



1  
00:00:15,049 --> 00:00:13,640  
well thank you very much and I guess the

2  
00:00:18,500 --> 00:00:15,059  
first thing I want to say is for all the

3  
00:00:19,849 --> 00:00:18,510  
folks that that are here and for all the

4  
00:00:22,040 --> 00:00:19,859  
folks that were part of our getting

5  
00:00:23,960 --> 00:00:22,050  
ready for this flight is with our

6  
00:00:26,660 --> 00:00:23,970  
sincere thanks and appreciation

7  
00:00:28,490 --> 00:00:26,670  
I think this flight was was extremely

8  
00:00:30,410 --> 00:00:28,500  
complex as we all know especially those

9  
00:00:32,959 --> 00:00:30,420  
of us that are close to it and we were

10  
00:00:35,270 --> 00:00:32,969  
trained for anything that potentially

11  
00:00:37,400 --> 00:00:35,280  
could have happened and kind of did

12  
00:00:40,220 --> 00:00:37,410  
happen but we were ready for whatever

13  
00:00:42,400 --> 00:00:40,230

the situation was and we felt ready for

14

00:00:47,270 --> 00:00:42,410

anything that could possibly even happen

15

00:00:50,150 --> 00:00:47,280

and I noticed that mr. Abbey published

16

00:00:54,799 --> 00:00:50,160

the note that I sent to him from from

17

00:00:56,029 --> 00:00:54,809

orbit and and it's the way we feel if

18

00:00:57,470 --> 00:00:56,039

there's a chance that we could take each

19

00:01:00,470 --> 00:00:57,480

and every person that would like to go

20

00:01:03,709 --> 00:01:00,480

with us we'd be more than happy to do

21

00:01:08,330 --> 00:01:03,719

that unfortunately the system just can't

22

00:01:10,130 --> 00:01:08,340

work that way but if it could we would

23

00:01:11,750 --> 00:01:10,140

certainly accommodate all those it

24

00:01:13,190 --> 00:01:11,760

wanted to go in so the best thing we can

25

00:01:15,499 --> 00:01:13,200

do is try to come back and share

26  
00:01:18,499 --> 00:01:15,509  
everything with you all at the same time

27  
00:01:20,179 --> 00:01:18,509  
realize that what got us there or the

28  
00:01:22,310 --> 00:01:20,189  
are the hearts and the souls and the

29  
00:01:23,929 --> 00:01:22,320  
efforts that the people have made down

30  
00:01:26,960 --> 00:01:23,939  
here on the ground to get us there and

31  
00:01:28,940 --> 00:01:26,970  
we definitely do appreciate it and that

32  
00:01:30,670 --> 00:01:28,950  
we are just an extension of what you

33  
00:01:33,020 --> 00:01:30,680  
prepare us to do when we go a lot of it

34  
00:01:35,870 --> 00:01:33,030  
with that we're gonna go ahead and show

35  
00:01:38,340 --> 00:01:35,880  
some slides of course the hardest thing

36  
00:01:40,750 --> 00:01:38,350  
that the crew has to do is

37  
00:01:45,370 --> 00:01:40,760  
is to decide on what their patch is

38  
00:01:47,020 --> 00:01:45,380

gonna look like to take seven very

39

00:01:48,820 --> 00:01:47,030

different people with seven different

40

00:01:51,039 --> 00:01:48,830

personalities strengths and weaknesses

41

00:01:56,350 --> 00:01:51,049

and I'll come up and put a patch

42

00:01:57,700 --> 00:01:56,360

together it takes some work we did come

43

00:02:00,219 --> 00:01:57,710

up with one and we're very happy with it

44

00:02:03,039 --> 00:02:00,229

we actually had the help of a friend and

45

00:02:05,350 --> 00:02:03,049

a co-worker here Mike Santee and and we

46

00:02:07,919 --> 00:02:05,360

he came up with a very nice idea for us

47

00:02:10,930 --> 00:02:07,929

and we were gonna had to put it together

48

00:02:12,190 --> 00:02:10,940

just a brief introduction we had lots of

49

00:02:13,960 --> 00:02:12,200

flight data file that's me with some of

50

00:02:15,100 --> 00:02:13,970

the flight data file on board we're

51  
00:02:16,479 --> 00:02:15,110  
gonna go through the slides kind of

52  
00:02:18,160 --> 00:02:16,489  
rapidly just so everyone gets an idea

53  
00:02:23,199 --> 00:02:18,170  
but what we look like without a coat and

54  
00:02:24,460 --> 00:02:23,209  
tie on which is our preferred mode and

55  
00:02:27,550 --> 00:02:24,470  
of course you can't fly the Space

56  
00:02:30,630 --> 00:02:27,560  
Shuttle without cool glasses so here's

57  
00:02:33,130 --> 00:02:30,640  
your pilot's cool glasses ready to go

58  
00:02:34,720 --> 00:02:33,140  
and I guess I'm about as happy as I can

59  
00:02:36,729 --> 00:02:34,730  
be when I've got a camera with some nice

60  
00:02:41,350 --> 00:02:36,739  
lenses on and looking out the window so

61  
00:02:43,870 --> 00:02:41,360  
I was real happy I guess that I am

62  
00:02:45,880 --> 00:02:43,880  
looking at the glove box which was a

63  
00:02:50,920 --> 00:02:45,890

very neat experiment we had in a mitten

64

00:02:52,539 --> 00:02:50,930

the midnight this was mission specialist

65

00:02:53,949 --> 00:02:52,549

number three European Space Agency

66

00:02:58,509 --> 00:02:53,959

astronaut and I'm here at my favorite

67

00:03:00,520 --> 00:02:58,519

spot near the galley holding on my left

68

00:03:01,960 --> 00:03:00,530

hand I'm very happy to be on this flight

69

00:03:04,150 --> 00:03:01,970

I would like to take this opportunity to

70

00:03:11,340 --> 00:03:04,160

think to thank NASA for signing me to

71

00:03:23,590 --> 00:03:21,340

possibly go wrong and that was my job

72

00:03:29,349 --> 00:03:23,600

onboard I mean taking care of the

73

00:03:31,420 --> 00:03:29,359

computers TSS T V T and this was

74

00:03:36,610 --> 00:03:31,430

actually David before the deployment

75

00:03:42,050 --> 00:03:38,870

as was already mentioned there was an

76

00:03:44,720 --> 00:03:42,060

important international aspects to this

77

00:03:47,450 --> 00:03:44,730

mission there were three space agencies

78

00:03:48,680 --> 00:03:47,460

NASA and the Italian space agency which

79

00:03:51,200 --> 00:03:48,690

were cooperating on the tethered

80

00:03:53,960 --> 00:03:51,210

satellite project and you see whom

81

00:03:56,090 --> 00:03:53,970

better in the middle has a Europe the

82

00:03:59,180 --> 00:03:56,100

Italian space agency patch on his

83

00:04:00,740 --> 00:03:59,190

shoulder but of course NASA and the ISA

84

00:04:02,690 --> 00:04:00,750

were the other two agencies each eye

85

00:04:08,630 --> 00:04:02,700

contributed in the loan of two astronaut

86

00:04:11,300 --> 00:04:08,640

or circadian myself and this is a view

87

00:04:13,730 --> 00:04:11,310

of the mid-deck at the time of the

88

00:04:16,370 --> 00:04:13,740

launch you can see that in this flight

89

00:04:22,880 --> 00:04:16,380

we had the me the glovebox that was just

90

00:04:24,710 --> 00:04:22,890

in front of Franklin and he was pretty

91

00:04:27,890 --> 00:04:24,720

good I mean he didn't feel anything

92

00:04:30,080 --> 00:04:27,900

different with this big thing just on

93

00:04:35,150 --> 00:04:30,090

top of it because we are sitting on our

94

00:04:36,590 --> 00:04:35,160

on our back of course well here's a

95

00:04:38,360 --> 00:04:36,600

here's a vantage point you don't get to

96

00:04:39,980 --> 00:04:38,370

see every day and you may be wondering

97

00:04:42,060 --> 00:04:39,990

who took the picture I'll just let you

98

00:04:44,580 --> 00:04:42,070

ponder that

99

00:04:47,100 --> 00:04:44,590

the orientation is you're up on the nose

100

00:04:48,600 --> 00:04:47,110

of the shuttle looking down at us st and

101

00:04:52,230 --> 00:04:48,610

the flight deck on the pad pretty

102

00:04:54,360 --> 00:04:52,240

interesting view that was a two-person

103

00:05:07,379 --> 00:05:03,540

actually we're gonna go and show the

104

00:05:08,340 --> 00:05:07,389

movie there's a Columbia she was all

105

00:05:10,350 --> 00:05:08,350

ready to go

106

00:05:12,930 --> 00:05:10,360

launch morning just waiting for the crew

107

00:05:14,189 --> 00:05:12,940

to show up and here comes the crew and

108

00:05:16,439 --> 00:05:14,199

of course for the thing that sent us in

109

00:05:19,710 --> 00:05:16,449

a cruise mine is what is some super have

110

00:05:21,300 --> 00:05:19,720

scripted for us that day and the best we

111

00:05:22,920 --> 00:05:21,310

can hope for is an on-time lunch and

112

00:05:24,480 --> 00:05:22,930

this is my third flight and my third

113

00:05:27,180 --> 00:05:24,490

on-time launch so I'm very grateful

114

00:05:28,830 --> 00:05:27,190

I was lucky pilot on board so my eyes a

115

00:05:30,659 --> 00:05:28,840

real big stare at those main engine

116

00:05:32,580 --> 00:05:30,669

gauges about this point of course the

117

00:05:34,350 --> 00:05:32,590

left engine said 40% so we were

118

00:05:36,180 --> 00:05:34,360

convinced that we're not going anywhere

119

00:05:37,950 --> 00:05:36,190

we're pad abort today so we were getting

120

00:05:41,360 --> 00:05:37,960

ready for our pad abort and all of a

121

00:05:43,190 --> 00:05:41,370

sudden main engines sour easily

122

00:05:44,720 --> 00:05:43,200

well it's exciting enough to ride the

123

00:05:47,870 --> 00:05:44,730

rocket but it's even more exciting right

124

00:05:49,430 --> 00:05:47,880

about now because we also have the fact

125

00:05:51,200 --> 00:05:49,440

that the computers not talking to the

126

00:05:52,580 --> 00:05:51,210

the engine at least it says so but Annie

127

00:05:54,050 --> 00:05:52,590

calls the roll program tells them what

128

00:05:55,460 --> 00:05:54,060

we got and the ground comes back and

129

00:05:57,350 --> 00:05:55,470

says you got three good engines so we're

130

00:05:59,030 --> 00:05:57,360

off to space it's a heck of a ride

131

00:06:03,230 --> 00:05:59,040

especially for a rookie I mean it's just

132

00:06:06,140 --> 00:06:03,240

a tremendous amount of power it's it's

133

00:06:07,460 --> 00:06:06,150

smooth it shakes on the SRBs and once

134

00:06:09,230 --> 00:06:07,470

you come off the SRBs it's like an

135

00:06:11,270 --> 00:06:09,240

electric jet going as fast as you can

136

00:06:12,980 --> 00:06:11,280

imagine probably the most awesome sight

137

00:06:14,540 --> 00:06:12,990

during the ascent was leaving Earth's

138

00:06:18,230 --> 00:06:14,550

atmosphere behind and going into the

139

00:06:19,490 --> 00:06:18,240

darkness of space quite a ride as soon

140

00:06:21,230 --> 00:06:19,500

as we get into orbit we have to

141

00:06:23,120 --> 00:06:21,240

configure the shuttle for orbit

142

00:06:24,950 --> 00:06:23,130

operations this is a nice picture of

143

00:06:27,380 --> 00:06:24,960

opening the payload bay door as you can

144

00:06:28,940 --> 00:06:27,390

see the shadow of the starboard side of

145

00:06:30,950 --> 00:06:28,950

the shuttle on the door and the earth in

146

00:06:33,050 --> 00:06:30,960

the background it's some spectacular

147

00:06:36,410 --> 00:06:33,060

visual effects soon after you get into

148

00:06:38,960 --> 00:06:36,420

orbit we're in the post insertion period

149

00:06:40,700 --> 00:06:38,970

we're using primary thrusters and a lot

150

00:06:42,080 --> 00:06:40,710

of the ice which is formed in the main

151  
00:06:44,300 --> 00:06:42,090  
engines because we're burning hydrogen

152  
00:06:46,790 --> 00:06:44,310  
and oxygen oxygen is coming out as

153  
00:06:53,960 --> 00:06:46,800  
crystals you could see the RCS fire in

154  
00:06:58,520 --> 00:06:53,970  
there it's it's quite exciting and next

155  
00:07:01,100 --> 00:06:58,530  
is the view of the flight deck one hour

156  
00:07:05,630 --> 00:07:01,110  
into the post in center you see somebody

157  
00:07:08,060 --> 00:07:05,640  
still wearing the underwear we but we

158  
00:07:11,200 --> 00:07:08,070  
were already hungry and you can see we

159  
00:07:15,380 --> 00:07:11,210  
had a big appetite at this point

160  
00:07:17,690 --> 00:07:15,390  
everybody felt great the and this is a

161  
00:07:19,730 --> 00:07:17,700  
view of the first sunrise on the on the

162  
00:07:21,410 --> 00:07:19,740  
cargo bay on the foreground you can see

163  
00:07:26,390 --> 00:07:21,420

the Terra satellite on the background

164

00:07:29,600 --> 00:07:26,400

there was a us and pea well a lot of

165

00:07:33,500 --> 00:07:29,610

stuff to do lots of equipment to set up

166

00:07:36,140 --> 00:07:33,510

computers cameras video stuff audio lots

167

00:07:39,080 --> 00:07:36,150

of wires and all of it in preparation

168

00:07:42,950 --> 00:07:39,090

for the big moment which was deployment

169

00:07:44,870 --> 00:07:42,960

of the tether and here I'm setting up

170

00:07:46,250 --> 00:07:44,880

one of our major computers which are

171

00:07:48,980 --> 00:07:46,260

only helped us on the science but also

172

00:07:50,409 --> 00:07:48,990

to keep in touch with the ground and and

173

00:07:55,510 --> 00:07:50,419

also our family

174

00:07:59,230 --> 00:07:55,520

in our homes next there will be some

175

00:08:03,129 --> 00:07:59,240

shots about the boom deploy we are very

176

00:08:04,959 --> 00:08:03,139

much into pre TSS deploy activities the

177

00:08:07,029 --> 00:08:04,969

first thing of course is to deploy the

178

00:08:09,879 --> 00:08:07,039

boom the purpose of the boom was to

179

00:08:12,459 --> 00:08:09,889

basically take the satellite away from

180

00:08:14,020 --> 00:08:12,469

the orbiter structure this is an

181

00:08:17,110 --> 00:08:14,030

accelerated view which normally would

182

00:08:19,029 --> 00:08:17,120

take about 12 minutes the boom is an

183

00:08:21,189 --> 00:08:19,039

incredible piece of engineering you can

184

00:08:24,490 --> 00:08:21,199

see it in this in these shots you can

185

00:08:26,350 --> 00:08:24,500

see the tears actually actual tether in

186

00:08:29,589 --> 00:08:26,360

the middle and all the electrical wires

187

00:08:31,959 --> 00:08:29,599

the satellite was lodged on top of the

188

00:08:33,909 --> 00:08:31,969

boom and just underneath the satellite

189

00:08:35,949 --> 00:08:33,919

you could see what we call it a vernier

190

00:08:39,850 --> 00:08:35,959

motor which was basically an auxiliary

191

00:08:40,659 --> 00:08:39,860

motor which helped extract the wire we

192

00:08:42,399 --> 00:08:40,669

had an attitude

193

00:08:45,579 --> 00:08:42,409

this kind of attitude with flying

194

00:08:47,829 --> 00:08:45,589

basically backwards with nose pitch down

195

00:08:52,780 --> 00:08:47,839

about 40 degrees and that was due to the

196

00:08:55,360 --> 00:08:52,790

particular dynamics of the this is the

197

00:08:57,910 --> 00:08:55,370

initial flyaway of the satellite it's

198

00:08:59,439 --> 00:08:57,920

pushed by two sets of two newton

199

00:09:01,630 --> 00:08:59,449

thrusters so very small thrusters

200

00:09:05,130 --> 00:09:01,640

pushing that half metric ton satellite

201  
00:09:07,240 --> 00:09:05,140  
upwards the cold gas thrusters

202  
00:09:08,620 --> 00:09:07,250  
everything happens very slowly at the

203  
00:09:10,449 --> 00:09:08,630  
beginning this is accelerated three

204  
00:09:11,920 --> 00:09:10,459  
times but the velocity initially was

205  
00:09:13,420 --> 00:09:11,930  
about one centimeter per second

206  
00:09:16,240 --> 00:09:13,430  
everything went very well at this time

207  
00:09:18,519 --> 00:09:16,250  
of the deployment everything was

208  
00:09:20,470 --> 00:09:18,529  
controlled and you see here in later the

209  
00:09:22,990 --> 00:09:20,480  
tether is taut which is always something

210  
00:09:24,220 --> 00:09:23,000  
we desire to see because it's much more

211  
00:09:25,900 --> 00:09:24,230  
controllable in this way slight

212  
00:09:27,639 --> 00:09:25,910  
oscillations but we were predicting

213  
00:09:29,319 --> 00:09:27,649

those and that was not a problem so very

214

00:09:31,980 --> 00:09:29,329

controlled initial phase of the

215

00:09:34,960 --> 00:09:31,990

deployment of the tethered satellite

216

00:09:37,060 --> 00:09:34,970

we're going to see a few sequences here

217

00:09:39,939 --> 00:09:37,070

of the phases of deployment this is the

218

00:09:42,040 --> 00:09:39,949

early phase and as you see it looked

219

00:09:43,960 --> 00:09:42,050

pretty straight low tension and you can

220

00:09:45,819 --> 00:09:43,970

see a little bit of the Wiggles of the

221

00:09:48,639 --> 00:09:45,829

tether and the bottom but everything

222

00:09:51,420 --> 00:09:48,649

completely nominal the tether speeds up

223

00:09:55,689 --> 00:09:51,430

and it gets to a high speed of about 2.2

224

00:09:57,670 --> 00:09:55,699

m/s maximum and as it does that it

225

00:09:59,770 --> 00:09:57,680

begins to of course

226

00:10:02,320 --> 00:09:59,780

develop a little bit of a bowl and you

227

00:10:04,330 --> 00:10:02,330

can see the bow as it begins to grow as

228

00:10:05,800 --> 00:10:04,340

the teller gets longer and longer of

229

00:10:07,750 --> 00:10:05,810

course as a teller it gets longer and

230

00:10:10,660 --> 00:10:07,760

longer also begins to generate more and

231

00:10:13,540 --> 00:10:10,670

more power we were generating quite high

232

00:10:18,430 --> 00:10:13,550

voltage and of course able to collect

233

00:10:20,560 --> 00:10:18,440

lots current and all in all on the order

234

00:10:22,750 --> 00:10:20,570

of about a couple of kilowatts of power

235

00:10:24,610 --> 00:10:22,760

where you were being generated and you

236

00:10:28,060 --> 00:10:24,620

can see also the progression of the bow

237

00:10:43,390 --> 00:10:28,070

at this in this longshot picture near

238

00:10:49,180 --> 00:10:46,030

clearly the tether had gone slack either

239

00:10:52,270 --> 00:10:49,190

because of the jam or a tether break

240

00:10:54,750 --> 00:10:52,280

looking back we quickly saw that in fact

241

00:10:57,940 --> 00:10:54,760

the tether had broken this was a very

242

00:11:00,040 --> 00:10:57,950

it's a big shock it's a kind of an empty

243

00:11:01,480 --> 00:11:00,050

feeling in the pit of your stomach when

244

00:11:03,430 --> 00:11:01,490

you look and you realize that there

245

00:11:06,280 --> 00:11:03,440

there is the tether moving away from us

246

00:11:08,110 --> 00:11:06,290

at about 80 feet per second and you just

247

00:11:10,210 --> 00:11:08,120

wanted to reach out and grab it and pull

248

00:11:11,500 --> 00:11:10,220

it back of course there was nothing we

249

00:11:13,120 --> 00:11:11,510

could do there you can see the end of

250

00:11:17,890 --> 00:11:13,130

the tether coming up in the lower part

251  
00:11:20,170 --> 00:11:17,900  
of the field of view and so at this

252  
00:11:24,460 --> 00:11:20,180  
point of course we have some procedures

253  
00:11:25,780 --> 00:11:24,470  
which were trained in basically here at

254  
00:11:27,130 --> 00:11:25,790  
this point in time there's four words

255  
00:11:28,810 --> 00:11:27,140  
that were awake the four veterans the

256  
00:11:30,280 --> 00:11:28,820  
three rookies were sleeping and of

257  
00:11:32,680 --> 00:11:30,290  
course the very first concern we have is

258  
00:11:34,990 --> 00:11:32,690  
to make sure that none of this ball of

259  
00:11:37,300 --> 00:11:35,000  
tether starts coming back towards the

260  
00:11:39,520 --> 00:11:37,310  
orbiter we were concerned pre-flight and

261  
00:11:41,470 --> 00:11:39,530  
we did it pretty sure good share of

262  
00:11:42,910 --> 00:11:41,480  
training pre-flight but if we had a ball

263  
00:11:44,680 --> 00:11:42,920

of tether coming back at as we do the

264

00:11:46,630 --> 00:11:44,690

proper base and maneuvering to make sure

265

00:11:49,329 --> 00:11:46,640

we didn't have a big problem but it all

266

00:11:51,010 --> 00:11:49,339

stayed with the satellite the tether

267

00:11:52,600 --> 00:11:51,020

actually broke inside the boom so there

268

00:11:55,180 --> 00:11:52,610

was nothing required on the orbiter side

269

00:11:57,760 --> 00:11:55,190

of the house other than to monitor the

270

00:12:00,130 --> 00:11:57,770

satellite and this is all that's left or

271

00:12:03,430 --> 00:12:00,140

that was left just a stub of tether and

272

00:12:05,200 --> 00:12:03,440

in close view with a very powerful lens

273

00:12:05,879 --> 00:12:05,210

we had we could see that it was charred

274

00:12:10,769 --> 00:12:05,889

and

275

00:12:13,439 --> 00:12:10,779

later with the hardware of the cake

276

00:12:15,960 --> 00:12:13,449

there was nothing much to do except to

277

00:12:18,269 --> 00:12:15,970

retract the bull and and really get

278

00:12:20,220 --> 00:12:18,279

ready for for the remainder of the

279

00:12:22,439 --> 00:12:20,230

flight which was concentrating on

280

00:12:24,569 --> 00:12:22,449

microgravity science it was a whole

281

00:12:26,249 --> 00:12:24,579

mission to do this spectacular views

282

00:12:29,970 --> 00:12:26,259

actually were taken from the ground by

283

00:12:32,609 --> 00:12:29,980

Paul Meili from mo D he was in Australia

284

00:12:34,889 --> 00:12:32,619

and he was able to capture a glimpse of

285

00:12:38,909 --> 00:12:34,899

the tether and you even see a meteorite

286

00:12:40,379 --> 00:12:38,919

go by just for a glimpse there so we are

287

00:12:42,749 --> 00:12:40,389

very appreciative too powerful you know

288

00:12:45,239 --> 00:12:42,759

what do that after the data was over we

289

00:12:47,429 --> 00:12:45,249

still used the top camera that was

290

00:12:50,609 --> 00:12:47,439

supposed to you to be used during the

291

00:12:52,499 --> 00:12:50,619

terror activity while we had the current

292

00:12:56,039 --> 00:12:52,509

flowing the Vader to observer glowing

293

00:13:00,900 --> 00:12:56,049

and we used to point to the earth glow

294

00:13:04,650 --> 00:13:00,910

and to the lightning that we had one

295

00:13:06,449 --> 00:13:04,660

during our night pass a lot of things

296

00:13:08,989 --> 00:13:06,459

behaved strange and wait with this

297

00:13:11,549 --> 00:13:08,999

you've seen pictures probably of

298

00:13:13,609 --> 00:13:11,559

astronauts doing strange things with

299

00:13:16,019 --> 00:13:13,619

water drops they they behave very

300

00:13:20,600 --> 00:13:16,029

counter-intuitively but a little

301

00:13:25,229 --> 00:13:23,009

blow air bubbles inside the water

302

00:13:28,259 --> 00:13:25,239

bubbles but other things behave strange

303

00:13:30,119 --> 00:13:28,269

too such as flames combustion and we did

304

00:13:32,100 --> 00:13:30,129

these combustion experiments in orbit

305

00:13:34,889 --> 00:13:32,110

and here is the place where we did him

306

00:13:36,720 --> 00:13:34,899

this glovebox facility which lived in

307

00:13:39,090 --> 00:13:36,730

the mid-deck and in it we actually

308

00:13:40,949 --> 00:13:39,100

burned different kinds of materials this

309

00:13:43,499 --> 00:13:40,959

is one of them is there just a birthday

310

00:13:45,419 --> 00:13:43,509

cake candle just like what you see on

311

00:13:47,909 --> 00:13:45,429

the ground but the the flame looks a lot

312

00:13:50,669 --> 00:13:47,919

different it's more round and it's more

313

00:13:53,100 --> 00:13:50,679

determined controlled by the amount of

314

00:13:56,669 --> 00:13:53,110

oxygen in it in its proximity and when

315

00:13:59,579 --> 00:13:56,679

the flame extinguishes itself the smoke

316

00:14:01,350 --> 00:13:59,589

just stagnates there inside the cavity

317

00:14:03,449 --> 00:14:01,360

just like what you see is not dominated

318

00:14:05,489 --> 00:14:03,459

by convection or anything like that the

319

00:14:07,829 --> 00:14:05,499

flow has stopped if we actually induce a

320

00:14:10,199 --> 00:14:07,839

flow you can see what happens is very

321

00:14:11,720 --> 00:14:10,209

moving are very slow and we use this to

322

00:14:13,850 --> 00:14:11,730

test some of the new

323

00:14:14,900 --> 00:14:13,860

narration smoke detectors this is

324

00:14:17,210 --> 00:14:14,910

another one of the combustion

325

00:14:19,069 --> 00:14:17,220

experiments called thrifty you can see

326

00:14:20,810 --> 00:14:19,079

all the little numerical data is giving

327

00:14:22,879 --> 00:14:20,820

temperatures of the probes you can see

328

00:14:25,639 --> 00:14:22,889

in the flow it's a cylindrical paper

329

00:14:28,040 --> 00:14:25,649

type sample and there's a very yellow

330

00:14:29,720 --> 00:14:28,050

flow the little ball on the left side is

331

00:14:32,629 --> 00:14:29,730

showing you the flow in centimeters per

332

00:14:35,019 --> 00:14:32,639

second and this sort of look like a jet

333

00:14:38,300 --> 00:14:35,029

engine to me and here comes another

334

00:14:40,759 --> 00:14:38,310

combustion experiment to read see we are

335

00:14:44,420 --> 00:14:40,769

burning the paper samples in this case

336

00:14:47,660 --> 00:14:44,430

flash lamp is used to ignite the the

337

00:14:49,939 --> 00:14:47,670

sample and the setup was such that there

338

00:14:52,490 --> 00:14:49,949

was higher flow circulation from the

339

00:14:55,579 --> 00:14:52,500

right and in fact you see that the flame

340

00:14:57,829 --> 00:14:55,589

tend to go on to the right that is quite

341

00:15:00,590 --> 00:14:57,839

uncommon with respect to the experiment

342

00:15:03,170 --> 00:15:00,600

we do on earth while the flame is trying

343

00:15:10,250 --> 00:15:03,180

to go the other way and you see that in

344

00:15:12,079 --> 00:15:10,260

fact the flame is on the right and until

345

00:15:15,110 --> 00:15:12,089

the old all the paper is gone and then

346

00:15:17,000 --> 00:15:15,120

it start to move on the left rate cig

347

00:15:19,550 --> 00:15:17,010

which stands for radiative ignition and

348

00:15:22,699 --> 00:15:19,560

transition to spread basically and use

349

00:15:26,569 --> 00:15:22,709

the same paper samples but two different

350

00:15:28,189 --> 00:15:26,579

types of investigations one was a

351

00:15:30,170 --> 00:15:28,199

flaming investigation which will you

352

00:15:31,790 --> 00:15:30,180

just saw and the next one we'll see was

353

00:15:33,290 --> 00:15:31,800

basically a smoldering investigation

354

00:15:35,960 --> 00:15:33,300

they were carried out inside this

355

00:15:38,030 --> 00:15:35,970

enclosed compartment was what was called

356

00:15:39,920 --> 00:15:38,040

glovebox which provided a safe

357

00:15:42,980 --> 00:15:39,930

environment for combustion experiments

358

00:15:47,269 --> 00:15:42,990

even this sample paper was ignited by

359

00:15:48,949 --> 00:15:47,279

radiative basically by radiation and the

360

00:15:52,750 --> 00:15:48,959

smouldering was really very interesting

361

00:15:55,430 --> 00:15:52,760

as you can see it assumed form such a

362

00:15:57,680 --> 00:15:55,440

quite strange somebody said don't let

363

00:16:00,620 --> 00:15:57,690

the animal out of the cage there

364

00:16:02,480 --> 00:16:00,630

and and scientists are still working on

365

00:16:04,820 --> 00:16:02,490

the data we brought back back from space

366

00:16:06,320 --> 00:16:04,830

to explain all this we're doing all that

367

00:16:08,690 --> 00:16:06,330

in the mid-deck out in the payload Bay

368

00:16:10,580 --> 00:16:08,700

we had a lot of microgravity experiments

369

00:16:12,050 --> 00:16:10,590

this is a picture of us some of those

370

00:16:14,060 --> 00:16:12,060

and one thing to be careful with it's

371

00:16:15,830 --> 00:16:14,070

like if you were doing exercise so here

372

00:16:17,180 --> 00:16:15,840

I'm on the ERG ometer and it's not

373

00:16:18,680 --> 00:16:17,190

during a microgravity period obviously

374

00:16:20,360 --> 00:16:18,690

because this actually could shake the

375

00:16:23,720 --> 00:16:20,370

whole orbiter and we had to be careful

376

00:16:26,090 --> 00:16:23,730

that even simple activity like moving

377

00:16:27,530 --> 00:16:26,100

into the cabin has to be done carefully

378

00:16:29,660 --> 00:16:27,540

when you are in a microgravity

379

00:16:32,510 --> 00:16:29,670

environment we had the axillary meter

380

00:16:35,450 --> 00:16:32,520

onboard that allow us to see real-time

381

00:16:38,090 --> 00:16:35,460

our contribution to the micro G

382

00:16:40,940 --> 00:16:38,100

environment and that was very used

383

00:16:42,470 --> 00:16:40,950

useful to keep it very low of course

384

00:16:45,230 --> 00:16:42,480

there are lots of other things you can

385

00:16:48,020 --> 00:16:45,240

do while being by ascent for of course

386

00:16:50,360 --> 00:16:48,030

eating and taking care of the cabin and

387

00:16:53,870 --> 00:16:50,370

of course we had to update all our

388

00:16:55,670 --> 00:16:53,880

documents the updates came up on sort of

389

00:16:59,420 --> 00:16:55,680

fax machine that we had on board and

390

00:17:01,280 --> 00:16:59,430

with Scott and Umberto I asked first

391

00:17:04,100 --> 00:17:01,290

time flies we try to spend as much time

392

00:17:06,950 --> 00:17:04,110

as possible free time of course looking

393

00:17:09,260 --> 00:17:06,960

out of the window here we are flying

394

00:17:11,780 --> 00:17:09,270

over Chad and unfortunately the movie

395

00:17:14,120 --> 00:17:11,790

doesn't really do justice to the real

396

00:17:18,200 --> 00:17:14,130

colors that we will be able to see from

397

00:17:20,420 --> 00:17:18,210

space we are around the tip st region

398

00:17:22,340 --> 00:17:20,430

and the colors are really really bright

399

00:17:25,370 --> 00:17:22,350

and vivid and this is something really

400

00:17:28,900 --> 00:17:25,380

catches your imaginations imagination

401  
00:17:31,730 --> 00:17:28,910  
after this we'll move on to the Nile

402  
00:17:34,180 --> 00:17:31,740  
valley which is of course one of the

403  
00:17:36,980 --> 00:17:34,190  
places it's very easy to detect from

404  
00:17:40,760 --> 00:17:36,990  
from space because you can really see

405  
00:17:43,460 --> 00:17:40,770  
the difference between the green of the

406  
00:17:46,700 --> 00:17:43,470  
area around the Nile and of course the

407  
00:17:48,140 --> 00:17:46,710  
desert around it we try to take shots of

408  
00:17:51,230 --> 00:17:48,150  
the pyramids several times unfortunately

409  
00:17:54,410 --> 00:17:51,240  
always overflowed the pyramids around noon

410  
00:17:56,750 --> 00:17:54,420  
and so we couldn't use the shadow to

411  
00:18:01,040 --> 00:17:56,760  
detect them and strange enough there was

412  
00:18:06,980 --> 00:18:01,050  
always a thin cloud layer overhanging

413  
00:18:10,520 --> 00:18:08,960

this is a zoom shot of the Mount Everest

414

00:18:12,350 --> 00:18:10,530

region you can see Mount Everest right

415

00:18:15,680 --> 00:18:12,360

in the middle McAloon below it on the

416

00:18:17,780 --> 00:18:15,690

arm valley and then we zoom back and you

417

00:18:20,660 --> 00:18:17,790

see really the whole Himalayan Massif

418

00:18:22,940 --> 00:18:20,670

with the Indian subcontinent on the Left

419

00:18:26,290 --> 00:18:22,950

crashing into the Tibetan Plateau on the

420

00:18:29,060 --> 00:18:26,300

right and if you take a strong zoom lens

421

00:18:31,010 --> 00:18:29,070

you aim it at these mountains this is

422

00:18:32,990 --> 00:18:31,020

the easternmost part of the Himalayas

423

00:18:35,330 --> 00:18:33,000

that's the top of the world and we're

424

00:18:37,310 --> 00:18:35,340

over flying China now actually out over

425

00:18:40,430 --> 00:18:37,320

the Pacific Ocean and you can actually

426

00:18:42,320 --> 00:18:40,440

see the Himalayas set behind the horizon

427

00:18:44,780 --> 00:18:42,330

it's a pretty spectacular view it really

428

00:18:46,400 --> 00:18:44,790

puts you in orbit one of the very

429

00:18:48,530 --> 00:18:46,410

important things to us onboard obviously

430

00:18:51,350 --> 00:18:48,540

is our personal map from home this is

431

00:18:53,720 --> 00:18:51,360

just a picture of coloring that my

432

00:18:55,160 --> 00:18:53,730

daughter did this is what the water damp

433

00:18:56,660 --> 00:18:55,170

looks like in space the water

434

00:18:59,150 --> 00:18:56,670

immediately crystallizes through ice

435

00:19:02,410 --> 00:18:59,160

crystals and as we are crossing the

436

00:19:04,700 --> 00:19:02,420

Terminator it's really a beautiful sight

437

00:19:06,980 --> 00:19:04,710

we were doing this periodically to

438

00:19:08,480 --> 00:19:06,990

maintain the water in the tanks all

439

00:19:09,919 --> 00:19:08,490

about the orbiter within predetermined

440

00:19:12,440 --> 00:19:09,929

limit and this is Jeff and I looking out

441

00:19:15,080 --> 00:19:12,450

the window at the sunrise and during the

442

00:19:16,910 --> 00:19:15,090

night we had a lot of light during the

443

00:19:19,030 --> 00:19:16,920

nights and you see these crystals of ice

444

00:19:22,190 --> 00:19:19,040

that are following us and are twinkling

445

00:19:23,840 --> 00:19:22,200

in moonlit over the moonlit landscape

446

00:19:28,610 --> 00:19:23,850

really a beautiful view during the night

447

00:19:29,900 --> 00:19:28,620

oh it's been one heck of a journey we've

448

00:19:32,600 --> 00:19:29,910

done a lot of experiments we've seen a

449

00:19:33,770 --> 00:19:32,610

lot of great sites and now you can see

450

00:19:35,180 --> 00:19:33,780

the folks on your flight deck you're

451  
00:19:37,940 --> 00:19:35,190  
probably this glasses again ready to go

452  
00:19:41,060 --> 00:19:37,950  
and we're already on the flight deck in

453  
00:19:44,900 --> 00:19:41,070  
our suits ready to come on home and the

454  
00:19:47,419 --> 00:19:44,910  
same situation seen from the mid deck we

455  
00:19:48,620 --> 00:19:47,429  
were very busy getting ready for reentry

456  
00:19:51,500 --> 00:19:48,630  
and you see a lot of stuff floating

457  
00:19:55,580 --> 00:19:51,510  
around included our parachutes that are

458  
00:19:58,299 --> 00:19:55,590  
still still up in the air you see and we

459  
00:20:02,450 --> 00:19:58,309  
have to do these flies because of the

460  
00:20:06,649 --> 00:20:02,460  
extra day this is the last pass over the

461  
00:20:09,509 --> 00:20:06,659  
Himalaya and you see the full moon

462  
00:20:12,739 --> 00:20:09,519  
it's always very impressive to see how

463  
00:20:17,700 --> 00:20:12,749

fast the moon and the Sun rise and set

464

00:20:19,289 --> 00:20:17,710

this is a view of the moon sets with the

465

00:20:21,359 --> 00:20:19,299

telephoto net sparf and telephoto lens

466

00:20:22,979 --> 00:20:21,369

about 40 millimeters and due to the

467

00:20:24,989 --> 00:20:22,989

differential refraction the atmosphere

468

00:20:27,989 --> 00:20:24,999

you have the whole world that is

469

00:20:30,060 --> 00:20:27,999

completely crushed to the penetrates the

470

00:20:35,369 --> 00:20:30,070

lower layers of the atmosphere very

471

00:20:37,080 --> 00:20:35,379

beautiful sign and now we're re-entering

472

00:20:38,849 --> 00:20:37,090

if you look closely you can start seeing

473

00:20:40,619 --> 00:20:38,859

kind of a red glow out out the side

474

00:20:42,239 --> 00:20:40,629

window there as exciting as launch was

475

00:20:45,090 --> 00:20:42,249

the reentry was just as a fascinating

476

00:20:48,840 --> 00:20:45,100

especially as you come into the in the

477

00:20:51,119 --> 00:20:48,850

atmosphere going Mach 25 the sky turns a

478

00:20:52,889 --> 00:20:51,129

pink and then a deeper and deeper red

479

00:20:55,229 --> 00:20:52,899

and orange and then you break out and

480

00:20:58,499 --> 00:20:55,239

then you can see below going a mere Mach

481

00:20:59,820 --> 00:20:58,509

15 over Houston we went zipping by and

482

00:21:02,210 --> 00:20:59,830

Andy was nice enough to leave us in a

483

00:21:04,919 --> 00:21:02,220

right bank so I could look out my window

484

00:21:08,340 --> 00:21:04,929

those puffs of smoke or the RCS Jets

485

00:21:09,419 --> 00:21:08,350

that shut off just prior to Mach 1 as

486

00:21:12,389 --> 00:21:09,429

we're coming into the Kennedy Space

487

00:21:14,220 --> 00:21:12,399

Center we did have a wave off day but

488

00:21:15,749 --> 00:21:14,230

finally it was a pretty day there's east

489

00:21:17,700 --> 00:21:15,759

coast of Florida going by Scott's right

490

00:21:20,369 --> 00:21:17,710

window there and we're in a right-hand

491

00:21:22,529 --> 00:21:20,379

turn here to land on KSC runway 33

492

00:21:23,789 --> 00:21:22,539

heading towards the North atmospheric

493

00:21:25,859 --> 00:21:23,799

conditions were great that day for the

494

00:21:27,389 --> 00:21:25,869

folks on the ground to see us as well as

495

00:21:29,460 --> 00:21:27,399

when they heard us when they when we did

496

00:21:30,840 --> 00:21:29,470

our double sonic boom so we made some

497

00:21:32,190 --> 00:21:30,850

nice contrails coming around the

498

00:21:33,690 --> 00:21:32,200

vertical Assembly Building down on

499

00:21:37,109 --> 00:21:33,700

Scott's right window again this is over

500

00:21:39,210 --> 00:21:37,119

his shoulder as we come on back in it's

501  
00:21:42,210 --> 00:21:39,220  
the standard world's worst glider at

502  
00:21:44,519 --> 00:21:42,220  
this point 390 I've 20 degrees down to

503  
00:21:46,609 --> 00:21:44,529  
the ground probably and Scott finally

504  
00:21:48,780 --> 00:21:46,619  
gets the gear out down there at about

505  
00:21:50,960 --> 00:21:48,790  
350 feet

506  
00:21:54,570 --> 00:21:50,970  
but that was just like we had planned

507  
00:21:56,670 --> 00:21:54,580  
and at that point we continually

508  
00:21:58,650 --> 00:21:56,680  
continuously decelerate as we're coming

509  
00:22:02,220 --> 00:21:58,660  
across the runway the shuttle training

510  
00:22:04,620 --> 00:22:02,230  
error data previously is coming by our

511  
00:22:06,030 --> 00:22:04,630  
left hand side there tried to make the

512  
00:22:07,830 --> 00:22:06,040  
black marks there but landed just a

513  
00:22:10,470 --> 00:22:07,840

little bit short some wind shears that

514

00:22:12,000 --> 00:22:10,480

day and headwind to help me do that we

515

00:22:14,340 --> 00:22:12,010

put the drag chute out to continue the

516

00:22:15,810 --> 00:22:14,350

deceleration process it's a real hard

517

00:22:17,430 --> 00:22:15,820

thing to do to lift your legs up to get

518

00:22:18,480 --> 00:22:17,440

on those brake pedals and you got to do

519

00:22:23,340 --> 00:22:18,490

it because you don't want to look bad on

520

00:22:25,800 --> 00:22:23,350

CNN I get the legs up there get on the

521

00:22:27,300 --> 00:22:25,810

brakes but the decelerates from the drag

522

00:22:28,830 --> 00:22:27,310

she provides us quite a bit of

523

00:22:31,080 --> 00:22:28,840

deceleration so it's not that hard of an

524

00:22:34,730 --> 00:22:31,090

effort we drop the drag chute off at

525

00:22:37,590 --> 00:22:34,740

about 60 knots or so just prior to

526  
00:22:40,860 --> 00:22:37,600  
coming to wheel stop and we were just

527  
00:22:43,050 --> 00:22:40,870  
real happy to be home few minutes into

528  
00:22:45,960 --> 00:22:43,060  
post inception it's a very busy period

529  
00:22:48,960 --> 00:22:45,970  
as you can see here and we are trying to

530  
00:22:54,450 --> 00:22:48,970  
get rid of our suits and make room for

531  
00:22:55,920 --> 00:22:54,460  
all the stuff that we have to store well

532  
00:22:58,230 --> 00:22:55,930  
there were three rookies on the flight

533  
00:23:00,030 --> 00:22:58,240  
and this is just after getting to orbit

534  
00:23:01,440 --> 00:23:00,040  
and as you can see everyone said you

535  
00:23:03,300 --> 00:23:01,450  
know be careful you may not feel good we

536  
00:23:04,650 --> 00:23:03,310  
all felt great so I decided just come on

537  
00:23:06,360 --> 00:23:04,660  
diving down the hatch into that mess

538  
00:23:07,890 --> 00:23:06,370

downstairs to let these guys get me out

539

00:23:09,030 --> 00:23:07,900

of my suit and I'm probably smiling

540

00:23:15,150 --> 00:23:09,040

because I know I'm gonna get out of my

541

00:23:21,540 --> 00:23:15,160

suit here soon well I'm packing for

542

00:23:24,030 --> 00:23:21,550

seven and we have to make the airlock

543

00:23:26,900 --> 00:23:24,040

the place to put all the stuff and of

544

00:23:30,000 --> 00:23:26,910

course it also had to be somebody's

545

00:23:32,370 --> 00:23:30,010

bedroom so we have to make provisions

546

00:23:36,810 --> 00:23:32,380

for somebody to actually sleep sleep

547

00:23:39,360 --> 00:23:36,820

right in there we are already into the

548

00:23:42,180 --> 00:23:39,370

payload operation activity you can see

549

00:23:44,430 --> 00:23:42,190

the satellite just left the top of the

550

00:23:47,820 --> 00:23:44,440

boom and on the satellite you can see

551  
00:23:49,280 --> 00:23:47,830  
the the nitrogen small nitrogen jet that

552  
00:23:50,950 --> 00:23:49,290  
they used to provide some initial

553  
00:23:55,930 --> 00:23:50,960  
tension for the

554  
00:23:58,240 --> 00:23:55,940  
tella this is a view of the after flight

555  
00:23:59,799 --> 00:23:58,250  
deck during the initial flyaway of the

556  
00:24:01,750 --> 00:23:59,809  
satellite as you see there was a very

557  
00:24:02,680 --> 00:24:01,760  
high density of bodies in the earth like

558  
00:24:05,440 --> 00:24:02,690  
that

559  
00:24:07,510 --> 00:24:05,450  
frankly the Scot went forward flight

560  
00:24:09,430 --> 00:24:07,520  
tech can you see Andy on the left

561  
00:24:11,889 --> 00:24:09,440  
flying the orbiter jet is in the middle

562  
00:24:15,480 --> 00:24:11,899  
of guiding us from the procedures and

563  
00:24:21,519 --> 00:24:15,490

using the binoculars I was busy with

564

00:24:24,070 --> 00:24:21,529

operating the CCTV cameras and Mauricio

565

00:24:25,840 --> 00:24:24,080

is using a laser rangefinder to

566

00:24:27,639 --> 00:24:25,850

determine the range and range rate of

567

00:24:29,019 --> 00:24:27,649

the satellite so it was very busy but

568

00:24:30,490 --> 00:24:29,029

everything went well this into

569

00:24:34,539 --> 00:24:30,500

deployment as I mentioned before but

570

00:24:36,820 --> 00:24:34,549

each of us had certain procedures he had

571

00:24:42,399 --> 00:24:36,830

to perform in case we were going to have

572

00:24:44,560 --> 00:24:42,409

problems so it was a big team effort the

573

00:24:46,539 --> 00:24:44,570

satellite actually as it left did not go

574

00:24:48,180 --> 00:24:46,549

completely straight up the boom like

575

00:24:50,680 --> 00:24:48,190

we'd liked it to

576

00:24:52,600 --> 00:24:50,690

and on this is 46 the first flight a

577

00:24:54,970 --> 00:24:52,610

tensor I didn't do that either but it

578

00:24:56,620 --> 00:24:54,980

was such a easy thing for us to do

579

00:24:58,690 --> 00:24:56,630

because we had seen it in practice so

580

00:25:00,159 --> 00:24:58,700

much in our simulations that having a

581

00:25:01,960 --> 00:25:00,169

satellite go out a little bit cockeyed

582

00:25:03,850 --> 00:25:01,970

was just a simple thing to do and all I

583

00:25:05,139 --> 00:25:03,860

needed to do is keep the orbiter I had

584

00:25:07,389 --> 00:25:05,149

to do something to keep the orbiter

585

00:25:09,010 --> 00:25:07,399

within a little bit of a cone to make

586

00:25:13,409 --> 00:25:09,020

sure that they get too far away from us

587

00:25:16,690 --> 00:25:13,419

and the TSS science work at the really

588

00:25:20,169 --> 00:25:16,700

flawless the during deployment we could

589

00:25:24,070 --> 00:25:20,179

verify the the power generated while the

590

00:25:26,830 --> 00:25:24,080

data was reeling out and actually was

591

00:25:32,500 --> 00:25:26,840

was completely nominal I mean we got

592

00:25:35,380 --> 00:25:32,510

very good data during this space well

593

00:25:40,000 --> 00:25:35,390

that's the sad picture after the tether

594

00:25:42,490 --> 00:25:40,010

did break we said there wasn't very much

595

00:25:44,840 --> 00:25:42,500

we could do with it except shed a few

596

00:25:47,399 --> 00:25:44,850

tears

597

00:25:54,580 --> 00:25:47,409

trying to cry when there's no weight to

598

00:25:59,590 --> 00:25:57,200

well we had a few opportunities to

599

00:26:02,450 --> 00:25:59,600

actually take a look at the feather

600

00:26:06,380 --> 00:26:02,460

flyover and this is one of the pictures

601  
00:26:10,100 --> 00:26:06,390  
taken with long lenses that we had and I

602  
00:26:12,710 --> 00:26:10,110  
should also say that serendipity plus

603  
00:26:16,220 --> 00:26:12,720  
the quick response of the ground

604  
00:26:18,710 --> 00:26:16,230  
controllers was able to define a new a

605  
00:26:21,890 --> 00:26:18,720  
new type of science I guess we call it

606  
00:26:23,480 --> 00:26:21,900  
the detach science and they actually

607  
00:26:25,820 --> 00:26:23,490  
turned on the instruments in the

608  
00:26:27,980 --> 00:26:25,830  
satellite and were able to do a whole

609  
00:26:35,540 --> 00:26:27,990  
bunch of new observations that were not

610  
00:26:38,180 --> 00:26:35,550  
were not expected and also after tether

611  
00:26:40,970 --> 00:26:38,190  
was over why we needed to get ready for

612  
00:26:43,010 --> 00:26:40,980  
all the microgravity operations and that

613  
00:26:46,460 --> 00:26:43,020

all came in instructions from the ground

614

00:26:49,130 --> 00:26:46,470

in miles and miles of teleprinter paper

615

00:26:52,720 --> 00:26:49,140

which would then have to sort out and

616

00:26:56,030 --> 00:26:52,730

put in our flight plan and execute it

617

00:26:58,430 --> 00:26:56,040

here we are very much into the second

618

00:27:01,430 --> 00:26:58,440

part of the mission we start to start

619

00:27:04,310 --> 00:27:01,440

concentrating on mid-deck activities we

620

00:27:06,560 --> 00:27:04,320

had basically three investigations that

621

00:27:11,270 --> 00:27:06,570

all had in common burning we all became

622

00:27:14,500 --> 00:27:11,280

a paramedics in one way and we use this

623

00:27:18,800 --> 00:27:14,510

mid-deck glove box for to provide safety

624

00:27:22,010 --> 00:27:18,810

for the for the shuttle this is a

625

00:27:25,310 --> 00:27:22,020

montage of the sequence of burning

626

00:27:29,600 --> 00:27:25,320

particulars experiment is ritzy as you

627

00:27:32,630 --> 00:27:29,610

can see the flame and we used normally

628

00:27:35,240 --> 00:27:32,640

we used video cameras to catch the whole

629

00:27:37,850 --> 00:27:35,250

burning sequence on one video on

630

00:27:39,890 --> 00:27:37,860

videotape and on top of the mid-deck

631

00:27:42,050 --> 00:27:39,900

glovebox we had a 35-millimeter camera

632

00:27:43,910 --> 00:27:42,060

to take these shots what is really

633

00:27:46,430 --> 00:27:43,920

astonishing is that the flame is really

634

00:27:48,730 --> 00:27:46,440

has to be is fear occur and it's

635

00:27:52,580 --> 00:27:48,740

counterintuitive and it tries to move

636

00:27:54,470 --> 00:27:52,590

into the basically upstream instead of

637

00:27:58,350 --> 00:27:54,480

downstream the flow in that picture was

638

00:28:03,700 --> 00:28:01,690

we had an immense amount of photo TV

639

00:28:05,889 --> 00:28:03,710

requirements for all of our payload plus

640

00:28:08,320 --> 00:28:05,899

we some of some of the events to do just

641

00:28:12,129 --> 00:28:08,330

with the public affairs I felt like we

642

00:28:14,019 --> 00:28:12,139

had about as much electrical outlets and

643

00:28:15,519 --> 00:28:14,029

ords on board as we did the tether that

644

00:28:18,549 --> 00:28:15,529

was floating up there somewhere in space

645

00:28:20,620 --> 00:28:18,559

so it was a it was quite a handful and

646

00:28:24,879 --> 00:28:20,630

very crew intensive getting ready for

647

00:28:27,639 --> 00:28:24,889

all the photo TV requirement a very

648

00:28:30,399 --> 00:28:27,649

modest experiment but nevertheless very

649

00:28:31,659 --> 00:28:30,409

important one was carried out in protein

650

00:28:34,419 --> 00:28:31,669

crystal growth and was the first

651  
00:28:37,180 --> 00:28:34,429  
experiment from a joint effort between

652  
00:28:39,100 --> 00:28:37,190  
the countries of Latin America among the

653  
00:28:42,159 --> 00:28:39,110  
countries and it was an effort to look

654  
00:28:44,620 --> 00:28:42,169  
for potential drugs to combat Chagas

655  
00:28:49,840 --> 00:28:44,630  
disease and we'll be looking to see more

656  
00:28:51,639 --> 00:28:49,850  
of this in the in the years to come you

657  
00:28:55,090 --> 00:28:51,649  
can't see yes as well as we can see you

658  
00:28:56,620 --> 00:28:55,100  
down here sometimes but this is just the

659  
00:28:59,379 --> 00:28:56,630  
shot of the Houston area the

660  
00:29:02,139 --> 00:28:59,389  
Intercontinental up there on the upper

661  
00:29:03,460 --> 00:29:02,149  
Center and Johnson Space Center clear

662  
00:29:08,350 --> 00:29:03,470  
there's down there towards the bottom

663  
00:29:11,470 --> 00:29:08,360

right going to space it was a really

664

00:29:14,080 --> 00:29:11,480

surprised how easy it is for the human

665

00:29:17,169 --> 00:29:14,090

body to adapt to different environments

666

00:29:21,250 --> 00:29:17,179

and I think this picture shares

667

00:29:24,039 --> 00:29:21,260

basically the same flavor this was was

668

00:29:25,930 --> 00:29:24,049

taken on the side in the side you can

669

00:29:29,019 --> 00:29:25,940

see the dunes there an incredible view

670

00:29:33,850 --> 00:29:29,029

and on the bottom right corner there's a

671

00:29:37,629 --> 00:29:33,860

human settlement this is a good shot of

672

00:29:41,320 --> 00:29:37,639

the Nile River on the upper left corner

673

00:29:43,149 --> 00:29:41,330

there is the luxor temple the big

674

00:29:45,250 --> 00:29:43,159

contrast between the green part and the

675

00:29:47,769 --> 00:29:45,260

surrounding desert to give you an idea

676

00:29:50,889 --> 00:29:47,779

how important is this piece of land for

677

00:29:53,080 --> 00:29:50,899

for edge it almost 95% of the people

678

00:29:58,360 --> 00:29:53,090

lives in this area even though it's only

679

00:30:00,399 --> 00:29:58,370

5% of the entire land in Egypt although

680

00:30:02,200 --> 00:30:00,409

later in the flight we got this

681

00:30:03,700 --> 00:30:02,210

wonderful picture you're looking at the

682

00:30:05,529 --> 00:30:03,710

southern tip of India and you can see

683

00:30:07,119 --> 00:30:05,539

the little land bridge going over to Sri

684

00:30:09,369 --> 00:30:07,129

Lanka and it's a fairly unusually a

685

00:30:14,259 --> 00:30:09,379

clear day in Sri Lanka it's just a

686

00:30:17,259 --> 00:30:14,269

gorgeous shot this is a view of East

687

00:30:19,750 --> 00:30:17,269

Himalaya and what I would call the big

688

00:30:22,600 --> 00:30:19,760

band of Brahmaputra Brahmaputra is a

689

00:30:24,850 --> 00:30:22,610

very long river about 1,800 miles long

690

00:30:27,220 --> 00:30:24,860

and it starts in the high Tibetan

691

00:30:30,639 --> 00:30:27,230

Plateau close to the top of the picture

692

00:30:32,799 --> 00:30:30,649

then flows to the East's which is toward

693

00:30:34,840 --> 00:30:32,809

the bottom of the picture north of the

694

00:30:37,509 --> 00:30:34,850

Himalaya then makes a band through these

695

00:30:39,730 --> 00:30:37,519

very narrow gorges that you see in the

696

00:30:42,549 --> 00:30:39,740

middle of the picture towards the left

697

00:30:44,169 --> 00:30:42,559

and then you see it takes a course to

698

00:30:46,000 --> 00:30:44,179

the west on the left-hand side of the

699

00:30:47,649 --> 00:30:46,010

picture it was amazing to see the

700

00:30:49,269 --> 00:30:47,659

different climate that you have here you

701  
00:30:51,129 --> 00:30:49,279  
have the high Tibetan Plateau which are

702  
00:30:53,950 --> 00:30:51,139  
rather dry or the Himalaya with all

703  
00:30:57,850 --> 00:30:53,960  
these high mountains and ice and snow in

704  
00:30:59,590 --> 00:30:57,860  
a very wet area on the left hand side in

705  
00:31:02,680 --> 00:30:59,600  
northern India and Bangladesh that gets

706  
00:31:06,100 --> 00:31:02,690  
up to 400 inches of rain per year an

707  
00:31:08,980 --> 00:31:06,110  
amazing picture and here if we follow

708  
00:31:10,930 --> 00:31:08,990  
the course of the Brahmaputra from the

709  
00:31:13,720 --> 00:31:10,940  
low end of the picture towards the

710  
00:31:15,639 --> 00:31:13,730  
center then he turns to the left and he

711  
00:31:17,470 --> 00:31:15,649  
joins with the Ganges that comes from

712  
00:31:19,840 --> 00:31:17,480  
the upper right corner of the picture

713  
00:31:21,460 --> 00:31:19,850

through Bangladesh and then he goes via

714

00:31:24,159 --> 00:31:21,470

the area of Dhaka the capital of

715

00:31:27,610 --> 00:31:24,169

Bangladesh in the Bay of Bengal really a

716

00:31:32,259 --> 00:31:27,620

very very clear view of this part of

717

00:31:35,080 --> 00:31:32,269

Indian Bangladesh very unusual of all

718

00:31:38,289 --> 00:31:35,090

the beauty of the Himalaya as euphoria

719

00:31:41,680 --> 00:31:38,299

over China you see here the red base and

720

00:31:45,940 --> 00:31:41,690

where the increasing population and the

721

00:31:47,799 --> 00:31:45,950

use of coal burning fires has created a

722

00:31:50,560 --> 00:31:47,809

pollution which has been measured now to

723

00:31:52,930 --> 00:31:50,570

be increasing over the last 50 years we

724

00:31:54,899 --> 00:31:52,940

have extensive records going back that

725

00:31:58,360 --> 00:31:54,909

long and so it's it's almost like a

726  
00:32:03,610 --> 00:31:58,370  
laboratory to study the effect of human

727  
00:32:05,890 --> 00:32:03,620  
beings on their environment well the

728  
00:32:08,710 --> 00:32:05,900  
extra day in space provided us with

729  
00:32:11,050 --> 00:32:08,720  
this unusually clear view of Costa Rica

730  
00:32:13,780 --> 00:32:11,060  
you can see almost 90% of the country

731  
00:32:16,510 --> 00:32:13,790  
both coasts and is basically looking

732  
00:32:18,460 --> 00:32:16,520  
from north to south you can see the

733  
00:32:21,220 --> 00:32:18,470  
under the clouds and the center there

734  
00:32:23,200 --> 00:32:21,230  
the city of San Jose my hometown and you

735  
00:32:28,360 --> 00:32:23,210  
can see my my home is right over there

736  
00:32:31,000 --> 00:32:28,370  
to the left actually my mom told me that

737  
00:32:33,730 --> 00:32:31,010  
it took me a thousand hours to to take

738  
00:32:37,470 --> 00:32:33,740

this picture and so I guess I must be

739

00:32:40,510 --> 00:32:37,480

getting better such an international

740

00:32:41,740 --> 00:32:40,520

crew onboard we all tried to have an

741

00:32:43,510 --> 00:32:41,750

opportunity to bring in some of our

742

00:32:45,640 --> 00:32:43,520

ethnic food from our cultures and our

743

00:32:48,790 --> 00:32:45,650

backgrounds of course film a few soft

744

00:32:50,230 --> 00:32:48,800

pretzels as bad as ethnic as I get but

745

00:32:52,090 --> 00:32:50,240

we did manage to bring some on board it

746

00:32:53,830 --> 00:32:52,100

was a great food especially for the

747

00:32:57,340 --> 00:32:53,840

first and second days while we're up

748

00:32:58,990 --> 00:32:57,350

there and why they were still fresh we

749

00:33:01,120 --> 00:32:59,000

had a lot of food on board but the two

750

00:33:07,970 --> 00:33:01,130

Italians had to fight for the last piece

751

00:33:12,210 --> 00:33:10,470

and I think firstly that the use of

752

00:33:14,640 --> 00:33:12,220

Swiss chocolate should be mandatory in

753

00:33:16,440 --> 00:33:14,650

every spaceflight it has been on every

754

00:33:17,970 --> 00:33:16,450

front I was privileged to fly on and

755

00:33:19,560 --> 00:33:17,980

this time the Swiss chocolate had the

756

00:33:20,700 --> 00:33:19,570

shape of an orbiter this is white

757

00:33:23,010 --> 00:33:20,710

chocolate is in the middle of the

758

00:33:24,690 --> 00:33:23,020

picture and in the bottom in one hand is

759

00:33:27,720 --> 00:33:24,700

the tethered satellite in chocolate also

760

00:33:31,500 --> 00:33:27,730

so we we ate buy a lot of chocolate on

761

00:33:33,180 --> 00:33:31,510

this market is very good well towards

762

00:33:34,890 --> 00:33:33,190

the end of the flight when we're getting

763

00:33:36,630 --> 00:33:34,900

a little tired of space food Franklin

764

00:33:38,130 --> 00:33:36,640

whipped up some dynamite burritos he's

765

00:33:40,200 --> 00:33:38,140

got all the ingredients here we thought

766

00:33:43,440 --> 00:33:40,210

you'd like to see just how you make

767

00:33:54,150 --> 00:33:43,450

burritos in space you've got the refried

768

00:33:57,060 --> 00:33:54,160

beans which is which tortillas actually

769

00:34:00,810 --> 00:33:57,070

are great in space if you don't eat them

770

00:34:02,580 --> 00:34:00,820

you can make frisbees out of them put on

771

00:34:03,960 --> 00:34:02,590

a little cheese which you have to

772

00:34:05,880 --> 00:34:03,970

squeeze out of a tube but that's

773

00:34:08,610 --> 00:34:05,890

spaceflight and put on a little taco

774

00:34:13,290 --> 00:34:08,620

sauce Tabasco to taste put in a

775

00:34:15,360 --> 00:34:13,300

toothpick in the oven wham-o and of

776

00:34:17,550 --> 00:34:15,370

course the best part is getting to eat

777

00:34:18,720 --> 00:34:17,560

the burritos and not having Mexican food

778

00:34:20,460 --> 00:34:18,730

for quite a while I was very

779

00:34:27,149 --> 00:34:20,470

appreciative of Franklin's handiwork it

780

00:34:33,580 --> 00:34:29,590

this is another meal this is the

781

00:34:36,129 --> 00:34:33,590

blueshift meal and we had a mentor for

782

00:34:37,990 --> 00:34:36,139

the the distinction of this meal jeff

783

00:34:40,270 --> 00:34:38,000

hoffman himself who doesn't take meals

784

00:34:42,190 --> 00:34:40,280

very lightly neither on the ground no in

785

00:34:45,340 --> 00:34:42,200

space and he suggested that we have a

786

00:34:48,280 --> 00:34:45,350

formal meal the whole blue team and we

787

00:34:51,010 --> 00:34:48,290

went in our sleeping stations with trays

788

00:34:53,530 --> 00:34:51,020

and we had napkins and we had appetizer

789

00:34:55,300 --> 00:34:53,540

and entree and silverware and we were

790

00:35:02,260 --> 00:34:55,310

listening to classical music we were

791

00:35:04,860 --> 00:35:02,270

eating this meal this flight was very

792

00:35:07,990 --> 00:35:04,870

special for Franklin and me who

793

00:35:09,730 --> 00:35:08,000

completed 1,000 hours of space shuttle

794

00:35:12,190 --> 00:35:09,740

time so we were quite pleased with that

795

00:35:13,840 --> 00:35:12,200

and we're looking forward to lots of

796

00:35:18,100 --> 00:35:13,850

other people joining the club but it's

797

00:35:20,290 --> 00:35:18,110

nice to be charter members well I think

798

00:35:21,820 --> 00:35:20,300

I made Andy nervous because every time

799

00:35:22,900 --> 00:35:21,830

he'd wake up he'd find me out there with

800

00:35:25,950 --> 00:35:22,910

the tools cuz I was looking for

801  
00:35:28,690 --> 00:35:25,960  
something to fix and good news bad news

802  
00:35:30,550 --> 00:35:28,700  
good news orbiter hard labor broke

803  
00:35:32,200 --> 00:35:30,560  
there's hardly anything to fix bad news

804  
00:35:33,190 --> 00:35:32,210  
was I didn't have anything to fix most

805  
00:35:35,010 --> 00:35:33,200  
of the time so I just played with the

806  
00:35:40,830 --> 00:35:35,020  
tools

807  
00:35:42,390 --> 00:35:40,840  
I just never shot when we finally got

808  
00:35:44,040 --> 00:35:42,400  
together again there's a little gray

809  
00:35:49,620 --> 00:35:44,050  
blotch there on my head it wasn't there

810  
00:35:53,940 --> 00:35:49,630  
before the flight maybe it's a misprint

811  
00:35:57,120 --> 00:35:53,950  
in the color flying in space especially

812  
00:35:58,680 --> 00:35:57,130  
for the first time flyers also also

813  
00:36:03,140 --> 00:35:58,690

means a lot of emotions are very

814

00:36:06,090 --> 00:36:03,150

difficult to to transmit or to catch

815

00:36:09,450 --> 00:36:06,100

basic describe it with words or pictures

816

00:36:11,280 --> 00:36:09,460

and this is basically what what what

817

00:36:12,960 --> 00:36:11,290

this picture is standing for I mean when

818

00:36:18,570 --> 00:36:12,970

there's a beautiful view of the earth

819

00:36:20,310 --> 00:36:18,580

and everything that represents space is

820

00:36:22,080 --> 00:36:20,320

no less emotional for a third time

821

00:36:23,520 --> 00:36:22,090

flying like myself or for people who

822

00:36:26,040 --> 00:36:23,530

have flown thousands of hours in space

823

00:36:28,410 --> 00:36:26,050

like the two of us this is a view at

824

00:36:30,330 --> 00:36:28,420

night so surely before sunrise we had

825

00:36:32,520 --> 00:36:30,340

the cargo bay illuminated by the moon

826  
00:36:35,490 --> 00:36:32,530  
and you see the earth underneath with

827  
00:36:37,859 --> 00:36:35,500  
the airglow and the Sun is starting to

828  
00:36:39,540 --> 00:36:37,869  
illuminate the tail of the orbiter and

829  
00:36:41,520 --> 00:36:39,550  
you can still see stars in fact the

830  
00:36:43,380 --> 00:36:41,530  
Stars the two bright stars that are

831  
00:36:45,420 --> 00:36:43,390  
dressed right of the tail are alpha and

832  
00:36:47,760 --> 00:36:45,430  
beta Centauri and even further to the

833  
00:36:50,070 --> 00:36:47,770  
right we had a Southern Cross and you

834  
00:36:53,010 --> 00:36:50,080  
see also in the atmosphere on the left

835  
00:36:54,960 --> 00:36:53,020  
hand side the beginning of a dawn just

836  
00:36:59,400 --> 00:36:54,970  
before sunrise a very beautiful sight

837  
00:37:00,930 --> 00:36:59,410  
it's incredible we try to share with all

838  
00:37:03,000 --> 00:37:00,940

of you some of the beauties of

839

00:37:04,859 --> 00:37:03,010

spaceflight which which does make it so

840

00:37:08,190 --> 00:37:04,869

special for all of us who have been

841

00:37:09,990 --> 00:37:08,200

privileged to to be up there and are

842

00:37:13,140 --> 00:37:10,000

sixteen times everyday you see the

843

00:37:14,220 --> 00:37:13,150

sunrise and the sunset and the colors

844

00:37:16,140 --> 00:37:14,230

are a little different every time

845

00:37:17,849 --> 00:37:16,150

depending on the atmospheric condition

846

00:37:20,460 --> 00:37:17,859

but it's always beautiful and this is a

847

00:37:22,470 --> 00:37:20,470

kind of the slow-motion montage of what

848

00:37:24,930 --> 00:37:22,480

the payload Bay looks like as the Sun

849

00:37:30,330 --> 00:37:24,940

gradually sets on it that's kind of a

850

00:37:35,550 --> 00:37:33,600

Space Flight of course has all the

851

00:37:37,650 --> 00:37:35,560

thrills chills challenges and rewards

852

00:37:40,080 --> 00:37:37,660

that anyone for everyone it's an honor

853

00:37:43,830 --> 00:37:40,090

and a privilege to have the opportunity

854

00:37:45,740 --> 00:37:43,840

to go but as much as we do go in as much

855

00:37:48,480 --> 00:37:45,750

as we enjoy it onboard it's it's also

856

00:37:51,570 --> 00:37:48,490

extra special and we certainly look

857

00:37:53,010 --> 00:37:51,580

forward to coming home Columbia there

858

00:37:54,720 --> 00:37:53,020

that started out as a rocket ship and

859

00:37:57,960 --> 00:37:54,730

turn into a spaceship and came back as

860

00:38:01,200 --> 00:37:57,970

an airplane albeit it's a different kind

861

00:38:03,630 --> 00:38:01,210

of airplane than most airplanes but that

862

00:38:04,950 --> 00:38:03,640

was our home for 16 days and and we're

863

00:38:06,990 --> 00:38:04,960

happy to be here and the crew was doing

864

00:38:09,720 --> 00:38:07,000

doing great and we did our walk around