



1
00:00:30,700 --> 00:00:28,660
we'll start with crew patch again and a

2
00:00:32,530 --> 00:00:30,710
view from orbit the crew patch is still

3
00:00:34,950 --> 00:00:32,540
flying on orbit firmly affixed to the

4
00:00:38,260 --> 00:00:34,960
bulkhead of mere and the core module

5
00:00:40,210 --> 00:00:38,270
meanwhile before dawn the vehicle is

6
00:00:42,640 --> 00:00:40,220
prepped on the pad we actually woke up

7
00:00:44,170 --> 00:00:42,650
before midnight launch morning for us

8
00:00:46,240 --> 00:00:44,180
was actually launched afternoon as we

9
00:00:49,150 --> 00:00:46,250
were already operating on moscow time

10
00:00:50,890 --> 00:00:49,160
we'd had a significant sleep shift here

11
00:00:53,350 --> 00:00:50,900
are getting into the suits after the

12
00:00:55,420 --> 00:00:53,360
morning or afternoon for us a weather

13
00:00:57,430 --> 00:00:55,430

brief we had a chance to take a look at

14

00:00:59,979 --> 00:00:57,440

what the towel weather was what the

15

00:01:01,329 --> 00:00:59,989

forecast for the Cape was Chris had

16

00:01:03,119 --> 00:01:01,339

already been through his suit pressure

17

00:01:06,520 --> 00:01:03,129

checks he was obviously ready to go

18

00:01:09,100 --> 00:01:06,530

Jerry's always ready and we had just got

19

00:01:11,110 --> 00:01:09,110

back from weather weather briefs and

20

00:01:12,969 --> 00:01:11,120

checks bill also had already completed

21

00:01:15,219 --> 00:01:12,979

all that work and we had a little bit of

22

00:01:17,500 --> 00:01:15,229

a chance to relax in the chairs there

23

00:01:19,030 --> 00:01:17,510

before was time to come out well here we

24

00:01:20,710 --> 00:01:19,040

are coming out of the ONC and one of the

25

00:01:21,880 --> 00:01:20,720

most pleasant surprises in addition to

26
00:01:23,620 --> 00:01:21,890
some of the media that was there to take

27
00:01:25,660 --> 00:01:23,630
our picture was to see some of the same

28
00:01:26,920 --> 00:01:25,670
faces I see here today and join this

29
00:01:28,719 --> 00:01:26,930
briefing they were there to greet us and

30
00:01:30,039 --> 00:01:28,729
to give us a bomb by Yas on our way so

31
00:01:31,330 --> 00:01:30,049
thanks for the training same and the

32
00:01:32,830 --> 00:01:31,340
rest of the people who travel down there

33
00:01:34,899 --> 00:01:32,840
to say goodbye we saw a beautiful

34
00:01:36,999 --> 00:01:34,909
sunrise over the Atlantic Ocean and then

35
00:01:38,679 --> 00:01:37,009
we got to go from launch Mel C see Kim

36
00:01:40,599 --> 00:01:38,689
waved goodbye at two minutes prior to

37
00:01:42,819 --> 00:01:40,609
launch and it's six seconds prior the

38
00:01:44,560 --> 00:01:42,829

main engines cranked up and exactly on

39

00:01:46,929 --> 00:01:44,570

time the solid rocket boosters ignited

40

00:01:48,700 --> 00:01:46,939

and the whole down boats let go and we

41

00:01:50,260 --> 00:01:48,710

were on our way and there's absolutely

42

00:01:52,510 --> 00:01:50,270

no doubt at this point in your mind that

43

00:01:55,359 --> 00:01:52,520

you know you're going somewhere the the

44

00:01:57,340 --> 00:01:55,369

first stage ride is is buckboard rough

45

00:01:59,139 --> 00:01:57,350

it's a lot of vibration a lot of noise

46

00:02:01,510 --> 00:01:59,149

it's an impressive thing to be a part of

47

00:02:03,099 --> 00:02:01,520

we punched through a low cloud deck

48

00:02:05,139 --> 00:02:03,109

right there and came out the other side

49

00:02:06,819 --> 00:02:05,149

and and the people who had assembled for

50

00:02:09,070 --> 00:02:06,829

our launch got one last view of us as we

51
00:02:11,830 --> 00:02:09,080
headed out over over the Atlantic Ocean

52
00:02:14,230 --> 00:02:11,840
a second stage ride is incredibly smooth

53
00:02:15,910 --> 00:02:14,240
just as rough as first stages second

54
00:02:18,760 --> 00:02:15,920
stage is just incredibly smooth and

55
00:02:20,559 --> 00:02:18,770
quiet once we got on orbit and opened up

56
00:02:22,090 --> 00:02:20,569
the payload bay doors here's an example

57
00:02:23,890 --> 00:02:22,100
some of the beautiful views that we got

58
00:02:26,890 --> 00:02:23,900
these are the snow-covered Pyrenees

59
00:02:29,020 --> 00:02:26,900
Mountains France to the north Spain to

60
00:02:32,800 --> 00:02:29,030
the south the islands of New York of

61
00:02:34,270 --> 00:02:32,810
menorca right here and this is actually

62
00:02:35,619 --> 00:02:34,280
better view than I often got from space

63
00:02:37,059 --> 00:02:35,629

because I'm not having to compete with

64

00:02:40,270 --> 00:02:37,069

the other four guys four

65

00:02:42,489 --> 00:02:40,280

a window room right here one of the

66

00:02:45,550 --> 00:02:42,499

first orders of business was to assemble

67

00:02:47,979 --> 00:02:45,560

the docking module in the bay and that

68

00:02:48,849 --> 00:02:47,989

involved up using the Canada arm and I

69

00:02:50,979 --> 00:02:48,859

had the honor of being the first

70

00:02:53,259 --> 00:02:50,989

Canadian to ever operate the Canada arm

71

00:02:55,360 --> 00:02:53,269

up in space so it was a real thrill for

72

00:02:58,809 --> 00:02:55,370

me to use this big piece of equipment to

73

00:03:00,970 --> 00:02:58,819

install this large 55 ton Russian

74

00:03:02,349 --> 00:03:00,980

docking module onto the top of the

75

00:03:04,569 --> 00:03:02,359

orbiter docking station here in

76

00:03:07,170 --> 00:03:04,579

preparation for attaching it to mere I

77

00:03:09,399 --> 00:03:07,180

used a bunch of different visual cues

78

00:03:11,199 --> 00:03:09,409

space vision system was one of them

79

00:03:12,699 --> 00:03:11,209

which looked at the dots here compared

80

00:03:14,740 --> 00:03:12,709

them to the dots up here and gave me

81

00:03:16,809 --> 00:03:14,750

relative position inside the cockpit i

82

00:03:19,119 --> 00:03:16,819

also had this view here which is a

83

00:03:21,189 --> 00:03:19,129

centerline camera you can see there's an

84

00:03:23,530 --> 00:03:21,199

actual reflection in this mirror of the

85

00:03:25,119 --> 00:03:23,540

camera itself by the camera looking at

86

00:03:27,789 --> 00:03:25,129

its own reflection I could align things

87

00:03:30,099 --> 00:03:27,799

very carefully but we got it carefully

88

00:03:31,809 --> 00:03:30,109

in position within about fractions of an

89

00:03:35,470 --> 00:03:31,819

inch in fractions of the degree and then

90

00:03:37,000 --> 00:03:35,480

Ken fired the thrusters and slam the two

91

00:03:38,920 --> 00:03:37,010

mechanisms home and it worked exactly

92

00:03:41,920 --> 00:03:38,930

like all of the people at JSC had told

93

00:03:44,429 --> 00:03:41,930

us and mechanism just worked perfectly

94

00:03:46,360 --> 00:03:44,439

to lock them together after we had

95

00:03:48,610 --> 00:03:46,370

successfully installed a docking module

96

00:03:50,770 --> 00:03:48,620

now it came time for our next big task

97

00:03:53,979 --> 00:03:50,780

was to put the doc take the docking

98

00:03:55,749 --> 00:03:53,989

module to its home in space and it was

99

00:03:58,719 --> 00:03:55,759

we could see mirror from the long way

100

00:04:01,349 --> 00:03:58,729

out the initial burns were done up on

101
00:04:04,240 --> 00:04:01,359
the Ford flight deck and then we moved

102
00:04:06,280 --> 00:04:04,250
Ken moved back to the a flight deck so

103
00:04:09,520 --> 00:04:06,290
we could continue with our operations

104
00:04:12,280 --> 00:04:09,530
here you can see I'm working with the

105
00:04:14,020 --> 00:04:12,290
rendezvous computers Chris was taking

106
00:04:17,110 --> 00:04:14,030
shots out the overhead window with the

107
00:04:19,120 --> 00:04:17,120
laser here he has taken the handheld

108
00:04:22,959 --> 00:04:19,130
laser marks we also had two laser

109
00:04:25,420 --> 00:04:22,969
systems in the payload Bay and it was

110
00:04:27,969 --> 00:04:25,430
great it was a beautiful sight as we got

111
00:04:30,730 --> 00:04:27,979
closer to mirror I think the activity on

112
00:04:32,890 --> 00:04:30,740
the flight deck increased Chris began to

113
00:04:34,839 --> 00:04:32,900

really operate the cameras bill shifted

114

00:04:37,810 --> 00:04:34,849

over to lasers as the TCS dropped

115

00:04:39,760 --> 00:04:37,820

offline jim was busy keeping track of

116

00:04:41,469 --> 00:04:39,770

the timing in a timeline and the orbiter

117

00:04:43,420 --> 00:04:41,479

and Jerry shot a lot of these pictures

118

00:04:45,490 --> 00:04:43,430

as well as operated the IMAX camera I

119

00:04:47,680 --> 00:04:45,500

think this is where you see that all the

120

00:04:49,839 --> 00:04:47,690

training and teamwork really come into

121

00:04:51,279 --> 00:04:49,849

play because everybody was

122

00:04:53,559 --> 00:04:51,289

doing all the things we've been trained

123

00:04:54,879 --> 00:04:53,569

to do we're working very closely and we

124

00:04:57,969 --> 00:04:54,889

were able to bring these two pieces of

125

00:05:00,219 --> 00:04:57,979

Russian hardware together on orbit 215

126
00:05:02,499 --> 00:05:00,229
miles up exactly where the Russians

127
00:05:05,709 --> 00:05:02,509
wanted them and as you'll see from the

128
00:05:07,929 --> 00:05:05,719
outside view the whole operation

129
00:05:09,669 --> 00:05:07,939
proceeded very gradually there in the

130
00:05:11,499 --> 00:05:09,679
lower right you can see the view if you

131
00:05:13,899 --> 00:05:11,509
were sitting out on the left wing tip as

132
00:05:14,799 --> 00:05:13,909
these two parts come together you might

133
00:05:15,969 --> 00:05:14,809
have noticed that we had a little

134
00:05:19,419 --> 00:05:15,979
trouble with that target some of the

135
00:05:22,269 --> 00:05:19,429
paint had peeled back and that will be

136
00:05:24,159 --> 00:05:22,279
replaced in future here just about this

137
00:05:25,419 --> 00:05:24,169
point the orbiter jets fired and

138
00:05:28,149 --> 00:05:25,429

accelerated the two pieces of hardware

139

00:05:30,429 --> 00:05:28,159

together the latch is captured and we

140

00:05:32,109 --> 00:05:30,439

were docked a mirror at this point all

141

00:05:33,850 --> 00:05:32,119

the activity on the inside shifted to

142

00:05:36,040 --> 00:05:33,860

operating the appts and drawing the two

143

00:05:37,629 --> 00:05:36,050

vehicles together well this is our first

144

00:05:39,969 --> 00:05:37,639

chance to relax just a little bit and

145

00:05:43,389 --> 00:05:39,979

give us a chance to really get a great

146

00:05:44,799 --> 00:05:43,399

view of the MIR Space Station as we were

147

00:05:46,449 --> 00:05:44,809

also going through a series of pressure

148

00:05:48,939 --> 00:05:46,459

checks at which would allow us to open

149

00:05:51,009 --> 00:05:48,949

up the hatches in between we also had a

150

00:05:52,659 --> 00:05:51,019

chance to capture on film the one of the

151
00:05:55,209 --> 00:05:52,669
solar rays right off the overhead window

152
00:05:57,819 --> 00:05:55,219
as it was rotating to track the Sun as

153
00:06:01,629 --> 00:05:57,829
we kept our Mary Gore go around around

154
00:06:03,489 --> 00:06:01,639
the world here's Ken topping up the

155
00:06:06,670 --> 00:06:03,499
hatch that goes from the docking module

156
00:06:08,739 --> 00:06:06,680
into the crystal module of mirror and as

157
00:06:10,420 --> 00:06:08,749
he opened up the hatch the mere crew is

158
00:06:11,949 --> 00:06:10,430
very excited to come in and see

159
00:06:13,329 --> 00:06:11,959
everybody they'd been on over for about

160
00:06:16,719 --> 00:06:13,339
two and a half months at this point this

161
00:06:22,269 --> 00:06:16,729
is the commander sergey a year sorry

162
00:06:27,609 --> 00:06:22,279
Yuri and here's Thomas the German ISA

163
00:06:29,469 --> 00:06:27,619

cosmonaut and Sergei FDA of the board

164

00:06:32,739 --> 00:06:29,479

engineer will be coming through in just

165

00:06:34,749 --> 00:06:32,749

a second here after this was completed

166

00:06:38,559 --> 00:06:34,759

we went back in the mirror and conducted

167

00:06:39,939 --> 00:06:38,569

a series of video cons down to the

168

00:06:42,549 --> 00:06:39,949

ground and then we went right back to

169

00:06:44,379 --> 00:06:42,559

work what we're going to show you here

170

00:06:46,149 --> 00:06:44,389

is a transfer of the protein crystal

171

00:06:48,759 --> 00:06:46,159

growth experiment from the shuttle over

172

00:06:51,459 --> 00:06:48,769

to the mirror of space station and then

173

00:06:54,399 --> 00:06:51,469

we returned a similar experiment that

174

00:06:57,249 --> 00:06:54,409

had been placed there by sts 71 and

175

00:06:58,389 --> 00:06:57,259

returned it back to the orbiter what

176

00:07:00,549 --> 00:06:58,399

we're trying to give you here is an

177

00:07:01,260 --> 00:07:00,559

impression as you saw in the slides for

178

00:07:07,380 --> 00:07:01,270

the

179

00:07:09,930 --> 00:07:07,390

clutter and stowage that has accumulated

180

00:07:12,260 --> 00:07:09,940

over the ten years of living in space

181

00:07:15,600 --> 00:07:12,270

with various different mere crews as

182

00:07:18,240 --> 00:07:15,610

Chris indicated earlier we did transfer

183

00:07:22,830 --> 00:07:18,250

over 2,000 pounds of hardware and

184

00:07:24,420 --> 00:07:22,840

supplies to the MIR station and in

185

00:07:26,450 --> 00:07:24,430

addition we return something in excess

186

00:07:29,310 --> 00:07:26,460

of 800 pounds of equipment and

187

00:07:31,820 --> 00:07:29,320

experimental results that scientists

188

00:07:33,900 --> 00:07:31,830

will be looking at for some time to come

189

00:07:36,330 --> 00:07:33,910

this is going right through the base

190

00:07:39,600 --> 00:07:36,340

block of the mirror and into the cove on

191

00:07:43,590 --> 00:07:39,610

one module and you're seeing yuri and

192

00:07:46,080 --> 00:07:43,600

sergey removed the old PCG experiment

193

00:07:47,550 --> 00:07:46,090

and i'm handing them a new one in

194

00:07:48,870 --> 00:07:47,560

addition to the science we head on board

195

00:07:50,730 --> 00:07:48,880

we also realize that we were these

196

00:07:53,070 --> 00:07:50,740

people's only visitors in a six-month

197

00:07:54,600 --> 00:07:53,080

stay on orbit and we try to bring them

198

00:07:57,180 --> 00:07:54,610

things that would improve the quality of

199

00:08:00,750 --> 00:07:57,190

their life which here included ice cream

200

00:08:02,760 --> 00:08:00,760

sandwiches and I have never seen three

201
00:08:06,090 --> 00:08:02,770
grown men eat ice cream as happily as

202
00:08:08,250 --> 00:08:06,100
those three guys didn't see eating up an

203
00:08:09,900 --> 00:08:08,260
ice cream sandwich and then Yuri floats

204
00:08:12,540 --> 00:08:09,910
the last of his little mini dove bar

205
00:08:14,490 --> 00:08:12,550
into his mouth there and they were very

206
00:08:20,490 --> 00:08:14,500
happy that we had thought of this and

207
00:08:22,140 --> 00:08:20,500
brought them those experiments though my

208
00:08:24,540 --> 00:08:22,150
lips were moving Fayette and brought

209
00:08:25,650 --> 00:08:24,550
them that but the gift that I think

210
00:08:28,590 --> 00:08:25,660
really meant the most was to bring

211
00:08:30,180 --> 00:08:28,600
Thomas this guitar they have this old

212
00:08:32,100 --> 00:08:30,190
guitar that actually went up in cell you

213
00:08:34,140 --> 00:08:32,110

at seven it's one of the oldest items in

214

00:08:35,580 --> 00:08:34,150

space it's been up there for 15 years we

215

00:08:37,140 --> 00:08:35,590

brought him a new classical practice

216

00:08:38,970 --> 00:08:37,150

guitar and had this opportunity to play

217

00:08:41,630 --> 00:08:38,980

together and sing in the mir core which

218

00:08:44,160 --> 00:08:41,640

was just very memorable for both of us

219

00:08:45,690 --> 00:08:44,170

well we did I actually do quite a bit of

220

00:08:48,120 --> 00:08:45,700

work while we were up there you could

221

00:08:50,850 --> 00:08:48,130

see the arm in position to gather data

222

00:08:53,940 --> 00:08:50,860

from mere jet firings part of a series

223

00:08:56,280 --> 00:08:53,950

of experiments in which we were trying

224

00:08:57,990 --> 00:08:56,290

to get data that will help us understand

225

00:09:00,030 --> 00:08:58,000

how the shuttle will interact with the

226

00:09:01,800 --> 00:09:00,040

International Space Station it was

227

00:09:03,960 --> 00:09:01,810

really quite a thrill to be maneuvering

228

00:09:06,210 --> 00:09:03,970

the arm or in proximity to the solar

229

00:09:08,600 --> 00:09:06,220

arrays and as it turned out it was quite

230

00:09:11,400 --> 00:09:08,610

a thrill for Yuri to see that as well

231

00:09:13,140 --> 00:09:11,410

here you can see things are starting to

232

00:09:15,240 --> 00:09:13,150

get ready to take a little bit sadder

233

00:09:17,280 --> 00:09:15,250

note these are folks that we became

234

00:09:19,470 --> 00:09:17,290

close friends with on orbit correction

235

00:09:21,930 --> 00:09:19,480

on the ground and became just lifelong

236

00:09:23,970 --> 00:09:21,940

friends with on orbit and unfortunately

237

00:09:27,900 --> 00:09:23,980

at some point it was time to say goodbye

238

00:09:30,600 --> 00:09:27,910

and here as it was quite appropriate Ken

239

00:09:33,750 --> 00:09:30,610

as the last one from the Atlantis crew

240

00:09:36,690 --> 00:09:33,760

to leave to leave mere and we close the

241

00:09:40,680 --> 00:09:36,700

hatch and then the next day it was time

242

00:09:43,320 --> 00:09:40,690

to actually undock do our fly round and

243

00:09:45,060 --> 00:09:43,330

then get ready to come home actually

244

00:09:46,530 --> 00:09:45,070

before we uh thought we did have one

245

00:09:48,090 --> 00:09:46,540

last opportunity to wave goodbye from

246

00:09:50,010 --> 00:09:48,100

our overhead windows we could see the

247

00:09:51,930 --> 00:09:50,020

one or several of the windows of mirror

248

00:09:54,450 --> 00:09:51,940

here we are waiving the a final goodbye

249

00:09:56,760 --> 00:09:54,460

to our drug compatriots up there and

250

00:09:58,470 --> 00:09:56,770

then the it was time to actually do the

251
00:09:59,910 --> 00:09:58,480
undocking with Canada controls we

252
00:10:02,730 --> 00:09:59,920
released the hooks that were holding us

253
00:10:04,260 --> 00:10:02,740
in place and springs pushed us away can

254
00:10:07,050 --> 00:10:04,270
fire the jets right about here to get

255
00:10:08,750 --> 00:10:07,060
about a point to foot per second opening

256
00:10:12,470 --> 00:10:08,760
rate then from their orbital mechanics

257
00:10:15,900 --> 00:10:12,480
accelerator Dyer are our rate of

258
00:10:17,400 --> 00:10:15,910
separation from near there is a good

259
00:10:19,110 --> 00:10:17,410
picture of the thing that we got some

260
00:10:21,180 --> 00:10:19,120
privilege to add to mirror the docking

261
00:10:23,520 --> 00:10:21,190
module we had these pictures taken by

262
00:10:25,500 --> 00:10:23,530
the mere crew as we continue to move

263
00:10:30,060 --> 00:10:25,510

away we moved out to a range of about

264

00:10:32,370 --> 00:10:30,070

500 525 feet from mere as we move to

265

00:10:34,530 --> 00:10:32,380

that distance mere rotated back to its

266

00:10:36,510 --> 00:10:34,540

solar inertial attitude that would put

267

00:10:39,480 --> 00:10:36,520

its or solar panels in the most

268

00:10:41,070 --> 00:10:39,490

advantageous orientation to the Sun Kim

269

00:10:42,930 --> 00:10:41,080

was generous enough to relinquish the

270

00:10:44,850 --> 00:10:42,940

controls for a period of time during the

271

00:10:47,040 --> 00:10:44,860

fly around let me get the opportunity to

272

00:10:48,510 --> 00:10:47,050

experience for the first time what it's

273

00:10:50,460 --> 00:10:48,520

like to fly the shuttle in space and I

274

00:10:52,800 --> 00:10:50,470

really appreciated that we flew two

275

00:10:54,660 --> 00:10:52,810

loops around mirror to complete loops

276

00:10:57,210 --> 00:10:54,670

around near and then Ken from the

277

00:11:00,390 --> 00:10:57,220

forward compartment actually I did the

278

00:11:02,850 --> 00:11:00,400

separation burn that finally separated

279

00:11:04,620 --> 00:11:02,860

us away from here well the commander

280

00:11:07,110 --> 00:11:04,630

never let us forget that he was in fact

281

00:11:08,700 --> 00:11:07,120

a marine colonel and he was always up at

282

00:11:10,560 --> 00:11:08,710

the crack of dawn in fact before many

283

00:11:12,720 --> 00:11:10,570

times and here he is shaving and he's

284

00:11:14,130 --> 00:11:12,730

already raked the rest of the crew out

285

00:11:16,290 --> 00:11:14,140

of their bunks and getting us ready to

286

00:11:20,450 --> 00:11:16,300

start on another busy day of activities

287

00:11:26,450 --> 00:11:24,950

you can see Chris and Jim shaving and

288

00:11:27,920 --> 00:11:26,460

Jim was one of these guys did a lot of

289

00:11:32,750 --> 00:11:27,930

parallel ops he's also brushing the

290

00:11:35,510 --> 00:11:32,760

teeth at the same time Jim still

291

00:11:37,250 --> 00:11:35,520

brushing his teeth and now and now bill

292

00:11:38,420 --> 00:11:37,260

got into the act and you see Chris in

293

00:11:45,860 --> 00:11:38,430

the background there he's reading his

294

00:11:48,080 --> 00:11:45,870

electronic mail well Ken as I said was a

295

00:11:50,960 --> 00:11:48,090

always anxious to make sure that his

296

00:11:52,400 --> 00:11:50,970

troop stayed in good shape kind of like

297

00:11:55,730 --> 00:11:52,410

a marine drill sergeant and here's Chris

298

00:11:58,250 --> 00:11:55,740

getting in some morning exercise and I

299

00:11:59,840 --> 00:11:58,260

was more into doing laps so here I am

300

00:12:05,950 --> 00:11:59,850

getting some laps in on the mid deck

301
00:12:12,920 --> 00:12:11,570
and you think that's easy to do well we

302
00:12:14,660 --> 00:12:12,930
demonstrate a little bit of physics here

303
00:12:17,090 --> 00:12:14,670
the conservation of angular momentum as

304
00:12:19,370 --> 00:12:17,100
we spend christened the mid-deck it's

305
00:12:20,810 --> 00:12:19,380
rather tight but as he expands his legs

306
00:12:22,250 --> 00:12:20,820
and arms you can see that rotational

307
00:12:28,420 --> 00:12:22,260
rate slows down and then when he brings

308
00:12:32,960 --> 00:12:30,530
Chris had told you during the slides

309
00:12:35,750 --> 00:12:32,970
that seeing sunrises and sunsets is one

310
00:12:37,280 --> 00:12:35,760
of our favorite things on orbit and this

311
00:12:39,560 --> 00:12:37,290
video gives you a good feeling for how

312
00:12:42,530 --> 00:12:39,570
rapidly a Sun sets in this case occurs

313
00:12:44,090 --> 00:12:42,540

and will cut away to a neck which is a

314

00:12:46,340 --> 00:12:44,100

very nice sequence here of you seeing

315

00:12:49,160 --> 00:12:46,350

from the elbow camera the sunset is

316

00:12:50,540 --> 00:12:49,170

occurs on the orbiter and you see that

317

00:12:51,890 --> 00:12:50,550

we have the lights on in the orbiter and

318

00:12:58,760 --> 00:12:51,900

continue to work through the dark

319

00:13:00,320 --> 00:12:58,770

periods of the orbit we still had some

320

00:13:02,270 --> 00:13:00,330

secondary payloads and science to

321

00:13:03,800 --> 00:13:02,280

conduct prior to coming home you can see

322

00:13:05,570 --> 00:13:03,810

we have a yaw rate this is looking out

323

00:13:07,040 --> 00:13:05,580

the F windows at a nighttime view of the

324

00:13:10,880 --> 00:13:07,050

horizon you're going to see the Rockets

325

00:13:12,620 --> 00:13:10,890

the primary RCS Jets fire is Kim

326

00:13:15,860 --> 00:13:12,630

commands the orbiter Scott that y'all

327

00:13:18,170 --> 00:13:15,870

rate and the as impressive as it is here

328

00:13:19,820 --> 00:13:18,180

the oohs and ahhs coming from the MS is

329

00:13:21,770 --> 00:13:19,830

at the flight deck looking out the

330

00:13:24,530 --> 00:13:21,780

window at this they were impressive

331

00:13:25,880 --> 00:13:24,540

impressed also shortly thereafter it's

332

00:13:27,860 --> 00:13:25,890

time to do the flight control system

333

00:13:30,950 --> 00:13:27,870

check in order to get ready to come home

334

00:13:33,320 --> 00:13:30,960

here you see Ken and myself and Jerry

335

00:13:34,310 --> 00:13:33,330

also going through that fairly long

336

00:13:35,960 --> 00:13:34,320

procedure to make sure

337

00:13:37,460 --> 00:13:35,970

all the AP use the flight control

338

00:13:39,260 --> 00:13:37,470

systems and the computers are ready to

339

00:13:41,420 --> 00:13:39,270

support entry here you'll see the

340

00:13:45,460 --> 00:13:41,430

hydraulically powered elephant's going

341

00:13:48,410 --> 00:13:45,470

through one of their test sequences and

342

00:13:50,510 --> 00:13:48,420

shortly thereafter actually the next day

343

00:13:51,890 --> 00:13:50,520

it was time to come home as the orbiter

344

00:13:53,330 --> 00:13:51,900

re-enters the Earth's atmosphere we

345

00:13:55,430 --> 00:13:53,340

experience temperatures on the outside

346

00:13:57,080 --> 00:13:55,440

of up to about 2800 degrees and that

347

00:13:58,940 --> 00:13:57,090

ionizes the atmosphere and leaves a

348

00:14:00,800 --> 00:13:58,950

contrail behind us that any jet would be

349

00:14:02,960 --> 00:14:00,810

proud to lay down there's a picture of

350

00:14:04,460 --> 00:14:02,970

that contrail going back behind us and

351

00:14:05,990 --> 00:14:04,470

if you I think you could really see it

352

00:14:08,090 --> 00:14:06,000

for about a thousand miles behind us you

353

00:14:09,530 --> 00:14:08,100

can see the globe behind can and here's

354

00:14:10,610 --> 00:14:09,540

Jerry demonstrating it yes we are

355

00:14:15,350 --> 00:14:10,620

starting to reenter the Earth's

356

00:14:17,180 --> 00:14:15,360

gravitational field out my window was

357

00:14:19,160 --> 00:14:17,190

the most spectacular view we had to pull

358

00:14:20,510 --> 00:14:19,170

our flight track about 600 miles south

359

00:14:22,970 --> 00:14:20,520

so we were banked to the right and that

360

00:14:26,630 --> 00:14:22,980

gave me the prime window real estate and

361

00:14:28,700 --> 00:14:26,640

this is from about 235,000 feet about 50

362

00:14:30,620 --> 00:14:28,710

miles in altitude going over the

363

00:14:32,030 --> 00:14:30,630

Canadian Cascades and Rockies and that

364

00:14:34,100 --> 00:14:32,040

gives you a real feel for just the

365

00:14:36,200 --> 00:14:34,110

sensation of speed that you get at this

366

00:14:37,580 --> 00:14:36,210

point in the entry well jim was doing a

367

00:14:39,590 --> 00:14:37,590

lot more than giving us a travel log

368

00:14:41,720 --> 00:14:39,600

across that high-altitude scorching path

369

00:14:43,820 --> 00:14:41,730

down across the northern United States

370

00:14:45,290 --> 00:14:43,830

but here the whole crew on the flight

371

00:14:46,790 --> 00:14:45,300

deck and I know the training team often

372

00:14:48,920 --> 00:14:46,800

wondered what we were doing up there in

373

00:14:51,670 --> 00:14:48,930

the motion base and this is how it

374

00:14:54,290 --> 00:14:51,680

looked we were busy monitor in the

375

00:14:56,450 --> 00:14:54,300

displays watching the orbiter keeping

376

00:14:59,540 --> 00:14:56,460

track of all the systems as we headed

377

00:15:01,550 --> 00:14:59,550

down getting set up for the intercept of

378

00:15:03,650 --> 00:15:01,560

the hack here up the right-hand window

379

00:15:06,080 --> 00:15:03,660

you can see some familiar territory the

380

00:15:09,350 --> 00:15:06,090

vehicle assembly building as we lined up

381

00:15:11,540 --> 00:15:09,360

for the final approach on to runway 33

382

00:15:13,490 --> 00:15:11,550

it was cloudy that day in fact we logged

383

00:15:16,490 --> 00:15:13,500

an instrument approach on this one we

384

00:15:19,010 --> 00:15:16,500

penetrated an overcast and here as we

385

00:15:21,050 --> 00:15:19,020

come down about 2,000 feet the pre flare

386

00:15:24,800 --> 00:15:21,060

was initiated and here the landing gear

387

00:15:27,350 --> 00:15:24,810

Jim Lord at 300 feet as we lined up on

388

00:15:28,700 --> 00:15:27,360

33 it was a good day for flying and

389

00:15:30,470 --> 00:15:28,710

soaring as you could see from that

390

00:15:32,840 --> 00:15:30,480

little clip of the Eagle slight

391

00:15:34,760 --> 00:15:32,850

crosswind but we had overall good

392

00:15:37,430 --> 00:15:34,770

conditions the lighting was just about

393

00:15:40,450 --> 00:15:37,440

perfect we touched down and then rolled

394

00:15:43,160 --> 00:15:40,460

out on 33 here we're using the

395

00:15:44,390 --> 00:15:43,170

aerodynamic braking and then the drag

396

00:15:45,369 --> 00:15:44,400

chute which has been a recent addition

397

00:15:48,129 --> 00:15:45,379

but a real

398

00:15:50,909 --> 00:15:48,139

breaks a ver as we used very little

399

00:15:53,219 --> 00:15:50,919

breaking coming down the runway and

400

00:15:56,019 --> 00:15:53,229

decelerating on centerline this

401
00:15:57,819 --> 00:15:56,029
particular view on the next shot gives

402
00:16:00,519 --> 00:15:57,829
you a little bit of an idea how nice it

403
00:16:02,469 --> 00:16:00,529
was to bring Atlantis back home you can

404
00:16:04,359 --> 00:16:02,479
see as we rolled out bringing it to a

405
00:16:06,939 --> 00:16:04,369
stop towards the end of the runway that

406
00:16:08,710 --> 00:16:06,949
the launch pad behind us was sort of

407
00:16:12,069 --> 00:16:08,720
indicative of all of the phases of

408
00:16:14,559 --> 00:16:12,079
shuttle operations as we launch from the

409
00:16:17,169 --> 00:16:14,569
background on a morning about a week ago

410
00:16:18,999 --> 00:16:17,179
and bring the vehicle back ready to be

411
00:16:21,759 --> 00:16:19,009
towed off and processed for another one

412
00:16:23,679 --> 00:16:21,769
I think very close to Dan there you can

413
00:16:26,019 --> 00:16:23,689

see what I have to admit was a sigh of

414

00:16:28,210 --> 00:16:26,029

relief as the wheels were stopped and

415

00:16:30,749 --> 00:16:28,220

then a chance to thank and congratulate

416

00:16:33,879 --> 00:16:30,759

all the crew there on the flight deck

417

00:16:37,239 --> 00:16:33,889

here we are at the start of the mission

418

00:16:47,739 --> 00:16:37,249

and no special thanks for the last

419

00:16:49,449 --> 00:16:47,749

minute fix to the to the UHF

420

00:16:50,859 --> 00:16:49,459

communication system that did manage to

421

00:16:53,499 --> 00:16:50,869

get us off the ground and this

422

00:16:56,529 --> 00:16:53,509

particular slot slide shows that hole in

423

00:16:58,719 --> 00:16:56,539

the clouds that the weather coordinators

424

00:17:00,269 --> 00:16:58,729

were able to find and as things cleared

425

00:17:02,379 --> 00:17:00,279

on that morning we were able to finally

426

00:17:05,379 --> 00:17:02,389

start on our way to the space station

427

00:17:06,519 --> 00:17:05,389

Mir one of the aspects of the mission I

428

00:17:09,069 --> 00:17:06,529

wanted to include in a slide

429

00:17:11,499 --> 00:17:09,079

presentation was a little vignette of

430

00:17:12,970 --> 00:17:11,509

life on board mere and this is in the

431

00:17:16,449 --> 00:17:12,980

core module of the Russian space station

432

00:17:19,449 --> 00:17:16,459

and Chris and Bill who proved to be very

433

00:17:21,610 --> 00:17:19,459

enthusiastic with all aspects of the

434

00:17:23,889 --> 00:17:21,620

mission particularly enjoyed the amateur

435

00:17:26,409 --> 00:17:23,899

radio payload as we all did and here

436

00:17:28,810 --> 00:17:26,419

they took a few moments to try out the

437

00:17:30,340 --> 00:17:28,820

Russians radio and I think that part of

438

00:17:33,789 --> 00:17:30,350

the international aspect of the mission

439

00:17:36,519 --> 00:17:33,799

was highlighted when the mirror atlantis

440

00:17:38,560 --> 00:17:36,529

complex was flying over canada and a

441

00:17:42,279 --> 00:17:38,570

canadian was on a russian radio talking

442

00:17:44,139 --> 00:17:42,289

to folks at home and a bill and chris

443

00:17:45,369 --> 00:17:44,149

took turns on that radio i think it was

444

00:17:47,499 --> 00:17:45,379

a little difficult to decide who is

445

00:17:49,539 --> 00:17:47,509

going to get to talk next but we all

446

00:17:51,610 --> 00:17:49,549

were very enthusiastic during that all

447

00:17:52,790 --> 00:17:51,620

whole period but this I thought showed a

448

00:17:56,870 --> 00:17:52,800

lot of what was

449

00:17:59,120 --> 00:17:56,880

this joint venture was all about one

450

00:18:01,490 --> 00:17:59,130

other aspect of the mission that is

451
00:18:03,650 --> 00:18:01,500
worth mentioning is also characterized

452
00:18:05,150 --> 00:18:03,660
by this particular photo we had another

453
00:18:06,980 --> 00:18:05,160
one that was difficult to get all of us

454
00:18:09,380 --> 00:18:06,990
in the photo since the photography was

455
00:18:12,740 --> 00:18:09,390
difficult but what you see here are

456
00:18:15,770 --> 00:18:12,750
representatives of Russia Germany or the

457
00:18:18,200 --> 00:18:15,780
European Space Agency the NASA and the

458
00:18:21,530 --> 00:18:18,210
Canadian Space Agency all participants

459
00:18:24,260 --> 00:18:21,540
in a combined spaceflight behind us is

460
00:18:27,050 --> 00:18:24,270
the united nations flag with it is the

461
00:18:29,800 --> 00:18:27,060
us-russian ISA and Canadian flag

462
00:18:33,470 --> 00:18:29,810
somewhat obscured and we're holding the

463
00:18:35,630 --> 00:18:33,480

copies of the United Nations Space

464

00:18:38,960 --> 00:18:35,640

Treaty and also of great interest

465

00:18:42,110 --> 00:18:38,970

astronauts and cosmonauts is the part of

466

00:18:46,040 --> 00:18:42,120

that treaty that deals with the aid and

467

00:18:49,190 --> 00:18:46,050

help to space travelers in the event of

468

00:18:53,540 --> 00:18:49,200

any landings unforeseen locations so we

469

00:18:55,190 --> 00:18:53,550

flew the UN flag and those Scrolls to

470

00:18:57,410 --> 00:18:55,200

commemorate the 50th anniversary of the

471

00:19:00,230 --> 00:18:57,420

United Nations the secretary-general of

472

00:19:03,230 --> 00:19:00,240

the UN mr. boutros boutros-ghali called

473

00:19:05,900 --> 00:19:03,240

at that time and spoke to us in fact the

474

00:19:08,600 --> 00:19:05,910

flag was launched aboard soyuz was flown

475

00:19:10,850 --> 00:19:08,610

aboard mir atlantis complex and returned

476

00:19:13,160 --> 00:19:10,860

earth on Atlantis and we're all looking

477

00:19:15,980 --> 00:19:13,170

forward to seeing our mirror crewmates

478

00:19:18,290 --> 00:19:15,990

again in April when we return to the

479

00:19:20,210 --> 00:19:18,300

United United Nations headquarters to

480

00:19:29,380 --> 00:19:20,220

return these articles to their rightful

481

00:19:33,530 --> 00:19:29,390

home the picture here is a crew photo

482

00:19:37,300 --> 00:19:33,540

and it's a rather unique one I think in

483

00:19:40,280 --> 00:19:37,310

that it was taken with the help of our

484

00:19:44,270 --> 00:19:40,290

mere crewmates and in the overhead

485

00:19:47,150 --> 00:19:44,280

windows there you can see five smiling

486

00:19:48,980 --> 00:19:47,160

faces and that was all of us taking a

487

00:19:51,590 --> 00:19:48,990

look at our home and take with the

488

00:19:55,960 --> 00:19:51,600

snapshot from the Russian space station

489

00:19:58,820 --> 00:19:55,970

and this was the kind of spirit that was

490

00:20:00,320 --> 00:19:58,830

present all the time in Atlantis we were

491

00:20:02,060 --> 00:20:00,330

all during the rendezvous during the

492

00:20:06,600 --> 00:20:02,070

undocking everybody wanted to be up in

493

00:20:08,340 --> 00:20:06,610

those windows but we were all

494

00:20:10,590 --> 00:20:08,350

very excited to be there and I think

495

00:20:12,690 --> 00:20:10,600

awed by the size of the MIR space

496

00:20:20,130 --> 00:20:12,700

station and all of this mission

497

00:20:24,180 --> 00:20:20,140

represented it's difficult to see from

498

00:20:26,460 --> 00:20:24,190

the side of the slides in focus okay

499

00:20:30,450 --> 00:20:26,470

thank you while docked with me r we had

500

00:20:32,160 --> 00:20:30,460

a pretty full plate of tasks to do a lot

501
00:20:33,840 --> 00:20:32,170
of transfer we transferred about a ton

502
00:20:35,130 --> 00:20:33,850
of gear across two thousand pounds

503
00:20:38,520 --> 00:20:35,140
including the water and all of the items

504
00:20:40,560 --> 00:20:38,530
and one of the items that we are to the

505
00:20:43,350 --> 00:20:40,570
items way to transfer with these large

506
00:20:45,870 --> 00:20:43,360
blue boxes teff which thermoelectric

507
00:20:47,909 --> 00:20:45,880
freezers and that's Thomas right or the

508
00:20:50,430 --> 00:20:47,919
German cosmonaut holding them and he's

509
00:20:51,900 --> 00:20:50,440
inside Spectre which was launched

510
00:20:54,960 --> 00:20:51,910
earlier this year so that's how it looks

511
00:20:56,669 --> 00:20:54,970
now up in orbit and not only a Spectre

512
00:20:58,650 --> 00:20:56,679
the laboratory that Thomas does most of

513
00:21:00,539 --> 00:20:58,660

his work in but it's also where he

514

00:21:02,820 --> 00:21:00,549

sleeps and lives he's got his a bedroll

515

00:21:04,500 --> 00:21:02,830

laid out on the floor of Spectre and he

516

00:21:06,210 --> 00:21:04,510

was pretty happy to see the docking

517

00:21:09,810 --> 00:21:06,220

module doc I think he was I on that is

518

00:21:11,909 --> 00:21:09,820

his potential birth from now on we

519

00:21:14,250 --> 00:21:11,919

brought these two flags up as a new

520

00:21:15,900 --> 00:21:14,260

design so a Jerry went through and

521

00:21:19,650 --> 00:21:15,910

change those out with Thomas's help on

522

00:21:21,299 --> 00:21:19,660

board all in all we were planning to

523

00:21:24,330 --> 00:21:21,309

transfer about a thousand pounds of

524

00:21:26,010 --> 00:21:24,340

water and there's a bit of an

525

00:21:27,900 --> 00:21:26,020

incompatibility between the two space

526

00:21:30,120 --> 00:21:27,910

vehicles on the shuttle of course we

527

00:21:33,180 --> 00:21:30,130

purify or keep our water clean with an

528

00:21:35,130 --> 00:21:33,190

iodine content and on mere they use

529

00:21:37,980 --> 00:21:35,140

silver by aside and the silver and the

530

00:21:40,049 --> 00:21:37,990

iodine aren't compatible so we needed to

531

00:21:42,150 --> 00:21:40,059

remove the iodine from our water and

532

00:21:43,380 --> 00:21:42,160

then inject silver biocyte into it so

533

00:21:46,470 --> 00:21:43,390

that they could store it and use it on

534

00:21:49,590 --> 00:21:46,480

board mirror I'm here in the mid deck

535

00:21:51,180 --> 00:21:49,600

and I was I did eight out of the ten

536

00:21:52,919 --> 00:21:51,190

bags that we did so I was largely the

537

00:21:55,500 --> 00:21:52,929

main Gunga Din on board creating and

538

00:21:57,000 --> 00:21:55,510

transport in the water you can see in my

539

00:21:58,830 --> 00:21:57,010

left hand is the hose that comes from

540

00:22:00,240 --> 00:21:58,840

the galley that's pumping are I had

541

00:22:03,720 --> 00:22:00,250

donated water then it goes through that

542

00:22:05,549 --> 00:22:03,730

long silver di di emanating filter and

543

00:22:07,220 --> 00:22:05,559

then if you look carefully right in the

544

00:22:09,480 --> 00:22:07,230

middle of the bag there's actually a

545

00:22:13,380 --> 00:22:09,490

syringe where I could inject the silver

546

00:22:15,510 --> 00:22:13,390

biocide but apart from all the transfer

547

00:22:16,919 --> 00:22:15,520

this was a real opportunity for the mere

548

00:22:18,990 --> 00:22:16,929

crew who had been there since early

549

00:22:20,010 --> 00:22:19,000

September about two and a half months to

550

00:22:21,990 --> 00:22:20,020

come over to a new

551
00:22:23,820 --> 00:22:22,000
place they've been inside the same walls

552
00:22:25,170 --> 00:22:23,830
for two and a half months and they got

553
00:22:27,360 --> 00:22:25,180
took every opportunity they could to

554
00:22:29,970 --> 00:22:27,370
come over into the shuttle not only to

555
00:22:31,500 --> 00:22:29,980
see another spaceship or to see Earth

556
00:22:32,850 --> 00:22:31,510
from a new vantage point but they could

557
00:22:34,950 --> 00:22:32,860
look out the windows and see their own

558
00:22:36,660 --> 00:22:34,960
home in a really unique point of view

559
00:22:38,790 --> 00:22:36,670
and they spent a lot of time here on the

560
00:22:40,560 --> 00:22:38,800
a flight deck of the shuttle looking out

561
00:22:44,460 --> 00:22:40,570
at the new docking module and looking up

562
00:22:46,050 --> 00:22:44,470
at their home in space this next slide

563
00:22:47,370 --> 00:22:46,060

has no people in there that's because

564

00:22:51,120 --> 00:22:47,380

we'd like to talk a couple of minutes

565

00:22:52,980 --> 00:22:51,130

about about mirror itself this is a

566

00:22:55,140 --> 00:22:52,990

representative sample of one of the

567

00:22:56,580 --> 00:22:55,150

modules you can see that the in any

568

00:22:58,260 --> 00:22:56,590

given point the walls are kind of close

569

00:23:00,630 --> 00:22:58,270

to you but the length and the total

570

00:23:02,370 --> 00:23:00,640

volume Amir is quite impressive when we

571

00:23:04,410 --> 00:23:02,380

first got on board mere we found that

572

00:23:06,210 --> 00:23:04,420

there were no orders to speak of this

573

00:23:07,890 --> 00:23:06,220

air smell fine telling us that their air

574

00:23:10,020 --> 00:23:07,900

revitalization system was working just

575

00:23:11,850 --> 00:23:10,030

great you'll notice that there's no

576

00:23:13,740 --> 00:23:11,860

particular matter floating around that

577

00:23:16,260 --> 00:23:13,750

means air filter system is working just

578

00:23:18,300 --> 00:23:16,270

fine the temperatures we found

579

00:23:19,890 --> 00:23:18,310

comfortable and the noise level we'd

580

00:23:21,960 --> 00:23:19,900

christen a lot of tests of the noise

581

00:23:23,970 --> 00:23:21,970

level on board mirror and found that

582

00:23:25,980 --> 00:23:23,980

their noise level was roughly compatible

583

00:23:28,170 --> 00:23:25,990

with what we had to deal with on the

584

00:23:30,030 --> 00:23:28,180

shuttle the one thing that all of us

585

00:23:31,590 --> 00:23:30,040

recognize right away and especially the

586

00:23:33,780 --> 00:23:31,600

people here from crew equipment and

587

00:23:35,190 --> 00:23:33,790

stowage is to all of us it looks like

588

00:23:37,890 --> 00:23:35,200

somebody just threw a hand grenade in

589

00:23:39,720 --> 00:23:37,900

here but that represents the the

590

00:23:41,370 --> 00:23:39,730

different philosophies that the Russians

591

00:23:43,140 --> 00:23:41,380

use as opposed to the Americans and has

592

00:23:44,670 --> 00:23:43,150

to do with our short duration missions

593

00:23:46,830 --> 00:23:44,680

versus they're very long duration

594

00:23:48,570 --> 00:23:46,840

missions their storage plan consists of

595

00:23:50,730 --> 00:23:48,580

their people being up there for months

596

00:23:52,530 --> 00:23:50,740

at a time and they know exactly where

597

00:23:54,540 --> 00:23:52,540

everything is if you look closely at

598

00:23:56,280 --> 00:23:54,550

this picture despite the apparent

599

00:23:58,080 --> 00:23:56,290

disarray you'll notice that nothing is

600

00:24:00,000 --> 00:23:58,090

floating around everything is either tie

601
00:24:03,000 --> 00:24:00,010
it off or tethered off or bungee it off

602
00:24:06,630 --> 00:24:03,010
and at no time during the flight where

603
00:24:08,130 --> 00:24:06,640
we're Thomas or Sergey or Yuri unable to

604
00:24:10,050 --> 00:24:08,140
find something when we ask for it they

605
00:24:11,550 --> 00:24:10,060
knew exactly where everything was so

606
00:24:13,920 --> 00:24:11,560
there really is a plan and a rhyme and

607
00:24:16,620 --> 00:24:13,930
reason here even though it's going to be

608
00:24:18,360 --> 00:24:16,630
a difficult challenge for us to merge

609
00:24:24,060 --> 00:24:18,370
our two different philosophies and this

610
00:24:29,070 --> 00:24:27,480
this is a very special picture for all

611
00:24:31,620 --> 00:24:29,080
of us we wanted to end the onboard

612
00:24:34,500 --> 00:24:31,630
section of our slides on Mir with this

613
00:24:36,210 --> 00:24:34,510

slide this is a picture of Sergei just a

614

00:24:37,710 --> 00:24:36,220

couple of hours prior to the final hatch

615

00:24:39,390 --> 00:24:37,720

closing when we would have to go to our

616

00:24:41,820 --> 00:24:39,400

vehicle and close the hatch and we would

617

00:24:43,800 --> 00:24:41,830

undock the very next morning he's

618

00:24:45,360 --> 00:24:43,810

writing a letter to his wife and he's

619

00:24:47,460 --> 00:24:45,370

doing it in his little his little

620

00:24:48,720 --> 00:24:47,470

enclave this is an area that he claimed

621

00:24:51,480 --> 00:24:48,730

as his own and the other mayor of

622

00:24:53,220 --> 00:24:51,490

cosmonauts respected that claim he's got

623

00:24:54,720 --> 00:24:53,230

some pictures of his family and some

624

00:24:56,970 --> 00:24:54,730

religious icons that were important to

625

00:24:58,320 --> 00:24:56,980

him on the walls there he's got his

626

00:25:01,620 --> 00:24:58,330

window and he sleeps in this particular

627

00:25:03,930 --> 00:25:01,630

area also in the evening he stole away

628

00:25:05,490 --> 00:25:03,940

for about an hour to write a letter to

629

00:25:07,410 --> 00:25:05,500

his wife and then just shortly after

630

00:25:08,880 --> 00:25:07,420

this picture was taken he folded the

631

00:25:10,230 --> 00:25:08,890

letter up and stuck it in a packet of

632

00:25:12,150 --> 00:25:10,240

material that we were honored to bring

633

00:25:14,070 --> 00:25:12,160

down and I'm sure I speak for all the

634

00:25:15,870 --> 00:25:14,080

crew and probably offer of you and I say

635

00:25:18,060 --> 00:25:15,880

that has probably never been any more

636

00:25:19,830 --> 00:25:18,070

important airmail ever delivered by an

637

00:25:21,690 --> 00:25:19,840

aerospace vehicle than the letter that

638

00:25:22,890 --> 00:25:21,700

you see him writing here it's important

639

00:25:24,330 --> 00:25:22,900

for us to keep in mind that he and the

640

00:25:25,530 --> 00:25:24,340

rest of his crewmates are still up there

641

00:25:26,910 --> 00:25:25,540

and there will be for another three

642

00:25:29,130 --> 00:25:26,920

months and they're doing important and

643

00:25:30,600 --> 00:25:29,140

sometimes difficult work and whatever

644

00:25:32,250 --> 00:25:30,610

degree we can help them out on that

645

00:25:35,160 --> 00:25:32,260

that's what the joint program is all

646

00:25:37,530 --> 00:25:35,170

about we'd like to shift gears now and

647

00:25:39,090 --> 00:25:37,540

go to what we were able to see from

648

00:25:41,520 --> 00:25:39,100

space some of the other our earth

649

00:25:43,260 --> 00:25:41,530

observation photos I'm sure many of you

650

00:25:44,820 --> 00:25:43,270

will recognize this photo right away as

651
00:25:49,020 --> 00:25:44,830
New Orleans it's a place that many of

652
00:25:50,670 --> 00:25:49,030
you have had a weekend trip to this is a

653
00:25:52,770 --> 00:25:50,680
picture of Atlanta another southern town

654
00:25:54,920 --> 00:25:52,780
and what's most apparent in this picture

655
00:25:57,900 --> 00:25:54,930
is the Hartsfield Airport right here and

656
00:26:02,690 --> 00:25:57,910
you can see the downtown area of atlanta

657
00:26:04,860 --> 00:26:02,700
right here in this region I 20 the same

658
00:26:06,960 --> 00:26:04,870
highway that goes across much of the

659
00:26:08,160 --> 00:26:06,970
South you can say see goes right through

660
00:26:09,450 --> 00:26:08,170
the center of town it takes a little

661
00:26:13,740 --> 00:26:09,460
here and then continues on

662
00:26:16,020 --> 00:26:13,750
eastbound if you hadn't realized by now

663
00:26:19,170 --> 00:26:16,030

there was significant Canadian

664

00:26:20,700 --> 00:26:19,180

involvement in this mission and it was

665

00:26:25,350 --> 00:26:20,710

particularly nice was with our

666

00:26:27,000 --> 00:26:25,360

inclination at 51.7 degrees we actually

667

00:26:30,120 --> 00:26:27,010

got to see a good bit of at least a

668

00:26:32,490 --> 00:26:30,130

southern part of Canada and needless to

669

00:26:34,890 --> 00:26:32,500

say most of Canada look like this it is

670

00:26:37,560 --> 00:26:34,900

indeed winter up there and it's tad

671

00:26:39,990 --> 00:26:37,570

different than our winters this is a

672

00:26:43,560 --> 00:26:40,000

this is James Bay it's a southern end of

673

00:26:46,350 --> 00:26:43,570

the Hudson Bay here you have the Moose

674

00:26:48,660 --> 00:26:46,360

River kind of going into James Bay

675

00:26:50,310 --> 00:26:48,670

there's some interesting linear features

676
00:26:55,320 --> 00:26:50,320
you'll notice that tend to sort of

677
00:26:57,330 --> 00:26:55,330
parallel the the coastline here as we're

678
00:27:00,600 --> 00:26:57,340
all aware this was a area that

679
00:27:05,250 --> 00:27:00,610
experience significant glaciation in the

680
00:27:07,470 --> 00:27:05,260
in the world's geological history and as

681
00:27:09,810 --> 00:27:07,480
the glaciers receded and the land

682
00:27:13,110 --> 00:27:09,820
essentially became lighter there was a

683
00:27:16,650 --> 00:27:13,120
lot of uplifting of the land and so in

684
00:27:19,620 --> 00:27:16,660
fact the shores of James Bay have

685
00:27:21,600 --> 00:27:19,630
receded over the years or more

686
00:27:25,080 --> 00:27:21,610
accurately we can say the old shores

687
00:27:26,940 --> 00:27:25,090
have risen resulting in you shores it's

688
00:27:30,300 --> 00:27:26,950

a little town here called Moose Factory

689

00:27:33,510 --> 00:27:30,310

and that was the one of the original

690

00:27:36,690 --> 00:27:33,520

sites of the Hudson Bay trading post in

691

00:27:38,640 --> 00:27:36,700

the 18th century once again an

692

00:27:40,620 --> 00:27:38,650

organization that figures prominently in

693

00:27:42,960 --> 00:27:40,630

the history of North America and the

694

00:27:45,510 --> 00:27:42,970

settlement of this continent and then

695

00:27:48,540 --> 00:27:45,520

just a little bit actually just across

696

00:27:51,060 --> 00:27:48,550

the river is moosonee and then we have

697

00:27:53,460 --> 00:27:51,070

Hannah Bay down here and Rupert bay

698

00:27:57,360 --> 00:27:53,470

here's Charleston island once again the

699

00:27:58,650 --> 00:27:57,370

our meteorologists are real interested

700

00:28:01,170 --> 00:27:58,660

in this because we see a lot of

701
00:28:03,750 --> 00:28:01,180
processes occurring around Charleston

702
00:28:06,510 --> 00:28:03,760
island ice forming out here then you can

703
00:28:08,250 --> 00:28:06,520
also see evidence of this dry southerly

704
00:28:09,780 --> 00:28:08,260
wind coming up over the water and

705
00:28:15,510 --> 00:28:09,790
starting to pick up moisture as

706
00:28:17,490 --> 00:28:15,520
evidenced by these clouds now I always

707
00:28:19,590 --> 00:28:17,500
like to ask kindergarteners is this

708
00:28:21,900 --> 00:28:19,600
picture upside down or right side up and

709
00:28:24,150 --> 00:28:21,910
of course it depends on your point of

710
00:28:26,580 --> 00:28:24,160
view and in space there is no right side

711
00:28:28,830 --> 00:28:26,590
up or upside down but here's a very

712
00:28:32,760 --> 00:28:28,840
distinctive feature that I know ken is

713
00:28:35,190 --> 00:28:32,770

particularly fond of and so right here

714

00:28:38,820 --> 00:28:35,200

if we go if we go right off we can see

715

00:28:41,910 --> 00:28:38,830

we can see Boston and as we go back pass

716

00:28:45,990 --> 00:28:41,920

Cape Cod see Long Island down here New

717

00:28:48,420 --> 00:28:46,000

York City my apologies to mr. abbey West

718

00:28:49,350 --> 00:28:48,430

Point is located right behind the module

719

00:28:51,810 --> 00:28:49,360

here and

720

00:28:55,320 --> 00:28:51,820

we sure enjoyed the game this weekend

721

00:28:58,140 --> 00:28:55,330

and as he mentioned up on the stage wait

722

00:29:00,900 --> 00:28:58,150

till next year and and I'm sure his alma

723

00:29:04,740 --> 00:29:00,910

mater is going to be ready to return the

724

00:29:06,690 --> 00:29:04,750

favor we go on down we get further down

725

00:29:09,900 --> 00:29:06,700

Delaware Bay and then the Chesapeake Bay

726

00:29:12,660 --> 00:29:09,910

and we had some just really fantastic

727

00:29:15,030 --> 00:29:12,670

panoramic views looking down North

728

00:29:18,210 --> 00:29:15,040

America we finally can see just a little

729

00:29:20,549 --> 00:29:18,220

bit of the outer banks here cape

730

00:29:22,140 --> 00:29:20,559

hatteras and in some of our pictures we

731

00:29:24,210 --> 00:29:22,150

could actually see all the way from New

732

00:29:28,500 --> 00:29:24,220

England down to the tip of Florida and

733

00:29:32,580 --> 00:29:28,510

Lake Okeechobee we were real fortunate

734

00:29:35,250 --> 00:29:32,590

in this flight that we passed out got

735

00:29:38,159 --> 00:29:35,260

some passes over Europe which were clear

736

00:29:39,390 --> 00:29:38,169

which is a pretty rare occurrence and

737

00:29:42,900 --> 00:29:39,400

here we are right over the English

738

00:29:46,130 --> 00:29:42,910

Channel this is the Isle of Wight this

739

00:29:49,740 --> 00:29:46,140

is Portsmouth here we have a London here

740

00:29:53,909 --> 00:29:49,750

the very famous white cliffs of Dover of

741

00:29:58,530 --> 00:29:53,919

Dover cherbourg france out on normandy

742

00:30:03,480 --> 00:29:58,540

out here and there also was a very

743

00:30:05,280 --> 00:30:03,490

strong Scottish heritage in this crew of

744

00:30:07,770 --> 00:30:05,290

course three of us have names of

745

00:30:09,510 --> 00:30:07,780

Scottish heritage and as it turns out we

746

00:30:11,789 --> 00:30:09,520

find out that Hatfield and wholesale

747

00:30:13,409 --> 00:30:11,799

even let some Scots into their into

748

00:30:14,990 --> 00:30:13,419

their families sometime in the past and

749

00:30:21,690 --> 00:30:15,000

we could even see as far north as

750

00:30:23,460 --> 00:30:21,700

Scotland in some of these pictures well

751

00:30:27,390 --> 00:30:23,470

as bill said we had the opportunity to

752

00:30:32,220 --> 00:30:27,400

see a good share of Europe and this is a

753

00:30:33,419 --> 00:30:32,230

part of central Poland something that

754

00:30:37,200 --> 00:30:33,429

none of us had ever seen from at least

755

00:30:39,510 --> 00:30:37,210

from this altitude the white stripes as

756

00:30:40,950 --> 00:30:39,520

you might guess our airliners going

757

00:30:42,780 --> 00:30:40,960

across the sky and laying out some

758

00:30:44,610 --> 00:30:42,790

contrails and it looks like the

759

00:30:46,830 --> 00:30:44,620

predominant wind was from this direction

760

00:30:48,480 --> 00:30:46,840

which is the west or Northwest because

761

00:30:49,830 --> 00:30:48,490

you can see older and older contrails is

762

00:30:52,560 --> 00:30:49,840

probably an error out through here and

763

00:30:53,909 --> 00:30:52,570

there's even a very new contrail being

764

00:30:56,280 --> 00:30:53,919

laid down and here that's rather faint

765

00:30:59,869 --> 00:30:56,290

to see but the predominant feature I

766

00:31:03,019 --> 00:30:59,879

wanted to show you is a river that goes

767

00:31:05,259 --> 00:31:03,029

through here and up to the north and

768

00:31:07,939 --> 00:31:05,269

eventually goes out into the Baltic Sea

769

00:31:11,019 --> 00:31:07,949

where it goes out into the Baltic Sea is

770

00:31:14,269 --> 00:31:11,029

close to the Polish town of Gdansk and

771

00:31:19,849 --> 00:31:14,279

this river starts down way to the south

772

00:31:22,279 --> 00:31:19,859

in the cap in mountains off the screen

773

00:31:24,229 --> 00:31:22,289

to the lower right is the capital of

774

00:31:27,259 --> 00:31:24,239

Warsaw we did capture it at least

775

00:31:30,979 --> 00:31:27,269

partially on another picture in the

776

00:31:34,189 --> 00:31:30,989

sequence the town of Toren is right in

777

00:31:37,069 --> 00:31:34,199

this area and the town of bromberg and

778

00:31:40,669 --> 00:31:37,079

that's the English version of the name

779

00:31:43,009 --> 00:31:40,679

of that town is done in here the

780

00:31:44,930 --> 00:31:43,019

interesting thing to point out in this

781

00:31:48,349 --> 00:31:44,940

picture however is if you look very

782

00:31:51,069 --> 00:31:48,359

closely at the river you actually see

783

00:31:54,949 --> 00:31:51,079

little white specks just in a very

784

00:31:57,379 --> 00:31:54,959

evenly spaced pattern along the river

785

00:32:00,439 --> 00:31:57,389

and we believe those to be the barge

786

00:32:03,409 --> 00:32:00,449

traffic flying back up and forth up and

787

00:32:10,399 --> 00:32:03,419

down the river a very unique site for us

788

00:32:11,989 --> 00:32:10,409

to be able to see well a little bit

789

00:32:16,099 --> 00:32:11,999

further off the east now we're into

790

00:32:20,869 --> 00:32:16,109

Turkey and this is the mountainous lake

791

00:32:23,959 --> 00:32:20,879

lake van and right next to it is a

792

00:32:27,199 --> 00:32:23,969

numerate lake it gave me all these great

793

00:32:30,159 --> 00:32:27,209

names to try to pronounce this lake is

794

00:32:32,719 --> 00:32:30,169

actually in the the cone of a volcano

795

00:32:35,209 --> 00:32:32,729

and there's a whole series of volcanoes

796

00:32:37,819 --> 00:32:35,219

that go up to the east to Mount Ararat

797

00:32:41,389 --> 00:32:37,829

which is off of this view and sliced

798

00:32:43,249 --> 00:32:41,399

back down across to the southwest these

799

00:32:46,579 --> 00:32:43,259

volcanoes are caused by the Saudi

800

00:32:48,859 --> 00:32:46,589

Arabian subcontinent common continental

801
00:32:52,039 --> 00:32:48,869
plates slamming up into into the Europe

802
00:32:53,359 --> 00:32:52,049
continent there is a town in the scene

803
00:32:56,209 --> 00:32:53,369
believe it or not it's right down here

804
00:33:00,019 --> 00:32:56,219
in this little bay it's called a tete

805
00:33:01,999 --> 00:33:00,029
van and let me see I guess the other

806
00:33:05,029 --> 00:33:02,009
thing to point out is that this region

807
00:33:08,629 --> 00:33:05,039
kind of separates two regions in Turkey

808
00:33:15,650 --> 00:33:08,639
the Armenian region to the north and the

809
00:33:20,460 --> 00:33:19,200
another unique site that we saw with a

810
00:33:24,470 --> 00:33:20,470
naked eye which was kind of surprising

811
00:33:28,200 --> 00:33:24,480
to us is this structure that goes across

812
00:33:29,880 --> 00:33:28,210
the plains of Russia you know if you can

813
00:33:31,800 --> 00:33:29,890

see it very well from out there but in

814

00:33:34,400 --> 00:33:31,810

particular this part stands out very

815

00:33:38,280 --> 00:33:34,410

well from my vantage point right here

816

00:33:40,050 --> 00:33:38,290

this is let me set the stage for you to

817

00:33:42,960 --> 00:33:40,060

the left over here would be the Volga

818

00:33:44,340 --> 00:33:42,970

River about 60 miles away and up in this

819

00:33:46,740 --> 00:33:44,350

direction would be the southern portion

820

00:33:51,540 --> 00:33:46,750

of the Ural Mountains so that would be

821

00:33:53,520 --> 00:33:51,550

putting a Kazakh Stein just to the lower

822

00:33:57,720 --> 00:33:53,530

right region of this view or maybe just

823

00:34:00,210 --> 00:33:57,730

off from it the interesting thing that

824

00:34:03,390 --> 00:34:00,220

I'm pointing out here however is a a

825

00:34:06,120 --> 00:34:03,400

windbreak or a shelter of some sort that

826
00:34:09,480 --> 00:34:06,130
has been established by the Russians we

827
00:34:11,310 --> 00:34:09,490
are assuming to cut down the soil

828
00:34:13,050 --> 00:34:11,320
erosion or things like that from the

829
00:34:19,350 --> 00:34:13,060
very strong winds that are predominant

830
00:34:22,290 --> 00:34:19,360
in this region we're always encouraged

831
00:34:25,050 --> 00:34:22,300
to try to keep in contact with natural

832
00:34:27,030 --> 00:34:25,060
as well as man-made causes of things

833
00:34:30,000 --> 00:34:27,040
that are detrimental to the environment

834
00:34:32,159 --> 00:34:30,010
and we were very fortunate to capture a

835
00:34:36,690 --> 00:34:32,169
nice picture of Mount Pinatubo and the

836
00:34:39,360 --> 00:34:36,700
Philippines this erupted back in 1991

837
00:34:42,990 --> 00:34:39,370
put out a tremendous amount of ash which

838
00:34:44,970 --> 00:34:43,000

caused the Americans to leave in a more

839

00:34:47,180 --> 00:34:44,980

expeditious fashion from Clark Air Force

840

00:34:49,110 --> 00:34:47,190

Base in Subic Bay and Philippines and

841

00:34:51,149 --> 00:34:49,120

let me see if I can figure out what

842

00:34:56,700 --> 00:34:51,159

Clark Air Force Base is it's going to be

843

00:35:00,040 --> 00:34:56,710

right down in this area and Subic Bay is

844

00:35:02,710 --> 00:35:00,050

where is it over here somewhere up here

845

00:35:05,109 --> 00:35:02,720

that it it's kind of hard to see from

846

00:35:08,079 --> 00:35:05,119

here but the main thing to point out is

847

00:35:10,710 --> 00:35:08,089

that there had been a very large typhoon

848

00:35:13,839 --> 00:35:10,720

in fact they call it a super typhoon

849

00:35:15,670 --> 00:35:13,849

Angela that had just gone across the

850

00:35:18,160 --> 00:35:15,680

Philippines about a week or so before we

851

00:35:21,130 --> 00:35:18,170

flew over the top of them and what

852

00:35:22,900 --> 00:35:21,140

you're seeing is a very large washing of

853

00:35:25,150 --> 00:35:22,910

the Ashley had been deposited from the

854

00:35:27,370 --> 00:35:25,160

eruption further down the slopes of the

855

00:35:29,800 --> 00:35:27,380

mountain and in fact this one right here

856

00:35:31,960 --> 00:35:29,810

caused a thousand people to be displaced

857

00:35:35,200 --> 00:35:31,970

from their temporary lodgings in this

858

00:35:36,640 --> 00:35:35,210

area this is something that the future

859

00:35:40,300 --> 00:35:36,650

shuttle crews will continue to monitor

860

00:35:41,680 --> 00:35:40,310

to see the impacts upon not only the

861

00:35:45,280 --> 00:35:41,690

people but the wildlife and vegetation

862

00:35:46,660 --> 00:35:45,290

in this area just going to show you a

863

00:35:50,170 --> 00:35:46,670

couple more slides going to take a run

864

00:35:55,510 --> 00:35:50,180

down the Rockies starting up in the

865

00:35:57,640 --> 00:35:55,520

north it's a lot of people ask what you

866

00:35:59,079 --> 00:35:57,650

can see from space especially with the

867

00:36:01,240 --> 00:35:59,089

light dusting of snow like this across

868

00:36:03,520 --> 00:36:01,250

the prairies it becomes very easy to see

869

00:36:06,099 --> 00:36:03,530

towns and the major roads that

870

00:36:10,180 --> 00:36:06,109

crisscross that part of the world this

871

00:36:12,160 --> 00:36:10,190

is Calgary here this is the bow river

872

00:36:14,950 --> 00:36:12,170

coming up from the south down to the

873

00:36:18,030 --> 00:36:14,960

south is drumheller and all of the

874

00:36:21,099 --> 00:36:18,040

tremendous dinosaur finds that are being

875

00:36:23,200 --> 00:36:21,109

excavated right now dinosaur eggs and in

876

00:36:25,750 --> 00:36:23,210

fact infant nests of dinosaurs all to

877

00:36:27,250 --> 00:36:25,760

the south to Calgary this is the

878

00:36:28,990 --> 00:36:27,260

foothills of the Rockies the Rockies

879

00:36:30,490 --> 00:36:29,000

just start right here on the left with

880

00:36:32,740 --> 00:36:30,500

the road leading up to banff and jasper

881

00:36:35,650 --> 00:36:32,750

and some pretty fine skiing up to the

882

00:36:37,450 --> 00:36:35,660

left here the winter olympics were in

883

00:36:39,160 --> 00:36:37,460

calgary just a few years ago and there's

884

00:36:40,930 --> 00:36:39,170

a huge ski jump just at the edge of the

885

00:36:42,520 --> 00:36:40,940

foothills as well and some smaller ski

886

00:36:44,559 --> 00:36:42,530

hills right on the left-hand side of

887

00:36:46,000 --> 00:36:44,569

calgary and have been able to ski in two

888

00:36:48,910 --> 00:36:46,010

years so i'm talking a lot about ski

889

00:36:50,800 --> 00:36:48,920

hills you and this road here is the main

890

00:36:52,569 --> 00:36:50,810

highway that leads straight up to

891

00:36:54,099 --> 00:36:52,579

Edmonton it's about the same distance in

892

00:36:58,830 --> 00:36:54,109

the same sort of highway as a heavy

893

00:37:05,820 --> 00:37:02,550

a little further on down comes to Great

894

00:37:07,860 --> 00:37:05,830

Salt Lake and it shows some man-made

895

00:37:09,660 --> 00:37:07,870

features really clearly this train

896

00:37:11,670 --> 00:37:09,670

bridge that cuts across Great Salt Lake

897

00:37:13,710 --> 00:37:11,680

has divided the waters of Great Salt

898

00:37:15,120 --> 00:37:13,720

Lake for several years and so they end

899

00:37:17,460 --> 00:37:15,130

up with an entirely different color it's

900

00:37:18,960 --> 00:37:17,470

very visible from space but apparently

901

00:37:20,550 --> 00:37:18,970

this train bridge is going to be

902

00:37:21,510 --> 00:37:20,560

dismantled in the near future so it's

903

00:37:23,490 --> 00:37:21,520

going to be interesting to watch the

904

00:37:26,490 --> 00:37:23,500

mixings of these two big sluggish bodies

905

00:37:27,780 --> 00:37:26,500

of water salt lake city is just down in

906

00:37:29,970 --> 00:37:27,790

the south here with the ring of

907

00:37:32,130 --> 00:37:29,980

mountains around it really dramatic

908

00:37:33,960 --> 00:37:32,140

setting up here are the Bonneville Salt

909

00:37:36,120 --> 00:37:33,970

Flats right there where all the land

910

00:37:38,010 --> 00:37:36,130

speed records have been set and if you

911

00:37:39,450 --> 00:37:38,020

look carefully you can see another man

912

00:37:41,670 --> 00:37:39,460

may feature cutting across the Great

913

00:37:49,410 --> 00:37:41,680

Salt desert here of i-80 the interstate

914

00:37:50,910 --> 00:37:49,420

80 cuttin right across and coming a

915

00:37:53,100 --> 00:37:50,920

little further down right on the border

916

00:37:57,750 --> 00:37:53,110

between the mountain and the plane is

917

00:37:59,670 --> 00:37:57,760

Colorado and right here is Denver if you

918

00:38:02,700 --> 00:37:59,680

look you can see the new airport just

919

00:38:05,520 --> 00:38:02,710

open recently outside of Denver to the

920

00:38:08,060 --> 00:38:05,530

north is a boulder colorado here again

921

00:38:12,300 --> 00:38:08,070

some great skin just over the left here

922

00:38:14,340 --> 00:38:12,310

and and down to the south colorado

923

00:38:15,870 --> 00:38:14,350

springs and down in the lower left

924

00:38:19,500 --> 00:38:15,880

corner with a little bit of snow on the

925

00:38:22,170 --> 00:38:19,510

top Pikes Peak and as a rookie on board

926

00:38:24,090 --> 00:38:22,180

it was absolutely amazing to be able to

927

00:38:27,060 --> 00:38:24,100

see the world every 92 minutes you know

928

00:38:28,710 --> 00:38:27,070

you hear about it but the world rolls by

929

00:38:30,600 --> 00:38:28,720

tremendously fast and it was just

930

00:38:32,340 --> 00:38:30,610

terrific to be able to see not only

931

00:38:34,110 --> 00:38:32,350

North America which I've seen most of

932

00:38:36,330 --> 00:38:34,120

flying airplanes around but to see all

933

00:38:37,650 --> 00:38:36,340

of Africa and to see Everest a dozen

934

00:38:39,930 --> 00:38:37,660

times it was just an incredible

935

00:38:41,940 --> 00:38:39,940

experience and another advantage of

936

00:38:43,500 --> 00:38:41,950

every 90 minutes is that you get to see

937

00:38:45,870 --> 00:38:43,510

the Sun Rise or set every 90 minutes

938

00:38:48,150 --> 00:38:45,880

another thing that amazed me from space

939

00:38:50,370 --> 00:38:48,160

was just how thin the atmosphere is I

940

00:38:52,890 --> 00:38:50,380

mean we were only a little over 200

941

00:38:54,810 --> 00:38:52,900

miles up and the atmosphere is way way

942

00:38:56,970 --> 00:38:54,820

below us it's just a finished of vales

943

00:38:59,310 --> 00:38:56,980

around the earth but looking through it

944

00:39:00,990 --> 00:38:59,320

what highlighted by a sunrise or a

945

00:39:03,300 --> 00:39:01,000

sunset you could see all the individual

946

00:39:05,460 --> 00:39:03,310

layers and some days it would just be

947

00:39:06,840 --> 00:39:05,470

kind of a gradual fade of colors and

948

00:39:09,360 --> 00:39:06,850

then some days like this one you'd

949

00:39:10,830 --> 00:39:09,370

actually see distinct bands and since we

950

00:39:11,320 --> 00:39:10,840

were to our orbit was tipped quite an

951

00:39:13,240 --> 00:39:11,330

angle to the

952

00:39:14,890 --> 00:39:13,250

sun the sunrises and sunsets lasted

953

00:39:17,080 --> 00:39:14,900

quite a while so it was just a beautiful

954

00:39:18,850 --> 00:39:17,090

thing to watch and everyone says that

955

00:39:20,530 --> 00:39:18,860

this picture doesn't do as justice it is

956

00:39:22,570 --> 00:39:20,540

just the most beautiful rainbow of