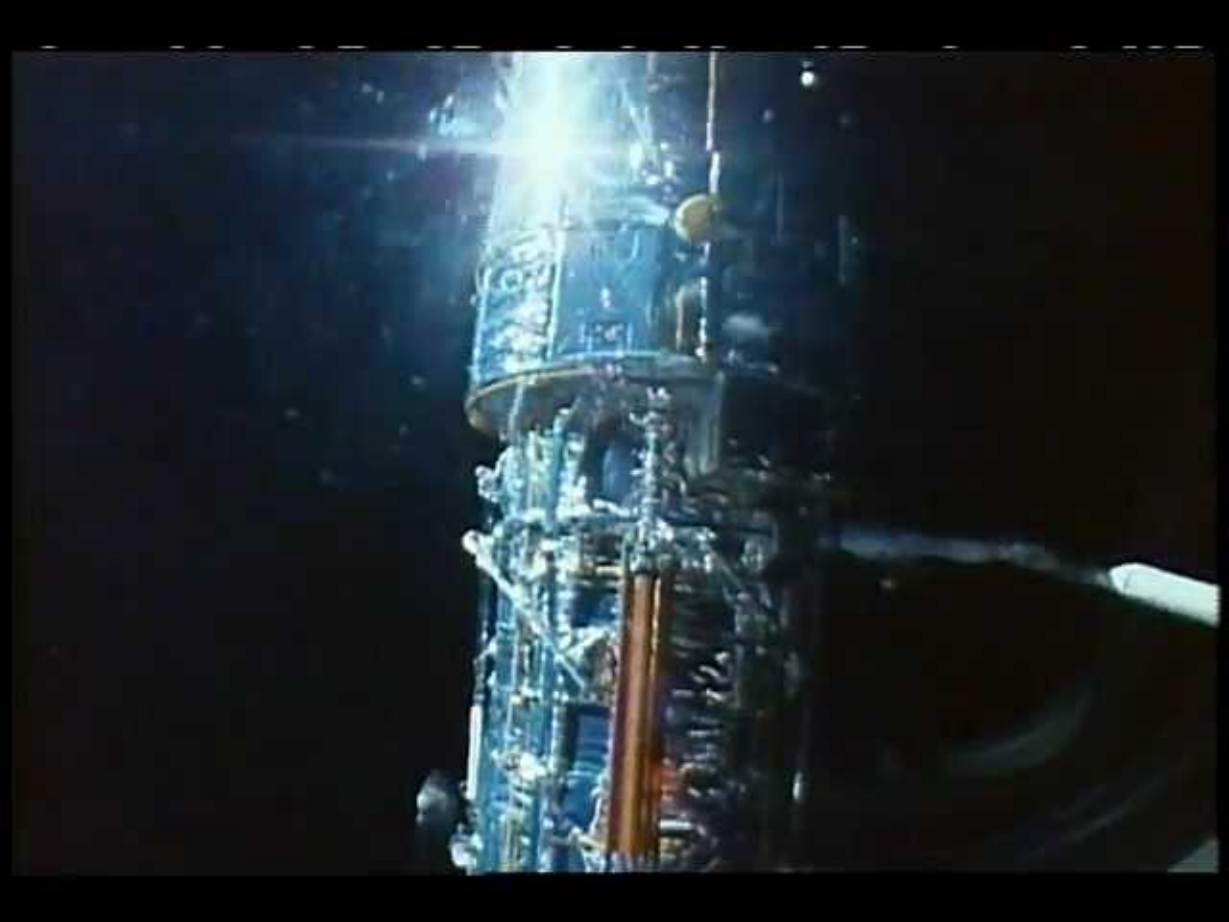

1
00:00:29,060 --> 00:00:26,570
good morning and welcome to the STS 31

2
00:00:31,130 --> 00:00:29,070
post flight crew press conference our

3
00:00:33,260 --> 00:00:31,140
crew of five has about 20 minutes of

4
00:00:35,780 --> 00:00:33,270
film and twenty six or seven slides with

5
00:00:38,000 --> 00:00:35,790
which to share their unique and rare

6
00:00:39,830 --> 00:00:38,010
perspective of this mission and with

7
00:00:42,079 --> 00:00:39,840
that I'll turn it right over to crew

8
00:00:44,420 --> 00:00:42,089
commander Lauren Schreiber thank you

9
00:00:46,340 --> 00:00:44,430
Jeff first of all let me welcome

10
00:00:48,740 --> 00:00:46,350
everybody here this morning in the room

11
00:00:52,100 --> 00:00:48,750
and around the country who's listening

12
00:00:55,700 --> 00:00:52,110
in if it hasn't been apparent so far in

13
00:00:58,579 --> 00:00:55,710

all of our discussions we really enjoyed

14
00:01:00,590 --> 00:00:58,589
flying this mission and we believe that

15
00:01:03,679 --> 00:01:00,600
we had a very successful mission overall

16
00:01:08,450 --> 00:01:03,689
we did exactly what the mission set out

17
00:01:10,820 --> 00:01:08,460
to do and it was just unbelievable end

18
00:01:14,719 --> 00:01:10,830
to end and what we tried to do

19
00:01:17,630 --> 00:01:14,729
throughout was document as best we could

20
00:01:21,170 --> 00:01:17,640
what was actually taking place at the

21
00:01:23,719 --> 00:01:21,180
time we were doing it and that's what we

22
00:01:27,080 --> 00:01:23,729
want to do this morning then is update

23
00:01:29,630 --> 00:01:27,090
everybody by means of a film that we put

24
00:01:31,940 --> 00:01:29,640
together and also show you some slides

25
00:01:36,020 --> 00:01:31,950
after that before we get into that

26
00:01:39,679 --> 00:01:36,030
though in case nobody anybody does not

27
00:01:44,120 --> 00:01:39,689
know the rest of the crew members on my

28
00:01:46,370 --> 00:01:44,130
right is Charlie Bolden a pilot and just

29
00:01:47,660 --> 00:01:46,380
did just a little bit of everything on

30
00:01:51,709 --> 00:01:47,670
board to shuttle while we were up there

31
00:01:55,359 --> 00:01:51,719
and we'll we'll have words from him as

32
00:02:00,499 --> 00:01:55,369
the movie goes on Bruce McCandless ms1

33
00:02:04,160 --> 00:02:00,509
he was our HST expert on on all of its

34
00:02:07,730 --> 00:02:04,170
systems and also of course ev1 and

35
00:02:11,600 --> 00:02:07,740
almost the guy to open the hatch and go

36
00:02:15,860 --> 00:02:11,610
outside and almost crank open the second

37
00:02:19,670 --> 00:02:15,870
solar array dr. Steve Hawley next to him

38
00:02:23,510 --> 00:02:19,680

he was our RMS operator ms2 going up

39
00:02:25,130 --> 00:02:23,520
hill and during entry and did an

40
00:02:28,280 --> 00:02:25,140
excellent job of course of maneuvering

41
00:02:32,390 --> 00:02:28,290
the HST on the end of the magic wand so

42
00:02:36,190 --> 00:02:32,400
to speak and in Kathy Sullivan ms3 for

43
00:02:39,559 --> 00:02:36,200
the flight again also ev2 and

44
00:02:41,929 --> 00:02:39,569
just about header hand on the airlock

45
00:02:45,559 --> 00:02:41,939
depressed dial to go that extra five psi

46
00:02:49,849 --> 00:02:45,569
to get down the vacuum for that almost

47
00:02:52,339 --> 00:02:49,859
EV a that we did with that and in order

48
00:02:54,949 --> 00:02:52,349
not to take up too much time so that we

49
00:02:58,190 --> 00:02:54,959
have time for your questions at the end

50
00:03:01,599 --> 00:02:58,200
let's go ahead and get started with the

51
00:03:05,599 --> 00:03:01,609
film will will be narrating as we go and

52
00:03:09,190 --> 00:03:05,609
one thing I would like you to try to pay

53
00:03:11,960 --> 00:03:09,200
attention to as the film unravels is the

54
00:03:14,059 --> 00:03:11,970
rather continuous pictures of the earth

55
00:03:16,190 --> 00:03:14,069
and the background and this is some of

56
00:03:18,589 --> 00:03:16,200
the beautiful sceneries that we were

57
00:03:21,319 --> 00:03:18,599
seeing always in the background whenever

58
00:03:22,970 --> 00:03:21,329
you look outside and it's daylight some

59
00:03:25,479 --> 00:03:22,980
of the very beautiful pictures of the

60
00:03:28,490 --> 00:03:25,489
earth as the rest of the events unfold

61
00:03:36,319 --> 00:03:28,500
so why don't we go ahead and roll that

62
00:03:38,869 --> 00:03:36,329
film this of course are a mission patch

63
00:03:41,330 --> 00:03:38,879

and we like it a lot we think it told a

64
00:03:44,750 --> 00:03:41,340
story all of its own very appropriate

65
00:03:47,569 --> 00:03:44,760
for the flight this is the morning of

66
00:03:50,839 --> 00:03:47,579
launch going through all of our suit up

67
00:03:53,059 --> 00:03:50,849
drill and each one of us then go through

68
00:03:55,460 --> 00:03:53,069
a pressure check a suit integrity check

69
00:04:01,540 --> 00:03:55,470
and you see that in progress here for

70
00:04:05,680 --> 00:04:03,760
shooting up has added a little time to

71
00:04:07,960 --> 00:04:05,690
the mornings events so we split the crew

72
00:04:09,400 --> 00:04:07,970
two and then three so that we can all

73
00:04:11,970 --> 00:04:09,410
arrive at a common state of readiness

74
00:04:15,160 --> 00:04:11,980
and walk out together as you see here

75
00:04:18,400 --> 00:04:15,170
the trip to the launch pads relatively

76
00:04:20,770 --> 00:04:18,410
quick it was dark as you could all see

77
00:04:22,690 --> 00:04:20,780
you get out there and I think you've

78
00:04:23,800 --> 00:04:22,700
heard it said by other crew members that

79
00:04:25,210 --> 00:04:23,810
you get out there and there's a little

80
00:04:27,310 --> 00:04:25,220
bit different on launch morning because

81
00:04:28,810 --> 00:04:27,320
the vehicle seems to be alive this is

82
00:04:30,730 --> 00:04:28,820
actually the main engine start which

83
00:04:33,190 --> 00:04:30,740
occurs roughly six to seven seconds

84
00:04:35,020 --> 00:04:33,200
before the liftoff and then the solid

85
00:04:36,280 --> 00:04:35,030
rocket boosters ignite on board this

86
00:04:38,860 --> 00:04:36,290
time I think I was a little bit more

87
00:04:41,230 --> 00:04:38,870
sensitized everything I actually felt

88
00:04:42,850 --> 00:04:41,240

the main engine ignition inside and you

89
00:04:45,040 --> 00:04:42,860
could feel the twang of the vehicle and

90
00:04:47,230 --> 00:04:45,050
everybody feels the solid rocket

91
00:04:49,450 --> 00:04:47,240
boosters ignite because you get lots

92
00:04:51,040 --> 00:04:49,460
more noise and vibration and with the

93
00:04:52,900 --> 00:04:51,050
suits which none of us had worn before

94
00:04:54,790 --> 00:04:52,910
you actually end up bouncing around

95
00:04:59,830 --> 00:04:54,800
inside this little environment of your

96
00:05:02,680 --> 00:04:59,840
own our asset was pretty much a normal

97
00:05:05,620 --> 00:05:02,690
what we call direct insertion where we

98
00:05:07,270 --> 00:05:05,630
actually did not do a owns or an orbital

99
00:05:10,330 --> 00:05:07,280
maneuvering system one burn we just

100
00:05:14,680 --> 00:05:10,340
allowed ourselves to glide on up to

101
00:05:16,150 --> 00:05:14,690
basically a 331 by 27 or forty seven

102
00:05:18,310 --> 00:05:16,160
nautical mile orbit before we did our

103
00:05:20,290 --> 00:05:18,320
insertion burn the main engine cutoff

104
00:05:22,990 --> 00:05:20,300
velocity was a little bit faster than we

105
00:05:25,450 --> 00:05:23,000
normally see roughly 26,000 feet per

106
00:05:26,890 --> 00:05:25,460
second and the most impressive thing to

107
00:05:32,350 --> 00:05:26,900
me was the way we could not see the

108
00:05:34,450 --> 00:05:32,360
earth after mikko as you all know our

109
00:05:37,960 --> 00:05:34,460
altitude was unique for the shuttle

110
00:05:40,510 --> 00:05:37,970
program we went to 330 miles circular

111
00:05:42,280 --> 00:05:40,520
orbit it was it was truly noticeable and

112
00:05:43,659 --> 00:05:42,290
impressive from onboard and we hope that

113
00:05:46,270 --> 00:05:43,669

we were able to share some of that with

114
00:05:48,370 --> 00:05:46,280
you on the downlink television first

115
00:05:50,380 --> 00:05:48,380
thing every crew does is get the orbiter

116
00:05:52,690 --> 00:05:50,390
configured for being on orbit and if I

117
00:05:55,480 --> 00:05:52,700
think particular concern to our crew was

118
00:05:58,480 --> 00:05:55,490
the number of activities that we had to

119
00:06:00,610 --> 00:05:58,490
accomplish on flight day one including

120
00:06:03,070 --> 00:06:00,620
checking out the RMS which you see us

121
00:06:04,990 --> 00:06:03,080
doing here we do that early in the

122
00:06:07,030 --> 00:06:05,000
flight of course because if there were

123
00:06:09,730 --> 00:06:07,040
failures with the arm we would have over

124
00:06:11,110 --> 00:06:09,740
night and the next morning to try to

125
00:06:12,939 --> 00:06:11,120
figure out what the impact would

126
00:06:15,370 --> 00:06:12,949
on the Hubble Space Telescope deploy

127
00:06:17,409 --> 00:06:15,380
operations in our case the arm worked

128
00:06:19,750 --> 00:06:17,419
beautifully and there were no problems

129
00:06:22,680 --> 00:06:19,760
at all with rms check out and we got

130
00:06:25,180 --> 00:06:22,690
that done on time on flight day one and

131
00:06:26,920 --> 00:06:25,190
the other major activity that was going

132
00:06:28,990 --> 00:06:26,930
on at that time was doing all the

133
00:06:32,409 --> 00:06:29,000
preparatory work for the potential

134
00:06:35,439 --> 00:06:32,419
spacewalk the next day what you're

135
00:06:38,050 --> 00:06:35,449
seeing here is the power erratic tool

136
00:06:40,750 --> 00:06:38,060
which is a device produced by the

137
00:06:43,150 --> 00:06:40,760
Goddard Space Flight Center adapted

138
00:06:44,830 --> 00:06:43,160

specifically to work on the Space

139
00:06:48,010 --> 00:06:44,840
Telescope both the maintenance and

140
00:06:50,529 --> 00:06:48,020
repair missions and for deploying the

141
00:06:54,490 --> 00:06:50,539
solar arrays which if done manually

142
00:06:56,260 --> 00:06:54,500
required 120 full turns and in suited

143
00:06:59,409 --> 00:06:56,270
tests underwater it proven to be fairly

144
00:07:02,110 --> 00:06:59,419
fatiguing this unit has its own internal

145
00:07:03,700 --> 00:07:02,120
battery a high-performance electric

146
00:07:06,189 --> 00:07:03,710
motor and little microprocessor

147
00:07:09,040 --> 00:07:06,199
controller to control the speed the

148
00:07:12,090 --> 00:07:09,050
torque and the number of turns per

149
00:07:14,379 --> 00:07:12,100
trigger setting or per trigger squeeze

150
00:07:17,950 --> 00:07:14,389
here you see some additional

151
00:07:20,920 --> 00:07:17,960
configuration of tools of going into the

152
00:07:23,800 --> 00:07:20,930
airlock in preparation for the EBA that

153
00:07:25,930 --> 00:07:23,810
almost was in addition to configuring

154
00:07:27,879 --> 00:07:25,940
the airlock with about a dozen tools

155
00:07:31,330 --> 00:07:27,889
most of which were unique to the HST

156
00:07:33,100 --> 00:07:31,340
possible deployment asks we had to

157
00:07:35,560 --> 00:07:33,110
conduct a pre breathe through deuce the

158
00:07:37,420 --> 00:07:35,570
cabin pressure and check out all three

159
00:07:38,920 --> 00:07:37,430
of the spacesuits we had we had an upper

160
00:07:40,990 --> 00:07:38,930
torso assembly which includes all the

161
00:07:42,640 --> 00:07:41,000
life-support systems and computer

162
00:07:44,860 --> 00:07:42,650
monitoring systems on the suit as a

163
00:07:46,600 --> 00:07:44,870

spare unit in the event that either of

164
00:07:49,200 --> 00:07:46,610
the primary suits for brucer I had

165
00:07:52,570 --> 00:07:49,210
developed a problem all in all it took

166
00:07:54,129 --> 00:07:52,580
Bruce and I the lion's share of our time

167
00:07:56,050 --> 00:07:54,139
on flight day one and a goodly measure

168
00:07:57,640 --> 00:07:56,060
of Charlie's time Charlie was always the

169
00:08:02,379 --> 00:07:57,650
critical resource being split through

170
00:08:04,270 --> 00:08:02,389
the RMS operations and the EBA early in

171
00:08:06,760 --> 00:08:04,280
the morning on flight day 2 which was

172
00:08:10,390 --> 00:08:06,770
actually less than 24 hours after launch

173
00:08:13,659 --> 00:08:10,400
we were given a go for HST deploy

174
00:08:16,210 --> 00:08:13,669
operations and that meant that I was go

175
00:08:18,189 --> 00:08:16,220
to uncrate all the RMS and move it over

176
00:08:20,680 --> 00:08:18,199
and grapple the space telescope in the

177
00:08:23,649 --> 00:08:20,690
bay which you see here we're trying to

178
00:08:24,890 --> 00:08:23,659
convey a sense I think of how big the

179
00:08:27,920 --> 00:08:24,900
space telescope is

180
00:08:29,629 --> 00:08:27,930
and the fact that the aperture door is

181
00:08:32,450 --> 00:08:29,639
bright and shiny and it sits right in

182
00:08:35,029 --> 00:08:32,460
front of the windows and all of that as

183
00:08:36,680 --> 00:08:35,039
I had described in the pre-flight press

184
00:08:40,100 --> 00:08:36,690
conference was of some concern to me

185
00:08:42,079 --> 00:08:40,110
being able to see to do the task it was

186
00:08:44,780 --> 00:08:42,089
about as difficult as as we had expected

187
00:08:47,450 --> 00:08:44,790
and and the views as you can see here

188
00:08:49,040 --> 00:08:47,460

out the window certainly degrade rapidly

189
00:08:51,620 --> 00:08:49,050
as the telescope begins to come out of

190
00:08:54,500 --> 00:08:51,630
the bay Charlie was very helpful at

191
00:08:56,240 --> 00:08:54,510
talking me through the deploy operations

192
00:08:58,730 --> 00:08:56,250
with the arm particularly as I mentioned

193
00:09:00,110 --> 00:08:58,740
down low in the Bay where the clearances

194
00:09:03,380 --> 00:09:00,120
are fairly small and you're trying to go

195
00:09:05,150 --> 00:09:03,390
go slowly if you look carefully through

196
00:09:07,070 --> 00:09:05,160
the window I think you'll be able to see

197
00:09:10,460 --> 00:09:07,080
the rate at which we were trying to move

198
00:09:12,590 --> 00:09:10,470
the HST up out of the bay slow is is

199
00:09:15,710 --> 00:09:12,600
good when you have two very large

200
00:09:17,150 --> 00:09:15,720
vehicles very close together and as you

201
00:09:20,800 --> 00:09:17,160
know it took a little bit longer on

202
00:09:23,360 --> 00:09:20,810
orbit to do that task then we had

203
00:09:25,090 --> 00:09:23,370
simulated on the ground and I think that

204
00:09:29,720 --> 00:09:25,100
that that's probably to be expected

205
00:09:31,310 --> 00:09:29,730
given the the fact that we weren't

206
00:09:33,860 --> 00:09:31,320
really the pacing item in the deploy

207
00:09:36,820 --> 00:09:33,870
sequence anyway and we wanted to make

208
00:09:38,660 --> 00:09:36,830
sure that the job was done properly

209
00:09:40,100 --> 00:09:38,670
there are a number of coordinated

210
00:09:42,560 --> 00:09:40,110
activities that actually need to take

211
00:09:44,720 --> 00:09:42,570
place it isn't just Charlie and me

212
00:09:47,000 --> 00:09:44,730
operating the arm but Lauren has to

213
00:09:49,100 --> 00:09:47,010

position the vehicle the orbiter vehicle

214
00:09:50,780 --> 00:09:49,110
in the proper attitude so that the Sun

215
00:09:52,940 --> 00:09:50,790
shines on the proper part of the Space

216
00:09:55,250 --> 00:09:52,950
Telescope and and he had to make a

217
00:09:57,590 --> 00:09:55,260
couple of different maneuvers in

218
00:10:01,519 --> 00:09:57,600
addition to manually holding the the

219
00:10:03,650 --> 00:10:01,529
orbiters attitude near where it wanted

220
00:10:05,120 --> 00:10:03,660
to be while the the arm and the

221
00:10:07,550 --> 00:10:05,130
telescope or emotion we had a number of

222
00:10:10,519 --> 00:10:07,560
constraints governing how the orbiter

223
00:10:12,680 --> 00:10:10,529
could move when the telescope was

224
00:10:14,410 --> 00:10:12,690
unbirth and when it was in motion and he

225
00:10:17,329 --> 00:10:14,420
had to manage all of that very carefully

226
00:10:20,780 --> 00:10:17,339
we did find that this manual control of

227
00:10:23,690 --> 00:10:20,790
the orbiter using certain app settings

228
00:10:27,620 --> 00:10:23,700
or digital auto pilot work very well and

229
00:10:30,230 --> 00:10:27,630
have recommended that that be highly

230
00:10:33,110 --> 00:10:30,240
considered as a mode of orbiter control

231
00:10:33,769 --> 00:10:33,120
and large payloads like this after Steve

232
00:10:36,679 --> 00:10:33,779
lifted

233
00:10:39,319 --> 00:10:36,689
the telescope clear of the bay he went

234
00:10:41,269 --> 00:10:39,329
through a number of maneuvers the end

235
00:10:43,150 --> 00:10:41,279
result of which was getting the the

236
00:10:46,639 --> 00:10:43,160
bottom or the base end of the telescope

237
00:10:48,829 --> 00:10:46,649
pointing forward and after Lauren

238
00:10:50,989 --> 00:10:48,839

oriented the orbiter these fish was

239
00:10:54,199 --> 00:10:50,999
pointing toward the Sun the solar array

240
00:10:57,019 --> 00:10:54,209
booms were folded up 90 degrees and as

241
00:10:59,239 --> 00:10:57,029
you see here the solar array panels were

242
00:11:01,879 --> 00:10:59,249
enrolled you have to watch very closely

243
00:11:05,239 --> 00:11:01,889
because this is a rather slow process

244
00:11:08,720 --> 00:11:05,249
taking on the order of six minutes to

245
00:11:11,780 --> 00:11:08,730
fully unreal these sets of solar array

246
00:11:13,819 --> 00:11:11,790
panels there are five separate solar

247
00:11:17,239 --> 00:11:13,829
panel assemblies on each side of the

248
00:11:21,379 --> 00:11:17,249
center drum two arrays on the entire

249
00:11:25,059 --> 00:11:21,389
telescope the set that you see here the

250
00:11:28,730 --> 00:11:25,069
plus v2 solar array deployed very nicely

251
00:11:30,619 --> 00:11:28,740
as I'm sure you're aware later on there

252
00:11:33,650 --> 00:11:30,629
were some difficulties deploying the

253
00:11:35,869 --> 00:11:33,660
minus v2 array which led Kathy and

254
00:11:39,610 --> 00:11:35,879
myself to finish the sitting up process

255
00:11:42,259 --> 00:11:39,620
and ultimately to get into the airlock

256
00:11:43,910 --> 00:11:42,269
depressurized the airlock 25 pounds per

257
00:11:46,309 --> 00:11:43,920
square inch or approximately half the

258
00:11:48,499 --> 00:11:46,319
cabin pressure and to stand by just

259
00:11:50,449 --> 00:11:48,509
inches away from the hatch and from the

260
00:11:54,980 --> 00:11:50,459
depressed valve for about two hours

261
00:11:57,079 --> 00:11:54,990
until telescope separation and released

262
00:11:59,420 --> 00:11:57,089
from the orbiter was complete and until

263
00:12:01,730 --> 00:11:59,430

Steve had completed birthing the RMS

264
00:12:04,879 --> 00:12:01,740
here you see the plus v2 array fully

265
00:12:07,189 --> 00:12:04,889
deployed these arrays are a contribution

266
00:12:09,019 --> 00:12:07,199
from the European Space Agency along

267
00:12:10,999 --> 00:12:09,029
with the faint object camera and

268
00:12:15,379 --> 00:12:11,009
represent fifteen to twenty percent of

269
00:12:17,540 --> 00:12:15,389
their participation in the program we at

270
00:12:20,059 --> 00:12:17,550
the solar array that had been giving us

271
00:12:21,290 --> 00:12:20,069
trouble was finally unfurled properly we

272
00:12:24,110 --> 00:12:21,300
actually didn't have very much time

273
00:12:26,150 --> 00:12:24,120
until the release opportunity as I

274
00:12:27,340 --> 00:12:26,160
recall it was around 30 minutes or so so

275
00:12:30,439 --> 00:12:27,350
through a number of activities that

276
00:12:31,730 --> 00:12:30,449
Lauren and I had to do with Charlie's

277
00:12:33,650 --> 00:12:31,740
helped and Charlie was kind of going

278
00:12:36,739 --> 00:12:33,660
back and forth between the deck and the

279
00:12:39,799 --> 00:12:36,749
mid-deck throughout the day we noticed

280
00:12:41,720 --> 00:12:39,809
that one of the surprises was the amount

281
00:12:44,780 --> 00:12:41,730
of clearance between the arm and the

282
00:12:45,660 --> 00:12:44,790
solar array at separation it was a

283
00:12:47,400 --> 00:12:45,670
little bit less

284
00:12:49,110 --> 00:12:47,410
we had been led to expect from the

285
00:12:51,060 --> 00:12:49,120
simulations that we have performed on

286
00:12:53,160 --> 00:12:51,070
the ground however the control of the

287
00:12:55,380 --> 00:12:53,170
arm was very precise and the control of

288
00:12:57,960 --> 00:12:55,390

the orbiter at separation was very

289
00:13:01,020 --> 00:12:57,970
precise and we had no concerns about

290
00:13:03,630 --> 00:13:01,030
about contacting the arm with the solar

291
00:13:05,970 --> 00:13:03,640
ray but it was something that Lord and I

292
00:13:07,560 --> 00:13:05,980
kept a very close eye on what you're

293
00:13:09,750 --> 00:13:07,570
saying in this scene is actually the

294
00:13:11,660 --> 00:13:09,760
Space Telescope after release as we are

295
00:13:13,830 --> 00:13:11,670
flying over the western coast of Peru

296
00:13:15,240 --> 00:13:13,840
actually crossing the Andes Mountains

297
00:13:19,290 --> 00:13:15,250
and that to me was pretty spectacular

298
00:13:20,520 --> 00:13:19,300
from a visual sense some of the

299
00:13:23,310 --> 00:13:20,530
information that we learned on this

300
00:13:24,780 --> 00:13:23,320
flight only hope to pass on to whichever

301
00:13:27,600 --> 00:13:24,790
crew is selected to do maintenance

302
00:13:29,970 --> 00:13:27,610
repair missions on the HST it's the fact

303
00:13:31,950 --> 00:13:29,980
that the HST is highly visible I guess

304
00:13:34,290 --> 00:13:31,960
you would expect that just because of

305
00:13:37,260 --> 00:13:34,300
the way it's it's configured with

306
00:13:39,690 --> 00:13:37,270
reflecting thermal blankets and the big

307
00:13:42,060 --> 00:13:39,700
solar arrays also providing a lot of

308
00:13:43,950 --> 00:13:42,070
reflecting surface area we can see it

309
00:13:45,870 --> 00:13:43,960
for a long time of course post-release

310
00:13:48,780 --> 00:13:45,880
in addition we found throughout the

311
00:13:51,180 --> 00:13:48,790
flight every terminator we would be able

312
00:13:53,810 --> 00:13:51,190
to see the HST reflecting sunlight even

313
00:13:58,350 --> 00:13:53,820

at a distance of greater than 40 miles

314
00:14:00,690 --> 00:13:58,360
that was a little bit of a surprise of

315
00:14:04,200 --> 00:14:00,700
course as Bruce and Kathy can describe

316
00:14:05,400 --> 00:14:04,210
this is not the end of anything but the

317
00:14:07,590 --> 00:14:05,410
beginning of the lifetime of the

318
00:14:10,080 --> 00:14:07,600
telescope and and a lot of the work that

319
00:14:11,640 --> 00:14:10,090
they did on this flight will will come

320
00:14:14,190 --> 00:14:11,650
back to have produced results years from

321
00:14:15,870 --> 00:14:14,200
now as the maintenance missions are our

322
00:14:17,430 --> 00:14:15,880
lives to service the telescope and keep

323
00:14:23,040 --> 00:14:17,440
it an operational observatory for years

324
00:14:26,550 --> 00:14:23,050
to come Stevens mentioned it is designed

325
00:14:30,240 --> 00:14:26,560
for a 15 to 20 year lifetime as an

326
00:14:33,210 --> 00:14:30,250
observatory facility with planned visits

327
00:14:35,070 --> 00:14:33,220
roughly every five years to replace

328
00:14:36,870 --> 00:14:35,080
those components which are known to

329
00:14:40,050 --> 00:14:36,880
degrade such as the batteries and the

330
00:14:42,180 --> 00:14:40,060
solar arrays to replace anything that

331
00:14:44,310 --> 00:14:42,190
fails and also to provide the

332
00:14:47,280 --> 00:14:44,320
opportunity for exchanging scientific

333
00:14:48,960 --> 00:14:47,290
instruments as the data which comes back

334
00:14:52,800 --> 00:14:48,970
from the current set of five instruments

335
00:14:56,250 --> 00:14:52,810
is analyzed and perhaps reveals new

336
00:14:58,860 --> 00:14:56,260
pathways to explore I talked with the

337
00:14:59,410 --> 00:14:58,870
folks in the Space Telescope operation

338
00:15:02,080 --> 00:14:59,420

control

339
00:15:03,910 --> 00:15:02,090
Center this morning they have rearranged

340
00:15:05,500 --> 00:15:03,920
some elements of the checkout bringing

341
00:15:07,600 --> 00:15:05,510
the scientific instrument check out

342
00:15:09,130 --> 00:15:07,610
forward and working on some minor

343
00:15:11,140 --> 00:15:09,140
problems in the pointing and control

344
00:15:14,260 --> 00:15:11,150
system but all in all they feel like

345
00:15:20,730 --> 00:15:14,270
they're about on schedule in terms of

346
00:15:27,610 --> 00:15:24,760
here you see me looking at the protein

347
00:15:29,500 --> 00:15:27,620
crystal growth experiment this is a

348
00:15:32,860 --> 00:15:29,510
secondary payload from the university of

349
00:15:36,490 --> 00:15:32,870
alabama in birmingham and in this close

350
00:15:39,940 --> 00:15:36,500
up shot chamber of c3 you can see some

351
00:15:42,700 --> 00:15:39,950
crystals of carboxyl ester hydrolysis

352
00:15:46,090 --> 00:15:42,710
which was one of the compounds the idea

353
00:15:48,640 --> 00:15:46,100
here is to create large defect free

354
00:15:52,180 --> 00:15:48,650
crystals in zero gravity that can be

355
00:15:54,760 --> 00:15:52,190
used under x-ray analysis to reveal the

356
00:15:57,610 --> 00:15:54,770
exact structure of the protein and once

357
00:16:01,260 --> 00:15:57,620
the structure has been revealed you can

358
00:16:04,260 --> 00:16:01,270
tailor anybody's or vaccines or other

359
00:16:07,510 --> 00:16:04,270
biological agents and then produce those

360
00:16:09,700 --> 00:16:07,520
to yield the desired effect unlike

361
00:16:11,710 --> 00:16:09,710
zero-g electrophoresis where we were

362
00:16:14,650 --> 00:16:11,720
attempting to manufacturers commercial

363
00:16:16,750 --> 00:16:14,660

quantities of substances this is just

364
00:16:19,960 --> 00:16:16,760
designed to discover the structure and

365
00:16:21,640 --> 00:16:19,970
do the rest work on the ground this is

366
00:16:24,670 --> 00:16:21,650
one of the other secondary experiments

367
00:16:26,800 --> 00:16:24,680
we had it was conceived of by a student

368
00:16:28,600 --> 00:16:26,810
at a high school at the time in Utah and

369
00:16:31,240 --> 00:16:28,610
sponsored by a corporation out there

370
00:16:32,920 --> 00:16:31,250
what you see are three different views

371
00:16:35,230 --> 00:16:32,930
the center one is the the actual

372
00:16:37,060 --> 00:16:35,240
electrical arc being struck and the two

373
00:16:39,130 --> 00:16:37,070
others are mirror views and the idea was

374
00:16:40,750 --> 00:16:39,140
to look at what affects driving an arc

375
00:16:43,450 --> 00:16:40,760
and affecting with outside magnetic

376
00:16:45,280 --> 00:16:43,460
fields would have in zero-g we carried

377
00:16:47,470 --> 00:16:45,290
two imax cameras one was the in cabin

378
00:16:49,750 --> 00:16:47,480
camera that you see kathy and me trying

379
00:16:52,240 --> 00:16:49,760
to get reloaded here the other was the

380
00:16:54,190 --> 00:16:52,250
imax cargo bay camera which we have not

381
00:16:56,590 --> 00:16:54,200
seen any of the film yet but hopefully

382
00:17:01,180 --> 00:16:56,600
we'll see in another week or two there's

383
00:17:02,950 --> 00:17:01,190
one of our élevage dad's fishing i was

384
00:17:04,810 --> 00:17:02,960
obligated to make sure i got a few good

385
00:17:07,690 --> 00:17:04,820
shots of some key places in baja

386
00:17:10,150 --> 00:17:07,700
california for my father but we also

387
00:17:12,460 --> 00:17:10,160
tried to put some of the spectacular

388
00:17:14,140 --> 00:17:12,470

views that we had on film

389
00:17:16,149 --> 00:17:14,150
to give you a sense of both the scale of

390
00:17:18,039 --> 00:17:16,159
v view and the rate of passage which is

391
00:17:21,130 --> 00:17:18,049
a little slower of course at this

392
00:17:22,630 --> 00:17:21,140
altitude than lower flights in some of

393
00:17:24,429 --> 00:17:22,640
the stills which we'll get to later you

394
00:17:28,720 --> 00:17:24,439
may get a better appreciation of this

395
00:17:30,850 --> 00:17:28,730
here you're over central Mexico the two

396
00:17:32,620 --> 00:17:30,860
bright dots at the upper center portion

397
00:17:34,899 --> 00:17:32,630
of the frame are the two large volcanoes

398
00:17:37,240 --> 00:17:34,909
just southeast of Mexico City and if you

399
00:17:39,190 --> 00:17:37,250
strain a little bit just up into the

400
00:17:41,350 --> 00:17:39,200
left of those volcanoes you may see a

401
00:17:43,029 --> 00:17:41,360
slightly lighter gray or patch of ground

402
00:17:46,390 --> 00:17:43,039
and that is in fact the urban area of

403
00:17:48,760 --> 00:17:46,400
mexico city itself it was easy to have

404
00:17:51,130 --> 00:17:48,770
all of Mexico literally from the

405
00:17:52,899 --> 00:17:51,140
California Mexico border to the Gulf

406
00:17:54,580 --> 00:17:52,909
Coast and on up to houston in your field

407
00:17:59,860 --> 00:17:54,590
of view at one time from our altitude

408
00:18:03,039 --> 00:17:59,870
which was very spectacular in fact as I

409
00:18:05,140 --> 00:18:03,049
mentioned perhaps during the flight one

410
00:18:07,899 --> 00:18:05,150
pass roughly in this location going to

411
00:18:09,850 --> 00:18:07,909
the east we were puzzled to see a lake

412
00:18:12,460 --> 00:18:09,860
worried we didn't recognize any lake

413
00:18:14,049 --> 00:18:12,470

should be on thinking about it Lauren

414
00:18:16,990 --> 00:18:14,059
realized that it was like Michigan that

415
00:18:19,450 --> 00:18:17,000
we were seeing and in fact we later saw

416
00:18:22,060 --> 00:18:19,460
a lake area and Lake Ontario being able

417
00:18:23,919 --> 00:18:22,070
to see entirely across the north-south

418
00:18:26,289 --> 00:18:23,929
width of the United States from over the

419
00:18:28,570 --> 00:18:26,299
Gulf of Mexico and here you're seeing

420
00:18:30,340 --> 00:18:28,580
across almost all of South America from

421
00:18:35,250 --> 00:18:30,350
just slightly east of the crest of the

422
00:18:39,490 --> 00:18:37,450
this was one of the least popular

423
00:18:41,049 --> 00:18:39,500
experiments aboard I wondered whether

424
00:18:43,720 --> 00:18:41,059
anyone would still speak to me after

425
00:18:45,880 --> 00:18:43,730
this if I hadn't already been hit this

426
00:18:49,659 --> 00:18:45,890
is something like 8 TB tests at once

427
00:18:52,510 --> 00:18:49,669
there's a certain toxin on each one of

428
00:18:55,600 --> 00:18:52,520
those sets of times and the idea is to

429
00:18:58,120 --> 00:18:55,610
determine whether the body's response to

430
00:19:00,520 --> 00:18:58,130
immune system response varies at all in

431
00:19:01,870 --> 00:19:00,530
zero-g some of the body's immune

432
00:19:04,060 --> 00:19:01,880
response of course is governed by the

433
00:19:06,610 --> 00:19:04,070
blood system and another level of it is

434
00:19:07,810 --> 00:19:06,620
controlled by the cellular structure of

435
00:19:10,299 --> 00:19:07,820
the body and the objective of this

436
00:19:12,789 --> 00:19:10,309
experiment specifically was to look at

437
00:19:14,230 --> 00:19:12,799
cell-mediated immune response and see if

438
00:19:16,600 --> 00:19:14,240

one mission specialist could survive

439
00:19:18,220 --> 00:19:16,610
administering it to two other people on

440
00:19:20,110 --> 00:19:18,230
the day before entry we go through a

441
00:19:22,899 --> 00:19:20,120
series of tests that we call flight

442
00:19:24,340 --> 00:19:22,909
control system or FCS check out what

443
00:19:25,629 --> 00:19:24,350
Lauren Steve and I were doing here was

444
00:19:27,759 --> 00:19:25,639
actually going through

445
00:19:29,979 --> 00:19:27,769
various tests of the hydraulic system

446
00:19:32,949 --> 00:19:29,989
with the auxiliary power unit running

447
00:19:35,889 --> 00:19:32,959
actually firing the RCS Jets to make

448
00:19:38,319 --> 00:19:35,899
sure they all operated properly and make

449
00:19:40,779 --> 00:19:38,329
sure that all the systems on board were

450
00:19:43,659 --> 00:19:40,789
going to be good or go for the entry day

451
00:19:48,099 --> 00:19:43,669
rfcs check out when very very smoothly

452
00:19:49,419 --> 00:19:48,109
with only very insignificant anomalies

453
00:19:54,369 --> 00:19:49,429
which we had seen before in previous

454
00:19:55,749 --> 00:19:54,379
flight this is a we were trying to get

455
00:19:58,180 --> 00:19:55,759
you some lightning and you can see it

456
00:20:00,909 --> 00:19:58,190
over in the left to the left of the

457
00:20:03,519 --> 00:20:00,919
earth slim there that's one of the more

458
00:20:06,099 --> 00:20:03,529
spectacular scenes of Natan is the

459
00:20:07,599 --> 00:20:06,109
lightning all over the earth just

460
00:20:10,810 --> 00:20:07,609
unbelievable when you when you get a

461
00:20:13,060 --> 00:20:10,820
chance to see it this is later in entry

462
00:20:15,579 --> 00:20:13,070
then some about Mach 6 taken from a

463
00:20:17,889 --> 00:20:15,589

tracking camera out at Vandenberg we

464
00:20:19,690 --> 00:20:17,899
have been doing several air opt is on

465
00:20:23,079 --> 00:20:19,700
the way in all the way through entry to

466
00:20:24,669 --> 00:20:23,089
gather aerodynamic data to try to expand

467
00:20:30,430 --> 00:20:24,679
the flight envelope of the shuttle

468
00:20:32,319 --> 00:20:30,440
slightly this is a scene here of we're

469
00:20:35,499 --> 00:20:32,329
rolling on the hack and coming around

470
00:20:37,839 --> 00:20:35,509
heading alignment circle you can see the

471
00:20:40,779 --> 00:20:37,849
Sun on the very bottom of the wing there

472
00:20:44,109 --> 00:20:40,789
that that Sun angle presented somewhat

473
00:20:46,359 --> 00:20:44,119
of a problem to Charlie and I as we flew

474
00:20:49,089 --> 00:20:46,369
right into it trying to turn on to the

475
00:20:50,919 --> 00:20:49,099
alignment circle and it wasn't until we

476
00:20:52,959 --> 00:20:50,929
got more than half way around the circle

477
00:20:55,089 --> 00:20:52,969
that we finally had the Sun out of our

478
00:20:57,699 --> 00:20:55,099
eyes hard to read inside and in

479
00:20:59,739 --> 00:20:57,709
transition to outside I was fortunate

480
00:21:02,799 --> 00:20:59,749
that Lauren is a real gracious soul in

481
00:21:04,149 --> 00:21:02,809
the pilot is kind of a misnomer you're a

482
00:21:05,769 --> 00:21:04,159
co-pilot but Lauren gave me an

483
00:21:08,409 --> 00:21:05,779
opportunity to fly the vehicle a little

484
00:21:11,889 --> 00:21:08,419
bit as we went subsonic and I thought it

485
00:21:13,799 --> 00:21:11,899
performed amazingly will we've just come

486
00:21:16,060 --> 00:21:13,809
through the inner glide slope there and

487
00:21:18,430 --> 00:21:16,070
once you start to pull the nose up of

488
00:21:20,289 --> 00:21:18,440

course you're losing all the precious

489
00:21:22,930 --> 00:21:20,299
airspeed that you had preserved at that

490
00:21:26,049 --> 00:21:22,940
point charlie lower to gear about 300

491
00:21:29,289 --> 00:21:26,059
feet above the ground and we just came

492
00:21:33,279 --> 00:21:29,299
on in establishing attitude and kind of

493
00:21:35,060 --> 00:21:33,289
hold it to the landing we had been sort

494
00:21:37,190 --> 00:21:35,070
of on-again off-again for

495
00:21:40,970 --> 00:21:37,200
that day for the wind situation out at

496
00:21:43,399 --> 00:21:40,980
Edwards as you probably recall and we

497
00:21:45,740 --> 00:21:43,409
seem to run out of a hair speed a little

498
00:21:49,730 --> 00:21:45,750
bit quicker than normal that I'm used to

499
00:21:51,889 --> 00:21:49,740
in the Sta but the shuttle does have a

500
00:21:54,470 --> 00:21:51,899
lot of reserve capability there so

501
00:21:57,519 --> 00:21:54,480
overall the landing went very smoothly

502
00:22:00,139 --> 00:21:57,529
in the nose wheel d rotation rate

503
00:22:04,220 --> 00:22:00,149
continued to be very slow for the

504
00:22:05,779 --> 00:22:04,230
entirety rotation we also flew the new

505
00:22:09,379 --> 00:22:05,789
carbon brakes for the shuttle program

506
00:22:11,299 --> 00:22:09,389
for the first time those brakes turned

507
00:22:14,049 --> 00:22:11,309
out to work very well they're very

508
00:22:16,700 --> 00:22:14,059
smooth and very positive I think

509
00:22:19,039 --> 00:22:16,710
there'll be a great asset to the program

510
00:22:21,430 --> 00:22:19,049
as we continue to fly those on other

511
00:22:24,980 --> 00:22:21,440
vehicles now and then look toward

512
00:22:26,990 --> 00:22:24,990
returning to KSC for landing and of

513
00:22:29,119 --> 00:22:27,000

course I planned that stop exactly in

514
00:22:31,369 --> 00:22:29,129
front of the tower with this camera in

515
00:22:36,110 --> 00:22:31,379
mind so we could get a new slant on

516
00:22:39,259 --> 00:22:36,120
things and we did Oh 30 or 40 minutes

517
00:22:41,840 --> 00:22:39,269
worth of post landing cleanup switches

518
00:22:44,509 --> 00:22:41,850
and reconfiguring and then we're ready

519
00:22:47,539 --> 00:22:44,519
to get out of the inside fairly cool

520
00:22:49,789 --> 00:22:47,549
outside that day it was about 44 45

521
00:22:53,600 --> 00:22:49,799
degrees windchill factor so we stayed

522
00:22:55,159 --> 00:22:53,610
inside the suits we had sent along the

523
00:22:56,990 --> 00:22:55,169
regular blue flight suits that we

524
00:22:58,399 --> 00:22:57,000
thought we were going to get into but as

525
00:23:00,649 --> 00:22:58,409
Lauren mentioned the wind chill factor

526
00:23:02,149 --> 00:23:00,659
made it desirous to just a combination

527
00:23:03,830 --> 00:23:02,159
of your heat inside the suit and the

528
00:23:10,510 --> 00:23:03,840
coolness of the desert air out there