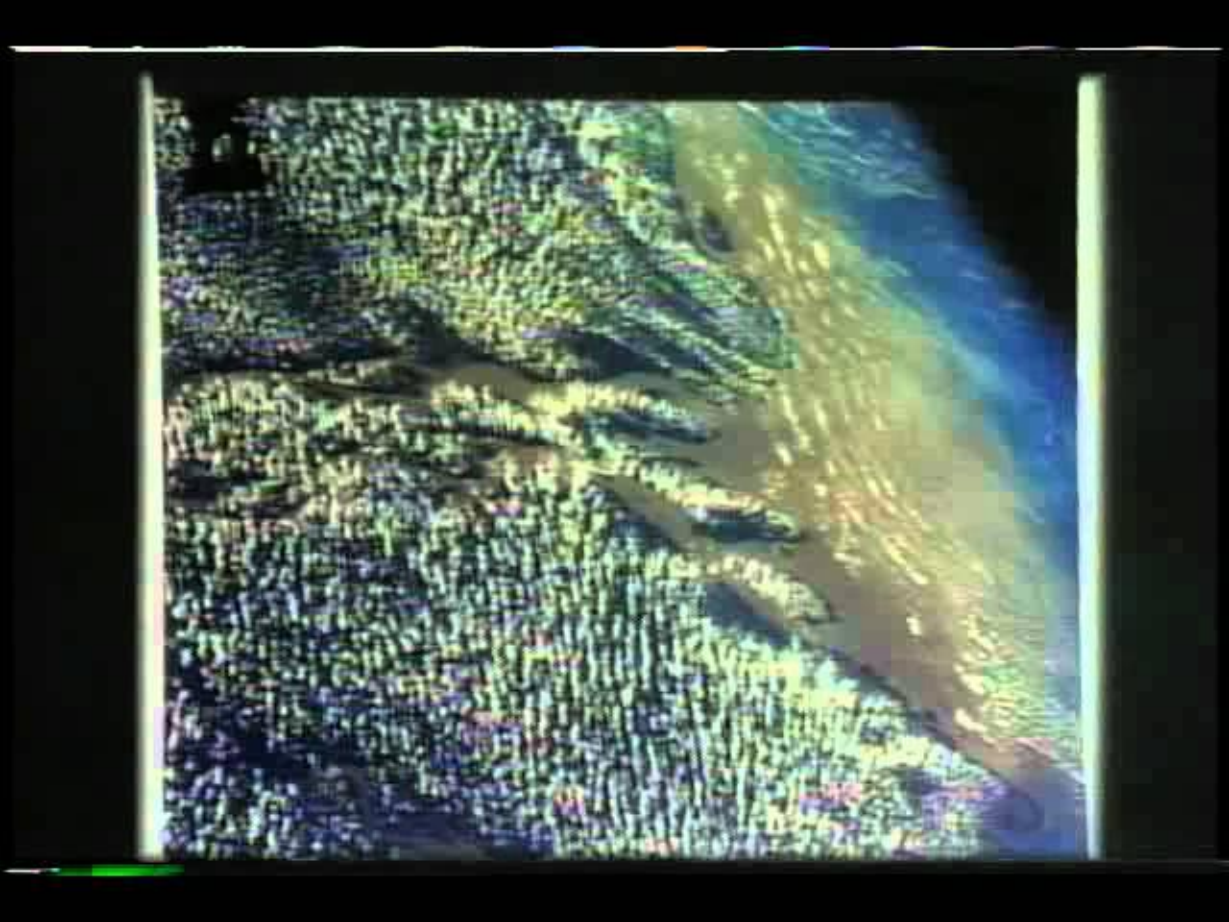

1
00:00:13,890 --> 00:00:11,490
good afternoon welcome to the Johnson

2
00:00:15,930 --> 00:00:13,900
Space Center for the STS 46 post flight

3
00:00:17,759 --> 00:00:15,940
crew press conference this is the crew

4
00:00:19,380 --> 00:00:17,769
show today so with that I'm pleased to

5
00:00:21,390 --> 00:00:19,390
introduce crew commander Lawrence reiber

6
00:00:24,059 --> 00:00:21,400
and we'll let lon introduce the rest of

7
00:00:26,009 --> 00:00:24,069
his crew glory thank you Jeff and let me

8
00:00:30,359 --> 00:00:26,019
say thank you to everybody for being

9
00:00:32,670 --> 00:00:30,369
here this afternoon the crew would like

10
00:00:35,279 --> 00:00:32,680
to take this opportunity to fill you in

11
00:00:38,729 --> 00:00:35,289
on what we feel was a very very exciting

12
00:00:41,369 --> 00:00:38,739
mission you've heard various little

13
00:00:44,939 --> 00:00:41,379

bites of our discussions from on orbit

14
00:00:46,709 --> 00:00:44,949
and we have a lot of excitement up there

15
00:00:49,200 --> 00:00:46,719
when we'd like to share a little bit of

16
00:00:51,509 --> 00:00:49,210
that with you we were here about a month

17
00:00:53,759 --> 00:00:51,519
and a half ago and told you all the

18
00:00:56,099 --> 00:00:53,769
things that we were setting out to do on

19
00:00:58,110 --> 00:00:56,109
a mission and now what we're going to do

20
00:01:00,540 --> 00:00:58,120
is come back and tell you a little bit

21
00:01:02,069 --> 00:01:00,550
about what actually did happen before we

22
00:01:06,780 --> 00:01:02,079
do that though let me briefly

23
00:01:09,690 --> 00:01:06,790
reintroduce everybody on my right as the

24
00:01:11,900 --> 00:01:09,700
pilot of the mission Andy Allen and of

25
00:01:15,090 --> 00:01:11,910
course Andy was also kind of the

26
00:01:17,040 --> 00:01:15,100
blueshift honcho and they found out

27
00:01:19,110 --> 00:01:17,050
exactly how difficult it was to shift

28
00:01:21,900 --> 00:01:19,120
about 12 hours away from everybody

29
00:01:23,940 --> 00:01:21,910
else's work schedule and found

30
00:01:25,680 --> 00:01:23,950
themselves Pena playing tiddlywinks in

31
00:01:27,750 --> 00:01:25,690
the middle of the night while the rest

32
00:01:30,240 --> 00:01:27,760
of us got good sleep going into the

33
00:01:33,900 --> 00:01:30,250
flight but they did an outstanding job

34
00:01:37,050 --> 00:01:33,910
of course during the flight ms1 and

35
00:01:39,000 --> 00:01:37,060
they're the first ISA mission

36
00:01:41,130 --> 00:01:39,010
specialists to fly on a NASA space

37
00:01:45,720 --> 00:01:41,140
shuttle flight quad Nicoli a clod was

38
00:01:49,320 --> 00:01:45,730

also the primary YMS operator and Eureka

39
00:01:54,380 --> 00:01:49,330
system specialist ms2 and flight

40
00:01:58,740 --> 00:01:54,390
engineer Marcia ivan's and she did

41
00:02:00,600 --> 00:01:58,750
photography and EO IM and imax and con

42
00:02:04,100 --> 00:02:00,610
cap and just about everything else on

43
00:02:08,660 --> 00:02:04,110
the flight as well ms3 and payload

44
00:02:11,090 --> 00:02:08,670
Jeff Hoffman and Jeff of course was our

45
00:02:14,360 --> 00:02:11,100
primary tether dynamics person and

46
00:02:16,190 --> 00:02:14,370
expert on the flight and knew a little

47
00:02:20,620 --> 00:02:16,200
bit about everything else on the fight I

48
00:02:23,690 --> 00:02:20,630
think as well ms for our dr. Spock and

49
00:02:27,800 --> 00:02:23,700
science representative Franklin

50
00:02:31,120 --> 00:02:27,810
chang-diaz and ps1 Franklin biloba the

51
00:02:33,560 --> 00:02:31,130
first Italian over to fly in space and

52
00:02:35,630 --> 00:02:33,570
Franco's got some words about we'll

53
00:02:39,470 --> 00:02:35,640
we'll have some words about the science

54
00:02:42,500 --> 00:02:39,480
that was actually accomplished and his

55
00:02:46,250 --> 00:02:42,510
impressions of first-time flyer in space

56
00:02:49,280 --> 00:02:46,260
I think he was tickled pink so to speak

57
00:02:52,490 --> 00:02:49,290
on his experiences so with that what

58
00:02:55,729 --> 00:02:52,500
we'd like to do is first of all they

59
00:02:57,979 --> 00:02:55,739
sort of a basic framework of the primary

60
00:02:59,720 --> 00:02:57,989
objectives of the mission by means of

61
00:03:04,040 --> 00:02:59,730
some slides some still photographs that

62
00:03:07,270 --> 00:03:04,050
we took give us time to explain what was

63
00:03:09,949 --> 00:03:07,280

going on and then we have video of

64
00:03:13,070 --> 00:03:09,959
actually some of the scenes that that

65
00:03:15,320 --> 00:03:13,080
really did happen and I think you'll see

66
00:03:17,420 --> 00:03:15,330
as we get into the tether operations

67
00:03:19,850 --> 00:03:17,430
especially there were some pretty

68
00:03:21,650 --> 00:03:19,860
exciting moments up there and and we we

69
00:03:23,720 --> 00:03:21,660
knew there would be and we told you that

70
00:03:25,460 --> 00:03:23,730
would be during the pre-flight press

71
00:03:27,050 --> 00:03:25,470
conference and now we have the proof so

72
00:03:29,570 --> 00:03:27,060
we're going to will show you what that

73
00:03:31,610 --> 00:03:29,580
looked like and then follow up with some

74
00:03:33,410 --> 00:03:31,620
final slides on some of the beautiful

75
00:03:35,140 --> 00:03:33,420
earth views and some of the other crew

76
00:03:41,570 --> 00:03:35,150
activities that happen during the flight

77
00:03:43,720 --> 00:03:41,580
so if we could have the first slide of

78
00:03:46,759 --> 00:03:43,730
course every mission starts off with

79
00:03:49,190 --> 00:03:46,769
getting established on orbit before you

80
00:03:50,960 --> 00:03:49,200
can do your job on orbit we've got to go

81
00:03:53,150 --> 00:03:50,970
through the post insertion phase and

82
00:03:55,400 --> 00:03:53,160
before we come back of course the dealer

83
00:03:59,150 --> 00:03:55,410
of prep phase this is our flight deck

84
00:04:02,569 --> 00:03:59,160
crew getting established at the post

85
00:04:05,410 --> 00:04:02,579
Miko time frame making sure everything

86
00:04:08,150 --> 00:04:05,420
is going to be set up properly for

87
00:04:09,120 --> 00:04:08,160
getting a payload bay doors open so we

88
00:04:15,480 --> 00:04:09,130

can begin work

89
00:04:17,490 --> 00:04:15,490
payload contingent next slide the first

90
00:04:19,620 --> 00:04:17,500
objective of the mission the first major

91
00:04:22,920 --> 00:04:19,630
objective of the mission in sequential

92
00:04:24,600 --> 00:04:22,930
order was the Eureka deployments a brief

93
00:04:26,670 --> 00:04:24,610
recap on Eureka age of scientific

94
00:04:28,980 --> 00:04:26,680
platform developed by the European Space

95
00:04:32,190 --> 00:04:28,990
Agency and built by the European

96
00:04:35,670 --> 00:04:32,200
industry the plant attractor being a mbb

97
00:04:37,500 --> 00:04:35,680
mo in bremen germany and that's a

98
00:04:41,190 --> 00:04:37,510
platform was sitting at the back of the

99
00:04:43,800 --> 00:04:41,200
cargo bay and on the second day second

100
00:04:47,520 --> 00:04:43,810
blue shift today which means about 12

101
00:04:50,520 --> 00:04:47,530
hours into the flight our task was to

102
00:04:53,640 --> 00:04:50,530
grapple Eureka pull it out of the cargo

103
00:04:57,170 --> 00:04:53,650
bay perform various maneuvers in order

104
00:05:00,810 --> 00:04:57,180
to calibrate various sensors on Eureka

105
00:05:03,690 --> 00:05:00,820
earth sensors and sentences then have

106
00:05:06,110 --> 00:05:03,700
the remote spirit operation control

107
00:05:08,280 --> 00:05:06,120
center in damp damp shop Germany

108
00:05:10,140 --> 00:05:08,290
performed the deployment of solar rays

109
00:05:12,840 --> 00:05:10,150
and antenna as then release Eureka

110
00:05:15,450 --> 00:05:12,850
things didn't go exactly that way the

111
00:05:19,710 --> 00:05:15,460
first portion that the deploy went very

112
00:05:22,680 --> 00:05:19,720
well the grapple and the unbirth from

113
00:05:23,910 --> 00:05:22,690

the cargo bay went well but we a little

114
00:05:26,610 --> 00:05:23,920
later got some problems with

115
00:05:28,080 --> 00:05:26,620
communication with a spacecrafts payload

116
00:05:30,810 --> 00:05:28,090
communication with the spacecraft so

117
00:05:34,080 --> 00:05:30,820
that it was only possible to command a

118
00:05:36,540 --> 00:05:34,090
spacecraft through ground-based sites as

119
00:05:38,940 --> 00:05:36,550
been sites in particular guru in the

120
00:05:41,910 --> 00:05:38,950
french guiana so we could not command

121
00:05:43,580 --> 00:05:41,920
the spacecraft either the build

122
00:05:46,260 --> 00:05:43,590
operation controls that are ourselves

123
00:05:50,280 --> 00:05:46,270
through the s-band communication system

124
00:05:54,480 --> 00:05:50,290
and we delayed one day the release of

125
00:05:56,550 --> 00:05:54,490
Eureka we release family at one day 17

126
00:05:58,770 --> 00:05:56,560
hours and 10 minutes so just about one

127
00:06:01,230 --> 00:05:58,780
day late after the pivot operation

128
00:06:04,340 --> 00:06:01,240
control center fix their problems or at

129
00:06:06,780 --> 00:06:04,350
least temporarily fix their problems and

130
00:06:08,580 --> 00:06:06,790
after release there was a period of

131
00:06:10,500 --> 00:06:08,590
station keeping that and yellin

132
00:06:13,620 --> 00:06:10,510
performed she want to take over Andy

133
00:06:17,640 --> 00:06:13,630
okay and I see the slide up the slide

134
00:06:19,080 --> 00:06:17,650
that we're looking at is the Eureka over

135
00:06:20,850 --> 00:06:19,090
the Kennedy Space Center

136
00:06:22,409 --> 00:06:20,860
you can see the little Peninsula where

137
00:06:25,290 --> 00:06:22,419
where the Kennedy Space Center is we

138
00:06:29,700 --> 00:06:25,300

couldn't have choreographed a a better

139
00:06:34,110 --> 00:06:29,710
shot to show for Eureka the the sequence

140
00:06:37,560 --> 00:06:34,120
as it went Claude release you Rico off

141
00:06:39,420 --> 00:06:37,570
the RMS and one was benevolent up to let

142
00:06:40,770 --> 00:06:39,430
me do the separation burning the station

143
00:06:44,270 --> 00:06:40,780
keeping which lasts a little bit longer

144
00:06:48,060 --> 00:06:44,280
than what we originally had planned but

145
00:06:50,159 --> 00:06:48,070
the separation burn was about point 7

146
00:06:52,590 --> 00:06:50,169
feet per second velocity change away

147
00:06:54,540 --> 00:06:52,600
from Eureka it went through that real

148
00:06:57,180 --> 00:06:54,550
nice we went after thousand feet and

149
00:07:00,930 --> 00:06:57,190
staying around a thousand feet for about

150
00:07:03,810 --> 00:07:00,940
five hours we relaxed a little bit of

151
00:07:06,629 --> 00:07:03,820
our plus or minus of a thousand feet to

152
00:07:08,129 --> 00:07:06,639
let all the mechanics take effect and we

153
00:07:09,320 --> 00:07:08,139
had already started thinking about that

154
00:07:12,150 --> 00:07:09,330
we want to try to conserve as much

155
00:07:15,510 --> 00:07:12,160
propellants as we could for but maybe

156
00:07:16,440 --> 00:07:15,520
one of our upcoming exciting episodes so

157
00:07:18,840 --> 00:07:16,450
we were working the orbital mechanics

158
00:07:23,190 --> 00:07:18,850
and this is one nice shot of Eureka

159
00:07:25,320 --> 00:07:23,200
winger the next slide also well I ignore

160
00:07:27,659 --> 00:07:25,330
that overly looking guy in the picture

161
00:07:30,000 --> 00:07:27,669
that if you look at the top of the

162
00:07:34,339 --> 00:07:30,010
picture you see a keyboard and computer

163
00:07:37,440 --> 00:07:34,349

that we called the science operations

164
00:07:40,730 --> 00:07:37,450
control center on orbit and it was from

165
00:07:44,129 --> 00:07:40,740
that little portable computer that we

166
00:07:46,440 --> 00:07:44,139
conducted all of the science that was on

167
00:07:50,460 --> 00:07:46,450
board the cargo bay of the shuttle and

168
00:07:53,000 --> 00:07:50,470
it's kind of a new application that is

169
00:07:56,490 --> 00:07:53,010
sort of the sign of things to come for

170
00:07:59,190 --> 00:07:56,500
fusion future science operations in on

171
00:08:02,190 --> 00:07:59,200
the shuttle where we control major

172
00:08:05,070 --> 00:08:02,200
payloads really directly from portable

173
00:08:07,860 --> 00:08:05,080
laptop computers and this is the example

174
00:08:11,430 --> 00:08:07,870
that we positioned it clear out of the

175
00:08:13,440 --> 00:08:11,440
way in the orbiter mid-deck originally

176
00:08:15,390 --> 00:08:13,450
we'd intended to to keep it up in the

177
00:08:17,520 --> 00:08:15,400
flight deck but it was real crowded up

178
00:08:19,680 --> 00:08:17,530
there and we had a lot of books and a

179
00:08:21,480 --> 00:08:19,690
lot of other things that clutter the

180
00:08:24,920 --> 00:08:21,490
space so we moved it down to the mid

181
00:08:28,380 --> 00:08:24,930
deck and Franklin I worked on it

182
00:08:31,110 --> 00:08:28,390
basically Greg grabbing the wall

183
00:08:32,700 --> 00:08:31,120
and the ladder with our legs and I think

184
00:08:36,150 --> 00:08:32,710
that's that you can see that in the next

185
00:08:38,280 --> 00:08:36,160
picture next slide yeah as a matter of

186
00:08:41,850 --> 00:08:38,290
fact that this was the first time that I

187
00:08:44,100 --> 00:08:41,860
saw the capsule flipping one once you

188
00:08:46,950 --> 00:08:44,110

put yourself in a position which

189
00:08:49,710 --> 00:08:46,960
originally was vertical because the in

190
00:08:51,450 --> 00:08:49,720
the previous slide of the PGC seemed to

191
00:08:55,140 --> 00:08:51,460
be glued to the wall but when I was

192
00:08:58,500 --> 00:08:55,150
straddling the side of the wall at the

193
00:09:00,810 --> 00:08:58,510
GSC looked as if it was on a table the

194
00:09:04,830 --> 00:09:00,820
software that we ran for the first time

195
00:09:07,950 --> 00:09:04,840
to drive the scientific experiments in

196
00:09:10,800 --> 00:09:07,960
the cargo bay work to work beautifully

197
00:09:12,810 --> 00:09:10,810
we didn't have any any hiccup with it we

198
00:09:15,300 --> 00:09:12,820
had also quite a few updates as you can

199
00:09:17,370 --> 00:09:15,310
imagine because the scientists on ground

200
00:09:18,690 --> 00:09:17,380
were going through a major route

201
00:09:21,420 --> 00:09:18,700
planning effort to throughout the

202
00:09:24,420 --> 00:09:21,430
mission they in fact have managed to

203
00:09:26,670 --> 00:09:24,430
achieve required to quite a substantial

204
00:09:29,700 --> 00:09:26,680
amount of interesting data they

205
00:09:33,270 --> 00:09:29,710
basically have proven the concept of

206
00:09:35,970 --> 00:09:33,280
generating power in inner space through

207
00:09:39,420 --> 00:09:35,980
this another concept of the tether we

208
00:09:42,030 --> 00:09:39,430
where you know going through various

209
00:09:43,560 --> 00:09:42,040
states of emotion hoping that the debtor

210
00:09:47,940 --> 00:09:43,570
would be deployed at the full length

211
00:09:52,170 --> 00:09:47,950
because that was the ultimate goal but

212
00:09:54,840 --> 00:09:52,180
also with the limited length that we

213
00:09:57,120 --> 00:09:54,850

achieved 250 meters we had all the

214
00:10:00,000 --> 00:09:57,130
instrumentations working including the

215
00:10:01,540 --> 00:10:00,010
two electron accelerators the one made

216
00:10:05,440 --> 00:10:01,550
in italy and the one

217
00:10:06,730 --> 00:10:05,450
in the US and we have got current

218
00:10:08,949 --> 00:10:06,740
flowing through the data we have

219
00:10:13,449 --> 00:10:08,959
demonstrated that this circuit in space

220
00:10:18,190 --> 00:10:13,459
works I think we can move to the next

221
00:10:20,860 --> 00:10:18,200
slide here is Claude prior to deployment

222
00:10:24,340 --> 00:10:20,870
the tethered satellite we already

223
00:10:25,720 --> 00:10:24,350
activated low-level light camera system

224
00:10:28,269 --> 00:10:25,730
they're called top tether optical

225
00:10:31,630 --> 00:10:28,279
phenomena camera and this is a rather

226
00:10:34,540 --> 00:10:31,640
versatile instrument that allows us to

227
00:10:36,850 --> 00:10:34,550
measure all kind of the low low level

228
00:10:40,480 --> 00:10:36,860
light phenomena either associated with a

229
00:10:44,050 --> 00:10:40,490
glow on the surface of the orbital when

230
00:10:48,670 --> 00:10:44,060
it moves through the ionosphere or a

231
00:10:50,139 --> 00:10:48,680
glow the faint lights that is produced

232
00:10:51,730 --> 00:10:50,149
by chemical processes in the high

233
00:10:55,300 --> 00:10:51,740
atmosphere about hundred kilometers hide

234
00:10:57,790 --> 00:10:55,310
or the phenomena associated with

235
00:10:59,259 --> 00:10:57,800
electron beams being generated in the

236
00:11:01,329 --> 00:10:59,269
cargo bay in association with the

237
00:11:03,009 --> 00:11:01,339
tethered satellite so even prior to

238
00:11:04,870 --> 00:11:03,019

deployment of the denison that we

239
00:11:07,540 --> 00:11:04,880
activated that camera to gather some

240
00:11:09,160 --> 00:11:07,550
data that we were going to be able to

241
00:11:10,900 --> 00:11:09,170
compare with the data we were going

242
00:11:14,670 --> 00:11:10,910
together when the satellite was deployed

243
00:11:17,710 --> 00:11:14,680
so this is a view of the aft cargo bay

244
00:11:25,030 --> 00:11:17,720
with the camera installed on one of the

245
00:11:28,329 --> 00:11:25,040
overhead windows finally after about a

246
00:11:32,590 --> 00:11:28,339
little over 24 hours of pre deploy

247
00:11:34,960 --> 00:11:32,600
science and after the first sort of

248
00:11:38,260 --> 00:11:34,970
false start which was not a successful

249
00:11:42,940 --> 00:11:38,270
deployment the the picture you see here

250
00:11:46,780 --> 00:11:42,950
is of the second flyweight attempt which

251
00:11:49,990 --> 00:11:46,790
was successful out to 179 meters as you

252
00:11:53,889 --> 00:11:50,000
can see in this slide we've got about

253
00:11:55,540 --> 00:11:53,899
five meters to tether out and if you

254
00:11:57,360 --> 00:11:55,550
look hard in there you can see the

255
00:12:00,220 --> 00:11:57,370
tether is straight there's no

256
00:12:02,920 --> 00:12:00,230
oscillatory motion the satellite was

257
00:12:04,960 --> 00:12:02,930
completely stable and the orbiter of

258
00:12:08,319 --> 00:12:04,970
course was in what we call free drift

259
00:12:10,870 --> 00:12:08,329
which means that it was not attempting

260
00:12:12,400 --> 00:12:10,880
to hold any kind of stable attitude we

261
00:12:13,030 --> 00:12:12,410
were just letting it do what it would

262
00:12:15,370 --> 00:12:13,040
while

263
00:12:18,790 --> 00:12:15,380

satellite flew away the reason for that

264
00:12:22,269 --> 00:12:18,800
was that we were a little bit uncertain

265
00:12:25,329 --> 00:12:22,279
as to how the large translational jet

266
00:12:27,490 --> 00:12:25,339
firings might affect the stability of

267
00:12:30,610 --> 00:12:27,500
the tether and the stability of the

268
00:12:32,530 --> 00:12:30,620
satellite system in case one of those

269
00:12:33,910 --> 00:12:32,540
jet firings would kind of yank on each

270
00:12:36,639 --> 00:12:33,920
other and therefore yank on the

271
00:12:38,439 --> 00:12:36,649
satellite and upset the satellite we did

272
00:12:41,590 --> 00:12:38,449
not want to do that sort of thing too

273
00:12:43,960 --> 00:12:41,600
too soon so the idea was to let the

274
00:12:45,999 --> 00:12:43,970
satellite get about 10 meters away from

275
00:12:49,420 --> 00:12:46,009
the show before we tried to do anything

276
00:12:52,269 --> 00:12:49,430
like that in actuality it didn't quite

277
00:12:54,999 --> 00:12:52,279
get there our simulations were very

278
00:12:58,120 --> 00:12:55,009
stable in free drift but in the real

279
00:13:02,079 --> 00:12:58,130
flight it seemed like the orbiter and

280
00:13:04,689 --> 00:13:02,089
the in the yard erection of the boom tip

281
00:13:08,189 --> 00:13:04,699
took off a little bit faster than we had

282
00:13:11,499 --> 00:13:08,199
ever experienced during simulations and

283
00:13:15,189 --> 00:13:11,509
I began to fire some of the vernier Jets

284
00:13:17,439 --> 00:13:15,199
are small controlled Jets well before 10

285
00:13:19,540 --> 00:13:17,449
meters and it turned out not to have any

286
00:13:21,939 --> 00:13:19,550
effect at all really understood of the

287
00:13:24,970 --> 00:13:21,949
tether so although that was an unplanned

288
00:13:30,280 --> 00:13:24,980

sort of maneuver it turned out not to

289
00:13:33,610 --> 00:13:30,290
have any impact next slide well the as

290
00:13:36,970 --> 00:13:33,620
the satellite went out further we

291
00:13:40,210 --> 00:13:36,980
started to see successively more and

292
00:13:42,759 --> 00:13:40,220
more motion in the tether there was

293
00:13:44,439 --> 00:13:42,769
always tension in the tether as it went

294
00:13:48,610 --> 00:13:44,449
out through a hundred meters or so and

295
00:13:50,980 --> 00:13:48,620
yet there was far more wiggling I guess

296
00:13:53,439 --> 00:13:50,990
then we had sort of imagined a question

297
00:13:57,220 --> 00:13:53,449
in the simulators we don't see the the

298
00:13:59,319 --> 00:13:57,230
tether moving at all with with this

299
00:14:03,490 --> 00:13:59,329
oscillatory motion so everything we were

300
00:14:05,470 --> 00:14:03,500
seeing here was new phenomena however

301
00:14:07,480 --> 00:14:05,480
the the deployment continued to go out

302
00:14:09,970 --> 00:14:07,490
very stable I'll review a little bit

303
00:14:12,490 --> 00:14:09,980
what happened we'll see some of this

304
00:14:14,379 --> 00:14:12,500
footage in motion in the film but it

305
00:14:16,720 --> 00:14:14,389
goes by very fast and I have to admit

306
00:14:19,090 --> 00:14:16,730
that when things got the most dynamic

307
00:14:19,860 --> 00:14:19,100
tended to be the times that we we threw

308
00:14:22,860 --> 00:14:19,870
the cameras

309
00:14:24,600 --> 00:14:22,870
and we're just glued to the windows to

310
00:14:25,740 --> 00:14:24,610
make sure that we were all doing the

311
00:14:27,750 --> 00:14:25,750
right thing that was sort of the

312
00:14:30,390 --> 00:14:27,760
watchword of this mission do the right

313
00:14:35,519 --> 00:14:30,400

thing and I think we did at any rate we

314
00:14:36,930 --> 00:14:35,529
we did get out to about 180 meters we

315
00:14:41,579 --> 00:14:36,940
had gone through our first nighttime

316
00:14:44,310 --> 00:14:41,589
pass it was extraordinary to us how the

317
00:14:46,470 --> 00:14:44,320
tether almost completely disappeared at

318
00:14:49,019 --> 00:14:46,480
night you could still see the satellite

319
00:14:50,100 --> 00:14:49,029
we had a large searchlight which we

320
00:14:51,810 --> 00:14:50,110
could shine on the satellite

321
00:14:53,880 --> 00:14:51,820
occasionally we played it up and down

322
00:14:56,910 --> 00:14:53,890
the tether and you could see small

323
00:14:58,710 --> 00:14:56,920
sections of the tether but I remember

324
00:15:00,750 --> 00:14:58,720
that moment when the when the Sun first

325
00:15:02,550 --> 00:15:00,760
row is on the on the tether was about a

326
00:15:05,340 --> 00:15:02,560
hundred and seventy meters of tether out

327
00:15:07,650 --> 00:15:05,350
there it was a glorious sight everybody

328
00:15:12,030 --> 00:15:07,660
everybody sort of came to the window and

329
00:15:14,250 --> 00:15:12,040
we have exclamations of joy and other

330
00:15:17,160 --> 00:15:14,260
things when people looked out the window

331
00:15:20,040 --> 00:15:17,170
at the the tether and the sunlight then

332
00:15:21,960 --> 00:15:20,050
the next thing we knew there was sort of

333
00:15:23,519 --> 00:15:21,970
tether flopping around in all which

334
00:15:25,350 --> 00:15:23,529
directions and what had happened was

335
00:15:29,310 --> 00:15:25,360
that the the tether had just stopped

336
00:15:32,790 --> 00:15:29,320
moving this we recognized very quickly

337
00:15:36,090 --> 00:15:32,800
what had happened we had seen this in

338
00:15:38,940 --> 00:15:36,100

the simulators we reacted we did the

339
00:15:41,390 --> 00:15:38,950
right thing and we were very pleased to

340
00:15:46,500 --> 00:15:41,400
see that in fact the the whole system

341
00:15:48,930 --> 00:15:46,510
regains stability and that gave us time

342
00:15:50,960 --> 00:15:48,940
to sort of sit back together with the

343
00:15:54,090 --> 00:15:50,970
ground and think about what to do next

344
00:15:57,660 --> 00:15:54,100
the ground came up with a plan by which

345
00:16:00,120 --> 00:15:57,670
we in order to clear what we assumed to

346
00:16:02,610 --> 00:16:00,130
be a jam we didn't know where we pulled

347
00:16:05,100 --> 00:16:02,620
back about five to ten meters of tether

348
00:16:07,140 --> 00:16:05,110
and then started it going out much

349
00:16:09,180 --> 00:16:07,150
faster than its normal rate and you'll

350
00:16:11,480 --> 00:16:09,190
see quite a dramatic sequence of that in

351
00:16:15,840 --> 00:16:11,490
the movie where we started basically

352
00:16:19,590 --> 00:16:15,850
spewing tether out all over the sky but

353
00:16:22,740 --> 00:16:19,600
again despite the intensely dramatic

354
00:16:25,410 --> 00:16:22,750
look of the situation the system became

355
00:16:27,780 --> 00:16:25,420
stable we were able to go all the way

356
00:16:30,540 --> 00:16:27,790
out at this point again we thought we

357
00:16:32,620 --> 00:16:30,550
had a nice deployment going but then we

358
00:16:36,420 --> 00:16:32,630
got out to a little over two

359
00:16:40,000 --> 00:16:36,430
150 meters once again the system hung up

360
00:16:43,360 --> 00:16:40,010
at this point the redshift had been up

361
00:16:47,650 --> 00:16:43,370
for well over 20 hours we went to bed

362
00:16:51,880 --> 00:16:47,660
the blue team took over station-keeping

363
00:16:56,560 --> 00:16:51,890

in science operations the next day we

364
00:16:59,560 --> 00:16:56,570
attempted to repeat this running start

365
00:17:02,650 --> 00:16:59,570
to start the deployment again the tether

366
00:17:05,110 --> 00:17:02,660
did not go out anymore we never did get

367
00:17:07,870 --> 00:17:05,120
the tether to go out any further we

368
00:17:10,929 --> 00:17:07,880
attempted now to reel in a little bit of

369
00:17:13,780 --> 00:17:10,939
tether and we found it would not real in

370
00:17:16,420 --> 00:17:13,790
at this point we were stuck between the

371
00:17:18,660 --> 00:17:16,430
proverbial rock and a hard place we

372
00:17:23,230 --> 00:17:18,670
couldn't go out we couldn't come in

373
00:17:25,569 --> 00:17:23,240
there were three options we could cut

374
00:17:30,160 --> 00:17:25,579
the tether which we didn't want to do we

375
00:17:32,740 --> 00:17:30,170
could go out do an ETA and pull in the

376
00:17:36,070 --> 00:17:32,750
tether hand over hand and Franklin and I

377
00:17:39,550 --> 00:17:36,080
were very willing and ready to do this

378
00:17:41,460 --> 00:17:39,560
and I think it would have worked the

379
00:17:44,530 --> 00:17:41,470
alternative was to come up with a

380
00:17:48,310 --> 00:17:44,540
another plan which Mission Control did

381
00:17:49,870 --> 00:17:48,320
and by moving the broom in and out we

382
00:17:52,330 --> 00:17:49,880
were able to free the jam and we

383
00:17:54,280 --> 00:17:52,340
proceeded to retrieve the tethered

384
00:17:56,770 --> 00:17:54,290
satellite in a very stable manner and

385
00:18:00,730 --> 00:17:56,780
you'll see as I say some of this footage

386
00:18:02,590 --> 00:18:00,740
in the movie but it does go by very fast

387
00:18:04,030 --> 00:18:02,600
so I think now you have the framework in

388
00:18:08,740 --> 00:18:04,040

which to appreciate it and we can go on

389
00:18:10,390 --> 00:18:08,750
with the slides one of the optical

390
00:18:12,430 --> 00:18:10,400
devices we attached to the top

391
00:18:14,500 --> 00:18:12,440
experiment that Claude talked about was

392
00:18:16,510 --> 00:18:14,510
a telescope that the top experiment was

393
00:18:18,520 --> 00:18:16,520
really an image intensifier with some

394
00:18:22,000 --> 00:18:18,530
regular camera lenses at one end of it

395
00:18:24,940 --> 00:18:22,010
we extended that camera lens into the

396
00:18:26,710 --> 00:18:24,950
telescope world and we had a basically a

397
00:18:29,920 --> 00:18:26,720
celestron telescope to put at the end of

398
00:18:32,380 --> 00:18:29,930
that this was quite an effort pre-flight

399
00:18:34,480 --> 00:18:32,390
in order to aim the telescope at

400
00:18:36,880 --> 00:18:34,490
something you needed a way to to find

401
00:18:38,860 --> 00:18:36,890
what you were aiming at it aiming with

402
00:18:40,600 --> 00:18:38,870
and so we had a couple of devices you

403
00:18:42,730 --> 00:18:40,610
can't see built around that telescope we

404
00:18:45,520 --> 00:18:42,740
put this in the window unfortunately the

405
00:18:45,940 --> 00:18:45,530
telescope or the satellite never got far

406
00:18:48,519 --> 00:18:45,950
enough

407
00:18:51,460 --> 00:18:48,529
a to really use this but Claude used it

408
00:18:53,139 --> 00:18:51,470
one night I think but this you can't

409
00:18:58,180 --> 00:18:53,149
really appreciate it takes up one entire

410
00:18:59,980 --> 00:18:58,190
window next slide I'm not trying out a

411
00:19:03,549 --> 00:18:59,990
new dance step here for the Houston

412
00:19:05,950 --> 00:19:03,559
Ballet a couple of people have already

413
00:19:10,090 --> 00:19:05,960

mentioned that we were doing a lot of

414
00:19:11,860 --> 00:19:10,100
nighttime observations and we we used

415
00:19:14,110 --> 00:19:11,870
every trick in the book that we could to

416
00:19:17,289 --> 00:19:14,120
optimize our ability to see low light

417
00:19:19,720 --> 00:19:17,299
level phenomena beings glow and all the

418
00:19:22,149 --> 00:19:19,730
other things that the Claude mentioned

419
00:19:25,690 --> 00:19:22,159
and one of the tricks we use was to try

420
00:19:28,870 --> 00:19:25,700
to get pre dark-adapted so that even

421
00:19:32,259 --> 00:19:28,880
during the daytime some of us would wear

422
00:19:34,180 --> 00:19:32,269
these dark goggles we also had red

423
00:19:35,379 --> 00:19:34,190
flashlights that we wore I think you saw

424
00:19:37,779 --> 00:19:35,389
a picture of Claude with his red

425
00:19:41,289 --> 00:19:37,789
flashlight on early so it was often

426
00:19:42,970 --> 00:19:41,299
quite a quite an amusing scene of

427
00:19:45,460 --> 00:19:42,980
various crew members and their goggles

428
00:19:49,810 --> 00:19:45,470
and flashlights traipsing around the

429
00:19:52,029 --> 00:19:49,820
cockpit next this mission had some

430
00:19:54,430 --> 00:19:52,039
significant data recording requirements

431
00:19:57,759 --> 00:19:54,440
that were beyond the capability of the

432
00:20:00,580 --> 00:19:57,769
orbiter as it presently flies and so to

433
00:20:05,169 --> 00:20:00,590
accommodate those requirements we added

434
00:20:07,419 --> 00:20:05,179
some additional recording camcorder and

435
00:20:09,370 --> 00:20:07,429
another little hi8 recorder which

436
00:20:11,259 --> 00:20:09,380
required external cabling in order to

437
00:20:12,820 --> 00:20:11,269
make all of that work we were recording

438
00:20:15,610 --> 00:20:12,830

from two sometimes three sources

439
00:20:17,500 --> 00:20:15,620
probably constantly for the entire time

440
00:20:19,810 --> 00:20:17,510
that the tether was out and satellite

441
00:20:22,269 --> 00:20:19,820
was out and with that if you can imagine

442
00:20:24,009 --> 00:20:22,279
seven people now clumped around all of

443
00:20:25,450 --> 00:20:24,019
this it should give you a feel for what

444
00:20:30,940 --> 00:20:25,460
it was like during the heat of battle

445
00:20:34,149 --> 00:20:30,950
for the TSS operations next slide this

446
00:20:36,519 --> 00:20:34,159
is a this is a picture that that doesn't

447
00:20:39,310 --> 00:20:36,529
quite do the scene justice but this is

448
00:20:40,750 --> 00:20:39,320
the this is the glow around the orbiter

449
00:20:42,909 --> 00:20:40,760
when we were down in our lowest orbit

450
00:20:45,010 --> 00:20:42,919
the last part of our mission was to drop

451
00:20:46,390 --> 00:20:45,020
down into

452
00:20:49,690 --> 00:20:46,400
is low in Earth orbit as we could

453
00:20:52,030 --> 00:20:49,700
probably get to 124 miles and and work

454
00:20:55,270 --> 00:20:52,040
the EU IM experiment which was basically

455
00:20:59,590 --> 00:20:55,280
a tray of different types of materials

456
00:21:04,780 --> 00:20:59,600
and in spectrometers and what we were

457
00:21:06,220 --> 00:21:04,790
trying to see there was was part of the

458
00:21:07,930 --> 00:21:06,230
materials would give us a real good idea

459
00:21:10,150 --> 00:21:07,940
of some of the things that we may be

460
00:21:12,130 --> 00:21:10,160
able to use in future future endeavors

461
00:21:13,630 --> 00:21:12,140
such as a space station but we get down

462
00:21:15,550 --> 00:21:13,640
that low in the atmosphere we actually

463
00:21:17,080 --> 00:21:15,560

get a glow around the orbiter much much

464
00:21:19,240 --> 00:21:17,090
more predominantly than we do at higher

465
00:21:20,800 --> 00:21:19,250
atmosphere and this is a picture taken

466
00:21:23,950 --> 00:21:20,810
out the back window of what it kind of

467
00:21:26,530 --> 00:21:23,960
looked like going through this dense

468
00:21:28,930 --> 00:21:26,540
area much more dense than 230 miles of

469
00:21:30,970 --> 00:21:28,940
atomic oxygen and how it kind of reacted

470
00:21:33,100 --> 00:21:30,980
with hitting the orbit or payload bay

471
00:21:34,990 --> 00:21:33,110
into the velocity vector here there's a

472
00:21:36,940 --> 00:21:35,000
little bit of a purple beam off the side

473
00:21:40,210 --> 00:21:36,950
there which is one of our jets that had

474
00:21:46,600 --> 00:21:40,220
just fired when we took this picture in

475
00:21:48,430 --> 00:21:46,610
next slide okay I think now we're ready

476
00:21:51,520 --> 00:21:48,440
to we've kind of given you an overview

477
00:21:54,430 --> 00:21:51,530
taking time to explain a few of the the

478
00:21:57,130 --> 00:21:54,440
details because the sequences as Jeff

479
00:21:59,370 --> 00:21:57,140
mentioned pass pretty quickly in the

480
00:22:02,170 --> 00:21:59,380
movie so why don't we go ahead and

481
00:22:06,310 --> 00:22:02,180
transition to the movie now and will

482
00:22:10,720 --> 00:22:06,320
narrate this as we go along as I

483
00:22:13,930 --> 00:22:10,730
mentioned time flies and we we had a lot

484
00:22:15,760 --> 00:22:13,940
of fun all through the whole thing first

485
00:22:18,430 --> 00:22:15,770
thing of course prior to getting ready

486
00:22:24,400 --> 00:22:18,440
to go was getting ready for the orange

487
00:22:27,010 --> 00:22:24,410
suits all of us getting prettied up

488
00:22:29,290 --> 00:22:27,020

doctored up we didn't know neither hair

489
00:22:34,960 --> 00:22:29,300
braided but here's clogged get an

490
00:22:37,630 --> 00:22:34,970
initial TSS familiar ization we enjoyed

491
00:22:39,490 --> 00:22:37,640
going out to the vehicle in daylight

492
00:22:41,500 --> 00:22:39,500
this was my first experience with that

493
00:22:43,380 --> 00:22:41,510
and that was kind of nice to be able to

494
00:22:45,370 --> 00:22:43,390
see what was going on for the first time

495
00:22:47,260 --> 00:22:45,380
I've seen a couple space shuttle

496
00:22:49,030 --> 00:22:47,270
launches from different viewing areas

497
00:22:49,980 --> 00:22:49,040
and it was always very spectacular being

498
00:22:52,410 --> 00:22:49,990
on the inside

499
00:22:54,240 --> 00:22:52,420
was quite a bit more spectacular launch

500
00:22:57,450 --> 00:22:54,250
countdown was about as perfect as it can

501
00:23:00,060 --> 00:22:57,460
get and I apologize we were 48 seconds

502
00:23:01,950 --> 00:23:00,070
late and I was just I was hoping that we

503
00:23:06,960 --> 00:23:01,960
could do it in 46 seconds but it missed

504
00:23:08,549 --> 00:23:06,970
by a couple seconds the thought that

505
00:23:10,500 --> 00:23:08,559
really crossed my mind more than else

506
00:23:12,630 --> 00:23:10,510
going through all of this was was what

507
00:23:14,940 --> 00:23:12,640
it took to make all this happen it's

508
00:23:16,290 --> 00:23:14,950
hard to think about and imagine the

509
00:23:17,549 --> 00:23:16,300
thousands of people are the tens of

510
00:23:19,860 --> 00:23:17,559
thousands of people that can make all of

511
00:23:21,570 --> 00:23:19,870
this work and it takes such a complex

512
00:23:23,760 --> 00:23:21,580
piece of machinery and make it look so

513
00:23:25,620 --> 00:23:23,770

simple and look so easy it's very

514
00:23:28,230 --> 00:23:25,630
graceful and very easy as it goes up on

515
00:23:29,700 --> 00:23:28,240
his asset there's some shock waves that

516
00:23:36,210 --> 00:23:29,710
are coming as we're going through Mach 1

517
00:23:39,600 --> 00:23:36,220
which is about 40,000 feet or so well

518
00:23:43,410 --> 00:23:39,610
this was the first of 126 space sunrises

519
00:23:44,910 --> 00:23:43,420
that we saw just soon after we got onto

520
00:23:48,150 --> 00:23:44,920
orbit we opened the payload bay doors

521
00:23:49,830 --> 00:23:48,160
and the complement of payloads that we

522
00:23:51,780 --> 00:23:49,840
carried you can see the tethered

523
00:23:55,110 --> 00:23:51,790
satellite up towards the front of the

524
00:23:57,930 --> 00:23:55,120
cargo bay behind at the Eureka which we

525
00:24:00,930 --> 00:23:57,940
soon deployed and then the eoi n payload

526
00:24:06,570 --> 00:24:00,940
so first order of business was to get

527
00:24:08,640 --> 00:24:06,580
the arm out and pick up Eureka this is

528
00:24:11,760 --> 00:24:08,650
the grapple of Eureka and the cargo bay

529
00:24:13,470 --> 00:24:11,770
I'm approaching Eureka with the arm and

530
00:24:16,669 --> 00:24:13,480
this was a view from the end-effector

531
00:24:19,830 --> 00:24:16,679
camera and this is a position i had from

532
00:24:22,590 --> 00:24:19,840
operating the remote manipulator system

533
00:24:23,880 --> 00:24:22,600
at this point I'm very close to Eureka

534
00:24:26,940 --> 00:24:23,890
and I'm going to grapple it press the

535
00:24:29,640 --> 00:24:26,950
trigger to grapple it's while Andy was

536
00:24:31,440 --> 00:24:29,650
maneuvering the orbiter and Franco was

537
00:24:34,620 --> 00:24:31,450
taking pictures it was a blue shift

538
00:24:36,360 --> 00:24:34,630

activity at this time now I'm unbirth in

539
00:24:37,890 --> 00:24:36,370
Eureka from the cargo bay this black

540
00:24:42,090 --> 00:24:37,900
structure that you see in front of

541
00:24:43,530 --> 00:24:42,100
Eureka are the folded solar arrays and

542
00:24:45,600 --> 00:24:43,540
this whole operation took about six

543
00:24:47,400 --> 00:24:45,610
hours were lifting Eureka out of the bay

544
00:24:49,850 --> 00:24:47,410
and also performing various maneuvers

545
00:24:52,549 --> 00:24:49,860
and as I mentioned before to calibrate

546
00:24:54,200 --> 00:24:52,559
sensors now you see the folded solar

547
00:24:57,169 --> 00:24:54,210
array on one side of you recap pretty

548
00:24:59,419 --> 00:24:57,179
clearly and it's about at that point

549
00:25:02,450 --> 00:24:59,429
that we started having problems with

550
00:25:04,610 --> 00:25:02,460
payload communication that when we were

551
00:25:06,950 --> 00:25:04,620
flying over some sites like guru french

552
00:25:08,750 --> 00:25:06,960
guiana the ground will command for

553
00:25:10,400 --> 00:25:08,760
instance solar a deployment which you

554
00:25:11,720 --> 00:25:10,410
see on this picture here where

555
00:25:14,000 --> 00:25:11,730
spectacular to see the solar a

556
00:25:16,280 --> 00:25:14,010
deployment quite a delicate mechanism

557
00:25:17,810 --> 00:25:16,290
also but it worked very well and in a

558
00:25:19,760 --> 00:25:17,820
few second you'll see that tensioning

559
00:25:21,590 --> 00:25:19,770
process at the end of the solar array

560
00:25:25,000 --> 00:25:21,600
deployment you see the solar array that

561
00:25:27,680 --> 00:25:25,010
take a stick shape and waved somewhat

562
00:25:30,799 --> 00:25:27,690
indicating a proper stiffening and

563
00:25:34,070 --> 00:25:30,809

tensioning of the cables that were used

564
00:25:37,610 --> 00:25:34,080
to deploy the solar rays a spectacular

565
00:25:39,320 --> 00:25:37,620
view of a pass over the Red Sea and the

566
00:25:41,900 --> 00:25:39,330
Middle East with you Rick at the tip of

567
00:25:45,590 --> 00:25:41,910
the arm shortly before release of Eureka

568
00:25:46,789 --> 00:25:45,600
and here we go after release this is

569
00:25:48,289 --> 00:25:46,799
coming back over the kennedy space

570
00:25:53,450 --> 00:25:48,299
center again we just really like this

571
00:25:55,400 --> 00:25:53,460
picture the separation burned when real

572
00:25:57,380 --> 00:25:55,410
fine we moved out to a thousand feet and

573
00:25:59,030 --> 00:25:57,390
we actually kept it to work over ELQ

574
00:26:00,020 --> 00:25:59,040
annex and save liberal propeller we

575
00:26:01,820 --> 00:26:00,030
actually work from about nine hundred

576
00:26:04,100 --> 00:26:01,830
twenty feet after that eleven hundred

577
00:26:05,450 --> 00:26:04,110
fifty feet this is basically what Eureka

578
00:26:08,810 --> 00:26:05,460
look like at a thousand feet away from

579
00:26:10,280 --> 00:26:08,820
us and then we did the otm burn which is

580
00:26:14,060 --> 00:26:10,290
about five hours later which put it in

581
00:26:15,169 --> 00:26:14,070
his proper attitude Jeff went ahead and

582
00:26:17,480 --> 00:26:15,179
took that picture for us a beautiful

583
00:26:19,190 --> 00:26:17,490
picture of the moon on by eureka here we

584
00:26:23,049 --> 00:26:19,200
are setting up the science operation

585
00:26:25,970 --> 00:26:23,059
center down in the mid deck we have this

586
00:26:27,799 --> 00:26:25,980
personal computer being up to date

587
00:26:30,620 --> 00:26:27,809
technologies coming into the space

588
00:26:32,600 --> 00:26:30,630

shuttle to and now we're raising the

589
00:26:34,340 --> 00:26:32,610
boom getting ready to deploy the

590
00:26:37,340 --> 00:26:34,350
tethered satellite so far everything

591
00:26:41,810 --> 00:26:37,350
with tss has gone perfectly the boom

592
00:26:44,060 --> 00:26:41,820
rose when we got up to the top we had

593
00:26:46,460 --> 00:26:44,070
the first difficulty we attempted to

594
00:26:48,890 --> 00:26:46,470
extract one of this that's little

595
00:26:51,950 --> 00:26:48,900
umbilical at the top it didn't pull out

596
00:26:54,919 --> 00:26:51,960
so we rotated back and forth a little

597
00:26:56,960 --> 00:26:54,929
bit we put it in a position where we

598
00:27:00,590 --> 00:26:56,970
could expose it to the Sun heat it up

599
00:27:04,140 --> 00:27:00,600
here's a nice close-up view of it

600
00:27:06,030 --> 00:27:04,150
in attempting to keep it exposed to the

601
00:27:10,050 --> 00:27:06,040
Sun we ended up with a site that we

602
00:27:11,700 --> 00:27:10,060
never thought we'd see the TSS boom and

603
00:27:14,490 --> 00:27:11,710
the satellite pointed down towards the

604
00:27:16,290 --> 00:27:14,500
Earth someday on a future mission we may

605
00:27:18,240 --> 00:27:16,300
actually lower a tether satellite down

606
00:27:20,460 --> 00:27:18,250
into the upper reaches of the atmosphere

607
00:27:24,450 --> 00:27:20,470
and that will also be very exciting but

608
00:27:26,670 --> 00:27:24,460
in any case finally Lauren moved the

609
00:27:30,030 --> 00:27:26,680
whole orbiter away and you can see the

610
00:27:32,310 --> 00:27:30,040
umbilical pulley we did then we were

611
00:27:35,220 --> 00:27:32,320
ready for fly away we had in the first

612
00:27:38,160 --> 00:27:35,230
attempt didn't work that finally we got

613
00:27:40,980 --> 00:27:38,170

the thing going and here it is and this

614
00:27:43,230 --> 00:27:40,990
is that portion then that where the

615
00:27:45,180 --> 00:27:43,240
orbiter is in free drift and the

616
00:27:49,020 --> 00:27:45,190
satellite as you can see here is moving

617
00:27:50,850 --> 00:27:49,030
very slowly away from the boom tip but

618
00:27:52,710 --> 00:27:50,860
notice also of course that it is very

619
00:27:56,400 --> 00:27:52,720
stable there's no tendency for the

620
00:27:59,820 --> 00:27:56,410
satellite to roll off or do any pitching

621
00:28:02,820 --> 00:27:59,830
moments and the tether was very stable

622
00:28:05,550 --> 00:28:02,830
also each of us had an assigned tasks

623
00:28:08,850 --> 00:28:05,560
that we were doing all through the early

624
00:28:11,550 --> 00:28:08,860
to deploy phases and that always entails

625
00:28:14,910 --> 00:28:11,560
somebody checking CRT displays upfront

626
00:28:16,770 --> 00:28:14,920
and looking out the windows to make sure

627
00:28:22,260 --> 00:28:16,780
that the satellite and a tether system

628
00:28:24,990 --> 00:28:22,270
were in a safe configuration we

629
00:28:27,060 --> 00:28:25,000
continued to fly it away you're about 15

630
00:28:29,250 --> 00:28:27,070
or 20 meters here notice that the tether

631
00:28:32,670 --> 00:28:29,260
is still very straight and very stable

632
00:28:34,620 --> 00:28:32,680
in this configuration it wasn't until we

633
00:28:36,600 --> 00:28:34,630
got much longer lengths that we started

634
00:28:39,750 --> 00:28:36,610
to notice any significant tether

635
00:28:42,840 --> 00:28:39,760
oscillations at about a 25 meter length

636
00:28:45,630 --> 00:28:42,850
then we deactivated the k-band system

637
00:28:47,640 --> 00:28:45,640
for communications and converted it into

638
00:28:50,910 --> 00:28:47,650

a radar and started tracking the

639
00:28:54,330 --> 00:28:50,920
satellite so we could tell an additional

640
00:28:55,530 --> 00:28:54,340
means of where it was now the tether it

641
00:28:58,140 --> 00:28:55,540
was getting long enough that we've

642
00:29:00,420 --> 00:28:58,150
started to see a lot of vibrations this

643
00:29:02,280 --> 00:29:00,430
this may look like a very loose tether

644
00:29:03,690 --> 00:29:02,290
but that there was normal tension in

645
00:29:06,630 --> 00:29:03,700
this tether this is just the way a

646
00:29:10,890 --> 00:29:06,640
tether behaves this is the system after

647
00:29:12,690 --> 00:29:10,900
we hit the first snag it it already has

648
00:29:13,000 --> 00:29:12,700
pretty much reached stability and we

649
00:29:15,490 --> 00:29:13,010
were

650
00:29:19,810 --> 00:29:15,500
ready now to run the tether out for this

651
00:29:21,700 --> 00:29:19,820
so-called running start it and here it

652
00:29:24,820 --> 00:29:21,710
goes you can see we were spewing tether

653
00:29:27,100 --> 00:29:24,830
out of we have probably about 20 or 30

654
00:29:29,380 --> 00:29:27,110
meters of slack tether you can see how

655
00:29:33,550 --> 00:29:29,390
it takes up the coiled shape that it was

656
00:29:36,310 --> 00:29:33,560
on the real but before long the

657
00:29:40,530 --> 00:29:36,320
satellite keeps moving the way it pulls

658
00:29:44,320 --> 00:29:40,540
out the slack tether and it's basically

659
00:29:46,030 --> 00:29:44,330
until we reach the next snag it

660
00:29:48,130 --> 00:29:46,040
continued to move away and even after

661
00:29:56,500 --> 00:29:48,140
the next snag it basically went into a

662
00:30:00,040 --> 00:29:56,510
stable configuration I guess the next

663
00:30:02,170 --> 00:30:00,050

part was the redshift have been up for a

664
00:30:03,700 --> 00:30:02,180
pretty long day here and now we need to

665
00:30:05,800 --> 00:30:03,710
get them put to bed so we put them to

666
00:30:07,990 --> 00:30:05,810
bed and for the blue shift it was pretty

667
00:30:09,520 --> 00:30:08,000
much watching the satellite that night

668
00:30:11,740 --> 00:30:09,530
normally we're going to be watching

669
00:30:13,960 --> 00:30:11,750
about 20 kilometers and doing our normal

670
00:30:16,660 --> 00:30:13,970
station keeping this is a site out the

671
00:30:18,160 --> 00:30:16,670
class which is a optical alignment site

672
00:30:20,140 --> 00:30:18,170
which is one of the ways that I could

673
00:30:21,910 --> 00:30:20,150
judge how the satellite was maneuvered

674
00:30:23,470 --> 00:30:21,920
force was actually extremely well

675
00:30:25,810 --> 00:30:23,480
behaved in over an eight hour period I

676
00:30:27,550 --> 00:30:25,820
never invited yet during all the on

677
00:30:30,130 --> 00:30:27,560
station phase of course all the science

678
00:30:32,020 --> 00:30:30,140
instrumentations were working and we

679
00:30:34,630 --> 00:30:32,030
were also watching with the top

680
00:30:38,230 --> 00:30:34,640
instrumentation the satellite which care

681
00:30:41,260 --> 00:30:38,240
shines against the image intensifier a

682
00:30:43,330 --> 00:30:41,270
picture of this guy we weren't able as i

683
00:30:45,130 --> 00:30:43,340
said to continue the deployment this is

684
00:30:47,590 --> 00:30:45,140
how you retrieve a satellite you have to

685
00:30:50,470 --> 00:30:47,600
move the shuttle underneath in order to

686
00:30:52,030 --> 00:30:50,480
get the tether to come back in the

687
00:30:55,060 --> 00:30:52,040
proper place and that's what we're about

688
00:30:56,860 --> 00:30:55,070

to do all of our operations were really

689
00:30:59,230 --> 00:30:56,870
conducted in the manual mode and I think

690
00:31:00,490 --> 00:30:59,240
that's important to note because this

691
00:31:02,890 --> 00:31:00,500
system was supposed to have been an

692
00:31:05,020 --> 00:31:02,900
automatic and he points out the value of

693
00:31:07,690 --> 00:31:05,030
the human being in the loop the

694
00:31:10,690 --> 00:31:07,700
satellite was being controlled by by jet

695
00:31:12,100 --> 00:31:10,700
firings from keyboards and the teller

696
00:31:14,500 --> 00:31:12,110
was being control those from the

697
00:31:17,380 --> 00:31:14,510
keyboard and everything was very smooth

698
00:31:20,380 --> 00:31:17,390
the in lines were turned in turn on a

699
00:31:20,899 --> 00:31:20,390
little bit later than expected but the

700
00:31:24,919 --> 00:31:20,909
dock

701
00:31:26,330 --> 00:31:24,929
was very very smooth after ducking the

702
00:31:27,919 --> 00:31:26,340
satellite of the docking ring we

703
00:31:31,219 --> 00:31:27,929
commanded the retraction of the room

704
00:31:33,799 --> 00:31:31,229
which you see here and there was still

705
00:31:35,659 --> 00:31:33,809
some alignment with satellite to perform

706
00:31:37,219 --> 00:31:35,669
prior to latching the satellite in cargo

707
00:31:40,279 --> 00:31:37,229
bay and there was of course a big relief

708
00:31:41,899 --> 00:31:40,289
in the crew at that time what you see

709
00:31:44,779 --> 00:31:41,909
now is the ohms burn that lowered us

710
00:31:47,269 --> 00:31:44,789
from 160 mile altitude down to the 128

711
00:31:49,339 --> 00:31:47,279
mile altitude and now while we had our

712
00:31:51,320 --> 00:31:49,349
EO IM experiment in the bay looking at

713
00:31:52,820 --> 00:31:51,330

atomic oxygen we proceeded with some

714
00:31:54,320 --> 00:31:52,830
different medical experiments in a

715
00:31:56,960 --> 00:31:54,330
little bit more relaxed time for the

716
00:31:59,330 --> 00:31:56,970
crew while Jeff is doing his medical

717
00:32:01,159 --> 00:31:59,340
experiments those of us they could now

718
00:32:04,099 --> 00:32:01,169
get to a window we had not been able to

719
00:32:05,659 --> 00:32:04,109
see a window we're upstairs taking

720
00:32:07,460 --> 00:32:05,669
pictures he also see in my hand there

721
00:32:09,739 --> 00:32:07,470
the controller that ran the IMAX camera

722
00:32:11,839 --> 00:32:09,749
we had in the payload Bay now we had the

723
00:32:13,580 --> 00:32:11,849
opportunity to see the earth out of the

724
00:32:16,339 --> 00:32:13,590
windows whereas before we've been

725
00:32:18,589 --> 00:32:16,349
looking pretty much at space and and we

726
00:32:20,779 --> 00:32:18,599
took advantage every time we could we

727
00:32:22,669 --> 00:32:20,789
noticed one thing at 128 miles that the

728
00:32:24,919 --> 00:32:22,679
earth appears to move much more quickly

729
00:32:26,719 --> 00:32:24,929
past you than it does it any higher

730
00:32:29,210 --> 00:32:26,729
altitude and we had the opportunity to

731
00:32:33,950 --> 00:32:29,220
look at 230 and 160 miles the earth just

732
00:32:36,649 --> 00:32:33,960
smoked right by this is a java you can

733
00:32:37,999 --> 00:32:36,659
see the line of volcanoes that look like

734
00:32:40,430 --> 00:32:38,009
they've been laid out with a straight

735
00:32:42,109 --> 00:32:40,440
edge you can also see how blue the

736
00:32:45,849 --> 00:32:42,119
planet looks I mean that it always

737
00:32:49,369 --> 00:32:45,859
amazed me how very blue things looked

738
00:32:52,039 --> 00:32:49,379

one of the things that most interest us

739
00:32:54,169 --> 00:32:52,049
these days is the burning of the Amazon

740
00:32:57,469 --> 00:32:54,179
forest and this what you see there are

741
00:33:00,589 --> 00:32:57,479
little plumes of ground fires in the

742
00:33:03,830 --> 00:33:00,599
area of central brazil and then of

743
00:33:06,139 --> 00:33:03,840
course we got to be able to zoom in with

744
00:33:08,509 --> 00:33:06,149
a very powerful lens and you can see

745
00:33:11,210 --> 00:33:08,519
some of the patches of deforestation in

746
00:33:12,320 --> 00:33:11,220
the state of rondonia in Brazil isn't it

747
00:33:16,820 --> 00:33:12,330
it's an area that we've been watching

748
00:33:18,999 --> 00:33:16,830
over and over us missions go by and we

749
00:33:23,049 --> 00:33:19,009
see all the patterns of deforestation

750
00:33:26,919 --> 00:33:23,059
xinlong geometrical lines as roads

751
00:33:32,009 --> 00:33:26,929
and population expands into that area we

752
00:33:36,850 --> 00:33:32,019
also tried to photograph the entire

753
00:33:40,779 --> 00:33:36,860
Caribbean Basin and of course Brazil and

754
00:33:42,759 --> 00:33:40,789
Central America we managed to to get

755
00:33:46,239 --> 00:33:42,769
pictures of all of the Central American

756
00:33:48,129 --> 00:33:46,249
capitals but we're not able to get Costa

757
00:33:52,950 --> 00:33:48,139
Rica because it was always cloudy over

758
00:33:55,450 --> 00:33:52,960
there I guess this is a part of the

759
00:33:59,799 --> 00:33:55,460
russian girl a dispersion awesome oil

760
00:34:05,350 --> 00:33:59,809
slick and a big big storm is a Javier

761
00:34:08,500 --> 00:34:05,360
audio champion somebody else this is

762
00:34:11,579 --> 00:34:08,510
Baja California and we come on down

763
00:34:14,889 --> 00:34:11,589

through Central America and southern and

764
00:34:18,369 --> 00:34:14,899
southern Mexico and we're able to zoom

765
00:34:21,369 --> 00:34:18,379
in into the city of Acapulco I think you

766
00:34:23,290 --> 00:34:21,379
can appreciate the power of that lens

767
00:34:25,960 --> 00:34:23,300
it's hard to it's hard to keep the

768
00:34:27,339 --> 00:34:25,970
camera steady when you're zooming in

769
00:34:31,389 --> 00:34:27,349
that closed until you have to wedge

770
00:34:35,200 --> 00:34:31,399
yourself against the window I said most

771
00:34:37,690 --> 00:34:35,210
of the area was cloudy but we were able

772
00:34:39,129 --> 00:34:37,700
to get the few good shots so feel for

773
00:34:40,809 --> 00:34:39,139
what it would take to do a simple task

774
00:34:44,409 --> 00:34:40,819
in orbit like changing the batteries in

775
00:34:45,819 --> 00:34:44,419
your camera it was sometimes more than a

776
00:34:47,349 --> 00:34:45,829
two minute we've been using the cameras

777
00:34:49,030 --> 00:34:47,359
a lot so the batteries are pretty hot

778
00:34:50,440 --> 00:34:49,040
but keep it I mean think about this try

779
00:34:53,470 --> 00:34:50,450
to change batteries one day without ever

780
00:34:56,290 --> 00:34:53,480
dropping apart and you were playing our

781
00:34:59,319 --> 00:34:56,300
volleyball lib against Switzerland

782
00:35:02,200 --> 00:34:59,329
against Italy it's a good way of keeping

783
00:35:04,000 --> 00:35:02,210
in shape in space and of course learning

784
00:35:06,190 --> 00:35:04,010
about dynamics in space this is

785
00:35:09,520 --> 00:35:06,200
something that we ran as a way of

786
00:35:12,910 --> 00:35:09,530
explaining in a in a future your visual

787
00:35:15,880 --> 00:35:12,920
to youngsters how that works works in

788
00:35:17,920 --> 00:35:15,890

space this is the principle for angular

789
00:35:20,290 --> 00:35:17,930
momentum conservation and as you see

790
00:35:25,630 --> 00:35:20,300
when we elongate the tetteh we have a

791
00:35:27,430 --> 00:35:25,640
slower rotational speed and of course

792
00:35:29,160 --> 00:35:27,440
the principal investigator of this

793
00:35:31,109 --> 00:35:29,170
research at the end of the

794
00:35:39,289 --> 00:35:31,119
the experiment that has the right to

795
00:35:49,620 --> 00:35:47,789
physics works well some of us still

796
00:35:51,089 --> 00:35:49,630
thought it was necessary to do a little

797
00:35:53,069 --> 00:35:51,099
bit of work during this final couple

798
00:35:54,780 --> 00:35:53,079
days you can see we did have an odometer

799
00:35:58,880 --> 00:35:54,790
on board that was one of our medical

800
00:36:02,450 --> 00:35:58,890
dsos but jeff still found found time to

801
00:36:04,890 --> 00:36:02,460
play with his all metal yoyo there and

802
00:36:07,740 --> 00:36:04,900
demonstrate yet more principles of

803
00:36:09,510 --> 00:36:07,750
physics with that the hcf the growth

804
00:36:11,309 --> 00:36:09,520
hormone experiment was there one mid dec

805
00:36:13,020 --> 00:36:11,319
experiment it required that you take it

806
00:36:15,420 --> 00:36:13,030
out and rotate it five times in ten

807
00:36:17,130 --> 00:36:15,430
seconds every day so instead of rotating

808
00:36:20,430 --> 00:36:17,140
the box I'm holding the box of

809
00:36:21,720 --> 00:36:20,440
Franklin's rotating me well eventually

810
00:36:23,700 --> 00:36:21,730
it gets time that we got to come home

811
00:36:25,260 --> 00:36:23,710
and this is just for an eye on the

812
00:36:26,579 --> 00:36:25,270
flight deck down the flight control

813
00:36:28,049 --> 00:36:26,589

check out you can see some of the yellow

814
00:36:29,849 --> 00:36:28,059
lines moving there in the picture there

815
00:36:31,620 --> 00:36:29,859
as we check out all the flight control

816
00:36:33,109 --> 00:36:31,630
services then we put the red team to bed

817
00:36:35,880 --> 00:36:33,119
and make sure we're all set to go for

818
00:36:37,680 --> 00:36:35,890
over the next morning when we launched

819
00:36:39,599 --> 00:36:37,690
it was just about a new moon we were up

820
00:36:41,400 --> 00:36:39,609
for eight days one day more than we had

821
00:36:44,339 --> 00:36:41,410
planned and this is what the moon looked

822
00:36:47,250 --> 00:36:44,349
like when we finished 126 times we got

823
00:36:50,190 --> 00:36:47,260
to see the moon rise and then the sunset

824
00:36:52,410 --> 00:36:50,200
over the payload Bay and it was just as

825
00:36:56,579 --> 00:36:52,420
beautiful every time we saw it but it

826
00:36:58,289 --> 00:36:56,589
was finally time to come home by the

827
00:37:00,630 --> 00:36:58,299
time we were ready to come home we knew

828
00:37:02,400 --> 00:37:00,640
that we were coming home either to que

829
00:37:04,620 --> 00:37:02,410
se or to Edward so it was a simple

830
00:37:06,539 --> 00:37:04,630
matter of putting on the suits and

831
00:37:08,099 --> 00:37:06,549
getting ready to do the entry we just

832
00:37:10,620 --> 00:37:08,109
didn't know where we were going to burn

833
00:37:12,990 --> 00:37:10,630
to for a while but KSC cleared out the

834
00:37:15,839 --> 00:37:13,000
weather as you can see here is only

835
00:37:17,940 --> 00:37:15,849
scattered clouds the very smooth error a

836
00:37:19,859 --> 00:37:17,950
lot of moisture we didn't see the

837
00:37:22,650 --> 00:37:19,869
condensation trails that you folks did

838
00:37:24,480 --> 00:37:22,660

on the ground but it was a pleasure to

839
00:37:26,130 --> 00:37:24,490
fly the entry and the final approach

840
00:37:30,089 --> 00:37:26,140
through that nice smooth air for a

841
00:37:32,490 --> 00:37:30,099
change as we come in start to pull up

842
00:37:35,370 --> 00:37:32,500
about 1,800 feet and pass through 300

843
00:37:37,020 --> 00:37:35,380
feet and he got the gear down another

844
00:37:40,069 --> 00:37:37,030
major task I assigned him a long time

845
00:37:42,390 --> 00:37:40,079
ago and he did a marvelous job with that

846
00:37:45,990 --> 00:37:42,400
probably much better than my subsequent

847
00:37:48,349 --> 00:37:46,000
landing but it it looks ok and it really

848
00:37:52,410 --> 00:37:48,359
did look good from the inside as well so

849
00:37:54,930 --> 00:37:52,420
we touched down there about 1,900 feet

850
00:38:00,960 --> 00:37:54,940
down the runway roughly and then rolled

851
00:38:02,789 --> 00:38:00,970
to a stop on runway 33 at KSC this is

852
00:38:06,210 --> 00:38:02,799
really some kind of an experience here

853
00:38:09,839 --> 00:38:06,220
after eight days in space and it took us

854
00:38:13,190 --> 00:38:09,849
a while to want to feel like jumping up

855
00:38:15,900 --> 00:38:13,200
and walking around the orbiter I

856
00:38:17,460 --> 00:38:15,910
remember sitting there doing switch

857
00:38:19,530 --> 00:38:17,470
throws and everything that wasn't too

858
00:38:21,660 --> 00:38:19,540
bad but that initial attempt to stand up

859
00:38:24,630 --> 00:38:21,670
with something else eventually we all

860
00:38:29,150 --> 00:38:24,640
found our legs though and stumbled out

861
00:38:34,339 --> 00:38:31,859
ok we need to go back to the slides now

862
00:38:36,359 --> 00:38:34,349
and pick up with some of our other

863
00:38:39,059 --> 00:38:36,369

activities that we didn't get a chance

864
00:38:42,240 --> 00:38:39,069
to show you before and I will start off

865
00:38:43,829 --> 00:38:42,250
with Andy here I think they shaved all

866
00:38:47,640 --> 00:38:43,839
the hair off my chest so I could do this

867
00:38:49,500 --> 00:38:47,650
so I could do this medical DSO here two

868
00:38:53,039 --> 00:38:49,510
of us Franklin and myself had to do what

869
00:38:55,680 --> 00:38:53,049
they call it intense exercise DSO where

870
00:38:57,390 --> 00:38:55,690
we had pretty much be hooked up to a lot

871
00:38:59,339 --> 00:38:57,400
of telemetry for EKG and heart

872
00:39:00,569 --> 00:38:59,349
monitoring to the sort of folks here on

873
00:39:01,920 --> 00:39:00,579
the ground and the flight surgeons could

874
00:39:04,589 --> 00:39:01,930
take a good look at us why we were

875
00:39:06,660 --> 00:39:04,599
trying to do an intense workout trying

876
00:39:08,730 --> 00:39:06,670
to correlate the day that we had given

877
00:39:10,770 --> 00:39:08,740
them pre-flight as to how we were

878
00:39:12,510 --> 00:39:10,780
reacted in how our hearts work why we're

879
00:39:18,569 --> 00:39:12,520
up in space and then also immediately

880
00:39:21,809 --> 00:39:18,579
after flight next line we did not only

881
00:39:23,819 --> 00:39:21,819
wear goggles and gloves to perform the

882
00:39:25,170 --> 00:39:23,829
top experiment that is to get dark

883
00:39:26,760 --> 00:39:25,180
adapted during the day in order to

884
00:39:29,220 --> 00:39:26,770
perform low-level light work during the

885
00:39:31,260 --> 00:39:29,230
night and to manipulate a delicate

886
00:39:34,200 --> 00:39:31,270
filters we also had some problems with

887
00:39:36,569 --> 00:39:34,210
the bathroom or the toilet or the WCS

888
00:39:40,100 --> 00:39:36,579

waste collection system as we as we call

889
00:39:42,530 --> 00:39:40,110
it nicely and we had to clear some

890
00:39:44,600 --> 00:39:42,540
pass it had been become clogged and we

891
00:39:46,850 --> 00:39:44,610
had one of the so-called fan separators

892
00:39:48,710 --> 00:39:46,860
are two of them one of them has to work

893
00:39:50,870 --> 00:39:48,720
one of them failed and the other one

894
00:39:52,730 --> 00:39:50,880
showed weaknesses so we had to do some

895
00:39:56,570 --> 00:39:52,740
work in order to maintain that's

896
00:39:57,650 --> 00:39:56,580
important facility finally it held on

897
00:40:03,380 --> 00:39:57,660
till the end of the mission we're very

898
00:40:05,570 --> 00:40:03,390
glad it did the cameras something near

899
00:40:07,070 --> 00:40:05,580
and dear to my heart we carried a

900
00:40:08,870 --> 00:40:07,080
standard complement of hasselblad and

901
00:40:12,950 --> 00:40:08,880
icon and Arriflex cameras and some

902
00:40:14,780 --> 00:40:12,960
camcorders and pretty much used all the

903
00:40:17,570 --> 00:40:14,790
film that we took on board here I'm

904
00:40:19,130 --> 00:40:17,580
using two at one time max effort which

905
00:40:20,690 --> 00:40:19,140
didn't make the rest of the crew very

906
00:40:25,700 --> 00:40:20,700
happy because I had been two thirds of

907
00:40:27,710 --> 00:40:25,710
all the cameras on board next slide we

908
00:40:31,100 --> 00:40:27,720
slept with the Sabbath observation views

909
00:40:33,830 --> 00:40:31,110
this is a set of old volcanoes in

910
00:40:37,010 --> 00:40:33,840
southern Bolivia it's in the northern

911
00:40:39,590 --> 00:40:37,020
akadama desert one of the driest part of

912
00:40:41,990 --> 00:40:39,600
the earth you see some some snow there

913
00:40:44,270 --> 00:40:42,000

but i would say ninety percent of the

914
00:40:48,230 --> 00:40:44,280
time you're a sky is clear over that

915
00:40:50,240 --> 00:40:48,240
part of the world okay we continue our

916
00:40:53,450 --> 00:40:50,250
trip over South America going back to

917
00:40:55,610 --> 00:40:53,460
the to the Amazon basin this is kind of

918
00:40:59,120 --> 00:40:55,620
a still of what you really saw in the

919
00:41:01,640 --> 00:40:59,130
movie it's more of that deforestation

920
00:41:05,510 --> 00:41:01,650
pattern going on in the state of

921
00:41:08,030 --> 00:41:05,520
rondonia nothing new but it it shows how

922
00:41:11,690 --> 00:41:08,040
the patterns have grown over over the

923
00:41:14,450 --> 00:41:11,700
years next slide another main objective

924
00:41:17,840 --> 00:41:14,460
that we had was the mouth of the Amazon

925
00:41:19,310 --> 00:41:17,850
River another area kind of dear to my

926
00:41:22,460 --> 00:41:19,320
heart because I used to live in that

927
00:41:24,740 --> 00:41:22,470
area so the the entire Delta's is

928
00:41:26,720 --> 00:41:24,750
pictured in this in this slide and you

929
00:41:29,660 --> 00:41:26,730
can see the sedimentation that is

930
00:41:31,700 --> 00:41:29,670
emptying into the ocean which has grown

931
00:41:34,010 --> 00:41:31,710
over over the course of the year of

932
00:41:37,280 --> 00:41:34,020
course all the all the effluent and all

933
00:41:39,950 --> 00:41:37,290
the nutrients that are coming off of the

934
00:41:43,490 --> 00:41:39,960
of the rainforest as they cut the trees

935
00:41:45,940 --> 00:41:43,500
end up on the river and ultimately in

936
00:41:50,000 --> 00:41:45,950
the ocean next

937
00:41:54,380 --> 00:41:50,010
the blue shift my shift was up at work

938
00:41:58,160 --> 00:41:54,390

mostly when we were flying over Africa

939
00:42:00,860 --> 00:41:58,170
Asia and Australia when we're over

940
00:42:03,650 --> 00:42:00,870
Africa of course like this slide shows

941
00:42:06,620 --> 00:42:03,660
in over the Sahara Desert I was staring

942
00:42:08,360 --> 00:42:06,630
at the horizon to see Italy my my

943
00:42:11,360 --> 00:42:08,370
country and in fact when we were at the

944
00:42:13,580 --> 00:42:11,370
higher altitude for the Eureka deploy I

945
00:42:15,470 --> 00:42:13,590
could definitely see Italy and I have

946
00:42:18,050 --> 00:42:15,480
some pictures which are not perfect as

947
00:42:20,450 --> 00:42:18,060
perfect as these but they are much more

948
00:42:23,540 --> 00:42:20,460
dear to my heart this is one of the most

949
00:42:26,630 --> 00:42:23,550
desert and unpopulated areas of the

950
00:42:29,900 --> 00:42:26,640
world it's in the northwest part of

951
00:42:33,140 --> 00:42:29,910
Sudan in Africa and John just could tell

952
00:42:37,220 --> 00:42:33,150
you all the history of this land I just

953
00:42:40,580 --> 00:42:37,230
like the colors and the incredible view

954
00:42:44,660 --> 00:42:40,590
from from the sky the next picture is

955
00:42:47,600 --> 00:42:44,670
the Nile and the lake nasser in fact in

956
00:42:51,260 --> 00:42:47,610
the top part of the picture you may see

957
00:42:55,600 --> 00:42:51,270
us one and the dam which was built some

958
00:42:58,490 --> 00:42:55,610
20 30 years ago it looks like this

959
00:43:00,920 --> 00:42:58,500
natural lake which is the second largest

960
00:43:04,790 --> 00:43:00,930
lake in the work artificial lake in the

961
00:43:09,110 --> 00:43:04,800
world is kind of plea by a couple of

962
00:43:11,990 --> 00:43:09,120
problems first the lack of water through

963
00:43:15,170 --> 00:43:12,000

the 80s the drought that afflicted that

964
00:43:18,530 --> 00:43:15,180
part of Africa and also you notice that

965
00:43:22,100 --> 00:43:18,540
the left side or the west side of the of

966
00:43:25,310 --> 00:43:22,110
the lake is much more radish than the

967
00:43:27,800 --> 00:43:25,320
right side because of the wind blowing

968
00:43:30,650 --> 00:43:27,810
and the sand moving it looks like a lot

969
00:43:33,290 --> 00:43:30,660
of sand falling into the lake therefore

970
00:43:39,589 --> 00:43:33,300
diminishing the overall capacity of the

971
00:43:45,410 --> 00:43:39,599
lake the next picture is the

972
00:43:47,930 --> 00:43:45,420
kuwait and gold and arabian sea type of

973
00:43:50,809 --> 00:43:47,940
environment you see the Euphrates and

974
00:43:55,759 --> 00:43:50,819
Tigris Rivers and you see in the bottom

975
00:44:00,650 --> 00:43:55,769
part of the picture the scars of the oil

976
00:44:03,620 --> 00:44:00,660
well fires these dark patches the south

977
00:44:07,039 --> 00:44:03,630
of Kuwait City are kind of disappearing

978
00:44:11,150 --> 00:44:07,049
now and observing flights over flights

979
00:44:15,229 --> 00:44:11,160
and throughout the different Shuttle

980
00:44:18,219 --> 00:44:15,239
missions we have noticed that sand is it

981
00:44:21,950 --> 00:44:18,229
slowly but surely covering up at these

982
00:44:25,940 --> 00:44:21,960
darker patches or so in a while possibly

983
00:44:27,650 --> 00:44:25,950
these cars would be disappeared moving

984
00:44:30,049 --> 00:44:27,660
on a little bit further to the east this

985
00:44:32,779 --> 00:44:30,059
is a portion of melville island which is

986
00:44:35,569 --> 00:44:32,789
part of the Northern Territory of

987
00:44:38,660 --> 00:44:35,579
Australia it's a relatively uninhabited

988
00:44:40,640 --> 00:44:38,670

island but I think it's obvious that

989
00:44:44,029 --> 00:44:40,650
somebody is there and there they've got

990
00:44:46,789 --> 00:44:44,039
a fire going most likely to burn off old

991
00:44:49,969 --> 00:44:46,799
pasture land underneath the open canopy

992
00:44:54,680 --> 00:44:49,979
trees to try to restore pasture land you

993
00:44:58,160 --> 00:44:54,690
can also see a lot of sediment and silt

994
00:45:00,709 --> 00:44:58,170
in the coastal areas that in this case

995
00:45:03,549 --> 00:45:00,719
is not due to erosion of the uplands

996
00:45:06,920 --> 00:45:03,559
like in Madagascar because they're the

997
00:45:10,130 --> 00:45:06,930
tropical growth is still there most of

998
00:45:12,229 --> 00:45:10,140
that activity is due to waves coming

999
00:45:15,019 --> 00:45:12,239
onshore or title activity that's

1000
00:45:18,109 --> 00:45:15,029
carrying a lot of silt and sediment back

1001
00:45:21,109 --> 00:45:18,119
out into into the shallow areas there

1002
00:45:24,890 --> 00:45:21,119
it's also if you look real closely the

1003
00:45:28,190 --> 00:45:24,900
inline the inland waterways are not

1004
00:45:31,749 --> 00:45:28,200
clogged with silt and so it's not due to

1005
00:45:37,400 --> 00:45:31,759
erosion of the island itself next slide

1006
00:45:39,920 --> 00:45:37,410
this was we had one very direct pass

1007
00:45:41,959 --> 00:45:39,930
toward the end of the flight right over

1008
00:45:44,660 --> 00:45:41,969
the top of Mount Pinatubo and that's

1009
00:45:46,819 --> 00:45:44,670
what you see in this picture I think

1010
00:45:49,760 --> 00:45:46,829
it's fairly obvious that a large portion

1011
00:45:52,280 --> 00:45:49,770
of the top of that volcano is

1012
00:45:54,680 --> 00:45:52,290
a gone or have been displaced and

1013
00:45:56,570 --> 00:45:54,690

perhaps you can see the gray streaks

1014
00:45:59,900 --> 00:45:56,580
then in the rivers that lead down from

1015
00:46:03,080 --> 00:45:59,910
that ash clogged and and then the whiter

1016
00:46:05,480 --> 00:46:03,090
spots if you look really close the white

1017
00:46:09,440 --> 00:46:05,490
areas in that in those rivers and those

1018
00:46:11,900 --> 00:46:09,450
flows are the the continuing washing

1019
00:46:14,420 --> 00:46:11,910
down of new ash deposits as they

1020
00:46:17,780 --> 00:46:14,430
continue to receive a lot of rainfall in

1021
00:46:20,390 --> 00:46:17,790
that area but this was relatively cloud

1022
00:46:23,620 --> 00:46:20,400
free and just we just couldn't pass up

1023
00:46:26,570 --> 00:46:23,630
this shot clark air base is just

1024
00:46:29,390 --> 00:46:26,580
directly to the east of the of the

1025
00:46:31,970 --> 00:46:29,400
volcano and of course is a deserted air

1026
00:46:35,180 --> 00:46:31,980
base now because of that volcano next

1027
00:46:38,210 --> 00:46:35,190
slide well we don't just take pictures

1028
00:46:40,100 --> 00:46:38,220
of dirt rock and trees in fact

1029
00:46:42,020 --> 00:46:40,110
four-fifths of the earth is covered by

1030
00:46:43,940 --> 00:46:42,030
water and there's atmosphere on top of

1031
00:46:46,190 --> 00:46:43,950
everything with lots of weather so we do

1032
00:46:48,710 --> 00:46:46,200
work with meteorologists and

1033
00:46:50,450 --> 00:46:48,720
oceanographers before the flight to get

1034
00:46:52,880 --> 00:46:50,460
sensitized to the sorts of things which

1035
00:46:55,850 --> 00:46:52,890
they're interested in seeing and then

1036
00:46:57,440 --> 00:46:55,860
during the flight we often get sent up

1037
00:46:59,900 --> 00:46:57,450
direct messages alerting us to

1038
00:47:02,750 --> 00:46:59,910

transitory phenomena which they'd like

1039
00:47:06,860 --> 00:47:02,760
pictures of such as typhoon janice here

1040
00:47:08,870 --> 00:47:06,870
of course we can see cyclonic storms

1041
00:47:11,150 --> 00:47:08,880
with the geosynchronous weather

1042
00:47:14,020 --> 00:47:11,160
satellites but from the shuttle we can

1043
00:47:16,790 --> 00:47:14,030
provide additional information

1044
00:47:18,950 --> 00:47:16,800
particularly as we fly over we can take

1045
00:47:20,930 --> 00:47:18,960
stereoscopic photography which gives a

1046
00:47:24,740 --> 00:47:20,940
good three-dimensional view of what's

1047
00:47:26,930 --> 00:47:24,750
happening we also at times this this

1048
00:47:28,730 --> 00:47:26,940
typhoon happens to have a closed eye but

1049
00:47:31,010 --> 00:47:28,740
there have been others where you can

1050
00:47:32,240 --> 00:47:31,020
actually stare right down the eye down

1051
00:47:34,820 --> 00:47:32,250
to the ocean so it was pretty

1052
00:47:37,850 --> 00:47:34,830
spectacular and we enjoyed watching this

1053
00:47:40,490 --> 00:47:37,860
storm evolved over the several days that

1054
00:47:43,640 --> 00:47:40,500
we were able to look at it the next

1055
00:47:47,480 --> 00:47:43,650
slide there's a story behind this as I

1056
00:47:49,370 --> 00:47:47,490
say people send us up messages we got

1057
00:47:52,100 --> 00:47:49,380
this message this was from the

1058
00:47:54,260 --> 00:47:52,110
oceanographers that they really like us

1059
00:47:57,200 --> 00:47:54,270
and they gave us a certain time they

1060
00:47:59,870 --> 00:47:57,210
said we'd be flying over the equatorial

1061
00:48:01,650 --> 00:47:59,880
Pacific just look out the window and

1062
00:48:03,180 --> 00:48:01,660
take a picture every 30 second

1063
00:48:06,990 --> 00:48:03,190

and I remember long I we're looking out

1064
00:48:09,510 --> 00:48:07,000
the window snapped wait snap wait

1065
00:48:11,279 --> 00:48:09,520
nothing but you're looking we were

1066
00:48:12,870 --> 00:48:11,289
looking at in a part of the ocean the

1067
00:48:14,609 --> 00:48:12,880
angles were such that the Sun was

1068
00:48:16,740 --> 00:48:14,619
reflecting and we were looking what we

1069
00:48:18,870 --> 00:48:16,750
call the Sun glint which is able to

1070
00:48:21,450 --> 00:48:18,880
bring out certain features and after

1071
00:48:22,980 --> 00:48:21,460
about five minutes of weight snap a

1072
00:48:24,240 --> 00:48:22,990
picture weight snap the picture we

1073
00:48:27,029 --> 00:48:24,250
started saying what are we doing here

1074
00:48:29,370 --> 00:48:27,039
you know what do they possibly expect us

1075
00:48:31,620 --> 00:48:29,380
to see and all of a sudden bingo this

1076
00:48:34,200 --> 00:48:31,630
huge line this is probably several

1077
00:48:37,620 --> 00:48:34,210
several hundred feet long what this is

1078
00:48:39,329 --> 00:48:37,630
it's this is a front you can have you

1079
00:48:41,730 --> 00:48:39,339
know cold fronts and warm fronts not

1080
00:48:44,870 --> 00:48:41,740
only in the air but in the water and

1081
00:48:48,510 --> 00:48:44,880
this is an this is an oceanic front

1082
00:48:50,910 --> 00:48:48,520
underwater where a cold cold water

1083
00:48:54,059 --> 00:48:50,920
upwelling from the bottom comes up

1084
00:48:55,620 --> 00:48:54,069
against warm surface water and the

1085
00:48:57,720 --> 00:48:55,630
exciting thing is that there's a big

1086
00:49:00,569 --> 00:48:57,730
oceanographic study effort going on in

1087
00:49:03,029 --> 00:49:00,579
this part of the ocean right now so they

1088
00:49:06,240 --> 00:49:03,039

have this picture which we were able to

1089
00:49:08,579 --> 00:49:06,250
take two combined with the on the ground

1090
00:49:11,789 --> 00:49:08,589
or on the ocean data which they were

1091
00:49:18,029 --> 00:49:11,799
taking and so it turned out to to really

1092
00:49:19,380 --> 00:49:18,039
pay off next slide very hopeful that

1093
00:49:21,809 --> 00:49:19,390
somehow I get a chance to see

1094
00:49:23,339 --> 00:49:21,819
Pennsylvania from 230 miles knowing that

1095
00:49:27,269 --> 00:49:23,349
we were in low inclination orbit and

1096
00:49:29,279 --> 00:49:27,279
really this picture is kind of it this

1097
00:49:31,079 --> 00:49:29,289
is a shot over over Florida we're a

1098
00:49:32,640 --> 00:49:31,089
little bit south of Florida you can see

1099
00:49:36,029 --> 00:49:32,650
the key some of Cuba and some of the

1100
00:49:39,029 --> 00:49:36,039
Bahamas but this particular pass the

1101
00:49:40,890 --> 00:49:39,039
whole coastline the whole east coast of

1102
00:49:43,109 --> 00:49:40,900
the United States was basically visibly

1103
00:49:45,210 --> 00:49:43,119
clear you can follow those cloud lines

1104
00:49:47,370 --> 00:49:45,220
as the small cloud lines all the way up

1105
00:49:49,829 --> 00:49:47,380
the east coast of the United States so I

1106
00:49:53,789 --> 00:49:49,839
was pretty happy with this pass next

1107
00:49:55,500 --> 00:49:53,799
slide 16 times a day the Sun came up and

1108
00:49:57,059 --> 00:49:55,510
went down and each time the Sun went

1109
00:50:00,269 --> 00:49:57,069
down it was more spectacular than the

1110
00:50:02,700 --> 00:50:00,279
sunset before it from 128 miles the

1111
00:50:04,200 --> 00:50:02,710
atmosphere is noticeably thicker and

1112
00:50:06,930 --> 00:50:04,210
more banded than it was at the higher

1113
00:50:09,120 --> 00:50:06,940

altitudes you can see clouds which

1114
00:50:11,579 --> 00:50:09,130
probably stop at 40,000 feet or so and

1115
00:50:12,520 --> 00:50:11,589
the atmospheric guys tell us that there

1116
00:50:13,930 --> 00:50:12,530
is a thin band

1117
00:50:15,910 --> 00:50:13,940
they're under the white stuff that's the

1118
00:50:19,030 --> 00:50:15,920
debris from the Mount Pinatubo eruption

1119
00:50:21,340 --> 00:50:19,040
a couple years ago but we never got

1120
00:50:29,470 --> 00:50:21,350
tired of taking pictures or watching the

1121
00:50:33,130 --> 00:50:29,480
sunsets well you may think that this is

1122
00:50:36,610 --> 00:50:33,140
the CDR finally enjoying a relaxing time

1123
00:50:38,380 --> 00:50:36,620
but actually rather than candy-coated

1124
00:50:40,590 --> 00:50:38,390
chocolate coated candy this is a

1125
00:50:44,160 --> 00:50:40,600
gigantic tranquilizers that they were

1126
00:50:46,650 --> 00:50:44,170
feeding me after our tss experience and

1127
00:50:53,050 --> 00:50:46,660
just to get me calmed down a little bit

1128
00:50:55,410 --> 00:50:53,060
but no next slide we really did have a

1129
00:50:58,750 --> 00:50:55,420
lot of fun we had we had a great time we

1130
00:51:01,540 --> 00:50:58,760
saw a little bit of everything we ever

1131
00:51:03,880 --> 00:51:01,550
hope to c plus a little bit more as you

1132
00:51:06,730 --> 00:51:03,890
saw from the movie some things that we

1133
00:51:09,070 --> 00:51:06,740
had hoped not to see we didn't quite get

1134
00:51:12,010 --> 00:51:09,080
to a 20 kilometers of tether out in the

1135
00:51:17,080 --> 00:51:12,020
case of TSS but we've got enough tether

1136
00:51:19,570 --> 00:51:17,090
out to prove the concept and allow I

1137
00:51:21,160 --> 00:51:19,580
think every science instrument to get a

1138
00:51:27,180 --> 00:51:21,170

little bit of data at least some about

1139
00:51:32,860 --> 00:51:29,320
anticipating a few questions I thought

1140
00:51:34,510 --> 00:51:32,870
we'd have the folks give you a brief

1141
00:51:37,510 --> 00:51:34,520
update on things that we have learned

1142
00:51:39,910 --> 00:51:37,520
about the successes of the mission since

1143
00:51:42,460 --> 00:51:39,920
we got back last Saturday morning so

1144
00:51:46,110 --> 00:51:42,470
just clawed once you start with Eureka

1145
00:51:48,700 --> 00:51:46,120
and just give a little short update okay

1146
00:51:51,550 --> 00:51:48,710
as I mentioned before Eureka had some

1147
00:51:53,170 --> 00:51:51,560
problems during the deploy process as

1148
00:51:55,240 --> 00:51:53,180
well communication with the spacecraft

1149
00:51:57,520 --> 00:51:55,250
and also during the so-called otm burn

1150
00:51:59,440 --> 00:51:57,530
orbit transfer maneuver burn this burn

1151
00:52:04,000 --> 00:51:59,450
had to be abandoned early because it

1152
00:52:07,840 --> 00:52:04,010
didn't was not nominal as the ground was

1153
00:52:10,330 --> 00:52:07,850
expecting it to be so when we left

1154
00:52:12,430 --> 00:52:10,340
Eureka it was in fact in a

1155
00:52:14,710 --> 00:52:12,440
in a transition orbit that was

1156
00:52:16,510 --> 00:52:14,720
unsatisfactory to perform its scientific

1157
00:52:18,310 --> 00:52:16,520
mission eventually the ground

1158
00:52:20,650 --> 00:52:18,320
controllers in damaged after Germany

1159
00:52:23,440 --> 00:52:20,660
were able to fix the problem perform

1160
00:52:27,400 --> 00:52:23,450
subsequently a satisfactory otn burn to

1161
00:52:30,070 --> 00:52:27,410
bring the apogee of the orbit through

1162
00:52:31,840 --> 00:52:30,080
about 580 kilometers at which time they

1163
00:52:34,510 --> 00:52:31,850

fired again their thrusters you know the

1164
00:52:36,580 --> 00:52:34,520
circular trajectory of Eureka the right

1165
00:52:38,580 --> 00:52:36,590
now it is on a stable founded kilometers

1166
00:52:41,050 --> 00:52:38,590
high orbit which is a nominal orbits

1167
00:52:42,160 --> 00:52:41,060
they have activated nearly all of the

1168
00:52:44,800 --> 00:52:42,170
scientific experiments on board

1169
00:52:47,020 --> 00:52:44,810
including and important interorbital

1170
00:52:52,360 --> 00:52:47,030
communication experiments communication

1171
00:52:54,220 --> 00:52:52,370
between eureka via olympus isa

1172
00:52:56,650 --> 00:52:54,230
communication satellites to the mass

1173
00:52:59,230 --> 00:52:56,660
Palomas ground station in the Canary

1174
00:53:00,790 --> 00:52:59,240
Islands and this is working well and by

1175
00:53:02,410 --> 00:53:00,800
the end of this week all of the

1176
00:53:03,640 --> 00:53:02,420
experiments onboard Eureka which is

1177
00:53:07,570 --> 00:53:03,650
finally the purpose of this whole thing

1178
00:53:10,540 --> 00:53:07,580
will be operating for this period of age

1179
00:53:18,130 --> 00:53:10,550
29 month until the recovery by flat 57

1180
00:53:20,550 --> 00:53:18,140
next year right all the instrument all

1181
00:53:23,800 --> 00:53:20,560
the science instrumentation that has

1182
00:53:26,890 --> 00:53:23,810
worked during this mission and which as

1183
00:53:28,810 --> 00:53:26,900
you probably recall is sort of fifty

1184
00:53:31,030 --> 00:53:28,820
percent from Italy and fifty percent

1185
00:53:34,300 --> 00:53:31,040
from the United States 12 major

1186
00:53:36,190 --> 00:53:34,310
investigations all together had their

1187
00:53:39,580 --> 00:53:36,200
share of data during this mission in

1188
00:53:41,800 --> 00:53:39,590

particular the ultimate goal which was a

1189
00:53:44,560 --> 00:53:41,810
the one of proving the concept of

1190
00:53:47,830 --> 00:53:44,570
driving current through this circuit to

1191
00:53:50,860 --> 00:53:47,840
me by the satellite the shuttle and the

1192
00:53:54,670 --> 00:53:50,870
wire in between the two and using the

1193
00:53:57,520 --> 00:53:54,680
natural battery created by the movement

1194
00:54:00,700 --> 00:53:57,530
of the wire and the earth magnetic field

1195
00:54:04,060 --> 00:54:00,710
this concept has been proven we have got

1196
00:54:06,670 --> 00:54:04,070
to say one point in the curve not to the

1197
00:54:09,630 --> 00:54:06,680
whole curve and we are anxious to get

1198
00:54:12,670 --> 00:54:09,640
more points with future missions but the

1199
00:54:15,610 --> 00:54:12,680
essential thing is is there there was a

1200
00:54:18,760 --> 00:54:15,620
current flowing through the tether this

1201
00:54:21,400 --> 00:54:18,770
current was about 23 milliamps

1202
00:54:25,210 --> 00:54:21,410
when the Italian electric generator was

1203
00:54:27,850 --> 00:54:25,220
working it was about 15 milli amps when

1204
00:54:29,380 --> 00:54:27,860
the American accelerator was working not

1205
00:54:31,410 --> 00:54:29,390
because the American accelerator was

1206
00:54:35,380 --> 00:54:31,420
better the configuration was different

1207
00:54:38,380 --> 00:54:35,390
but these measures were confirmed both

1208
00:54:40,450 --> 00:54:38,390
by the instruments in the cargo bay and

1209
00:54:44,590 --> 00:54:40,460
by the instruments on the satellite at

1210
00:54:47,260 --> 00:54:44,600
250 meters in addition all the

1211
00:54:50,500 --> 00:54:47,270
diagnostic instruments in the cargo bay

1212
00:54:52,690 --> 00:54:50,510
and on the satellite measuring spectra

1213
00:54:54,910 --> 00:54:52,700

of the electrons have confirmed

1214
00:54:57,010 --> 00:54:54,920
different signatures while current was

1215
00:54:59,800 --> 00:54:57,020
driven through through the wire so I

1216
00:55:03,580 --> 00:54:59,810
think we have a sound set of data which

1217
00:55:05,410 --> 00:55:03,590
of course is not as a satisfactory as it

1218
00:55:08,020 --> 00:55:05,420
would have been if we had the chance to

1219
00:55:11,950 --> 00:55:08,030
go out of 220 kilometers but it's still

1220
00:55:14,350 --> 00:55:11,960
a very remarkable point in the story in

1221
00:55:17,830 --> 00:55:14,360
the history of debtors in space we have

1222
00:55:20,200 --> 00:55:17,840
also found that the famous paint and

1223
00:55:21,880 --> 00:55:20,210
there was on the satellite has a very

1224
00:55:24,910 --> 00:55:21,890
lower resistance this was a an

1225
00:55:28,120 --> 00:55:24,920
incredible project that was run in the

1226
00:55:29,650 --> 00:55:28,130
very last weeks before launch and I

1227
00:55:32,170 --> 00:55:29,660
think we have to give credit to the

1228
00:55:34,180 --> 00:55:32,180
people took the risk of disassembling

1229
00:55:36,100 --> 00:55:34,190
these skins of the satellite and change

1230
00:55:38,970 --> 00:55:36,110
the pain to just to have a lower

1231
00:55:41,980 --> 00:55:38,980
resistance on the on the satellite

1232
00:55:44,050 --> 00:55:41,990
external shell had we not done that

1233
00:55:46,210 --> 00:55:44,060
perhaps we would not not have seen the

1234
00:55:49,990 --> 00:55:46,220
currents that we have seen so altogether

1235
00:55:52,720 --> 00:55:50,000
I would say we have a very working set

1236
00:55:54,580 --> 00:55:52,730
of instruments for electro dynamic and

1237
00:55:57,100 --> 00:55:54,590
dynamic experiments with tethers in

1238
00:56:00,280 --> 00:55:57,110

space and we are looking forward to a

1239
00:56:04,210 --> 00:56:00,290
second chance to really do the thorough

1240
00:56:07,150 --> 00:56:04,220
mission and finally say one or two

1241
00:56:09,550 --> 00:56:07,160
things about the dynamics investigations

1242
00:56:13,630 --> 00:56:09,560
we stressed before this flight that this

1243
00:56:17,080 --> 00:56:13,640
was a test flight of a new space system

1244
00:56:19,690 --> 00:56:17,090
and the measure of success of a of a

1245
00:56:23,440 --> 00:56:19,700
test flight is how much information you

1246
00:56:26,170 --> 00:56:23,450
got the bottom line is we got an

1247
00:56:27,310 --> 00:56:26,180
incredible amount of information in many

1248
00:56:29,080 --> 00:56:27,320
ways

1249
00:56:31,060 --> 00:56:29,090
we learned a lot of things that we would

1250
00:56:33,580 --> 00:56:31,070
not have learned had the flight been

1251
00:56:36,730 --> 00:56:33,590
completely nominal science

1252
00:56:39,220 --> 00:56:36,740
investigations every time you go out

1253
00:56:42,310 --> 00:56:39,230
twice as far you generate twice as much

1254
00:56:44,410 --> 00:56:42,320
voltage that's not the way it works in

1255
00:56:47,200 --> 00:56:44,420
dynamics I think you need to think about

1256
00:56:51,130 --> 00:56:47,210
things in terms of a factor of 10 in

1257
00:56:54,640 --> 00:56:51,140
other words we were able to get data on

1258
00:56:57,220 --> 00:56:54,650
many different flight regimes the first

1259
00:56:58,900 --> 00:56:57,230
two meters of deployment had a whole set

1260
00:57:01,540 --> 00:56:58,910
of problems which we didn't know how it

1261
00:57:03,910 --> 00:57:01,550
was going to work and we did have a fly

1262
00:57:05,260 --> 00:57:03,920
away aboard in that region and now I

1263
00:57:07,960 --> 00:57:05,270

think we have a very good understanding

1264
00:57:09,970 --> 00:57:07,970
of what it's like to initially deploy in

1265
00:57:15,190 --> 00:57:09,980
the final retrieval of a tethered

1266
00:57:18,610 --> 00:57:15,200
satellite from 2 to 20 meters a whole

1267
00:57:20,740 --> 00:57:18,620
other set of problems opens up in order

1268
00:57:22,330 --> 00:57:20,750
to retrieve the satellite we knew that

1269
00:57:24,670 --> 00:57:22,340
we were going to have to fly the shuttle

1270
00:57:26,530 --> 00:57:24,680
underneath the satellite and there were

1271
00:57:28,270 --> 00:57:26,540
real questions as to whether this would

1272
00:57:30,930 --> 00:57:28,280
cause perturbations in the satellite

1273
00:57:34,840 --> 00:57:30,940
which might lead to instabilities and

1274
00:57:36,850 --> 00:57:34,850
all the tests find that that Lauren was

1275
00:57:38,620 --> 00:57:36,860
able to do to stay underneath that

1276
00:57:42,580 --> 00:57:38,630
satellite showed that that that whole

1277
00:57:46,050 --> 00:57:42,590
concept works from 20 meters out to

1278
00:57:50,350 --> 00:57:46,060
about 200 meters or a little bit longer

1279
00:57:52,240 --> 00:57:50,360
one of the biggest uncertainties in this

1280
00:57:55,210 --> 00:57:52,250
whole system was how would the system

1281
00:57:58,270 --> 00:57:55,220
perform with low tensions on the tether

1282
00:58:01,240 --> 00:57:58,280
and we showed that not only could it

1283
00:58:03,880 --> 00:58:01,250
perform with low tensions but even when

1284
00:58:05,440 --> 00:58:03,890
the tether went completely slack that we

1285
00:58:07,510 --> 00:58:05,450
could control the shuttle and can

1286
00:58:10,560 --> 00:58:07,520
control the satellite and that that is

1287
00:58:13,750 --> 00:58:10,570
an unexpected and very exciting result

1288
00:58:15,930 --> 00:58:13,760

from 200 out to 2,000 meters we never

1289
00:58:19,600 --> 00:58:15,940
got to go that far but the biggest

1290
00:58:21,790 --> 00:58:19,610
uncertainty was that's the the range

1291
00:58:24,670 --> 00:58:21,800
where you enter the the resonances

1292
00:58:27,250 --> 00:58:24,680
between the tether and the satellite and

1293
00:58:30,250 --> 00:58:27,260
I think we showed that the satellite

1294
00:58:34,000 --> 00:58:30,260
control was so good and so positive that

1295
00:58:36,130 --> 00:58:34,010
I think when we do enter that region

1296
00:58:38,470 --> 00:58:36,140
will do it with a lot more confidence

1297
00:58:39,700 --> 00:58:38,480
than we when we could have done before

1298
00:58:42,609 --> 00:58:39,710
this flight

1299
00:58:45,220 --> 00:58:42,619
and so it's only that final region I the

1300
00:58:47,859 --> 00:58:45,230
that last region from 2,000 meters out

1301
00:58:50,980 --> 00:58:47,869
to twenty thousand meters which we

1302
00:58:53,320 --> 00:58:50,990
didn't get to explore and yet this is

1303
00:58:55,359 --> 00:58:53,330
the region where the the tension and the

1304
00:58:56,829 --> 00:58:55,369
tether is the greatest and where I think

1305
00:58:58,810 --> 00:58:56,839
we had the most confidence because

1306
00:59:02,920 --> 00:58:58,820
that's the region was really tested on

1307
00:59:05,710 --> 00:59:02,930
the ground so all in all the most

1308
00:59:07,240 --> 00:59:05,720
uncertain areas we were able to explore

1309
00:59:09,670 --> 00:59:07,250
on this flight we have a tremendous

1310
00:59:11,890 --> 00:59:09,680
amount of data a lot of things for

1311
00:59:14,020 --> 00:59:11,900
people to look at of course we have a

1312
00:59:17,290 --> 00:59:14,030
lot of work to do now and there's

1313
00:59:19,870 --> 00:59:17,300

already a study board set up to try to

1314
00:59:22,210 --> 00:59:19,880
determine why the tether hung up and to

1315
00:59:24,730 --> 00:59:22,220
make sure that we can solve the problem

1316
00:59:27,760 --> 00:59:24,740
so that hopefully sometime in the future

1317
00:59:30,550 --> 00:59:27,770
it'll be able it'll be possible to to

1318
00:59:35,800 --> 00:59:30,560
test this system again and this time run

1319
00:59:38,740 --> 00:59:35,810
it all the way out and I think we're

1320
00:59:40,780 --> 00:59:38,750
back to you okay we'll start with

1321
00:59:43,359 --> 00:59:40,790
questions here in Houston before going

1322
00:59:45,160 --> 00:59:43,369
on to the Kennedy Space Center you do

1323
00:59:47,260 --> 00:59:45,170
have a question raise your hand wait for

1324
01:00:04,539 --> 00:59:47,270
the microphone and then identify

1325
01:00:09,980 --> 01:00:06,650
mark if you get all for just a min let's

1326
01:00:11,509 --> 01:00:09,990
bring the other mic over and get the

1327
01:00:30,890 --> 01:00:11,519
question on the air for the benefit of

1328
01:00:35,580 --> 01:00:32,820
okay we've got a little bit of a

1329
01:00:37,650 --> 01:00:35,590
breakdown in our audio connection with

1330
01:00:39,990 --> 01:00:37,660
the the mics if you guys could just very

1331
01:00:42,330 --> 01:00:40,000
briefly summarize a question for you

1332
01:00:45,720 --> 01:00:42,340
answer the question was that even though

1333
01:00:48,290 --> 01:00:45,730
we have the investigation going on into

1334
01:00:51,630 --> 01:00:48,300
the to try to determine the causes of

1335
01:00:54,990 --> 01:00:51,640
the snags of the problems and deployment

1336
01:00:56,940 --> 01:00:55,000
that we had during a mission do have we

1337
01:00:59,370 --> 01:00:56,950
found out anything during the week that

1338
01:01:04,020 --> 01:00:59,380

we've been back that would point out

1339
01:01:07,260 --> 01:01:04,030
what the causes really were I think to

1340
01:01:09,450 --> 01:01:07,270
say to try to say categorically that we

1341
01:01:12,930 --> 01:01:09,460
know what happened would be a little

1342
01:01:14,730 --> 01:01:12,940
presumptuous I don't think we do and the

1343
01:01:17,400 --> 01:01:14,740
team is just now beginning to get a look

1344
01:01:23,610 --> 01:01:17,410
at the the actual hardware there was a

1345
01:01:27,180 --> 01:01:23,620
lot of I guess a prime contender in the

1346
01:01:30,090 --> 01:01:27,190
first snag especially was that down in

1347
01:01:32,510 --> 01:01:30,100
the real witch lives down on the pallet

1348
01:01:35,700 --> 01:01:32,520
down in the bottom of the payload Bay

1349
01:01:38,000 --> 01:01:35,710
that there may have been because we're

1350
01:01:41,580 --> 01:01:38,010
operating at such a low tension value

1351
01:01:44,220 --> 01:01:41,590
when it got to that point the tension in

1352
01:01:48,290 --> 01:01:44,230
the system was unable to pull that

1353
01:01:50,670 --> 01:01:48,300
winding up and and free it so that's

1354
01:01:53,550 --> 01:01:50,680
again that's a guess that's not the

1355
01:01:56,610 --> 01:01:53,560
final answer but that may have been what

1356
01:01:59,160 --> 01:01:56,620
stopped us the first time when we backed

1357
01:02:01,620 --> 01:01:59,170
up and got the running start apparently

1358
01:02:05,280 --> 01:02:01,630
that was enough momentum to go on

1359
01:02:07,500 --> 01:02:05,290
through that point and then as we slowed

1360
01:02:09,450 --> 01:02:07,510
down to try to get back on the profile

1361
01:02:12,300 --> 01:02:09,460
so we didn't continue to create that

1362
01:02:17,280 --> 01:02:12,310
massive amount of slack tether that you

1363
01:02:20,630 --> 01:02:17,290

saw briefly in the video then we came to

1364
01:02:23,490 --> 01:02:20,640
the second stop there at that point and

1365
01:02:25,350 --> 01:02:23,500
I don't think we're really quite sure at

1366
01:02:27,540 --> 01:02:25,360
all what may have happened there it may

1367
01:02:28,940 --> 01:02:27,550
have been something very similar may

1368
01:02:33,150 --> 01:02:28,950
have been something totally different

1369
01:02:35,340 --> 01:02:33,160
and then from then on i would i would

1370
01:02:38,250 --> 01:02:35,350
think we'd be really guessing after that

1371
01:02:40,560 --> 01:02:38,260
because we eventually got to the point

1372
01:02:42,840 --> 01:02:40,570
where we could neither go out or in

1373
01:02:46,530 --> 01:02:42,850
either one and that

1374
01:02:49,430 --> 01:02:46,540
suggests some kind of snag up in the

1375
01:02:52,080 --> 01:02:49,440
upper control mechanism that

1376
01:02:56,720 --> 01:02:52,090
subsequently we were able to clear out

1377
01:02:59,160 --> 01:02:56,730
but only after a lot of several hours of

1378
01:03:00,930 --> 01:02:59,170
thinking by the folks on the ground who

1379
01:03:03,810 --> 01:03:00,940
built the equipment as to what we might

1380
01:03:07,040 --> 01:03:03,820
try to get that free it was at that

1381
01:03:09,960 --> 01:03:07,050
point when we could not go neither

1382
01:03:13,530 --> 01:03:09,970
outboard with the tether or pull it in

1383
01:03:15,720 --> 01:03:13,540
that I think the focus of everybody

1384
01:03:19,140 --> 01:03:15,730
concerned including us on board I

1385
01:03:22,500 --> 01:03:19,150
believe we sort of you Nana unanimously

1386
01:03:24,360 --> 01:03:22,510
shifted our attention toward freeing

1387
01:03:26,520 --> 01:03:24,370
that jam if we could and then bringing

1388
01:03:29,240 --> 01:03:26,530

the satellite back either via the

1389
01:03:32,250 --> 01:03:29,250
natural means which we ended up doing or

1390
01:03:37,920 --> 01:03:32,260
using the EV a that we began to prepare

1391
01:03:40,680 --> 01:03:37,930
for also Zelda notify Luna vocal teacher

1392
01:03:45,150 --> 01:03:40,690
mrs. Shriver you have been three times

1393
01:03:48,180 --> 01:03:45,160
in the space until now you have been

1394
01:03:51,660 --> 01:03:48,190
last time with the Space Telescope and

1395
01:03:55,470 --> 01:03:51,670
it was not to really really is a great

1396
01:03:59,490 --> 01:03:55,480
success after after the fright is it not

1397
01:04:03,510 --> 01:03:59,500
frustrating to have such mission there

1398
01:04:09,570 --> 01:04:03,520
is a crew work fine and after that

1399
01:04:12,570 --> 01:04:09,580
somebody did a bad job and the

1400
01:04:15,150 --> 01:04:12,580
experiment doesn't work flying in space

1401
01:04:19,950 --> 01:04:15,160
is not a frustrating experience let me

1402
01:04:22,200 --> 01:04:19,960
tell you know we we've tried to stress

1403
01:04:24,060 --> 01:04:22,210
especially here that we were involved in

1404
01:04:26,640 --> 01:04:24,070
a test flight and I don't think we have

1405
01:04:28,710 --> 01:04:26,650
any real not really any right to expect

1406
01:04:32,400 --> 01:04:28,720
it everything is going to go absolutely

1407
01:04:35,520 --> 01:04:32,410
perfectly it is always nice when it does

1408
01:04:38,930 --> 01:04:35,530
of course but I think we got enough

1409
01:04:42,930 --> 01:04:38,940
tether deployed as Jeff explained to

1410
01:04:46,800 --> 01:04:42,940
investigate a really critical part of

1411
01:04:49,530 --> 01:04:46,810
the tether envelope that really needed

1412
01:04:53,780 --> 01:04:49,540
to be looked at and I think we were very

1413
01:04:56,060 --> 01:04:53,790

successful in determining that we could

1414
01:05:00,940 --> 01:04:56,070
control a tether system at short

1415
01:05:03,950 --> 01:05:00,950
distance we could control the satellite

1416
01:05:07,250 --> 01:05:03,960
as long as we have stable endpoints to

1417
01:05:09,980 --> 01:05:07,260
the system the tether can be doing an

1418
01:05:14,240 --> 01:05:09,990
awful lot of fairly wild gyrations in

1419
01:05:17,540 --> 01:05:14,250
between and you're still basically okay

1420
01:05:20,030 --> 01:05:17,550
with the system so I think we learned an

1421
01:05:22,010 --> 01:05:20,040
awful lot even though we didn't get out

1422
01:05:23,720 --> 01:05:22,020
to the full length there's always a

1423
01:05:25,870 --> 01:05:23,730
little bit of disappointment one doesn't

1424
01:05:30,680 --> 01:05:25,880
something doesn't go exactly as planned

1425
01:05:32,600 --> 01:05:30,690
to go back to SD s 31 for a moment the

1426
01:05:35,240 --> 01:05:32,610
furthest thing from my mind is that that

1427
01:05:37,040 --> 01:05:35,250
mission was not a success I think you

1428
01:05:39,710 --> 01:05:37,050
have the wrong slant on the Hubble Space

1429
01:05:41,630 --> 01:05:39,720
Telescope if you think that it's not

1430
01:05:43,580 --> 01:05:41,640
working or if anybody thinks that it's

1431
01:05:48,710 --> 01:05:43,590
not working it's got some fantastic

1432
01:05:52,100 --> 01:05:48,720
images and the public I hope is getting

1433
01:05:54,320 --> 01:05:52,110
reeducation all the fantastic things

1434
01:05:57,590 --> 01:05:54,330
that it really is doing even with the

1435
01:05:59,360 --> 01:05:57,600
aberration that it has now something

1436
01:06:01,370 --> 01:05:59,370
because i think you know you ask how do

1437
01:06:03,380 --> 01:06:01,380
we feel about it and i think what i'm

1438
01:06:06,560 --> 01:06:03,390

going to say applies to Hubble as well

1439
01:06:08,150 --> 01:06:06,570
as to what we just did from an

1440
01:06:09,740 --> 01:06:08,160
astronomical point of view what Lauren

1441
01:06:12,920 --> 01:06:09,750
said is absolutely correct the Hubble

1442
01:06:14,540 --> 01:06:12,930
has been a great success the computers

1443
01:06:16,790 --> 01:06:14,550
on the ground have been able to correct

1444
01:06:18,260 --> 01:06:16,800
the aberration the only thing it hasn't

1445
01:06:20,930 --> 01:06:18,270
been able to do is get down to the

1446
01:06:22,970 --> 01:06:20,940
lowest light levels that eventually will

1447
01:06:25,340 --> 01:06:22,980
be able to do when people go up on

1448
01:06:27,830 --> 01:06:25,350
another shuttle flight and fix it and

1449
01:06:31,400 --> 01:06:27,840
what I'm trying to stress here is the

1450
01:06:34,070 --> 01:06:31,410
extreme value of having people in space

1451
01:06:35,990 --> 01:06:34,080
who can respond to unexpected situations

1452
01:06:38,720 --> 01:06:36,000
and that's what makes us feel good about

1453
01:06:42,410 --> 01:06:38,730
our flights looking at this right that

1454
01:06:45,080 --> 01:06:42,420
we just did when we first started

1455
01:06:48,050 --> 01:06:45,090
working with the system it had been

1456
01:06:50,930 --> 01:06:48,060
designed as an essentially an automated

1457
01:06:52,850 --> 01:06:50,940
system where you tell the tethered to go

1458
01:06:55,340 --> 01:06:52,860
up and it would go up and you tell it to

1459
01:06:57,890 --> 01:06:55,350
come back and it comes back I would have

1460
01:06:59,510 --> 01:06:57,900
felt very bad if I had devoted several

1461
01:07:02,570 --> 01:06:59,520
years of my life to training for a

1462
01:07:04,910 --> 01:07:02,580
flight push the button to make the

1463
01:07:05,690 --> 01:07:04,920

system work and then it didn't work and

1464
01:07:09,200 --> 01:07:05,700
there was nothing I

1465
01:07:11,240 --> 01:07:09,210
do about it that would really be bad but

1466
01:07:13,010 --> 01:07:11,250
that's not what we do when we get

1467
01:07:15,470 --> 01:07:13,020
involved in a flight we looked at the

1468
01:07:19,040 --> 01:07:15,480
operations we determined that there were

1469
01:07:21,650 --> 01:07:19,050
many areas were having people on board

1470
01:07:24,530 --> 01:07:21,660
we could build more flexibility into the

1471
01:07:26,210 --> 01:07:24,540
system and I won't go into any detail

1472
01:07:29,150 --> 01:07:26,220
about what we did except to say that

1473
01:07:31,520 --> 01:07:29,160
almost every operation that we ended up

1474
01:07:34,550 --> 01:07:31,530
doing than this tether both to finally

1475
01:07:36,920 --> 01:07:34,560
deploy it as far as we did and finally

1476
01:07:39,350 --> 01:07:36,930
retrieve it was done with purely manual

1477
01:07:41,870 --> 01:07:39,360
operation we basically had complete

1478
01:07:44,510 --> 01:07:41,880
override of our automatic systems and it

1479
01:07:47,120 --> 01:07:44,520
worked so the many years that we spent

1480
01:07:50,480 --> 01:07:47,130
working on the system and developing all

1481
01:07:52,580 --> 01:07:50,490
of this capability for people to use the

1482
01:07:54,830 --> 01:07:52,590
flexibility that we have in space paid

1483
01:07:59,930 --> 01:07:54,840
off and I feel great about this and I

1484
01:08:02,300 --> 01:07:59,940
think everybody in the crew does he

1485
01:08:04,670 --> 01:08:02,310
declined from the daily tacos on tiger

1486
01:08:09,380 --> 01:08:04,680
in Zurich Switzerland my question goes

1487
01:08:13,550 --> 01:08:09,390
to Russia Ivan's this crew is a mixed

1488
01:08:18,050 --> 01:08:13,560

crew in a variety of categories male

1489
01:08:22,480 --> 01:08:18,060
female Arjun languages Spanish Italian

1490
01:08:26,990 --> 01:08:22,490
French English question one how about

1491
01:08:30,320 --> 01:08:27,000
harmony within this family second what

1492
01:08:33,350 --> 01:08:30,330
language did your colleagues use when

1493
01:08:36,620 --> 01:08:33,360
there were these problems with PSS when

1494
01:08:43,160 --> 01:08:36,630
they tried to do it again and again 11 x

1495
01:08:45,140 --> 01:08:43,170
12 times of all of the apples and

1496
01:08:46,760 --> 01:08:45,150
oranges that you described we have one

1497
01:08:49,550 --> 01:08:46,770
thing in common and that's we are people

1498
01:08:51,230 --> 01:08:49,560
and that's all that counts among this

1499
01:08:53,300 --> 01:08:51,240
crew or any other crew that you put

1500
01:08:55,730 --> 01:08:53,310
together as for your second question

1501
01:08:57,320 --> 01:08:55,740
everybody spoke whatever language got

1502
01:08:59,150 --> 01:08:57,330
the point across at the time and

1503
01:09:04,400 --> 01:08:59,160
everybody understood what everybody else

1504
01:09:06,470 --> 01:09:04,410
was saying ok we can come back here and

1505
01:09:08,060 --> 01:09:06,480
take some questions afterwards but right

1506
01:09:10,960 --> 01:09:08,070
now let's go to the Kennedy Space Center

1507
01:09:13,970 --> 01:09:10,970
take some questions there KSC go ahead

1508
01:09:17,480 --> 01:09:13,980
this is Jim Bankia Florida today I guess

1509
01:09:18,930 --> 01:09:17,490
a question for Jeff perhaps in the

1510
01:09:21,390 --> 01:09:18,940
investigation going on

1511
01:09:23,220 --> 01:09:21,400
Kennedy will you or any member of the

1512
01:09:24,900 --> 01:09:23,230
crew i guess be coming here to help or

1513
01:09:27,479 --> 01:09:24,910

take a look at the hardware and point

1514
01:09:29,910 --> 01:09:27,489
out anything to anybody i think we have

1515
01:09:31,439 --> 01:09:29,920
a unique perspective to to lend to the

1516
01:09:33,240 --> 01:09:31,449
investigation i think the first thing

1517
01:09:35,189 --> 01:09:33,250
that that we're going to be trying to do

1518
01:09:37,140 --> 01:09:35,199
is to go through all of our voice

1519
01:09:39,990 --> 01:09:37,150
records and the video records that we

1520
01:09:41,760 --> 01:09:40,000
took make some order in them and make

1521
01:09:45,630 --> 01:09:41,770
that available to the formal

1522
01:09:48,120 --> 01:09:45,640
investigative board and then i suspect

1523
01:09:50,010 --> 01:09:48,130
that that will do well i know that will

1524
01:09:52,289 --> 01:09:50,020
do everything that we can both in terms

1525
01:09:54,720 --> 01:09:52,299
of looking at the hardware and reviewing

1526
01:09:58,890 --> 01:09:54,730
some of the the data to try to correlate

1527
01:10:00,900 --> 01:09:58,900
what we saw on the spot with things that

1528
01:10:03,920 --> 01:10:00,910
happened from the grounds point of view

1529
01:10:06,120 --> 01:10:03,930
and see if we can figure this system out

1530
01:10:07,470 --> 01:10:06,130
quick follow that means you'll be will

1531
01:10:09,209 --> 01:10:07,480
you actually be coming here to florida

1532
01:10:12,270 --> 01:10:09,219
to do that anytime soon to that day

1533
01:10:14,400 --> 01:10:12,280
schedule I it's not scheduled yet you

1534
01:10:16,709 --> 01:10:14,410
know what what's being done now is I

1535
01:10:18,870 --> 01:10:16,719
think the the first formal meeting of

1536
01:10:21,510 --> 01:10:18,880
the investigation board is this coming

1537
01:10:24,600 --> 01:10:21,520
Monday they have a certain amount of

1538
01:10:28,140 --> 01:10:24,610

proprietary work to do in looking at

1539
01:10:30,630 --> 01:10:28,150
some of the possible faults to prepare

1540
01:10:32,490 --> 01:10:30,640
for taking the the hardware apart you

1541
01:10:36,870 --> 01:10:32,500
don't want to go diving into the

1542
01:10:40,290 --> 01:10:36,880
hardware and destroy evidence so they'll

1543
01:10:43,860 --> 01:10:40,300
do some very careful groundwork before

1544
01:10:46,740 --> 01:10:43,870
coming down to open up the hardware and

1545
01:10:49,500 --> 01:10:46,750
I don't know when that will be and my

1546
01:10:51,840 --> 01:10:49,510
second question for Lauren Shriver as

1547
01:10:53,250 --> 01:10:51,850
you came in here to florida and the

1548
01:10:54,930 --> 01:10:53,260
clouds were building a little bit was

1549
01:10:57,120 --> 01:10:54,940
you came in on the hack and around a

1550
01:10:59,130 --> 01:10:57,130
final did you have any problems seeing

1551
01:11:00,840 --> 01:10:59,140
the runway or did any time you fly

1552
01:11:05,189 --> 01:11:00,850
through clouds and obscure your ability

1553
01:11:06,959 --> 01:11:05,199
to touch down well we do we were doing a

1554
01:11:09,720 --> 01:11:06,969
right-handed turn and the shuttle

1555
01:11:12,630 --> 01:11:09,730
cockpit of course is a like a normal

1556
01:11:16,260 --> 01:11:12,640
fairly large airplane cockpit and i'm

1557
01:11:18,930 --> 01:11:16,270
sitting on the left side so I I really

1558
01:11:21,660 --> 01:11:18,940
couldn't see the runway until at least

1559
01:11:23,100 --> 01:11:21,670
halfway around the turn but on the other

1560
01:11:24,479 --> 01:11:23,110
hand I wasn't looking for it because I

1561
01:11:26,790 --> 01:11:24,489
knew I wouldn't be able to see it anyway

1562
01:11:29,250 --> 01:11:26,800
and that's a that's an artifact of the

1563
01:11:30,260 --> 01:11:29,260

way the shuttle is bill but it was not

1564
01:11:31,610 --> 01:11:30,270
due to weather

1565
01:11:33,950 --> 01:11:31,620
I think I think your question was

1566
01:11:35,540 --> 01:11:33,960
slanted toward was there any problem

1567
01:11:38,870 --> 01:11:35,550
with the weather and the answer is no

1568
01:11:41,600 --> 01:11:38,880
yeah I've seen some of the videos since

1569
01:11:44,000 --> 01:11:41,610
I got back of the landing and I know

1570
01:11:45,860 --> 01:11:44,010
looking at that video from the ground it

1571
01:11:47,870 --> 01:11:45,870
appears like the clouds were a lot more

1572
01:11:50,690 --> 01:11:47,880
there was a lot more to the cloud deck

1573
01:11:53,300 --> 01:11:50,700
then there really was it was really from

1574
01:11:55,790 --> 01:11:53,310
our point of view just thin wispy clouds

1575
01:11:58,190 --> 01:11:55,800
that never did obscure the view of the

1576
01:12:01,910 --> 01:11:58,200
runway or the aimpoint lights or

1577
01:12:04,940 --> 01:12:01,920
anything like that this is a filter on

1578
01:12:06,260 --> 01:12:04,950
earth news for Claude it appears that in

1579
01:12:07,370 --> 01:12:06,270
your conversations to the ground of

1580
01:12:09,260 --> 01:12:07,380
Mission Control they were treating you

1581
01:12:12,110 --> 01:12:09,270
somewhat more formally than the other

1582
01:12:13,010 --> 01:12:12,120
mission specialists wondering how did

1583
01:12:15,290 --> 01:12:13,020
you have any problems as far as

1584
01:12:17,450 --> 01:12:15,300
adjusting were you treated as another ms

1585
01:12:19,250 --> 01:12:17,460
on the crew or as somebody who is

1586
01:12:21,500 --> 01:12:19,260
different as a guest and any advice you

1587
01:12:23,060 --> 01:12:21,510
might have for the Europeans Canadians

1588
01:12:26,420 --> 01:12:23,070

and Japanese will be joining desarmar

1589
01:12:28,910 --> 01:12:26,430
course well I think I was treated

1590
01:12:30,500 --> 01:12:28,920
exactly like any other ms and they could

1591
01:12:34,250 --> 01:12:30,510
maybe ask the question to other crew

1592
01:12:38,300 --> 01:12:34,260
members this flight but I really felt

1593
01:12:40,880 --> 01:12:38,310
that I was and I well maybe it's in my

1594
01:12:42,770 --> 01:12:40,890
nature I talk sparingly that is I I

1595
01:12:45,710 --> 01:12:42,780
speak when I feel I need to speak but

1596
01:12:48,650 --> 01:12:45,720
maybe not I don't add words when I feel

1597
01:12:50,390 --> 01:12:48,660
that he's not needed but I when I had

1598
01:12:51,920 --> 01:12:50,400
something to say I expressed it and what

1599
01:12:54,650 --> 01:12:51,930
I felt it was not needed for me to speak

1600
01:12:56,420 --> 01:12:54,660
I cannot speak but really I feel that

1601
01:12:58,160 --> 01:12:56,430
not only doing this mission but during

1602
01:13:00,110 --> 01:12:58,170
the 12 years I was here and doing the

1603
01:13:05,240 --> 01:13:00,120
whole mission preparation I was

1604
01:13:07,520 --> 01:13:05,250
considered as one member of the team for

1605
01:13:10,250 --> 01:13:07,530
projector Lauren it seemed like a lot of

1606
01:13:12,590 --> 01:13:10,260
the problem-solving to get the tether to

1607
01:13:14,000 --> 01:13:12,600
move seemed to be almost made up on the

1608
01:13:15,590 --> 01:13:14,010
spot wondering how much of this you

1609
01:13:17,690 --> 01:13:15,600
encounter during assimilations ahead of

1610
01:13:19,130 --> 01:13:17,700
time and how much of it was the smart

1611
01:13:20,960 --> 01:13:19,140
keep on the ground and the smart coupon

1612
01:13:24,650 --> 01:13:20,970
the orbit figuring out how to do

1613
01:13:27,140 --> 01:13:24,660

something on the spot one of the things

1614
01:13:32,240 --> 01:13:27,150
you learn in simulations is to think on

1615
01:13:35,450 --> 01:13:32,250
the spot when we hit the snags in the

1616
01:13:38,640 --> 01:13:35,460
tether we knew what to do because we had

1617
01:13:40,729 --> 01:13:38,650
simulated that and it was really quite a

1618
01:13:43,439 --> 01:13:40,739
comforting feeling despite the fact that

1619
01:13:45,540 --> 01:13:43,449
there was tether moving all over the

1620
01:13:47,820 --> 01:13:45,550
place the tether didn't get in the way

1621
01:13:50,399 --> 01:13:47,830
of controlling the shuttle or

1622
01:13:52,200 --> 01:13:50,409
controlling satellite so we flew it like

1623
01:13:54,060 --> 01:13:52,210
we had simulated it and it worked great

1624
01:13:56,910 --> 01:13:54,070
on the other hand some of the

1625
01:14:02,340 --> 01:13:56,920
troubleshooting plans that was

1626
01:14:04,530 --> 01:14:02,350
definitely real time real time reaction

1627
01:14:06,899 --> 01:14:04,540
at its best people coming up with new

1628
01:14:10,140 --> 01:14:06,909
ways of doing things which we had never

1629
01:14:14,959 --> 01:14:10,150
really dreamed of before yeah that's

1630
01:14:17,880 --> 01:14:14,969
exactly right simulations we we tried to

1631
01:14:20,130 --> 01:14:17,890
you know gather together a set of

1632
01:14:21,750 --> 01:14:20,140
procedures and a way of operating that

1633
01:14:24,630 --> 01:14:21,760
would cover anything that we might run

1634
01:14:26,970 --> 01:14:24,640
across and that included practicing for

1635
01:14:28,500 --> 01:14:26,980
sudden stops of the tether the satellite

1636
01:14:32,580 --> 01:14:28,510
on the way out or on the way back either

1637
01:14:34,320 --> 01:14:32,590
one and I think we used we probably used

1638
01:14:36,840 --> 01:14:34,330

ninety-eight percent of all the things

1639
01:14:39,810 --> 01:14:36,850
we ever did in a simulator at some point

1640
01:14:43,500 --> 01:14:39,820
in this 24 hours of deployed operations

1641
01:14:46,110 --> 01:14:43,510
we exercise that so the simulator was

1642
01:14:50,660 --> 01:14:46,120
invaluable to us in preparing for the

1643
01:14:53,939 --> 01:14:50,670
mission but the actual cause then of the

1644
01:14:55,530 --> 01:14:53,949
sudden stops and all that was a took

1645
01:14:57,899 --> 01:14:55,540
real-time analysis to figure that out

1646
01:15:02,399 --> 01:14:57,909
and then come up with something else to

1647
01:15:04,110 --> 01:15:02,409
try to learn your last mission the STS

1648
01:15:07,410 --> 01:15:04,120
31 set the altitude record for the

1649
01:15:09,330 --> 01:15:07,420
shuttle and this wondering you do IM was

1650
01:15:10,470 --> 01:15:09,340
the second-lowest shuttle mission and

1651
01:15:12,390 --> 01:15:10,480
can you tell us from your point of view

1652
01:15:13,919 --> 01:15:12,400
how different is from being on top and

1653
01:15:17,399 --> 01:15:13,929
being on the bottom as far as seeing the

1654
01:15:21,090 --> 01:15:17,409
earth yeah and marcia alluded to that a

1655
01:15:24,899 --> 01:15:21,100
little bit at 330 miles with the space

1656
01:15:28,890 --> 01:15:24,909
telescope that was really eye-catching

1657
01:15:31,729 --> 01:15:28,900
in that the panoramic views the the

1658
01:15:34,290 --> 01:15:31,739
aisle Blake views that we had of

1659
01:15:36,180 --> 01:15:34,300
thousands of miles of our surface at one

1660
01:15:39,180 --> 01:15:36,190
time was really amazing and we try to

1661
01:15:41,550 --> 01:15:39,190
take along cameras and lenses that would

1662
01:15:44,310 --> 01:15:41,560
capture those views and I think we did

1663
01:15:46,590 --> 01:15:44,320

that and we had the imax cargo bay

1664
01:15:49,860 --> 01:15:46,600
camera as well and it had some fantastic

1665
01:15:51,750 --> 01:15:49,870
shots you kind of like

1666
01:15:56,220 --> 01:15:51,760
you get the impression much like you do

1667
01:15:59,190 --> 01:15:56,230
and a commercial jetliner here at 40,000

1668
01:16:00,960 --> 01:15:59,200
feet on a close to the ground you look

1669
01:16:02,460 --> 01:16:00,970
down and you seem to be kind of floating

1670
01:16:05,250 --> 01:16:02,470
over the surface and that's kind of the

1671
01:16:08,580 --> 01:16:05,260
way it was at 330 but when we drop down

1672
01:16:10,710 --> 01:16:08,590
to 128 I just couldn't believe how fast

1673
01:16:13,680 --> 01:16:10,720
we it appeared that we were moving over

1674
01:16:15,990 --> 01:16:13,690
the surface and it didn't you know it's

1675
01:16:17,640 --> 01:16:16,000
almost like well how will we ever get

1676
01:16:19,440 --> 01:16:17,650
pictures of any of this because we won't

1677
01:16:21,090 --> 01:16:19,450
be able to hold it you know focus on one

1678
01:16:24,030 --> 01:16:21,100
spot long enough to get to the

1679
01:16:27,030 --> 01:16:24,040
photograph and we have imax again we had

1680
01:16:29,760 --> 01:16:27,040
to cargo bay camera again and i think

1681
01:16:33,240 --> 01:16:29,770
that might be a good depiction of the

1682
01:16:35,490 --> 01:16:33,250
real difference between 330 and 130

1683
01:16:37,800 --> 01:16:35,500
miles i think it's going to be

1684
01:16:41,640 --> 01:16:37,810
interesting to look at some of those

1685
01:16:43,470 --> 01:16:41,650
late pictures and for francoeur Claude a

1686
01:16:44,820 --> 01:16:43,480
lot of us were following the Olympics

1687
01:16:46,380 --> 01:16:44,830
while we were following your mission in

1688
01:16:48,270 --> 01:16:46,390

orbit and just wondering who won the

1689
01:16:55,860 --> 01:16:48,280
first Italian Swiss volleyball game in

1690
01:16:58,950 --> 01:16:55,870
space in fact it was a great experience

1691
01:17:01,940 --> 01:16:58,960
into being space with an old friend of

1692
01:17:04,860 --> 01:17:01,950
mine code and and with all the other

1693
01:17:06,870 --> 01:17:04,870
crew members who have become also very

1694
01:17:09,750 --> 01:17:06,880
good friends of mine this is a great

1695
01:17:13,230 --> 01:17:09,760
experience that I will never forget it's

1696
01:17:15,990 --> 01:17:13,240
also a great pride to be the first

1697
01:17:17,940 --> 01:17:16,000
Italian in space with this satellite

1698
01:17:19,680 --> 01:17:17,950
made in Italy which after all has

1699
01:17:21,870 --> 01:17:19,690
performed so well throughout the whole

1700
01:17:24,570 --> 01:17:21,880
mission and with all the people will

1701
01:17:27,600 --> 01:17:24,580
come over both at the Kennedy Space

1702
01:17:29,940 --> 01:17:27,610
Center to see the launch and landing so

1703
01:17:32,370 --> 01:17:29,950
we are really building a new culture a

1704
01:17:34,860 --> 01:17:32,380
new aerospace culture in Italy which I I

1705
01:17:39,870 --> 01:17:34,870
think it's really a great thing to think

1706
01:17:42,420 --> 01:17:39,880
of technically done or no TKD phaser for

1707
01:17:44,760 --> 01:17:42,430
Franco malerba how did you feel and how

1708
01:17:49,110 --> 01:17:44,770
do you feel now about the decision to

1709
01:17:51,110 --> 01:17:49,120
real the satellite back in well I share

1710
01:17:56,780 --> 01:17:51,120
very much of the decision that was made

1711
01:17:58,729 --> 01:17:56,790
at that point it was a very unclear what

1712
01:18:00,890 --> 01:17:58,739
what would have happen

1713
01:18:03,589 --> 01:18:00,900

if we had reeled further out to the

1714
01:18:07,509 --> 01:18:03,599
satellite of the risk of losing the

1715
01:18:10,220 --> 01:18:07,519
satellite was very high and the hope to

1716
01:18:13,549 --> 01:18:10,230
manage to get a detective fully deployed

1717
01:18:15,799 --> 01:18:13,559
was relatively slim a plus the satellite

1718
01:18:18,830 --> 01:18:15,809
was running out of gas as you know ago

1719
01:18:20,959 --> 01:18:18,840
there is a bottle of nitrogen inside

1720
01:18:23,149 --> 01:18:20,969
which is what makes the some of the

1721
01:18:25,790 --> 01:18:23,159
science experiments possible and more

1722
01:18:28,040 --> 01:18:25,800
important to help the retrieval actually

1723
01:18:30,500 --> 01:18:28,050
Japan Franklin and Lauren managed to

1724
01:18:33,049 --> 01:18:30,510
retrieve it almost without gas but we

1725
01:18:38,149 --> 01:18:33,059
couldn't count on it right right off the

1726
01:18:41,509 --> 01:18:38,159
bat so altogether it was a very rational

1727
01:18:43,759 --> 01:18:41,519
decision to make I think however that

1728
01:18:46,189 --> 01:18:43,769
because we've gone through all this

1729
01:18:48,410 --> 01:18:46,199
experiment to D deploy in the retrieval

1730
01:18:50,959 --> 01:18:48,420
we have the satellite so to speak ready

1731
01:18:54,700 --> 01:18:50,969
to go we have also a case to reply this

1732
01:18:57,859 --> 01:18:54,710
mission yeah this was my second question

1733
01:19:00,589 --> 01:18:57,869
both acid Italian space agency and

1734
01:19:02,870 --> 01:19:00,599
Elena's patio said they have strong

1735
01:19:05,089 --> 01:19:02,880
hopes for a tss reef flight is there a

1736
01:19:08,540 --> 01:19:05,099
chance we'll see a Franco Olympus the

1737
01:19:11,930 --> 01:19:08,550
flight well personally I was very happy

1738
01:19:15,140 --> 01:19:11,940

in space I lifted off with a little bit

1739
01:19:19,310 --> 01:19:15,150
of anxiety as to what my adapt a Shinto

1740
01:19:20,750 --> 01:19:19,320
zero-g would be like and what my ability

1741
01:19:23,660 --> 01:19:20,760
to work in that extraordinary

1742
01:19:26,180 --> 01:19:23,670
environment would be like things went

1743
01:19:28,160 --> 01:19:26,190
very well and perhaps because it was

1744
01:19:31,609 --> 01:19:28,170
lucky enough on the blue ship they went

1745
01:19:34,399 --> 01:19:31,619
to bed right right away when I was in

1746
01:19:37,430 --> 01:19:34,409
orbit so I didn't have to do you know to

1747
01:19:40,640 --> 01:19:37,440
work too hard when still the world looks

1748
01:19:44,239 --> 01:19:40,650
very strange because of the of the

1749
01:19:47,270 --> 01:19:44,249
zero-g environment so now I feel like

1750
01:19:52,129 --> 01:19:47,280
have gained an experience which which is

1751
01:19:55,609 --> 01:19:52,139
very valuable and and also I still have

1752
01:19:58,250 --> 01:19:55,619
this excited to see this this experiment

1753
01:20:01,700 --> 01:19:58,260
work in the full bloom in the full

1754
01:20:03,799 --> 01:20:01,710
deployed length so I believe it first

1755
01:20:07,100 --> 01:20:03,809
first of all we need to get this a

1756
01:20:08,810 --> 01:20:07,110
second chance and if I had enough

1757
01:20:13,370 --> 01:20:08,820
to fly on the future mission I would be

1758
01:20:16,250 --> 01:20:13,380
very pleased with that Rob Navy is CBS

1759
01:20:18,350 --> 01:20:16,260
News for Jeff Hoffman from the capture

1760
01:20:20,630 --> 01:20:18,360
bar used in the int'l saturday travel to

1761
01:20:22,370 --> 01:20:20,640
your deployer mechanism we've seen some

1762
01:20:25,310 --> 01:20:22,380
very costly equipment go through

1763
01:20:28,340 --> 01:20:25,320

extraordinary ground testing only to

1764
01:20:29,600 --> 01:20:28,350
betray astronauts on orbit is there a

1765
01:20:31,610 --> 01:20:29,610
feeling that there may be something

1766
01:20:33,830 --> 01:20:31,620
generic about the environment of space

1767
01:20:36,860 --> 01:20:33,840
that may be crippling such high-tech

1768
01:20:39,010 --> 01:20:36,870
gear and making efforts in orbit more

1769
01:20:42,950 --> 01:20:39,020
difficult than they need be no

1770
01:20:45,260 --> 01:20:42,960
absolutely not the problem is in the

1771
01:20:48,230 --> 01:20:45,270
difficulty of testing on the ground I

1772
01:20:50,750 --> 01:20:48,240
mean in in lsat I think the the

1773
01:20:54,260 --> 01:20:50,760
post-mission analysis showed that the

1774
01:20:56,180 --> 01:20:54,270
satellite behaved exactly as high school

1775
01:21:01,490 --> 01:20:56,190
physics would predict it would behave

1776
01:21:04,700 --> 01:21:01,500
the problem was that the the difficulty

1777
01:21:08,090 --> 01:21:04,710
of recreating that behavior on the

1778
01:21:11,600 --> 01:21:08,100
ground was not sufficiently appreciated

1779
01:21:13,430 --> 01:21:11,610
and so the practicing that was done was

1780
01:21:15,830 --> 01:21:13,440
not done with a system that really

1781
01:21:19,220 --> 01:21:15,840
behaved like the system did in space and

1782
01:21:21,650 --> 01:21:19,230
I think the same thing is probably true

1783
01:21:23,870 --> 01:21:21,660
and and I don't want to speculate on

1784
01:21:25,520 --> 01:21:23,880
what the cause of the failure are the

1785
01:21:26,960 --> 01:21:25,530
failures because we think there were

1786
01:21:30,950 --> 01:21:26,970
probably different things that went

1787
01:21:34,780 --> 01:21:30,960
wrong were on our mission however we

1788
01:21:37,160 --> 01:21:34,790

always knew that the the most sensitive

1789
01:21:40,040 --> 01:21:37,170
part of this whole system where you're

1790
01:21:42,170 --> 01:21:40,050
reeling wires around around pulleys is

1791
01:21:43,520 --> 01:21:42,180
when there's very little tension on the

1792
01:21:44,990 --> 01:21:43,530
wire if you're pulling on the wire it

1793
01:21:47,300 --> 01:21:45,000
stays where it's supposed to and it's

1794
01:21:50,030 --> 01:21:47,310
it's going to going to work but

1795
01:21:53,390 --> 01:21:50,040
recreating this environment on the

1796
01:21:55,880 --> 01:21:53,400
ground where there's almost no tension

1797
01:21:57,980 --> 01:21:55,890
on the wire was essentially impossible

1798
01:21:59,900 --> 01:21:57,990
we always knew that there was a regime

1799
01:22:01,150 --> 01:21:59,910
right at the beginning of the deployment

1800
01:22:06,010 --> 01:22:01,160
and the end of the retrieval process

1801
01:22:09,680 --> 01:22:06,020
where we were in untested territory

1802
01:22:12,320 --> 01:22:09,690
we've designed I say we the system was

1803
01:22:14,360 --> 01:22:12,330
designed so that it we thought it would

1804
01:22:16,670 --> 01:22:14,370
work but obviously we're smarter now and

1805
01:22:19,390 --> 01:22:16,680
we've got to figure out how in the

1806
01:22:21,130 --> 01:22:19,400
future we can properly test

1807
01:22:22,240 --> 01:22:21,140
and that's that's an important thing I

1808
01:22:24,330 --> 01:22:22,250
think we're getting out of these boats

1809
01:22:27,280 --> 01:22:24,340
both these flights when we're doing

1810
01:22:30,310 --> 01:22:27,290
fundamentally new things we've really

1811
01:22:31,960 --> 01:22:30,320
got to pay close attention to how we're

1812
01:22:34,770 --> 01:22:31,970
doing the testing than the ground else

1813
01:22:37,390 --> 01:22:34,780

we're going to continue to get surprised

1814
01:22:39,070 --> 01:22:37,400
this is Marsha done with the associated

1815
01:22:40,570 --> 01:22:39,080
press for Jeff Hoffman I'm wondering how

1816
01:22:42,730 --> 01:22:40,580
the Silver Bullet worked how you

1817
01:22:44,320 --> 01:22:42,740
incorporated it into the educational

1818
01:22:48,040 --> 01:22:44,330
video and did you get to try any tricks

1819
01:22:49,960 --> 01:22:48,050
on orbit the the what you saw in the

1820
01:22:51,370 --> 01:22:49,970
movie was about what we got we were

1821
01:22:53,920 --> 01:22:51,380
pretty busy than this flight as you

1822
01:22:55,780 --> 01:22:53,930
could see you know I we are on my very

1823
01:22:59,170 --> 01:22:55,790
first flight we did I think a very nice

1824
01:23:02,560 --> 01:22:59,180
educational sequence in on toys in space

1825
01:23:04,960 --> 01:23:02,570
and I think the the yo-yo was one of the

1826
01:23:07,390 --> 01:23:04,970
stars of that show this was for me I

1827
01:23:11,860 --> 01:23:07,400
think a little bit of nostalgia as well

1828
01:23:13,450 --> 01:23:11,870
as the fact that it was it was fun that

1829
01:23:14,830 --> 01:23:13,460
wraps up our questions at the Kennedy

1830
01:23:16,630 --> 01:23:14,840
Space Center we can come back and