1
00:16:25,549 --> 00:16:21,439
the crew now headed for the elevator

2
00:16:28,579 --> 00:16:25,559
that will take them down to the first

3
00:16:31,749 --> 00:16:28,589
floor will they'll board the Astro van

4
00:16:35,150 --> 00:16:31,759
for the 20-minute ride out to pad B

5
00:16:41,179 --> 00:16:35,160
commander and the pilot commander

6
00:16:46,189 --> 00:16:41,189
Shriver and pilot Charlie Bolden Bruce

7
00:16:47,989 --> 00:16:46,199
McCandless and members of the support

8
00:16:50,410 --> 00:16:47,999
team but we'll be going up standing by

9
00:16:59,059 --> 00:16:50,420
now for a go for autosequence start

10
00:17:00,739 --> 00:16:59,069
t minus 33 has happened is the ground

11
00:17:03,379 --> 00:17:00,749
launch sequencer would not hand off to

12
00:17:06,470 --> 00:17:03,389
the orbiters computers to complete the

13
00:17:09,500 --> 00:17:06,480

count because the liquid oxygen fill and

14
00:17:13,730 --> 00:17:09,510
drain valve was showing off when it

15
00:17:16,309 --> 00:17:13,740
should be on t minus 10 go for main

16
00:17:20,889 --> 00:17:16,319
engine start we are go for main engine

17
00:17:24,230 --> 00:17:20,899
start t-minus six five four three two

18
00:17:26,029 --> 00:17:24,240
one and liftoff of the space shuttle

19
00:17:30,669 --> 00:17:26,039
Discovery with the Hubble Space

20
00:17:30,679 --> 00:17:39,880
Mission Control Houston

21
00:17:47,920 --> 00:17:42,080
puts the vehicle in the proper launch

22
00:18:00,470 --> 00:17:50,480
guidance officer confirms a good roll

23
00:18:00,480 --> 00:18:41,990
you

24
00:18:42,000 --> 00:18:47,210
thanks Lord

25
00:18:53,070 --> 00:18:49,859
when fully deployed both of the arrays

26
00:18:55,769 --> 00:18:53,080
together produce about 6,000 volts about

27
00:18:57,869 --> 00:18:55,779
half of which is required to operate

28
00:18:59,580 --> 00:18:57,879
telescopes systems and during the

29
00:19:03,600 --> 00:18:59,590
daylight side of the past the other half

30
00:19:12,210 --> 00:19:03,610
is used to recharge the six nickel

31
00:19:17,249 --> 00:19:12,220
hydrogen batteries shift supervisor Pete

32
00:19:19,440 --> 00:19:17,259
Petare oh just checking with his control

33
00:19:22,229 --> 00:19:19,450
team receiving a report that from the

34
00:19:25,169 --> 00:19:22,239
ground as confirmed by the crew from

35
00:19:28,229 --> 00:19:25,179
orbit the deploy activity so far is

36
00:19:37,320 --> 00:19:28,239
going very smoothly we see no

37
00:20:39,899 --> 00:20:01,880
you

38
00:20:39,909 --> 00:20:49,590

landing gear is down and locked

39
00:20:49,600 --> 00:21:03,240
thank your touchdown nose gear touchdown

40
00:21:11,350 --> 00:21:07,419
discovery rolls out on runway 22 at

41
00:21:13,090 --> 00:21:11,360
Edwards at the end mission STS 31 after

42
00:21:15,669 --> 00:21:13,100
traveling two million sixty-eight

43
00:21:21,669 --> 00:21:15,679
thousand two hundred thirteen statute

44
00:21:24,549 --> 00:21:21,679
miles on this mission mechanical systems

45
00:21:26,379 --> 00:21:24,559
officer reports steady braking the

46
00:21:31,210 --> 00:21:26,389
normal amount of braking is about eight

47
00:21:33,159 --> 00:21:31,220
to ten feet per second and this detailed

48
00:21:36,159 --> 00:21:33,169
test objective today is designed to be a

49
00:21:49,630 --> 00:21:36,169
light braking or low energy braking to

50
00:21:59,440 --> 00:21:57,010
we'll stop we'll stop right after that

51
00:22:01,870 --> 00:21:59,450
discovery welcome back congratulations

52
00:22:03,550 --> 00:22:01,880
on a super mission and the world is

53
00:22:05,850 --> 00:22:03,560
looking forward to reaping the benefits

54
00:22:08,290 --> 00:22:05,860
of your good work over the next 15 years

55
00:22:16,840 --> 00:22:08,300
welcome back guys and we have no

56
00:22:16,850 --> 00:22:21,840
you

57
00:22:26,470 --> 00:22:23,740
don't it's like a welding torch going on

58
00:22:28,090 --> 00:22:26,480
when the SRB is labeled Katie got to

59
00:22:30,850 --> 00:22:28,100
look out the overhead windows and I

60
00:22:32,620 --> 00:22:30,860
think that was pretty spectacular - it

61
00:22:34,870 --> 00:22:32,630
looked like daylight behind us on the

62
00:22:37,870 --> 00:22:34,880
pad and and I could follow it for maybe

63
00:22:41,230 --> 00:22:37,880

20 seconds before it went into just like

64
00:22:43,660 --> 00:22:41,240
just fire behind us the vibrations and

65
00:22:45,910 --> 00:22:43,670
the the roar is pretty much the same as

66
00:22:47,170 --> 00:22:45,920
in the daytime probably the big

67
00:22:51,700 --> 00:22:47,180
difference is up when you get towards

68
00:22:53,440 --> 00:22:51,710
SRB Sep when rockets go off to separate

69
00:22:55,510 --> 00:22:53,450
those boosters it really flashes outside

70
00:22:57,820 --> 00:22:55,520
aside the windows and it gives me a

71
00:23:00,160 --> 00:22:57,830
thrill just seeing that right there

72
00:23:09,000 --> 00:23:00,170
tried to warn these guys yeah cubby

73
00:23:09,010 --> 00:27:01,380
you

74
00:27:12,299 --> 00:27:08,730
have a go for engine start three two one

75
00:27:14,190 --> 00:27:12,309
ignition and liftoff discovery now on

76
00:27:25,480 --> 00:27:14,200
its way to service NASA's Hubble Space

77
00:27:28,810 --> 00:27:27,400
roll maneuver is complete aboard

78
00:27:30,580 --> 00:27:28,820
discovery the vehicles now in a

79
00:27:32,020 --> 00:27:30,590
heads-down position on course for a

80
00:27:35,320 --> 00:27:32,030
twenty eight and a half degree three

81
00:27:37,120 --> 00:27:35,330
hundred nine nautical mile orbit three

82
00:27:39,130 --> 00:27:37,130
main engines uh beginning to throttle

83
00:27:40,480 --> 00:27:39,140
down now as the orbiter prepares to pass

84
00:27:42,490 --> 00:27:40,490
through the area of maximum dynamic

85
00:27:45,550 --> 00:27:42,500
pressure on the vehicle in the lower

86
00:27:50,950 --> 00:27:45,560
atmosphere the three engines now at

87
00:27:53,320 --> 00:27:50,960
sixty seven percent of rated thrust the

88
00:27:55,240 --> 00:27:53,330

solid rocket boosters beginning to tail

89
00:27:57,490 --> 00:27:55,250
off with their chamber pressure standing

90
00:28:08,419 --> 00:27:57,500
by for burnout and separation of the

91
00:28:08,429 --> 00:30:36,050
you

92
00:30:41,510 --> 00:30:38,960
and see that everything's okay the solid

93
00:30:43,700 --> 00:30:41,520
rocket motors are ignited here's the

94
00:30:45,380 --> 00:30:43,710
view inside the cockpit at SRB ignition

95
00:30:48,590 --> 00:30:45,390
and you could see a lot of shaking going

96
00:30:49,940 --> 00:30:48,600
on looks a little bit slow coming off

97
00:30:52,010 --> 00:30:49,950
the pad but there's nothing slow about

98
00:30:57,680 --> 00:30:52,020
it the things that come to my mind are

99
00:30:59,030 --> 00:30:57,690
power and speed there's a beautiful view

100
00:31:00,950 --> 00:30:59,040
of the orbiter you can see here it gets

101
00:31:03,320 --> 00:31:00,960
pretty hot down at the bottom of the

102
00:31:06,740 --> 00:31:03,330
external tank but the insulation does a

103
00:31:09,200 --> 00:31:06,750
really good job about two minutes after

104
00:31:19,340 --> 00:31:09,210
liftoff the solid rocket motors come off

105
00:31:19,350 --> 00:34:22,730
you

106
00:34:22,740 --> 00:34:35,619
five

107
00:34:38,610 --> 00:34:37,480
Atlantis on his way all three engines

108
00:34:40,920 --> 00:34:38,620
now throttling

109
00:34:42,210 --> 00:34:40,930
the area begins and the vehicle passes

110
00:35:12,900 --> 00:34:42,220
through the area of maximum dynamic

111
00:35:19,990 --> 00:35:15,819
Atlantis Houston you are go for orbit

112
00:35:27,910 --> 00:35:20,000
ops here's the Atlantis good words go

113
00:35:31,180 --> 00:35:27,920

for over top thank you closure where

114
00:35:32,740 --> 00:35:31,190
Stalin minus 0.05 at 151 feet okay I

115
00:35:59,099 --> 00:35:32,750
just don't want to see the numbers get

116
00:36:06,549 --> 00:36:04,780
we have the Pope in the radio we copy

117
00:36:12,280 --> 00:36:06,559
and we're pulling down the kayuu right

118
00:36:18,460 --> 00:36:12,290
now we see that thank you and the

119
00:36:22,270 --> 00:36:18,470
grapple fixture now in view Megan

120
00:36:24,490 --> 00:36:22,280
McArthur now repositioning the shuttles

121
00:36:27,370 --> 00:36:24,500
robotic arm to align with the grapple

122
00:36:29,770 --> 00:36:27,380
fixture on the telescope space shuttle

123
00:37:08,440 --> 00:36:29,780
Atlantis all of its thruster Jets have

124
00:37:13,030 --> 00:37:12,049
has arrived onboard Atlantis with the

125
00:37:16,579 --> 00:37:13,040
arm

126
00:37:18,380 --> 00:37:16,589
landis houston we copy nice job Megan

127
00:37:23,380 --> 00:37:18,390
nice job and the procs flying as well

128
00:37:30,260 --> 00:37:25,789
thanks and everybody's are very excited

129
00:37:31,520 --> 00:37:30,270
up here I can tell you I'm just looking

130
00:37:35,030 --> 00:37:31,530
out the window here and it's an

131
00:37:37,670 --> 00:37:35,040
unbelievably beautiful sight amazingly

132
00:37:39,829 --> 00:37:37,680
the experience of an old man of nineteen

133
00:37:43,180 --> 00:37:39,839
years in space still looks in fantastic

134
00:37:43,190 --> 00:37:54,190
we copy dad thanks for those words

135
00:37:57,849 --> 00:37:56,500
that was exciting with you set of

136
00:38:00,609 --> 00:37:57,859
challenges there you said it was a

137
00:38:02,800 --> 00:38:00,619
little faster we came in we had kind of

138
00:38:06,579 --> 00:38:02,810

a little extra closure with a lot of

139
00:38:08,500 --> 00:38:06,589
plain maneuvering trying to get up to

140
00:38:11,740 --> 00:38:08,510
the telescope had to do some braking and

141
00:38:18,120 --> 00:38:11,750
then the telescope wasn't rotated for us

142
00:38:20,470 --> 00:38:18,130
we had to wait all right that's great

143
00:38:33,010 --> 00:38:20,480
hey John you can open the thermal cover

144
00:38:33,020 --> 00:38:37,240
the recovers

145
00:38:37,250 --> 00:39:19,330
you can do this activity okay here we go

146
00:39:52,880 --> 00:39:49,280
definitely and we have like fuel camera

147
00:39:54,350 --> 00:39:52,890
three in the telescope and a new

148
00:39:58,220 --> 00:39:54,360
scientific instrument command and data

149
00:40:01,340 --> 00:39:58,230
handling mike massimino is reflection in

150
00:40:05,780 --> 00:40:01,350
the aft shroud of the hubble space

151
00:40:07,790 --> 00:40:05,790
telescope he prepares to open the doors

152
00:40:11,560 --> 00:40:07,800
protective doors over the fixed-head

153
00:40:14,810 --> 00:40:11,570
star trackers and the rate sensor units

154
00:40:16,880 --> 00:40:14,820
and now looking from the opposite helmet

155
00:40:30,280 --> 00:40:16,890
can this view from Michael good-looking

156
00:40:39,590 --> 00:40:35,210
Michael good now seating the new rate

157
00:40:42,020 --> 00:40:39,600
sensor unit planets usin free VA we have

158
00:40:52,210 --> 00:40:42,030
a good aliveness test and RSU to are you

159
00:40:57,740 --> 00:40:55,789
wanna quarter on 13 through massimino

160
00:41:00,920 --> 00:40:57,750
has engaged all of the bolts on the old

161
00:41:03,589 --> 00:41:00,930
battery module the first five bolts on

162
00:41:22,640 --> 00:41:03,599
the new module securing it to the bait

163
00:41:26,660 --> 00:41:22,650

two door had been engaged installed back

164
00:41:29,240 --> 00:41:26,670
in December 1993 to correct the

165
00:41:33,140 --> 00:41:29,250
spherical aberration that was detected

166
00:42:02,870 --> 00:41:33,150
in the telescope's mirrors after its

167
00:42:04,940 --> 00:42:02,880
initial deploy in 1990 yeah fastener

168
00:42:09,109 --> 00:42:04,950
capture plate now removed having done

169
00:42:25,789 --> 00:42:09,119
its job of capturing the 32 tiny screws

170
00:42:28,120 --> 00:42:25,799
inside the protective enclosure takes a

171
00:42:34,220 --> 00:42:28,130
few more turns to get it out of the

172
00:42:36,650 --> 00:42:34,230
connector up in the matter there are you

173
00:42:40,850 --> 00:42:36,660
taking them back to the telescope

174
00:42:46,470 --> 00:42:45,120
as for the Haven jewels that's for a

175
00:42:53,660 --> 00:42:46,480
point we've been over and I thought

176
00:43:05,660 --> 00:42:56,220
okay generic over this one on the lower

177
00:43:25,800 --> 00:43:05,670
right flip the thing and turn handrail

178
00:43:29,490 --> 00:43:25,810
sunset in 11 minutes we're ready are you

179
00:43:48,440 --> 00:43:29,500
happy with the wireless view Venice

180
00:43:56,309 --> 00:43:54,450
what a beautiful view John I'm the

181
00:43:58,430 --> 00:43:56,319
witness on this you actually were the

182
00:44:00,569 --> 00:43:58,440
last guy to Pat it goodbye

183
00:44:01,650 --> 00:44:00,579
what were you thinking when you patted

184
00:44:02,220 --> 00:44:01,660
hubble goodbye what was going through

185
00:44:04,710 --> 00:44:02,230
your mind

186
00:44:09,059 --> 00:44:04,720
epi wages I hope everything that we did

187
00:44:10,880 --> 00:44:09,069
work it's hard not to think of publish

188
00:44:13,130 --> 00:44:10,890

something alive

189
00:44:15,830 --> 00:44:13,140
but I really was thinking that problem

190
00:44:19,550 --> 00:44:15,840
wasn't fresh it was like five seconds

191
00:44:30,789 --> 00:44:19,560
remote switches in Auto three two one

192
00:44:30,799 --> 00:44:37,880
Claire the pen mode switch isn't off

193
00:44:37,890 --> 00:44:41,059
clear the antenna

194
00:44:41,069 --> 00:44:52,590
okay I need the mic

195
00:45:00,100 --> 00:44:56,980
twenty four feet okay is that the keel

196
00:45:10,690 --> 00:45:00,110
camera on monitor - for me 28 the actual

197
00:45:12,850 --> 00:45:10,700
monitor - 35 thank you supposed to be at

198
00:45:24,540 --> 00:45:12,860
a red ball of about 60 bucks or 35

199
00:45:26,560 --> 00:45:24,550
opening give up each time tremendous

200
00:45:29,590 --> 00:45:26,570
adventure that we've been on a very

201
00:45:30,460 --> 00:45:29,600
challenging mission couple isn't just

202
00:45:32,890 --> 00:45:30,470
for satellites

203
00:45:36,160 --> 00:45:32,900
it's about humanity's quest for

204
00:45:38,770 --> 00:45:36,170
knowledge that Clark says the only way

205
00:45:40,810 --> 00:45:38,780
of finding the limits of the possible if

206
00:45:44,320 --> 00:45:40,820
I book going beyond them and see

207
00:45:45,940 --> 00:45:44,330
impossible in an efficient we tried some

208
00:45:49,260 --> 00:45:45,950
things that many people said was

209
00:45:51,730 --> 00:45:49,270
impossible fixing 5th repairing ACS

210
00:45:55,200 --> 00:45:51,740
achieving all the content that we have

211
00:45:59,110 --> 00:45:55,210
and efficient but we've achieved that

212
00:46:00,520 --> 00:45:59,120
and we will trouble the very best it's

213
00:46:02,110 --> 00:46:00,530

really a sign of the great country that

214
00:46:03,910 --> 00:46:02,120
we live in that were able to do things

215
00:46:06,820 --> 00:46:03,920
like this on a marvelous spaceship like

216
00:46:08,770 --> 00:46:06,830
space shuttle Atlantis and I'm convinced

217
00:46:11,260 --> 00:46:08,780
that if we can solve problems like

218
00:46:14,020 --> 00:46:11,270
preparing a novel getting to space being

219
00:46:16,630 --> 00:46:14,030
the surfacing we do traveling 17,500

220
00:46:18,130 --> 00:46:16,640
miles an hour around the earth that we

221
00:46:20,320 --> 00:46:18,140
can achieve other great things like

222
00:46:23,320 --> 00:46:20,330
solving our energy problems and our

223
00:46:25,570 --> 00:46:23,330
climate problem all things that are in

224
00:46:29,740 --> 00:46:25,580
the middle of NASA's time and core

225
00:46:31,420 --> 00:46:29,750
values I want to wish Hubble its own set

226
00:46:33,520 --> 00:46:31,430
of adventures and with the new

227
00:46:53,910 --> 00:46:33,530
instruments we've installed that it may

228
00:47:00,620 --> 00:46:57,660
we had no clue that Hubble would would

229
00:47:02,520 --> 00:47:00,630
result in in you know the incredible

230
00:47:05,250 --> 00:47:02,530
advances that it's made in our

231
00:47:06,810 --> 00:47:05,260
understanding of our universe none of us

232
00:47:08,730 --> 00:47:06,820
thought that people would be rewriting

233
00:47:14,410 --> 00:47:08,740
textbooks the way that they continue to

234
00:47:19,030 --> 00:47:16,840
we now understand much more about our

235
00:47:22,830 --> 00:47:19,040
universe than we ever would have known

236
00:47:27,300 --> 00:47:22,840
had it not been for Hubble that we have

237
00:47:29,650 --> 00:47:27,310
not only young people students but now

238
00:47:32,290 --> 00:47:29,660

professionals who have grown up with

239
00:47:34,090 --> 00:47:32,300
Hubble and who have had Hubble changed

240
00:47:36,580 --> 00:47:34,100
their lives and change their minds about

241
00:47:38,530 --> 00:47:36,590
about careers because they saw a Hubble

242
00:47:40,840 --> 00:47:38,540
image and decided that you know I don't

243
00:47:46,710 --> 00:47:40,850
really think I like science but I think

244
00:47:51,630 --> 00:47:48,990
we saw the first light images and to the

245
00:47:53,640 --> 00:47:51,640
amateur like me it looked great because

246
00:47:55,319 --> 00:47:53,650
we had made this great discovery right

247
00:47:58,140 --> 00:47:55,329
off the bat what we thought was a single

248
00:47:59,640 --> 00:47:58,150
star turned out to be a binary star and

249
00:48:01,170 --> 00:47:59,650
we were looking at a star that

250
00:48:06,920 --> 00:48:01,180
astronomers had been studying for

251
00:48:10,880 --> 00:48:09,290
when we learned that no it's not really

252
00:48:12,800 --> 00:48:10,890
that good an image it's it's kind of

253
00:48:15,170 --> 00:48:12,810
blurred because we have this thing

254
00:48:20,740 --> 00:48:15,180
called the spherical aberration we were

255
00:48:25,660 --> 00:48:23,590
we refused to say no refused to say

256
00:48:28,870 --> 00:48:25,670
we'll give up refused to say we failed

257
00:48:32,080 --> 00:48:28,880
and with with a number of subsequent

258
00:48:35,080 --> 00:48:32,090
servicing missions we turned Hubble from

259
00:48:37,570 --> 00:48:35,090
a potential failure to what is today the

260
00:48:44,030 --> 00:48:37,580
most incredible instrument that humanity

261
00:48:50,000 --> 00:48:48,290
Hubble kind of rewrote the textbooks we

262
00:48:51,980 --> 00:48:50,010
now have the next of the Great

263
00:48:55,240 --> 00:48:51,990

observatories that's scheduled to launch

264
00:49:00,020 --> 00:48:55,250
in 2018 the James Webb Space Telescope

265
00:49:03,050 --> 00:49:00,030
James Webb is projected to dwarf Hubble

266
00:49:05,990 --> 00:49:03,060
in its discoveries and its ability to to

267
00:49:09,140 --> 00:49:06,000
look out into the universe in and peer

268
00:49:16,630 --> 00:49:09,150
into the the atmospheres of distant

269
00:49:16,640 --> 00:49:25,489
you

270
00:49:33,870 --> 00:49:29,309
Americanos discovery we just that's in

271
00:49:36,390 --> 00:49:33,880
our national one DNA when Lewis and

272
00:49:38,759 --> 00:49:36,400
Clark was sent out on their expedition

273
00:49:40,950 --> 00:49:38,769
by a President of the United States who

274
00:49:43,499 --> 00:49:40,960
was called discovery and that's when we

275
00:49:50,760 --> 00:49:43,509
send out our astronauts that's when

276
00:49:57,210 --> 00:49:53,580
Hubble did not cord the information

277
00:49:59,280 --> 00:49:57,220
Hubble shared the information not only

278
00:50:04,819 --> 00:49:59,290
with brilliant scientists but with

279
00:50:10,579 --> 00:50:08,120
I listened and watched schoolchildren in

280
00:50:13,279 --> 00:50:10,589
our own country and around the world

281
00:50:15,709 --> 00:50:13,289
feel that they had developed a personal

282
00:50:18,769 --> 00:50:15,719
relationship with Hubble Hubble had its

283
00:50:20,959 --> 00:50:18,779
own website and it heard from scientists

284
00:50:23,509 --> 00:50:20,969
and it heard from the school kids and

285
00:50:29,499 --> 00:50:23,519
then we heard that the American people

286
00:50:34,929 --> 00:50:32,439
I was there when they fattened down the

287
00:50:37,719 --> 00:50:34,939
Hubble for and we said goodbye as it

288
00:50:40,870 --> 00:50:37,729

went when its final journey but we knew

289
00:50:41,709 --> 00:50:40,880
it wouldn't be its final broadcast back

290
00:50:43,689 --> 00:50:41,719
to us

291
00:50:47,529 --> 00:50:43,699
the Hubble is out there now it's gonna

292
00:50:50,049 --> 00:50:47,539
keep going for a long time you know that

293
00:50:59,710 --> 00:50:50,059
Acco question are we there yet the

294
00:50:59,720 --> 00:51:07,430
you

295
00:51:12,890 --> 00:51:10,130
the famous press conference

296
00:51:15,109 --> 00:51:12,900
27th 1990 where I had the unique honour

297
00:51:17,210 --> 00:51:15,119
of explaining to the American people in

298
00:51:20,210 --> 00:51:17,220
the press that Hubble wouldn't be doing

299
00:51:22,339 --> 00:51:20,220
the science we had promised and that was

300
00:51:25,309 --> 00:51:22,349
a horrific experience to say the least

301
00:51:26,599 --> 00:51:25,319
the press was not too receptive even

302
00:51:28,640 --> 00:51:26,609
though at the end of the press

303
00:51:35,970 --> 00:51:28,650
conference I said we do have a fix in

304
00:51:40,349 --> 00:51:37,620
finally figured out that what we had was

305
00:51:42,480 --> 00:51:40,359
circle aberration what does that mean to

306
00:51:44,490 --> 00:51:42,490
a normal person well the mirror was

307
00:51:46,140 --> 00:51:44,500
still a perfect smooth curve but it had

308
00:51:48,960 --> 00:51:46,150
the wrong prescription it wasn't the

309
00:51:50,580 --> 00:51:48,970
right curve just like my eye as a

310
00:51:51,840 --> 00:51:50,590
perfectly good eye it's got a smooth

311
00:51:53,460 --> 00:51:51,850
curve to it but it's the wrong

312
00:51:56,400 --> 00:51:53,470
prescription light doesn't come to a

313
00:51:58,320 --> 00:51:56,410

focus at the right spot so how do we fix

314
00:52:04,859 --> 00:51:58,330
it well we fix it with corrective lenses

315
00:52:08,330 --> 00:52:06,650
but I remember

316
00:52:09,860 --> 00:52:08,340
image started to come up and right at

317
00:52:11,240 --> 00:52:09,870
the center was the star we're taking a

318
00:52:13,670 --> 00:52:11,250
picture of and it was there it's very

319
00:52:15,950 --> 00:52:13,680
bright and very sharp that was good but

320
00:52:18,050 --> 00:52:15,960
then as we waited the picture got deeper

321
00:52:21,040 --> 00:52:18,060
and deeper and all the faint star starts

322
00:52:24,740 --> 00:52:21,050
showing up all just pinpoints of light

323
00:52:28,100 --> 00:52:24,750
perfect focus then it was silence

324
00:52:30,230 --> 00:52:28,110
then suddenly cheers screams corpse from

325
00:52:32,690 --> 00:52:30,240
champagne bottles the moment was even

326
00:52:37,980 --> 00:52:32,700
caught on NASA TV I understand because

327
00:52:44,540 --> 00:52:41,069
we have made major breakthroughs in

328
00:52:47,849 --> 00:52:44,550
almost every field of astrophysics from

329
00:52:50,940 --> 00:52:47,859
planetary nearby to our own galaxy to

330
00:52:53,880 --> 00:52:50,950
the very very beginning of time and to

331
00:52:57,059 --> 00:52:53,890
think that we mere humans are sitting

332
00:52:59,609 --> 00:52:57,069
here and and getting close to

333
00:53:02,160 --> 00:52:59,619
understanding this incredible universe

334
00:53:04,380 --> 00:53:02,170
that's around us and Hubble has been a

335
00:53:11,960 --> 00:53:04,390
key component in that over the last 25

336
00:53:11,970 --> 00:53:20,680
you

337
00:53:24,910 --> 00:53:22,839
and so we're celebrating the 25th

338
00:53:26,530 --> 00:53:24,920

anniversary this year we have every

339
00:53:28,599 --> 00:53:26,540
expectation the way things have been

340
00:53:31,599 --> 00:53:28,609
going that Hubble should be able to make

341
00:53:32,950 --> 00:53:31,609
it till 2020 and maybe even beyond doing

342
00:53:36,589 --> 00:53:32,960
this great mission of scientific

343
00:53:39,919 --> 00:53:38,509
it's just the breath of the scientific

344
00:53:42,249 --> 00:53:39,929
discoveries that's been able to make

345
00:53:45,019 --> 00:53:42,259
everything from the age of the universe

346
00:53:47,539 --> 00:53:45,029
proving the existence of black holes to

347
00:53:49,339 --> 00:53:47,549
discovering brand-new things like the

348
00:53:54,970 --> 00:53:49,349
universe is accelerating to the

349
00:53:58,810 --> 00:53:56,319
and I was holding out into a handrail

350
00:54:00,819 --> 00:53:58,820
looking up at the earth go by behind the

351
00:54:03,940 --> 00:54:00,829
Hubble and it was a truly remarkable

352
00:54:05,920 --> 00:54:03,950
moment but I did realize you know how

353
00:54:08,440 --> 00:54:05,930
far away we were from the Earth's

354
00:54:10,780 --> 00:54:08,450
atmosphere from our homes from our

355
00:54:13,150 --> 00:54:10,790
companions inside the space shuttle and

356
00:54:15,640 --> 00:54:13,160
I wouldn't say that I felt a sense of

357
00:54:17,050 --> 00:54:15,650
loneliness but a sense of awe you know

358
00:54:19,120 --> 00:54:17,060
that we're doing these kind of things

359
00:54:28,410 --> 00:54:19,130
that were able to to fix the Hubble to

360
00:54:39,780 --> 00:54:35,230
you

361
00:54:42,900 --> 00:54:39,790
a sharp point of light and that's what

362
00:54:45,390 --> 00:54:42,910
we've not got inaudible and the older

363
00:54:47,790 --> 00:54:45,400

Hubble before to repair that bright star

364
00:54:50,490 --> 00:54:47,800
was spread out over a whole area like

365
00:54:52,170 --> 00:54:50,500
that so the bright star did not look

366
00:54:59,330 --> 00:54:52,180
like a bright point of light it was

367
00:55:06,570 --> 00:55:04,050
to hear the screams and deceit and faces

368
00:55:09,090 --> 00:55:06,580
when the first light that first popped

369
00:55:11,400 --> 00:55:09,100
on the monitor and they knew all I had

370
00:55:17,270 --> 00:55:11,410
was that one moment they knew it was

371
00:55:22,190 --> 00:55:19,670
but the real magic was that you could in

372
00:55:22,850 --> 00:55:22,200
fact go out and do that in the space my

373
00:55:25,280 --> 00:55:22,860
environment

374
00:55:28,670 --> 00:55:25,290
innocent because it was designed for

375
00:55:36,850 --> 00:55:28,680
that that was the real the real victory

376
00:55:41,140 --> 00:55:39,310
humanity's always looked out there to

377
00:55:43,690 --> 00:55:41,150
the heavens to get the meeting at a hope

378
00:55:45,910 --> 00:55:43,700
of the life here so yet you look out

379
00:55:48,250 --> 00:55:45,920
there for what's going on down here

380
00:55:50,830 --> 00:55:48,260
you see it's that kind of that kind of

381
00:55:53,290 --> 00:55:50,840
gap that you're bridging so people

382
00:56:01,190 --> 00:55:53,300
understood that about Hubble before we

383
00:56:01,200 --> 00:56:09,819
you

384
00:56:15,579 --> 00:56:14,289
um 25 years yeah it's it's it's been

385
00:56:18,190 --> 00:56:15,589
that's that's quite an achievement I'm

386
00:56:19,809 --> 00:56:18,200
glad it's worked for that long and been

387
00:56:23,709 --> 00:56:19,819
providing great science for most of that

388
00:56:31,270 --> 00:56:23,719

time and and I'm looking forward to two

389
00:56:34,999 --> 00:56:32,839
I think Hubble

390
00:56:37,910 --> 00:56:35,009
changed humanity by showing us what is

391
00:56:41,420 --> 00:56:37,920
out there yeah the the immenseness of

392
00:56:43,130 --> 00:56:41,430
the of the heavens of the universe we

393
00:56:46,039 --> 00:56:43,140
know it was a big place but we didn't

394
00:56:48,979 --> 00:56:46,049
know the beauty of what was out there

395
00:56:50,509 --> 00:56:48,989
and just how big it is and how many

396
00:56:53,359 --> 00:56:50,519
other possibilities there are

397
00:56:55,430 --> 00:56:53,369
to find discoveries that we can't even

398
00:56:57,559 --> 00:56:55,440
imagine it not only answer questions

399
00:57:00,349 --> 00:56:57,569
about created questions so I think it

400
00:57:05,850 --> 00:57:00,359
made up it's made a great impact on the

401
00:57:09,010 --> 00:57:07,600
and I can make the argue

402
00:57:12,550 --> 00:57:09,020
greatest scientific instrument ever

403
00:57:15,610 --> 00:57:12,560
built what do you think of that but it

404
00:57:18,780 --> 00:57:15,620
was built and so and the it was built by

405
00:57:21,880 --> 00:57:18,790
engineers and I think it is a great

406
00:57:24,670 --> 00:57:21,890
combination of engineering because it's

407
00:57:28,120 --> 00:57:24,680
a magnificent machine and science that

408
00:57:30,280 --> 00:57:28,130
provides us great data this great in

409
00:57:32,140 --> 00:57:30,290
these images this great looking to the

410
00:57:33,850 --> 00:57:32,150
universe that astronomers can use to

411
00:57:36,130 --> 00:57:33,860
make discoveries that's only possible

412
00:57:46,089 --> 00:57:36,140
because of this engineering achievement

413
00:57:46,099 --> 00:57:54,990

you

414
00:58:00,730 --> 00:57:58,540
releasing the telescope was not as

415
00:58:03,520 --> 00:58:00,740
bittersweet as you might imagine because

416
00:58:05,590 --> 00:58:03,530
you know that it's that that an

417
00:58:07,750 --> 00:58:05,600
incredible repair job has just been done

418
00:58:09,940 --> 00:58:07,760
and by releasing it it's getting sort of

419
00:58:11,380 --> 00:58:09,950
sent out there to to do its new mission

420
00:58:13,480 --> 00:58:11,390
and we knew that there was going to be

421
00:58:18,610 --> 00:58:13,490
some pretty incredible science returned

422
00:58:23,590 --> 00:58:21,700
not only is the telescope have better

423
00:58:25,870 --> 00:58:23,600
capability than it had before but better

424
00:58:28,210 --> 00:58:25,880
than they expected from the repair work

425
00:58:30,220 --> 00:58:28,220
that was planned and so I think everyone

426
00:58:31,450 --> 00:58:30,230
is very excited about the the science

427
00:58:36,980 --> 00:58:31,460
return that we'll be seeing in the next

428
00:58:41,299 --> 00:58:38,750
like that the other thing I think is

429
00:58:43,309 --> 00:58:41,309
that it seems like Hubble is sort of you

430
00:58:44,839 --> 00:58:43,319
know sort of the comeback kid it's hard

431
00:58:46,790 --> 00:58:44,849
for me to believe that it really truly

432
00:58:48,799 --> 00:58:46,800
was the last time people are gonna see

433
00:58:50,240 --> 00:58:48,809
it I feel like somebody somewhere is

434
00:58:51,740 --> 00:58:50,250
going to come up with a way so well if

435
00:58:54,170 --> 00:58:51,750
we did this and this and this we could

436
00:58:55,790 --> 00:58:54,180
go back and you know so so we'll see I