1
00:00:11,480 --> 00:00:09,169
well thanks for coming out today this is

2
00:00:13,129 --> 00:00:11,490
always I think the best part of what we

3
00:00:16,010 --> 00:00:13,139
can do is talk to everybody that works

4
00:00:18,470 --> 00:00:16,020
here at Johnson Space Center our family

5
00:00:21,140 --> 00:00:18,480
and friends because this is where really

6
00:00:22,880 --> 00:00:21,150
all a major portion of the work is

7
00:00:26,420 --> 00:00:22,890
accomplished for a space shuttle flight

8
00:00:28,009 --> 00:00:26,430
and we are happy to be here to tell you

9
00:00:30,140 --> 00:00:28,019
a little bit about it through our movie

10
00:00:31,429 --> 00:00:30,150
and slides before I do that let me go

11
00:00:33,950 --> 00:00:31,439
ahead and introduce the crew real

12
00:00:36,350 --> 00:00:33,960
briefly am i right is Terry will cut the

13
00:00:38,000 --> 00:00:36,360

pilot Terry is a Marine Corps pilot and

14
00:00:41,330 --> 00:00:38,010
it was from Kentucky and up being the

15
00:00:42,770 --> 00:00:41,340
first Kentucky and to fly in space next

16
00:00:46,760 --> 00:00:42,780
to him is Tom Jones our payload

17
00:00:49,100 --> 00:00:46,770
commander Tom flew on 59 the first fight

18
00:00:50,420 --> 00:00:49,110
of SRL as you know and it was very

19
00:00:53,119 --> 00:00:50,430
valuable member of our crew on this

20
00:00:56,150 --> 00:00:53,129
fight Steve Smith is next to him

21
00:00:59,689 --> 00:00:56,160
steve is ms1 he flew on his first

22
00:01:02,450 --> 00:00:59,699
spaceflight next to Steve is dan burisch

23
00:01:05,539 --> 00:01:02,460
is on his second flight as flew as ms2

24
00:01:08,060 --> 00:01:05,549
our flight engineer and on the end is

25
00:01:13,280 --> 00:01:08,070
Jeff wise off who's also flew is second

26
00:01:14,450 --> 00:01:13,290
flight on the srl too as ms3 and with

27
00:01:18,920 --> 00:01:14,460
that we'll just go ahead and start our

28
00:01:20,810 --> 00:01:18,930
movie and will narrate it as it goes the

29
00:01:22,580 --> 00:01:20,820
shuttle sitting out on the launchpad the

30
00:01:24,320 --> 00:01:22,590
night during the night time as we're

31
00:01:25,789 --> 00:01:24,330
sleeping and getting ready or some of us

32
00:01:29,810 --> 00:01:25,799
were sleeping I guess the blue shift was

33
00:01:31,580 --> 00:01:29,820
up and about they woke the red shift up

34
00:01:34,219 --> 00:01:31,590
about five hours before launch which is

35
00:01:34,789 --> 00:01:34,229
fairly standard we went in to have some

36
00:01:36,590 --> 00:01:34,799
breakfast

37
00:01:38,710 --> 00:01:36,600
when went to a weather briefing and then

38
00:01:41,060 --> 00:01:38,720

immediately went in to get our suits on

39
00:01:43,460 --> 00:01:41,070
of course in the suit room we checked

40
00:01:50,749 --> 00:01:43,470
the suits for pressure integrity there's

41
00:01:54,810 --> 00:01:50,759
Terry again Tom and he's the one in the

42
00:02:07,570 --> 00:02:05,499
Steve and Dan and Jeff and of course we

43
00:02:09,820 --> 00:02:07,580
take off from the crew quarters so

44
00:02:11,260 --> 00:02:09,830
fairly standard scene I guess jump on

45
00:02:12,790 --> 00:02:11,270
the Astro van and head out to the pad

46
00:02:15,130 --> 00:02:12,800
where we get onboard about two and a

47
00:02:17,830 --> 00:02:15,140
half hours before launch you'll see in

48
00:02:20,710 --> 00:02:17,840
just a second the water deluge coming

49
00:02:23,559 --> 00:02:20,720
down and the engine starting and this

50
00:02:26,740 --> 00:02:23,569
time starting for good

51
00:02:29,559 --> 00:02:26,750
a little twang and again when the solid

52
00:02:30,430 --> 00:02:29,569
rocket motors ignite you're going out of

53
00:02:33,370 --> 00:02:30,440
town very quickly

54
00:02:35,170 --> 00:02:33,380
it's a beautiful launch it felt great on

55
00:02:37,259 --> 00:02:35,180
board and jump right up to two and a

56
00:02:42,009 --> 00:02:37,269
half G's that our roll maneuver

57
00:02:44,289 --> 00:02:42,019
throttled down and had a very I guess

58
00:02:49,150 --> 00:02:44,299
nominal asset know what failure is any

59
00:02:51,670 --> 00:02:49,160
sort is very nice yes and the expression

60
00:02:53,259 --> 00:02:51,680
we were kicked off the pad as a as an

61
00:02:55,030 --> 00:02:53,269
accurate one there's a pretty

62
00:02:58,090 --> 00:02:55,040
spectacular view of us penetrating a

63
00:03:01,780 --> 00:02:58,100

cloud layer during asset you can see the

64
00:03:03,490 --> 00:03:01,790
reflection off the clouds and the dark

65
00:03:05,830 --> 00:03:03,500
line off to the left there is of course

66
00:03:07,000 --> 00:03:05,840
the shadow from our exhaust plume took

67
00:03:07,690 --> 00:03:07,010
us eight and a half minutes to get to

68
00:03:09,550 --> 00:03:07,700
space

69
00:03:13,569 --> 00:03:09,560
here come the sod rockets being kicked

70
00:03:20,140 --> 00:03:13,579
off the et if you watch carefully you

71
00:03:22,180 --> 00:03:20,150
can see their exhaust tail off and eight

72
00:03:23,560 --> 00:03:22,190
and a half minutes later after liftoff

73
00:03:31,030 --> 00:03:23,570
of course we get rid of the et tank and

74
00:03:32,949 --> 00:03:31,040
we're in space these pictures you can

75
00:03:34,300 --> 00:03:32,959
see the port door going open and it

76
00:03:36,880 --> 00:03:34,310
exposes the cargo bay and the space

77
00:03:39,430 --> 00:03:36,890
radar lab to earth for the first time

78
00:03:42,039 --> 00:03:39,440
and the largest lab side of antennas

79
00:03:43,660 --> 00:03:42,049
visible on the left at Circe XR is the

80
00:03:45,819 --> 00:03:43,670
tilted folded segment up against its

81
00:03:47,380 --> 00:03:45,829
upper right corner and the maps carbon

82
00:03:49,120 --> 00:03:47,390
monoxide pollution sensor is on the

83
00:03:51,160 --> 00:03:49,130
bridge structure at the forward end of

84
00:03:52,690 --> 00:03:51,170
the bay now inside we were activating

85
00:03:55,030 --> 00:03:52,700
ourselves - we got all our cameras out

86
00:03:57,550 --> 00:03:55,040
we had 14 cameras to document the radar

87
00:03:59,319 --> 00:03:57,560
science onboard and the maps pollution

88
00:04:00,610 --> 00:03:59,329

science there was a large lynn Hoff

89
00:04:03,640 --> 00:04:00,620
mapping camera and I'm holding a

90
00:04:05,920 --> 00:04:03,650
Hasselblad telephoto lens we took about

91
00:04:06,490 --> 00:04:05,930
14,000 shots to document the science

92
00:04:08,560 --> 00:04:06,500
onboard

93
00:04:11,020 --> 00:04:08,570
in addition to taking a lot of pictures

94
00:04:13,960 --> 00:04:11,030
we changed out tapes on board which

95
00:04:16,120 --> 00:04:13,970
recorded the data this radar puts out

96
00:04:18,430 --> 00:04:16,130
enough information it's like 45 TV

97
00:04:20,380 --> 00:04:18,440
channels broadcasting at once and by the

98
00:04:22,660 --> 00:04:20,390
end of the flight we had enough data

99
00:04:25,060 --> 00:04:22,670
that could have equivalent to floppy

100
00:04:26,470 --> 00:04:25,070
disks stacked up 15 miles high so it was

101
00:04:28,420 --> 00:04:26,480
quite a quite amount of data that we

102
00:04:30,490 --> 00:04:28,430
brought back one of the recorders uh

103
00:04:32,200 --> 00:04:30,500
failed in flight so we had to change it

104
00:04:38,320 --> 00:04:32,210
out this is the failed recorder getting

105
00:04:40,510 --> 00:04:38,330
ready to be put back under the floor now

106
00:04:41,980 --> 00:04:40,520
the radar need to be pointed while we

107
00:04:44,440 --> 00:04:41,990
were up there in the right direction to

108
00:04:46,120 --> 00:04:44,450
all the the sites on the ground Here I

109
00:04:48,850 --> 00:04:46,130
am typing in one of the 400-plus

110
00:04:50,140 --> 00:04:48,860
maneuvers that it took each shift ended

111
00:04:52,420 --> 00:04:50,150
up doing about eleven thousand

112
00:04:54,400 --> 00:04:52,430
keystrokes this is a view that we didn't

113
00:04:56,080 --> 00:04:54,410

see too often about every 24 hours we

114
00:04:58,060 --> 00:04:56,090
had to point the star trackers which are

115
00:05:00,520 --> 00:04:58,070
located on the nose of the shuttle

116
00:05:04,090 --> 00:05:00,530
towards the stars to align our inertial

117
00:05:07,090 --> 00:05:04,100
measurement units on board and here we

118
00:05:13,000 --> 00:05:07,100
are coasting down traveling southeast

119
00:05:15,490 --> 00:05:13,010
over India the west west coast of India

120
00:05:17,530 --> 00:05:15,500
once we get the radar set up and ready

121
00:05:19,540 --> 00:05:17,540
to go it's ready to start taking data

122
00:05:21,250 --> 00:05:19,550
and the next scene that you're gonna see

123
00:05:23,050 --> 00:05:21,260
is a picture of us passing over the

124
00:05:24,820 --> 00:05:23,060
Sahara Desert as you can see that to the

125
00:05:26,409 --> 00:05:24,830
eye it doesn't look very like there many

126
00:05:27,460 --> 00:05:26,419
features but when you turn the radar on

127
00:05:28,510 --> 00:05:27,470
this is what the radar can see

128
00:05:31,120 --> 00:05:28,520
underneath the ground or ancient

129
00:05:32,560 --> 00:05:31,130
riverbeds and that was part of our study

130
00:05:34,030 --> 00:05:32,570
this was a geological site that we

131
00:05:35,650 --> 00:05:34,040
wouldn't understand the history of how

132
00:05:37,600 --> 00:05:35,660
the Sahara Desert became what it is

133
00:05:38,800 --> 00:05:37,610
today because obviously it's climate in

134
00:05:43,180 --> 00:05:38,810
the past must have been very different

135
00:05:44,380 --> 00:05:43,190
to have these riverbeds underneath now

136
00:05:46,270 --> 00:05:44,390
we were looking into Earth's past

137
00:05:47,920 --> 00:05:46,280
history here in the Sahara but we also

138
00:05:50,470 --> 00:05:47,930

got a chance to see some of the dynamic

139
00:05:52,300 --> 00:05:50,480
geology going on on earth on launch day

140
00:05:55,240 --> 00:05:52,310
the clue chips quarry volcano erupted on

141
00:05:56,830 --> 00:05:55,250
up on Kamchatka and you can see the ash

142
00:05:59,170 --> 00:05:56,840
and smoke plume going up over 50

143
00:06:00,550 --> 00:05:59,180
thousand feet here from this nadir view

144
00:06:02,350 --> 00:06:00,560
you can even make out the lava flows

145
00:06:04,330 --> 00:06:02,360
going down the snow-covered sides of the

146
00:06:06,130 --> 00:06:04,340
volcano and that ash plume was blown by

147
00:06:08,560 --> 00:06:06,140
the jet stream well out to the east

148
00:06:10,630 --> 00:06:08,570
several hundred miles downstream and the

149
00:06:12,700 --> 00:06:10,640
the site of this plume blowing downwind

150
00:06:14,290 --> 00:06:12,710
was really amazing each day when we came

151
00:06:16,440 --> 00:06:14,300
up over the horizon and saw this plume

152
00:06:18,430 --> 00:06:16,450
waiting for us over Kamchatka and

153
00:06:20,260 --> 00:06:18,440
volcanoes were an important part of our

154
00:06:21,670 --> 00:06:20,270
studies onboard we're looking at

155
00:06:24,130 --> 00:06:21,680
fifteen dangerous ones around the world

156
00:06:26,620 --> 00:06:24,140
that in danger of populated areas after

157
00:06:28,180 --> 00:06:26,630
a snowfall food chefs coy was almost

158
00:06:30,040 --> 00:06:28,190
pristine again you couldn't even tell

159
00:06:32,650 --> 00:06:30,050
that it had erupted but in our rate

160
00:06:34,780 --> 00:06:32,660
radar data here you can see in this

161
00:06:36,700 --> 00:06:34,790
false color image the ash colored in red

162
00:06:38,620 --> 00:06:36,710
on the mountain slopes the lime-green

163
00:06:40,900 --> 00:06:38,630

lava flow that was freshly generated

164
00:06:43,420 --> 00:06:40,910
during our flight coming down sloped

165
00:06:45,220 --> 00:06:43,430
towards the Kamchatka River Valley and I

166
00:06:47,680 --> 00:06:45,230
had actually brought up a small volcanic

167
00:06:49,780 --> 00:06:47,690
rock on board to give a little talk

168
00:06:52,090 --> 00:06:49,790
about our volcanic studies and we hoped

169
00:06:53,260 --> 00:06:52,100
by unraveling the past eruptive

170
00:06:58,120 --> 00:06:53,270
histories of these mountains to tell you

171
00:07:00,400 --> 00:06:58,130
about the future hazards of them we

172
00:07:02,740 --> 00:07:00,410
worked 24 hours around the clock up

173
00:07:05,350 --> 00:07:02,750
there and this is two out of the three

174
00:07:08,020 --> 00:07:05,360
people on the blue shift with Tom on the

175
00:07:11,590 --> 00:07:08,030
Left myself on the right and Steve Smith

176
00:07:13,930 --> 00:07:11,600
is the one out of that picture here we

177
00:07:16,060 --> 00:07:13,940
are coming over Australia it was clear

178
00:07:18,310 --> 00:07:16,070
although several fires and we would

179
00:07:19,870 --> 00:07:18,320
point out these fires and indicate when

180
00:07:21,280 --> 00:07:19,880
there were fires so the maps instrument

181
00:07:22,810 --> 00:07:21,290
could correlate that to their

182
00:07:25,120 --> 00:07:22,820
measurements of carbon monoxide that

183
00:07:28,360 --> 00:07:25,130
they were making here we are coming over

184
00:07:30,460 --> 00:07:28,370
the Philippine Islands and this is three

185
00:07:33,190 --> 00:07:30,470
times normal speed so we really don't go

186
00:07:34,630 --> 00:07:33,200
that fast and you can see the

187
00:07:35,830 --> 00:07:34,640
reflections off the water we can

188
00:07:37,690 --> 00:07:35,840

actually see several hundred feet

189
00:07:40,000 --> 00:07:37,700
beneath the surface because of what

190
00:07:41,890 --> 00:07:40,010
these internal waves do to the surface

191
00:07:43,210 --> 00:07:41,900
of the water you can't detect with the

192
00:07:45,940 --> 00:07:43,220
naked eye but you can with the

193
00:07:48,250 --> 00:07:45,950
reflections and yet continue the blue

194
00:07:50,170 --> 00:07:48,260
team's explanation of what we saw here

195
00:07:51,610 --> 00:07:50,180
welcomes you to the rooftop of the world

196
00:07:54,160 --> 00:07:51,620
that's what this areas call this is

197
00:07:55,870 --> 00:07:54,170
Tibet even the valleys in this area are

198
00:07:57,790 --> 00:07:55,880
fifteen to twenty thousand feet above

199
00:08:00,010 --> 00:07:57,800
sea level this was one of the beautiful

200
00:08:01,900 --> 00:08:00,020
sites we saw the blue team saw the earth

201
00:08:03,460 --> 00:08:01,910
lit from Europe all the way through New

202
00:08:05,410 --> 00:08:03,470
Zealand this was always one of our

203
00:08:08,170 --> 00:08:05,420
personal favourites to see the beautiful

204
00:08:09,730 --> 00:08:08,180
iceberg colored Lakes up in the Tibetan

205
00:08:12,070 --> 00:08:09,740
Highlands and you see off in the

206
00:08:15,370 --> 00:08:12,080
distance there is the Himalayas and past

207
00:08:17,410 --> 00:08:15,380
that is India as Tom said we took 14,000

208
00:08:19,720 --> 00:08:17,420
pictures have kept us very busy it was

209
00:08:21,010 --> 00:08:19,730
often a competition to get to any

210
00:08:22,270 --> 00:08:21,020
certain window this is Dan looking out

211
00:08:23,530 --> 00:08:22,280
the commander's window we were rolled

212
00:08:25,330 --> 00:08:23,540
slightly so the commander's window

213
00:08:28,020 --> 00:08:25,340

looked at earth it was always nice to be

214
00:08:31,270 --> 00:08:28,030
able to pass the cameras so easily

215
00:08:32,920 --> 00:08:31,280
we always had time for a little bit of

216
00:08:33,820 --> 00:08:32,930
fun as we prepared our meals here this

217
00:08:35,470 --> 00:08:33,830
is a way

218
00:08:37,080 --> 00:08:35,480
our meals were packed this is me

219
00:08:39,250 --> 00:08:37,090
bringing up the lunch tray here and

220
00:08:41,050 --> 00:08:39,260
showing Tom and Dan what they could have

221
00:08:43,450 --> 00:08:41,060
we often ate on the fly for lunch

222
00:08:45,370 --> 00:08:43,460
very quickly we did have more time for

223
00:08:46,960 --> 00:08:45,380
dinner before we went to sleep we often

224
00:08:48,910 --> 00:08:46,970
went down downstairs which we call the

225
00:08:50,920 --> 00:08:48,920
mid-deck that's Dan eating dinner on the

226
00:08:52,870 --> 00:08:50,930
ceiling that me on the left and Tom

227
00:08:57,070 --> 00:08:52,880
doing a last minute film change before

228
00:08:59,860 --> 00:08:57,080
we went to sleep everybody knows that

229
00:09:01,450 --> 00:08:59,870
Mike Baker is so cool calm and collect

230
00:09:03,310 --> 00:09:01,460
it's really hard to spin them up so this

231
00:09:06,820 --> 00:09:03,320
is the only way I've found on-orbit to

232
00:09:10,720 --> 00:09:06,830
do it behind us there you see the sleep

233
00:09:12,700 --> 00:09:10,730
bunks that we used I couldn't quite get

234
00:09:15,070 --> 00:09:12,710
into it the same way that I learned as I

235
00:09:17,230 --> 00:09:15,080
was growing up and takes a while to

236
00:09:19,330 --> 00:09:17,240
practice to do it without banging your

237
00:09:24,220 --> 00:09:19,340
head too much but it was nice to have

238
00:09:25,960 --> 00:09:24,230

those and well even though the shuttle

239
00:09:29,560 --> 00:09:25,970
was designed to be autonomous you never

240
00:09:31,450 --> 00:09:29,570
can quite escape the ground nor would we

241
00:09:33,730 --> 00:09:31,460
want to this is how we started every

242
00:09:35,470 --> 00:09:33,740
shift and we'd get a new attitude

243
00:09:37,660 --> 00:09:35,480
timeline science timeline up from the

244
00:09:39,760 --> 00:09:37,670
ground and has changes to the flight

245
00:09:41,890 --> 00:09:39,770
plan like Dan said earlier we had over

246
00:09:44,200 --> 00:09:41,900
400 maneuvers we had to manually type in

247
00:09:48,690 --> 00:09:44,210
and that equated to over 22,000

248
00:09:53,140 --> 00:09:51,400
every night pass which was half our time

249
00:09:54,550 --> 00:09:53,150
up there we would spend going over the

250
00:09:56,080 --> 00:09:54,560
flight plan seeing what secondary

251
00:09:59,770 --> 00:09:56,090
activities we had to do and also

252
00:10:01,270 --> 00:09:59,780
reviewing the our onboard maps to study

253
00:10:03,400 --> 00:10:01,280
what land sites were going to pass over

254
00:10:04,900 --> 00:10:03,410
this upcoming scene you'll be able to

255
00:10:06,520 --> 00:10:04,910
tell that this is a California past

256
00:10:09,750 --> 00:10:06,530
because you can watch our commander get

257
00:10:12,520 --> 00:10:09,760
ready to take pictures of his home state

258
00:10:13,180 --> 00:10:12,530
they say getting fairly excited here cuz

259
00:10:15,370 --> 00:10:13,190
we're getting ready to go over

260
00:10:18,370 --> 00:10:15,380
California this is San Francisco Bay

261
00:10:20,790 --> 00:10:18,380
Area San Jose see the Sacramento area

262
00:10:22,630 --> 00:10:20,800
here the Central Valley of California

263
00:10:26,560 --> 00:10:22,640

down here at the very bottom of the

264
00:10:28,180 --> 00:10:26,570
screen is Monterey Bay and right in here

265
00:10:29,650 --> 00:10:28,190
somewhere is Fresno and L'Amour's where

266
00:10:31,770 --> 00:10:29,660
I'm from the top you can see the

267
00:10:34,390 --> 00:10:31,780
snow-capped Sierra Nevada mountains and

268
00:10:37,120 --> 00:10:34,400
then pretty soon here you'll see this V

269
00:10:38,770 --> 00:10:37,130
is the San Andreas Fault and the Garlock

270
00:10:42,820 --> 00:10:38,780
fault that come together right here and

271
00:10:45,819 --> 00:10:42,830
right in there is Edward's lake bed and

272
00:10:50,110 --> 00:10:45,829
then you'll be able see Los Angeles and

273
00:10:51,999 --> 00:10:50,120
jpo it was right in this area San Diego

274
00:10:54,910 --> 00:10:52,009
right there at the top of the screen is

275
00:10:57,389 --> 00:10:54,920
a Salton Sea and this light brown area

276
00:11:00,129 --> 00:10:57,399
see in there is a large plankton bloom a

277
00:11:02,379 --> 00:11:00,139
large awkward agricultural area in the

278
00:11:05,220 --> 00:11:02,389
Colorado River Basin and the Colorado

279
00:11:07,780 --> 00:11:05,230
River Delta that opens up into Baja and

280
00:11:11,980 --> 00:11:07,790
of course on the bottom of the screen is

281
00:11:14,199 --> 00:11:11,990
the Baja California and then you can see

282
00:11:16,059 --> 00:11:14,209
as we look back over the past that we

283
00:11:21,579 --> 00:11:16,069
just made you can see by extending off

284
00:11:23,410 --> 00:11:21,589
into the north this is the Chesapeake

285
00:11:25,179 --> 00:11:23,420
Bay area you can see Baltimore up here

286
00:11:25,929 --> 00:11:25,189
in Washington's just going off the

287
00:11:28,389 --> 00:11:25,939
screen there

288
00:11:30,100 --> 00:11:28,399

here's Potomac coming up to the

289
00:11:31,569 --> 00:11:30,110
Washington area this area is very

290
00:11:34,059 --> 00:11:31,579
important because it acts as a nursery

291
00:11:37,150 --> 00:11:34,069
for fish and one of our prime sites was

292
00:11:39,790 --> 00:11:37,160
to study the Gulf Stream just off of the

293
00:11:42,009 --> 00:11:39,800
shore of Eastern Virginia and as we

294
00:11:45,009 --> 00:11:42,019
passed down here you can now see Norfolk

295
00:11:47,590 --> 00:11:45,019
Virginia my hometown and our mouth sound

296
00:11:48,759 --> 00:11:47,600
and down here is Cape Hatteras and of

297
00:11:50,799 --> 00:11:48,769
course Kitty Hawk where the great

298
00:11:53,049 --> 00:11:50,809
adventure started is just down there so

299
00:11:55,030 --> 00:11:53,059
this is a nice view looking south going

300
00:11:56,319 --> 00:11:55,040
off the coast and just off the coast you

301
00:11:57,490 --> 00:11:56,329
would be the Gulf Stream area which we

302
00:12:04,059 --> 00:11:57,500
would study and Sun glint with our

303
00:12:06,639 --> 00:12:04,069
cameras this is a picture of a South

304
00:12:08,799 --> 00:12:06,649
America looking north along the Andes

305
00:12:10,629 --> 00:12:08,809
this particular area here is what we

306
00:12:12,790 --> 00:12:10,639
used is kind of our visual aid and

307
00:12:15,040 --> 00:12:12,800
helping locate where we were Coquimbo

308
00:12:17,139 --> 00:12:15,050
Chile is right in that bite along the

309
00:12:18,069 --> 00:12:17,149
coast and as you cross over the Andes

310
00:12:19,299 --> 00:12:18,079
here it almost looks very

311
00:12:21,160 --> 00:12:19,309
three-dimensional there were a number of

312
00:12:25,119 --> 00:12:21,170
mountains and volcanoes that were of

313
00:12:26,559 --> 00:12:25,129

interest as geology sites primary

314
00:12:28,720 --> 00:12:26,569
pellets we also had several experiments

315
00:12:30,939 --> 00:12:28,730
in the crew cabin here I am setting up a

316
00:12:33,189 --> 00:12:30,949
100-pound chair which is very easy to

317
00:12:35,559 --> 00:12:33,199
manipulate in space for ahead and I move

318
00:12:38,110 --> 00:12:35,569
an experiment here terry has a laser

319
00:12:39,790 --> 00:12:38,120
mounted to his head and he and I both

320
00:12:42,489 --> 00:12:39,800
did this experiment where we moved the

321
00:12:45,040 --> 00:12:42,499
laser to follow a target that was on the

322
00:12:47,499 --> 00:12:45,050
forward bulkhead and again it was to to

323
00:12:49,030 --> 00:12:47,509
judge how well our eyes were working

324
00:12:50,499 --> 00:12:49,040
with our head movements and we actually

325
00:12:52,360 --> 00:12:50,509
saw some degradation during space that's

326
00:12:54,340 --> 00:12:52,370
the target on the forward bulkhead we

327
00:12:56,619 --> 00:12:54,350
also had to do daily maintenance to

328
00:12:58,389 --> 00:12:56,629
clean out filters anything that's loose

329
00:12:59,350 --> 00:12:58,399
flying within the shuttle actually ends

330
00:13:00,910 --> 00:12:59,360
up on these filters

331
00:13:02,110 --> 00:13:00,920
they draw the air to them that's the

332
00:13:04,180 --> 00:13:02,120
commercial protein crystal growth

333
00:13:06,400 --> 00:13:04,190
experiment growing crystals of an

334
00:13:07,720 --> 00:13:06,410
anti-cancer drug so we just use great

335
00:13:13,030 --> 00:13:07,730
tape to clean all those filters every

336
00:13:16,389 --> 00:13:13,040
day well here I am caught again playing

337
00:13:17,500 --> 00:13:16,399
with my food actually if you'll watch

338
00:13:19,750 --> 00:13:17,510

this you'll see some pretty interesting

339
00:13:21,940 --> 00:13:19,760
fluid dynamics and of course what I'm

340
00:13:34,300 --> 00:13:21,950
trying to do is keep that tropical punch

341
00:13:36,280 --> 00:13:34,310
off my shirt success here's an exercise

342
00:13:38,110 --> 00:13:36,290
period baeksan Jeff if you look

343
00:13:44,440 --> 00:13:38,120
carefully you'll notice that baek's is

344
00:13:47,050 --> 00:13:44,450
the only one with an ergometer and

345
00:13:49,660 --> 00:13:47,060
here's Jeff with a model of the Starship

346
00:13:51,250 --> 00:13:49,670
Enterprise and also Molly's shuttle he

347
00:13:52,630 --> 00:13:51,260
took these up there because he knew that

348
00:13:59,620 --> 00:13:52,640
was the only thing baek's and I work is

349
00:14:01,329 --> 00:13:59,630
gonna let him fly here's Terry and I

350
00:14:03,850 --> 00:14:01,339
coming up to the flight deck to get

351
00:14:05,680 --> 00:14:03,860
ready to do one of the 14 trim burns

352
00:14:09,280 --> 00:14:05,690
that we did for the interferometry data

353
00:14:10,990 --> 00:14:09,290
takes towards the end of the mission Dan

354
00:14:13,509 --> 00:14:11,000
put together a nice procedure along with

355
00:14:14,980 --> 00:14:13,519
the help of the photos to get these

356
00:14:17,769 --> 00:14:14,990
burns turned down to an unprecedented

357
00:14:21,430 --> 00:14:17,779
accuracy of about 0.05 feet per second

358
00:14:24,490 --> 00:14:21,440
for the Delta V goes and we were able to

359
00:14:26,530 --> 00:14:24,500
successfully perform those burns and get

360
00:14:29,350 --> 00:14:26,540
the orbiter to within 200 feet of where

361
00:14:31,600 --> 00:14:29,360
it was the day before and also within

362
00:14:34,180 --> 00:14:31,610
200 feet of where the endeavour was in

363
00:14:37,180 --> 00:14:34,190

April on the first flight of srl it's

364
00:14:39,370 --> 00:14:37,190
pretty a remarkable feat I think this is

365
00:14:43,180 --> 00:14:39,380
an example of what the acceleration of

366
00:14:47,439 --> 00:14:43,190
the plus X Jets will do to the folks on

367
00:14:49,540 --> 00:14:47,449
the mid-deck we put together the images

368
00:14:51,460 --> 00:14:49,550
from last April in October over Long

369
00:14:53,019 --> 00:14:51,470
Valley California an old volcanic crater

370
00:14:54,460 --> 00:14:53,029
in California to make this

371
00:14:56,019 --> 00:14:54,470
three-dimensional topographic map the

372
00:14:57,579 --> 00:14:56,029
whole objective of this interferometry

373
00:14:59,920 --> 00:14:57,589
experiment and this this is digital

374
00:15:01,720 --> 00:14:59,930
topography made from the radar without

375
00:15:04,750 --> 00:15:01,730
any contour elevations from the ground

376
00:15:06,670 --> 00:15:04,760
now the radar was cooking throughout the

377
00:15:07,900 --> 00:15:06,680
whole 10 or 11 days of science but

378
00:15:09,910 --> 00:15:07,910
eventually we started to run out of film

379
00:15:11,290 --> 00:15:09,920
here it is piling up exposed in our

380
00:15:13,000 --> 00:15:11,300
storage bags on board

381
00:15:14,379 --> 00:15:13,010
and when we ran down out of film

382
00:15:15,790 --> 00:15:14,389
the radar was also running down its

383
00:15:17,439 --> 00:15:15,800
investigations there's Mike and Jeff

384
00:15:20,800 --> 00:15:17,449
wave and goodbye from the crew cabin and

385
00:15:22,689 --> 00:15:20,810
while the Sun was setting on SRL 2 we

386
00:15:25,689 --> 00:15:22,699
were also getting ourselves set up to

387
00:15:27,879 --> 00:15:25,699
come back for entry day hopefully to

388
00:15:29,620 --> 00:15:27,889

Florida but we wound up in California as

389
00:15:32,620 --> 00:15:29,630
you can see we've turned our orbiting

390
00:15:34,509 --> 00:15:32,630
laboratory into a reentry vehicle and

391
00:15:37,030 --> 00:15:34,519
also an airplane Jeff on the right there

392
00:15:38,800 --> 00:15:37,040
there's a shot towards baixo you see out

393
00:15:41,319 --> 00:15:38,810
the window the glow the atmosphere as we

394
00:15:44,129 --> 00:15:41,329
start to re-enter and the hot plasma

395
00:15:47,050 --> 00:15:44,139
gases as they come over the orbiter

396
00:15:48,819 --> 00:15:47,060
periodically meet at overhead and cause

397
00:15:50,740 --> 00:15:48,829
bright flashes there's looking over at

398
00:15:54,009 --> 00:15:50,750
Terry's shoulder on the right hand side

399
00:15:57,280 --> 00:15:54,019
the pilot and see the sunset there and

400
00:15:58,930 --> 00:15:57,290
there it's baek's flying at this point

401
00:16:01,439 --> 00:15:58,940
now we take over manually at about

402
00:16:03,819 --> 00:16:01,449
50,000 feet overhead the runway and

403
00:16:06,280 --> 00:16:03,829
flight around the heading line of cone

404
00:16:09,519 --> 00:16:06,290
and here you see us turning on the final

405
00:16:11,199 --> 00:16:09,529
just prior to doing our subsonic DTO our

406
00:16:12,819 --> 00:16:11,209
flight test there's a little wing rock

407
00:16:16,960 --> 00:16:12,829
which is about all the motion that you

408
00:16:20,139 --> 00:16:16,970
see out of the aileron doublet in yaw

409
00:16:22,689 --> 00:16:20,149
doublet that we did coming down 18

410
00:16:24,309 --> 00:16:22,699
degree glide path at 300 knots at 2,000

411
00:16:25,960 --> 00:16:24,319
feet we performed the pre flare to

412
00:16:28,389 --> 00:16:25,970
reduce our glide path to about one and a

413
00:16:31,509 --> 00:16:28,399

half degrees 300 feet Terry put the gear

414
00:16:35,949 --> 00:16:31,519
down and we crossed the threshold at

415
00:16:37,780 --> 00:16:35,959
about 235 knots and 35 feet looking for

416
00:16:40,420 --> 00:16:37,790
a touchdown about 200 we touched down at

417
00:16:42,699 --> 00:16:40,430
195 about one foot per second on the

418
00:16:44,350 --> 00:16:42,709
sync rate and we were also doing the

419
00:16:46,480 --> 00:16:44,360
drag chute flight test so we put the

420
00:16:47,129 --> 00:16:46,490
chute out immediately on main gear

421
00:16:51,340 --> 00:16:47,139
touchdown

422
00:16:53,230 --> 00:16:51,350
and a lot of to fully deploy and from

423
00:16:55,930 --> 00:16:53,240
touchdown to the start of the rotation

424
00:16:58,480 --> 00:16:55,940
was about 15 knots started the D

425
00:17:03,250 --> 00:16:58,490
rotation got the nose on the ground

426
00:17:05,980 --> 00:17:03,260
about 130 knots and started braking

427
00:17:07,510 --> 00:17:05,990
about 80 knots and at 60 knots you'll

428
00:17:10,179 --> 00:17:07,520
see in a second we'll jettison the chute

429
00:17:12,520 --> 00:17:10,189
and came to a stop about 12,000 feet

430
00:17:16,210 --> 00:17:12,530
down the runway with 3,000 feet

431
00:17:17,980 --> 00:17:16,220
remaining it's a great flying machine it

432
00:17:18,730 --> 00:17:17,990
was a joy to fly on this mission to

433
00:17:21,819 --> 00:17:18,740
Planet Earth

434
00:17:24,530 --> 00:17:21,829
and it was landing was a nice ending to

435
00:17:35,690 --> 00:17:24,540
a successful mission

436
00:17:38,210 --> 00:17:35,700
thank you we have we now have a set of

437
00:17:44,420 --> 00:17:38,220
slides to show you and I guess time you

438
00:17:45,680 --> 00:17:44,430

can start off srl too and you're

439
00:17:47,540 --> 00:17:45,690
probably familiar somewhat with it

440
00:17:50,230 --> 00:17:47,550
already from last spring's flight the

441
00:17:53,720 --> 00:17:50,240
large flat array of antennas is from the

442
00:17:55,730 --> 00:17:53,730
Circe element built by JPL a synthetic

443
00:17:57,980 --> 00:17:55,740
aperture radar that includes both C and

444
00:17:59,930 --> 00:17:57,990
L ban wavelengths the set tilting

445
00:18:01,700 --> 00:17:59,940
motorized portion up here is the expan

446
00:18:04,220 --> 00:18:01,710
antenna built by the German and Italian

447
00:18:05,780 --> 00:18:04,230
space agencies and both of these

448
00:18:07,970 --> 00:18:05,790
operated in concert at three different

449
00:18:10,310 --> 00:18:07,980
wavelengths to scan the Earth's

450
00:18:13,100 --> 00:18:10,320
environment at the surface and looking

451
00:18:14,630 --> 00:18:13,110
at the atmosphere forward was the Maps

452
00:18:16,250 --> 00:18:14,640
experiment on its fourth space flight

453
00:18:18,680 --> 00:18:16,260
aboard the shuttle measurement of air

454
00:18:20,840 --> 00:18:18,690
pollution from satellites which was

455
00:18:23,810 --> 00:18:20,850
designed to track sources and transport

456
00:18:26,240 --> 00:18:23,820
of carbon monoxide around the planet it

457
00:18:27,920 --> 00:18:26,250
tells us about the carbon cycle and the

458
00:18:30,530 --> 00:18:27,930
input of trace gases that might be

459
00:18:31,940 --> 00:18:30,540
important to global warming and Langley

460
00:18:36,370 --> 00:18:31,950
Research Center built this experiment

461
00:18:38,900 --> 00:18:36,380
and it operated very successfully next

462
00:18:41,270 --> 00:18:38,910
now inside while the instruments were

463
00:18:43,520 --> 00:18:41,280

doing their tasks under ground command

464
00:18:45,440 --> 00:18:43,530
the crew was operating all its cameras

465
00:18:47,510 --> 00:18:45,450
full-time during the daylight passes and

466
00:18:49,250 --> 00:18:47,520
here's Terry with all four of our

467
00:18:50,960 --> 00:18:49,260
Hasselblad cameras each of which had a

468
00:18:53,540 --> 00:18:50,970
lens of a different focal length or film

469
00:18:55,490 --> 00:18:53,550
type and here's the large lynn hoffman

470
00:18:58,010 --> 00:18:55,500
camera we had two of those that were

471
00:19:00,110 --> 00:18:58,020
locked into our bracket pointing where

472
00:19:02,300 --> 00:19:00,120
the radar was so in many cases when we

473
00:19:04,220 --> 00:19:02,310
didn't have field teams on the Earth's

474
00:19:06,560 --> 00:19:04,230
surface documenting the truth of the

475
00:19:07,970 --> 00:19:06,570
radars data we had the cameras on board

476
00:19:09,800 --> 00:19:07,980
providing that ground truth to the

477
00:19:12,470 --> 00:19:09,810
science teams so we were an important

478
00:19:14,570 --> 00:19:12,480
source of correlative or documentary

479
00:19:16,040 --> 00:19:14,580
information for the science to prove

480
00:19:20,510 --> 00:19:16,050
that the radar was giving accurate data

481
00:19:22,430 --> 00:19:20,520
to the scientists well as Tom mentioned

482
00:19:24,350 --> 00:19:22,440
one of the important jobs we had was to

483
00:19:27,020 --> 00:19:24,360
try to document what the radar was

484
00:19:29,690 --> 00:19:27,030
looking at this is myself and one of the

485
00:19:31,550 --> 00:19:29,700
eff overhead windows getting ready to

486
00:19:32,780 --> 00:19:31,560
use two of our Hasselblad cameras just

487
00:19:33,860 --> 00:19:32,790
to give you a feel as we go through

488
00:19:36,080 --> 00:19:33,870

these slides of kind of what you're

489
00:19:38,000 --> 00:19:36,090
looking at this camera here with the

490
00:19:40,010 --> 00:19:38,010
hundred millimeter lens two

491
00:19:41,690 --> 00:19:40,020
they had a field of view of about 66

492
00:19:43,520 --> 00:19:41,700
nautical miles so when you see some of

493
00:19:45,440 --> 00:19:43,530
those you'll get an idea of the scale

494
00:19:48,290 --> 00:19:45,450
whereas this lens here with the 250

495
00:19:50,810 --> 00:19:48,300
millimeter would zoom in to about a 26

496
00:19:52,580 --> 00:19:50,820
nautical mile radius that you're looking

497
00:19:54,520 --> 00:19:52,590
at and so we use these these cameras as

498
00:19:57,050 --> 00:19:54,530
well as a wider angle camera to document

499
00:19:58,370 --> 00:19:57,060
most of the photographs we also as Tom

500
00:19:59,990 --> 00:19:58,380
mentioned had a Lin HOF camera which

501
00:20:03,070 --> 00:20:00,000
allowed us to get some wider format

502
00:20:05,240 --> 00:20:03,080
pictures as well next slide please

503
00:20:07,640 --> 00:20:05,250
well of course you've got to show your

504
00:20:09,800 --> 00:20:07,650
hometown this is Norfolk Virginia one

505
00:20:11,720 --> 00:20:09,810
reason for showing it is appears Langley

506
00:20:14,180 --> 00:20:11,730
which was the sponsor of the Maps

507
00:20:15,740 --> 00:20:14,190
instrument which worked superbly off

508
00:20:18,080 --> 00:20:15,750
through the flight monitoring the carbon

509
00:20:19,640 --> 00:20:18,090
monoxide around the world right here you

510
00:20:21,920 --> 00:20:19,650
can see the ship piers along the Norfolk

511
00:20:24,080 --> 00:20:21,930
Naval Base and as you come in here you

512
00:20:25,580 --> 00:20:24,090
go up to the James River this is the

513
00:20:27,410 --> 00:20:25,590

Elizabeth River that comes down to

514
00:20:29,750 --> 00:20:27,420
downtown Norfolk and then the Lafayette

515
00:20:31,340 --> 00:20:29,760
River scoots off to the side here if you

516
00:20:32,960 --> 00:20:31,350
go on out into the Chesapeake Bay area

517
00:20:34,460 --> 00:20:32,970
you round this corner which is Cape Anne

518
00:20:36,800 --> 00:20:34,470
where you'll go out along the Virginia

519
00:20:38,030 --> 00:20:36,810
Beach area and out of course to one of

520
00:20:40,160 --> 00:20:38,040
our super sites that I mentioned earlier

521
00:20:41,570 --> 00:20:40,170
which is the Gulf Stream and you could

522
00:20:42,890 --> 00:20:41,580
actually see the boundary of the Gulf

523
00:20:44,240 --> 00:20:42,900
Stream and the Sun glint because there's

524
00:20:45,920 --> 00:20:44,250
a difference in the texture of the water

525
00:20:51,200 --> 00:20:45,930
that you can see with the sun shining on

526
00:20:52,580 --> 00:20:51,210
it next slide please well this is a view

527
00:20:55,520 --> 00:20:52,590
of the northern part of the Chesapeake

528
00:20:57,650 --> 00:20:55,530
Bay area you can see of course up here

529
00:20:59,690 --> 00:20:57,660
the Baltimore area and as we come down

530
00:21:01,340 --> 00:20:59,700
from the Baltimore area you can see the

531
00:21:02,930 --> 00:21:01,350
napa Louis area right in here which I

532
00:21:05,690 --> 00:21:02,940
was told to mention by my commander and

533
00:21:08,210 --> 00:21:05,700
of course down here was pax river's area

534
00:21:10,460 --> 00:21:08,220
and you have Washington DC up here along

535
00:21:11,720 --> 00:21:10,470
the Potomac and off in the distance here

536
00:21:13,370 --> 00:21:11,730
you can see the Blue Ridge Mountain the

537
00:21:16,340 --> 00:21:13,380
area so this is a really a nice clear

538
00:21:17,780 --> 00:21:16,350

day in Virginia and Maryland area and as

539
00:21:19,490 --> 00:21:17,790
I mentioned earlier this is of course a

540
00:21:21,440 --> 00:21:19,500
very important waterway it's the home of

541
00:21:23,930 --> 00:21:21,450
the delicious blue crabs in the area as

542
00:21:25,310 --> 00:21:23,940
well as a number of fish and it's

543
00:21:26,870 --> 00:21:25,320
important for the marine life in that

544
00:21:29,120 --> 00:21:26,880
area that these wetlands are protected

545
00:21:33,160 --> 00:21:29,130
and we were studying that entire region

546
00:21:36,470 --> 00:21:33,170
with our instruments on board next time

547
00:21:39,140 --> 00:21:36,480
this picture here is of California this

548
00:21:41,480 --> 00:21:39,150
is Mono Lake here and Crowley Lake is a

549
00:21:44,090 --> 00:21:41,490
small lake here and one of our backup

550
00:21:45,520 --> 00:21:44,100
hydrology super sites was the mammoth

551
00:21:47,510 --> 00:21:45,530
mountain area which is right here

552
00:21:50,000 --> 00:21:47,520
Yosemite National Park is in the

553
00:21:51,360 --> 00:21:50,010
background here you saw earlier the

554
00:21:53,640 --> 00:21:51,370
three-dimensional map that

555
00:21:55,170 --> 00:21:53,650
talked about of the long valley area and

556
00:21:58,170 --> 00:21:55,180
that was this ridge that extends along

557
00:22:00,330 --> 00:21:58,180
here what happened was about 750,000

558
00:22:03,170 --> 00:22:00,340
years ago a volcano collapse and created

559
00:22:05,250 --> 00:22:03,180
this depression now one of the prime

560
00:22:06,450 --> 00:22:05,260
science objectives near the end of our

561
00:22:08,160 --> 00:22:06,460
mission was to do it was called

562
00:22:10,080 --> 00:22:08,170
interferometry the way to think about

563
00:22:11,430 --> 00:22:10,090

this is when we took our normal radar

564
00:22:13,740 --> 00:22:11,440
pictures during the early part of the

565
00:22:15,510 --> 00:22:13,750
flight that measures elevation a lot

566
00:22:17,790 --> 00:22:15,520
like a policeman measures how fast your

567
00:22:19,350 --> 00:22:17,800
car's going it bounces radar waves off

568
00:22:21,660 --> 00:22:19,360
the ground and measures the time for the

569
00:22:23,610 --> 00:22:21,670
echo to come back but interferometry

570
00:22:24,990 --> 00:22:23,620
does is it uses the same principles as

571
00:22:26,669 --> 00:22:25,000
those three-dimensional images you see

572
00:22:29,730 --> 00:22:26,679
on your credit cards called Holograms it

573
00:22:31,710 --> 00:22:29,740
actually interferes patterns of several

574
00:22:33,210 --> 00:22:31,720
multiple images and you can use that to

575
00:22:34,470 --> 00:22:33,220
construct a three-dimensional image of

576
00:22:36,030 --> 00:22:34,480
course here the challenges we're trying

577
00:22:37,440 --> 00:22:36,040
to do it on a global scale as opposed to

578
00:22:39,510 --> 00:22:37,450
a small three dimensional image that you

579
00:22:40,490 --> 00:22:39,520
see on your credit card next slide

580
00:22:42,799 --> 00:22:40,500
please

581
00:22:45,600 --> 00:22:42,809
this is actually a three dimensional

582
00:22:47,250 --> 00:22:45,610
this is a topographic map of that same

583
00:22:48,630 --> 00:22:47,260
area this is Crowley Lake the smaller

584
00:22:50,549 --> 00:22:48,640
lake that I showed you and this is the

585
00:22:51,900 --> 00:22:50,559
ridge along here and it's probably a

586
00:22:53,700 --> 00:22:51,910
little hard to see from your seats but

587
00:22:55,590 --> 00:22:53,710
there are topographic lines on this map

588
00:22:58,080 --> 00:22:55,600

that show elevation changes for about

589
00:23:02,370 --> 00:22:58,090
every 50 feet of elevation change along

590
00:23:03,510 --> 00:23:02,380
that surface next slide please well

591
00:23:05,040 --> 00:23:03,520
there were two ways that we could

592
00:23:06,780 --> 00:23:05,050
actually do interferometry on our flight

593
00:23:09,390 --> 00:23:06,790
one was to take images that were taken

594
00:23:10,830 --> 00:23:09,400
from the April flight STS 59 and combine

595
00:23:12,600 --> 00:23:10,840
them with images taken from our flight

596
00:23:14,250 --> 00:23:12,610
the other way and that was how that

597
00:23:17,220 --> 00:23:14,260
previous map was made the other way is

598
00:23:19,110 --> 00:23:17,230
to actually do passes over the same

599
00:23:20,430 --> 00:23:19,120
target within one flight and that's what

600
00:23:22,350 --> 00:23:20,440
we did on the last few days of our

601
00:23:23,370 --> 00:23:22,360
flight is we kept doing repeat orbits

602
00:23:25,650 --> 00:23:23,380
every 24 hours

603
00:23:27,540 --> 00:23:25,660
this shows the data taken with the

604
00:23:31,560 --> 00:23:27,550
l-band part of the radar which is 24

605
00:23:34,020 --> 00:23:31,570
centimeters and this shows a topographic

606
00:23:35,940 --> 00:23:34,030
image taken with the c-band which is 6

607
00:23:37,830 --> 00:23:35,950
centimeters and what you'll notice is

608
00:23:39,570 --> 00:23:37,840
that the color changes are four times as

609
00:23:41,190 --> 00:23:39,580
fast for this one as for that that's

610
00:23:43,320 --> 00:23:41,200
because of the difference of four times

611
00:23:45,030 --> 00:23:43,330
in the wavelengths so these images are

612
00:23:47,250 --> 00:23:45,040
basically the raw interference fringes

613
00:23:49,110 --> 00:23:47,260

taken from this part of the world and

614
00:23:54,540 --> 00:23:49,120
they can be processed into a topographic

615
00:23:57,020 --> 00:23:54,550
map at a later time so we talked about

616
00:23:59,580 --> 00:23:57,030
earlier this is a commander's window

617
00:24:01,919 --> 00:23:59,590
most of the photography that we took in

618
00:24:04,050 --> 00:24:01,929
support of the radar was out the

619
00:24:04,899 --> 00:24:04,060
overhead windows the one Leno if you saw

620
00:24:07,450 --> 00:24:04,909
on the bracket was

621
00:24:09,009 --> 00:24:07,460
the right after window and then the

622
00:24:10,779 --> 00:24:09,019
other window was used with the hip for

623
00:24:12,609 --> 00:24:10,789
handheld Hasselblad or lint off pictures

624
00:24:16,690 --> 00:24:12,619
but the commander's window looked in the

625
00:24:18,989 --> 00:24:16,700
opposite direction then the radar did so

626
00:24:21,909 --> 00:24:18,999
you were able to take other photographic

627
00:24:23,769 --> 00:24:21,919
documentation of other things that our

628
00:24:25,869 --> 00:24:23,779
general her thoughts were tagged Rafi

629
00:24:28,149 --> 00:24:25,879
that's done on any flight so that's kind

630
00:24:29,940 --> 00:24:28,159
of what we did out that window and we

631
00:24:32,109 --> 00:24:29,950
also took pictures of radar sites

632
00:24:34,450 --> 00:24:32,119
depending on whether we had nose forward

633
00:24:37,690 --> 00:24:34,460
our nose after going along our velocity

634
00:24:39,519 --> 00:24:37,700
vector we may see radar sites on a

635
00:24:43,499 --> 00:24:39,529
different path than when we were

636
00:24:48,009 --> 00:24:46,060
this is just a photo of the tile damage

637
00:24:51,729 --> 00:24:48,019
we received on the right after Alma's

638
00:24:53,109 --> 00:24:51,739

pod and I think that that this was

639
00:24:59,109 --> 00:24:53,119
caused by the tile that came off the

640
00:25:01,089 --> 00:24:59,119
overhead window on launched a shot of

641
00:25:06,519 --> 00:25:01,099
San Francisco Bay we have to point out a

642
00:25:08,560 --> 00:25:06,529
few things here or I guess just start

643
00:25:13,719 --> 00:25:08,570
off with downtown San Francisco and the

644
00:25:16,299 --> 00:25:13,729
Golden Gate Park Golden Gate Bridge down

645
00:25:17,349 --> 00:25:16,309
south was just off the side of San Jose

646
00:25:20,049 --> 00:25:17,359
there's San Francisco International

647
00:25:21,930 --> 00:25:20,059
Airport this island is Alameda right

648
00:25:24,399 --> 00:25:21,940
there's a Naval Air Station in Alameda

649
00:25:28,119 --> 00:25:24,409
and Oakland International Airport is

650
00:25:31,299 --> 00:25:28,129
over here and here's Alcatraz Island and

651
00:25:32,229 --> 00:25:31,309
Angel Island in Sausalito the other

652
00:25:33,639 --> 00:25:32,239
thing that's kind of interesting about

653
00:25:35,710 --> 00:25:33,649
this shot as you can see the San Andreas

654
00:25:43,629 --> 00:25:35,720
Fault that goes up here and extends

655
00:25:46,139 --> 00:25:43,639
across the bay up here this is San

656
00:25:49,289 --> 00:25:46,149
Francisco at night we had very nice

657
00:25:51,609 --> 00:25:49,299
night passes over San Francisco and

658
00:25:53,259 --> 00:25:51,619
unfortunately you know we see most of

659
00:25:55,119 --> 00:25:53,269
the Earth's there 50% of our time

660
00:25:56,830 --> 00:25:55,129
looking at the earth is at night and

661
00:25:59,109 --> 00:25:56,840
it's really a beautiful thing to see and

662
00:26:01,089 --> 00:25:59,119
unfortunately and unfortunately there's

663
00:26:02,229 --> 00:26:01,099

not really good way to show you what it

664
00:26:04,960 --> 00:26:02,239
looks like from Earth it's very

665
00:26:07,269 --> 00:26:04,970
difficult to get good photography at

666
00:26:10,479 --> 00:26:07,279
night but this one turned out ok you can

667
00:26:12,940 --> 00:26:10,489
see the the bridges in the San Francisco

668
00:26:15,430 --> 00:26:12,950
Bay here San Mateo Bridge this is the

669
00:26:17,409 --> 00:26:15,440
Dumbarton bridge and this is downtown

670
00:26:18,400 --> 00:26:17,419
San Francisco with the lights the bright

671
00:26:19,960 --> 00:26:18,410
lights and you

672
00:26:22,210 --> 00:26:19,970
see the Bay Bridge and a little bit of

673
00:26:28,980 --> 00:26:22,220
lights from Treasure Island and you can

674
00:26:37,120 --> 00:26:34,330
this is a shot of the Northwest Canada

675
00:26:39,520 --> 00:26:37,130
are actually south it's just north of

676
00:26:41,290 --> 00:26:39,530
the Washington Idaho border inside of

677
00:26:43,210 --> 00:26:41,300
Canada and it's very typical of the

678
00:26:46,930 --> 00:26:43,220
northwest part of the country and of the

679
00:26:48,610 --> 00:26:46,940
hemisphere and it's just an example of

680
00:26:51,430 --> 00:26:48,620
some of the things that we can see you

681
00:26:53,770 --> 00:26:51,440
can see all these rectangular areas that

682
00:26:56,620 --> 00:26:53,780
you see all throughout the picture are a

683
00:26:58,810 --> 00:26:56,630
clear cutting of logs and timber in the

684
00:27:00,550 --> 00:26:58,820
northwest and it's a very same thing

685
00:27:03,610 --> 00:27:00,560
that we see in Washington in the Oregon

686
00:27:05,620 --> 00:27:03,620
and in the US and the radar is very

687
00:27:08,530 --> 00:27:05,630
valuable if we had a permanent one at

688
00:27:10,540 --> 00:27:08,540

any rate to monitor these areas and see

689
00:27:20,800 --> 00:27:10,550
how they're recovering with their

690
00:27:23,710 --> 00:27:20,810
biomass this is a picture of me and when

691
00:27:24,850 --> 00:27:23,720
baek's was letting me sit in his sea of

692
00:27:26,200 --> 00:27:24,860
course I've got the flight plan in my

693
00:27:28,960 --> 00:27:26,210
hand it was interesting as a first-time

694
00:27:31,300 --> 00:27:28,970
flyer to realize that a day/night cycle

695
00:27:33,580 --> 00:27:31,310
does not define the normal day anymore

696
00:27:35,230 --> 00:27:33,590
and with the flight plan we use thatis

697
00:27:36,400 --> 00:27:35,240
of course the coordinating document for

698
00:27:39,040 --> 00:27:36,410
all our activities including our

699
00:27:40,930 --> 00:27:39,050
secondary experiments and literally the

700
00:27:43,300 --> 00:27:40,940
only thing that defines your day-to-day

701
00:27:49,180 --> 00:27:43,310
existence was that flight plan and the M

702
00:27:51,520 --> 00:27:49,190
et clock this is a picture of Denver and

703
00:27:53,140 --> 00:27:51,530
if you look carefully down here and get

704
00:27:58,090 --> 00:27:53,150
this to work that's the new airport

705
00:27:59,710 --> 00:27:58,100
nicknamed the land of lost luggage this

706
00:28:00,880 --> 00:27:59,720
is Denver and we showed this up here in

707
00:28:02,530 --> 00:28:00,890
the mountains above Denver it's where

708
00:28:04,780 --> 00:28:02,540
the great plains meet the Front Range of

709
00:28:06,400 --> 00:28:04,790
the Rocky Mountains we had a map sight

710
00:28:07,840 --> 00:28:06,410
up there there were 28 of the maps and

711
00:28:08,920 --> 00:28:07,850
maps in this case of course is the

712
00:28:15,400 --> 00:28:08,930
measurement of air pollution from

713
00:28:16,870 --> 00:28:15,410

satellites this is a picture we were

714
00:28:19,030 --> 00:28:16,880
lucky to get usually the light levels

715
00:28:20,890 --> 00:28:19,040
down this far south were too low but

716
00:28:22,450 --> 00:28:20,900
fortunately managed to get it this is

717
00:28:24,220 --> 00:28:22,460
actually the country of Chile and this

718
00:28:25,120 --> 00:28:24,230
is at the southern tip of South America

719
00:28:27,220 --> 00:28:25,130
and what you're looking at here are a

720
00:28:28,540 --> 00:28:27,230
couple of glaciers and I think our TV

721
00:28:30,850 --> 00:28:28,550
people are going to highlight this for

722
00:28:32,040 --> 00:28:30,860
the folks on video here's one of the

723
00:28:35,130 --> 00:28:32,050
glaciers here and

724
00:28:36,840 --> 00:28:35,140
another one right down here if you look

725
00:28:39,720 --> 00:28:36,850
carefully in the water you'll see that

726
00:28:41,910 --> 00:28:39,730
icebergs actually being a flicked off

727
00:28:44,760 --> 00:28:41,920
the inner cavities glaciers into the

728
00:28:46,380 --> 00:28:44,770
water these glaciers also have these

729
00:28:48,270 --> 00:28:46,390
dark streaks Rome and that's boulders

730
00:28:49,650 --> 00:28:48,280
that have been entrained inside the the

731
00:28:51,780 --> 00:28:49,660
glaciers as they move down the mountains

732
00:28:53,610 --> 00:28:51,790
we study glaciers because we think we

733
00:28:55,860 --> 00:28:53,620
can detect movement whether they're

734
00:28:57,450 --> 00:28:55,870
receding or progressing and the we

735
00:29:03,890 --> 00:28:57,460
believe this to be an important

736
00:29:08,310 --> 00:29:06,030
this is the Panama Canal

737
00:29:10,950 --> 00:29:08,320
this is Panama City and the canal traces

738
00:29:12,750 --> 00:29:10,960

a path right through here notice the

739
00:29:15,210 --> 00:29:12,760
dark vegetation areas on either side of

740
00:29:18,030 --> 00:29:15,220
the canal this is actually portray

741
00:29:19,680 --> 00:29:18,040
protected vegetation or Woodlands and

742
00:29:22,020 --> 00:29:19,690
one of the things we're worried about in

743
00:29:24,240 --> 00:29:22,030
Panama is encroaching development with a

744
00:29:26,460 --> 00:29:24,250
Panama City right here we're worried

745
00:29:27,870 --> 00:29:26,470
that well these are protected forests

746
00:29:29,280 --> 00:29:27,880
right now but if they do develop in

747
00:29:31,440 --> 00:29:29,290
there and they log or harvest this

748
00:29:32,940 --> 00:29:31,450
timber then the heavy rains that they

749
00:29:34,230 --> 00:29:32,950
receive in this area will flood down

750
00:29:35,940 --> 00:29:34,240
into the canal and they'll actually fill

751
00:29:38,880 --> 00:29:35,950
it up with silt and the canal will be

752
00:29:41,820 --> 00:29:38,890
useless it's a perfect example of a

753
00:29:43,230 --> 00:29:41,830
short-sighted miss Sun with a lot of

754
00:29:44,760 --> 00:29:43,240
human activities if you fill up the

755
00:29:47,760 --> 00:29:44,770
canal was silt obviously the country

756
00:29:50,190 --> 00:29:47,770
would lose a lot of its input there in

757
00:29:52,680 --> 00:29:50,200
money and capital also the Smithsonian

758
00:29:53,820 --> 00:29:52,690
has a biological preserve located right

759
00:29:59,760 --> 00:29:53,830
in here which is another reason to

760
00:30:01,620 --> 00:29:59,770
protect this area this is a picture of

761
00:30:04,800 --> 00:30:01,630
the Sahara Desert these are called the

762
00:30:06,360 --> 00:30:04,810
tip earning dunes and it's difficult to

763
00:30:08,010 --> 00:30:06,370

see in this picture but there are a lot

764
00:30:09,330 --> 00:30:08,020
of sand dunes in there and scientists

765
00:30:10,860 --> 00:30:09,340
actually get a lot of information on

766
00:30:12,900 --> 00:30:10,870
wind currents from the direction in the

767
00:30:15,020 --> 00:30:12,910
shape of these dunes and also a state of

768
00:30:17,550 --> 00:30:15,030
previously we imaged a lot of our

769
00:30:18,900 --> 00:30:17,560
targets and sites were in the Sahara

770
00:30:21,120 --> 00:30:18,910
Desert because we're imaging the

771
00:30:22,800 --> 00:30:21,130
subsurface drainage patterns from when

772
00:30:29,280 --> 00:30:22,810
the Sahara was a lot wetter place than

773
00:30:31,980 --> 00:30:29,290
it is now well it's time to tuck the red

774
00:30:35,430 --> 00:30:31,990
team into bed and here's a shot of three

775
00:30:37,680 --> 00:30:35,440
of the four bunks that that we fly banks

776
00:30:40,770 --> 00:30:37,690
bunks are really nice they provide some

777
00:30:43,170 --> 00:30:40,780
sound insulation for us as well as a

778
00:30:44,910 --> 00:30:43,180
place to display some of your banners

779
00:30:45,190 --> 00:30:44,920
some of the better banners come a little

780
00:30:50,470 --> 00:30:45,200
bit

781
00:30:52,600 --> 00:30:50,480
in the flight but anyways these bunks we

782
00:30:54,009 --> 00:30:52,610
did get to take some pictures here these

783
00:30:56,500 --> 00:30:54,019
pictures are kind of unique in that they

784
00:30:59,289 --> 00:30:56,510
were backlit by some slave flashes that

785
00:31:01,360 --> 00:30:59,299
we have several photo TV people that

786
00:31:02,950 --> 00:31:01,370
help us train for taking all these

787
00:31:10,090 --> 00:31:02,960
photos when we appreciate all your hard

788
00:31:13,659 --> 00:31:10,100

work next slide and here's a chart that

789
00:31:16,269 --> 00:31:13,669
was helped us out we need needed a more

790
00:31:19,480 --> 00:31:16,279
detailed map to help us find some of

791
00:31:21,549 --> 00:31:19,490
these radar targets and through the help

792
00:31:24,549 --> 00:31:21,559
of JPL and the flight data file people

793
00:31:26,919 --> 00:31:24,559
here at JSC we developed these charts

794
00:31:28,570 --> 00:31:26,929
and it was kind of like if anybody's

795
00:31:31,960 --> 00:31:28,580
familiar with a triptych when you go on

796
00:31:34,389 --> 00:31:31,970
a on a trip through the US air you can

797
00:31:36,159 --> 00:31:34,399
you can find your orbit and find where

798
00:31:39,490 --> 00:31:36,169
you are well this is what happens when

799
00:31:41,409 --> 00:31:39,500
you put a b-52 pilot in an a6 Bombardier

800
00:31:45,370 --> 00:31:41,419
navigator on the same shift you argue

801
00:31:47,110 --> 00:31:45,380
about where you are but actually I was

802
00:31:50,070 --> 00:31:47,120
just we were trying to point out what

803
00:31:53,830 --> 00:31:50,080
would happen in the next orbit but

804
00:31:56,830 --> 00:31:53,840
anyways it again we worked in two shifts

805
00:31:59,529 --> 00:31:56,840
and this is Tom myself on the on the

806
00:32:02,200 --> 00:31:59,539
blue shift with Steve taking this

807
00:32:09,669 --> 00:32:02,210
picture for us and the charts really

808
00:32:12,490 --> 00:32:09,679
helped us out next why well back to our

809
00:32:14,080 --> 00:32:12,500
most spectacular probably sight that we

810
00:32:16,629 --> 00:32:14,090
saw in the mission the eruption of

811
00:32:17,740 --> 00:32:16,639
Jeff's coy on on the blue shift we were

812
00:32:19,779 --> 00:32:17,750
lucky enough to see this for about the

813
00:32:22,090 --> 00:32:19,789

first four or five days of the mission

814
00:32:24,070 --> 00:32:22,100
this was our morning part of our workday

815
00:32:26,830 --> 00:32:24,080
coming over Kamchatka in northern Asia

816
00:32:28,720 --> 00:32:26,840
so here you see a nice shot of the plume

817
00:32:31,090 --> 00:32:28,730
blowing well out to the east into the

818
00:32:32,529 --> 00:32:31,100
Pacific Ocean pointing out all the ash

819
00:32:34,450 --> 00:32:32,539
and smoke coming from that single

820
00:32:35,950 --> 00:32:34,460
eruption the companion mountains were

821
00:32:40,539 --> 00:32:35,960
also erupting and you'll see that in the

822
00:32:42,789 --> 00:32:40,549
next close-up picture this is Jeff's coy

823
00:32:45,220 --> 00:32:42,799
and full eruption this is the mountain

824
00:32:46,960 --> 00:32:45,230
of Clue Jeff Sukhoi itself the eruptive

825
00:32:50,889 --> 00:32:46,970
vent was on the northeast flank of the

826
00:32:52,450 --> 00:32:50,899
volcano here in the shadow and down to

827
00:32:54,129 --> 00:32:52,460
the south a little bit as bezu me Ani

828
00:32:55,269 --> 00:32:54,139
another volcano that was building a

829
00:32:57,639 --> 00:32:55,279
little lava dome and there was some

830
00:32:58,560 --> 00:32:57,649
steam coming off of that plume is off of

831
00:33:00,630 --> 00:32:58,570
that mountain as well

832
00:33:02,700 --> 00:33:00,640
and this was just a magnificent sight to

833
00:33:04,410 --> 00:33:02,710
watch this plume evolving day to day in

834
00:33:05,640 --> 00:33:04,420
the mission and we turned the radar on

835
00:33:07,350 --> 00:33:05,650
this with some quick replanting

836
00:33:09,570 --> 00:33:07,360
on-the-ground science teams part and

837
00:33:13,790 --> 00:33:09,580
captured some good data about a mountain

838
00:33:19,410 --> 00:33:16,470

later in the flight the eruption

839
00:33:20,790 --> 00:33:19,420
eruption calmed down and the actual

840
00:33:22,080 --> 00:33:20,800
outgassing stopped but the mountain

841
00:33:24,120 --> 00:33:22,090
itself here is all covered with that

842
00:33:25,620 --> 00:33:24,130
dark ash that was coming out of the

843
00:33:27,390 --> 00:33:25,630
mountain a few days earlier and then

844
00:33:29,520 --> 00:33:27,400
later as you saw in the film snow

845
00:33:31,830 --> 00:33:29,530
covered the entire scene and made this a

846
00:33:33,570 --> 00:33:31,840
brand-new area again but here's a clue

847
00:33:36,870 --> 00:33:33,580
chefs coy and bezel yani to the south

848
00:33:39,060 --> 00:33:36,880
this dormant volcano up here is called

849
00:33:45,600 --> 00:33:39,070
Shiva Luke another target for the radar

850
00:33:47,280 --> 00:33:45,610
next as Terry mentioned earlier with the

851
00:33:48,810 --> 00:33:47,290
film we do receive messages every

852
00:33:50,160 --> 00:33:48,820
morning on our fax machine this is our

853
00:33:52,440 --> 00:33:50,170
fax machine right here basically I'm

854
00:33:53,400 --> 00:33:52,450
turning the changing the paper out often

855
00:33:54,990 --> 00:33:53,410
when you look at a picture from the

856
00:33:56,220 --> 00:33:55,000
Space Shuttle I encourage you to take

857
00:33:58,200 --> 00:33:56,230
time to kind of look at and see what

858
00:33:59,430 --> 00:33:58,210
else you see in the background and you

859
00:34:01,200 --> 00:33:59,440
can learn something from that you'll

860
00:34:02,550 --> 00:34:01,210
notice I'm wearing two watches most of

861
00:34:04,290 --> 00:34:02,560
us wore two watches so that we could

862
00:34:05,640 --> 00:34:04,300
keep track not only of the mission

863
00:34:08,220 --> 00:34:05,650

elapsed time but also what time it was

864
00:34:09,990 --> 00:34:08,230
back in Houston on my right wrist you've

865
00:34:11,220 --> 00:34:10,000
seen this device also on Dan's left

866
00:34:13,350 --> 00:34:11,230
wrist it's one of our medical

867
00:34:15,270 --> 00:34:13,360
experiments onboard through this little

868
00:34:16,680 --> 00:34:15,280
prism right here it's actually measuring

869
00:34:18,150 --> 00:34:16,690
the light levels that we were exposed to

870
00:34:20,130 --> 00:34:18,160
and recording that with in the silver

871
00:34:21,810 --> 00:34:20,140
box and within the silver box there was

872
00:34:24,450 --> 00:34:21,820
also accelerometers measuring our

873
00:34:25,830 --> 00:34:24,460
activity levels particularly our

874
00:34:27,470 --> 00:34:25,840
activity levels while we're sleeping to

875
00:34:29,669 --> 00:34:27,480
make to measure our quality of our sleep

876
00:34:32,610 --> 00:34:29,679
this experiment was designed basically

877
00:34:33,990 --> 00:34:32,620
to study how well the blue shift who we

878
00:34:36,930 --> 00:34:34,000
actually were working basically from 8

879
00:34:39,090 --> 00:34:36,940
a.m. to 4 p.m. local time how well we

880
00:34:40,830 --> 00:34:39,100
were sleep shifted also on the back

881
00:34:42,150 --> 00:34:40,840
you'll see one of a little yellow

882
00:34:43,380 --> 00:34:42,160
package there that's one of the tasty

883
00:34:47,840 --> 00:34:43,390
cakes that Tom brought from his

884
00:34:50,190 --> 00:34:47,850
philadelphia roots next slide please

885
00:34:52,020 --> 00:34:50,200
as we mentioned in the film we did

886
00:34:54,600 --> 00:34:52,030
change that one of the payload high rate

887
00:34:55,680 --> 00:34:54,610
recorders it was very easy to do we had

888
00:34:57,510 --> 00:34:55,690

thought it would take about two hours

889
00:35:00,300 --> 00:34:57,520
and end up taking us about an hour and a

890
00:35:01,920 --> 00:35:00,310
half Jeff and I had made a specific trip

891
00:35:04,110 --> 00:35:01,930
to the Kennedy Space Center to practice

892
00:35:06,090 --> 00:35:04,120
this in-flight maintenance procedure in

893
00:35:08,100 --> 00:35:06,100
case it occurred and that turned out to

894
00:35:10,020 --> 00:35:08,110
be a very valuable trip it just speaks

895
00:35:11,580 --> 00:35:10,030
volumes for the preparation that we have

896
00:35:12,450 --> 00:35:11,590
before the flight and we'd like to thank

897
00:35:14,490 --> 00:35:12,460
all the folks who helped

898
00:35:18,290 --> 00:35:14,500
in all aspects of training in order to

899
00:35:21,089 --> 00:35:18,300
prepare for the fight next slide please

900
00:35:22,380 --> 00:35:21,099
as I mentioned before the blue team saw

901
00:35:24,660 --> 00:35:22,390
basically from Europe all the way

902
00:35:27,930 --> 00:35:24,670
through New Zealand this is a picture of

903
00:35:30,480 --> 00:35:27,940
Australia the eastern coast just south

904
00:35:31,799 --> 00:35:30,490
of Cape York one of the things that has

905
00:35:34,349 --> 00:35:31,809
been happening in Australia in recent

906
00:35:36,240 --> 00:35:34,359
months is a terrible drought and several

907
00:35:37,740 --> 00:35:36,250
fires have been started by the very few

908
00:35:40,349 --> 00:35:37,750
thunderstorms they do get in lightning

909
00:35:41,880 --> 00:35:40,359
striking the trees so much of Australia

910
00:35:44,460 --> 00:35:41,890
was suffering unfortunately from these

911
00:35:46,079 --> 00:35:44,470
natural fires the other interesting

912
00:35:47,609 --> 00:35:46,089
thing about the fires we saw is that

913
00:35:49,859 --> 00:35:47,619

recall one of our experiments was

914
00:35:51,750 --> 00:35:49,869
measuring carbon monoxide in the

915
00:35:53,309 --> 00:35:51,760
atmosphere that was the measurement of

916
00:35:55,440 --> 00:35:53,319
air pollution from satellites experiment

917
00:35:57,150 --> 00:35:55,450
or maps so every time we saw a fire we

918
00:35:59,730 --> 00:35:57,160
reported that so that the scientists

919
00:36:03,059 --> 00:35:59,740
would know that a producer of Co which

920
00:36:05,460 --> 00:36:03,069
are fires produced Co was at our

921
00:36:07,230 --> 00:36:05,470
location and they were able to analyze

922
00:36:09,329 --> 00:36:07,240
the data and sure enough the data show

923
00:36:11,130 --> 00:36:09,339
that there was higher Co levels here so

924
00:36:12,510 --> 00:36:11,140
fires are a big production producer of

925
00:36:16,130 --> 00:36:12,520
CO in the world then we noted them

926
00:36:18,569 --> 00:36:16,140
wherever we saw them next night please

927
00:36:20,640 --> 00:36:18,579
what we have here in the picture right

928
00:36:21,930 --> 00:36:20,650
here on the left side of the screen for

929
00:36:24,480 --> 00:36:21,940
those of you at home is Mount Pinatubo

930
00:36:26,730 --> 00:36:24,490
so this is the island of Luzon in the

931
00:36:29,880 --> 00:36:26,740
Philippines you'll recall back in June

932
00:36:31,620 --> 00:36:29,890
of 1991 we had a terrible volcanic

933
00:36:34,470 --> 00:36:31,630
eruption in this area displacing many

934
00:36:35,760 --> 00:36:34,480
families and also Clark Air Force Base

935
00:36:37,260 --> 00:36:35,770
the United States installation right

936
00:36:40,049 --> 00:36:37,270
here you can look real close you can see

937
00:36:41,880 --> 00:36:40,059
the runways was displaced in this photo

938
00:36:43,349 --> 00:36:41,890

what you see here just let me orient you

939
00:36:45,960 --> 00:36:43,359
first of all this is what is called

940
00:36:48,299 --> 00:36:45,970
Subic Bay on the west coast of Luzon

941
00:36:50,700 --> 00:36:48,309
this is Manila Bay excuse me right down

942
00:36:52,170 --> 00:36:50,710
here and from military history this is

943
00:36:54,240 --> 00:36:52,180
the Bataan Peninsula you may have heard

944
00:36:55,740 --> 00:36:54,250
of Manila City is right here just

945
00:36:58,049 --> 00:36:55,750
peeking out from underneath these clouds

946
00:37:00,150 --> 00:36:58,059
at the tip of the bay here now if you'll

947
00:37:01,559 --> 00:37:00,160
go back to Pinatubo again the crater is

948
00:37:03,539 --> 00:37:01,569
right here and what you'll notice

949
00:37:06,299 --> 00:37:03,549
interrupting all this nice green and

950
00:37:08,039 --> 00:37:06,309
brown natural color are these very

951
00:37:10,770 --> 00:37:08,049
light-colored floes and what those are

952
00:37:12,900 --> 00:37:10,780
are where mud and ash has been washed

953
00:37:15,180 --> 00:37:12,910
down from the very sleep steep slopes of

954
00:37:17,670 --> 00:37:15,190
Pinatubo and actually destroyed

955
00:37:20,400 --> 00:37:17,680
vegetation and in many cases communities

956
00:37:24,180 --> 00:37:20,410
with this mud flown we call these lahars

957
00:37:26,279 --> 00:37:24,190
now the eruption itself also as we know

958
00:37:28,469 --> 00:37:26,289
had a major climate

959
00:37:30,449 --> 00:37:28,479
packed around the world and of course

960
00:37:34,620 --> 00:37:30,459
displaced many people here if well go to

961
00:37:37,079 --> 00:37:34,630
the next slide now now this are two

962
00:37:40,199 --> 00:37:37,089
images from the space radar lab the

963
00:37:41,729 --> 00:37:40,209

image on the left is from STS 59 the

964
00:37:43,679 --> 00:37:41,739
image on the right is from our flight

965
00:37:46,049 --> 00:37:43,689
STS 68 so about five months have passed

966
00:37:47,729 --> 00:37:46,059
between these two flights first let's

967
00:37:49,499 --> 00:37:47,739
look at one of the images let's look at

968
00:37:52,140 --> 00:37:49,509
the image on the left this is what we

969
00:37:55,169 --> 00:37:52,150
can produce using the radar it basically

970
00:37:56,669 --> 00:37:55,179
it shows the different elevations it see

971
00:37:58,469 --> 00:37:56,679
the different colors here this orange

972
00:38:01,229 --> 00:37:58,479
you see here is actually ash that's come

973
00:38:03,029 --> 00:38:01,239
from the Creator right here and so using

974
00:38:06,029 --> 00:38:03,039
the radar you can get a real-time image

975
00:38:07,169 --> 00:38:06,039
of what is happening in any part of the

976
00:38:09,630 --> 00:38:07,179
world of course it doesn't matter what

977
00:38:11,069 --> 00:38:09,640
the weather is now it also with the

978
00:38:12,689 --> 00:38:11,079
radar you can take an image from one

979
00:38:14,130 --> 00:38:12,699
point in time and compare it with an

980
00:38:16,380 --> 00:38:14,140
image from another point in time and

981
00:38:18,150 --> 00:38:16,390
compare the differences in this case in

982
00:38:20,309 --> 00:38:18,160
this five months and in particular three

983
00:38:21,269 --> 00:38:20,319
weeks before our flight the Philippines

984
00:38:24,390 --> 00:38:21,279
were hit with some very dramatic

985
00:38:27,059 --> 00:38:24,400
monsoons their 1994 monsoon season hit

986
00:38:29,309 --> 00:38:27,069
and that those monsoons carried large

987
00:38:32,249 --> 00:38:29,319
amounts of dirt and ash down these

988
00:38:33,809 --> 00:38:32,259

lahars and 80,000 people were displaced

989
00:38:36,329 --> 00:38:33,819
in that short amount of time by all this

990
00:38:38,249 --> 00:38:36,339
rainfall rainfall and the ensuing mud

991
00:38:39,959 --> 00:38:38,259
flows if you look at this lahar right

992
00:38:42,809 --> 00:38:39,969
here this mud flow right here it's a

993
00:38:44,069 --> 00:38:42,819
fairly thin black line well five months

994
00:38:46,679 --> 00:38:44,079
later you can see how dramatically it's

995
00:38:48,089 --> 00:38:46,689
increased in size so again the radar can

996
00:38:49,349 --> 00:38:48,099
tell you something in real time about

997
00:38:51,630 --> 00:38:49,359
what's going on and then you can compare

998
00:38:52,309 --> 00:38:51,640
to four changes over time next slide

999
00:38:54,929 --> 00:38:52,319
please

1000
00:38:56,519 --> 00:38:54,939
well here we are again at the roof of

1001
00:38:58,649 --> 00:38:56,529
the world is the tibetan plateau is

1002
00:39:01,140 --> 00:38:58,659
called again the dramatic lakes in this

1003
00:39:02,939 --> 00:39:01,150
area alternating with the peaks again

1004
00:39:05,609 --> 00:39:02,949
the minimum altitude in this area is

1005
00:39:07,679 --> 00:39:05,619
usually around 15 or 20,000 feet this is

1006
00:39:09,959 --> 00:39:07,689
Jung soo-jung ko is the name of this

1007
00:39:12,899 --> 00:39:09,969
Lake also I'd like you to look at the

1008
00:39:14,699 --> 00:39:12,909
Rama Rama who try River here and notice

1009
00:39:16,109 --> 00:39:14,709
how it meanders through the valley here

1010
00:39:18,479 --> 00:39:16,119
it's very interesting ribbon effect

1011
00:39:20,159 --> 00:39:18,489
that's visually spectacular I'd also

1012
00:39:21,479 --> 00:39:20,169
like to point out that on this tributary

1013
00:39:22,919 --> 00:39:21,489

right up here in the upper left-hand

1014
00:39:25,229 --> 00:39:22,929
corner of the picture for those of you

1015
00:39:27,929 --> 00:39:25,239
at home as a city called Lhasa and it's

1016
00:39:33,079 --> 00:39:27,939
the traditional home town for the Dalai

1017
00:39:38,399 --> 00:39:36,239
this is a picture looking from China and

1018
00:39:39,840 --> 00:39:38,409
a desert in China called the Taklamakan

1019
00:39:42,420 --> 00:39:39,850
that's right here

1020
00:39:44,610 --> 00:39:42,430
south all the way to India so in between

1021
00:39:46,860 --> 00:39:44,620
the Taklamakan desert here where of

1022
00:39:49,410 --> 00:39:46,870
course it's sand and very dry you go

1023
00:39:51,630 --> 00:39:49,420
through the Tibetan Plateau here 1520

1024
00:39:53,670 --> 00:39:51,640
thousand foot valleys and the peaks get

1025
00:39:56,190 --> 00:39:53,680
up in the twenty twenty-five twenty

1026
00:39:57,810 --> 00:39:56,200
eight thousand foot area through Kashmir

1027
00:40:00,270 --> 00:39:57,820
on the right side of the screen here

1028
00:40:02,430 --> 00:40:00,280
some places you've heard about Nepal and

1029
00:40:04,890 --> 00:40:02,440
over here is the kingdom of Bhutan all

1030
00:40:06,330 --> 00:40:04,900
the way through to India we studied

1031
00:40:08,040 --> 00:40:06,340
several sites in this area for

1032
00:40:10,110 --> 00:40:08,050
geographical reasons again under the

1033
00:40:11,900 --> 00:40:10,120
sand here our potential old river

1034
00:40:14,790 --> 00:40:11,910
drainages things like that to look at

1035
00:40:17,040 --> 00:40:14,800
another interesting cultural aspect of

1036
00:40:18,450 --> 00:40:17,050
this is right along the face of the

1037
00:40:21,090 --> 00:40:18,460
mountains here is something called the

1038
00:40:24,120 --> 00:40:21,100

Silk Trail and in centuries ago that's

1039
00:40:27,600 --> 00:40:24,130
how China shipped things like silk and

1040
00:40:29,880 --> 00:40:27,610
spices to the east excuse me to the west

1041
00:40:32,790 --> 00:40:29,890
to Europe just along this path right

1042
00:40:36,450 --> 00:40:32,800
here and Europe return Goods things like

1043
00:40:38,190 --> 00:40:36,460
armor jewels things like that and every

1044
00:40:39,180 --> 00:40:38,200
fifty or hundred miles along this silk

1045
00:40:40,650 --> 00:40:39,190
trail you'd have a little trading

1046
00:40:43,200 --> 00:40:40,660
outpost and that's how things slowly

1047
00:40:45,660 --> 00:40:43,210
worked their way across here as a side

1048
00:40:48,000 --> 00:40:45,670
benefit to our study because the radar

1049
00:40:49,380 --> 00:40:48,010
can look beneath the stands the sand we

1050
00:40:52,080 --> 00:40:49,390
might potentially see some kind of

1051
00:40:53,730 --> 00:40:52,090
trails here or some evidence of these

1052
00:41:00,780 --> 00:40:53,740
stations that were placed along the Silk

1053
00:41:01,950 --> 00:41:00,790
trail well here I am looking up at earth

1054
00:41:04,230 --> 00:41:01,960
you know you always get the question

1055
00:41:06,660 --> 00:41:04,240
what's it look like to look down at our

1056
00:41:08,700 --> 00:41:06,670
planet well there is no real up or down

1057
00:41:11,070 --> 00:41:08,710
when you're up there and Here I am using

1058
00:41:16,230 --> 00:41:11,080
one of the many cameras out out an

1059
00:41:20,070 --> 00:41:16,240
overhead window next slide this is a

1060
00:41:21,720 --> 00:41:20,080
early morning shot of Moscow we knew if

1061
00:41:26,880 --> 00:41:21,730
we were passing over Moscow it must be

1062
00:41:29,190 --> 00:41:26,890
early in in the blueshifts time up but I

1063
00:41:31,530 --> 00:41:29,200

try to point out some of the things in

1064
00:41:34,320 --> 00:41:31,540
the picture I don't know if we can work

1065
00:41:37,100 --> 00:41:34,330
on the focus on that shot or not but

1066
00:41:39,930 --> 00:41:37,110
right in the center there is a Kremlin

1067
00:41:42,270 --> 00:41:39,940
up in this area which several people in

1068
00:41:44,400 --> 00:41:42,280
the audience right now have been before

1069
00:41:46,800 --> 00:41:44,410
and maybe going in the future

1070
00:41:49,500 --> 00:41:46,810
and we have many folks from JSC that are

1071
00:41:52,830 --> 00:41:49,510
there right now is Star City where the

1072
00:41:53,620 --> 00:41:52,840
Russian cosmonauts trained they actually

1073
00:41:56,710 --> 00:41:53,630
there's a complex

1074
00:41:58,680 --> 00:41:56,720
not too far from this large runway where

1075
00:42:01,420 --> 00:41:58,690
they actually do most of their training

1076
00:42:04,330 --> 00:42:01,430
their large International Airport is

1077
00:42:09,010 --> 00:42:04,340
right right here this photograph is is

1078
00:42:10,840 --> 00:42:09,020
oriented with north at the top this city

1079
00:42:12,490 --> 00:42:10,850
of Moscow is interesting this part of

1080
00:42:17,320 --> 00:42:12,500
the world people have inhabited for

1081
00:42:20,320 --> 00:42:17,330
2,000 years Moscow itself is 750 years

1082
00:42:23,950 --> 00:42:20,330
old and this is a home to eight million

1083
00:42:25,500 --> 00:42:23,960
people quite a large city next slide

1084
00:42:29,620 --> 00:42:25,510
please

1085
00:42:33,060 --> 00:42:29,630
this is in China an area called Alice

1086
00:42:36,670 --> 00:42:33,070
Shan was a this was a high

1087
00:42:38,580 --> 00:42:36,680
desertification site we're interest this

1088
00:42:42,160 --> 00:42:38,590

is an area where they actually irrigate

1089
00:42:45,130 --> 00:42:42,170
and this is the Yellow River here it's

1090
00:42:47,920 --> 00:42:45,140
high highlighted in Sun glint as you can

1091
00:42:50,640 --> 00:42:47,930
see we caught the Yellow River in China

1092
00:42:53,140 --> 00:42:50,650
it's known as the Hawaiian hoe and

1093
00:42:54,700 --> 00:42:53,150
actually we were trying to get several

1094
00:42:57,030 --> 00:42:54,710
shots of this area because we were told

1095
00:43:00,280 --> 00:42:57,040
that the the Great Wall of China

1096
00:43:01,450 --> 00:43:00,290
intersects right about in here and it's

1097
00:43:03,220 --> 00:43:01,460
off the bottom of the slide

1098
00:43:06,520 --> 00:43:03,230
unfortunately but there's another area

1099
00:43:09,670 --> 00:43:06,530
so we're still taking a good hard look

1100
00:43:11,800 --> 00:43:09,680
at this shot the Great Wall ran along

1101
00:43:14,260 --> 00:43:11,810
the mountain front in an effort to to

1102
00:43:18,820 --> 00:43:14,270
keep out them on goal invaders next

1103
00:43:21,130 --> 00:43:18,830
slide this is a two hundred and fifty

1104
00:43:22,780 --> 00:43:21,140
millimeter shot of the Everest Mount

1105
00:43:26,200 --> 00:43:22,790
Everest region the highest point in the

1106
00:43:29,080 --> 00:43:26,210
world Mount Everest is right there in

1107
00:43:31,090 --> 00:43:29,090
the middle of shot I wish we had some

1108
00:43:33,400 --> 00:43:31,100
audio going when we when we went over

1109
00:43:35,920 --> 00:43:33,410
Everest because we just just about went

1110
00:43:37,570 --> 00:43:35,930
crazy everybody to with about four

1111
00:43:40,270 --> 00:43:37,580
cameras in each hand trying to take

1112
00:43:43,410 --> 00:43:40,280
pictures the way we find Mount Everest

1113
00:43:46,540 --> 00:43:43,420

this shot is looking mostly to the south

1114
00:43:48,760 --> 00:43:46,550
there's a irrigation towards the bottom

1115
00:43:52,110 --> 00:43:48,770
of the photo which kind of turns into a

1116
00:43:55,330 --> 00:43:52,120
V and then we know if you look along the

1117
00:43:57,370 --> 00:43:55,340
Eastern V at the end of it is Mount

1118
00:44:00,270 --> 00:43:57,380
Everest and that's how we found it there

1119
00:44:06,160 --> 00:44:00,280
the elevation of Mount Everest is about

1120
00:44:07,540 --> 00:44:06,170
29,000 feet so almost five statute miles

1121
00:44:11,830 --> 00:44:07,550
our elevation

1122
00:44:14,020 --> 00:44:11,840
was about or almost I guess five

1123
00:44:17,080 --> 00:44:14,030
nautical miles our elevation or our

1124
00:44:18,580 --> 00:44:17,090
orbit was 150 nautical miles so that's

1125
00:44:20,080 --> 00:44:18,590
the closest that we ever got to the

1126
00:44:23,500 --> 00:44:20,090
earth right there when we're actually in

1127
00:44:28,030 --> 00:44:23,510
orbit the next highest peak is called k2

1128
00:44:30,670 --> 00:44:28,040
it's located to the west and it's its

1129
00:44:31,570 --> 00:44:30,680
elevation is just over 28,000 feet also

1130
00:44:33,940 --> 00:44:31,580
in the Himalayas

1131
00:44:36,940 --> 00:44:33,950
there was a hydrology site here called

1132
00:44:38,590 --> 00:44:36,950
khumba himalaya that was not too far

1133
00:44:43,240 --> 00:44:38,600
away which were interested in as well

1134
00:44:44,920 --> 00:44:43,250
next job and after the blue shift is

1135
00:44:48,280 --> 00:44:44,930
done of course it's our turn to get into

1136
00:44:50,620 --> 00:44:48,290
the bunks and there you see a picture of

1137
00:44:51,970 --> 00:44:50,630
part of my family there and as I said

1138
00:44:56,650 --> 00:44:51,980

before some of the better banners that

1139
00:44:58,410 --> 00:44:56,660
would come out and again you see the

1140
00:45:01,090 --> 00:44:58,420
active looms that we had to wear

1141
00:45:03,820 --> 00:45:01,100
throughout the flight and it's kind of

1142
00:45:05,080 --> 00:45:03,830
funny I've my daughter is 7 weeks old

1143
00:45:07,300 --> 00:45:05,090
and I've noticed some of the things that

1144
00:45:09,760 --> 00:45:07,310
that a small baby does and one of them

1145
00:45:11,560 --> 00:45:09,770
is the reflex and and both Steve and I

1146
00:45:14,200 --> 00:45:11,570
had kind of when we were falling asleep

1147
00:45:15,870 --> 00:45:14,210
we had some reflexes every so often you

1148
00:45:19,180 --> 00:45:15,880
know where you kind of get startled and

1149
00:45:20,680 --> 00:45:19,190
so we fit in the beginning of our sleep

1150
00:45:23,080 --> 00:45:20,690
period usually kept each other up by

1151
00:45:25,350 --> 00:45:23,090
having a reflex and banging the side of

1152
00:45:31,720 --> 00:45:25,360
the bunks here and keeping each other up

1153
00:45:34,180 --> 00:45:31,730
next one this is a shot of the Aurora

1154
00:45:36,280 --> 00:45:34,190
Australis it's a Southern Lights is

1155
00:45:38,050 --> 00:45:36,290
really quite incredible to me one of the

1156
00:45:39,940 --> 00:45:38,060
most spectacular things that we got to

1157
00:45:42,160 --> 00:45:39,950
see on the flight being high inclination

1158
00:45:45,100 --> 00:45:42,170
we got far enough south to be able to

1159
00:45:47,860 --> 00:45:45,110
see this in the redshift got to see the

1160
00:45:49,750 --> 00:45:47,870
lights about on three revs just south of

1161
00:45:52,600 --> 00:45:49,760
Australia they're really incredible

1162
00:45:55,390 --> 00:45:52,610
things to see you can see the entire at

1163
00:46:00,190 --> 00:45:55,400

least on one drive the entire magnetic

1164
00:46:01,990 --> 00:46:00,200
pole and you can see point out some more

1165
00:46:04,120 --> 00:46:02,000
features here you can see the the

1166
00:46:05,890 --> 00:46:04,130
Earth's limb right here the top of the

1167
00:46:08,230 --> 00:46:05,900
atmosphere up here and you can see the

1168
00:46:10,540 --> 00:46:08,240
lights extending up way above that

1169
00:46:12,490 --> 00:46:10,550
in fact on some of the resin we actually

1170
00:46:18,400 --> 00:46:12,500
went through or appeared to go through

1171
00:46:22,760 --> 00:46:20,839
and of course one of my favorite things

1172
00:46:25,370 --> 00:46:22,770
to see on orbit or sunsets and sunrises

1173
00:46:29,180 --> 00:46:25,380
and you know they occur about every 45

1174
00:46:37,069 --> 00:46:29,190
minutes and just fantastic beautiful

1175
00:46:39,289 --> 00:46:37,079
blues that you can see here and with