



1
00:00:17,029 --> 00:00:15,350
we see its familiar iconic delta shape

2
00:00:19,349 --> 00:00:17,039
all around us

3
00:00:21,189 --> 00:00:19,359
even in silhouette we instantly know

4
00:00:22,950 --> 00:00:21,199
what it is

5
00:00:24,070 --> 00:00:22,960
the space shuttle

6
00:00:26,710 --> 00:00:24,080
versatile

7
00:00:29,189 --> 00:00:26,720
reusable revolutionary

8
00:00:30,870 --> 00:00:29,199
the first and only spacecraft of its

9
00:00:33,750 --> 00:00:30,880
kind

10
00:00:35,590 --> 00:00:33,760
for 30 years the shuttle is known for

11
00:00:37,670 --> 00:00:35,600
stunning achievements

12
00:00:41,350 --> 00:00:37,680
heartbreaking tragedies

13
00:00:45,110 --> 00:00:41,360

and ultimately triumph in the human will

14

00:00:48,069 --> 00:00:45,120

to explore work and live in space

15

00:00:50,869 --> 00:00:48,079

like no other spacecraft before it the

16

00:00:52,069 --> 00:00:50,879

shuttle is able to launch our nation's

17

00:01:11,670 --> 00:00:52,079

dreams

18

00:01:16,070 --> 00:01:14,310

for 30 years the shuttle has risen into

19

00:01:19,030 --> 00:01:16,080

the sky

20

00:01:20,630 --> 00:01:19,040

as spectacular and familiar as a sunrise

21

00:01:21,910 --> 00:01:20,640

its achievements can be taken for

22

00:01:24,070 --> 00:01:21,920

granted

23

00:01:26,630 --> 00:01:24,080

with every liftoff of the dreams of

24

00:01:28,310 --> 00:01:26,640

exploration and for the people who work

25

00:01:29,910 --> 00:01:28,320

on the shuttle the pride of

26

00:01:31,749 --> 00:01:29,920

accomplishment

27

00:01:33,590 --> 00:01:31,759

what does it take to get a shuttle to

28

00:01:36,069 --> 00:01:33,600

fly

29

00:01:38,069 --> 00:01:36,079

for three decades shuttle launches

30

00:01:40,550 --> 00:01:38,079

involve the entire nation

31

00:01:42,789 --> 00:01:40,560

with parts coming from more than 37

32

00:01:45,990 --> 00:01:42,799

states around the country

33

00:01:49,270 --> 00:01:46,000

not a product of nasa but a product of

34

00:01:52,310 --> 00:01:49,280

america with human hands putting loving

35

00:01:54,389 --> 00:01:52,320

care into each and every component

36

00:01:56,069 --> 00:01:54,399

well getting a shuttle ready to fly is a

37

00:01:58,069 --> 00:01:56,079

tremendous effort by thousands and

38

00:02:00,709 --> 00:01:58,079

thousands and thousands of people

39

00:02:02,630 --> 00:02:00,719

the external tank arrives by barge

40

00:02:13,430 --> 00:02:02,640

at the turn basin

41

00:02:18,070 --> 00:02:15,350

and the saw rocket booster segments come

42

00:02:20,550 --> 00:02:18,080

to us on rail from from utah

43

00:02:22,390 --> 00:02:20,560

and um so they all come together um we

44

00:02:24,070 --> 00:02:22,400

we stack the boosters

45

00:02:25,510 --> 00:02:24,080

then we attach the external tank and

46

00:02:28,869 --> 00:02:25,520

then the orbiter gets attached to the

47

00:02:30,710 --> 00:02:28,879

tank and we roll out a shuttle launch

48

00:02:33,509 --> 00:02:30,720

it's the icing on the cake

49

00:02:36,470 --> 00:02:33,519

for all the work that they've done the

50

00:02:39,509 --> 00:02:36,480

launch team includes folks that worked

51
00:02:41,910 --> 00:02:39,519
on the hardware or the software months

52
00:02:43,350 --> 00:02:41,920
before in a building that

53
00:02:45,830 --> 00:02:43,360
in the middle of the night that may not

54
00:02:47,910 --> 00:02:45,840
have any windows in it they know

55
00:02:51,030 --> 00:02:47,920
that you don't have to have a highly

56
00:02:52,390 --> 00:02:51,040
visible job to be important

57
00:02:54,470 --> 00:02:52,400
in this business

58
00:02:56,229 --> 00:02:54,480
so on behalf of the kc processing and

59
00:02:57,750 --> 00:02:56,239
launch team i wish you good luck

60
00:02:59,509 --> 00:02:57,760
godspeed we'll see you back here just

61
00:03:00,710 --> 00:02:59,519
after thanksgiving

62
00:03:02,070 --> 00:03:00,720
well the launch here is very very

63
00:03:03,750 --> 00:03:02,080

special

64

00:03:06,470 --> 00:03:03,760

i haven't seen one from outside for over

65

00:03:08,710 --> 00:03:06,480

10 years i'm always in the control room

66

00:03:10,309 --> 00:03:08,720

but uh thousands and thousands of people

67

00:03:12,229 --> 00:03:10,319

come to titusville and cocoa beach and

68

00:03:13,830 --> 00:03:12,239

cape canaveral to see a launch

69

00:03:16,149 --> 00:03:13,840

you watch the tourists you know come

70

00:03:18,550 --> 00:03:16,159

here special you know the kids

71

00:03:19,589 --> 00:03:18,560

with the just in awe when the orbiter

72

00:03:21,750 --> 00:03:19,599

lifts off

73

00:03:30,550 --> 00:03:21,760

it's a tremendous feeling of again of

74

00:03:34,070 --> 00:03:31,670

and to think that we're doing it on

75

00:03:35,589 --> 00:03:34,080

behalf of of the country and and now

76

00:03:37,750 --> 00:03:35,599

with the international space station on

77

00:03:45,270 --> 00:03:37,760

behalf of all the international partners

78

00:03:49,750 --> 00:03:47,750

uh show lunch is quite a

79

00:03:51,030 --> 00:03:49,760

is a quite an experience new year here

80

00:03:52,309 --> 00:03:51,040

uh

81

00:03:54,390 --> 00:03:52,319

you know wake up or in your fancy

82

00:03:55,589 --> 00:03:54,400

clothes you know you have a breakfast

83

00:03:56,390 --> 00:03:55,599

together before you put the fancy

84

00:03:58,309 --> 00:03:56,400

clothes on because you don't want to get

85

00:04:00,229 --> 00:03:58,319

them dirty so you have you have your

86

00:04:02,390 --> 00:04:00,239

breakfast and you put your fancy clothes

87

00:04:04,309 --> 00:04:02,400

on and everything put in your space suit

88

00:04:05,509 --> 00:04:04,319

and you walk out into the astro van they

89

00:04:13,670 --> 00:04:05,519

drive you out there and you get in the

90

00:04:17,990 --> 00:04:15,830

leading up to the launch it's it's a lot

91

00:04:19,830 --> 00:04:18,000

of training and it's something you've

92

00:04:21,590 --> 00:04:19,840

been preparing for

93

00:04:23,350 --> 00:04:21,600

really kind of all of your life if you

94

00:04:25,670 --> 00:04:23,360

think about it because

95

00:04:27,909 --> 00:04:25,680

you know this whole aspiration of being

96

00:04:30,150 --> 00:04:27,919

able to go into space is something that

97

00:04:31,510 --> 00:04:30,160

starts pretty early on for most people

98

00:04:33,350 --> 00:04:31,520

even though you

99

00:04:36,310 --> 00:04:33,360

you're exhaustively trained for it

100

00:04:37,670 --> 00:04:36,320

nothing really prepares you for

101
00:04:38,790 --> 00:04:37,680
what you're actually going to feel

102
00:04:40,390 --> 00:04:38,800
because there's no way to really

103
00:04:41,270 --> 00:04:40,400
simulate that

104
00:04:43,270 --> 00:04:41,280
so

105
00:04:45,990 --> 00:04:43,280
it really is you know

106
00:04:47,670 --> 00:04:46,000
on-the-job training as the

107
00:04:49,350 --> 00:04:47,680
as the saying goes

108
00:04:50,790 --> 00:04:49,360
uh the launch is a pretty incredible

109
00:04:53,189 --> 00:04:50,800
experience and i've heard a lot of

110
00:04:55,350 --> 00:04:53,199
people attempt to describe what it feels

111
00:04:56,710 --> 00:04:55,360
like i've heard people say oh

112
00:04:58,150 --> 00:04:56,720
it's like getting hit in the back of

113
00:05:00,790 --> 00:04:58,160

your chair with the baseball bat it's

114

00:05:02,390 --> 00:05:00,800

nothing like that it's it's very hard to

115

00:05:04,070 --> 00:05:02,400

describe in fact because you're going

116

00:05:06,550 --> 00:05:04,080

from not moving at all

117

00:05:08,310 --> 00:05:06,560

to 26 times the speed of sound in only

118

00:05:11,029 --> 00:05:08,320

eight minutes and so the tremendous

119

00:05:12,790 --> 00:05:11,039

sense of acceleration is not one that

120

00:05:15,430 --> 00:05:12,800

you can really prepare for unless you've

121

00:05:17,029 --> 00:05:15,440

done it before and then at six seconds

122

00:05:19,749 --> 00:05:17,039

the main engines

123

00:05:21,990 --> 00:05:19,759

uh light and you feel that and the

124

00:05:25,110 --> 00:05:22,000

shuttle pitches and then kind of comes

125

00:05:29,510 --> 00:05:25,120

back up right at zero in the countdown

126
00:05:32,390 --> 00:05:31,430
and then you you there's no doubt you're

127
00:05:34,629 --> 00:05:32,400
moving

128
00:05:36,310 --> 00:05:34,639
and i remember looking over and seeing

129
00:05:37,830 --> 00:05:36,320
on the display yep all those main

130
00:05:42,070 --> 00:05:37,840
engines are 100

131
00:05:42,080 --> 00:06:49,110
we were kicked off the bed

132
00:06:52,469 --> 00:06:50,790
and within a couple seconds that thought

133
00:06:54,390 --> 00:06:52,479
went through our mind was man we're

134
00:06:55,270 --> 00:06:54,400
really we're we're like far away from

135
00:06:57,350 --> 00:06:55,280
home

136
00:06:58,950 --> 00:06:57,360
already you knew you were going

137
00:07:01,189 --> 00:06:58,960
someplace

138
00:07:04,070 --> 00:07:01,199

far away

139

00:07:05,909 --> 00:07:04,080

and as we go then we separate from the

140

00:07:08,390 --> 00:07:05,919

uh from the solid rocket booster and

141

00:07:11,270 --> 00:07:08,400

then the ryba comes very smooth

142

00:07:13,749 --> 00:07:11,280

um there's no shaking much anymore but

143

00:07:16,550 --> 00:07:13,759

we are outside the atmosphere of the

144

00:07:19,430 --> 00:07:16,560

earth and we can accelerate real fast

145

00:07:22,150 --> 00:07:19,440

now we have to reach 25 times the speed

146

00:07:23,589 --> 00:07:22,160

of sound so as we accelerate we start

147

00:07:25,909 --> 00:07:23,599

feeling the

148

00:07:28,390 --> 00:07:25,919

g acceleration and being pushed back to

149

00:07:31,430 --> 00:07:28,400

our seats in the next five minutes we're

150

00:07:32,629 --> 00:07:31,440

under 3g which means three times our

151
00:07:33,430 --> 00:07:32,639
weight

152
00:07:35,909 --> 00:07:33,440
and

153
00:07:37,830 --> 00:07:35,919
that seemed a little bit more than 3gs

154
00:07:39,350 --> 00:07:37,840
i've pulled in other situations and i

155
00:07:42,309 --> 00:07:39,360
think again it's just because of the

156
00:07:43,110 --> 00:07:42,319
excitement of this being a real flight

157
00:07:44,869 --> 00:07:43,120
and

158
00:07:46,390 --> 00:07:44,879
i felt like i was fighting much harder

159
00:07:48,790 --> 00:07:46,400
to get breath

160
00:07:50,309 --> 00:07:48,800
and it's over about a minute minute and

161
00:07:51,830 --> 00:07:50,319
a half time frame and then all of a

162
00:07:53,510 --> 00:07:51,840
sudden it's off of you

163
00:07:56,309 --> 00:07:53,520

and you're like

164

00:07:58,390 --> 00:07:56,319

wow things are floating up and

165

00:08:00,550 --> 00:07:58,400

and we're really here you know this is

166

00:08:02,629 --> 00:08:00,560

really where we wanted to be okay

167

00:08:04,710 --> 00:08:02,639

daddy how do you like space i love space

168

00:08:06,950 --> 00:08:04,720

i feel better and better and better i

169

00:08:09,350 --> 00:08:06,960

feel like i'm hanging upside down but i

170

00:08:10,230 --> 00:08:09,360

guess i'm not there is just quarter of a

171

00:08:12,950 --> 00:08:10,240

second

172

00:08:14,469 --> 00:08:12,960

transition into real real heavy to

173

00:08:16,710 --> 00:08:14,479

whoops floating

174

00:08:18,869 --> 00:08:16,720

and that's when you have to adapt to

175

00:08:29,670 --> 00:08:18,879

weightlessness it's a great ride

176
00:08:34,149 --> 00:08:31,990
before the space shuttle spacecraft like

177
00:08:36,149 --> 00:08:34,159
this apollo capsule are built for no

178
00:08:38,149 --> 00:08:36,159
more than three astronauts

179
00:08:40,790 --> 00:08:38,159
landing in the ocean and recovered by

180
00:08:43,750 --> 00:08:40,800
aircraft carriers the space capsule and

181
00:08:47,990 --> 00:08:43,760
the 360 foot rocket that launched it are

182
00:08:52,550 --> 00:08:49,430
when the shuttle rolls out of the

183
00:08:54,550 --> 00:08:52,560
factory in the 1970s it is obvious that

184
00:08:56,310 --> 00:08:54,560
america has taken a huge leap in

185
00:08:59,110 --> 00:08:56,320
spacecraft design

186
00:09:01,509 --> 00:08:59,120
the largest fastest winged hypersonic

187
00:09:04,550 --> 00:09:01,519
craft in history the shuttle lands on a

188
00:09:05,829 --> 00:09:04,560

runway and can be refitted to fly again

189

00:09:08,310 --> 00:09:05,839

and again

190

00:09:10,790 --> 00:09:08,320

it can hold up to seven astronauts and

191

00:09:12,230 --> 00:09:10,800

its payload bay can haul cargo to and

192

00:09:14,550 --> 00:09:12,240

from space

193

00:09:16,550 --> 00:09:14,560

space flight and how we conduct it

194

00:09:17,670 --> 00:09:16,560

changes radically with the shuttle

195

00:09:19,350 --> 00:09:17,680

concept

196

00:09:21,269 --> 00:09:19,360

if you can imagine

197

00:09:24,070 --> 00:09:21,279

the early spacecraft

198

00:09:26,710 --> 00:09:24,080

barely the size of a desk for one or two

199

00:09:29,030 --> 00:09:26,720

astronauts now the spacecraft is the

200

00:09:32,389 --> 00:09:29,040

size of an airliner

201
00:09:35,670 --> 00:09:32,399
and it has thousands of components and

202
00:09:38,630 --> 00:09:35,680
miles of wiring and we were making the

203
00:09:42,710 --> 00:09:38,640
transition from the era of wires and

204
00:09:44,150 --> 00:09:42,720
switches and meters to digital and

205
00:09:46,550 --> 00:09:44,160
computers

206
00:09:48,870 --> 00:09:46,560
the shuttle's flexible design means it

207
00:09:51,509 --> 00:09:48,880
can carry out a variety of missions not

208
00:09:53,430 --> 00:09:51,519
possible before including scientific and

209
00:09:56,230 --> 00:09:53,440
astronomical missions

210
00:09:59,269 --> 00:09:56,240
nasa needs a new breed of astronauts not

211
00:10:01,350 --> 00:09:59,279
just flyers but scientists engineers

212
00:10:03,750 --> 00:10:01,360
doctors and other disciplines

213
00:10:06,069 --> 00:10:03,760

a whole new world of opportunity opens

214

00:10:08,790 --> 00:10:06,079

up for astronaut candidates who may not

215

00:10:11,350 --> 00:10:08,800

have applied to nasa before the shuttle

216

00:10:13,670 --> 00:10:11,360

in addition a space program actively

217

00:10:21,829 --> 00:10:13,680

recruits women and minority astronauts

218

00:10:27,110 --> 00:10:24,310

one of the earliest uses of the shuttle

219

00:10:30,150 --> 00:10:27,120

is for space lab missions for the first

220

00:10:32,630 --> 00:10:30,160

time an entire laboratory the size of a

221

00:10:35,269 --> 00:10:32,640

school bus can be hauled into space in

222

00:10:36,310 --> 00:10:35,279

the shuttle payload bay and returned to

223

00:10:39,110 --> 00:10:36,320

earth

224

00:10:41,269 --> 00:10:39,120

built by the european space agency space

225

00:10:44,069 --> 00:10:41,279

lab is a prime example of early

226

00:10:46,230 --> 00:10:44,079

international cooperation in space

227

00:10:48,550 --> 00:10:46,240

the shuttle missions allow scientists

228

00:10:50,710 --> 00:10:48,560

and researchers from around the globe to

229

00:10:52,470 --> 00:10:50,720

participate in the high-flying

230

00:10:55,350 --> 00:10:52,480

experiments

231

00:10:57,910 --> 00:10:55,360

but why conduct science in space

232

00:10:59,430 --> 00:10:57,920

by going into space it allows us to be

233

00:11:02,150 --> 00:10:59,440

able to study

234

00:11:04,230 --> 00:11:02,160

everything that we can think of without

235

00:11:06,230 --> 00:11:04,240

the presence of gravity and if you think

236

00:11:07,910 --> 00:11:06,240

about it everything that we've done in

237

00:11:10,230 --> 00:11:07,920

the laboratories here on earth all the

238

00:11:12,550 --> 00:11:10,240

science that we have have had the

239

00:11:14,949 --> 00:11:12,560

presence of gravity and so this is a

240

00:11:18,310 --> 00:11:14,959

very very unique opportunity that we

241

00:11:21,750 --> 00:11:18,320

have so we can find out just how gravity

242

00:11:24,550 --> 00:11:21,760

affects all different kinds of systems

243

00:11:25,910 --> 00:11:24,560

shuttle science missions also study the

244

00:11:27,829 --> 00:11:25,920

earth itself

245

00:11:30,150 --> 00:11:27,839

aiming instruments located in the

246

00:11:32,870 --> 00:11:30,160

shuttle payload bay to monitor the

247

00:11:35,350 --> 00:11:32,880

earth's ozone layer the shuttle also

248

00:11:37,430 --> 00:11:35,360

launches satellites to further observe

249

00:11:40,150 --> 00:11:37,440

the earth's atmosphere

250

00:11:43,030 --> 00:11:40,160

over time the data gives researchers

251
00:11:44,710 --> 00:11:43,040
important information about our changing

252
00:11:47,190 --> 00:11:44,720
planet

253
00:11:49,509 --> 00:11:47,200
the shuttle also orbits the earth with a

254
00:11:51,750 --> 00:11:49,519
series of radar mapping missions

255
00:11:55,590 --> 00:11:51,760
allowing us to view the features of our

256
00:11:57,990 --> 00:11:55,600
world with a new level of detail

257
00:11:59,829 --> 00:11:58,000
shuttle missions also allow students to

258
00:12:03,110 --> 00:11:59,839
participate in science

259
00:12:04,710 --> 00:12:03,120
two programs kid sat and earth cam

260
00:12:06,870 --> 00:12:04,720
allows students to make earth

261
00:12:11,910 --> 00:12:06,880
observations using a remote control

262
00:12:17,030 --> 00:12:14,069
for the first time students take an

263
00:12:19,509 --> 00:12:17,040

active role in a space mission

264

00:12:21,990 --> 00:12:19,519

my name is ebony miranda we want to know

265

00:12:24,790 --> 00:12:22,000

if you can start the car on top of the

266

00:12:27,030 --> 00:12:24,800

track

267

00:12:29,350 --> 00:12:27,040

okay let's try the top

268

00:12:31,509 --> 00:12:29,360

astronauts also take advantage of space

269

00:12:33,670 --> 00:12:31,519

to partake in educational events with

270

00:12:36,470 --> 00:12:33,680

students from around the world

271

00:12:38,550 --> 00:12:36,480

in the microgravity of space experiments

272

00:12:42,949 --> 00:12:38,560

are filmed and distributed to schools

273

00:12:47,910 --> 00:12:45,670

the shuttle is not only a science vessel

274

00:12:49,269 --> 00:12:47,920

commercial clients from around the world

275

00:12:51,509 --> 00:12:49,279

take advantage of the shuttle's

276

00:12:52,870 --> 00:12:51,519

capability to carry satellites into

277

00:12:55,269 --> 00:12:52,880

space

278

00:12:58,230 --> 00:12:55,279

the physics of frisbees works up here as

279

00:13:01,350 --> 00:12:58,240

well as it does on the ground

280

00:13:04,150 --> 00:13:01,360

space hardware of all shapes and sizes

281

00:13:06,150 --> 00:13:04,160

launches from the shuttle payload bay

282

00:13:09,190 --> 00:13:06,160

and you you point the orbiter in the

283

00:13:11,670 --> 00:13:09,200

right direction and spin these babies up

284

00:13:14,629 --> 00:13:11,680

and eject them out and then about half a

285

00:13:15,910 --> 00:13:14,639

rev later those motors would burn and

286

00:13:19,190 --> 00:13:15,920

the thing was pointed in the right

287

00:13:20,710 --> 00:13:19,200

direction to take it on its way to the

288

00:13:22,710 --> 00:13:20,720

final orbit

289

00:13:25,030 --> 00:13:22,720

a great capability that

290

00:13:27,350 --> 00:13:25,040

that the orbiter provided

291

00:13:29,750 --> 00:13:27,360

before the shuttle if a satellite

292

00:13:32,389 --> 00:13:29,760

malfunctioned in space it became

293

00:13:34,470 --> 00:13:32,399

multi-million dollar space junk

294

00:13:37,509 --> 00:13:34,480

the shuttle gives ailing satellites a

295

00:13:45,350 --> 00:13:37,519

second chance offering rescue and repair

296

00:13:51,030 --> 00:13:48,150

the shuttle scenario of having people

297

00:13:53,829 --> 00:13:51,040

and a work platform in space benefits

298

00:13:57,030 --> 00:13:53,839

all types of space hardware but one

299

00:14:00,550 --> 00:13:57,040

repair job stands out above the rest a

300

00:14:03,670 --> 00:14:00,560

space telescope named hubble

301
00:14:06,069 --> 00:14:03,680
launched in 1990 hubble is to float high

302
00:14:08,069 --> 00:14:06,079
above the haze of earth's atmosphere

303
00:14:10,470 --> 00:14:08,079
free to view the cosmos with

304
00:14:12,710 --> 00:14:10,480
unprecedented clarity but when

305
00:14:14,829 --> 00:14:12,720
scientists get the first pictures back

306
00:14:17,590 --> 00:14:14,839
the results are less than

307
00:14:20,230 --> 00:14:17,600
spectacular hubble has a flaw in its

308
00:14:21,670 --> 00:14:20,240
primary mirror resulting in fuzzy

309
00:14:23,990 --> 00:14:21,680
imagery

310
00:14:25,829 --> 00:14:24,000
nasa mounts a repair mission to try and

311
00:14:27,990 --> 00:14:25,839
salvage the telescope

312
00:14:30,710 --> 00:14:28,000
using the shuttle payload bay as a work

313
00:14:39,110 --> 00:14:30,720

platform astronauts conduct a series of

314

00:14:44,790 --> 00:14:41,269

the shuttle releases the hubble once

315

00:14:48,790 --> 00:14:47,269

scientists soon discover the mission is

316

00:14:51,030 --> 00:14:48,800

a success

317

00:14:53,269 --> 00:14:51,040

hubble's vision is restored and the

318

00:14:56,310 --> 00:14:53,279

space telescope begins rewriting

319

00:14:57,350 --> 00:14:56,320

astronomy books with every new stunning

320

00:14:58,790 --> 00:14:57,360

image

321

00:15:01,509 --> 00:14:58,800

i think the public

322

00:15:03,110 --> 00:15:01,519

had not a terrific view into what the

323

00:15:05,670 --> 00:15:03,120

universe is like until we had the hubble

324

00:15:07,590 --> 00:15:05,680

space telescope as a result

325

00:15:09,350 --> 00:15:07,600

people associate those images with the

326

00:15:11,910 --> 00:15:09,360

beauty of the universe

327

00:15:13,910 --> 00:15:11,920

the numbers and the answers we get about

328

00:15:16,550 --> 00:15:13,920

the universe beginning with the big bang

329

00:15:19,509 --> 00:15:16,560

and the age and chemical elements being

330

00:15:21,910 --> 00:15:19,519

built in stars turning into planets

331

00:15:23,750 --> 00:15:21,920

solar systems all of that information

332

00:15:25,269 --> 00:15:23,760

mixed in with these beautiful pictures

333

00:15:27,670 --> 00:15:25,279

has allowed hubble to actually be an

334

00:15:43,030 --> 00:15:27,680

icon for science and an icon for the

335

00:15:48,069 --> 00:15:46,230

in 30 years of flying in the treacherous

336

00:15:51,590 --> 00:15:48,079

environment of space

337

00:15:53,990 --> 00:15:51,600

the shuttle is not without tragedy

338

00:15:56,790 --> 00:15:54,000

the loss of two space shuttles

339

00:15:59,910 --> 00:15:56,800

challenger in 1986

340

00:16:04,069 --> 00:15:59,920

and colombia in 2003

341

00:16:07,350 --> 00:16:04,079

claims the lives of 14 astronauts

342

00:16:10,550 --> 00:16:07,360

the nation mourns the crews as friends

343

00:16:13,430 --> 00:16:10,560

neighbors colleagues and as the heroes

344

00:16:19,189 --> 00:16:16,150

for some the tragic events

345

00:16:20,949 --> 00:16:19,199

are a source of inspiration

346

00:16:22,629 --> 00:16:20,959

when i was in high school i was probably

347

00:16:24,470 --> 00:16:22,639

in the 10th grade i think when we had

348

00:16:26,470 --> 00:16:24,480

the challenger accident and that was

349

00:16:28,389 --> 00:16:26,480

sort of the first thing from the space

350

00:16:31,430 --> 00:16:28,399

program that really sort of made it onto

351
00:16:33,189 --> 00:16:31,440
my radar screen as a big event

352
00:16:35,350 --> 00:16:33,199
and it seems like a strange thing to say

353
00:16:36,790 --> 00:16:35,360
well that inspired me but at the same

354
00:16:38,389 --> 00:16:36,800
time it was something that it you know

355
00:16:40,710 --> 00:16:38,399
made me aware of the shuttle program it

356
00:16:43,590 --> 00:16:40,720
made me aware of how important this work

357
00:16:45,269 --> 00:16:43,600
was that the shuttle program was doing

358
00:16:47,110 --> 00:16:45,279
and that people were willing to risk

359
00:16:49,110 --> 00:16:47,120
their lives for it so that was sort of

360
00:16:51,269 --> 00:16:49,120
the big event to me that put it onto the

361
00:16:56,949 --> 00:16:51,279
map and and made me think about what

362
00:17:01,430 --> 00:16:59,110
for colombia which was lost in its

363
00:17:03,430 --> 00:17:01,440

return to earth the public becomes

364

00:17:04,870 --> 00:17:03,440

directly involved with the recovery of

365

00:17:07,829 --> 00:17:04,880

the spacecraft

366

00:17:10,470 --> 00:17:07,839

recovery teams many of them volunteers

367

00:17:13,029 --> 00:17:10,480

diligently search for debris hoping to

368

00:17:14,150 --> 00:17:13,039

help nasa discover how the accident

369

00:17:16,390 --> 00:17:14,160

happened

370

00:17:19,510 --> 00:17:16,400

the public outpouring of grief was

371

00:17:21,669 --> 00:17:19,520

matched only by the drive to continue

372

00:17:24,230 --> 00:17:21,679

nasa and the nation were determined to

373

00:17:26,470 --> 00:17:24,240

make the shuttle better and safer

374

00:17:28,309 --> 00:17:26,480

and to persist

375

00:17:31,029 --> 00:17:28,319

the shuttle was grounded for years

376

00:17:33,990 --> 00:17:31,039

following each accident as it rose again

377

00:17:37,590 --> 00:17:34,000

each time the pride in america and its

378

00:17:40,230 --> 00:17:37,600

space program was palpable

379

00:17:41,510 --> 00:17:40,240

you know you hear in tragedies that they

380

00:17:42,950 --> 00:17:41,520

said well they died doing what they

381

00:17:44,789 --> 00:17:42,960

loved to do and they would have wanted

382

00:17:47,029 --> 00:17:44,799

us to carry on

383

00:17:51,270 --> 00:17:47,039

and and that is

384

00:17:53,110 --> 00:17:51,280

absolutely 100 true in the columbia case

385

00:17:55,350 --> 00:17:53,120

i know every one of those astronauts

386

00:17:57,190 --> 00:17:55,360

personally and i know each one of them

387

00:17:59,350 --> 00:17:57,200

would have been extremely disappointed

388

00:18:01,750 --> 00:17:59,360

how the program ended because of that

389

00:18:03,270 --> 00:18:01,760

tragedy they truly truly believed in

390

00:18:05,270 --> 00:18:03,280

what they did they gave their lives for

391

00:18:07,270 --> 00:18:05,280

what they did

392

00:18:10,230 --> 00:18:07,280

what they believed in so we had to find

393

00:18:11,750 --> 00:18:10,240

the problem fix it and fly again

394

00:18:13,669 --> 00:18:11,760

and on launch day we were doing just

395

00:18:16,230 --> 00:18:13,679

that it's what we do

396

00:18:17,350 --> 00:18:16,240

we are we are launching america's space

397

00:18:18,630 --> 00:18:17,360

shuttle

398

00:18:20,390 --> 00:18:18,640

for the good of the country and the good

399

00:18:21,590 --> 00:18:20,400

of the world it's what we do we have to

400

00:18:23,750 --> 00:18:21,600

do this

401
00:18:26,070 --> 00:18:23,760
a lot of thoughts back to to rick and

402
00:18:49,270 --> 00:18:26,080
his crew

403
00:18:53,110 --> 00:18:51,270
the mere space station

404
00:18:54,789 --> 00:18:53,120
for years the russians had pursued

405
00:18:56,390 --> 00:18:54,799
living and working in space with

406
00:18:58,710 --> 00:18:56,400
long-term missions

407
00:18:59,909 --> 00:18:58,720
the space station mir is their latest

408
00:19:02,150 --> 00:18:59,919
achievement

409
00:19:04,950 --> 00:19:02,160
for shorter missions america develops

410
00:19:06,710 --> 00:19:04,960
the ultimate spacecraft with the shuttle

411
00:19:09,510 --> 00:19:06,720
what would happen if the two space

412
00:19:12,070 --> 00:19:09,520
programs work together the united states

413
00:19:14,230 --> 00:19:12,080

and russia long rivals on earth and in

414

00:19:16,870 --> 00:19:14,240
space embark on a program of

415

00:19:18,950 --> 00:19:16,880
unprecedented cooperation called the

416

00:19:21,350 --> 00:19:18,960
shuttle mir program

417

00:19:23,430 --> 00:19:21,360
we have these very different programs

418

00:19:25,750 --> 00:19:23,440
and we saw that they were complementary

419

00:19:27,350 --> 00:19:25,760
even the water that we dump overboard

420

00:19:28,070 --> 00:19:27,360
from the fuel cells on the shuttle could

421

00:19:29,110 --> 00:19:28,080
be

422

00:19:31,430 --> 00:19:29,120
drank

423

00:19:33,590 --> 00:19:31,440
on the space station uh they were they

424

00:19:35,590 --> 00:19:33,600
fit together beautifully the russian

425

00:19:38,789 --> 00:19:35,600
outpost is serviced by the american

426
00:19:40,150 --> 00:19:38,799
shuttle which brings supplies hardware

427
00:19:42,230 --> 00:19:40,160
and people

428
00:19:44,710 --> 00:19:42,240
us and russian astronauts conduct

429
00:19:47,190 --> 00:19:44,720
spacewalks together and american

430
00:19:50,070 --> 00:19:47,200
scientists live onboard mir for months

431
00:19:52,950 --> 00:19:50,080
at a time conducting research

432
00:19:54,950 --> 00:19:52,960
i found it very very interesting to live

433
00:19:56,870 --> 00:19:54,960
and to work on the mirror space station

434
00:19:58,310 --> 00:19:56,880
a lot of times people say well

435
00:19:59,590 --> 00:19:58,320
of the flight that you've had what is

436
00:20:01,190 --> 00:19:59,600
your favorite flight of course you can't

437
00:20:02,950 --> 00:20:01,200
pick out a favorite flight because you

438
00:20:06,390 --> 00:20:02,960

know you enjoyed every single one that

439

00:20:08,470 --> 00:20:06,400

you did but if i could only choose one

440

00:20:10,950 --> 00:20:08,480

and i was limited to just one i would

441

00:20:12,950 --> 00:20:10,960

have picked the mirror flight that i was

442

00:20:14,630 --> 00:20:12,960

on and the reason why was because it

443

00:20:17,750 --> 00:20:14,640

gave me the opportunity to be in space

444

00:20:19,669 --> 00:20:17,760

for a long period of time the program is

445

00:20:22,230 --> 00:20:19,679

not without challenges

446

00:20:25,270 --> 00:20:22,240

a fire breaks out on the mirror but the

447

00:20:27,909 --> 00:20:25,280

crew manages to save the outpost

448

00:20:29,710 --> 00:20:27,919

on a later mission an unmanned supply

449

00:20:32,310 --> 00:20:29,720

ship collides with mir

450

00:20:35,350 --> 00:20:32,320

depressurizing one of the modules and

451
00:20:38,149 --> 00:20:35,360
tumbling the station out of control

452
00:20:40,070 --> 00:20:38,159
once again the crew works together to

453
00:20:42,789 --> 00:20:40,080
keep mirror flying

454
00:20:45,590 --> 00:20:42,799
through the dangers and hardships there

455
00:20:47,830 --> 00:20:45,600
are many lessons learned

456
00:20:49,990 --> 00:20:47,840
perhaps the most important element of

457
00:20:52,149 --> 00:20:50,000
that program beyond the

458
00:20:54,710 --> 00:20:52,159
physical engineering accomplishment

459
00:20:57,750 --> 00:20:54,720
which was substantial was

460
00:21:00,390 --> 00:20:57,760
i'll say it in russian first the zainaba

461
00:21:03,669 --> 00:21:00,400
doveria

462
00:21:05,909 --> 00:21:03,679
the mutual trust and respect it turns

463
00:21:07,110 --> 00:21:05,919

out that these complex programs that we

464

00:21:09,110 --> 00:21:07,120

undertake

465

00:21:09,990 --> 00:21:09,120

you can't put them in place by signing a

466

00:21:11,750 --> 00:21:10,000

law

467

00:21:13,830 --> 00:21:11,760

or a bill and saying it will be done

468

00:21:16,549 --> 00:21:13,840

that doesn't make it happen it happens

469

00:21:18,789 --> 00:21:16,559

one-on-one person to person with mutual

470

00:21:22,230 --> 00:21:18,799

trust and respect that's what we

471

00:21:24,789 --> 00:21:22,240

achieved in the mir program along with

472

00:21:31,190 --> 00:21:24,799

the very products and engineering

473

00:21:36,390 --> 00:21:33,590

from the beginning it is imagined that

474

00:21:39,110 --> 00:21:36,400

the shuttle can build a space station

475

00:21:42,070 --> 00:21:39,120

yet for the first 20 years the shuttle

476
00:21:48,549 --> 00:21:42,080
is never used for this purpose

477
00:21:53,430 --> 00:21:50,470
building on the success of the shuttle

478
00:21:56,149 --> 00:21:53,440
mir program the united states partners

479
00:21:59,909 --> 00:21:56,159
with russia and other countries to build

480
00:22:03,110 --> 00:21:59,919
an international space station

481
00:22:05,909 --> 00:22:03,120
the station is so large it must be sent

482
00:22:08,630 --> 00:22:05,919
into orbit one module at a time for

483
00:22:13,190 --> 00:22:11,190
russia sends up the first component

484
00:22:16,549 --> 00:22:13,200
zarya

485
00:22:18,630 --> 00:22:16,559
the first us module unity is loaded onto

486
00:22:21,750 --> 00:22:18,640
the shuttle endeavor

487
00:22:24,789 --> 00:22:21,760
this new international era in space

488
00:22:26,870 --> 00:22:24,799

starts with a bit of magic there's a

489

00:22:30,549 --> 00:22:26,880

picture red huber took

490

00:22:32,070 --> 00:22:30,559

it was a rainbow over uh endeavour

491

00:22:33,830 --> 00:22:32,080

sitting out on the pad

492

00:22:36,149 --> 00:22:33,840

and i have to share a little private

493

00:22:38,950 --> 00:22:36,159

story my daughter and i are real wizard

494

00:22:40,950 --> 00:22:38,960

of oz affectionately we launch you know

495

00:22:42,549 --> 00:22:40,960

then that night everything went

496

00:22:44,310 --> 00:22:42,559

absolutely perfect

497

00:22:46,549 --> 00:22:44,320

we're on orbit

498

00:22:48,870 --> 00:22:46,559

and uh the wake up music

499

00:22:50,149 --> 00:22:48,880

for our first day on orbit was judy

500

00:22:52,789 --> 00:22:50,159

garland singing somewhere over the

501
00:23:02,470 --> 00:22:52,799
rainbow and man it brought tears to my

502
00:23:06,310 --> 00:23:04,390
and i always tell folks somewhere over

503
00:23:07,990 --> 00:23:06,320
the rainbow dreams come true because we

504
00:23:08,950 --> 00:23:08,000
launched over that rainbow that night

505
00:23:12,549 --> 00:23:08,960
and

506
00:23:15,350 --> 00:23:12,559
everything went absolutely perfect

507
00:23:17,830 --> 00:23:15,360
two station components built in two

508
00:23:18,710 --> 00:23:17,840
different countries meet for the first

509
00:23:20,470 --> 00:23:18,720
time

510
00:23:22,549 --> 00:23:20,480
in space

511
00:23:25,270 --> 00:23:22,559
the shuttle robot arm does the heavy

512
00:23:27,590 --> 00:23:25,280
lifting and a series of space walks

513
00:23:28,710 --> 00:23:27,600

finishes the job of connecting them

514

00:23:30,710 --> 00:23:28,720

together

515

00:23:33,830 --> 00:23:30,720

i was fortunate enough to be assigned to

516

00:23:37,110 --> 00:23:33,840

the very first assembly flight

517

00:23:38,230 --> 00:23:37,120

which was a tremendous feeling for me to

518

00:23:40,070 --> 00:23:38,240

be

519

00:23:42,390 --> 00:23:40,080

in at the very ground floor and

520

00:23:44,470 --> 00:23:42,400

basically laying the cornerstones of the

521

00:23:48,149 --> 00:23:44,480

international space station

522

00:23:51,669 --> 00:23:48,159

over many missions piece by piece

523

00:23:53,350 --> 00:23:51,679

the shuttle brings up station components

524

00:23:55,830 --> 00:23:53,360

more laboratories

525

00:23:57,909 --> 00:23:55,840

solar arrays and segments of the

526
00:24:00,470 --> 00:23:57,919
enormous station truss

527
00:24:02,549 --> 00:24:00,480
the backbone of the station

528
00:24:10,549 --> 00:24:02,559
the station becomes the largest

529
00:24:15,269 --> 00:24:12,870
the station was humongous

530
00:24:18,070 --> 00:24:15,279
the size of two football fields eight

531
00:24:20,789 --> 00:24:18,080
habitable modules six people permanently

532
00:24:22,630 --> 00:24:20,799
inhabiting it was a living laboratory

533
00:24:25,990 --> 00:24:22,640
that we walked in with people inside

534
00:24:28,070 --> 00:24:26,000
with life with stuff everywhere it was

535
00:24:29,029 --> 00:24:28,080
humongous compared to what it seemed

536
00:24:31,830 --> 00:24:29,039
before

537
00:24:34,789 --> 00:24:31,840
as a final mission for the space shuttle

538
00:24:38,149 --> 00:24:34,799

building the international space station

539

00:24:39,830 --> 00:24:38,159

may be the most lasting achievement

540

00:24:41,990 --> 00:24:39,840

so the space station would never been

541

00:24:44,149 --> 00:24:42,000

possible without the space shuttle it's

542

00:24:45,909 --> 00:24:44,159

a phenomenal accomplishment

543

00:24:47,909 --> 00:24:45,919

when you consider not just the

544

00:24:49,510 --> 00:24:47,919

engineering of it i mean here's hardware

545

00:24:51,669 --> 00:24:49,520

from around the world that comes

546

00:24:53,669 --> 00:24:51,679

together in space is put together and

547

00:24:56,230 --> 00:24:53,679

works for the first time

548

00:24:58,789 --> 00:24:56,240

but the cultural differences between you

549

00:25:01,110 --> 00:24:58,799

know japan issa and all its partners

550

00:25:03,350 --> 00:25:01,120

united states canada russia and and

551
00:25:06,390 --> 00:25:03,360
we're all working together as one and

552
00:25:08,549 --> 00:25:06,400
that that is really a fantastic model

553
00:25:10,070 --> 00:25:08,559
and a great model for the future when we

554
00:25:20,710 --> 00:25:10,080
eventually explore beyond our home

555
00:25:24,470 --> 00:25:22,470
for the thousands coming to view the

556
00:25:26,390 --> 00:25:24,480
launch the troubles began early this

557
00:25:28,070 --> 00:25:26,400
morning the roads leading to the space

558
00:25:30,230 --> 00:25:28,080
center were jammed hours before the

559
00:25:31,990 --> 00:25:30,240
scheduled liftoff these people were here

560
00:25:33,590 --> 00:25:32,000
because they believe in the shuttle and

561
00:25:36,070 --> 00:25:33,600
they wanted to show it

562
00:25:38,070 --> 00:25:36,080
history is being made i want to be right

563
00:25:39,830 --> 00:25:38,080

there right well that was being made

564

00:25:41,909 --> 00:25:39,840

well i'd like to be an astronaut but you

565

00:25:43,669 --> 00:25:41,919

know it takes a lot of courage and i'd

566

00:25:45,269 --> 00:25:43,679

be scared to go up there right now i've

567

00:25:47,750 --> 00:25:45,279

seen more launches than anybody else

568

00:25:49,510 --> 00:25:47,760

here and everyone is just as exciting

569

00:25:52,149 --> 00:25:49,520

but this means more to me than any other

570

00:26:11,350 --> 00:25:52,159

i think what does it mean to me

571

00:26:14,630 --> 00:26:12,950

well i definitely think since the

572

00:26:15,990 --> 00:26:14,640

shuttle was invented it was

573

00:26:17,590 --> 00:26:16,000

people they thought it was like a

574

00:26:19,350 --> 00:26:17,600

revolutionary

575

00:26:22,230 --> 00:26:19,360

thing and it's definitely helped us to

576

00:26:24,149 --> 00:26:22,240

build iss and

577

00:26:26,630 --> 00:26:24,159

i'm kind of sad to see they're retiring

578

00:26:28,149 --> 00:26:26,640

it i mean i always loved to watch on tv

579

00:26:30,149 --> 00:26:28,159

when they first

580

00:26:32,390 --> 00:26:30,159

started when they shot them in the air

581

00:26:34,950 --> 00:26:32,400

i've always been fascinated with rockets

582

00:26:36,390 --> 00:26:34,960

but shuttles they just really astound me

583

00:26:38,390 --> 00:26:36,400

i believe that

584

00:26:40,789 --> 00:26:38,400

the space shuttle program is one of the

585

00:26:42,789 --> 00:26:40,799

most significant engineering feats that

586

00:26:43,430 --> 00:26:42,799

the united states has ever been involved

587

00:26:44,149 --> 00:26:43,440

in

588

00:26:53,190 --> 00:26:44,159

the

589

00:26:56,070 --> 00:26:53,200

memorable experience i've ever had it is

590

00:26:57,590 --> 00:26:56,080

an awesome awesome experience you when

591

00:26:59,029 --> 00:26:57,600

you explore you're always looking

592

00:27:02,390 --> 00:26:59,039

forward you're always looking at what's

593

00:27:04,230 --> 00:27:02,400

next instead of just where you've been

594

00:27:05,990 --> 00:27:04,240

what this shuttle brought i always felt

595

00:27:08,470 --> 00:27:06,000

that apollo lack there's a sense of

596

00:27:11,269 --> 00:27:08,480

science fiction to it here's a

597

00:27:12,870 --> 00:27:11,279

spaceship that you can fly and land and

598

00:27:14,789 --> 00:27:12,880

there was something very romantic about

599

00:27:16,549 --> 00:27:14,799

landing a ship rather than parachuting

600

00:27:18,950 --> 00:27:16,559

down into the water and i think that

601
00:27:21,510 --> 00:27:18,960
captivated people

602
00:27:23,029 --> 00:27:21,520
um i think it's a great deal to america

603
00:27:25,269 --> 00:27:23,039
it allows us to be some of the first

604
00:27:26,470 --> 00:27:25,279
people to explore the world and to be

605
00:27:28,389 --> 00:27:26,480
the leaders to tell the rest of the

606
00:27:30,070 --> 00:27:28,399
world about what's going on in outer

607
00:27:31,830 --> 00:27:30,080
space and to let us know that it's

608
00:27:33,269 --> 00:27:31,840
bigger than just us

609
00:27:34,950 --> 00:27:33,279
well i think it was like a great

610
00:27:36,789 --> 00:27:34,960
experience and we got to explore you

611
00:27:39,750 --> 00:27:36,799
know a lot out of space and about what

612
00:27:44,230 --> 00:27:41,990
it's been a new frontier for america

613
00:27:45,990 --> 00:27:44,240

it's been a chance for us to continue

614

00:27:48,789 --> 00:27:46,000

kind of the american dream of reaching

615

00:27:50,470 --> 00:27:48,799

into new lands and it's given us hope of

616

00:27:52,789 --> 00:27:50,480

being able to continue spreading out

617

00:27:54,950 --> 00:27:52,799

through the universe i would like to see

618

00:27:56,149 --> 00:27:54,960

if we can maybe explore one of the gas

619

00:27:59,029 --> 00:27:56,159

giants

620

00:28:00,149 --> 00:27:59,039

um i would like to go to mars

621

00:28:03,510 --> 00:28:00,159

neptune

622

00:28:07,190 --> 00:28:03,520

i want to go to mars i

623

00:28:08,630 --> 00:28:07,200

want to journey to mercury