



1
00:00:44,189 --> 00:00:42,240
using balloons and rockets astronomers

2
00:00:46,500 --> 00:00:44,199
have successfully launched telescopes

3
00:00:49,350 --> 00:00:46,510
into earth orbit above the distorting

4
00:00:51,840 --> 00:00:49,360
effects of the atmosphere to explore

5
00:00:55,110 --> 00:00:51,850
deep space nASA has had great success

6
00:00:57,360 --> 00:00:55,120
with robotic probes like Voyager that

7
00:01:00,329 --> 00:00:57,370
have observed and sent back images of

8
00:01:02,729 --> 00:01:00,339
our solar system NASA and its partner

9
00:01:04,979 --> 00:01:02,739
the European Space Agency are now on the

10
00:01:07,460 --> 00:01:04,989
verge of launching a huge optical

11
00:01:11,279 --> 00:01:07,470
Observatory into orbit around the earth

12
00:01:13,190 --> 00:01:11,289
Hubble Space Telescope will see objects

13
00:01:16,350 --> 00:01:13,200

even near the edge of the known universe

14

00:01:19,649 --> 00:01:16,360
with ten times finer detailed and

15

00:01:21,719 --> 00:01:19,659
possible from the ground at the heart of

16

00:01:24,990 --> 00:01:21,729
the observatory is an eight-foot mirror

17

00:01:27,270 --> 00:01:25,000
grounded near perfection when pointed at

18

00:01:30,840 --> 00:01:27,280
an object the mirror collects light and

19

00:01:33,149 --> 00:01:30,850
sends it to six instruments various

20

00:01:34,980 --> 00:01:33,159
satellites and ground stations relay the

21

00:01:37,200 --> 00:01:34,990
instruments information to the Space

22

00:01:40,380 --> 00:01:37,210
Telescope Science Institute in Baltimore

23

00:01:42,359 --> 00:01:40,390
Maryland viewing screens will allow

24

00:01:44,969 --> 00:01:42,369
scientists to make real-time

25

00:01:47,039 --> 00:01:44,979
observations at the same time a

26

00:01:49,980 --> 00:01:47,049

tremendous amount of data will be

27

00:01:51,630 --> 00:01:49,990

generated according to dr. Eric JSON

28

00:01:53,870 --> 00:01:51,640

we're talking about a huge amount of

29

00:01:55,980 --> 00:01:53,880

information in fact we colloquially

30

00:01:57,990 --> 00:01:55,990

refer to this as drinking from a

31

00:02:00,480 --> 00:01:58,000

firehose in order to help astronomers

32

00:02:03,779 --> 00:02:00,490

plan observations the Space Telescope

33

00:02:06,630 --> 00:02:03,789

Institute has the largest star catalogue

34

00:02:10,770 --> 00:02:06,640

in the world containing 19 million

35

00:02:13,349 --> 00:02:10,780

celestial objects the catalog was made

36

00:02:16,319 --> 00:02:13,359

by scanning over 1,400 photographic

37

00:02:19,380 --> 00:02:16,329

plates of the entire sky the plates are

38

00:02:21,720 --> 00:02:19,390

also stored in a giant database so

39

00:02:24,449 --> 00:02:21,730

astronomers can call up a region like

40

00:02:28,110 --> 00:02:24,459

the Andromeda galaxy and manipulate the

41

00:02:33,420 --> 00:02:31,199

in our lifetime Space Telescope should

42

00:02:37,589 --> 00:02:33,430

match the discoveries made since the

43

00:02:40,350 --> 00:02:37,599

beginning of astronomy we hope to see in

44

00:02:42,570 --> 00:02:40,360

the words of galileo galilei wondrous

45

00:02:43,740 --> 00:02:42,580

things those were the words that he used

46

00:02:46,979 --> 00:02:43,750

in 1609

47

00:02:50,009 --> 00:02:46,989

we want to see star systems we'll want

48

00:02:51,690 --> 00:02:50,019

to see images of the planets but in

49

00:02:54,270 --> 00:02:51,700

particular space dollars will be

50

00:02:57,030 --> 00:02:54,280

designed to look out into deep space to

51
00:02:58,740 --> 00:02:57,040
study deep space astrophysics to arrive

52
00:03:17,480 --> 00:02:58,750
to a realm that we've not yet been able

53
00:03:24,120 --> 00:03:21,180
in 1990 shuttle discovery launched

54
00:03:27,479 --> 00:03:24,130
NASA's Hubble Space Telescope the most

55
00:03:30,860 --> 00:03:27,489
powerful Observatory ever built able to

56
00:03:33,540 --> 00:03:30,870
image detail up to 15 billion miles away

57
00:03:44,729 --> 00:03:33,550
Hubble has provided astronomers with a

58
00:03:47,070 --> 00:03:44,739
clearer window to our universe soon

59
00:03:49,740 --> 00:03:47,080
after Hubble was deployed scientists

60
00:03:54,120 --> 00:03:49,750
discovered an aberration in the 94 inch

61
00:03:56,190 --> 00:03:54,130
primary mirror even so the huge space

62
00:03:58,430 --> 00:03:56,200
porn telescope has been returning a

63
00:04:01,290 --> 00:03:58,440

steady stream of new information

64

00:04:04,890 --> 00:04:01,300

particularly with the aid of computer

65

00:04:07,440 --> 00:04:04,900

enhancement similar processing has been

66

00:04:11,300 --> 00:04:07,450

used on data from other spacecraft like

67

00:04:13,830 --> 00:04:11,310

Voyager which traveled past the planets

68

00:04:18,479 --> 00:04:13,840

enhancement now brings up more detail

69

00:04:20,810 --> 00:04:18,489

for Hubble scientists this is the

70

00:04:24,540 --> 00:04:20,820

telescope's original image of a galaxy

71

00:04:29,430 --> 00:04:24,550

52 million light-years from Earth as it

72

00:04:32,130 --> 00:04:29,440

is cleaned up to its final version here

73

00:04:36,120 --> 00:04:32,140

light pulses in a straight line between

74

00:04:38,640 --> 00:04:36,130

Earth and a distant quasar years ago

75

00:04:41,490 --> 00:04:38,650

Albert Einstein suggested that if a

76

00:04:44,159 --> 00:04:41,500

uniform object crossed the path light

77

00:04:46,980 --> 00:04:44,169

would bend into a ring but if the object

78

00:04:50,250 --> 00:04:46,990

were not uniform the ring would break up

79

00:04:53,640 --> 00:04:50,260

into four patches known as the Einstein

80

00:04:56,980 --> 00:04:53,650

cross Hubble's imagery confirmed this

81

00:05:02,080 --> 00:04:56,990

part of Einstein's theory of relativity

82

00:05:05,560 --> 00:05:02,090

a bull also showed scientists a

83

00:05:08,140 --> 00:05:05,570

celestial X marking the exact spot of a

84

00:05:13,300 --> 00:05:08,150

black hole with the possible mass of 1

85

00:05:15,040 --> 00:05:13,310

million of our Suns astronauts are

86

00:05:17,140 --> 00:05:15,050

already training to fix the Hubble

87

00:05:20,980 --> 00:05:17,150

mirror problem during a shuttle service

88

00:05:23,350 --> 00:05:20,990

call scheduled for late 1993 by

89

00:05:25,630 --> 00:05:23,360

substituting a special component in the

90

00:05:29,380 --> 00:05:25,640

telescope the aberration will be

91

00:05:31,540 --> 00:05:29,390

repaired called co-star this corrective

92

00:05:34,390 --> 00:05:31,550

optics package contains a series of

93

00:05:36,970 --> 00:05:34,400

mirrors that work like contact lenses to

94

00:05:41,920 --> 00:05:36,980

restore Hubble close to its full imaging

95

00:05:44,350 --> 00:05:41,930

potential in a clean room at NASA's

96

00:05:46,660 --> 00:05:44,360

Goddard Space Flight Center technicians

97

00:05:49,180 --> 00:05:46,670

also practice removing the spacecraft

98

00:05:57,160 --> 00:05:49,190

star tracker which helps point the

99

00:06:00,190 --> 00:05:57,170

telescope in the meantime I will

100

00:06:06,360 --> 00:06:00,200

continue to send back fine detail of the

101
00:06:10,960 --> 00:06:06,370
planets faraway galaxies black hole and

102
00:13:55,170 --> 00:06:10,970
distant stars rewriting the textbooks on

103
00:13:55,180 --> 00:13:59,050
yeah

104
00:14:04,340 --> 00:14:02,629
the science team knew that the best from

105
00:14:10,900 --> 00:14:04,350
the newly restored hubble space

106
00:14:17,480 --> 00:14:14,180
the purpose of today's press conference

107
00:14:19,930 --> 00:14:17,490
is to present and explain the first

108
00:14:23,120 --> 00:14:19,940
images from the hubble space telescope

109
00:14:27,139 --> 00:14:23,130
and i'm happy to announce today that

110
00:14:28,670 --> 00:14:27,149
after its launch now in 1990 some of its

111
00:14:32,780 --> 00:14:28,680
earlier disappointments

112
00:14:34,460 --> 00:14:32,790
the trouble with hubble is over it's

113
00:14:35,389 --> 00:14:34,470

often said that a picture is worth a

114

00:14:38,269 --> 00:14:35,399

thousand words

115

00:14:40,670 --> 00:14:38,279

in fact these corrected images are as

116

00:14:52,810 --> 00:14:40,680

perfect as engineering can achieve and

117

00:14:59,720 --> 00:14:56,480

for NASA at the beginning it had been

118

00:15:03,320 --> 00:14:59,730

tough to be the first then tougher still

119

00:15:16,890 --> 00:15:03,330

to stay at the front and now toughest of

120

00:15:20,940 --> 00:15:19,769

we appreciate your frankness ambling for

121

00:15:24,810 --> 00:15:20,950

the planning ship it's nice to know

122

00:15:28,040 --> 00:15:24,820

we're really working on yeah better

123

00:15:30,079 --> 00:15:28,050

educated or four-door

124

00:15:31,550 --> 00:15:30,089

our pleasure I've never seen the

125

00:15:33,680 --> 00:15:31,560

teamwork I've seen in this program

126

00:15:35,260 --> 00:15:33,690

people have pulled together from all the

127

00:15:39,199 --> 00:15:35,270

Centers Johnson at Kennedy Space Center

128

00:15:42,829 --> 00:15:39,209

Goddard headquarters contractors because

129

00:15:44,540 --> 00:15:42,839

I think deep down people realize because

130

00:15:48,410 --> 00:15:44,550

of what what's happened this program is

131

00:15:55,050 --> 00:15:52,500

to fix a telescope already in space the

132

00:15:57,210 --> 00:15:55,060

team had to diagnose the optics problem

133

00:15:59,760 --> 00:15:57,220

from the flawed images then build

134

00:16:02,760 --> 00:15:59,770

replicas of the telescope to develop

135

00:16:06,540 --> 00:16:02,770

test and retest the corrective optics

136

00:16:08,550 --> 00:16:06,550

and replacement hardware it was really

137

00:16:11,010 --> 00:16:08,560

exciting to see all the work that I had

138

00:16:13,140 --> 00:16:11,020

been manifested in in the tests because

139

00:16:15,720 --> 00:16:13,150

I spent you know two years preparing to

140

00:16:17,880 --> 00:16:15,730

actually test the co-star in the system

141

00:16:20,340 --> 00:16:17,890

functional and to have it all work

142

00:16:24,270 --> 00:16:20,350

quickly unplanned was really wonderful

143

00:16:26,490 --> 00:16:24,280

had to build mock-ups of every part of

144

00:16:30,450 --> 00:16:26,500

this of the servicing mission including

145

00:16:32,580 --> 00:16:30,460

the science instruments and complete

146

00:16:34,350 --> 00:16:32,590

mock-ups of the equipment going into the

147

00:16:36,600 --> 00:16:34,360

cargo bay of the shuttle what we're

148

00:16:39,270 --> 00:16:36,610

doing now is verifying that the camera

149

00:16:41,550 --> 00:16:39,280

is going to play properly with the rest

150

00:16:45,390 --> 00:16:41,560

of HST that it's going to fit into HST

151
00:16:47,670 --> 00:16:45,400
and that it's also going to be commanded

152
00:16:49,530 --> 00:16:47,680
properly by the ground system and talk

153
00:16:53,610 --> 00:16:49,540
to the computers onboard the HST

154
00:16:56,750 --> 00:16:53,620
properly to prepare the astronauts and

155
00:17:00,390 --> 00:16:56,760
servicing teams planned modified and

156
00:17:05,159 --> 00:17:00,400
endlessly practiced each task using a

157
00:17:10,749 --> 00:17:07,480
every time we set out to think through a

158
00:17:13,029 --> 00:17:10,759
task during every step along the way we

159
00:17:14,499 --> 00:17:13,039
go well what if that doesn't work what

160
00:17:16,509 --> 00:17:14,509
if this happens what if that happened

161
00:17:19,539 --> 00:17:16,519
and for each one of those what ifs we

162
00:17:22,470 --> 00:17:19,549
need to have a plan before the actual

163
00:17:25,870 --> 00:17:22,480

spacewalks astronaut story Musgrave

164

00:17:27,819 --> 00:17:25,880

predicted what they would face for every

165

00:17:30,190 --> 00:17:27,829

sub task I've looked at the things which

166

00:17:33,070 --> 00:17:30,200

are the most delicate and required the

167

00:17:36,399 --> 00:17:33,080

most really critical care the rate

168

00:17:38,680 --> 00:17:36,409

sensing units a place in name on and

169

00:17:44,919 --> 00:17:38,690

they have very narrow tolerance placing

170

00:17:47,390 --> 00:17:44,929

those on the tooth pins and then the

171

00:17:53,180 --> 00:17:47,400

solar rays I think it is making you like

172

00:17:55,970 --> 00:17:53,190

Snickers wide field planetary theory

173

00:17:58,580 --> 00:17:55,980

it's taken the mirror off in a very and

174

00:18:00,590 --> 00:17:58,590

very careful way and then protected and

175

00:18:07,010 --> 00:18:00,600

that optics which is right out there in

176

00:18:09,830 --> 00:18:07,020

front of your face the coasts are as big

177

00:18:21,410 --> 00:18:09,840

as a telephone booth very squared it's

178

00:18:24,080 --> 00:18:21,420

gotta go into the Ray that's exactly all

179

00:18:26,900 --> 00:18:24,090

the careful planning really paid off

180

00:18:29,240 --> 00:18:26,910

during the mission the crew and ground

181

00:18:32,090 --> 00:18:29,250

team even had prepared for surprises

182

00:18:34,940 --> 00:18:32,100

when a broken solar array wouldn't roll

183

00:18:42,450 --> 00:18:34,950

up for storage Kathy Thornton jettison

184

00:19:03,280 --> 00:18:46,080

it was caught like a sail on the wind of

185

00:19:10,610 --> 00:19:07,180

the mission sharpened Hubble's sight and

186

00:19:17,120 --> 00:19:14,510

we're actually building up our abilities

187

00:19:21,279 --> 00:19:17,130

to work in space we're laying the

188

00:19:23,259 --> 00:19:21,289

groundwork for the future

189

00:19:25,240 --> 00:19:23,269

the Hubble is our eyes that's how we're

190

00:19:26,560 --> 00:19:25,250

going to see back to the beginning of

191

00:19:28,330 --> 00:19:26,570

the universe that's how we tell what's

192

00:22:01,470 --> 00:19:28,340

happened to us in the past and where our

193

00:22:05,560 --> 00:22:04,180

so in some sense when we look at an

194

00:22:25,440 --> 00:22:05,570

object like this we're looking at the

195

00:25:01,730 --> 00:22:27,629

and the same fear well it's possible at

196

00:25:11,100 --> 00:25:09,180

moving material out there yeah and the

197

00:25:15,210 --> 00:25:11,110

same day well it's possibly the coldest

198

00:25:18,120 --> 00:25:15,220

actual was produced by a yeah in fact

199

00:25:21,650 --> 00:25:18,130

you could have particular future

200

00:25:24,770 --> 00:25:21,660

producing us in the structure

201
00:25:40,070 --> 00:25:24,780
that item look at those little tiny

202
00:25:42,230 --> 00:25:40,080
knots that's because this represents the

203
00:25:46,280 --> 00:25:42,240
last stage in the evolution of ordinary

204
00:25:49,400 --> 00:25:46,290
stars a star like our own like our own

205
00:25:52,250 --> 00:25:49,410
Sun is going to go through an episode of

206
00:25:53,030 --> 00:25:52,260
this sort in maybe 5 6 billion years

207
00:25:55,340 --> 00:25:53,040
from now

208
00:25:56,750 --> 00:25:55,350
so in some sense when we look at an

209
00:26:06,290 --> 00:25:56,760
object like this we're looking at the

210
00:26:08,690 --> 00:26:06,300
future of our own solar system if this

211
00:26:12,110 --> 00:26:08,700
star did have planets they would have

212
00:26:21,950 --> 00:26:12,120
been vaporized early in the stages of

213
00:26:24,710 --> 00:26:21,960

ejection they're not there anymore it

214

00:26:27,080 --> 00:26:24,720

was clearly the best image of planetary

215

00:26:29,050 --> 00:26:27,090

that I have certainly ever been involved

216

00:26:33,500 --> 00:26:29,060

with and that I've really ever seen and

217

00:26:35,480 --> 00:26:33,510

I remember stopping on the way home from

218

00:26:37,640 --> 00:26:35,490

looking at this and saying we've got to

219

00:26:40,220 --> 00:26:37,650

get a bottle of champagne and and have a

220

00:26:47,950 --> 00:26:40,230

toast because this is a spectacular

221

00:26:52,060 --> 00:26:49,900

I think it's beautiful for the same

222

00:27:03,060 --> 00:26:52,070

reason that it's interesting which is

223

00:27:06,610 --> 00:27:03,070

all the symmetry I think that this is

224

00:27:08,680 --> 00:27:06,620

probably the most exciting image of a

225

00:27:11,170 --> 00:27:08,690

planetary that I have seen because of

226

00:27:12,070 --> 00:27:11,180

the level of complexity in detail that

227

00:27:15,460 --> 00:27:12,080

we see here

228

00:27:17,440 --> 00:27:15,470

it's really quite unprecedented other

229

00:27:19,690 --> 00:27:17,450

objects are simply messy but this one

230

00:27:29,470 --> 00:27:19,700

has got all sorts of fascinating

231

00:27:32,050 --> 00:27:29,480

structure well this is a planetary

232

00:27:36,730 --> 00:27:32,060

nebula planetary nebula is sort of a

233

00:27:39,250 --> 00:27:36,740

misnomer actually it's sort of gas cloud

234

00:27:41,680 --> 00:27:39,260

the fireworks that are produced when a

235

00:27:44,260 --> 00:27:41,690

fairly ordinary star reaches the end of

236

00:27:46,000 --> 00:27:44,270

its life and throws its outer layers

237

00:27:47,620 --> 00:27:46,010

into space the reason they're called

238

00:27:49,450 --> 00:27:47,630

planetary nebulae is because in the last

239

00:27:52,210 --> 00:27:49,460

century when people were using small

240

00:27:54,430 --> 00:27:52,220

telescopes some of the small round ones

241

00:27:56,560 --> 00:27:54,440

looked a little bit like the planets

242

00:27:58,660 --> 00:27:56,570

Uranus and Neptune in our solar system

243

00:28:01,870 --> 00:27:58,670

and that's how they picked up that name

244

00:28:03,580 --> 00:28:01,880

but really it is the cloud of gas which

245

00:28:15,010 --> 00:28:03,590

is produced at the end of the star's

246

00:28:19,300 --> 00:28:15,020

lifetime what we see here is a record of

247

00:28:21,160 --> 00:28:19,310

a multi-stage process the actual loss of

248

00:28:24,070 --> 00:28:21,170

the outer layers of the star turns out

249

00:28:27,230 --> 00:28:24,080

to be enormous ly complicated we can see

250

00:28:33,680 --> 00:28:27,240

that at the present time

251

00:28:39,010 --> 00:28:33,690

the star is blowing a bubble it has a a

252

00:28:42,710 --> 00:28:39,020

wind which is flowing rapidly into space

253

00:28:45,020 --> 00:28:42,720

and this tenuous fast wind is sweeping

254

00:28:47,300 --> 00:28:45,030

up the nebula material and constructing

255

00:28:50,390 --> 00:28:47,310

a bubble but outside of that we see this

256

00:28:53,030 --> 00:28:50,400

ring of knots which must correspond to

257

00:28:55,070 --> 00:28:53,040

some earlier stage rejection and further

258

00:28:57,520 --> 00:28:55,080

beyond the boundary of the picture that

259

00:29:00,770 --> 00:28:57,530

we see there's actually an outer halo

260

00:29:05,030 --> 00:29:00,780

furthermore the Jets that we can see in

261

00:29:08,510 --> 00:29:05,040

some of the images represent the very

262

00:29:10,370 --> 00:29:08,520

rapid phase of mass loss which occurs

263

00:29:12,380 --> 00:29:10,380

after the main structures have been

264

00:29:23,530 --> 00:29:12,390

formed so it's an extremely complicated

265

00:29:25,850 --> 00:29:23,540

process for a specialist like myself

266

00:29:29,360 --> 00:29:25,860

there's an enormous amount of detail

267

00:29:31,160 --> 00:29:29,370

that's going to tell us about many

268

00:29:32,780 --> 00:29:31,170

things it's going to tell us about the

269

00:29:34,700 --> 00:29:32,790

kinds of elements that are created in

270

00:29:37,340 --> 00:29:34,710

the last stages of the star's life it's

271

00:29:39,110 --> 00:29:37,350

going to tell us about the ejection

272

00:29:41,180 --> 00:29:39,120

process itself

273

00:29:43,160 --> 00:29:41,190

it raises interesting questions about

274

00:29:45,140 --> 00:29:43,170

how these Jets can form in the last

275

00:29:50,110 --> 00:29:45,150

stages and then change their direction

276

00:29:53,930 --> 00:29:50,120

suddenly but from the point of view of

277

00:29:55,550 --> 00:29:53,940

just the average person I suppose you

278

00:29:59,570 --> 00:29:55,560

could say that it's interesting because

279

00:30:03,110 --> 00:29:59,580

it's a window on our own future it tells

280

00:32:03,520 --> 00:30:03,120

us what is going to happen to a star

281

00:32:15,550 --> 00:32:05,710

or tell me what you're putting in I'm

282

00:32:19,930 --> 00:32:18,250

if you don't go with mark and start

283

00:32:27,760 --> 00:32:19,940

thinking about the positions that stick

284

00:32:29,470 --> 00:32:27,770

this puppy in bad thing about this is

285

00:32:33,070 --> 00:32:29,480

Ron you can cheat and look through it

286

00:32:40,000 --> 00:32:33,080

yeah I understand but you wouldn't do

287

00:32:43,900 --> 00:32:40,010

that come from it I know look at the big

288

00:32:45,970 --> 00:32:43,910

picture here okay looks fairly looks

289

00:32:47,980 --> 00:32:45,980

little to me yeah looks good

290

00:32:50,770 --> 00:32:47,990

okay this dropped me down now mark a

291

00:32:52,240 --> 00:32:50,780

little bit gently don't take me any

292

00:32:54,790 --> 00:32:52,250

forward so I can keep pressure in it

293

00:32:56,920 --> 00:32:54,800

here just dropped me straight down okay

294

00:32:59,920 --> 00:32:56,930

now I can apply pressure back here now

295

00:33:03,550 --> 00:32:59,930

I've got it on the handrail okay let's

296

00:33:07,240 --> 00:33:03,560

go down barn let's just wait till I get

297

00:33:08,980 --> 00:33:07,250

in position now Jen okay okay I've got

298

00:33:11,590 --> 00:33:08,990

it I want to get over on this left side

299

00:33:13,090 --> 00:33:11,600

now I've got it I've got it good hand on

300

00:33:15,400 --> 00:33:13,100

it you can even let go if you have to

301
00:33:17,800 --> 00:33:15,410
want to watch this guy but drop me down

302
00:33:19,450 --> 00:33:17,810
mark can you see the guide rail up there

303
00:33:20,080 --> 00:33:19,460
yep that's what I'm getting down to yes

304
00:33:24,310 --> 00:33:20,090
I can

305
00:33:32,410 --> 00:33:24,320
okay coming down mark you're coming down

306
00:33:34,690 --> 00:33:32,420
mark okay I'm happy Stephen in okay we

307
00:33:37,060 --> 00:33:34,700
we're back at the end of the forward

308
00:33:38,920 --> 00:33:37,070
guide rail we've got to lift it up a

309
00:33:41,500 --> 00:33:38,930
little bit to get onto the Afghan realm

310
00:33:47,280 --> 00:33:41,510
okay come on down then mark well I can

311
00:33:52,500 --> 00:33:49,230
okie-dokie

312
00:33:54,360 --> 00:33:52,510
Oh key whoa here I come

313
00:33:57,520 --> 00:33:54,370

are you clear and I'm gonna help you

314

00:34:04,440 --> 00:34:00,100

okay mark keep bringing me out keep some

315

00:34:06,789 --> 00:34:04,450

pressure on the door Jeff here

316

00:34:10,899 --> 00:34:06,799

possibility that it's cocked slightly

317

00:34:13,030 --> 00:34:10,909

okay okay story yes remember and Cathy

318

00:34:14,740 --> 00:34:13,040

when you get about five foot out you

319

00:34:16,810 --> 00:34:14,750

want to we want to stop take a picture

320

00:34:19,359 --> 00:34:16,820

okay no Katie you want to put a tether

321

00:34:22,180 --> 00:34:19,369

on it I could have a tether okay okay

322

00:34:24,700 --> 00:34:22,190

okay my clear tonight right yes right

323

00:34:27,330 --> 00:34:24,710

level yes you got it okay she's coming

324

00:34:30,220 --> 00:34:27,340

straight out have at it

325

00:34:31,930 --> 00:34:30,230

okay it's clear okay I want a picture

326

00:34:37,210 --> 00:34:31,940

time here no I think you wants you out a

327

00:34:41,050 --> 00:34:37,220

little further b5 quarter-turn t-handles

328

00:34:43,599 --> 00:34:41,060

yes - Cathy you're going to translate

329

00:34:45,460 --> 00:34:43,609

the HSP to the or to the F fixture at

330

00:34:48,190 --> 00:34:45,470

the or you carrier and temporaries throw

331

00:34:50,919 --> 00:34:48,200

the HST by engaging the one pit pin on

332

00:34:55,149 --> 00:34:50,929

the top fork now this does not slide in

333

00:35:00,700 --> 00:34:55,159

sideways a slide in from the top yes

334

00:35:02,109 --> 00:35:00,710

ma'am you got it in right you could if

335

00:35:03,520 --> 00:35:02,119

you were to pick it down now you're okay

336

00:35:05,200 --> 00:35:03,530

Teddy that's the way you want it to go

337

00:35:11,860 --> 00:35:05,210

in I'm talking about down on the a

338

00:35:17,230 --> 00:35:15,280

and if you could roll me 90 to my left

339

00:35:20,340 --> 00:35:17,240

Martin and then go down I'll come in on

340

00:35:25,590 --> 00:35:23,370

and if well that is if the RMS is going

341

00:35:27,990 --> 00:35:25,600

to clear that forward picture I won't be

342

00:35:36,870 --> 00:35:28,000

able to tell you that pain going after

343

00:35:42,180 --> 00:35:36,880

about a foot okay an outboard I need to

344

00:35:54,790 --> 00:35:44,460

if you need me to scoot over there Katie

345

00:35:54,800 --> 00:38:06,210

a story you can tell you're gonna

346

00:38:06,220 --> 00:38:24,640

the other glove is better actually

347

00:38:29,180 --> 00:38:27,770

reach reach down and get those pop - but

348

00:38:30,290 --> 00:38:29,190

if you are into a high doesn't really

349

00:38:31,700 --> 00:38:30,300

matter because this is where we would

350

00:38:34,280 --> 00:38:31,710

take you from there on you would

351

00:38:42,120 --> 00:38:34,290

Saturday see if it is you think far to a

352

00:38:59,870 --> 00:38:45,250

yeah let me do that no statute needs to

353

00:38:59,880 --> 00:39:10,120

doesn't want them stanchion

354

00:39:10,130 --> 00:39:15,760

can we open the radial site

355

00:39:34,600 --> 00:39:19,640

okay well that's okay we're positioned

356

00:39:34,610 --> 00:39:45,060

he's me and Claude

357

00:39:48,210 --> 00:39:46,800

you can have to look there's riding up

358

00:39:49,500 --> 00:39:48,220

on the rail and I need to lift up just a

359

00:39:50,190 --> 00:39:49,510

little bit to get it up on this rail

360

00:39:52,800 --> 00:39:50,200

down here

361

00:39:54,000 --> 00:39:52,810

no Katie can you transition to the LMA

362

00:39:57,330 --> 00:39:54,010

oh yeah you ought to be able to help

363

00:40:01,380 --> 00:39:57,340

down there now Katie yeah but I can't

364

00:40:03,150 --> 00:40:01,390

push much okay hold on a second

365

00:40:04,410 --> 00:40:03,160

bring your end out a little Katie we're

366

00:40:06,390 --> 00:40:04,420

pitching in at the bottom you're way

367

00:40:10,350 --> 00:40:06,400

ahead of me down there hey bring me down

368

00:40:13,080 --> 00:40:10,360

Claud a foot down Claud thank you wait a

369

00:40:22,670 --> 00:40:13,090

second here tone that's a good stuff on

370

00:40:39,720 --> 00:40:37,050

okay let's stop right there all right

371

00:40:41,880 --> 00:40:39,730

budget okay now drop me down Claud where

372

00:40:45,240 --> 00:40:41,890

I get more on the seat you can't push

373

00:40:52,410 --> 00:40:45,250

any I can't push me Paul here hang on a

374

00:40:58,230 --> 00:40:52,420

sec hey bring me up Claud stop they meet

375

00:40:58,590 --> 00:40:58,240

up Klaus stop we had a strap hang in

376

00:41:00,750 --> 00:40:58,600

there

377

00:41:02,850 --> 00:41:00,760

that's Matt be real world what's your

378

00:41:04,410 --> 00:41:02,860

hang-up from who knows bring me up a

379

00:41:12,590 --> 00:41:04,420

little more of is in the way they bring

380

00:41:16,910 --> 00:41:16,160

how they say we're okay now Katie can

381

00:41:27,020 --> 00:41:16,920

you look at it

382

00:41:30,400 --> 00:41:27,030

see y'all eyes if we're okay presently

383

00:41:34,090 --> 00:41:30,410

the technicians the psychic crew are

384

00:41:38,120 --> 00:41:34,100

attempting to align the co-star into the

385

00:41:41,330 --> 00:41:38,130

extender rails and adjusting for pitch

386

00:41:43,210 --> 00:41:41,340

roll and yaw make sure that the co-star

387

00:41:46,130 --> 00:41:43,220

is correctly aligned with the rails

388

00:41:49,160 --> 00:41:46,140

prior to inserting into the - mechanical

389

00:41:53,360 --> 00:41:49,170

simulator well they'll have to make sure

390

00:41:57,060 --> 00:41:53,370

that the rails capture the co-star guide

391

00:41:59,070 --> 00:41:57,070

blocks and rails and so that

392

00:42:03,720 --> 00:41:59,080

when the co-star is correctly aligned it

393

01:00:31,250 --> 00:42:03,730

will insert all the way into the OTA in

394

01:00:37,850 --> 01:00:36,140

three two one and liftoff of the space

395

01:00:41,860 --> 01:00:37,860

shuttle Discovery with the Hubble Space

396

01:00:44,930 --> 01:00:41,870

Telescope our window on the universe in

397

01:00:47,270 --> 01:00:44,940

1990 ISA and NASA launched the most

398

01:00:50,870 --> 01:00:47,280

powerful astronomical tool ever built

399

01:00:52,700 --> 01:00:50,880

the Hubble Space Telescope since then

400

01:00:54,650 --> 01:00:52,710

astronomers have been making

401
01:00:58,910 --> 01:00:54,660
observations which are at the forefront

402
01:01:00,470 --> 01:00:58,920
of space science in December 1993 space

403
01:01:02,780 --> 01:01:00,480
shuttle Endeavour will link up with

404
01:01:05,170 --> 01:01:02,790
Hubble in orbit to carry out a space

405
01:01:07,820 --> 01:01:05,180
mission never before attempted

406
01:01:10,010 --> 01:01:07,830
astronauts will make several spacewalks

407
01:01:12,980 --> 01:01:10,020
during which they will service the key

408
01:01:15,590 --> 01:01:12,990
components one of our first tasks will

409
01:01:31,230 --> 01:01:15,600
be to replace the solar arrays the power

410
01:01:37,390 --> 01:01:34,600
Hubble has some 50,000 individual solar

411
01:01:40,420 --> 01:01:37,400
cells mounted on its - 12 meter long

412
01:01:42,880 --> 01:01:40,430
solar arrays each cell receives energy

413
01:01:46,960 --> 01:01:42,890

from the sun's rays and converts them

414

01:01:49,510 --> 01:01:46,970

into electricity since the launch in

415

01:01:52,720 --> 01:01:49,520

1990 the arrays have successfully

416

01:01:56,800 --> 01:01:52,730

produced a reliable 4.5 to 5 kilowatts

417

01:01:58,480 --> 01:01:56,810

of output this electricity is used to

418

01:02:00,490 --> 01:01:58,490

power the telescope's scientific

419

01:02:03,730 --> 01:02:00,500

instruments and communication systems

420

01:02:05,980 --> 01:02:03,740

the cells are glued to a blanket which

421

01:02:13,930 --> 01:02:05,990

expands and contracts as the spacecraft

422

01:02:15,970 --> 01:02:13,940

orbits in and out of the Sun radiation

423

01:02:18,880 --> 01:02:15,980

and other processes such as atomic

424

01:02:21,370 --> 01:02:18,890

oxygen erosion however gradually degrade

425

01:02:24,760 --> 01:02:21,380

spacecraft and in particular the

426

01:02:27,100 --> 01:02:24,770

sensitive solar sounds after four years

427

01:02:29,410 --> 01:02:27,110

in space the arrays are coming to the

428

01:02:32,350 --> 01:02:29,420

end of their useful lifespan and like a

429

01:02:34,270 --> 01:02:32,360

further 49 key components of Hubble they

430

01:02:43,500 --> 01:02:34,280

were designed and are ready to be

431

01:02:48,370 --> 01:02:46,120

though scheduled servicing mission has

432

01:02:50,740 --> 01:02:48,380

given ISA the opportunity to redesign

433

01:02:54,010 --> 01:02:50,750

the solar arrays in order to cure a

434

01:02:55,810 --> 01:02:54,020

curious problem extremely rapid

435

01:02:58,300 --> 01:02:55,820

temperature changes during the sunrise

436

01:03:01,060 --> 01:02:58,310

and sunset together with some friction

437

01:03:03,850 --> 01:03:01,070

effects are causing uneven movement of

438

01:03:05,710 --> 01:03:03,860

the system of pulleys and Springs these

439

01:03:08,710 --> 01:03:05,720

compensate for the expansion and

440

01:03:10,330 --> 01:03:08,720

contraction of the blanket additional

441

01:03:13,150 --> 01:03:10,340

movement is being detected at the drum

442

01:03:15,280 --> 01:03:13,160

for the blanket is anchored at the same

443

01:03:20,580 --> 01:03:15,290

time the temperature changes cause the

444

01:03:25,630 --> 01:03:23,860

this stick-slip movement causes a slight

445

01:03:28,080 --> 01:03:25,640

jitter at the observing end of the

446

01:03:30,910 --> 01:03:28,090

telescope the pointing control system

447

01:03:33,430 --> 01:03:30,920

when Hubble observes a distant celestial

448

01:03:36,460 --> 01:03:33,440

object it does so with minut accuracy

449

01:03:39,250 --> 01:03:36,470

the jitter although very small has an

450

01:03:41,260 --> 01:03:39,260

obvious effect imagine looking through a

451
01:03:44,440 --> 01:03:41,270
pair of binoculars whilst traveling

452
01:03:46,180 --> 01:03:44,450
along a bumpy road up to now engineers

453
01:03:49,420 --> 01:03:46,190
have minimized the effect of the jitter

454
01:03:51,490 --> 01:03:49,430
by using special computer software but

455
01:03:55,900 --> 01:03:51,500
this takes up valuable memory capacity

456
01:03:58,030 --> 01:03:55,910
within HSTs onboard computers to make

457
01:04:00,280 --> 01:03:58,040
this capacity available for scientific

458
01:04:02,890 --> 01:04:00,290
purposes and to correct the stick-slip

459
01:04:09,359 --> 01:04:02,900
movement a deceptively simple and

460
01:04:14,130 --> 01:04:11,789
the mechanisms linking the supporting

461
01:04:18,569 --> 01:04:14,140
booms to the array blankets have been

462
01:04:20,549 --> 01:04:18,579
replaced with simpler structures the

463
01:04:23,430 --> 01:04:20,559

blanket is wrapped around the end boom

464

01:04:25,829 --> 01:04:23,440

and when the Sun rises and sets a system

465

01:04:30,029 --> 01:04:25,839

of Springs allows the blanket to expand

466

01:04:35,849 --> 01:04:30,039

and contract at the drum a simple brake

467

01:04:37,829 --> 01:04:35,859

mechanism is used to keep it still the

468

01:04:40,229 --> 01:04:37,839

side support booms are covered by a

469

01:04:43,079 --> 01:04:40,239

special concertina like thermal shield

470

01:04:44,819 --> 01:04:43,089

which almost eliminates bending by

471

01:04:48,120 --> 01:04:44,829

greatly reducing the day-night

472

01:04:50,400 --> 01:04:48,130

temperature differential apart from

473

01:04:53,309 --> 01:04:50,410

these modifications British Aerospace

474

01:04:55,529 --> 01:04:53,319

Space Systems eases european solar array

475

01:04:57,900 --> 01:04:55,539

contractor has used the same basic

476
01:05:02,910 --> 01:04:57,910
flight proven design for the replacement

477
01:05:04,680 --> 01:05:02,920
solar arrays at British Aerospace the

478
01:05:06,989 --> 01:05:04,690
solar arrays are being checked out

479
01:05:10,739 --> 01:05:06,999
during their deployment on a water test

480
01:05:12,779 --> 01:05:10,749
bed to minimize the effects of rent this

481
01:05:15,660 --> 01:05:12,789
is the final test before their launch in

482
01:05:18,209 --> 01:05:15,670
December and also a chance for five of

483
01:05:20,130 --> 01:05:18,219
the seven Shuttle Endeavor astronauts to

484
01:05:23,579 --> 01:05:20,140
get to know the mechanics involved in

485
01:05:26,549 --> 01:05:23,589
deploying the array my role during this

486
01:05:29,400 --> 01:05:26,559
exchange the solar arrays will be to

487
01:05:32,219 --> 01:05:29,410
support the extra vehicle activity of my

488
01:05:34,529 --> 01:05:32,229

American colleagues by moving crew

489

01:05:36,900 --> 01:05:34,539

members at the tip of the arm to the

490

01:05:38,549 --> 01:05:36,910

proper location to do their job to pick

491

01:05:41,009 --> 01:05:38,559

up the solar arrays the solar array

492

01:05:43,859 --> 01:05:41,019

carrier in the cargo bay remember and

493

01:05:45,630 --> 01:05:43,869

bring them to the place of work to fix

494

01:05:47,309 --> 01:05:45,640

the solar arrays on the

495

01:05:48,989 --> 01:05:47,319

on the hubble space telescope and of

496

01:05:51,539 --> 01:05:48,999

course before doing that we'll have to

497

01:05:55,049 --> 01:05:51,549

remove the old solar arrays and put them

498

01:05:57,539 --> 01:05:55,059

in the cargo bay the new design and

499

01:05:59,729 --> 01:05:57,549

replacement of the solar arrays is a key

500

01:06:03,390 --> 01:05:59,739

element and the first service mission of

501
01:06:05,910 --> 01:06:03,400
the ether NASA space telescope this and

502
01:06:08,519 --> 01:06:05,920
future planned missions will continue to

503
01:06:46,420 --> 01:06:08,529
enhance the high sensitivity needed to

504
01:06:51,890 --> 01:06:49,609
the Hubble Space Telescope the largest

505
01:06:54,500 --> 01:06:51,900
most sophisticated space astronomical

506
01:06:56,750 --> 01:06:54,510
observatory ever launched by NASA it's

507
01:06:58,539 --> 01:06:56,760
data has already rewritten much of what

508
01:07:01,370 --> 01:06:58,549
we thought we knew about our universe

509
01:07:03,349 --> 01:07:01,380
launched in April of 1990 it carries

510
01:07:05,150 --> 01:07:03,359
five scientific instruments to look at

511
01:07:07,819 --> 01:07:05,160
the universe in both visible light and

512
01:07:09,890 --> 01:07:07,829
the ultraviolet wavelengths one of those

513
01:07:12,799 --> 01:07:09,900

instruments the goddard high-resolution

514

01:07:14,870 --> 01:07:12,809

spectrograph or G hrs for short was

515

01:07:16,700 --> 01:07:14,880

built by Ball corporation's aerospace

516

01:07:19,549 --> 01:07:16,710

and communications group in Boulder

517

01:07:21,589 --> 01:07:19,559

Colorado during orbital checkout however

518

01:07:23,960 --> 01:07:21,599

a flaw was discovered in the telescope's

519

01:07:26,329 --> 01:07:23,970

primary mirror that blurred the images

520

01:07:28,700 --> 01:07:26,339

enough to reduce the image quality to

521

01:07:30,980 --> 01:07:28,710

some instruments and require computer

522

01:07:33,440 --> 01:07:30,990

enhancements it was determined that the

523

01:07:35,660 --> 01:07:33,450

giant 94 inch circular mirror had an

524

01:07:38,270 --> 01:07:35,670

edge that was one ten thousandth of an

525

01:07:40,309 --> 01:07:38,280

inch too low the telescope had been

526

01:07:42,950 --> 01:07:40,319

designed for on-orbit maintenance and

527

01:07:45,500 --> 01:07:42,960

repair over its 15-year life including

528

01:07:48,230 --> 01:07:45,510

replacement of instruments but the giant

529

01:07:50,510 --> 01:07:48,240

mirror was another story then a group of

530

01:07:52,430 --> 01:07:50,520

scientists including optical experts at

531

01:07:54,109 --> 01:07:52,440

ball developed a design for an

532

01:07:56,059 --> 01:07:54,119

instrument that might correct the flaw

533

01:07:58,279 --> 01:07:56,069

when NASA decided to build this

534

01:08:00,710 --> 01:07:58,289

instrument ball was chosen as the prime

535

01:08:02,779 --> 01:08:00,720

contractor balls aerospace group

536

01:08:05,779 --> 01:08:02,789

produced the instrument called co-star

537

01:08:07,370 --> 01:08:05,789

in just 26 months about half the time

538

01:08:09,279 --> 01:08:07,380

considered routine for a space

539

01:08:11,779 --> 01:08:09,289

instrument of its size and complexity

540

01:08:15,349 --> 01:08:11,789

co-star is short for corrective optics

541

01:08:17,390 --> 01:08:15,359

Space Telescope axial replacement if all

542

01:08:19,490 --> 01:08:17,400

goes as planned space shuttle astronauts

543

01:08:22,370 --> 01:08:19,500

will capture the telescope and perform a

544

01:08:25,130 --> 01:08:22,380

variety of tasks on orbit one of those

545

01:08:27,289 --> 01:08:25,140

will be installing co-star once inserted

546

01:08:29,479 --> 01:08:27,299

into place co-star will extend five

547

01:08:31,459 --> 01:08:29,489

pairs of mirrors into the light path

548

01:08:33,979 --> 01:08:31,469

between the flawed mirror and three

549

01:08:36,110 --> 01:08:33,989

other instruments in each pair the first

550

01:08:38,059 --> 01:08:36,120

mirror images the distorted light onto

551
01:08:39,740 --> 01:08:38,069
the second mirror the second mirror is

552
01:08:42,709 --> 01:08:39,750
designed to correct the flaw in the

553
01:08:44,630 --> 01:08:42,719
telescope's primary mirror but by far

554
01:08:46,180 --> 01:08:44,640
the most demanding part of this mission

555
01:08:48,950 --> 01:08:46,190
will follow the crew of Endeavour

556
01:08:51,289 --> 01:08:48,960
astronauts also will have to install new

557
01:08:54,260 --> 01:08:51,299
solar panels a new wide field planetary

558
01:08:57,680 --> 01:08:54,270
camera and install an electronics repair

559
01:08:59,599 --> 01:08:57,690
kit on the G hrs that's why in March of

560
01:09:01,760 --> 01:08:59,609
1993 the crew came

561
01:09:04,039 --> 01:09:01,770
two balls Boulder Colorado operations

562
01:09:07,280 --> 01:09:04,049
for some visual and hands-on training

563
01:09:09,200 --> 01:09:07,290

with co-star ng hrs the astronauts

564

01:09:11,720 --> 01:09:09,210

inspected co-star and discussed how to

565

01:09:14,059 --> 01:09:11,730

handle and install it as well as testing

566

01:09:16,189 --> 01:09:14,069

the tools they will use they also gained

567

01:09:19,160 --> 01:09:16,199

experience with the electronics kit for

568

01:09:21,439 --> 01:09:19,170

the GH RS the upcoming space telescope

569

01:09:22,700 --> 01:09:21,449

servicing mission will no doubt be one

570

01:09:25,070 --> 01:09:22,710

of the most exciting and challenging

571

01:11:14,770 --> 01:09:25,080

ever attempted and Boulder Colorado

572

01:11:20,060 --> 01:11:18,020

after launching it into space NASA and

573

01:11:23,060 --> 01:11:20,070

the nation realized the hubble space

574

01:11:25,839 --> 01:11:23,070

telescope had a perfectly smooth yet

575

01:11:28,609 --> 01:11:25,849

flawed mirror the NASA teams challenge

576

01:11:31,430 --> 01:11:28,619

find the prescription and restore

577

01:11:36,200 --> 01:11:31,440

precision optics on a spacecraft already

578

01:11:38,540 --> 01:11:36,210

flying to fly what you test and test

579

01:11:42,529 --> 01:11:38,550

what you fly would be easier if the

580

01:11:44,569 --> 01:11:42,539

telescope were back on Earth but landing

581

01:11:49,689 --> 01:11:44,579

and relaunching could contaminate the

582

01:11:54,709 --> 01:11:52,279

NASA couldn't test the new corrective

583

01:11:57,200 --> 01:11:54,719

optics in the actual telescope so to

584

01:11:59,149 --> 01:11:57,210

make sure the optics will work the team

585

01:12:01,669 --> 01:11:59,159

had to determine the condition of Hubble

586

01:12:06,109 --> 01:12:01,679

in space and replicate that on the

587

01:12:08,209 --> 01:12:06,119

ground one independent review panel used

588

01:12:10,430 --> 01:12:08,219

Hubble images to determine the precise

589

01:12:14,660 --> 01:12:10,440

shape of the flawed primary mirror and

590

01:12:16,910 --> 01:12:14,670

the prescription to fix it another team

591

01:12:20,569 --> 01:12:16,920

had to verify that the corrective optics

592

01:12:23,120 --> 01:12:20,579

will work teams had to test two optical

593

01:12:25,669 --> 01:12:23,130

packages the replacement wide field

594

01:12:27,830 --> 01:12:25,679

planetary camera and the corrective

595

01:12:31,040 --> 01:12:27,840

optics for the other instruments called

596

01:12:33,529 --> 01:12:31,050

co-star engineers built several

597

01:12:35,510 --> 01:12:33,539

independent analyzers to test that they

598

01:12:39,859 --> 01:12:35,520

had replicated what the Hubble telescope

599

01:12:42,589 --> 01:12:39,869

does to light an independent team here

600

01:12:45,140 --> 01:12:42,599

at Ball Aerospace measured both sets of

601
01:12:49,399 --> 01:12:45,150
optics then we measured the measuring

602
01:12:51,350 --> 01:12:49,409
tools for mechanical testing engineers

603
01:12:53,660 --> 01:12:51,360
built a simulator at Goddard Space

604
01:12:55,729 --> 01:12:53,670
Flight Center using the same precision

605
01:12:58,549 --> 01:12:55,739
equipment that built Hubble originally

606
01:13:00,709 --> 01:12:58,559
the corrective optics and the new camera

607
01:13:02,779 --> 01:13:00,719
attachments were installed so that their

608
01:13:05,750 --> 01:13:02,789
locations duplicate the telescope

609
01:13:08,620 --> 01:13:05,760
attachments within six thousandths of an

610
01:13:11,209 --> 01:13:08,630
inch the thickness of a piece of paper

611
01:13:13,069 --> 01:13:11,219
the clearances are even tighter in the

612
01:13:19,359 --> 01:13:13,079
simulator than they will be on the real

613
01:13:24,080 --> 01:13:22,250

to replicate Hubble during electrical

614

01:13:26,479 --> 01:13:24,090

tests of the corrective optics package

615

01:13:28,189 --> 01:13:26,489

and the new camera an electrical test

616

01:13:30,890 --> 01:13:28,199

facility was built with the same

617

01:13:33,439 --> 01:13:30,900

schematics as the original telescope and

618

01:13:38,510 --> 01:13:33,449

it too was audited by an independent

619

01:13:41,270 --> 01:13:38,520

team all three optical mechanical and

620

01:13:44,149 --> 01:13:41,280

electrical were merged together in a

621

01:13:45,649 --> 01:13:44,159

test of the whole system data from the

622

01:13:48,589 --> 01:13:45,659

tests were sent to the Space Telescope

623

01:13:53,930 --> 01:13:48,599

Science Institute just the way data will

624

01:13:56,660 --> 01:13:53,940

be sent from the telescope hardware has

625

01:13:59,000 --> 01:13:56,670

been thoroughly tested on the ground the

626

01:14:01,339 --> 01:13:59,010

Hubble servicing team is preparing for

627

01:14:04,580 --> 01:14:01,349

contingencies but this mission is a

628

01:14:07,729 --> 01:14:04,590

first so no one can predict everything

629

01:14:45,129 --> 01:14:07,739

that could happen the real test will be

630

01:14:45,139 --> 01:16:07,739

you understand

631

01:16:07,749 --> 01:18:48,350

yes ready

632

01:18:54,840 --> 01:18:52,680

well neutral buoyancy and having been

633

01:18:56,070 --> 01:18:54,850

EBA you get up there and you go out in

634

01:18:57,720 --> 01:18:56,080

the payload Bay and you think you're

635

01:19:00,030 --> 01:18:57,730

right back in the pool I mean it's just

636

01:19:02,100 --> 01:19:00,040

as realistic as you can get and being

637

01:19:03,899 --> 01:19:02,110

able to float around like you do in the

638

01:19:06,180 --> 01:19:03,909

suit so that's the real advantage of it

639

01:19:08,580 --> 01:19:06,190

because you can train almost exactly

640

01:19:10,020 --> 01:19:08,590

like being in space you have a little

641

01:19:12,149 --> 01:19:10,030

bit of drag from the water but you're

642

01:19:14,189 --> 01:19:12,159

able to move around the bay test out the

643

01:19:15,750 --> 01:19:14,199

tools we make them the tools neutrally

644

01:19:17,550 --> 01:19:15,760

buoyant also so you don't have a lot of

645

01:19:19,560 --> 01:19:17,560

a lot of weight and it just gets you

646

01:19:25,169 --> 01:19:19,570

very well prepared to do the job in

647

01:19:27,629 --> 01:19:25,179

orbit well I think everyone remembers

648

01:19:29,340 --> 01:19:27,639

the last Hubble repair mission and what

649

01:19:32,280 --> 01:19:29,350

we're doing right now is we're going

650

01:19:33,689 --> 01:19:32,290

through a series of possible tasks that

651
01:19:35,669 --> 01:19:33,699
they're gonna do on a second servicing

652
01:19:37,500 --> 01:19:35,679
mission so we're trying to do is see if

653
01:19:39,360 --> 01:19:37,510
we need new tools new equipment and

654
01:19:41,490 --> 01:19:39,370
that's the real reason we're here is see

655
01:19:44,220 --> 01:19:41,500
if we have any long lead items to get

656
01:19:46,740 --> 01:19:44,230
ready for that second repair mission and

657
01:19:48,330 --> 01:19:46,750
then later on probably by the end of

658
01:19:50,790 --> 01:19:48,340
this year they're gonna decide exactly

659
01:19:52,560 --> 01:19:50,800
what tasks we're gonna do and the next

660
01:19:54,450 --> 01:19:52,570
series of runs and on in the next year