



1
00:00:26,310 --> 00:00:23,189
like to welcome you all good afternoon

2
00:00:27,349 --> 00:00:26,320
to the sts-61 post flight crew press

3
00:00:29,109 --> 00:00:27,359
conference

4
00:00:31,750 --> 00:00:29,119
uh joining us of course is the seven

5
00:00:33,350 --> 00:00:31,760
member crew and uh as usual with all of

6
00:00:36,069 --> 00:00:33,360
our briefings the crew will show some

7
00:00:38,709 --> 00:00:36,079
slides from the mission as well as some

8
00:00:40,630 --> 00:00:38,719
video that was shot on orbit

9
00:00:42,549 --> 00:00:40,640
and after that we'll take our usual

10
00:00:44,150 --> 00:00:42,559
question and answers from here at jsc

11
00:00:46,150 --> 00:00:44,160
and check with some of the other nasa

12
00:00:47,830 --> 00:00:46,160
centers with that i'll turn it over to

13
00:00:49,110 --> 00:00:47,840

the commander of the flight richard

14

00:00:50,470 --> 00:00:49,120

covey

15

00:00:52,470 --> 00:00:50,480

thank you kyle

16

00:00:55,029 --> 00:00:52,480

uh well good afternoon uh it's really a

17

00:00:58,549 --> 00:00:55,039

pleasure for the sts-61 crew to be here

18

00:01:00,790 --> 00:00:58,559

today a month ago today we had

19

00:01:02,790 --> 00:01:00,800

snugly tucked uh

20

00:01:05,670 --> 00:01:02,800

hubble into the payload bay of endeavor

21

00:01:07,270 --> 00:01:05,680

and we're beginning to embark upon

22

00:01:09,750 --> 00:01:07,280

the rest of the great adventure that was

23

00:01:12,070 --> 00:01:09,760

the hubble servicing and repair i'd like

24

00:01:13,750 --> 00:01:12,080

to briefly introduce reintroduced to you

25

00:01:15,990 --> 00:01:13,760

the crew members

26
00:01:17,749 --> 00:01:16,000
just so you can recognize them in their

27
00:01:18,789 --> 00:01:17,759
coats and ties and

28
00:01:20,630 --> 00:01:18,799
nice

29
00:01:24,390 --> 00:01:20,640
suits

30
00:01:27,030 --> 00:01:24,400
on my right immediately is is the pilot

31
00:01:30,310 --> 00:01:27,040
and rms uh operator uh backup rms

32
00:01:31,749 --> 00:01:30,320
operator uh ken bowersox uh probably

33
00:01:32,630 --> 00:01:31,759
heard him called sockslot during a

34
00:01:34,710 --> 00:01:32,640
mission

35
00:01:37,350 --> 00:01:34,720
uh next to him is claude nicolier

36
00:01:39,270 --> 00:01:37,360
claude's european space agency uh

37
00:01:40,390 --> 00:01:39,280
astronaut that we were really privileged

38
00:01:43,190 --> 00:01:40,400

to have on board

39

00:01:45,109 --> 00:01:43,200

uh served as the rms operator and also

40

00:01:47,990 --> 00:01:45,119

as flight engineer for ascent and entry

41

00:01:49,190 --> 00:01:48,000

and other orbiter functions

42

00:01:50,149 --> 00:01:49,200

next

43

00:01:51,830 --> 00:01:50,159

are the

44

00:01:55,030 --> 00:01:51,840

the odd couple and they're called the

45

00:01:57,429 --> 00:01:55,040

odd couple because they perform the evas

46

00:02:01,910 --> 00:01:57,439

one three and five and that's dr story

47

00:02:05,270 --> 00:02:02,870

and

48

00:02:07,030 --> 00:02:05,280

dr jeff hoffman

49

00:02:09,350 --> 00:02:07,040

and last but

50

00:02:11,670 --> 00:02:09,360

certainly not least are the even couple

51

00:02:13,670 --> 00:02:11,680

performed bbas two and four

52

00:02:19,670 --> 00:02:13,680

and that's tom akers air force

53

00:02:25,350 --> 00:02:21,670

we're going to move right on into

54

00:02:28,630 --> 00:02:27,510

the night assets pretty spectacular you

55

00:02:30,390 --> 00:02:28,640

look out the window and it's like a

56

00:02:31,750 --> 00:02:30,400

welding torch going off when the srb is

57

00:02:33,589 --> 00:02:31,760

light

58

00:02:35,190 --> 00:02:33,599

kt got to look at the overhead windows

59

00:02:36,550 --> 00:02:35,200

and i think that was pretty spectacular

60

00:02:38,390 --> 00:02:36,560

too

61

00:02:40,470 --> 00:02:38,400

it looked like uh daylight behind us on

62

00:02:42,710 --> 00:02:40,480

the pad and and i could follow it for

63

00:02:43,589 --> 00:02:42,720

maybe 20 seconds before it went into

64

00:02:48,710 --> 00:02:43,599

just

65

00:02:51,270 --> 00:02:48,720

the vibrations and the the roar is

66

00:02:52,550 --> 00:02:51,280

pretty much the same as in the daytime

67

00:02:55,589 --> 00:02:52,560

probably the big difference is up when

68

00:02:57,589 --> 00:02:55,599

you get towards srb sep

69

00:02:59,509 --> 00:02:57,599

when the rockets go off to separate

70

00:03:00,949 --> 00:02:59,519

those boosters it really flashes outside

71

00:03:03,030 --> 00:03:00,959

the windows and it

72

00:03:04,390 --> 00:03:03,040

gives me a thrill just seeing that right

73

00:03:06,149 --> 00:03:04,400

there

74

00:03:08,390 --> 00:03:06,159

tried to warn these guys yeah cubby

75

00:03:09,670 --> 00:03:08,400

warned us but it was still exciting

76

00:03:11,190 --> 00:03:09,680

the engines worked pretty well and the

77

00:03:13,190 --> 00:03:11,200

next thing you know we were up on orbit

78

00:03:14,869 --> 00:03:13,200

saw beautiful sunrise

79

00:03:17,270 --> 00:03:14,879

because of the altitude of the hubble

80

00:03:20,309 --> 00:03:17,280

space telescope we got to go into a

81

00:03:21,910 --> 00:03:20,319

relatively high insert into high orbit

82

00:03:24,309 --> 00:03:21,920

what we found almost immediately is this

83

00:03:26,790 --> 00:03:24,319

orbit allowed us

84

00:03:28,550 --> 00:03:26,800

greater views than we had seen before on

85

00:03:30,229 --> 00:03:28,560

any of our flights

86

00:03:31,589 --> 00:03:30,239

this was what houston looked like at

87

00:03:33,030 --> 00:03:31,599

night in fact you can follow a gulf

88

00:03:34,869 --> 00:03:33,040

freeway down to the bottom part of the

89

00:03:38,949 --> 00:03:34,879

picture you see clear lake and texas

90

00:03:41,030 --> 00:03:38,959

city and galveston all in in there

91

00:03:43,110 --> 00:03:41,040

we never saw the u.s uh in the daytime

92

00:03:44,470 --> 00:03:43,120

we saw it at night but this shows you uh

93

00:03:46,229 --> 00:03:44,480

some of the view of the lights if you

94

00:03:48,949 --> 00:03:46,239

see new orleans just going off the left

95

00:03:50,789 --> 00:03:48,959

side of the screen at the far top left

96

00:03:53,030 --> 00:03:50,799

is chicago

97

00:03:55,270 --> 00:03:53,040

center screen is atlanta

98

00:03:56,869 --> 00:03:55,280

as we come across here you can see the

99

00:04:00,149 --> 00:03:56,879

lights of florida and on up the east

100

00:04:05,589 --> 00:04:02,789

uh post insertion is a busy time for the

101
00:04:08,309 --> 00:04:05,599
crew you're adapting to zero g and uh

102
00:04:09,670 --> 00:04:08,319
spectacular views uh but uh

103
00:04:12,550 --> 00:04:09,680
we were able to get everything cleaned

104
00:04:14,710 --> 00:04:12,560
up this and and ready for our uh stay in

105
00:04:16,870 --> 00:04:14,720
orbit it shows the crew members at their

106
00:04:19,189 --> 00:04:16,880
different positions and

107
00:04:23,830 --> 00:04:19,199
being busy claude and

108
00:04:23,840 --> 00:04:28,390
and story

109
00:04:34,469 --> 00:04:31,030
and tom trying to work on our rat's nest

110
00:04:36,390 --> 00:04:34,479
of photo tv equipment over in the corner

111
00:04:38,310 --> 00:04:36,400
there's our beautiful payload bay again

112
00:04:43,749 --> 00:04:38,320
just waiting for us to go to work out

113
00:04:46,550 --> 00:04:44,629

here we're getting ready for the

114

00:04:47,909 --> 00:04:46,560

rendezvous yeah before those guys could

115

00:04:48,870 --> 00:04:47,919

go to work we had to get the orbiter up

116

00:04:50,310 --> 00:04:48,880

there

117

00:04:51,749 --> 00:04:50,320

and uh this next sequence will give you

118

00:04:53,270 --> 00:04:51,759

a feel just how busy it is during a

119

00:04:54,870 --> 00:04:53,280

rendezvous

120

00:04:56,469 --> 00:04:54,880

cubby claude and i were working up front

121

00:04:57,909 --> 00:04:56,479

most of the time maneuvering the orbiter

122

00:04:58,950 --> 00:04:57,919

and then covey moved back to the ass

123

00:05:00,629 --> 00:04:58,960

station

124

00:05:02,710 --> 00:05:00,639

everybody else was busy taking pictures

125

00:05:04,469 --> 00:05:02,720

like with this imax camera shooting a

126
00:05:05,510 --> 00:05:04,479
laser out the window

127
00:05:07,189 --> 00:05:05,520
and

128
00:05:08,469 --> 00:05:07,199
getting pictures like that of the

129
00:05:10,710 --> 00:05:08,479
telescope

130
00:05:12,550 --> 00:05:10,720
the closer we got the more excited i got

131
00:05:13,749 --> 00:05:12,560
and i was pretty impressed when i got my

132
00:05:15,270 --> 00:05:13,759
first view out the window and that's

133
00:05:19,830 --> 00:05:15,280
just what it looked like you can see the

134
00:05:23,029 --> 00:05:21,430
and this is the final approach to the

135
00:05:25,590 --> 00:05:23,039
telescope

136
00:05:26,550 --> 00:05:25,600
cavi was flying the orbiter

137
00:05:28,550 --> 00:05:26,560
in a

138
00:05:30,070 --> 00:05:28,560

very professional way and

139

00:05:32,070 --> 00:05:30,080

stabilized the orbiter versus a

140

00:05:32,950 --> 00:05:32,080

telescope in such a position that i

141

00:05:34,870 --> 00:05:32,960

could

142

00:05:36,390 --> 00:05:34,880

grab it that the

143

00:05:38,550 --> 00:05:36,400

remote manipulated system had been

144

00:05:40,310 --> 00:05:38,560

already put in the poise for capture

145

00:05:41,990 --> 00:05:40,320

position about an hour before the final

146

00:05:44,150 --> 00:05:42,000

grapple and this is the final grapple we

147

00:05:46,070 --> 00:05:44,160

saw the target that i was using in order

148

00:05:48,710 --> 00:05:46,080

to position the end effector on the

149

00:05:50,710 --> 00:05:48,720

telescope and grab it and rigidize it

150

00:05:52,550 --> 00:05:50,720

and then move it in the aft cargo bay to

151

00:05:56,550 --> 00:05:52,560

install it on the flight service

152

00:05:59,670 --> 00:05:57,990

we had checked out the suits on flight

153

00:06:01,590 --> 00:05:59,680

day two so we knew we had four good

154

00:06:03,270 --> 00:06:01,600

suits going into this we'd spent a lot

155

00:06:04,870 --> 00:06:03,280

of hours training in the water tank and

156

00:06:11,990 --> 00:06:04,880

we were all excited and ready to go do

157

00:06:17,029 --> 00:06:14,390

here we are doing it for real on eva day

158

00:06:18,309 --> 00:06:17,039

one uh get up stuff some breakfast down

159

00:06:19,909 --> 00:06:18,319

and while you're eating breakfast you

160

00:06:22,150 --> 00:06:19,919

start putting electrodes on those are

161

00:06:25,270 --> 00:06:22,160

biomed electrodes to

162

00:06:27,110 --> 00:06:25,280

get the electrocardiogram off

163

00:06:29,590 --> 00:06:27,120

next thing you do is uh

164

00:06:32,230 --> 00:06:29,600

kt and tom put you in a suit here's jeff

165

00:06:34,309 --> 00:06:32,240

inside the suit

166

00:06:36,550 --> 00:06:34,319

and myself you check out the suits and

167

00:06:40,950 --> 00:06:36,560

uh they're all checked out uh

168

00:06:42,790 --> 00:06:40,960

depressurized to your lock go outside

169

00:06:44,309 --> 00:06:42,800

it's an exciting moment when you first

170

00:06:46,150 --> 00:06:44,319

open the airlock and you look out and

171

00:06:48,469 --> 00:06:46,160

there's the entire universe staring you

172

00:06:50,070 --> 00:06:48,479

in the face here i am coming out the

173

00:06:51,430 --> 00:06:50,080

first eva

174

00:06:53,430 --> 00:06:51,440

um

175

00:06:55,749 --> 00:06:53,440

grabbing onto the manipulator arm while

176
00:06:57,510 --> 00:06:55,759
story is coming out now and i've took a

177
00:06:58,870 --> 00:06:57,520
whole bunch of tools on the arm and the

178
00:07:00,710 --> 00:06:58,880
arm is now

179
00:07:02,710 --> 00:07:00,720
under claudes skillful guidance

180
00:07:04,629 --> 00:07:02,720
carrying me over to

181
00:07:06,390 --> 00:07:04,639
where i'll get the manipulator foot

182
00:07:08,950 --> 00:07:06,400
restraint which will then remain

183
00:07:11,029 --> 00:07:08,960
attached to the arm

184
00:07:12,950 --> 00:07:11,039
we should tell you some of these eva

185
00:07:15,350 --> 00:07:12,960
shots are actually speeded up two or

186
00:07:16,950 --> 00:07:15,360
even four times because things move

187
00:07:18,629 --> 00:07:16,960
pretty slowly

188
00:07:20,950 --> 00:07:18,639

this gives you the basic idea of how we

189

00:07:23,990 --> 00:07:20,960

work one person on the arm one person

190

00:07:26,710 --> 00:07:24,000

moving helping free floating

191

00:07:28,790 --> 00:07:26,720

the first task the the gyros

192

00:07:31,510 --> 00:07:28,800

inside the the bay here i'm opening the

193

00:07:33,589 --> 00:07:31,520

doors and story's coming up and

194

00:07:35,909 --> 00:07:33,599

we're ready to go and jeff positions me

195

00:07:38,710 --> 00:07:35,919

very carefully inside and puts my feet

196

00:07:40,309 --> 00:07:38,720

inside the portable foot restraints and

197

00:07:42,070 --> 00:07:40,319

here we're as we talked about earlier

198

00:07:44,390 --> 00:07:42,080

changing out

199

00:07:46,070 --> 00:07:44,400

four out of the range gyros

200

00:07:47,430 --> 00:07:46,080

here we're working on the doors as you

201
00:07:49,990 --> 00:07:47,440
recall during the flight we had a

202
00:07:51,830 --> 00:07:50,000
difficult time closing the doors so with

203
00:07:53,510 --> 00:07:51,840
jeff on the central handle myself on a

204
00:07:55,270 --> 00:07:53,520
come along we were able to position the

205
00:07:57,589 --> 00:07:55,280
doors and then work the striker plates

206
00:08:04,550 --> 00:07:57,599
and get them closed

207
00:08:08,550 --> 00:08:06,950
and now here's myself getting this a leg

208
00:08:10,150 --> 00:08:08,560
up on the solar rate change out for the

209
00:08:12,469 --> 00:08:10,160
next day i'm just

210
00:08:14,390 --> 00:08:12,479
undoing various bolts there so when tom

211
00:08:20,309 --> 00:08:14,400
and kt come along they won't have quite

212
00:08:24,550 --> 00:08:22,469
while story was doing this i was working

213
00:08:26,550 --> 00:08:24,560

on the fuses it was pretty spectacular

214

00:08:28,710 --> 00:08:26,560

working you can see right underneath the

215

00:08:29,990 --> 00:08:28,720

the solar array there

216

00:08:31,830 --> 00:08:30,000

that

217

00:08:33,509 --> 00:08:31,840

this is a view from the elbow camera

218

00:08:34,389 --> 00:08:33,519

looking down from the top of the solar

219

00:08:41,670 --> 00:08:34,399

array

220

00:08:46,389 --> 00:08:44,149

the solar rays were slewed to the xy

221

00:08:48,470 --> 00:08:46,399

plane to prepare for retraction after

222

00:08:49,910 --> 00:08:48,480

the end of that eva

223

00:08:52,070 --> 00:08:49,920

you can see the one on the left is the

224

00:08:53,509 --> 00:08:52,080

one that we expected to behave well and

225

00:08:55,509 --> 00:08:53,519

it did

226

00:08:56,710 --> 00:08:55,519

this uh footage is also sped up a little

227

00:08:58,630 --> 00:08:56,720

bit it took several minutes for this

228

00:09:00,150 --> 00:08:58,640

slew to occur

229

00:09:01,829 --> 00:09:00,160

i spent most of this time when it was

230

00:09:03,190 --> 00:09:01,839

happening down in the mid deck in the

231

00:09:05,030 --> 00:09:03,200

airline cleaning up suits and getting

232

00:09:06,550 --> 00:09:05,040

ready for the next day but i did pop my

233

00:09:08,070 --> 00:09:06,560

head up every now and then to watch the

234

00:09:09,910 --> 00:09:08,080

retraction so we'd know what was going

235

00:09:12,630 --> 00:09:09,920

to happen for tomorrow

236

00:09:15,030 --> 00:09:12,640

this is the good solar array the plus v2

237

00:09:16,470 --> 00:09:15,040

array which retracted normally the

238

00:09:17,910 --> 00:09:16,480

bystims are being pulled up in the

239

00:09:19,750 --> 00:09:17,920

cassette and the blankets rolling

240

00:09:21,590 --> 00:09:19,760

smoothly on the drum

241

00:09:22,790 --> 00:09:21,600

and this is where we wanted them both to

242

00:09:24,870 --> 00:09:22,800

work

243

00:09:26,550 --> 00:09:24,880

the other one we could tell by a kink

244

00:09:27,990 --> 00:09:26,560

and the bystander it was unlikely that

245

00:09:29,350 --> 00:09:28,000

that was going to be pulled up in the

246

00:09:31,430 --> 00:09:29,360

cassette that we would have to leave

247

00:09:33,430 --> 00:09:31,440

this thing partially deployed

248

00:09:35,590 --> 00:09:33,440

the retraction is ground commanded

249

00:09:36,470 --> 00:09:35,600

however we do have a stop command on

250

00:09:38,310 --> 00:09:36,480

board

251
00:09:40,470 --> 00:09:38,320
and we did exercise it when this one was

252
00:09:41,910 --> 00:09:40,480
retracting when the blanket began to get

253
00:09:43,430 --> 00:09:41,920
a little bit slack

254
00:09:46,070 --> 00:09:43,440
it seemed like the prudent thing to do

255
00:09:48,710 --> 00:09:46,080
was to stop the retraction at that point

256
00:09:49,990 --> 00:09:48,720
and let us take care of it by hand when

257
00:09:51,829 --> 00:09:50,000
we got out there the next day this is

258
00:09:53,430 --> 00:09:51,839
the kinked by stem

259
00:09:54,710 --> 00:09:53,440
the bystander is two pieces of metal

260
00:09:56,070 --> 00:09:54,720
that are flat when they're in the

261
00:09:57,750 --> 00:09:56,080
cassette and when they're released from

262
00:09:58,949 --> 00:09:57,760
the cassette roll up into tubes one

263
00:10:00,550 --> 00:09:58,959

around the other

264

00:10:02,310 --> 00:10:00,560

and it appeared that one of those tubes

265

00:10:05,110 --> 00:10:02,320

was eight or ten inches longer than the

266

00:10:06,870 --> 00:10:05,120

other so it made some loops in the

267

00:10:09,509 --> 00:10:06,880

bystand

268

00:10:11,269 --> 00:10:09,519

story and jeff were ivs they put

269

00:10:12,949 --> 00:10:11,279

me and tom in the suits as we had done

270

00:10:14,310 --> 00:10:12,959

for them the day before and sent us out

271

00:10:15,990 --> 00:10:14,320

to do our work

272

00:10:17,750 --> 00:10:16,000

as i said earlier this

273

00:10:19,350 --> 00:10:17,760

jettison had to be done and

274

00:10:20,710 --> 00:10:19,360

the disconnecting of the electrical

275

00:10:22,150 --> 00:10:20,720

connections had to be done at night

276

00:10:23,910 --> 00:10:22,160

because with the solar rays still

277

00:10:26,150 --> 00:10:23,920

deployed it is still producing

278

00:10:27,910 --> 00:10:26,160

electricity when the sun is on it

279

00:10:29,829 --> 00:10:27,920

so tom had to cut some lock wire and

280

00:10:31,670 --> 00:10:29,839

take some connectors off and

281

00:10:33,509 --> 00:10:31,680

open the clamp while i was holding it

282

00:10:35,750 --> 00:10:33,519

because the solar ray tended to flap and

283

00:10:37,350 --> 00:10:35,760

move around a lot anytime anybody was

284

00:10:39,269 --> 00:10:37,360

touching it

285

00:10:40,949 --> 00:10:39,279

i held it up there and let it go it with

286

00:10:43,590 --> 00:10:40,959

no rates on it at all it was very very

287

00:10:44,550 --> 00:10:43,600

stable quad pulled me back away from it

288

00:10:46,630 --> 00:10:44,560

and then

289

00:10:48,310 --> 00:10:46,640

socks did the separation maneuver that

290

00:10:51,030 --> 00:10:48,320

that pushed us away from it and you can

291

00:10:52,790 --> 00:10:51,040

see some of the jets fire the solar ray

292

00:10:55,350 --> 00:10:52,800

begins flapping and it looked like a

293

00:10:57,030 --> 00:10:55,360

giant bird a giant soaring bird over the

294

00:10:58,870 --> 00:10:57,040

desert it was just the most incredible

295

00:11:04,230 --> 00:10:58,880

sight i was mesmerized for a period of

296

00:11:07,990 --> 00:11:05,430

there's not much more you can say about

297

00:11:09,910 --> 00:11:08,000

it it's just fabulous

298

00:11:16,150 --> 00:11:09,920

you see the red sea and the gulf of aden

299

00:11:21,110 --> 00:11:17,990

on the solar array that retracted

300

00:11:22,790 --> 00:11:21,120

properly they were not unable to stow it

301
00:11:23,910 --> 00:11:22,800
by ground command because it wasn't

302
00:11:25,269 --> 00:11:23,920
slewed in the right direction the

303
00:11:26,710 --> 00:11:25,279
latches were not going to mate when it

304
00:11:29,269 --> 00:11:26,720
came up to the top so we did that

305
00:11:31,190 --> 00:11:29,279
manually as well tom was driving up with

306
00:11:32,710 --> 00:11:31,200
a wrench although it was actually

307
00:11:34,310 --> 00:11:32,720
posting on its own pretty much and i

308
00:11:35,829 --> 00:11:34,320
went up to the top to be sure that i had

309
00:11:37,509 --> 00:11:35,839
my hand on it when it got close to the

310
00:11:39,430 --> 00:11:37,519
telescope so we didn't

311
00:11:43,590 --> 00:11:39,440
do any damage

312
00:11:47,670 --> 00:11:45,670
we removed that one put it on the solar

313
00:11:49,829 --> 00:11:47,680

ray carrier it's been brought back to

314

00:11:51,829 --> 00:11:49,839

earth for people to study and see what

315

00:11:53,750 --> 00:11:51,839

life is like in orbit for three years of

316

00:11:55,350 --> 00:11:53,760

orbit for solar arrays

317

00:11:56,389 --> 00:11:55,360

and what we can do to future solar rays

318

00:11:57,829 --> 00:11:56,399

to make them better

319

00:11:59,590 --> 00:11:57,839

this was our first mass handling

320

00:12:01,590 --> 00:11:59,600

exercise it weighs between three and

321

00:12:03,350 --> 00:12:01,600

four hundred pounds and it moves as if

322

00:12:05,350 --> 00:12:03,360

it's nothing

323

00:12:07,590 --> 00:12:05,360

just put your hand on it and pretty much

324

00:12:09,509 --> 00:12:07,600

the just the natural forces in the suit

325

00:12:11,190 --> 00:12:09,519

cause your hands to wanna be in a

326

00:12:13,750 --> 00:12:11,200

semi-closed position and that's all it

327

00:12:15,590 --> 00:12:13,760

takes to hang on to it

328

00:12:17,269 --> 00:12:15,600

i held it in place while tom closed the

329

00:12:19,110 --> 00:12:17,279

clamp

330

00:12:21,030 --> 00:12:19,120

to mechanically connect it to the

331

00:12:23,110 --> 00:12:21,040

telescope and then i came down to help

332

00:12:25,590 --> 00:12:23,120

with the electrical connections the

333

00:12:27,509 --> 00:12:25,600

connectors are driven in place by one

334

00:12:29,110 --> 00:12:27,519

drive screw and we were very very

335

00:12:31,269 --> 00:12:29,120

concerned about stripping that screw

336

00:12:32,790 --> 00:12:31,279

because it had happened other in ground

337

00:12:36,150 --> 00:12:32,800

testing at times

338

00:12:37,590 --> 00:12:36,160

so we opted to drive that by hand

339

00:12:38,790 --> 00:12:37,600

very very gently so that we would feel

340

00:12:40,310 --> 00:12:38,800

if there were any kind of torques that

341

00:12:42,710 --> 00:12:40,320

we weren't expecting we could back off

342

00:12:45,269 --> 00:12:42,720

and try it again

343

00:12:48,310 --> 00:12:45,279

after each eva we had to go through it

344

00:12:50,389 --> 00:12:48,320

was really about a three hour process to

345

00:12:51,990 --> 00:12:50,399

clean up the old suits pack them up for

346

00:12:53,670 --> 00:12:52,000

the night get the new suits out before

347

00:12:56,629 --> 00:12:53,680

we're ready to go here we are on the

348

00:12:58,629 --> 00:12:56,639

third eva we talked about uh the use of

349

00:13:00,550 --> 00:12:58,639

these searchlights from inside this is a

350

00:13:02,710 --> 00:13:00,560

good example of what it was like working

351

00:13:04,710 --> 00:13:02,720

at night and the people inside would

352

00:13:06,710 --> 00:13:04,720

shine the light to augment our helmet

353

00:13:08,790 --> 00:13:06,720

lights here i am putting

354

00:13:11,110 --> 00:13:08,800

the guide studs these little two ended

355

00:13:13,350 --> 00:13:11,120

bolts into the wide field planetary

356

00:13:16,150 --> 00:13:13,360

camera this is so that uh

357

00:13:18,550 --> 00:13:16,160

this handhold that i'm picking up now

358

00:13:20,949 --> 00:13:18,560

we can then attach it and we have a

359

00:13:22,389 --> 00:13:20,959

little set of nuts which we then put on

360

00:13:24,629 --> 00:13:22,399

top of those

361

00:13:26,870 --> 00:13:24,639

guide bolts or guide studs as we call

362

00:13:28,949 --> 00:13:26,880

them so we take the hand hold up we

363

00:13:31,910 --> 00:13:28,959

install it

364

00:13:33,350 --> 00:13:31,920

onto the wiff pick you can see story

365

00:13:34,710 --> 00:13:33,360

free floating over at the right he's

366

00:13:37,110 --> 00:13:34,720

going to get into the foot restraint

367

00:13:39,670 --> 00:13:37,120

right below him

368

00:13:41,430 --> 00:13:39,680

i'm undoing the bolts here that hold the

369

00:13:44,310 --> 00:13:41,440

whiff pick in

370

00:13:45,509 --> 00:13:44,320

and then the two of us working together

371

00:13:48,870 --> 00:13:45,519

actually

372

00:13:52,790 --> 00:13:48,880

pull the wiff pick one out from the

373

00:13:56,550 --> 00:13:54,949

and it slides out on some tracks and it

374

00:13:59,509 --> 00:13:56,560

just came out

375

00:14:09,350 --> 00:14:00,790

claude

376

00:14:12,150 --> 00:14:09,360

know it was hardly necessary to say what

377

00:14:13,750 --> 00:14:12,160

you wanted to do he almost anticipated

378

00:14:15,590 --> 00:14:13,760

where we needed to be

379

00:14:17,670 --> 00:14:15,600

both claud and sox did an incredible

380

00:14:20,230 --> 00:14:17,680

job driving the arm

381

00:14:21,350 --> 00:14:20,240

we stowed the whiff pick one on the side

382

00:14:23,430 --> 00:14:21,360

of the

383

00:14:24,470 --> 00:14:23,440

shuttle in a temporary stowage bracket

384

00:14:25,430 --> 00:14:24,480

there

385

00:14:28,150 --> 00:14:25,440

and then

386

00:14:30,550 --> 00:14:28,160

extracted the wiff pick number two and

387

00:14:34,310 --> 00:14:30,560

remember this is about four times real

388

00:14:35,750 --> 00:14:34,320

speed we were doing this very slowly

389

00:14:37,509 --> 00:14:35,760

so slowly that you probably wouldn't

390

00:14:39,110 --> 00:14:37,519

want to watch the whole thing

391

00:14:41,590 --> 00:14:39,120

in real time

392

00:14:43,350 --> 00:14:41,600

but it came out with without a hitch

393

00:14:45,350 --> 00:14:43,360

and then the

394

00:14:47,750 --> 00:14:45,360

delicate process of inserting it in

395

00:14:50,550 --> 00:14:47,760

again with me on one side and story on

396

00:14:52,550 --> 00:14:50,560

the other side went very well just just

397

00:14:55,670 --> 00:14:52,560

beautifully this was a

398

00:14:59,829 --> 00:14:55,680

very finely designed instrument

399

00:15:01,269 --> 00:14:59,839

for eva repair and handling it's a good

400

00:15:09,269 --> 00:15:01,279

example of what you can do when you

401
00:15:12,629 --> 00:15:11,110
the story was around back in the apollo

402
00:15:15,110 --> 00:15:12,639
days and he had commented that nobody

403
00:15:17,829 --> 00:15:15,120
had ever taken a hasselblad into space

404
00:15:19,910 --> 00:15:17,839
since apollo and so he arranged to

405
00:15:22,230 --> 00:15:19,920
have this reactivated and there i am

406
00:15:23,350 --> 00:15:22,240
using it and it we got some fabulous

407
00:15:24,389 --> 00:15:23,360
pictures

408
00:15:25,670 --> 00:15:24,399
with that

409
00:15:27,910 --> 00:15:25,680
here we are putting on the the

410
00:15:29,509 --> 00:15:27,920
magnetometer it's it's a unit which we

411
00:15:31,990 --> 00:15:29,519
basically put on top of the old

412
00:15:34,389 --> 00:15:32,000
magnetometers so we never remove the old

413
00:15:35,509 --> 00:15:34,399

ones and then we we screw it in into

414

00:15:38,150 --> 00:15:35,519

place

415

00:15:41,829 --> 00:15:38,160

um and we're 50 feet above

416

00:15:44,069 --> 00:15:41,839

the payload bay and uh so not only was

417

00:15:45,590 --> 00:15:44,079

it uh quite a view looking towards the

418

00:15:48,710 --> 00:15:45,600

earth but looking down towards the

419

00:15:52,710 --> 00:15:48,720

shuttle was pretty spectacular

420

00:15:53,509 --> 00:15:52,720

eva day four uh as we mentioned the swap

421

00:15:55,110 --> 00:15:53,519

out

422

00:15:57,670 --> 00:15:55,120

the new costar

423

00:15:59,350 --> 00:15:57,680

instrument for the hsp

424

00:16:01,110 --> 00:15:59,360

opening the doors they're getting into

425

00:16:04,710 --> 00:16:01,120

the bay and then it got dark fairly

426
00:16:06,069 --> 00:16:04,720
quickly so we did the hsp removal

427
00:16:07,990 --> 00:16:06,079
in the dark

428
00:16:12,710 --> 00:16:08,000
and you can see the searchlight

429
00:16:16,470 --> 00:16:14,470
kt then took the

430
00:16:18,550 --> 00:16:16,480
hsp

431
00:16:23,829 --> 00:16:18,560
down and stowed it on a temporary

432
00:16:29,350 --> 00:16:27,030
then came and pulled out the new co-star

433
00:16:32,069 --> 00:16:29,360
unit from its

434
00:16:34,310 --> 00:16:32,079
stowage container

435
00:16:36,710 --> 00:16:34,320
brought it up and then

436
00:16:38,550 --> 00:16:36,720
held it here and then pointed the corner

437
00:16:41,670 --> 00:16:38,560
down toward me as i came around to

438
00:16:42,710 --> 00:16:41,680

remove the dob or deployable optical

439

00:16:44,790 --> 00:16:42,720

bench

440

00:16:46,949 --> 00:16:44,800

protective cover

441

00:16:48,150 --> 00:16:46,959

all those little mirrors and coast are

442

00:16:50,629 --> 00:16:48,160

right in that corner and they're

443

00:16:52,870 --> 00:16:50,639

retracted down inside there and then

444

00:16:54,629 --> 00:16:52,880

those were deployed several inches up

445

00:16:56,069 --> 00:16:54,639

out of the co-star

446

00:16:58,790 --> 00:16:56,079

several days

447

00:17:00,150 --> 00:16:58,800

after we had come home

448

00:17:02,150 --> 00:17:00,160

getting ready to

449

00:17:04,470 --> 00:17:02,160

put co-star in again we spent quite a

450

00:17:06,630 --> 00:17:04,480

bit of time making sure it's perfectly

451
00:17:07,990 --> 00:17:06,640
lined up and again with only about an

452
00:17:10,789 --> 00:17:08,000
inch of clearance

453
00:17:12,870 --> 00:17:10,799
kt did a super job of just giving me

454
00:17:13,590 --> 00:17:12,880
millimeters of control when i asked for

455
00:17:17,110 --> 00:17:13,600
it

456
00:17:18,870 --> 00:17:17,120
and she might want to say something

457
00:17:20,870 --> 00:17:18,880
about how it felt

458
00:17:22,309 --> 00:17:20,880
uh it was very easy to move but it was

459
00:17:24,949 --> 00:17:22,319
uh all i could see in front of my face

460
00:17:26,710 --> 00:17:24,959
was a box so tom was my eyes to put it

461
00:17:29,669 --> 00:17:26,720
in that little hole

462
00:17:31,350 --> 00:17:29,679
this is uh getting the new co-processor

463
00:17:33,110 --> 00:17:31,360

out and then we did a swap out on the

464

00:17:36,230 --> 00:17:33,120

end of the arm and i got on the end of

465

00:17:39,669 --> 00:17:36,240

the arm and kt uh behind me there to

466

00:17:41,590 --> 00:17:39,679

manage tools and the co-processor

467

00:17:43,029 --> 00:17:41,600

went up using the power tool as you

468

00:17:45,590 --> 00:17:43,039

noticed here

469

00:17:47,510 --> 00:17:45,600

all the bolts that we had to do except

470

00:17:49,430 --> 00:17:47,520

those

471

00:17:51,350 --> 00:17:49,440

solar array connector bolts we used a

472

00:17:52,390 --> 00:17:51,360

power tool on and our tools really held

473

00:17:54,789 --> 00:17:52,400

up well

474

00:17:56,549 --> 00:17:54,799

and served us well during the mission

475

00:17:58,310 --> 00:17:56,559

coming back in this is a good shot of

476

00:18:00,789 --> 00:17:58,320

coming back in the air lock again this

477

00:18:03,029 --> 00:18:00,799

is four or five times actual speed i

478

00:18:04,470 --> 00:18:03,039

think you have to be really careful

479

00:18:05,990 --> 00:18:04,480

coming into the airline it's got a

480

00:18:07,830 --> 00:18:06,000

fragile

481

00:18:09,669 --> 00:18:07,840

covering on it

482

00:18:13,350 --> 00:18:09,679

going out at the end of every day we had

483

00:18:15,110 --> 00:18:13,360

to untether the mfr or manipulator foot

484

00:18:16,710 --> 00:18:15,120

restraint so if we had to get rid of it

485

00:18:19,350 --> 00:18:16,720

overnight it would come loose from the

486

00:18:23,110 --> 00:18:21,590

see all the tools hanging off of each of

487

00:18:26,390 --> 00:18:23,120

us as we come in you had to be very

488

00:18:29,750 --> 00:18:28,310

and then again at the the end of each

489

00:18:33,270 --> 00:18:29,760

eva

490

00:18:35,830 --> 00:18:33,280

getting out of suits reconfiguring tools

491

00:18:42,470 --> 00:18:35,840

and suits changing out batteries for the

492

00:18:47,350 --> 00:18:44,789

it shows uh covey clawden socks

493

00:18:50,390 --> 00:18:47,360

configuring mli for the covers that we

494

00:18:54,830 --> 00:18:50,400

were going to put on the magnetometers

495

00:18:58,710 --> 00:18:54,840

on the last eva ev8 day number

496

00:19:01,750 --> 00:18:58,720

five and here's eva day number five

497

00:19:03,430 --> 00:19:01,760

i was on the mfr day five and the other

498

00:19:05,669 --> 00:19:03,440

two days that jeff and i were out uh

499

00:19:08,230 --> 00:19:05,679

jeff was on the mfr so we took turns at

500

00:19:10,070 --> 00:19:08,240

that here's jeff is getting the

501
00:19:12,710 --> 00:19:10,080
ghrs that the goddard high rate

502
00:19:14,950 --> 00:19:12,720
spectrometer our repair kit

503
00:19:16,950 --> 00:19:14,960
out here's myself and jeff working on

504
00:19:18,470 --> 00:19:16,960
mercedes the solar ray drive electronics

505
00:19:19,909 --> 00:19:18,480
changing that out

506
00:19:22,549 --> 00:19:19,919
there's not much to look at here it's

507
00:19:23,590 --> 00:19:22,559
just very intensive workout doing mostly

508
00:19:25,430 --> 00:19:23,600
electric

509
00:19:27,830 --> 00:19:25,440
connectors

510
00:19:30,150 --> 00:19:27,840
for about three hours this is one of the

511
00:19:32,710 --> 00:19:30,160
more spectacular views up on top here

512
00:19:34,390 --> 00:19:32,720
looking straight down to earth 370 miles

513
00:19:36,470 --> 00:19:34,400

we're getting ready to do uh put the

514

00:19:41,029 --> 00:19:36,480

covers those mli covers that we had

515

00:19:43,110 --> 00:19:41,039

constructed on top of the magnetometers

516

00:19:45,669 --> 00:19:43,120

here's deployment of the main solar ray

517

00:19:47,750 --> 00:19:45,679

boom it just took a couple ounces to get

518

00:19:50,070 --> 00:19:47,760

it started down but the motors were

519

00:19:52,549 --> 00:19:50,080

unable to deploy that so jeff and i just

520

00:19:54,630 --> 00:19:52,559

with a couple ounces on a wrench we're

521

00:19:56,070 --> 00:19:54,640

able to deploy the

522

00:19:57,990 --> 00:19:56,080

what's called the primary drive

523

00:20:03,590 --> 00:19:58,000

mechanism but it's really just the solar

524

00:20:07,750 --> 00:20:06,070

here's deployment of the the new solar

525

00:20:09,669 --> 00:20:07,760

rays the blankets

526

00:20:13,350 --> 00:20:09,679

which will go out there and convert

527

00:20:15,430 --> 00:20:13,360

solar energy into electrical energy

528

00:20:18,630 --> 00:20:15,440

but this is the the final completion

529

00:20:20,470 --> 00:20:18,640

really of the eva here they're able to

530

00:20:23,350 --> 00:20:20,480

deploy these while we were still out and

531

00:20:24,789 --> 00:20:23,360

also to be able to deploy the high gain

532

00:20:26,310 --> 00:20:24,799

antennas and all these things it was

533

00:20:28,470 --> 00:20:26,320

great to get these things done because

534

00:20:30,149 --> 00:20:28,480

they did have eva backups in case any of

535

00:20:35,669 --> 00:20:30,159

these mechanisms

536

00:20:41,350 --> 00:20:38,149

here we are coming inside after the

537

00:20:43,270 --> 00:20:41,360

final eva eba day number five and uh

538

00:20:45,590 --> 00:20:43,280

we never really did let our hair down

539

00:20:47,990 --> 00:20:45,600

until uh this final

540

00:20:49,830 --> 00:20:48,000

this final day here we breathed a slight

541

00:20:52,470 --> 00:20:49,840

sigh of relief on each day when we

542

00:20:53,990 --> 00:20:52,480

because we got each day's job done

543

00:20:56,230 --> 00:20:54,000

but i'll tell you we've been working at

544

00:20:58,070 --> 00:20:56,240

this for years incredible attention to

545

00:20:59,510 --> 00:20:58,080

detail and we did have a moment of

546

00:21:01,510 --> 00:20:59,520

jubilation

547

00:21:03,669 --> 00:21:01,520

here although of course we had many

548

00:21:04,789 --> 00:21:03,679

weeks to wait to see that hubble really

549

00:21:08,390 --> 00:21:04,799

did work

550

00:21:09,909 --> 00:21:08,400

this is flight day nine the release day

551
00:21:12,710 --> 00:21:09,919
you saw the telescope in the back of the

552
00:21:14,950 --> 00:21:12,720
bay ready for release first we had to

553
00:21:17,430 --> 00:21:14,960
capture the telescope using the arm you

554
00:21:19,190 --> 00:21:17,440
see here the final approach

555
00:21:21,270 --> 00:21:19,200
to the grapple friction of the telescope

556
00:21:23,510 --> 00:21:21,280
then we release the latches

557
00:21:25,510 --> 00:21:23,520
on the flat surface structure lifted

558
00:21:26,950 --> 00:21:25,520
hubble over the flight surface structure

559
00:21:29,990 --> 00:21:26,960
over the cargo bay

560
00:21:31,909 --> 00:21:30,000
and here you can see the release of the

561
00:21:34,310 --> 00:21:31,919
telescope

562
00:21:36,070 --> 00:21:34,320
the arm is being pulled away

563
00:21:39,110 --> 00:21:36,080

and the socks is at the controls of the

564

00:21:41,669 --> 00:21:39,120

orbiter for the separation maneuver

565

00:21:43,990 --> 00:21:41,679

yeah after claude released the telescope

566

00:21:45,350 --> 00:21:44,000

i fired a few pulses to get us backing

567

00:21:46,950 --> 00:21:45,360

away

568

00:21:48,070 --> 00:21:46,960

and the telescope slowly started

569

00:21:49,590 --> 00:21:48,080

drifting

570

00:21:50,950 --> 00:21:49,600

once it was at a safe distance we put

571

00:21:52,390 --> 00:21:50,960

some cameras up in the window and i hope

572

00:21:53,990 --> 00:21:52,400

we got some good photos especially with

573

00:21:55,350 --> 00:21:54,000

the imax camera

574

00:21:57,350 --> 00:21:55,360

and that's what i look like a pretty

575

00:21:59,190 --> 00:21:57,360

majestic sight with that big telescope

576
00:22:04,549 --> 00:21:59,200
and its brand new solar arrays drifting

577
00:22:08,390 --> 00:22:06,390
we got lots of film and

578
00:22:10,470 --> 00:22:08,400
we can't wait to to see it i think we're

579
00:22:12,950 --> 00:22:10,480
making an advanced screening here on

580
00:22:17,830 --> 00:22:12,960
thursday or friday of some of our imax

581
00:22:23,110 --> 00:22:21,270
after uh deploy uh we did this as sax

582
00:22:25,190 --> 00:22:23,120
talked about earlier had a day off i

583
00:22:26,710 --> 00:22:25,200
showed some of the activities on our

584
00:22:29,510 --> 00:22:26,720
light day and actually on every day

585
00:22:31,270 --> 00:22:29,520
reading the mail that we'd get up on our

586
00:22:34,070 --> 00:22:31,280
to our computers uh

587
00:22:36,470 --> 00:22:34,080
here's uh socks uh doing some trash

588
00:22:38,470 --> 00:22:36,480

compaction and management and kt's

589

00:22:41,430 --> 00:22:38,480

taking care of the laundry

590

00:22:45,270 --> 00:22:41,440

and um

591

00:22:47,270 --> 00:22:45,280

we also uh on the day before entry uh

592

00:22:51,110 --> 00:22:47,280

uh practiced uh

593

00:22:52,950 --> 00:22:51,120

uh landing with our new pilot simulator

594

00:22:55,510 --> 00:22:52,960

it's a little on board

595

00:22:57,830 --> 00:22:55,520

computer simulation of the landing tasks

596

00:23:00,549 --> 00:22:57,840

and it true proved extremely useful to

597

00:23:02,470 --> 00:23:00,559

us for getting ready for landing

598

00:23:04,070 --> 00:23:02,480

we had

599

00:23:06,070 --> 00:23:04,080

great passes over

600

00:23:08,149 --> 00:23:06,080

north america and europe and this is a

601
00:23:10,230 --> 00:23:08,159
passover

602
00:23:12,230 --> 00:23:10,240
the mediterranean sea or south of melton

603
00:23:13,830 --> 00:23:12,240
and sea you can see sicily and the

604
00:23:15,110 --> 00:23:13,840
southern tip of italy

605
00:23:17,029 --> 00:23:15,120
we just

606
00:23:18,789 --> 00:23:17,039
could see a row on the disappearance on

607
00:23:20,070 --> 00:23:18,799
the left hand side and brindisy on the

608
00:23:23,350 --> 00:23:20,080
right hand side

609
00:23:25,270 --> 00:23:23,360
a little later we had passes over the

610
00:23:26,390 --> 00:23:25,280
delta of the Nile and you can see Cairo

611
00:23:28,950 --> 00:23:26,400
in the middle

612
00:23:31,029 --> 00:23:28,960
and a little further north the lights of

613
00:23:33,190 --> 00:23:31,039

tel aviv and the

614

00:23:36,710 --> 00:23:33,200

west coast

615

00:23:39,350 --> 00:23:36,720

we complete our trip around the world

616

00:23:42,230 --> 00:23:39,360

you can see san francisco bay up in the

617

00:23:45,029 --> 00:23:42,240

center los angeles down at the bottom

618

00:23:46,789 --> 00:23:45,039

las vegas coming into view las vegas is

619

00:23:49,590 --> 00:23:46,799

outrageously bright

620

00:23:51,350 --> 00:23:49,600

you could see the strip from 350 miles

621

00:23:53,350 --> 00:23:51,360

this is houston take a look in the upper

622

00:23:54,870 --> 00:23:53,360

left corner and you'll see a very bright

623

00:23:56,710 --> 00:23:54,880

fireball meteor come through the

624

00:23:59,110 --> 00:23:56,720

atmosphere

625

00:24:00,789 --> 00:23:59,120

there you go there it is

626

00:24:02,710 --> 00:24:00,799

and you can also see dallas and san

627

00:24:04,710 --> 00:24:02,720

antonio

628

00:24:06,310 --> 00:24:04,720

this is looking up the east coast you

629

00:24:08,070 --> 00:24:06,320

can see lightning storms you could see a

630

00:24:10,230 --> 00:24:08,080

little bit of aurora up there looking

631

00:24:14,470 --> 00:24:10,240

back towards the west now over florida

632

00:24:16,230 --> 00:24:14,480

you can see all the way back to houston

633

00:24:17,669 --> 00:24:16,240

we had a lot of long hours and intense

634

00:24:19,830 --> 00:24:17,679

days and when covey said it was time to

635

00:24:21,269 --> 00:24:19,840

go to bed it was time to go to bed and

636

00:24:23,350 --> 00:24:21,279

he covered the windows and sent the kids

637

00:24:26,230 --> 00:24:23,360

down to the mid deck with five of us

638

00:24:27,590 --> 00:24:26,240

sleeping down there it was pretty cozy

639

00:24:29,590 --> 00:24:27,600

you knew if you moved you were waking

640

00:24:31,029 --> 00:24:29,600

somebody else up

641

00:24:32,950 --> 00:24:31,039

but we managed to all find a place to

642

00:24:34,230 --> 00:24:32,960

strap our sleeping bags and set story to

643

00:24:36,070 --> 00:24:34,240

the airlock

644

00:24:39,110 --> 00:24:36,080

for that on our get ready to come home

645

00:24:40,310 --> 00:24:39,120

day this is flight control checkout

646

00:24:42,310 --> 00:24:40,320

we're making sure all the orbiter

647

00:24:43,750 --> 00:24:42,320

systems are working we brought home

648

00:24:45,029 --> 00:24:43,760

everything that we had intended to bring

649

00:24:47,190 --> 00:24:45,039

home with the exception of that one

650

00:24:48,710 --> 00:24:47,200

solar array and the solar ray carrier

651
00:24:50,310 --> 00:24:48,720
looks like a tool board in your garage

652
00:24:53,590 --> 00:24:50,320
with one tool missing so we call that

653
00:24:57,190 --> 00:24:55,909
this is hst it continued to stay with us

654
00:24:58,789 --> 00:24:57,200
through the rest of the flight and we

655
00:25:00,070 --> 00:24:58,799
called it our morning star because we

656
00:25:02,710 --> 00:25:00,080
would see it every morning when the sun

657
00:25:04,390 --> 00:25:02,720
was reflecting off of it

658
00:25:06,470 --> 00:25:04,400
all missions have to end they end with a

659
00:25:08,950 --> 00:25:06,480
deorbit and landing hopefully and this

660
00:25:10,630 --> 00:25:08,960
shows us getting ready for uh for

661
00:25:13,110 --> 00:25:10,640
deorbit and then

662
00:25:16,310 --> 00:25:13,120
the infrared pictures

663
00:25:19,110 --> 00:25:16,320

from ksc and uh cape canaveral air force

664

00:25:20,070 --> 00:25:19,120

station of our uh of our turn around to

665

00:25:22,230 --> 00:25:20,080

hack

666

00:25:23,909 --> 00:25:22,240

and and approach to uh runway three

667

00:25:25,350 --> 00:25:23,919

three at the kennedy space center like i

668

00:25:27,669 --> 00:25:25,360

said before there's nothing like

669

00:25:33,669 --> 00:25:27,679

bringing a space shuttle back to kennedy

670

00:25:38,710 --> 00:25:35,990

we had an extraordinary night to fly

671

00:25:42,070 --> 00:25:38,720

across florida with the lights and and

672

00:25:45,350 --> 00:25:42,080

to make this landing

673

00:25:47,430 --> 00:25:45,360

onto on the runway 3-3 orbiter flies

674

00:25:49,590 --> 00:25:47,440

exceptionally well for a

675

00:25:51,430 --> 00:25:49,600

a big glider

676

00:25:53,990 --> 00:25:51,440

and we felt

677

00:25:57,830 --> 00:25:54,000

very good about safely rolling out to

678

00:25:59,990 --> 00:25:57,840

stop and bringing sts-61