



1
00:00:30,859 --> 00:00:28,519
this is shuttle launch control at

2
00:00:34,040 --> 00:00:30,869
t-minus four hours 43 minutes in the

3
00:00:36,740 --> 00:00:34,050
counting all continuing to go well in

4
00:00:39,830 --> 00:00:36,750
our tanking operation with the shuttle

5
00:00:43,640 --> 00:00:39,840
Discovery getting ready for the STS 41

6
00:00:45,820 --> 00:00:43,650
launch 7:35 a.m. Eastern Time this

7
00:00:48,350 --> 00:00:45,830
morning

8
00:00:54,680 --> 00:00:48,360
Discovery's carrying the Ulysses payload

9
00:00:56,869 --> 00:00:54,690
and several mid-deck experiments this

10
00:00:58,430 --> 00:00:56,879
shuttle launch control at t-minus three

11
00:01:01,780 --> 00:00:58,440
hours and holding or during the flight

12
00:01:04,930 --> 00:01:01,790
group rest has 41 in the crew quarters

13
00:01:07,399 --> 00:01:04,940

its mission specialist Booth's Melnick

14

00:02:32,490 --> 00:01:07,409

he's making his first flight today

15

00:02:32,500 --> 00:03:25,510

today

16

00:03:36,830 --> 00:03:32,110

members are boarding the Ovid insisted

17

00:03:45,050 --> 00:03:36,840

right now is commander Richards the

18

00:03:49,700 --> 00:03:45,060

commander the flight today now climbing

19

00:03:53,870 --> 00:03:49,710

aboard and we'll be getting strapped

20

00:03:56,960 --> 00:03:53,880

into his seat shortly pilot Robert

21

00:03:58,970 --> 00:03:56,970

Cabana is now being assisted by members

22

00:04:02,030 --> 00:03:58,980

of the closeout crew at the final items

23

00:04:04,160 --> 00:04:02,040

of the air of you will need or launch

24

00:04:06,650 --> 00:04:04,170

today he's a lieutenant colonel in the

25

00:04:09,440 --> 00:04:06,660

United States Marine Corps we're in a

26
00:04:12,290 --> 00:04:09,450
Minneapolis Minnesota he was selected

27
00:04:14,030 --> 00:04:12,300
into the NASA asked a lot of 1985 and is

28
00:04:17,840 --> 00:04:14,040
making his first trip aboard the Space

29
00:04:18,530 --> 00:04:17,850
Shuttle today which is specialist Tom

30
00:04:21,620 --> 00:04:18,540
Akers

31
00:04:23,360 --> 00:04:21,630
he's been assisted with his equipment in

32
00:04:26,330 --> 00:04:23,370
half to get into the schools cooking

33
00:04:29,170 --> 00:04:26,340
Ivan he's making his first trip into

34
00:04:32,800 --> 00:04:29,180
space today aboard the shuttle discovery

35
00:04:36,200 --> 00:04:32,810
and the closeout crew is now assisting

36
00:04:39,770 --> 00:04:36,210
mission specialist Bruce knowledge with

37
00:04:41,150 --> 00:04:39,780
the rest of his psychic equipment not

38
00:04:43,630 --> 00:04:41,160

only was a commander in the United

39

00:04:46,400 --> 00:04:43,640

States Coast Guard born in New York City

40

00:05:16,920 --> 00:04:46,410

but considers Clearwater Florida to be

41

00:06:24,339 --> 00:06:21,760

to begin we have a go for retracting

42

00:06:29,989 --> 00:06:24,349

orbiter approve access all the way to

43

00:06:29,999 --> 00:06:43,429

engineer light like SPC's are on board

44

00:06:49,229 --> 00:06:45,809

coming up on t-minus four minutes and

45

00:06:51,089 --> 00:06:49,239

Counting AP news have been started and

46

00:07:01,169 --> 00:06:51,099

you're over heaters have been turned on

47

00:07:05,129 --> 00:07:01,179

for long a final purge of the main

48

00:07:07,469 --> 00:07:05,139

engines is underway to prepare the

49

00:07:09,029 --> 00:07:07,479

engines or start and the one minute

50

00:07:21,560 --> 00:07:09,039

point in the count and engine ready

51
00:07:32,730 --> 00:07:24,300
protection of the gaseous oxygen vent

52
00:07:34,320 --> 00:07:32,740
hood is now underway just a few minutes

53
00:07:36,240 --> 00:07:34,330
away now from the launch of discovery

54
00:07:49,730 --> 00:07:36,250
and the four day mission the five crew

55
00:07:49,740 --> 00:07:59,000
we have a go to auto sequence start

56
00:07:59,010 --> 00:08:02,540
function

57
00:08:12,630 --> 00:08:10,160
t-minus 15 seconds two minutes to nine

58
00:08:19,710 --> 00:08:12,640
we had a go for main engine start

59
00:08:22,350 --> 00:08:19,720
six five four three two one ignition and

60
00:08:24,750 --> 00:08:22,360
liftoff of discovery and the university

61
00:08:46,449 --> 00:08:24,760
facepack bound for the polar regions of

62
00:08:53,420 --> 00:08:48,769
guidance officer confirms a good roll

63
00:08:55,250 --> 00:08:53,430

maneuver engines now throttling down in

64

00:08:57,800 --> 00:08:55,260

preparation the polar Discovery's

65

00:09:15,500 --> 00:08:57,810

passage through the air maximum

66

00:09:18,079 --> 00:09:15,510

aerodynamic loads area auxiliary power

67

00:09:28,720 --> 00:09:18,089

units all free looking be discovered

68

00:09:36,290 --> 00:09:34,699

discovery you go at throttle up then you

69

00:09:38,510 --> 00:09:36,300

go at throttle up call means that

70

00:09:40,430 --> 00:09:38,520

everything is working well for discovery

71

00:09:43,010 --> 00:09:40,440

all engines now back I'm gonna do four

72

00:10:03,860 --> 00:09:43,020

percent performance velocity is now

73

00:10:08,700 --> 00:10:06,570

discovering Hannum 14 nautical miles

74

00:10:24,560 --> 00:10:08,710

downrange from the Kennedy at a velocity

75

00:10:37,200 --> 00:10:28,590

and again separation of the solid rocket

76

00:10:39,810 --> 00:10:37,210

boosters velocity now 5,400 feet per

77

00:10:43,470 --> 00:10:39,820

second and discovery 31 nautical miles

78

00:10:45,660 --> 00:10:43,480

downrange I was in repairing still for

79

00:10:48,270 --> 00:10:45,670

minimum all three engines at a hundred

80

00:11:02,230 --> 00:10:48,280

cool percent no systems problems for

81

00:11:21,950 --> 00:11:12,410

discovery performance now this is

82

00:11:28,450 --> 00:11:21,960

Mission Control Houston discovery that's

83

00:11:34,340 --> 00:11:32,180

crew has just been given the go for the

84

00:11:35,960 --> 00:11:34,350

payload bay door operations they will

85

00:11:38,750 --> 00:11:35,970

begin opening the payload bay doors

86

00:11:40,820 --> 00:11:38,760

aboard discovery and will be is standing

87

00:12:22,850 --> 00:11:40,830

by for a status on that in the next few

88

00:12:34,950 --> 00:12:32,850

this is mission better the crew confirms

89

00:12:38,520 --> 00:12:34,960

payload bay doors were open and the

90

00:12:40,350 --> 00:12:38,530

motors go properly max officer had given

91

00:13:34,070 --> 00:12:40,360

that fat confirmation just a couple of

92

00:13:48,770 --> 00:13:37,320

you send every vector pass for complete

93

00:13:53,760 --> 00:13:51,180

and the good reporting that they're

94

00:13:56,300 --> 00:13:53,770

about to move into the release of the

95

00:13:58,650 --> 00:13:56,310

payload retention latches and the

96

00:14:02,280 --> 00:13:58,660

elevation of the tilt table the 29

97

00:14:04,530 --> 00:14:02,290

degrees or with one motor operating the

98

00:14:06,720 --> 00:14:04,540

nominal time for that to take place is

99

00:14:09,420 --> 00:14:06,730

about 40 seconds and with two motors

100

00:14:11,880 --> 00:14:09,430

going the tilt table will go up 29

101
00:14:14,670 --> 00:14:11,890
degrees in about 20 seconds it will

102
00:14:17,220 --> 00:14:14,680
stand off the word on that talk table

103
00:14:25,050 --> 00:14:17,230
raises up in two stages first 29 degrees

104
00:15:02,410 --> 00:14:25,060
and then to the deploy elevation 58

105
00:15:02,420 --> 00:17:18,160
we

106
00:17:18,170 --> 00:17:24,449
that's a great job

107
00:17:30,610 --> 00:17:27,549
while Ulysses took place right on time

108
00:17:33,909 --> 00:17:30,620
six hours and 59 seconds into the fight

109
00:18:08,940 --> 00:17:33,919
that's off one second from the pre

110
00:18:15,160 --> 00:18:12,390
through winding down after a long day

111
00:18:18,970 --> 00:18:15,170
miss Nicole sent them to bed with a

112
00:18:21,520 --> 00:18:18,980
couple of final asking details and or

113
00:18:22,960 --> 00:18:21,530

anything that comes up in the next hour

114

00:18:25,990 --> 00:18:22,970

or so we don't intend to talk to them

115

00:18:31,759 --> 00:18:26,000

we'll let them get some sleep and enjoy

116

00:18:38,310 --> 00:18:34,769

this is Mission Control discovery is

117

00:18:41,340 --> 00:18:38,320

just about to cross the eastern coast of

118

00:18:43,889 --> 00:18:41,350

Australia going out across the Great

119

00:19:39,250 --> 00:18:43,899

Barrier Reef on the frontal part of the

120

00:19:56,930 --> 00:19:54,740

just reduced and good morning okay but I

121

00:20:28,140 --> 00:19:56,940

have to cut this thing at Tiesto's

122

00:20:32,680 --> 00:20:30,160

and what they're doing there I was

123

00:20:34,810 --> 00:20:32,690

setting this thing up to park it for the

124

00:20:36,730 --> 00:20:34,820

in Asansol or a coupon

125

00:20:41,830 --> 00:20:36,740

experiment that we're doing now with an

126
00:20:43,750 --> 00:20:41,840
honor to the mission next year - well

127
00:20:45,010 --> 00:20:43,760
after the Innosight satellite that was

128
00:20:46,890 --> 00:20:45,020
stranded in low earth a little bit

129
00:20:49,450 --> 00:20:46,900
earlier this year

130
00:20:52,690 --> 00:20:49,460
the idea is to study some of the same

131
00:20:55,860 --> 00:20:52,700
materials that are on the inset and get

132
00:20:59,860 --> 00:20:55,870
a view of the kind of degradation from

133
00:21:02,530 --> 00:20:59,870
on our particles near Earth that that

134
00:21:04,630 --> 00:21:02,540
satellite might experience the gaps were

135
00:21:08,320 --> 00:21:04,640
seen here again produced by telemetry

136
00:21:10,419 --> 00:21:08,330
coming down from Discovery and after

137
00:21:12,430 --> 00:21:10,429
they passed through the computer system

138
00:21:15,310 --> 00:21:12,440

here on the ground show up on this

139

00:22:34,120 --> 00:21:15,320
screen in Mission Control at the PBRs

140

00:22:38,690 --> 00:22:37,160
and here's what we recorded on board

141

00:22:48,170 --> 00:22:38,700
with the fiber spoke just a few minutes

142

00:23:57,020 --> 00:22:48,180
ago okay we're like you are camera

143

00:24:01,010 --> 00:23:59,030
discovering our passing out over the

144

00:24:04,160 --> 00:24:01,020
coast of South America actually this

145

00:24:20,970 --> 00:24:04,170
looks like Brazil not over the southern

146

00:24:29,280 --> 00:24:23,590
following completion of this SSP new

147

00:24:32,980 --> 00:24:29,290
vinny for review day to take crew will

148

00:24:35,350 --> 00:24:32,990
begin to perform the calibration a

149

00:24:38,110 --> 00:24:35,360
number of calibrations throughout the

150

00:24:41,130 --> 00:24:38,120
flight both in the early phases of SSB

151
00:24:43,780 --> 00:24:41,140
UV data takes and in the middle of the

152
00:24:46,150 --> 00:24:43,790
process of the data takes and then later

153
00:24:48,400 --> 00:24:46,160
in the flight also the SS bu the

154
00:24:50,260 --> 00:24:48,410
instruments are calibrated with sure the

155
00:24:52,390 --> 00:24:50,270
accuracy of the measurements taken both

156
00:24:53,860 --> 00:24:52,400
in the direct Sun pointing and as well

157
00:24:57,960 --> 00:24:53,870
as the back scatter measurements from

158
00:25:01,870 --> 00:24:57,970
the Earth's atmosphere that particular

159
00:25:55,360 --> 00:25:01,880
process will take just about 45 to 50

160
00:26:02,090 --> 00:25:58,670
this is Mission Control discovery is now

161
00:26:07,060 --> 00:26:02,100
over the South Pacific going seeing one

162
00:26:13,550 --> 00:26:10,280
the crew currently has about four hours

163
00:26:17,960 --> 00:26:13,560

and 35 minutes left in its sleep here in

164

00:26:19,550 --> 00:26:17,970

their sleep period and all remains

165

00:26:21,740 --> 00:26:19,560

together quite smoothly here in the

166

00:27:04,340 --> 00:26:21,750

flight control room as controllers

167

00:27:07,550 --> 00:27:04,350

preparing messages for uplink - good

168

00:27:15,570 --> 00:27:07,560

morning discovered more than isn't good

169

00:27:19,750 --> 00:27:18,130

see how it's been working for short

170

00:27:21,610 --> 00:27:19,760

hours our that's crew down there some

171

00:27:23,710 --> 00:27:21,620

stuff state better put together a system

172

00:27:25,480 --> 00:27:23,720

that allows us to control the cameras

173

00:27:27,580 --> 00:27:25,490

without using our hands we can just use

174

00:28:56,250 --> 00:27:27,590

voice commands off their cameras here's

175

00:29:04,600 --> 00:29:02,830

meet the latest NASA computer nantan

176
00:29:06,940 --> 00:29:04,610
engineers have come up with a computer

177
00:29:09,340 --> 00:29:06,950
and how onboard discovery it's a

178
00:29:12,450 --> 00:29:09,350
computer that talks and listens and

179
00:29:15,040 --> 00:29:12,460
controls the shuttles television cameras

180
00:29:41,070 --> 00:29:15,050
fresque airfoils is one of the engineers

181
00:29:46,290 --> 00:29:43,930
the system is in the orbiters light

182
00:29:48,880 --> 00:29:46,300
dinner and it's very easy to operate

183
00:29:51,550 --> 00:29:48,890
with a flip of a switch the system's

184
00:29:54,670 --> 00:29:51,560
ready to go and that's the only time the

185
00:29:56,740 --> 00:29:54,680
astronaut we use his hands the computer

186
00:29:57,160 --> 00:29:56,750
actually tells the astronaut what to do

187
00:30:01,300 --> 00:29:57,170
next

188
00:30:03,190 --> 00:30:01,310

by using this monitor STS 41 mission

189

00:30:05,740 --> 00:30:03,200

specialists bill Shepard and boost

190

00:30:08,840 --> 00:30:05,750

Melnick will be using the system for 20

191

00:30:10,850 --> 00:30:08,850

minutes each during 3 flight days

192

00:30:14,420 --> 00:30:10,860

they tell the computer to move the

193

00:30:16,130 --> 00:30:14,430

camera in payload Bay the astronauts use

194

00:30:31,660 --> 00:30:16,140

this mock-up at the Johnson Space Center

195

00:30:42,320 --> 00:30:34,130

Lincoln Shepard began training on the

196

00:30:44,150 --> 00:30:42,330

system last spring the vocabulary it's

197

00:30:46,070 --> 00:30:44,160

made up of 40 simple words the

198

00:31:09,410 --> 00:30:46,080

astronauts used to control the cameras

199

00:31:12,080 --> 00:31:09,420

words like zoom in the computer had to

200

00:31:30,200 --> 00:31:12,090

learn to understand those words that's

201
00:31:32,090 --> 00:31:30,210
done by first letting the the astronauts

202
00:31:34,760 --> 00:31:32,100
must match the one the computer

203
00:31:54,690 --> 00:31:34,770
remembers sounds simple here on earth

204
00:31:59,169 --> 00:31:57,400
so the astronauts can make a new set of

205
00:32:02,320 --> 00:31:59,179
templates in a matter of minutes if

206
00:32:04,690 --> 00:32:02,330
their voice is altering space gerhard's

207
00:32:06,720 --> 00:32:04,700
summers and project manager Jorge

208
00:32:29,169 --> 00:32:06,730
Salazar are excited about the future

209
00:33:03,359 --> 00:32:29,179
applications of this field to see their

210
00:33:11,049 --> 00:33:08,560
Casey ibmp as the generals experiment

211
00:33:12,969 --> 00:33:11,059
sir that we were activating since joint

212
00:33:15,430 --> 00:33:12,979
investigation characteristics over a

213
00:33:28,289 --> 00:33:15,440

polymer membrane so filters that

214

00:33:35,669 --> 00:33:32,489

for reward the vehicle will begin test

215

00:33:40,709 --> 00:33:35,679

objective 1206 which is the birth

216

00:33:44,719 --> 00:33:40,719

control device evaluation bill shepherd

217

00:33:49,259 --> 00:33:44,729

mission specialist number two we'll be

218

00:33:52,769 --> 00:33:49,269

evaluating a virtual control device that

219

00:33:55,680 --> 00:33:52,779

has a potential of affecting design and

220

00:33:57,629 --> 00:33:55,690

pushing control devices for a crewed

221

00:36:19,200 --> 00:33:57,639

computer workstation aboard the space

222

00:36:23,380 --> 00:36:21,550

thanks for that playback we are a couple

223

00:36:36,730 --> 00:36:23,390

minutes now Louis we'll see you on the

224

00:36:39,310 --> 00:36:36,740

other side at 5:51 this is Mission

225

00:36:43,360 --> 00:36:39,320

Control discovery which is orbiting

226

00:36:46,450 --> 00:36:43,370

about 178 by 160 not a

227

00:37:30,480 --> 00:36:46,460

it was currently in crossing Malaysia

228

00:37:35,560 --> 00:37:33,100

this is Mission Control where admission

229

00:37:38,500 --> 00:37:35,570

reps time of two days 11 hours 55

230

00:37:45,240 --> 00:37:38,510

minutes the crew has just over 6 hours

231

00:37:53,130 --> 00:37:48,030

currently Discovery's payload fake

232

00:37:56,110 --> 00:37:53,140

cameras are once again catching some

233

00:38:00,370 --> 00:37:56,120

lightning and activity as discovery

234

00:38:03,160 --> 00:38:00,380

passes overhead or in previous night's

235

00:40:04,620 --> 00:38:03,170

we've seen quite a bit of lightning

236

00:40:04,630 --> 00:41:12,410

we don't

237

00:41:18,630 --> 00:41:15,420

this is Mission Control Houston at two

238

00:41:20,760 --> 00:41:18,640

days 22 hours 26 minutes all quiet here

239

00:41:22,440 --> 00:41:20,770

in the flight control room as the crew

240

00:41:24,030 --> 00:41:22,450

aboard discovery continues to work

241

00:41:27,420 --> 00:41:24,040

through their flight control systems

242

00:41:29,130 --> 00:41:27,430

check out that's a check out to verify

243

00:41:32,070 --> 00:41:29,140

that all flight control systems aboard

244

00:41:34,770 --> 00:41:32,080

discovery are in good health and ready

245

00:41:37,680 --> 00:41:34,780

to support the orbit entry and landing

246

00:41:39,930 --> 00:41:37,690

operations tomorrow discovery just about

247

00:42:01,910 --> 00:41:39,940

to cross the equator and begin the orbit

248

00:42:06,900 --> 00:42:04,290

submission control all continuing to go

249

00:42:09,960 --> 00:42:06,910

smoothly in the checkout of Discovery's

250

00:42:12,750 --> 00:42:09,970

reaction control system Jeff there's but

251
00:42:14,880 --> 00:42:12,760
second visuals of the reaction control

252
00:42:16,890 --> 00:42:14,890
system Jets as they are put through

253
00:42:24,630 --> 00:42:16,900
their paces and tested for tomorrow's

254
00:42:27,270 --> 00:42:24,640
intrigue and landing meanwhile aboard

255
00:42:30,630 --> 00:42:27,280
discovery this is a while canister King

256
00:42:32,400 --> 00:42:30,640
job these lithium hydroxide canisters

257
00:42:34,320 --> 00:42:32,410
are used to cleanse the breathing air

258
00:42:36,630 --> 00:42:34,330
and that's part of the nightly routine

259
00:42:44,130 --> 00:42:36,640
before putting off the ship and getting

260
00:42:47,070 --> 00:42:44,140
ready for that this is Mission Control

261
00:42:51,800 --> 00:42:47,080
genius pictures taken from discovery and

262
00:43:23,170 --> 00:42:51,810
an altitude of that 162 nautical miles

263
00:43:32,029 --> 00:43:28,130

in the lower right hand corner of the

264

00:43:36,109 --> 00:43:32,039

screen one can see a small circle that

265

00:43:39,319 --> 00:43:36,119

is the patch that in that the astronauts

266

00:43:43,210 --> 00:43:39,329

go to them from the orbiter and their

267

00:43:47,450 --> 00:43:43,220

Danny on earth and the large panels

268

00:43:59,920 --> 00:43:47,460

extending up to the left-hand corner of

269

00:44:03,979 --> 00:44:02,390

we're looking down on South America now

270

00:44:07,430 --> 00:44:03,989

one has to presume that's the Andes

271

00:45:35,669 --> 00:44:07,440

discovery coming up on the coastline and

272

00:45:44,649 --> 00:45:41,880

okay my control team here has declared

273

00:45:51,609 --> 00:45:44,659

themselves go for a payload bay door

274

00:46:02,260 --> 00:45:51,619

closure normal and we don't need numbers

275

00:46:08,090 --> 00:46:04,850

this is Mission Control Houston at three

276
00:46:09,830 --> 00:46:08,100
days 22 hours 35 minutes a chemical

277
00:46:14,780 --> 00:46:09,840
systems officer here in the control

278
00:46:17,930 --> 00:46:14,790
center confirming that the other guys

279
00:46:43,260 --> 00:46:17,940
are returning then the payload bay doors

280
00:46:48,900 --> 00:46:46,109
we're now 58 minutes and 30 seconds away

281
00:46:51,330 --> 00:46:48,910
from ignition of Discovery's twin

282
00:46:54,359 --> 00:46:51,340
orbital maneuvering system engines for

283
00:46:56,490 --> 00:46:54,369
the deorbit burn the burn that will drop

284
00:47:14,100 --> 00:46:56,500
discovery and crew out of orbit and

285
00:47:17,070 --> 00:47:14,110
begin the entry and landing phase the

286
00:47:37,050 --> 00:47:17,080
deorbit burn should be underway about 22

287
00:47:38,760 --> 00:47:37,060
23 seconds into the burn this is Mission

288
00:47:40,290 --> 00:47:38,770

Control Houston discovery beginning to

289

00:47:42,480 --> 00:47:40,300

encounter the first effects of the

290

00:47:45,720 --> 00:47:42,490

Earth's atmosphere onboard navigation

291

00:47:48,150 --> 00:47:45,730

aids beginning to produce altitude data

292

00:47:49,950 --> 00:47:48,160

showing discovery or an altitude of

293

00:47:52,410 --> 00:47:49,960

three hundred eighty nine thousand feet

294

00:47:55,020 --> 00:47:52,420

traveling at Mach twenty four point four

295

00:48:01,320 --> 00:47:55,030

and descending into the atmosphere at a

296

00:48:03,300 --> 00:48:01,330

rate of 518 feet per second we're now

297

00:48:05,070 --> 00:48:03,310

taking live scenes onassis a live

298

00:48:18,970 --> 00:48:05,080

television of the edwards air force base

299

00:48:24,579 --> 00:48:22,180

when out taking our first live views of

300

00:48:26,140 --> 00:48:24,589

Discovery on our way to network lending

301
00:48:36,470 --> 00:48:26,150
this is from the Vanderburgh long range

302
00:49:19,980 --> 00:48:39,539
all systems continuing to work well

303
00:49:19,990 --> 00:49:36,970
w10 like a state vector transfer to BFS

304
00:49:41,660 --> 00:49:39,200
we've stopped booms announcing

305
00:49:43,510 --> 00:49:41,670
Discovery's arrival overhead at the

306
00:49:45,530 --> 00:49:43,520
words landing field

307
00:50:15,930 --> 00:49:45,540
discovery headed for the hitting

308
00:51:00,200 --> 00:50:18,130
every Houston looking good on the hack

309
00:51:00,210 --> 00:51:17,000
discovery sinking at 174 feet per second

310
00:51:20,880 --> 00:51:19,530
discovering under manual control of the

311
00:51:23,520 --> 00:51:20,890
cool commander dick Richards now

312
00:51:46,800 --> 00:51:23,530
performing the freeform maneuver some of

313
00:53:23,000 --> 00:51:46,810

this deep take a lot of folks down here

314

00:53:27,330 --> 00:53:25,380

official landing times are as follows

315

00:53:30,060 --> 00:53:27,340

main gear touchdown at four days two

316

00:53:33,510 --> 00:53:30,070

hours ten minutes and four seconds those

317

00:53:36,330 --> 00:53:33,520

gear down to 10 minutes in 16 seconds we