1
00:00:27,910 --> 00:00:25,830
well i'd like to begin by thanking all

2
00:00:30,630 --> 00:00:27,920
of you both nasa employees and

3
00:00:33,110 --> 00:00:30,640
contractors for all your work your very

4
00:00:35,270 --> 00:00:33,120
hard work in making the spf 77 mission

5
00:00:37,590 --> 00:00:35,280
both safe and successful

6
00:00:40,069 --> 00:00:37,600
and you know when we're up on orbit

7
00:00:42,470 --> 00:00:40,079
uh some 180 miles above the earth we are

8
00:00:44,389 --> 00:00:42,480
continually reminded of the tremendous

9
00:00:45,830 --> 00:00:44,399
teamwork that it takes to bring one of

10
00:00:47,510 --> 00:00:45,840
these missions off

11
00:00:49,670 --> 00:00:47,520
we're inside endeavor and it's just

12
00:00:51,910 --> 00:00:49,680
humming along beautifully

13
00:00:53,670 --> 00:00:51,920

and that's due in large part to the hard

14
00:00:55,189 --> 00:00:53,680
work of the folks down at the cape as

15
00:00:56,549 --> 00:00:55,199
well as many other centers around the

16
00:00:58,389 --> 00:00:56,559
country

17
00:00:59,990 --> 00:00:58,399
to turn the vehicle around to get the

18
00:01:02,470 --> 00:01:00,000
engines ready to get everything ready to

19
00:01:04,070 --> 00:01:02,480
fly and also to the uh

20
00:01:06,550 --> 00:01:04,080
to the designers and

21
00:01:08,870 --> 00:01:06,560
and contractors who built that

22
00:01:09,990 --> 00:01:08,880
orbiter to operate as it's supposed to

23
00:01:13,109 --> 00:01:10,000
operate

24
00:01:15,350 --> 00:01:13,119
we had the experiments working with just

25
00:01:17,190 --> 00:01:15,360
a few minor exceptions working very very

26
00:01:19,030 --> 00:01:17,200
well and of course that's due to the

27
00:01:20,469 --> 00:01:19,040
hard work of the scientists and

28
00:01:22,630 --> 00:01:20,479
principal investigators all over the

29
00:01:24,469 --> 00:01:22,640
country who designed their equipment to

30
00:01:26,230 --> 00:01:24,479
work properly in that microgravity

31
00:01:27,190 --> 00:01:26,240
environment

32
00:01:29,190 --> 00:01:27,200
and then

33
00:01:31,749 --> 00:01:29,200
of course we were talking to houston

34
00:01:34,069 --> 00:01:31,759
and on the air-to-ground network and and

35
00:01:35,749 --> 00:01:34,079
reminded of the flight control teams

36
00:01:37,910 --> 00:01:35,759
that are on the ground taking care of us

37
00:01:40,710 --> 00:01:37,920
looking after us the training teams that

38
00:01:42,469 --> 00:01:40,720

had gotten us ready to fly

39
00:01:43,990 --> 00:01:42,479
and all the people the rendezvous teams

40
00:01:45,749 --> 00:01:44,000
the flight design teams that put this

41
00:01:47,429 --> 00:01:45,759
incredible flight together this mixture

42
00:01:49,270 --> 00:01:47,439
of

43
00:01:52,149 --> 00:01:49,280
technology development and

44
00:01:53,670 --> 00:01:52,159
and microgravity science

45
00:01:55,109 --> 00:01:53,680
and it made us

46
00:01:56,389 --> 00:01:55,119
i think i speak for the whole crew it

47
00:01:59,030 --> 00:01:56,399
made us feel

48
00:02:03,109 --> 00:01:59,040
very fortunate uh very proud to be able

49
00:02:07,749 --> 00:02:05,510
reap the benefits of all your hard work

50
00:02:10,309 --> 00:02:07,759
it made us feel very very honored very

51
00:02:11,750 --> 00:02:10,319
privileged to represent you in space

52
00:02:14,150 --> 00:02:11,760
because in a sense

53
00:02:16,470 --> 00:02:14,160
we took part of you up there with us

54
00:02:19,110 --> 00:02:16,480
and we'd like to share that with you now

55
00:02:21,430 --> 00:02:19,120
and show you some of our

56
00:02:24,150 --> 00:02:21,440
movies and some of the sites that we saw

57
00:02:25,589 --> 00:02:24,160
up on orbit and looking down on earth

58
00:02:28,229 --> 00:02:25,599
before we run the movie i'd like to

59
00:02:31,350 --> 00:02:28,239
introduce the the rest of the crew

60
00:02:32,949 --> 00:02:31,360
to my right pilot kurt brown

61
00:02:35,030 --> 00:02:32,959
mission specialist

62
00:02:38,229 --> 00:02:35,040
number one andy thomas

63
00:02:40,150 --> 00:02:38,239

nation specialist number two dan bursch

64
00:02:41,110 --> 00:02:40,160
mission specialist number three mario

65
00:02:42,869 --> 00:02:41,120
runco

66
00:02:44,869 --> 00:02:42,879
and mission specialist number four mark

67
00:02:46,390 --> 00:02:44,879
garneau

68
00:02:54,309 --> 00:02:46,400
and if we had could have the movie

69
00:02:58,390 --> 00:02:56,150
well we're suiting up in our launch and

70
00:03:00,630 --> 00:02:58,400
entry suits getting ready for the

71
00:03:02,149 --> 00:03:00,640
launch we had awakened about five hours

72
00:03:05,270 --> 00:03:02,159
before launch here's kurt getting a

73
00:03:12,390 --> 00:03:05,280
pressure check

74
00:03:12,400 --> 00:03:15,910
mark

75
00:03:22,309 --> 00:03:18,790
these launch and entry suits protect us

76
00:03:24,790 --> 00:03:22,319
if we should lose cabin pressure

77
00:03:27,270 --> 00:03:24,800
they also form part of our survival gear

78
00:03:28,390 --> 00:03:27,280
walking out of the onc building at the

79
00:03:30,869 --> 00:03:28,400
cape

80
00:03:32,789 --> 00:03:30,879
getting ready to get on the astro van

81
00:03:34,789 --> 00:03:32,799
and go out to the

82
00:03:37,910 --> 00:03:34,799
to the launch pad on my right there is

83
00:03:42,070 --> 00:03:40,070
andy in the white room up at the 195

84
00:03:45,509 --> 00:03:42,080
level

85
00:03:50,070 --> 00:03:47,750
activities there before he gets on board

86
00:03:51,670 --> 00:03:50,080
we had a beautiful morning for the 77th

87
00:03:53,190 --> 00:03:51,680
launch of the space shuttle program the

88
00:03:55,910 --> 00:03:53,200

first shuttle launch with a full set of

89
00:03:57,429 --> 00:03:55,920
the new modified block one engines at

90
00:03:59,110 --> 00:03:57,439
t-minus six and a half seconds the

91
00:04:00,229 --> 00:03:59,120
manage and start sequence began and

92
00:04:01,910 --> 00:04:00,239
shortly thereafter with all three

93
00:04:04,390 --> 00:04:01,920
engines up to speed where

94
00:04:05,670 --> 00:04:04,400
we're on our way with the srb booster

95
00:04:07,750 --> 00:04:05,680
ignition

96
00:04:09,270 --> 00:04:07,760
endeavor was on its 11th mission into

97
00:04:10,949 --> 00:04:09,280
space

98
00:04:12,869 --> 00:04:10,959
after clearing the tower we rolled to

99
00:04:14,309 --> 00:04:12,879
the ascent attitude

100
00:04:16,870 --> 00:04:14,319
heads down which was going to place us

101
00:04:20,870 --> 00:04:16,880
in the 39 degree inclination orbit with

102
00:04:22,550 --> 00:04:20,880
an altitude of about 160 nautical miles

103
00:04:24,469 --> 00:04:22,560
at this point endeavour and all its

104
00:04:26,710 --> 00:04:24,479
systems were consuming about 3 000

105
00:04:32,469 --> 00:04:26,720
pounds of fuel and propellant per second

106
00:04:36,390 --> 00:04:34,310
for a first-time flyer such as myself

107
00:04:38,390 --> 00:04:36,400
the ascent was really an amazing and

108
00:04:39,830 --> 00:04:38,400
wonderful experience i was on the flight

109
00:04:42,390 --> 00:04:39,840
deck and i could look out the overhead

110
00:04:44,469 --> 00:04:42,400
windows with a wrist mirror and i could

111
00:04:46,150 --> 00:04:44,479
see the flame in the flame trench prior

112
00:04:48,710 --> 00:04:46,160
to lift off i could see the flash of the

113
00:04:50,870 --> 00:04:48,720

srb ignition and then feel the lurch as

114
00:04:52,629 --> 00:04:50,880
we were accelerated upwards

115
00:04:54,870 --> 00:04:52,639
into the flight we saw a flash out the

116
00:04:57,270 --> 00:04:54,880
front windows as the srb separation

117
00:04:58,870 --> 00:04:57,280
motors fired as you can see here then we

118
00:05:02,150 --> 00:04:58,880
could feel the steady acceleration that

119
00:05:05,430 --> 00:05:02,160
carried us on up to orbital velocity and

120
00:05:06,950 --> 00:05:05,440
orbital altitude it was a wonderful ride

121
00:05:08,469 --> 00:05:06,960
as soon as we got on orbit we had to

122
00:05:10,469 --> 00:05:08,479
start work

123
00:05:13,110 --> 00:05:10,479
first business of the day as you know is

124
00:05:15,350 --> 00:05:13,120
to open the payload bay doors and expose

125
00:05:16,870 --> 00:05:15,360
the radiators that uh

126
00:05:18,469 --> 00:05:16,880
line the doors in order to provide

127
00:05:21,189 --> 00:05:18,479
cooling for the spacecraft during its

128
00:05:23,749 --> 00:05:21,199
subsequent on-orbit operations you see

129
00:05:25,990 --> 00:05:23,759
the starboard door being opened and will

130
00:05:27,670 --> 00:05:26,000
be followed shortly by the

131
00:05:30,230 --> 00:05:27,680
port door

132
00:05:33,189 --> 00:05:30,240
in the payload bay there you can see

133
00:05:34,790 --> 00:05:33,199
the spartan spacecraft and the gold

134
00:05:36,550 --> 00:05:34,800
covered canister which contains the

135
00:05:39,110 --> 00:05:36,560
inflatable antenna which we will be

136
00:05:41,350 --> 00:05:39,120
showing shortly and which we deployed on

137
00:05:43,270 --> 00:05:41,360
the second day of the flight

138
00:05:44,950 --> 00:05:43,280

when we first get up on orbit it is a

139
00:05:46,950 --> 00:05:44,960
very busy time after the engine shut

140
00:05:49,270 --> 00:05:46,960
down to configure the space the rocket

141
00:05:51,029 --> 00:05:49,280
ship to be an orbital spacecraft

142
00:05:52,550 --> 00:05:51,039
but the lure of the windows calls and

143
00:05:54,469 --> 00:05:52,560
everybody tries to get to the window to

144
00:05:55,909 --> 00:05:54,479
sneak a first view

145
00:05:57,670 --> 00:05:55,919
while the flight deck crew was

146
00:05:59,830 --> 00:05:57,680
configuring the ship for on orbit

147
00:06:01,510 --> 00:05:59,840
operations i was down on the middeck

148
00:06:03,029 --> 00:06:01,520
doing the same for the systems down

149
00:06:06,150 --> 00:06:03,039
there as well as helping each crew

150
00:06:08,629 --> 00:06:06,160
member unsuit and get ready for on orbit

151
00:06:10,390 --> 00:06:08,639
after the post insertion phase uh andy

152
00:06:12,150 --> 00:06:10,400
thomas and i were

153
00:06:13,830 --> 00:06:12,160
on our way to the space hab and of

154
00:06:15,590 --> 00:06:13,840
course a very exciting moment for us

155
00:06:17,029 --> 00:06:15,600
here where we're opening the hatch to

156
00:06:18,790 --> 00:06:17,039
the space have because this is where

157
00:06:21,510 --> 00:06:18,800
we're going to spend the majority of the

158
00:06:23,749 --> 00:06:21,520
next 10 days and obviously eager to see

159
00:06:25,510 --> 00:06:23,759
that everything looks fine and and

160
00:06:26,390 --> 00:06:25,520
certainly from our first look in there

161
00:06:29,270 --> 00:06:26,400
it looked

162
00:06:32,710 --> 00:06:29,280
as if space habit traveled very well

163
00:06:35,510 --> 00:06:32,720

meanwhile pilot kurt brown is in the mid

164
00:06:37,510 --> 00:06:35,520
deck also doing some more configuration

165
00:06:39,670 --> 00:06:37,520
on orbit here you see the

166
00:06:42,629 --> 00:06:39,680
ergometer which is sort of an exercise

167
00:06:44,230 --> 00:06:42,639
bicycle that curt is assembling down on

168
00:06:45,830 --> 00:06:44,240
the mid deck the ergometer is a very

169
00:06:47,909 --> 00:06:45,840
popular device

170
00:06:49,510 --> 00:06:47,919
used by all of the astronauts usually on

171
00:06:50,710 --> 00:06:49,520
a daily basis to get a little bit of

172
00:06:52,469 --> 00:06:50,720
exercise

173
00:06:54,550 --> 00:06:52,479
so that we can strain our muscles a

174
00:06:56,150 --> 00:06:54,560
little bit also on day one we had to

175
00:06:58,790 --> 00:06:56,160
check out the arm because we were going

176
00:07:00,710 --> 00:06:58,800
to use it later on for uh spartan deploy

177
00:07:02,790 --> 00:07:00,720
and retrieve and andy thomas did all the

178
00:07:05,029 --> 00:07:02,800
checkout on day one with the arm and

179
00:07:07,350 --> 00:07:05,039
also a payload-based survey

180
00:07:08,870 --> 00:07:07,360
after andy uh checked out the arm and

181
00:07:10,950 --> 00:07:08,880
assured me that it would work i had the

182
00:07:12,710 --> 00:07:10,960
good fortune to

183
00:07:15,589 --> 00:07:12,720
be in charge of the deploy of the

184
00:07:17,830 --> 00:07:15,599
satellite uh here you see a view of the

185
00:07:19,430 --> 00:07:17,840
grapple of the satellite the end

186
00:07:20,870 --> 00:07:19,440
effector of the arm coming over the

187
00:07:23,510 --> 00:07:20,880
grapple pin

188
00:07:25,350 --> 00:07:23,520

this is a view from the camera a and the

189
00:07:26,950 --> 00:07:25,360
front looking toward the aft and it's

190
00:07:29,510 --> 00:07:26,960
the same view i had because the space

191
00:07:31,909 --> 00:07:29,520
have in the payload bay blocks your view

192
00:07:34,309 --> 00:07:31,919
direct view of this

193
00:07:37,270 --> 00:07:34,319
task so we had to use the camera what we

194
00:07:38,950 --> 00:07:37,280
had to do is lift the spacecraft up to a

195
00:07:40,550 --> 00:07:38,960
certain level above the payload bay and

196
00:07:41,990 --> 00:07:40,560
then bring it forward in this case

197
00:07:43,670 --> 00:07:42,000
forward is

198
00:07:45,830 --> 00:07:43,680
toward the background of the picture

199
00:07:48,230 --> 00:07:45,840
where you see the the two windows of the

200
00:07:48,950 --> 00:07:48,240
cockpit where the the operation station

201
00:07:51,029 --> 00:07:48,960
is

202
00:07:53,189 --> 00:07:51,039
in the course of uh that evolution we

203
00:07:54,950 --> 00:07:53,199
wound up flying over egypt here you see

204
00:07:57,189 --> 00:07:54,960
in the background the nile river uh the

205
00:07:59,589 --> 00:07:57,199
aswan dam and lake nassar

206
00:08:01,749 --> 00:07:59,599
that all took place in daylight the

207
00:08:04,790 --> 00:08:01,759
deploy actually took place as we went

208
00:08:06,950 --> 00:08:04,800
around the dark side uh after sunset

209
00:08:09,189 --> 00:08:06,960
here you see the deploy we'd have to

210
00:08:10,869 --> 00:08:09,199
ungrapple the uh

211
00:08:12,230 --> 00:08:10,879
put the arm in the ungrappled position

212
00:08:14,390 --> 00:08:12,240
and then back it away from the

213
00:08:15,270 --> 00:08:14,400

spacecraft and after backing the arm

214
00:08:16,790 --> 00:08:15,280
away

215
00:08:18,790 --> 00:08:16,800
john and curt then

216
00:08:27,270 --> 00:08:18,800
took the orbiter and backed it away from

217
00:08:32,310 --> 00:08:29,430
the deploy itself was in the night phase

218
00:08:33,829 --> 00:08:32,320
but in the next orbital sunrise sun

219
00:08:36,389 --> 00:08:33,839
sensors which were positioned on the

220
00:08:38,709 --> 00:08:36,399
spartan spacecraft initiated the

221
00:08:40,389 --> 00:08:38,719
deployment of the inflatable antenna and

222
00:08:41,589 --> 00:08:40,399
its subsequent inflation

223
00:08:43,589 --> 00:08:41,599
as you can imagine this was a

224
00:08:45,269 --> 00:08:43,599
particularly impressive site in fact was

225
00:08:47,990 --> 00:08:45,279
spectacular seeing this from the orbiter

226
00:08:49,670 --> 00:08:48,000
we were just 400 feet away looking down

227
00:08:51,750 --> 00:08:49,680
upon the spartan and we saw this

228
00:08:55,190 --> 00:08:51,760
sequence that you can see here

229
00:08:56,630 --> 00:08:55,200
doors on the spartan carrier opened and

230
00:08:59,110 --> 00:08:56,640
the antenna

231
00:09:01,350 --> 00:08:59,120
mylar structure was pushed out into free

232
00:09:03,750 --> 00:09:01,360
space as you can see here

233
00:09:05,590 --> 00:09:03,760
and then inflation started by filling it

234
00:09:07,590 --> 00:09:05,600
with nitrogen gas

235
00:09:09,350 --> 00:09:07,600
and in a moment you will see one of the

236
00:09:10,949 --> 00:09:09,360
legs of the antenna

237
00:09:13,750 --> 00:09:10,959
fill out with

238
00:09:16,630 --> 00:09:13,760

nitrogen gas a bit like water and a fire

239
00:09:18,150 --> 00:09:16,640
hose there you see it

240
00:09:20,630 --> 00:09:18,160
antenna structures like these have a lot

241
00:09:22,550 --> 00:09:20,640
of applications they can be used for

242
00:09:24,550 --> 00:09:22,560
antennas for deep space probes they

243
00:09:26,790 --> 00:09:24,560
could be used for radar mapping

244
00:09:28,870 --> 00:09:26,800
spacecraft of planets or earth

245
00:09:31,670 --> 00:09:28,880
observations or they could be used for

246
00:09:33,910 --> 00:09:31,680
sun sun shades for uh orbiting space

247
00:09:36,150 --> 00:09:33,920
stations my crewmates tell me here that

248
00:09:41,670 --> 00:09:36,160
the legs look a bit like the number 77

249
00:09:45,829 --> 00:09:44,230
this deployment and inflation took place

250
00:09:47,750 --> 00:09:45,839
as we're crossing the west coast of the

251
00:09:49,269 --> 00:09:47,760
united states and you can see that in

252
00:09:50,790 --> 00:09:49,279
the background as we're crossing over

253
00:09:52,550 --> 00:09:50,800
california

254
00:09:54,710 --> 00:09:52,560
and in a moment you will see us crossing

255
00:09:56,470 --> 00:09:54,720
over the dry lakes of edwards air force

256
00:09:58,550 --> 00:09:56,480
base you can see the inflation

257
00:10:00,470 --> 00:09:58,560
continuing the last leg of the antenna

258
00:10:02,790 --> 00:10:00,480
being deployed you can see the gyrations

259
00:10:04,389 --> 00:10:02,800
that the spacecraft is going through

260
00:10:06,790 --> 00:10:04,399
under that action

261
00:10:09,829 --> 00:10:06,800
the antenna when it was deployed was uh

262
00:10:11,829 --> 00:10:09,839
nearly 100 feet long bright silver and

263
00:10:13,990 --> 00:10:11,839

nearly 50 feet in diameter and since we

264
00:10:15,990 --> 00:10:14,000
were only 400 feet away from it you can

265
00:10:19,509 --> 00:10:16,000
imagine that it was a really grand sight

266
00:10:21,829 --> 00:10:19,519
to see from or from orbit

267
00:10:24,790 --> 00:10:21,839
after a few moments the instabilities

268
00:10:27,750 --> 00:10:24,800
created by the inflation settled down

269
00:10:36,389 --> 00:10:27,760
transit settled out and we got

270
00:10:39,829 --> 00:10:38,389
this shows a view of the canopy itself

271
00:10:42,790 --> 00:10:39,839
after the inflation you can see some

272
00:10:44,550 --> 00:10:42,800
ripples following the inflation process

273
00:10:46,150 --> 00:10:44,560
we tracked it for one orbit while it did

274
00:10:47,910 --> 00:10:46,160
self measurements of its shape and then

275
00:10:49,750 --> 00:10:47,920
we jettison the spartan spacecraft from

276
00:10:51,509 --> 00:10:49,760
the antenna and the next frame will show

277
00:10:53,750 --> 00:10:51,519
you the jettison process and i draw your

278
00:10:55,670 --> 00:10:53,760
attention to the canopy disc itself

279
00:10:58,230 --> 00:10:55,680
where you'll see a shock wave that

280
00:11:00,550 --> 00:10:58,240
envelops the canopy as the pyros fire

281
00:11:01,990 --> 00:11:00,560
and dump the spartan spacecraft there

282
00:11:03,829 --> 00:11:02,000
you see it

283
00:11:07,269 --> 00:11:03,839
a bit like striking a 100 foot diameter

284
00:11:11,670 --> 00:11:09,670
the jettison took place again as we're

285
00:11:14,630 --> 00:11:11,680
tracking over the united states we

286
00:11:15,990 --> 00:11:14,640
didn't retrieve the antenna itself

287
00:11:17,990 --> 00:11:16,000
it subsequently re-entered the

288
00:11:21,190 --> 00:11:18,000

atmosphere and burned up a couple of

289
00:11:24,710 --> 00:11:23,110
the following day we went back to

290
00:11:26,230 --> 00:11:24,720
retrieve the

291
00:11:27,509 --> 00:11:26,240
spartan itself which you can see in the

292
00:11:29,910 --> 00:11:27,519
lower part of the screen there is a

293
00:11:31,829 --> 00:11:29,920
small black speck and this is our

294
00:11:33,430 --> 00:11:31,839
farewell view of the antenna as we're

295
00:11:41,590 --> 00:11:33,440
crossing over the midwest region of the

296
00:11:45,030 --> 00:11:43,350
as andy said the next day we went back

297
00:11:46,630 --> 00:11:45,040
to pick up spartan this is a view

298
00:11:48,069 --> 00:11:46,640
looking out the overhead window you see

299
00:11:50,310 --> 00:11:48,079
the spartan

300
00:11:52,389 --> 00:11:50,320
at a few hundred feet in the optical

301
00:11:54,069 --> 00:11:52,399
site this is now view looking out a

302
00:11:56,310 --> 00:11:54,079
payload bay camera looking straight up

303
00:11:57,910 --> 00:11:56,320
you see the rms the robotic arm on the

304
00:12:00,550 --> 00:11:57,920
right and the spartan on the left about

305
00:12:02,550 --> 00:12:00,560
a hundred feet uh mark garneau uh very

306
00:12:04,389 --> 00:12:02,560
carefully getting ready to retrieve the

307
00:12:06,389 --> 00:12:04,399
spartan and the grapple it

308
00:12:07,750 --> 00:12:06,399
the grapple occurred at night time so it

309
00:12:10,389 --> 00:12:07,760
was a bit of a challenge for us to

310
00:12:12,629 --> 00:12:10,399
adjust the cameras form

311
00:12:14,870 --> 00:12:12,639
fortunately dan did some adjusting on

312
00:12:16,470 --> 00:12:14,880
the camera parameters and and we got a

313
00:12:19,509 --> 00:12:16,480

good view of the end effector and here's

314
00:12:21,910 --> 00:12:19,519
a view from an aft camera you see the

315
00:12:23,990 --> 00:12:21,920
end effector of the arm moving over the

316
00:12:26,389 --> 00:12:24,000
grapple fixture john did such a great

317
00:12:28,389 --> 00:12:26,399
job of bringing a spartan in it was rock

318
00:12:30,389 --> 00:12:28,399
solid it was a very easy job for me just

319
00:12:33,829 --> 00:12:30,399
to move the end effector in

320
00:12:36,230 --> 00:12:33,839
over it and and to close the snares and

321
00:12:38,230 --> 00:12:36,240
then to do the rigidization you might

322
00:12:40,470 --> 00:12:38,240
observe when the rigidization takes

323
00:12:42,870 --> 00:12:40,480
place you're pulling in the spartan

324
00:12:44,790 --> 00:12:42,880
and also the arm sort of goes limp and

325
00:12:47,350 --> 00:12:44,800
it looks like everything's sort of

326
00:12:48,150 --> 00:12:47,360
shaking around a little bit but

327
00:12:51,030 --> 00:12:48,160
after

328
00:12:52,790 --> 00:12:51,040
capturing it the spartan

329
00:12:54,069 --> 00:12:52,800
folks wanted to have a look at it so

330
00:12:56,069 --> 00:12:54,079
andy uh

331
00:12:58,150 --> 00:12:56,079
rotated it a little bit and we pointed

332
00:13:01,430 --> 00:12:58,160
it at cameras and then we had to put it

333
00:13:02,710 --> 00:13:01,440
away obviously it had all the data that

334
00:13:05,030 --> 00:13:02,720
the spartan

335
00:13:06,870 --> 00:13:05,040
folks wanted to retrieve to analyze

336
00:13:08,790 --> 00:13:06,880
after the flight so there you see the

337
00:13:10,470 --> 00:13:08,800
spartan being put away it's a very busy

338
00:13:12,389 --> 00:13:10,480

time retrieval you can see a lot of

339
00:13:15,030 --> 00:13:12,399
people on the flight deck everybody

340
00:13:16,230 --> 00:13:15,040
doing part of the job to

341
00:13:18,230 --> 00:13:16,240
make sure that

342
00:13:19,990 --> 00:13:18,240
we get spartan back

343
00:13:24,150 --> 00:13:20,000
and just in case you'd forgotten what

344
00:13:27,750 --> 00:13:26,230
very next day we deployed our second

345
00:13:30,230 --> 00:13:27,760
satellite it's part of an experiment

346
00:13:33,430 --> 00:13:30,240
called pam stew uh this small satellite

347
00:13:35,030 --> 00:13:33,440
weighs about 115 pounds um it's

348
00:13:37,269 --> 00:13:35,040
aerodynamically stabilized and

349
00:13:39,590 --> 00:13:37,279
magnetically damped the whole idea is to

350
00:13:42,310 --> 00:13:39,600
produce a a satellite that perhaps

351
00:13:43,750 --> 00:13:42,320
doesn't need active stabilization

352
00:13:45,190 --> 00:13:43,760
what you're looking at right now is the

353
00:13:47,829 --> 00:13:45,200
heavy end of the satellite and we

354
00:13:50,310 --> 00:13:47,839
deployed it readily towards the earth

355
00:13:52,550 --> 00:13:50,320
and eventually that heavy end did orient

356
00:13:54,629 --> 00:13:52,560
itself into the velocity vector

357
00:13:56,150 --> 00:13:54,639
again it's kind of tough to concentrate

358
00:13:57,670 --> 00:13:56,160
on the on the small satellite in the

359
00:14:00,150 --> 00:13:57,680
center when you're passing over sites

360
00:14:01,750 --> 00:14:00,160
such as this north africa the coast of

361
00:14:03,750 --> 00:14:01,760
portugal and spain and the straits of

362
00:14:05,350 --> 00:14:03,760
gibraltar that you see at the top

363
00:14:07,750 --> 00:14:05,360

of the picture and coming into the

364
00:14:09,269 --> 00:14:07,760
mediterranean sea again at the top

365
00:14:10,150 --> 00:14:09,279
of the image

366
00:14:12,629 --> 00:14:10,160
the

367
00:14:14,949 --> 00:14:12,639
stew satellite had a series of laser

368
00:14:16,949 --> 00:14:14,959
reflectors that were designed to be

369
00:14:18,069 --> 00:14:16,959
tracked by a laser in the payload bay

370
00:14:18,949 --> 00:14:18,079
additionally

371
00:14:28,069 --> 00:14:18,959
i

372
00:14:30,790 --> 00:14:28,079
plots that we had on board so we could

373
00:14:33,189 --> 00:14:30,800
maintain station keeping with the

374
00:14:35,430 --> 00:14:33,199
stew satellite we station kept about

375
00:14:36,550 --> 00:14:35,440
2000 feet behind the satellite which is

376
00:14:38,550 --> 00:14:36,560
something that had never been done

377
00:14:40,949 --> 00:14:38,560
before and we did that three times

378
00:14:42,949 --> 00:14:40,959
kurt flew two of those rendezvous

379
00:14:44,949 --> 00:14:42,959
in front of the laptops you see right

380
00:14:46,870 --> 00:14:44,959
now kurt's looking at to the right hand

381
00:14:49,350 --> 00:14:46,880
side you see he's looking at a

382
00:14:51,189 --> 00:14:49,360
station keeping box that

383
00:14:52,949 --> 00:14:51,199
and they both john kirk did a great job

384
00:14:54,629 --> 00:14:52,959
of keeping us

385
00:14:57,110 --> 00:14:54,639
in the station keeping you see the pam

386
00:14:59,509 --> 00:14:57,120
stew now is only about 20 degrees off it

387
00:15:01,269 --> 00:14:59,519
did end up with about a 20 degree cone

388
00:15:03,110 --> 00:15:01,279

in addition to these rather spectacular

389
00:15:04,870 --> 00:15:03,120
satellite deployment retrieve operations

390
00:15:06,629 --> 00:15:04,880
we also were lucky enough to have a

391
00:15:08,389 --> 00:15:06,639
space hab module

392
00:15:10,310 --> 00:15:08,399
in the payload bay which provided us a

393
00:15:11,670 --> 00:15:10,320
lot of room to conduct some scientific

394
00:15:13,350 --> 00:15:11,680
experiments

395
00:15:15,189 --> 00:15:13,360
here you see mark working on one a

396
00:15:17,350 --> 00:15:15,199
crystal growth furnace that ran very

397
00:15:19,430 --> 00:15:17,360
successfully throughout the flight

398
00:15:21,189 --> 00:15:19,440
and dan and i working on various

399
00:15:22,870 --> 00:15:21,199
experiments in the space hub we had 12

400
00:15:25,829 --> 00:15:22,880
experiments in all

401
00:15:28,470 --> 00:15:25,839
looking at the effect of microgravity on

402
00:15:29,509 --> 00:15:28,480
physical processes materials science and

403
00:15:32,870 --> 00:15:29,519
some

404
00:15:34,389 --> 00:15:32,880
biological or biotechnology samples

405
00:15:36,870 --> 00:15:34,399
it's a very good working environment to

406
00:15:38,870 --> 00:15:36,880
have the space have module and

407
00:15:40,710 --> 00:15:38,880
we enjoyed working back there some of

408
00:15:42,949 --> 00:15:40,720
the experiments were mounted in the mid

409
00:15:44,949 --> 00:15:42,959
deck and here you see mario activating

410
00:15:47,189 --> 00:15:44,959
one of the biotechnology experiments

411
00:15:53,509 --> 00:15:47,199
that we carried in the mid deck for this

412
00:15:57,350 --> 00:15:55,350
and of course we had our usual uh

413
00:15:59,670 --> 00:15:57,360

unofficial experiments here we have the

414
00:16:01,590 --> 00:15:59,680
the ball of water with a ball of air

415
00:16:03,910 --> 00:16:01,600
that's been injected into it and a good

416
00:16:06,230 --> 00:16:03,920
demonstration of physics one image is

417
00:16:07,189 --> 00:16:06,240
inverted and the other is back upright

418
00:16:09,189 --> 00:16:07,199
and

419
00:16:11,430 --> 00:16:09,199
about this time dan was getting thirsty

420
00:16:13,110 --> 00:16:11,440
and asked me to prepare a tropical punch

421
00:16:15,189 --> 00:16:13,120
ball which

422
00:16:18,150 --> 00:16:15,199
he uh very

423
00:16:18,160 --> 00:16:21,590
took care of

424
00:16:24,629 --> 00:16:22,870
well as with most of our shuttle

425
00:16:26,550 --> 00:16:24,639
missions our own orbit timeline was uh

426
00:16:28,710 --> 00:16:26,560
very busy thanks to our flight activity

427
00:16:29,749 --> 00:16:28,720
officers and however we did find some

428
00:16:31,269 --> 00:16:29,759
time

429
00:16:33,030 --> 00:16:31,279
to have some meals together and share

430
00:16:34,790 --> 00:16:33,040
our experiences on orbit the mid deck is

431
00:16:36,550 --> 00:16:34,800
quite small but on orbit

432
00:16:38,150 --> 00:16:36,560
with six people you're able to take

433
00:16:39,670 --> 00:16:38,160
available all space

434
00:16:41,749 --> 00:16:39,680
also other activities taking care of the

435
00:16:44,310 --> 00:16:41,759
morning mail from earth for upcoming

436
00:16:45,990 --> 00:16:44,320
rendezvous and he's busy typing some

437
00:16:49,030 --> 00:16:46,000
family mail to be sent back down to

438
00:16:50,710 --> 00:16:49,040

earth at next available opportunity

439
00:16:52,389 --> 00:16:50,720
and on the mid deck john is busy

440
00:16:54,870 --> 00:16:52,399
exercising again we all try to stay in

441
00:16:56,870 --> 00:16:54,880
good shape for an inevitable return to

442
00:16:59,189 --> 00:16:56,880
earth and mario is putting away the

443
00:17:00,470 --> 00:16:59,199
vacuum cleaner he's been busy doing some

444
00:17:02,470 --> 00:17:00,480
scheduled maintenance that we do each

445
00:17:04,710 --> 00:17:02,480
day to keep the orbiter atmosphere in

446
00:17:06,630 --> 00:17:04,720
pristine shape

447
00:17:09,029 --> 00:17:06,640
mar excuse me andy wasn't quite that

448
00:17:10,470 --> 00:17:09,039
busy he was catching some sleep

449
00:17:11,909 --> 00:17:10,480
back in the space half this is our

450
00:17:13,429 --> 00:17:11,919
sleeping configuration in the sleeping

451
00:17:15,350 --> 00:17:13,439
bag with a head restraint and a little

452
00:17:17,189 --> 00:17:15,360
eye patch and relax with the bungees

453
00:17:19,429 --> 00:17:17,199
across to give you some pressure in the

454
00:17:20,870 --> 00:17:19,439
middle personal hygiene is always a

455
00:17:22,470 --> 00:17:20,880
challenge in space

456
00:17:23,750 --> 00:17:22,480
dan here is working with some contact

457
00:17:25,350 --> 00:17:23,760
lenses

458
00:17:27,110 --> 00:17:25,360
we do use contacts in space and they

459
00:17:29,029 --> 00:17:27,120
work quite well well in the zero-g

460
00:17:33,669 --> 00:17:29,039
environment and

461
00:17:38,230 --> 00:17:35,669
i think andy and the flight design team

462
00:17:39,990 --> 00:17:38,240
got together to plan sts-77 so it would

463
00:17:41,190 --> 00:17:40,000

pass very frequently over australia

464
00:17:43,190 --> 00:17:41,200
shown here

465
00:17:45,430 --> 00:17:43,200
uh this is a view of the northwest coast

466
00:17:46,950 --> 00:17:45,440
uh sharks base specifically uh rather

467
00:17:48,549 --> 00:17:46,960
spectacular just

468
00:17:50,950 --> 00:17:48,559
when you look at the earth the blues and

469
00:17:52,549 --> 00:17:50,960
greens are just spectacular here you see

470
00:17:53,909 --> 00:17:52,559
from our low light level camera looking

471
00:17:55,830 --> 00:17:53,919
down at the earth over florida

472
00:17:57,510 --> 00:17:55,840
specifically the flashes you see are

473
00:17:59,029 --> 00:17:57,520
lightning flashes from a line of

474
00:18:00,390 --> 00:17:59,039
thunderstorms that were passing over the

475
00:18:02,710 --> 00:18:00,400
state at that time

476
00:18:04,549 --> 00:18:02,720
and in the center on the left there that

477
00:18:06,150 --> 00:18:04,559
those lights are cities and that one

478
00:18:07,430 --> 00:18:06,160
moving off the top of the screen now is

479
00:18:09,270 --> 00:18:07,440
tallahassee

480
00:18:11,909 --> 00:18:09,280
here you see a view a rather spectacular

481
00:18:14,630 --> 00:18:11,919
one moving over mexico this is a view

482
00:18:16,789 --> 00:18:14,640
looking over the rockies westward toward

483
00:18:18,870 --> 00:18:16,799
the gulf of california baja california

484
00:18:21,029 --> 00:18:18,880
and out in the distance the deep blue of

485
00:18:23,029 --> 00:18:21,039
the pacific ocean

486
00:18:24,950 --> 00:18:23,039
unfortunately all great missions have to

487
00:18:26,549 --> 00:18:24,960
come to an end and that's signaled

488
00:18:28,549 --> 00:18:26,559

rather dramatically by the closing of

489
00:18:30,470 --> 00:18:28,559
the payload bay doors which you see here

490
00:18:31,990 --> 00:18:30,480
the starboard door coming in to close

491
00:18:33,830 --> 00:18:32,000
and you can see spartan not looking

492
00:18:36,549 --> 00:18:33,840
quite so big in the payload bay now that

493
00:18:39,510 --> 00:18:36,559
it's lost its inflatable antenna

494
00:18:41,669 --> 00:18:39,520
but we proceeded through the deorbit

495
00:18:44,150 --> 00:18:41,679
prep phase as it's known this was

496
00:18:46,230 --> 00:18:44,160
choreographed by mario rather well and

497
00:18:48,710 --> 00:18:46,240
he's taking care of people putting on

498
00:18:51,029 --> 00:18:48,720
their their suits i won't describe the

499
00:18:52,950 --> 00:18:51,039
feeling of sticking your head through

500
00:18:54,470 --> 00:18:52,960
you probably can imagine what it's like

501
00:18:56,789 --> 00:18:54,480
but obviously we have to wear these

502
00:18:58,549 --> 00:18:56,799
suits and here we have our pilot kurt

503
00:19:00,950 --> 00:18:58,559
brown and looking out the window to his

504
00:19:02,549 --> 00:19:00,960
right you can see the orange glow that's

505
00:19:04,710 --> 00:19:02,559
beginning to increase and this is an

506
00:19:07,110 --> 00:19:04,720
overhead view through

507
00:19:08,789 --> 00:19:07,120
an overhead window and you can see those

508
00:19:10,710 --> 00:19:08,799
those lights

509
00:19:12,710 --> 00:19:10,720
the light show that's going on sometimes

510
00:19:15,029 --> 00:19:12,720
rather spectacular as

511
00:19:15,909 --> 00:19:15,039
arcing takes place in the plasma above

512
00:19:17,590 --> 00:19:15,919
you

513
00:19:19,270 --> 00:19:17,600

we're now getting back into gravity as

514
00:19:24,230 --> 00:19:19,280
you can see john is holding this cue

515
00:19:29,110 --> 00:19:26,230
in this shot we've slowed down from our

516
00:19:31,110 --> 00:19:29,120
orbital speed of 17 500 miles an hour to

517
00:19:32,870 --> 00:19:31,120
about 300 miles an hour

518
00:19:34,710 --> 00:19:32,880
and i'm hand flying the orbiter around

519
00:19:37,350 --> 00:19:34,720
the heading alignment circle

520
00:19:39,270 --> 00:19:37,360
at about four to five miles above the

521
00:19:41,430 --> 00:19:39,280
shuttle landing facility

522
00:19:43,110 --> 00:19:41,440
it's always amazing to me that this

523
00:19:46,070 --> 00:19:43,120
vehicle which has been our

524
00:19:48,470 --> 00:19:46,080
on-orbit uh laboratory and

525
00:19:50,390 --> 00:19:48,480
and spaceship now is configured and

526
00:19:52,070 --> 00:19:50,400
comes down and lands like an airplane

527
00:19:54,070 --> 00:19:52,080
with of course one big exception there

528
00:19:55,669 --> 00:19:54,080
are no engines running so we're a

529
00:19:58,070 --> 00:19:55,679
high-speed glider

530
00:20:00,630 --> 00:19:58,080
but very very versatile

531
00:20:02,470 --> 00:20:00,640
uh spacecraft and of course the only one

532
00:20:11,190 --> 00:20:02,480
in the world that will that can come

533
00:20:14,390 --> 00:20:12,710
touching down here a little over 200

534
00:20:16,950 --> 00:20:14,400
miles an hour

535
00:20:19,430 --> 00:20:16,960
we'll deploy the drag chute to help us

536
00:20:21,750 --> 00:20:19,440
slow down

537
00:20:22,950 --> 00:20:21,760
our flight had covered about 4.1 million

538
00:20:25,029 --> 00:20:22,960

miles

539
00:20:28,549 --> 00:20:25,039
we're uh trying to file for frequent

540
00:20:32,230 --> 00:20:30,789
and we've been around the earth 160

541
00:20:33,909 --> 00:20:32,240
times the total

542
00:20:36,149 --> 00:20:33,919
flight duration was a little over 10

543
00:20:37,590 --> 00:20:36,159
days

544
00:20:40,149 --> 00:20:37,600
and as you can see it was beautiful

545
00:20:46,950 --> 00:20:40,159
weather at the cape on time launch

546
00:20:50,549 --> 00:20:48,390
as we roll out

547
00:20:55,029 --> 00:20:50,559
to about 60 miles an hour jettison the

548
00:20:55,039 --> 00:21:02,070
and a very happy crew after the flight

549
00:21:05,990 --> 00:21:04,149
well we've got a few uh slides that we'd

550
00:21:08,390 --> 00:21:06,000
like to show you

551
00:21:10,470 --> 00:21:08,400
of uh some of the earth views that

552
00:21:12,789 --> 00:21:10,480
we weren't we're not able to capture for

553
00:21:14,789 --> 00:21:12,799
you on the film i'd just like to make a

554
00:21:17,110 --> 00:21:14,799
special thanks to glenn peterson from

555
00:21:20,230 --> 00:21:17,120
the photo lab who put this

556
00:21:21,830 --> 00:21:20,240
video together for us a lot of

557
00:21:24,149 --> 00:21:21,840
long hours and thank you very much for

558
00:21:27,909 --> 00:21:24,159
that effort

559
00:21:33,029 --> 00:21:30,950
and a unique view of the orbiter rollout

560
00:21:37,510 --> 00:21:33,039
uh as it's rolling out to the cape about

561
00:21:42,070 --> 00:21:40,390
dramatic view of the sunrise launch

562
00:21:44,870 --> 00:21:42,080
launched at 6 30 in the morning just as

563
00:21:50,070 --> 00:21:44,880

the sun was coming up

564
00:21:57,029 --> 00:21:52,310
and a

565
00:21:58,470 --> 00:21:57,039
a rather dramatic earth shot here of the

566
00:22:00,070 --> 00:21:58,480
some of the views that we saw there with

567
00:22:08,470 --> 00:22:00,080
the spartan on the

568
00:22:12,789 --> 00:22:10,870
this is a you've seen the

569
00:22:14,310 --> 00:22:12,799
inflatable antenna but we wanted to show

570
00:22:16,630 --> 00:22:14,320
you this slide because it's over the

571
00:22:19,270 --> 00:22:16,640
grand canyon and if you don't notice

572
00:22:21,590 --> 00:22:19,280
through the middle of the

573
00:22:22,630 --> 00:22:21,600
picture and just slightly to the left

574
00:22:25,029 --> 00:22:22,640
behind the

575
00:22:30,950 --> 00:22:25,039
inflatable antennas the grand canyon

576
00:22:34,789 --> 00:22:33,110
and then later on in that same sequence

577
00:22:37,350 --> 00:22:34,799
we were passing over the united states

578
00:22:39,990 --> 00:22:37,360
during this after the deploy or after

579
00:22:42,230 --> 00:22:40,000
the inflation of the antenna this is the

580
00:22:43,830 --> 00:22:42,240
norfolk virginia area chesapeake bay on

581
00:22:45,110 --> 00:22:43,840
the right running up to the top of the

582
00:22:47,190 --> 00:22:45,120
photograph

583
00:22:48,549 --> 00:22:47,200
and some of that area the rappahannock

584
00:22:52,230 --> 00:22:48,559
river at the top

585
00:22:56,230 --> 00:22:52,240
york river james river behind the

586
00:23:00,549 --> 00:22:58,230
um although i don't actually sound it of

587
00:23:02,230 --> 00:23:00,559
course i am american but i was raised in

588
00:23:04,470 --> 00:23:02,240

australia and this flight was a splendid

589
00:23:07,430 --> 00:23:04,480
opportunity to see the country where i

590
00:23:09,510 --> 00:23:07,440
grew up and this is a view of the

591
00:23:11,510 --> 00:23:09,520
south coast of southern australia from

592
00:23:13,029 --> 00:23:11,520
orbit and we had some spectacular places

593
00:23:15,029 --> 00:23:13,039
over australia every morning the crew

594
00:23:16,789 --> 00:23:15,039
would alert me when we were coming by so

595
00:23:18,710 --> 00:23:16,799
i could get some pictures and this is

596
00:23:20,950 --> 00:23:18,720
the area of south australia where i grew

597
00:23:23,430 --> 00:23:22,149
flying over australia is interesting

598
00:23:25,590 --> 00:23:23,440
because if you ever visit australia and

599
00:23:26,390 --> 00:23:25,600
go to the outback it seems very desolate

600
00:23:28,230 --> 00:23:26,400
and

601
00:23:30,470 --> 00:23:28,240
not much topography but when you see it

602
00:23:33,190 --> 00:23:30,480
from orbit it's really very impressive

603
00:23:35,029 --> 00:23:33,200
as the next slide will show

604
00:23:36,950 --> 00:23:35,039
this is a view of an area in the

605
00:23:38,470 --> 00:23:36,960
northern territory of australia uh

606
00:23:40,149 --> 00:23:38,480
called the mcdonnell rangers in that

607
00:23:41,909 --> 00:23:40,159
wavy form that you see across the center

608
00:23:43,270 --> 00:23:41,919
part of the slide but what is unique

609
00:23:45,350 --> 00:23:43,280
here is if you look in the upper part of

610
00:23:46,950 --> 00:23:45,360
the slide you can see a feature which is

611
00:23:49,510 --> 00:23:46,960
known as goss's bluff but it's actually

612
00:23:52,390 --> 00:23:49,520
an impact crater from an ancient uh

613
00:23:55,830 --> 00:23:52,400

meteor impact um this crate is thought

614
00:23:57,830 --> 00:23:55,840
to be about 140 million years old uh and

615
00:23:59,669 --> 00:23:57,840
it's about 22 kilometers in diameter so

616
00:24:00,789 --> 00:23:59,679
it's a very large feature

617
00:24:02,230 --> 00:24:00,799
um

618
00:24:04,390 --> 00:24:02,240
in the countryside but as you can see

619
00:24:06,710 --> 00:24:04,400
there is a lot of texture and coloring

620
00:24:08,549 --> 00:24:06,720
in the outback of australia

621
00:24:10,870 --> 00:24:08,559
the next slide shows the countryside we

622
00:24:13,110 --> 00:24:10,880
saw following australia which was new

623
00:24:14,870 --> 00:24:13,120
zealand and one of the amazing things is

624
00:24:17,029 --> 00:24:14,880
you go from this desolate region of

625
00:24:20,390 --> 00:24:17,039
australia to this lush region of new

626
00:24:22,950 --> 00:24:20,400
zealand and you're struck by the amazing

627
00:24:25,190 --> 00:24:22,960
uh geography of new zealand with its uh

628
00:24:27,590 --> 00:24:25,200
jagged mountains and snow-covered peaks

629
00:24:29,750 --> 00:24:27,600
and very rough terrain and this is a

630
00:24:32,630 --> 00:24:29,760
volcano in new zealand

631
00:24:35,269 --> 00:24:32,640
called mount rajpiu and this actually is

632
00:24:36,950 --> 00:24:35,279
an active volcano it last erupted

633
00:24:38,789 --> 00:24:36,960
sometime last year with some loss of

634
00:24:40,549 --> 00:24:38,799
life actually

635
00:24:43,430 --> 00:24:40,559
and it's still

636
00:24:45,110 --> 00:24:43,440
issuing steam and mud as an active

637
00:24:46,470 --> 00:24:45,120
volcanic site

638
00:24:51,510 --> 00:24:46,480

it was very impressive to see these

639
00:24:55,750 --> 00:24:53,590
as andy mentioned the the volcanoes do

640
00:24:59,350 --> 00:24:55,760
catch your eye and here is one shown

641
00:25:01,269 --> 00:24:59,360
over uh the high altiplano of the of the

642
00:25:03,990 --> 00:25:01,279
northern part of chile and in south

643
00:25:05,830 --> 00:25:04,000
america and the center uh central part

644
00:25:07,510 --> 00:25:05,840
of the screen toward the top there what

645
00:25:10,149 --> 00:25:07,520
caught our eye was the steam plume

646
00:25:12,149 --> 00:25:10,159
emanating from the volcano you see here

647
00:25:14,549 --> 00:25:12,159
and interestingly enough this volcano

648
00:25:16,789 --> 00:25:14,559
was photographed by the crew of sts-55

649
00:25:19,110 --> 00:25:16,799
back in april of 1993

650
00:25:23,590 --> 00:25:19,120
and at that time the volcano had erupted

651
00:25:25,750 --> 00:25:23,600
and put out a large ash cloud as well as

652
00:25:28,310 --> 00:25:25,760
a lava flow and then the lava flow flows

653
00:25:29,750 --> 00:25:28,320
north here toward the top of the picture

654
00:25:31,510 --> 00:25:29,760
and then it turns left and what's

655
00:25:34,789 --> 00:25:31,520
interesting in in just the three years

656
00:25:37,669 --> 00:25:34,799
time since the eruption unlike the

657
00:25:39,830 --> 00:25:37,679
ancient uh crater that andy just showed

658
00:25:41,510 --> 00:25:39,840
you in in australia that that has not

659
00:25:43,430 --> 00:25:41,520
changed its character very much because

660
00:25:46,070 --> 00:25:43,440
of the very dry climate there

661
00:25:48,390 --> 00:25:46,080
this climate being very wet the the gray

662
00:25:50,789 --> 00:25:48,400
feature of the lava flow is uh all but

663
00:25:53,350 --> 00:25:50,799

disappeared and now it's uh covered over

664
00:25:55,350 --> 00:25:53,360
and appears to take on the hue of the

665
00:26:00,950 --> 00:25:55,360
surrounding countryside as

666
00:26:05,590 --> 00:26:03,350
and uh we had a quick shot of this view

667
00:26:07,029 --> 00:26:05,600
in the film this is a view looking

668
00:26:09,669 --> 00:26:07,039
westward across the western

669
00:26:11,350 --> 00:26:09,679
mediterranean sea uh the alboran sea

670
00:26:14,310 --> 00:26:11,360
being the western extent of the

671
00:26:16,710 --> 00:26:14,320
mediterranean the strait of gibraltar uh

672
00:26:18,950 --> 00:26:16,720
the rock of gibraltar is actually off

673
00:26:20,950 --> 00:26:18,960
the peninsula that emanates from the

674
00:26:23,029 --> 00:26:20,960
right side from the coast of spain there

675
00:26:24,470 --> 00:26:23,039
uh sticking out into the water to the

676
00:26:26,630 --> 00:26:24,480
left

677
00:26:28,950 --> 00:26:26,640
the rock of gibraltar and that part of

678
00:26:30,789 --> 00:26:28,960
gibraltar is a

679
00:26:32,870 --> 00:26:30,799
territory of great britain

680
00:26:35,029 --> 00:26:32,880
morocco is to the left and the atlantic

681
00:26:36,870 --> 00:26:35,039
ocean is out in the background of the

682
00:26:39,269 --> 00:26:36,880
picture toward the top rather

683
00:26:41,269 --> 00:26:39,279
spectacular view and and sometimes we

684
00:26:42,950 --> 00:26:41,279
like to look in great detail as you've

685
00:26:45,110 --> 00:26:42,960
seen in the last couple of photographs

686
00:26:48,870 --> 00:26:45,120
and and sometimes just the panoramas

687
00:26:52,549 --> 00:26:50,789
and hear another panorama although

688
00:26:55,350 --> 00:26:52,559

there's a great bit of detail in here

689
00:26:58,310 --> 00:26:55,360
this is of the sinai and israel uh you

690
00:27:00,549 --> 00:26:58,320
can see uh the the dead sea rift valley

691
00:27:02,630 --> 00:27:00,559
here the dead sea being uh in the

692
00:27:04,710 --> 00:27:02,640
northern part of

693
00:27:08,070 --> 00:27:04,720
the photograph the dead sea had opened

694
00:27:10,149 --> 00:27:08,080
had a is about 1300 feet below sea level

695
00:27:11,909 --> 00:27:10,159
and it had there was a passage that had

696
00:27:13,909 --> 00:27:11,919
opened to the sea many millions of years

697
00:27:16,470 --> 00:27:13,919
ago that passage is closed up and the

698
00:27:18,710 --> 00:27:16,480
water is now uh remaining there and that

699
00:27:20,630 --> 00:27:18,720
is the cause for the high uh saline

700
00:27:23,110 --> 00:27:20,640
content as much of it has eroded and is

701
00:27:25,510 --> 00:27:23,120
now fed very uh uh

702
00:27:27,510 --> 00:27:25,520
meagerly by uh streams and underground

703
00:27:29,830 --> 00:27:27,520
springs the rift valley extends

704
00:27:31,510 --> 00:27:29,840
southward to the gulf of akaba here and

705
00:27:33,029 --> 00:27:31,520
interestingly enough if you can make it

706
00:27:34,549 --> 00:27:33,039
out

707
00:27:36,310 --> 00:27:34,559
to the left center of the picture

708
00:27:38,310 --> 00:27:36,320
there's a diagonal line very faintly

709
00:27:40,870 --> 00:27:38,320
showing across here which is actually

710
00:27:42,870 --> 00:27:40,880
the southern border of israel and even

711
00:27:45,269 --> 00:27:42,880
though this is a political boundary we

712
00:27:47,029 --> 00:27:45,279
can see it and and the differentiation

713
00:27:49,110 --> 00:27:47,039

there is between the land use patterns

714
00:27:51,269 --> 00:27:49,120
the irrigation that goes on to the north

715
00:27:53,110 --> 00:27:51,279
of that border and and the lack of

716
00:28:00,470 --> 00:27:53,120
irrigation or the natural desert state

717
00:28:04,149 --> 00:28:01,590
and

718
00:28:06,470 --> 00:28:04,159
very close to the last slide that mario

719
00:28:08,870 --> 00:28:06,480
just described is another one that uh

720
00:28:10,950 --> 00:28:08,880
shows a lot of egypt uh it doesn't

721
00:28:12,630 --> 00:28:10,960
matter what inclination you're on you're

722
00:28:14,070 --> 00:28:12,640
generally always going to go over this

723
00:28:16,789 --> 00:28:14,080
part of the world and it's always going

724
00:28:19,350 --> 00:28:16,799
to have clear weather so you get a good

725
00:28:22,630 --> 00:28:19,360
view of it and it's particularly

726
00:28:24,470 --> 00:28:22,640
attractive because of the the history of

727
00:28:28,470 --> 00:28:24,480
the location and also because the

728
00:28:30,070 --> 00:28:28,480
contrast between the very green triangle

729
00:28:31,990 --> 00:28:30,080
which is at the top center which

730
00:28:34,549 --> 00:28:32,000
represents the nile delta and you can

731
00:28:37,430 --> 00:28:34,559
see it threading down towards the bottom

732
00:28:40,149 --> 00:28:37,440
left more like a ribbon as it works its

733
00:28:41,350 --> 00:28:40,159
way into the very dry part of northern

734
00:28:44,070 --> 00:28:41,360
africa

735
00:28:46,789 --> 00:28:44,080
at the apex of the green triangle just a

736
00:28:47,750 --> 00:28:46,799
little bit to the right is cairo and a

737
00:28:50,149 --> 00:28:47,760
little bit

738
00:28:52,310 --> 00:28:50,159

to its left

739
00:28:53,510 --> 00:28:52,320
is the location where the pyramids of

740
00:28:55,909 --> 00:28:53,520
egypt are

741
00:28:59,909 --> 00:28:55,919
located as well you can see over on the

742
00:29:02,310 --> 00:28:59,919
right side the famous gulf of suez which

743
00:29:05,590 --> 00:29:02,320
up in the right hand corner empties into

744
00:29:08,149 --> 00:29:05,600
the mediterranean at port saeed and the

745
00:29:10,789 --> 00:29:08,159
lake that's halfway down the

746
00:29:13,350 --> 00:29:10,799
suez canal great bitter lake and finally

747
00:29:16,630 --> 00:29:13,360
going further down emptying into the

748
00:29:18,870 --> 00:29:16,640
gulf of suez always a very striking part

749
00:29:21,029 --> 00:29:18,880
of the world to fly over next slide

750
00:29:21,909 --> 00:29:21,039
please

751
00:29:23,830 --> 00:29:21,919
of course

752
00:29:27,029 --> 00:29:23,840
one of the most

753
00:29:29,190 --> 00:29:27,039
startling set of islands that we have on

754
00:29:31,430 --> 00:29:29,200
our planet are the galapagos islands

755
00:29:32,549 --> 00:29:31,440
which are off the west coast of south

756
00:29:33,430 --> 00:29:32,559
america

757
00:29:35,750 --> 00:29:33,440
and

758
00:29:37,669 --> 00:29:35,760
we were fortunate in being able to see

759
00:29:38,870 --> 00:29:37,679
them several times in a cloud-free

760
00:29:40,789 --> 00:29:38,880
situation

761
00:29:44,389 --> 00:29:40,799
the biggest island is quite striking

762
00:29:45,269 --> 00:29:44,399
because it does look like a horse's head

763
00:29:47,190 --> 00:29:45,279

and

764
00:29:49,430 --> 00:29:47,200
it if you went from the bottom of its

765
00:29:51,190 --> 00:29:49,440
body towards the top you'd be pointing

766
00:29:52,310 --> 00:29:51,200
in the northerly direction and of course

767
00:29:54,230 --> 00:29:52,320
this is a

768
00:29:56,789 --> 00:29:54,240
a set of islands that became famous

769
00:29:59,750 --> 00:29:56,799
because charles darwin spent quite a bit

770
00:30:01,750 --> 00:29:59,760
of time there in the the 19th century uh

771
00:30:03,990 --> 00:30:01,760
looking at the unique animal and bird

772
00:30:07,190 --> 00:30:04,000
life on these islands in it and it was

773
00:30:08,310 --> 00:30:07,200
this animal life that helped him to uh

774
00:30:11,669 --> 00:30:08,320
to uh

775
00:30:14,789 --> 00:30:11,679
develop his uh theories on the evolution

776
00:30:16,950 --> 00:30:14,799
of the species and and natural selection

777
00:30:19,750 --> 00:30:16,960
and and even today uh

778
00:30:21,590 --> 00:30:19,760
there are still unique life

779
00:30:24,630 --> 00:30:21,600
life forms on this island on these

780
00:30:26,389 --> 00:30:24,640
islands next slide please

781
00:30:28,230 --> 00:30:26,399
well this one is a little bit difficult

782
00:30:30,710 --> 00:30:28,240
to see but it's very important to me

783
00:30:32,389 --> 00:30:30,720
because as a canadian i was not going to

784
00:30:34,710 --> 00:30:32,399
be allowed to go back up to canada

785
00:30:37,750 --> 00:30:34,720
unless i showed everybody that i'd seen

786
00:30:40,470 --> 00:30:37,760
some of canada during my mission

787
00:30:42,070 --> 00:30:40,480
if you look up in the top left corner

788
00:30:44,389 --> 00:30:42,080

you can actually see

789
00:30:46,470 --> 00:30:44,399
some of lake ontario and i have to admit

790
00:30:47,830 --> 00:30:46,480
i did not see this view and i'm very

791
00:30:49,830 --> 00:30:47,840
grateful to

792
00:30:52,230 --> 00:30:49,840
my colleague dan who took this picture

793
00:30:55,110 --> 00:30:52,240
because he's also from new york and i'll

794
00:30:56,789 --> 00:30:55,120
let him describe the other part of it

795
00:30:59,029 --> 00:30:56,799
it wasn't until we were in space that i

796
00:31:01,110 --> 00:30:59,039
realized how close uh the areas that

797
00:31:02,389 --> 00:31:01,120
were our home towns were where we grew

798
00:31:04,630 --> 00:31:02,399
up because

799
00:31:06,389 --> 00:31:04,640
where mark grew up on the northern part

800
00:31:08,470 --> 00:31:06,399
of this slide or the top part of this

801
00:31:10,149 --> 00:31:08,480
slide i grew up in the south part you

802
00:31:11,909 --> 00:31:10,159
see these are some of the river valleys

803
00:31:14,230 --> 00:31:11,919
down to the bottom this is actually the

804
00:31:16,230 --> 00:31:14,240
susquehanna river right here river

805
00:31:18,389 --> 00:31:16,240
valley towards the

806
00:31:21,669 --> 00:31:18,399
bottom center and left of the of the

807
00:31:24,149 --> 00:31:21,679
photo um my hometown is just in in the

808
00:31:25,909 --> 00:31:24,159
lower uh left center of the picture near

809
00:31:28,149 --> 00:31:25,919
binghamton new york actually vestal new

810
00:31:30,470 --> 00:31:28,159
york and and uh fortunately this was an

811
00:31:32,789 --> 00:31:30,480
early morning uh pass it's why it's a

812
00:31:34,230 --> 00:31:32,799
little bit a bit hazy and how the fog

813
00:31:36,149 --> 00:31:34,240

still

814
00:31:37,350 --> 00:31:36,159
lingers in the river valleys the

815
00:31:42,630 --> 00:31:37,360
chenango

816
00:31:47,190 --> 00:31:45,269
seemed like every time a few hours after

817
00:31:49,269 --> 00:31:47,200
we woke up we always had a west coast

818
00:31:51,909 --> 00:31:49,279
pass very close to

819
00:31:53,590 --> 00:31:51,919
san francisco uh you see the orbiter

820
00:31:54,710 --> 00:31:53,600
tail and just to the left of the tail

821
00:31:56,950 --> 00:31:54,720
you can see

822
00:31:58,789 --> 00:31:56,960
uh san francisco bay

823
00:32:01,029 --> 00:31:58,799
uh golden gate bridge it can't quite

824
00:32:03,029 --> 00:32:01,039
make it out in the photo here just to

825
00:32:04,950 --> 00:32:03,039
the right of the tail is monterey bay if

826
00:32:06,310 --> 00:32:04,960
anybody's ever been in that part of

827
00:32:08,310 --> 00:32:06,320
california

828
00:32:10,230 --> 00:32:08,320
and uh

829
00:32:12,310 --> 00:32:10,240
actually you can see some of the the

830
00:32:13,430 --> 00:32:12,320
surface waves uh

831
00:32:14,470 --> 00:32:13,440
approaching

832
00:32:16,870 --> 00:32:14,480
the uh

833
00:32:19,830 --> 00:32:16,880
the mouth of the san francisco bay

834
00:32:24,630 --> 00:32:23,029
this is uh town of el paso el paso

835
00:32:26,230 --> 00:32:24,640
happens to be one of the oldest set

836
00:32:29,669 --> 00:32:26,240
settlements in north america it was

837
00:32:32,710 --> 00:32:29,679
first settled in 1598

838
00:32:35,669 --> 00:32:32,720

got its name from el paso del norte from

839
00:32:37,830 --> 00:32:35,679
the spanish uh it was a pass through the

840
00:32:39,430 --> 00:32:37,840
the rocky mountains this part of the

841
00:32:42,149 --> 00:32:39,440
mountains extension the rocky mountains

842
00:32:45,029 --> 00:32:42,159
is called the franklin mountains

843
00:32:47,909 --> 00:32:45,039
the river itself if you've

844
00:32:50,070 --> 00:32:47,919
if you follow kind of like the dark area

845
00:32:52,230 --> 00:32:50,080
and avoiding the mountains itself but

846
00:32:54,149 --> 00:32:52,240
the dark area comes down here and that's

847
00:32:56,310 --> 00:32:54,159
the rio grande

848
00:32:58,230 --> 00:32:56,320
we fly out to el paso a lot it's we

849
00:33:00,070 --> 00:32:58,240
routinely stop there when we fly out to

850
00:33:02,310 --> 00:33:00,080
the west coast the pilots fly there all

851
00:33:03,909 --> 00:33:02,320
the time because they use it kind of as

852
00:33:06,470 --> 00:33:03,919
a fueling stop where they pick up the

853
00:33:08,389 --> 00:33:06,480
sta and then they fly to the north north

854
00:33:10,630 --> 00:33:08,399
is is to the upper right part of the

855
00:33:11,909 --> 00:33:10,640
photo and where they fly towards new

856
00:33:13,990 --> 00:33:11,919
mexico

857
00:33:15,750 --> 00:33:14,000
in white sands and and do a lot of their

858
00:33:19,669 --> 00:33:15,760
training runs in the sta

859
00:33:22,789 --> 00:33:21,269
this is a picture a little bit closer to

860
00:33:24,549 --> 00:33:22,799
home

861
00:33:27,669 --> 00:33:24,559
towards the bottom you see the coast

862
00:33:28,549 --> 00:33:27,679
this is uh galveston island right in the

863
00:33:31,669 --> 00:33:28,559

middle

864
00:33:34,230 --> 00:33:31,679
of the flight you see some of the puffy

865
00:33:37,110 --> 00:33:34,240
clouds which and i i remember this day i

866
00:33:38,789 --> 00:33:37,120
called down to mcc and i said looks like

867
00:33:40,549 --> 00:33:38,799
a clear day but the only word that came

868
00:33:43,029 --> 00:33:40,559
back would says

869
00:33:44,389 --> 00:33:43,039
bill mcarthur said yeah but it's hot

870
00:33:46,789 --> 00:33:44,399
so i think that's when you all were

871
00:33:49,430 --> 00:33:46,799
having some 90-plus degree weather at

872
00:33:53,750 --> 00:33:49,440
that time while we're in orbit you can

873
00:33:55,669 --> 00:33:53,760
see this is a dyke that extends out

874
00:33:57,750 --> 00:33:55,679
and also here's the

875
00:34:00,149 --> 00:33:57,760
the causeway that goes over to galveston

876
00:34:06,470 --> 00:34:00,159
island itself just in the lower

877
00:34:09,829 --> 00:34:07,990
this slide is a

878
00:34:13,109 --> 00:34:09,839
an example one of the techniques that we

879
00:34:14,710 --> 00:34:13,119
use in earth ops observations

880
00:34:16,790 --> 00:34:14,720
we call it sun glint we use the

881
00:34:19,430 --> 00:34:16,800
reflection of the sun off the surface of

882
00:34:21,829 --> 00:34:19,440
water bodies on the earth to gather more

883
00:34:23,270 --> 00:34:21,839
detail with that glint we're able to see

884
00:34:25,750 --> 00:34:23,280
the activities

885
00:34:26,629 --> 00:34:25,760
and the condition of the surface of the

886
00:34:27,990 --> 00:34:26,639
water

887
00:34:29,909 --> 00:34:28,000
this particular

888
00:34:31,270 --> 00:34:29,919

shot is taken of the west coast of

889
00:34:35,030 --> 00:34:31,280
florida

890
00:34:36,869 --> 00:34:35,040
the little island you see dead center of

891
00:34:39,669 --> 00:34:36,879
the photo is

892
00:34:41,589 --> 00:34:39,679
sanibel island and fort myers is just to

893
00:34:43,349 --> 00:34:41,599
the north or just above that on the

894
00:34:44,470 --> 00:34:43,359
coast and in naples florida is on the

895
00:34:46,389 --> 00:34:44,480
far right

896
00:34:48,790 --> 00:34:46,399
of the coast but with this sun glint on

897
00:34:51,270 --> 00:34:48,800
the surface of water we're able to see

898
00:34:53,829 --> 00:34:51,280
quite a bit activity in this shot this

899
00:34:55,510 --> 00:34:53,839
occurred on sunday afternoon

900
00:34:57,750 --> 00:34:55,520
and you can see all the pleasure boaters

901
00:34:58,470 --> 00:34:57,760
out the little v wakes which is actually

902
00:35:07,750 --> 00:34:58,480
the

903
00:35:11,190 --> 00:35:09,670
one of our most favorite

904
00:35:12,470 --> 00:35:11,200
shots here is i'm sure everyone

905
00:35:13,589 --> 00:35:12,480
recognizes

906
00:35:15,670 --> 00:35:13,599
is the

907
00:35:16,790 --> 00:35:15,680
our launch or departure site from from

908
00:35:18,390 --> 00:35:16,800
earth

909
00:35:19,829 --> 00:35:18,400
almost dead center of the photo you can

910
00:35:22,150 --> 00:35:19,839
see the shuttle landing facility the

911
00:35:23,589 --> 00:35:22,160
little straight line about a 15 000 foot

912
00:35:24,790 --> 00:35:23,599
long runway

913
00:35:28,230 --> 00:35:24,800

if you look a little bit to the right of

914
00:35:34,470 --> 00:35:30,950
the land there the atlantic you can see

915
00:35:36,710 --> 00:35:34,480
the pad bravo and alpha pad 39 that we

916
00:35:38,310 --> 00:35:36,720
departed from the northernmost pad

917
00:35:39,750 --> 00:35:38,320
and you can see the qualler tracks that

918
00:35:41,829 --> 00:35:39,760
lead out to the pad from the vertical

919
00:35:43,349 --> 00:35:41,839
assembly building

920
00:35:44,710 --> 00:35:43,359
if you look a little bit south of that

921
00:35:46,470 --> 00:35:44,720
the little

922
00:35:48,630 --> 00:35:46,480
cape that sticks out cape canaveral you

923
00:35:50,470 --> 00:35:48,640
can see all the launch pads that have

924
00:35:52,470 --> 00:35:50,480
played such an important part of our

925
00:35:55,109 --> 00:35:52,480
history in the space program

926
00:35:57,589 --> 00:35:55,119
during the early days of

927
00:35:59,670 --> 00:35:57,599
mercury gemini and apollo

928
00:36:01,910 --> 00:35:59,680
you can see the town of titusville and

929
00:36:03,109 --> 00:36:01,920
also within the bodies of water about

930
00:36:05,670 --> 00:36:03,119
center of the photo you can actually see

931
00:36:10,829 --> 00:36:05,680
the intercoastal waterway that the ships

932
00:36:16,150 --> 00:36:13,750
coast this is a good shot of landing uh

933
00:36:18,069 --> 00:36:16,160
after 10 days of a very successful and a

934
00:36:19,589 --> 00:36:18,079
very exciting mission we obviously have

935
00:36:21,670 --> 00:36:19,599
to come back to earth

936
00:36:24,390 --> 00:36:21,680
and we landed on runway 33 at the

937
00:36:26,069 --> 00:36:24,400
kennedy space center the weather was

938
00:36:28,390 --> 00:36:26,079

very nice early morning right after

939
00:36:29,750 --> 00:36:28,400
sunrise type landing and and john did an

940
00:36:32,950 --> 00:36:29,760
excellent job bringing us all home

941
00:36:34,470 --> 00:36:32,960
safely and we're very happy and sad

942
00:36:36,870 --> 00:36:34,480
happy to be back home to our loved ones

943
00:36:38,790 --> 00:36:36,880
but very sad to have completed

944
00:36:44,310 --> 00:36:38,800
our short stay in space looking forward

945
00:36:48,150 --> 00:36:46,069
here's another shot of the crew out in

946
00:36:49,190 --> 00:36:48,160
front of the orbiter about an hour after

947
00:36:51,910 --> 00:36:49,200
landing

948
00:36:53,510 --> 00:36:51,920
and getting the traditional thumbs up

949
00:36:55,990 --> 00:36:53,520
again happy to

950
00:36:59,750 --> 00:36:56,000
be back safely after an amazing

951
00:37:03,750 --> 00:36:59,760
and very successful 10 days on orbit

952
00:37:07,750 --> 00:37:03,760
our closing slide is the

953
00:37:09,829 --> 00:37:07,760
sunset shot of looking across

954
00:37:11,910 --> 00:37:09,839
and in uh in closing i would like to

955
00:37:14,790 --> 00:37:11,920
again thank all of you for

956
00:37:16,630 --> 00:37:14,800
uh coming here today and uh

957
00:37:18,630 --> 00:37:16,640
for the part that you played your in

958
00:37:19,990 --> 00:37:18,640
this mission your your dedication your

959
00:37:21,990 --> 00:37:20,000
hard work

960
00:37:24,950 --> 00:37:22,000
and i'd ask you to keep it up because uh

961
00:37:27,349 --> 00:37:24,960
sts 77 is is now history we've got

962
00:37:28,870 --> 00:37:27,359
sts-78 on the launch pad

963
00:37:31,190 --> 00:37:28,880

ready to go

964
00:37:32,870 --> 00:37:31,200
and uh next year we look forward to

965
00:37:34,630 --> 00:37:32,880
launching the first

966
00:37:36,710 --> 00:37:34,640
component of the international space

967
00:37:38,790 --> 00:37:36,720
station so we've got a lot going on in

968
00:37:40,950 --> 00:37:38,800
the future and i would ask you all to

969
00:37:44,150 --> 00:37:40,960
keep up the good work all the great work