:37:08,940 --> 00:37:07,630
there like that approval but that's at

373
00:37:11,730 --> 00:37:08,950
your convenience team

374
00:37:17,849 --> 00:37:11,740
but once we do have the RMS tone in wolf

375
00:37:19,170 --> 00:37:17,859
Bank on EPA okay okay we'll just a few

376
00:37:20,000 --> 00:37:19,180
more minutes then getting some pictures

377
00:37:39,990 --> 00:37:20,010
here

378
00:37:49,120 --> 00:37:44,230
you've been talkin to me

379
00:38:46,680 --> 00:37:49,130
you've been so good to me - no you make

380
00:38:51,580 --> 00:38:49,060
good morning discovery I guess you're

381
00:38:53,530 --> 00:38:51,590
awake after that song there are a lot of

382
00:38:55,840 --> 00:38:53,540
happy people down here we saw a great

383
00:38:59,170 --> 00:38:55,850
deploy yesterday and Hubble had a good

384
00:39:00,730 --> 00:38:59,180
night while you were asleep well we

385
00:39:08,080 --> 00:39:00,740
better find that guy and sign him up for

386
00:39:09,850 --> 00:39:08,090
XQ that did the wakeup music and we're

387
00:39:12,870 --> 00:39:09,860
here this morning to perform student

388
00:39:15,640 --> 00:39:12,880

389
00:39:18,300 --> 00:39:15,650
this is an experiment designed to

390
00:39:20,770 --> 00:39:18,310
investigate what affects gravity-driven

391
00:39:23,050 --> 00:39:20,780
buoyancy may have on the behavior of an

392
00:39:25,300 --> 00:39:23,060
electrical arc as you observe it on the

393
00:39:27,640 --> 00:39:25,310
ground in 1g say during a Jacob's Ladder

394
00:39:29,980 --> 00:39:27,650
experiment in high school and that is

395
00:39:34,750 --> 00:39:29,990
exactly in fact the kind of experiment

396
00:39:36,400 --> 00:39:34,760
that first gave this idea to Greg what

397
00:39:38,620 --> 00:39:36,410
you see on your right here taped to the

398
00:39:40,600 --> 00:39:38,630
forward lockers is the Ark chamber

399
00:39:42,460 --> 00:39:40,610
itself and the Aaron flex camera is set

400
00:39:43,990 --> 00:39:42,470
up to look into the ark there are

401
00:39:46,300 --> 00:39:44,000
mirrors behind the ark so that you get

402
00:39:47,980 --> 00:39:46,310
in fact three different views of it the

403
00:39:50,290 --> 00:39:47,990
first thing we're going to do here is

404
00:39:52,480 --> 00:39:50,300
photograph the Ark behavior in the

405
00:39:54,070 --> 00:39:52,490
ambient magnetic fields of the orbiter

406
00:39:56,380 --> 00:39:54,080
and we in fact will look at three

407
00:39:57,940 --> 00:39:56,390
different orientations the path of the

408
00:40:00,640 --> 00:39:57,950
Ark as the experiment is currently

409
00:40:03,430 --> 00:40:00,650
placed goes parallel to the orbiters Y

410
00:40:06,400 --> 00:40:03,440
axis through the wings will then rotate

411
00:40:09,160 --> 00:40:06,410
the box and camera 90 degrees to look at

412
00:40:12,040 --> 00:40:09,170
the orbiter z-axis vertical like this

413
00:40:13,930 --> 00:40:12,050

and then again we will rotate it 90

414
00:40:16,870 --> 00:40:13,940
degrees and tape it on the overhead

415
00:40:19,240 --> 00:40:16,880
panel so that we can look at the ambient

416
00:40:24,280 --> 00:40:19,250
magnetic field parallel to the vehicle

417
00:40:28,210 --> 00:40:24,290
z-axis will show you this a little bit

418
00:40:31,060 --> 00:40:28,220
weird actually as you can tell turn the

419
00:40:33,220 --> 00:40:31,070
power on and we have actually applied a

420
00:40:35,890 --> 00:40:33,230
magnetic field so we're stepping through

421
00:40:38,860 --> 00:40:35,900
the fields the reasons we think you see

422
00:40:40,870 --> 00:40:38,870
a very finely designed to art on your

423
00:40:46,990 --> 00:40:40,880
right is because that's the different

424
00:40:48,670 --> 00:40:47,000
nail the other part of the art system is

425
00:40:51,130 --> 00:40:48,680
actually the round the head of a nail

426
00:40:51,670 --> 00:40:51,140
and we think that the that the arc is

427
00:40:53,890 --> 00:40:51,680
just or

428
00:40:55,450 --> 00:40:53,900
charges just kind of jumping around from

429
00:40:56,829 --> 00:40:55,460
place to place on the head of the nail

430
00:40:58,660 --> 00:40:56,839
and that's what allows it to go that way

431
00:40:59,859 --> 00:40:58,670
but if you guys can get Greg to come in

432
00:41:03,579 --> 00:40:59,869
he probably tell you whether we're right

433
00:41:05,250 --> 00:41:03,589
or wrong so we did notice that the

434
00:41:10,569 --> 00:41:05,260
behavior of the arch became horribly

435
00:41:13,839 --> 00:41:10,579
erratic and its amplitude increase as as

436
00:41:16,720 --> 00:41:13,849
the field went up and just as they have

437
00:41:19,359 --> 00:41:16,730
told us this place once you put a charge

438
00:41:20,500 --> 00:41:19,369

into the system it never comes out of

439
00:41:22,780 --> 00:41:20,510
there fully even when we go back to

440
00:41:26,740 --> 00:41:22,790
though feel at all we still have the

441
00:41:36,450 --> 00:41:26,750
erratic behavior on the art ok thank you

442
00:41:41,770 --> 00:41:40,270
City stabilized binoculars I convinced

443
00:42:11,300 --> 00:41:41,780
myself that I could still make out the

444
00:43:11,570 --> 00:42:15,380
there's a place called Kokomo

445
00:43:17,099 --> 00:43:15,210
good morning discovery for max Q's

446
00:43:19,410 --> 00:43:17,109
keyboard that's the way that song should

447
00:43:25,340 --> 00:43:19,420
really be done your next practice is

448
00:43:32,640 --> 00:43:28,470
we're getting tv down here is that

449
00:43:35,990 --> 00:43:32,650
lightning as you see down there that is

450
00:43:38,250 --> 00:43:36,000
extremely typical a boy you've been

451
00:43:45,240 --> 00:43:38,260
CCTVs I've never seen him pick it up

452
00:43:48,370 --> 00:43:45,250
like that this is the Hubble telescope

453
00:43:52,390 --> 00:43:48,380
control in Greenbelt

454
00:44:04,690 --> 00:43:52,400
commands have been sent up to open the

455
00:44:07,390 --> 00:44:04,700
aperture door and we have confirmation

456
00:44:27,830 --> 00:44:07,400
that the motor is running on the door

457
00:44:46,510 --> 00:44:31,590
and we have confirmation from the stuff

458
00:44:56,500 --> 00:44:52,510
okay thank you Steve you know what that

459
00:44:59,970 --> 00:44:56,510
is a bet not only what it is but whose

460
00:45:14,510 --> 00:45:02,500
how much do you think it's worth to have

461
00:45:14,520 --> 00:45:23,250
let's go run it too

462
00:45:29,750 --> 00:45:25,920
well they that wuntch gets two rides for

463
00:45:29,760 --> 00:45:37,560

absolutely

464
00:45:43,589 --> 00:45:42,150
what we wanted to do was say a little

465
00:45:46,440 --> 00:45:43,599
bit of well-deserved thanks to our

466
00:45:50,160 --> 00:45:46,450
training people who work really so hard

467
00:45:51,870 --> 00:45:50,170
with us for actually quite a long time a

468
00:45:55,859 --> 00:45:51,880
couple of years ago I've been with the

469
00:45:58,620 --> 00:45:55,869
crew anyway so we really appreciate all

470
00:46:01,140 --> 00:45:58,630
the long hours and late hours and all

471
00:46:04,050 --> 00:46:01,150
the hard work that they did and it's

472
00:46:07,710 --> 00:46:04,060
really stayed on we believe and we'd

473
00:46:10,140 --> 00:46:07,720
like to thank them for the little cards

474
00:46:13,589 --> 00:46:10,150
they gave us to read while we're on our

475
00:46:15,810 --> 00:46:13,599
but they're very appropriate and we just

476
00:46:25,980 --> 00:46:15,820
like to let them know that all is going

477
00:46:27,990 --> 00:46:25,990
well we feel it great and - okay I'm

478
00:46:45,300 --> 00:46:28,000
sure they're watching if they don't

479
00:46:46,710 --> 00:46:45,310
happen to be right now I will call have

480
00:46:48,630 --> 00:46:46,720
been working like many others on a

481
00:46:51,540 --> 00:46:48,640
telescope project for a long time to

482
00:46:54,150 --> 00:46:51,550
bring this vision off and we again as

483
00:46:56,490 --> 00:46:54,160
many others have numerous times about

484
00:46:59,089 --> 00:46:56,500
the historical significance that the

485
00:47:01,980 --> 00:46:59,099
advent of an observatory such as the HST

486
00:47:04,440 --> 00:47:01,990
would have and how it stands like a

487
00:47:09,690 --> 00:47:04,450
Saracen to the advances of Galileo and

488
00:47:11,550 --> 00:47:09,700

even to the advances of and in searching

489
00:47:13,890 --> 00:47:11,560
for some way to possibly commemorate

490
00:47:16,950 --> 00:47:13,900
that or betoken that during our flight I

491
00:47:19,620 --> 00:47:16,960
happened upon the idea that there must

492
00:47:22,109 --> 00:47:19,630
be some astronomical artifact from one

493
00:47:23,670 --> 00:47:22,119
of the observatories Hubble worked on

494
00:47:31,260 --> 00:47:23,680
that we possibly could take along as

495
00:47:34,050 --> 00:47:31,270
memento and we managed to obtain this

496
00:47:36,980 --> 00:47:34,060
device which is guiding eyepiece we are

497
00:47:41,400 --> 00:47:36,990
assured from the

498
00:47:43,050 --> 00:47:41,410
on which Edwin Hubble did many of his

499
00:47:45,120 --> 00:47:43,060
observations out at Mount Wilson in

500
00:47:48,810 --> 00:47:45,130
California so his fundamental work in

501
00:47:50,790 --> 00:47:48,820
fact we have it with us here as I said

502
00:47:53,160 --> 00:47:50,800
courtesy of the Smithsonian and the

503
00:47:55,380 --> 00:47:53,170
American Astronomical Society it was

504
00:47:57,360 --> 00:47:55,390
presented to the crew at the hundredth

505
00:48:00,480 --> 00:47:57,370
anniversary meeting of the SS back in

506
00:48:02,400 --> 00:48:00,490
January great pleasure to have something

507
00:48:05,070 --> 00:48:02,410
of such historical significance and

508
00:48:06,750 --> 00:48:05,080
something that so directly symbolizes

509
00:48:11,100 --> 00:48:06,760
Edwin Hubble's fundamental contributions

510
00:48:15,150 --> 00:48:11,110
to astronomy as you can see as a rioter

511
00:48:16,970 --> 00:48:15,160
that the stars are gradually dimmed as

512
00:48:19,290 --> 00:48:16,980
they pass through the Earth's atmosphere

513
00:48:21,180 --> 00:48:19,300

which is of course the problem in earth

514
00:48:24,060 --> 00:48:21,190
bound astronomers have faced for a long

515
00:48:25,650 --> 00:48:24,070
time not only does it diminish and

516
00:48:28,890 --> 00:48:25,660
spread out the amount of light that you

517
00:48:30,930 --> 00:48:28,900
can see but additionally the atmosphere

518
00:48:32,520 --> 00:48:30,940
is not transparent to all wavelengths

519
00:48:35,460 --> 00:48:32,530
that are of interest scientifically and

520
00:48:37,110 --> 00:48:35,470
Hubble Space Telescope will be able to

521
00:48:40,440 --> 00:48:37,120
observe wavelengths both short and

522
00:48:47,010 --> 00:48:40,450
longer the wavelengths that are visible

523
00:48:48,510 --> 00:48:47,020
to telescopes on the ground and there is

524
00:48:50,520 --> 00:48:48,520
nothing in the void where the bank was

525
00:48:52,110 --> 00:48:50,530
the hole in the middle of it all there's

526
00:48:54,150 --> 00:48:52,120
nothing in the void where the bang goes

527
00:48:59,340 --> 00:48:54,160
the hole in the middle of it all there's

528
00:49:00,600 --> 00:48:59,350
a hole there's a hole and now I'm

529
00:49:01,950 --> 00:49:00,610
looking for the nothing in the void

530
00:49:03,930 --> 00:49:01,960
where the bank was the hole in the

531
00:49:05,340 --> 00:49:03,940
middle of it all I'm looking for the

532
00:49:07,350 --> 00:49:05,350
nothing in the void where the bang goes

533
00:49:10,370 --> 00:49:07,360
the hole in the middle of it all there's

534
00:49:13,710 --> 00:49:10,380
a hole there's old

535
00:49:15,630 --> 00:49:13,720
there's a hole there's a hole assuming

536
00:49:21,630 --> 00:49:15,640
the theory holds there's a hole in the

537
00:49:25,829 --> 00:49:21,640
middle of it all this is something like

538
00:49:28,109 --> 00:49:25,839

8 TB tests at once there's a certain

539
00:49:31,079 --> 00:49:28,119
toxin on each one of those sets of times

540
00:49:34,079 --> 00:49:31,089
and the idea is to determine whether the

541
00:49:37,259 --> 00:49:34,089
body's response to immune system

542
00:49:38,609 --> 00:49:37,269
response varies doll and 0g some of the

543
00:49:40,470 --> 00:49:38,619
body's immune response of course is

544
00:49:42,779 --> 00:49:40,480
governed by the blood system and another

545
00:49:44,400 --> 00:49:42,789
level of it is controlled by the

546
00:49:45,420 --> 00:49:44,410
cellular structure of the body and the

547
00:49:47,759 --> 00:49:45,430
objective of this experiment

548
00:49:57,690 --> 00:49:47,769
specifically was to look at cell

549
00:50:02,489 --> 00:49:57,700
mediated immune response ready to close

550
00:50:05,069 --> 00:50:02,499
doors aren't you that we were just

551
00:50:06,779 --> 00:50:05,079
talking about that and the fest looks

552
00:50:13,829 --> 00:50:06,789
good and you have a go for payload bay

553
00:50:16,200 --> 00:50:13,839
door closing this is Mission Control

554
00:50:20,789 --> 00:50:16,210
crews been given the go for payload bay

555
00:50:22,979 --> 00:50:20,799
door closing based on the possibility

556
00:50:25,650 --> 00:50:22,989
that weather forecasters will be able to

557
00:50:28,380 --> 00:50:25,660
revise the forecast downward on wind

558
00:50:36,499 --> 00:50:28,390
conditions for Edwards later this

559
00:50:40,890 --> 00:50:38,910
discovery Houston we've taken a look at

560
00:50:43,950 --> 00:50:40,900
the weather weatherman says it's going

561
00:50:47,130 --> 00:50:43,960
to hang in there you have a go to Pro to

562
00:50:51,479 --> 00:50:47,140
ops 3o to go to maneuver to burn

563
00:51:00,240 --> 00:50:51,489

attitude and a go for the burn Roger

564
00:51:05,770 --> 00:51:03,190
we have exciting discovery on the

565
00:51:09,100 --> 00:51:05,780
long-range optics from Vandenberg Air

566
00:51:14,230 --> 00:51:09,110
Force Base Discovery's velocity now Mach

567
00:51:18,400 --> 00:51:14,240
6 altitude 133 thousand feet 181 miles

568
00:51:37,930 --> 00:51:18,410
away from Edwards discovery Houston

569
00:52:04,340 --> 00:51:40,999
discovery now at 14,000 feet making the

570
00:52:11,070 --> 00:52:06,450
and discovery is on the glide slope

571
00:52:16,470 --> 00:52:11,080
converging on the centerline coming up

572
00:53:13,600 --> 00:52:16,480
now for the pre-flare maneuver at 2500

573
00:53:13,610 --> 00:53:23,280
landing gear is down and locked

574
00:53:23,290 --> 00:53:36,930
thank your touchdown nose gear touchdown

575
00:53:44,110 --> 00:53:41,110
discovery rolls out on runway 22 at

576
00:53:46,810 --> 00:53:44,120
Edwards at the end of mission STS 31

577
00:53:49,360 --> 00:53:46,820
after traveling two million sixty-eight

578
00:53:55,360 --> 00:53:49,370
thousand two hundred thirteen statute

579
00:53:58,270 --> 00:53:55,370
miles on this mission mechanical systems

580
00:54:00,070 --> 00:53:58,280
officer reports steady braking the

581
00:54:04,900 --> 00:54:00,080
normal amount of braking is about eight

582
00:54:06,850 --> 00:54:04,910
to ten feet per second and this detailed

583
00:54:09,850 --> 00:54:06,860
test objective today is designed to be a

584
00:54:23,170 --> 00:54:09,860
light braking or low energy braking to

585
00:54:32,140 --> 00:54:29,320
we'll stop here some discovery will stop

586
00:54:34,310 --> 00:54:32,150
right after that discovery welcome back

587
00:54:36,740 --> 00:54:34,320
congratulations on a super mission and

588
00:54:38,300 --> 00:54:36,750

the world is looking forward to reaping

589
00:54:41,600 --> 00:54:38,310
the benefits of your good work over the

590
00:54:46,160 --> 00:54:41,610
next 15 years welcome back guys and we

591
00:54:49,250 --> 00:54:46,170
have no post-landing deltas okay thank

592
00:54:51,670 --> 00:54:49,260
you see them we sure enjoyed it also it