



1
00:00:41,869 --> 00:00:37,100
an idea born in unsettled times becomes

2
00:00:45,890 --> 00:00:41,879
a feat of engineering excellence the

3
00:00:50,830 --> 00:00:45,900
most complex machine ever built to bring

4
00:00:53,990 --> 00:00:50,840
humans to and from space Gallery and

5
00:00:57,350 --> 00:00:54,000
eventually construct the next stop on

6
00:01:02,540 --> 00:00:57,360
the road to space exploration we are on

7
00:01:07,160 --> 00:01:04,610
as thirty years of flight draw to a

8
00:01:10,340 --> 00:01:07,170
close its legacy is one of unsurpassed

9
00:01:16,609 --> 00:01:10,350
achievement tragedy overcome and

10
00:01:21,429 --> 00:01:18,630
the NASA space shuttle

11
00:01:24,039 --> 00:01:21,439
[Music]

12
00:01:26,830 --> 00:01:24,049
Space Shuttle Endeavor is rolling out to

13
00:01:28,350 --> 00:01:26,840

launch pad 39a at NASA's Kennedy Space

14

00:01:31,310 --> 00:01:28,360

Center in Florida

15

00:01:35,110 --> 00:01:31,320

[Music]

16

00:01:37,910 --> 00:01:35,120

in 24 missions flown over 20 years

17

00:01:41,200 --> 00:01:37,920

endeavour has logged more than 103

18

00:01:43,240 --> 00:01:41,210

million miles in space

19

00:01:46,860 --> 00:01:43,250

the last of NASA shuttles to be built

20

00:01:50,500 --> 00:01:46,870

endeavour prepares for her final flight

21

00:01:52,650 --> 00:01:50,510

sts-134 I marvel that when I when I see

22

00:01:55,830 --> 00:01:52,660

the space shell up close and personal

23

00:02:00,370 --> 00:01:55,840

behind the panels where we have Hardware

24

00:02:03,250 --> 00:02:00,380

plumbing black boxes electronic devices

25

00:02:05,350 --> 00:02:03,260

and that sort of thing the workmanship

26

00:02:08,770 --> 00:02:05,360

that I see in this is astounding and

27

00:02:10,030 --> 00:02:08,780

that points right at the people that do

28

00:02:12,640 --> 00:02:10,040

this when you integrate all that

29

00:02:14,770 --> 00:02:12,650

together it results in and what I think

30

00:02:18,310 --> 00:02:14,780

has been a marvelous program with the

31

00:02:19,810 --> 00:02:18,320

Space Shuttle well before any shuttle

32

00:02:21,810 --> 00:02:19,820

reaches the launch pad however a

33

00:02:25,510 --> 00:02:21,820

staggering amount of work is required

34

00:02:28,380 --> 00:02:25,520

the parts plans and people necessary to

35

00:02:33,699 --> 00:02:28,390

make each launch span the entire nation

36

00:02:35,890 --> 00:02:33,709

one single goal is the focus the safety

37

00:02:37,360 --> 00:02:35,900

of the orbiter and earth Queen you've

38

00:02:38,650 --> 00:02:37,370

got all these people all these folks

39

00:02:40,750 --> 00:02:38,660

that are in their 20s some of them in

40

00:02:43,510 --> 00:02:40,760

their 30s and they are no kidding in

41

00:02:46,420 --> 00:02:43,520

charge of some part of the space shuttle

42

00:02:48,670 --> 00:02:46,430

some part of the space station or some

43

00:02:51,130 --> 00:02:48,680

part of the plan and every one of those

44

00:02:52,930 --> 00:02:51,140

people absolutely believes that they are

45

00:02:54,580 --> 00:02:52,940

the one that makes the difference on

46

00:03:02,890 --> 00:02:54,590

getting those astronauts back down to

47

00:03:07,880 --> 00:03:05,809

at NASA's Michoud assembly facility in

48

00:03:11,290 --> 00:03:07,890

New Orleans production begins on the

49

00:03:16,490 --> 00:03:11,300

shuttles external fuel tank the last of

50

00:03:18,559 --> 00:03:16,500

136 produced here since 1973 each one a

51
00:03:21,559 --> 00:03:18,569
hundred and fifty four feet tall and

52
00:03:23,600 --> 00:03:21,569
twenty seven point six feet around is

53
00:03:25,370 --> 00:03:23,610
capable of handling five hundred and

54
00:03:29,660 --> 00:03:25,380
thirty-five thousand gallons of liquid

55
00:03:33,440 --> 00:03:29,670
hydrogen and oxygen enough to fill 13375

56
00:03:35,000 --> 00:03:33,450
average household bathtubs three

57
00:03:37,130 --> 00:03:35,010
versions of the external tank were

58
00:03:39,650 --> 00:03:37,140
created during the program in an effort

59
00:03:44,850 --> 00:03:39,660
to reduce the tanks overall weight and

60
00:03:51,900 --> 00:03:48,380
around the same time in Clearfield Utah

61
00:03:54,120 --> 00:03:51,910
technicians at ATK launch systems start

62
00:03:59,390 --> 00:03:54,130
work on the shuttle system solid rocket

63
00:04:05,600 --> 00:04:02,660

together these SRBs produced nearly 6

64

00:04:07,819 --> 00:04:05,610

million pounds of thrust about 83% of a

65

00:04:11,449 --> 00:04:07,829

thrust needed to push the orbiter into

66

00:04:13,550 --> 00:04:11,459

space the remaining 17% is furnished by

67

00:04:14,979 --> 00:04:13,560

the shuttles three main engines fueled

68

00:04:17,749 --> 00:04:14,989

by the external tank

69

00:04:19,969 --> 00:04:17,759

unlike the orange external tank that is

70

00:04:22,370 --> 00:04:19,979

used only once the Boosters detached

71

00:04:23,659 --> 00:04:22,380

themselves and parachute into the

72

00:04:26,659 --> 00:04:23,669

Atlantic Ocean

73

00:04:32,640 --> 00:04:26,669

they are then retrieved refurbished and

74

00:04:37,200 --> 00:04:35,129

the shuttle missions crew is assigned

75

00:04:39,960 --> 00:04:37,210

folks on there that are like my brothers

76

00:04:41,969 --> 00:04:39,970

and sisters I mean we really do get

77

00:04:44,790 --> 00:04:41,979

close after a year training for a flight

78

00:04:46,560 --> 00:04:44,800

and having flown in space together and

79

00:04:48,719 --> 00:04:46,570

there's a special bond that comes with

80

00:04:50,730 --> 00:04:48,729

that right up until launch a shuttle

81

00:04:54,510 --> 00:04:50,740

crew will train in a variety of critical

82

00:04:57,709 --> 00:04:54,520

regimens some basic others specific to

83

00:05:01,519 --> 00:04:57,719

their mission simulators

84

00:05:04,759 --> 00:05:01,529

safety and contingency science

85

00:05:08,929 --> 00:05:04,769

experiments and underwater in the

86

00:05:10,839 --> 00:05:08,939

world's largest indoor pool sts-134

87

00:05:13,669 --> 00:05:10,849

astronauts floating in actual spacesuits

88

00:05:18,729 --> 00:05:13,679

trained to work during extra vehicular

89

00:05:24,109 --> 00:05:22,279

the neutral buoyancy lab or NBL at

90

00:05:26,629 --> 00:05:24,119

NASA's Johnson Space Center in Houston

91

00:05:29,209 --> 00:05:26,639

is the best simulation of microgravity

92

00:05:31,459 --> 00:05:29,219

on earth an ideal for practicing

93

00:05:33,949 --> 00:05:31,469

spacewalks one of the most amazing

94

00:05:37,009 --> 00:05:33,959

facilities that we work in is the NBL

95

00:05:39,049 --> 00:05:37,019

the neutral buoyancy lab and the divers

96

00:05:41,809 --> 00:05:39,059

and the guys who run helped us run the

97

00:05:44,059 --> 00:05:41,819

robotic arm are all there to ensure that

98

00:05:46,339 --> 00:05:44,069

our spacewalks are flawless their

99

00:05:48,769 --> 00:05:46,349

efforts in that pool have helped us and

100

00:05:51,679 --> 00:05:48,779

made us able to have this program every

101
00:05:53,719 --> 00:05:51,689
step of a spacewalk every step of EPA is

102
00:05:54,559 --> 00:05:53,729
so critical and even though we see it

103
00:05:56,509 --> 00:05:54,569
every day

104
00:05:59,269 --> 00:05:56,519
that's what not one little safety tether

105
00:06:01,519 --> 00:05:59,279
could be life or death for every hour

106
00:06:03,499 --> 00:06:01,529
that they spend in orbit they'll spend

107
00:06:06,199 --> 00:06:03,509
five to six hours training for that same

108
00:06:07,759 --> 00:06:06,209
task so we've built up from the suit

109
00:06:09,439 --> 00:06:07,769
engineers and suit technicians who help

110
00:06:10,969 --> 00:06:09,449
them get into the suit now we've got

111
00:06:12,499 --> 00:06:10,979
trainers who help them learn how to use

112
00:06:14,359 --> 00:06:12,509
the suit and learn how to understand the

113
00:06:19,459 --> 00:06:14,369

suit and then we've got divers who

114

00:06:21,259 --> 00:06:19,469

support them whether in the pool the

115

00:06:23,329 --> 00:06:21,269

closer they get to actually flying in

116

00:06:24,799 --> 00:06:23,339

the suit the team of people who help

117

00:06:26,329 --> 00:06:24,809

them tends to grow maybe not

118

00:06:28,439 --> 00:06:26,339

exponentially but it's certainly getting

119

00:06:45,659 --> 00:06:28,449

bigger

120

00:06:49,079 --> 00:06:45,669

a 12-person crews kept a week-long vigil

121

00:06:51,480 --> 00:06:49,089

while the barge carrying with ET made

122

00:06:56,820 --> 00:06:51,490

the 900 mile trek from Louisiana to

123

00:06:59,670 --> 00:06:56,830

Florida's Central East Coast the iconic

124

00:07:03,749 --> 00:06:59,680

orange external tank finally arrives at

125

00:07:06,689 --> 00:07:03,759

the Kennedy Space Center one month later

126

00:07:09,360 --> 00:07:06,699

the et is mated to the solid rocket

127

00:07:12,390 --> 00:07:09,370

boosters to form the backbone of the

128

00:07:17,909 --> 00:07:12,400

stack now all that's missing is the

129

00:07:19,739 --> 00:07:17,919

spacecraft itself when an orbiter

130

00:07:20,820 --> 00:07:19,749

returns from a mission processing for

131

00:07:23,369 --> 00:07:20,830

the next flight begins almost

132

00:07:27,779 --> 00:07:23,379

immediately it's a task requiring no

133

00:07:29,879 --> 00:07:27,789

less than 650,000 hours of labor this

134

00:07:32,129 --> 00:07:29,889

includes the removal of its three liquid

135

00:07:35,100 --> 00:07:32,139

fuel engine and their replacement by

136

00:07:42,760 --> 00:07:35,110

three from the previous mission

137

00:07:45,700 --> 00:07:42,770

[Music]

138

00:07:48,839 --> 00:07:45,710

they've been refurbished inspected and

139

00:07:51,490 --> 00:07:48,849

tested at the Stennis Space Center but

140

00:07:53,559 --> 00:07:51,500

most of its flight preparations complete

141

00:07:57,309 --> 00:07:53,569

endeavour is towed in what is called the

142

00:07:59,080 --> 00:07:57,319

roll over a short rolled over a quarter

143

00:08:00,820 --> 00:07:59,090

mile distance on a thirty six wheeled

144

00:08:05,499 --> 00:08:00,830

vehicle from the orbiter processing

145

00:08:10,020 --> 00:08:05,509

facility the old pf2 the VAB here it

146

00:08:15,690 --> 00:08:13,230

the rollout looking now much like it

147

00:08:18,060 --> 00:08:15,700

will at liftoff the space shuttle is

148

00:08:20,550 --> 00:08:18,070

carried to the launch pad atop the six

149

00:08:23,390 --> 00:08:20,560

million pound crawler-transporter at a

150

00:08:25,200 --> 00:08:23,400

blazing pace of less than a mile amount

151

00:08:27,840 --> 00:08:25,210

not exactly

152

00:08:30,510 --> 00:08:27,850

warp speed at our peak carrying full

153

00:08:33,209 --> 00:08:30,520

load we get a right around 38 feet per

154

00:08:36,570 --> 00:08:33,219

gallon not too bad for an original 1965

155

00:08:41,610 --> 00:08:36,580

hybrid vehicle with low miles the 3.4

156

00:08:44,130 --> 00:08:41,620

mile journey takes up to six hours just

157

00:08:47,220 --> 00:08:44,140

enough time to appreciate the roots

158

00:08:49,350 --> 00:08:47,230

picturesque surroundings Kennedy Space

159

00:08:50,850 --> 00:08:49,360

Center is situated on a National

160

00:08:59,910 --> 00:08:50,860

Wildlife Refuge

161

00:09:03,269 --> 00:08:59,920

[Music]

162

00:09:05,329 --> 00:09:03,279

bald eagles osprey and vultures are just

163

00:09:10,680 --> 00:09:05,339

a few of the scores of bird species

164

00:09:15,689 --> 00:09:13,559

both land and sea are home to a wide

165

00:09:20,819 --> 00:09:15,699

variety of creatures including manatees

166

00:09:25,199 --> 00:09:20,829

dolphins and of course the ever-present

167

00:09:34,439 --> 00:09:25,209

alligator visitors are always urged to

168

00:09:36,629 --> 00:09:34,449

watch their step now on the launch pad

169

00:09:39,389 --> 00:09:36,639

the orbiter is ready to take on its main

170

00:09:42,809 --> 00:09:39,399

pay load testing assures that the multi

171

00:09:44,910 --> 00:09:42,819

ton cargo is secure and safely stowed in

172

00:09:47,160 --> 00:09:44,920

the payload Bay before the technicians

173

00:09:51,710 --> 00:09:47,170

certified the orbiter is ready for

174

00:09:56,610 --> 00:09:54,449

flying t-38 aircraft from Ellington

175

00:09:58,470 --> 00:09:56,620

field and Houston the crew members

176

00:10:01,429 --> 00:09:58,480

arrive at Kennedy's Shuttle Landing

177

00:10:04,939 --> 00:10:03,199

but finally the day comes when you're

178

00:10:06,499 --> 00:10:04,949

there and you're getting ready to launch

179

00:10:07,819 --> 00:10:06,509

and you're going to launch countdown and

180

00:10:09,349 --> 00:10:07,829

it's like going up the hill on that

181

00:10:12,169 --> 00:10:09,359

rollercoaster this is full of

182

00:10:14,210 --> 00:10:12,179

expectation and you're both thrilled and

183

00:10:16,579 --> 00:10:14,220

terrified at the same time because

184

00:10:18,499 --> 00:10:16,589

anything could go wrong but when it goes

185

00:10:20,629 --> 00:10:18,509

right it's a thing of beauty if there

186

00:10:22,879 --> 00:10:20,639

are no issues or concerns technicians

187

00:10:27,739 --> 00:10:22,889

begin fueling the external tank with

188

00:10:30,229 --> 00:10:27,749

volatile liquid hydrogen and oxygen the

189

00:10:32,719 --> 00:10:30,239

predominant emotion is pride there's a

190

00:10:35,119 --> 00:10:32,729

tremendous sense of pride in all that

191

00:10:37,039 --> 00:10:35,129

that not only that you do but that your

192

00:10:39,139 --> 00:10:37,049

teammates do that people in this this

193

00:10:43,039 --> 00:10:39,149

very firing room do and folks all across

194

00:10:45,799 --> 00:10:43,049

the country this is shuttle launch

195

00:10:48,619 --> 00:10:45,809

control t-minus nine minutes at the

196

00:10:52,369 --> 00:10:48,629

t-minus nine minute plate the launch

197

00:10:53,629 --> 00:10:52,379

director leads one finally we finally

198

00:10:54,229 --> 00:10:53,639

come out of the hold at t-minus nine

199

00:10:57,559 --> 00:10:54,239

minutes

200

00:10:59,269 --> 00:10:57,569

I sit back and watch my data but I know

201
00:11:01,909 --> 00:10:59,279
that there are souls on board that's

202
00:11:03,649 --> 00:11:01,919
chef Anne whose lives are depending on

203
00:11:07,549 --> 00:11:03,659
the launch team to make the right

204
00:11:09,879 --> 00:11:07,559
decisions because I don't think about

205
00:11:12,849 --> 00:11:09,889
that consciously

206
00:11:15,569 --> 00:11:12,859
the decision-maker launched authority

207
00:11:18,009 --> 00:11:15,579
and responsibility I know what's there

208
00:11:21,009 --> 00:11:18,019
but I do think consciously about the

209
00:11:22,689 --> 00:11:21,019
crew and the people were about to about

210
00:11:28,419 --> 00:11:22,699
to put on top of a controlled explosion

211
00:11:31,619 --> 00:11:28,429
and get to order verify ready to reserve

212
00:11:38,859 --> 00:11:31,629
count at Dover 1 OKC

213
00:11:41,249 --> 00:11:38,869

pvp pvp go EP 6 pcs go help you Houston

214

00:11:44,019 --> 00:11:41,259

flight is go after nearly three years

215

00:11:48,359 --> 00:11:44,029

hundreds of thousands of hours logged by

216

00:11:52,299 --> 00:11:48,369

engineers technicians scientists

217

00:11:56,199 --> 00:11:52,309

seamstresses electricians and other

218

00:12:03,849 --> 00:11:56,209

program workers across the globe we have

219

00:12:11,360 --> 00:12:03,859

main engine start two one the shuttle

220

00:12:18,260 --> 00:12:15,590

at liftoff 6.6 million pounds of thrust

221

00:12:21,920 --> 00:12:18,270

begin hurtling the vehicle and crew at

222

00:12:24,950 --> 00:12:21,930

speeds that will reach 17,500 miles per

223

00:12:30,480 --> 00:12:27,330

the shuttle is like no other machine

224

00:12:32,490 --> 00:12:30,490

ever built for its launch to succeed

225

00:12:40,320 --> 00:12:32,500

more than a million parts must move

226

00:12:42,960 --> 00:12:40,330

together perfectly how this engineering

227

00:12:46,200 --> 00:12:42,970

marvel came to be as an amazing story

228

00:12:48,660 --> 00:12:46,210

that begins in the early 1970s the yet

229

00:12:50,670 --> 00:12:48,670

Nam war is divisive and costly the

230

00:12:52,410 --> 00:12:50,680

economy is sliding into recession

231

00:12:56,010 --> 00:12:52,420

and with the race to the moon already

232

00:12:59,810 --> 00:12:56,020

won the Apollo program is cancelled a

233

00:13:02,220 --> 00:12:59,820

[Music]

234

00:13:05,700 --> 00:13:02,230

new mission is sought for NASA to send

235

00:13:07,290 --> 00:13:05,710

humans into space but Mars for many the

236

00:13:10,410 --> 00:13:07,300

next logical step on the path of

237

00:13:13,320 --> 00:13:10,420

exploration is dismissed as too costly a

238

00:13:16,550 --> 00:13:13,330

destination for a country preoccupied

239

00:13:21,180 --> 00:13:16,560

with events back on earth instead on

240

00:13:24,930 --> 00:13:21,190

January 5th 1972 another destination is

241

00:13:28,020 --> 00:13:24,940

selected low-earth orbit as early as the

242

00:13:30,690 --> 00:13:28,030

mid 1960s NASA had concluded that the

243

00:13:34,230 --> 00:13:30,700

technology was available to build and

244

00:13:37,680 --> 00:13:34,240

fly a reusable spacecraft President

245

00:13:40,290 --> 00:13:37,690

Nixon really liked the idea and told the

246

00:13:42,420 --> 00:13:40,300

NASA Administrator go do it and the NASA

247

00:13:43,980 --> 00:13:42,430

Administrator got a call from OMB the

248

00:13:46,320 --> 00:13:43,990

next morning someone there and said hey

249

00:13:48,900 --> 00:13:46,330

what the president really meant to say

250

00:13:52,470 --> 00:13:48,910

was you're gonna get this much money and

251
00:13:55,790 --> 00:13:52,480
so do as best you can with the space

252
00:13:58,140 --> 00:13:55,800
transportation system and our choice

253
00:14:00,240 --> 00:13:58,150
logically was we have to have a vehicle

254
00:14:02,520 --> 00:14:00,250
first and so that that was the birth of

255
00:14:04,200 --> 00:14:02,530
the Space Shuttle as the first in the

256
00:14:07,350 --> 00:14:04,210
three-part space transportation system

257
00:14:09,150 --> 00:14:07,360
many designs were considered often they

258
00:14:11,460 --> 00:14:09,160
combined the best features of different

259
00:14:13,830 --> 00:14:11,470
concepts at that time they were looking

260
00:14:16,080 --> 00:14:13,840
at having jet engines on the shuttle for

261
00:14:18,300 --> 00:14:16,090
landing and for transporting it across

262
00:14:22,010 --> 00:14:18,310
the country the idea of the lifting

263
00:14:23,490 --> 00:14:22,020

bodies was to bring ass home

264

00:14:26,760 --> 00:14:23,500

conventional runway

265

00:14:29,730 --> 00:14:26,770

and previously all of our thick paths

266

00:14:31,770 --> 00:14:29,740

which were capital and down in the ocean

267

00:14:33,870 --> 00:14:31,780

someone came up with the idea of a

268

00:14:36,090 --> 00:14:33,880

vehicle that could land like an airplane

269

00:14:38,190 --> 00:14:36,100

the key thing was to understand

270

00:14:40,860 --> 00:14:38,200

aerodynamic stability across the

271

00:14:43,440 --> 00:14:40,870

hypersonic supersonic subsonic and

272

00:14:46,710 --> 00:14:43,450

landing speed type of environments that

273

00:14:48,030 --> 00:14:46,720

a single vehicle has to fly safely that

274

00:14:49,830 --> 00:14:48,040

was a key thing that was learned from

275

00:14:52,500 --> 00:14:49,840

those and you'll see it reflected in the

276

00:14:55,410 --> 00:14:52,510

shape of the space shuttle one was the

277

00:14:58,080 --> 00:14:55,420

use of a lifting body an aircraft with

278

00:14:59,970 --> 00:14:58,090

no conventional wings only its fuselage

279

00:15:04,140 --> 00:14:59,980

would keep the aircraft airborne and

280

00:15:06,810 --> 00:15:04,150

guided safely back to earth they were

281

00:15:09,840 --> 00:15:06,820

known as a flying bathtub for the first

282

00:15:13,140 --> 00:15:09,850

half the m2 f1 was towed behind a car

283

00:15:15,600 --> 00:15:13,150

souped up potty act whitey Whiteside

284

00:15:18,300 --> 00:15:15,610

drove that Pontiac across the light that

285

00:15:21,000 --> 00:15:18,310

at about 120 miles per hour dragging us

286

00:15:23,160 --> 00:15:21,010

flying bathtub behind it as well as

287

00:15:31,780 --> 00:15:23,170

ground breaking their tests could also

288

00:15:38,990 --> 00:15:37,010

the x24 be a lifting body with wings was

289

00:15:41,360 --> 00:15:39,000

the first such craft to land on an

290

00:15:43,220 --> 00:15:41,370

actual runway as all shuttles would

291

00:15:46,820 --> 00:15:43,230

eventually do early on the space shuttle

292

00:15:48,890 --> 00:15:46,830

was going to have jet engines to return

293

00:15:52,030 --> 00:15:48,900

for horizontal landing much like an

294

00:15:53,720 --> 00:15:52,040

airliner the x-15 had proven fairly

295

00:15:55,760 --> 00:15:53,730

specifically that they can make

296

00:15:58,400 --> 00:15:55,770

horizontal landings very accurately

297

00:16:00,280 --> 00:15:58,410

unpowered flying a steep glide slope

298

00:16:02,630 --> 00:16:00,290

that they could do a horizontal

299

00:16:05,540 --> 00:16:02,640

unpowered landing with the shuttle as

300

00:16:09,020 --> 00:16:05,550

they tried to narrow its size shape and

301
00:16:11,200 --> 00:16:09,030
weight engineers also considered how

302
00:16:13,310 --> 00:16:11,210
this new orbiter would be propelled

303
00:16:15,410 --> 00:16:13,320
safely out of the reach of Earth's

304
00:16:18,080 --> 00:16:15,420
gravity at the Marshall Space Flight

305
00:16:21,740 --> 00:16:18,090
Center in Huntsville home of the rockets

306
00:16:29,240 --> 00:16:21,750
that had sent every Mercury Gemini and

307
00:16:30,730 --> 00:16:29,250
Apollo astronaut into space design teams

308
00:16:33,530 --> 00:16:30,740
would devise the partially reusable

309
00:16:36,870 --> 00:16:33,540
propulsion system that would finally be

310
00:16:40,290 --> 00:16:38,460
the main engines were always something

311
00:16:44,040 --> 00:16:40,300
we paid very close attention to lots of

312
00:16:47,250 --> 00:16:44,050
moving parts lots of lots of high-energy

313
00:16:49,650 --> 00:16:47,260

and very tight places and very cold

314

00:16:56,520 --> 00:16:49,660

liquid open one side of a very small

315

00:17:01,230 --> 00:16:58,620

and that thing finally that off for me

316

00:17:02,730 --> 00:17:01,240

it just showed the power of a space

317

00:17:04,260 --> 00:17:02,740

shuttle main engine in and then there's

318

00:17:06,810 --> 00:17:04,270

three on the back of an orbiter and then

319

00:17:09,420 --> 00:17:06,820

there's the two solid rocket motors that

320

00:17:10,590 --> 00:17:09,430

was probably the spark that got me so

321

00:17:12,300 --> 00:17:10,600

interested in the space shuttle program

322

00:17:14,940 --> 00:17:12,310

in general and what it took to actually

323

00:17:17,430 --> 00:17:14,950

get one engine to light much less three

324

00:17:20,250 --> 00:17:17,440

and two boosters to take the shuttle to

325

00:17:22,860 --> 00:17:20,260

orbit as for the orbiter spiraling costs

326
00:17:25,800 --> 00:17:22,870
forced NASA to abandon equipping it with

327
00:17:27,180 --> 00:17:25,810
its own jet engines and escape pod

328
00:17:30,960 --> 00:17:27,190
originally it was going to be an

329
00:17:33,330 --> 00:17:30,970
air-breathing airplane that would fly to

330
00:17:35,130 --> 00:17:33,340
space as a rocket and then come back to

331
00:17:37,980 --> 00:17:35,140
earth the orbital maneuvering system

332
00:17:40,440 --> 00:17:37,990
pods that sit on the back now we're to

333
00:17:41,820 --> 00:17:40,450
be where deployable air breathing

334
00:17:44,430 --> 00:17:41,830
engines would come out and it would be

335
00:17:45,930 --> 00:17:44,440
able to fly from its intended point of

336
00:17:47,910 --> 00:17:45,940
landing to another place if the weather

337
00:17:51,210 --> 00:17:47,920
were bad or something like that NASA's

338
00:17:54,270 --> 00:17:51,220

new shuttle would essentially glide its

339

00:17:55,800 --> 00:17:54,280

way back to earth producing the

340

00:17:58,050 --> 00:17:55,810

components of this new space

341

00:18:00,210 --> 00:17:58,060

transportation system fell to familiar

342

00:18:02,220 --> 00:18:00,220

names in the space industry prime

343

00:18:03,870 --> 00:18:02,230

contractor Rockwell North American now

344

00:18:07,110 --> 00:18:03,880

Boeing had built the Apollo

345

00:18:10,320 --> 00:18:07,120

command/service module Morton Thiokol

346

00:18:12,930 --> 00:18:10,330

now ATK would build the solid rocket

347

00:18:16,670 --> 00:18:12,940

boosters and martin marietta now

348

00:18:18,750 --> 00:18:16,680

Lockheed Martin would construct the et

349

00:18:21,090 --> 00:18:18,760

responsibility for producing the space

350

00:18:24,030 --> 00:18:21,100

shuttles main engines went to Rocketdyne

351

00:18:26,100 --> 00:18:24,040

now Pratt Whitney there's a lot of

352

00:18:28,020 --> 00:18:26,110

teamwork that was going on it was

353

00:18:31,980 --> 00:18:28,030

bringing people from all across the

354

00:18:34,950 --> 00:18:31,990

country from Kennedy from Johnson from

355

00:18:36,840 --> 00:18:34,960

Marshall so many people involved that

356

00:18:38,910 --> 00:18:36,850

had to have work together know at the

357

00:18:40,850 --> 00:18:38,920

beginning there was a lot of anxiety

358

00:18:43,350 --> 00:18:40,860

that we weren't going to work together

359

00:18:44,670 --> 00:18:43,360

but when people got to know each other

360

00:18:47,790 --> 00:18:44,680

and could trust each other

361

00:18:50,400 --> 00:18:47,800

that's when the work became it was an

362

00:18:52,110 --> 00:18:50,410

amazing vehicle and a lot of ways way

363

00:18:54,840 --> 00:18:52,120

ahead of its time to have a reusable

364

00:18:58,150 --> 00:18:54,850

spacecraft they could carry such

365

00:19:02,200 --> 00:18:58,160

tremendous amounts of cargo

366

00:19:05,110 --> 00:19:02,210

to space was unprecedented September

367

00:19:07,780 --> 00:19:05,120

1976 more than four-and-a-half years

368

00:19:10,500 --> 00:19:07,790

after President Nixon signed off on its

369

00:19:13,870 --> 00:19:10,510

development America's new spacecraft

370

00:19:16,360 --> 00:19:13,880

Constitution gets its first close up

371

00:19:17,920 --> 00:19:16,370

before the cameras the orbiter itself is

372

00:19:20,620 --> 00:19:17,930

well received by the public but

373

00:19:22,840 --> 00:19:20,630

impassioned fans of a particular long

374

00:19:25,240 --> 00:19:22,850

cancelled television series called Star

375

00:19:27,970 --> 00:19:25,250

Trek wanted it called something else

376

00:19:30,280 --> 00:19:27,980

they staged a successful write-in

377

00:19:33,580 --> 00:19:30,290

campaign and the orbiter was renamed for

378

00:19:36,790 --> 00:19:33,590

the starship featured on the show

379

00:19:40,360 --> 00:19:36,800

thus NASA's new shuttle would be the

380

00:19:47,030 --> 00:19:40,370

enterprise boldly going as no spacecraft

381

00:19:58,790 --> 00:19:50,700

whatever its name this bird still needed

382

00:20:05,070 --> 00:20:02,210

in an age before computer simulations

383

00:20:07,710 --> 00:20:05,080

balsa wood models and Windtunnel testing

384

00:20:10,230 --> 00:20:07,720

was the only means to test the airliner

385

00:20:13,470 --> 00:20:10,240

sized glider we put together a very

386

00:20:15,990 --> 00:20:13,480

aggressive flight test profile that

387

00:20:17,970 --> 00:20:16,000

consisted of data points continuously

388

00:20:20,250 --> 00:20:17,980

all the way down they were just not

389

00:20:23,130 --> 00:20:20,260

there was not a matter of ten seconds

390

00:20:25,800 --> 00:20:23,140

went by without another either a pitch

391

00:20:28,920 --> 00:20:25,810

doublet or a rudder kick or an angle of

392

00:20:30,900 --> 00:20:28,930

attack sweep the things that really turn

393

00:20:31,950 --> 00:20:30,910

on a test pilot to fly them as

394

00:20:35,220 --> 00:20:31,960

accurately as possible

395

00:20:37,380 --> 00:20:35,230

August 12th 1977 on a crystal-clear

396

00:20:40,650 --> 00:20:37,390

California morning high above the Mojave

397

00:20:43,650 --> 00:20:40,660

Desert to NASA test pilots ready for

398

00:20:46,290 --> 00:20:43,660

enterprises first flight the plan was

399

00:20:49,700 --> 00:20:46,300

for Fred Hayes jr. and Gordon Fullerton

400

00:20:53,760 --> 00:20:49,710

to lift the orbiter off a modified 747

401
00:20:56,580 --> 00:20:53,770
then land on a dry lakebed 15,000 feet

402
00:21:00,180 --> 00:20:56,590
below the thing that we were most

403
00:21:02,370 --> 00:21:00,190
concerned about was if we were going to

404
00:21:04,650 --> 00:21:02,380
be able to get to a launch speed if Fitz

405
00:21:07,500 --> 00:21:04,660
Fulton was going to be able to put the

406
00:21:09,990 --> 00:21:07,510
747 into a slight dive so that we would

407
00:21:12,570 --> 00:21:10,000
have enough lift on the enterprise to

408
00:21:14,370 --> 00:21:12,580
when he did push the separation button

409
00:21:16,770 --> 00:21:14,380
blow the bolts to lift away from the

410
00:21:19,050 --> 00:21:16,780
airplane without hidden fits his tail

411
00:21:25,110 --> 00:21:19,060
and of course both of us were interested

412
00:21:28,200 --> 00:21:25,120
in the pilots on the 747 Fitz Fulton and

413
00:21:30,270 --> 00:21:28,210

Tom mcmerkin sit and wait for the

414

00:21:32,430 --> 00:21:30,280

command to release and steer their

415

00:21:34,320 --> 00:21:32,440

massive aircraft out from under

416

00:21:37,230 --> 00:21:34,330

enterprise there were still questions

417

00:21:38,850 --> 00:21:37,240

about whether they gonna actually happen

418

00:21:40,919 --> 00:21:38,860

as we

419

00:21:44,190 --> 00:21:40,929

from those simulations and the analysis

420

00:21:46,830 --> 00:21:44,200

and everything there's a very loud thump

421

00:21:48,630 --> 00:21:46,840

when the shuttle separates there was

422

00:21:52,080 --> 00:21:48,640

always a question was coming on slide

423

00:21:54,899 --> 00:21:52,090

back hit the tail at 747 but we couldn't

424

00:21:56,370 --> 00:21:54,909

see that but we could after a few

425

00:21:59,490 --> 00:21:56,380

seconds we could tell it didn't hit us

426
00:22:02,159 --> 00:21:59,500
and so the chase called clear once we

427
00:22:04,380 --> 00:22:02,169
reached the 240 knots and Fitz called on

428
00:22:06,060 --> 00:22:04,390
speed I think he really pushed some of

429
00:22:07,680 --> 00:22:06,070
the sensors he was looking at in order

430
00:22:10,259 --> 00:22:07,690
to let us get to there but and we

431
00:22:14,460 --> 00:22:10,269
appreciated that but once once we heard

432
00:22:17,460 --> 00:22:14,470
fit say on speed I pushed the separation

433
00:22:19,279 --> 00:22:17,470
button and we we just broke free we had

434
00:22:21,450 --> 00:22:19,289
about one and a half G's of lift

435
00:22:23,730 --> 00:22:21,460
honestly that was probably the most

436
00:22:28,980 --> 00:22:23,740
exciting moment in the approach and

437
00:22:31,500 --> 00:22:28,990
landing test to feel and be there when

438
00:22:33,750 --> 00:22:31,510

the shuttle separated from the platform

439

00:22:35,190 --> 00:22:33,760

ever file accounts this first freefall

440

00:22:38,080 --> 00:22:35,200

test is a success

441

00:22:41,170 --> 00:22:38,090

[Music]

442

00:22:43,870 --> 00:22:41,180

five weeks later Enterprise is brought

443

00:22:46,420 --> 00:22:43,880

to twenty two thousand for her second

444

00:22:48,340 --> 00:22:46,430

freefall test pilots Joe Engel and dick

445

00:22:50,590 --> 00:22:48,350

truly have only two minutes to capture

446

00:22:53,170 --> 00:22:50,600

flight and maneuvering data before

447

00:22:55,690 --> 00:22:53,180

landing the aircraft again without any

448

00:22:57,940 --> 00:22:55,700

engine it was a real team effort the

449

00:23:00,280 --> 00:22:57,950

challenge was for dick truly and I to

450

00:23:03,490 --> 00:23:00,290

fly that profile and fly those data

451
00:23:05,560 --> 00:23:03,500
points those maneuvers as precisely as

452
00:23:07,780 --> 00:23:05,570
possible to give them the best data

453
00:23:11,770 --> 00:23:07,790
possible it was it was a test pilot ream

454
00:23:14,200 --> 00:23:11,780
a total of 16 taxi captive and drop

455
00:23:16,660 --> 00:23:14,210
tests confirm the sounds of the crafts

456
00:23:27,920 --> 00:23:16,670
design and green-lighted production of

457
00:23:27,930 --> 00:23:42,980
[Music]

458
00:23:47,340 --> 00:23:45,600
Columbia NASA's first orbiter is

459
00:23:52,100 --> 00:23:47,350
fittingly named after the first American

460
00:23:57,680 --> 00:23:54,980
however Columbia quickly becomes a

461
00:23:59,210 --> 00:23:57,690
daunting challenge for NASA it's complex

462
00:24:01,820 --> 00:23:59,220
makeup had engineers struggling

463
00:24:04,880 --> 00:24:01,830

constantly to reduce Columbia's weight

464

00:24:06,980 --> 00:24:04,890

and simplify construction especially

465

00:24:10,370 --> 00:24:06,990

frustrating was keeping the orbiters

466

00:24:13,760 --> 00:24:10,380

ceramic tiles attached to its fuselage

467

00:24:16,760 --> 00:24:13,770

more than \$25,000 fit together to

468

00:24:18,110 --> 00:24:16,770

protect Columbia from the searing 3,000

469

00:24:20,210 --> 00:24:18,120

degree heat of reentry

470

00:24:21,650 --> 00:24:20,220

we were having a lot of problems with

471

00:24:24,890 --> 00:24:21,660

the thermal protection system of the

472

00:24:26,780 --> 00:24:24,900

tiles the way we were trying to glue a

473

00:24:29,960 --> 00:24:26,790

moment with this wouldn't stay off and

474

00:24:32,570 --> 00:24:29,970

we had to come up with a way of making

475

00:24:34,820 --> 00:24:32,580

sure that they'd stay on and we had some

476

00:24:37,340 --> 00:24:34,830

really great people that work that and

477

00:24:38,840 --> 00:24:37,350

that's why it took such a long time I

478

00:24:40,640 --> 00:24:38,850

had hoped it was not going to take that

479

00:24:42,680 --> 00:24:40,650

long since so John and I were named as a

480

00:24:44,990 --> 00:24:42,690

crew so we had a lot more time to Train

481

00:24:46,909 --> 00:24:45,000

than what I had we'd both initially

482

00:24:49,940 --> 00:24:46,919

planned the requirement was to be able

483

00:24:52,270 --> 00:24:49,950

to handle temperatures like 2500 degrees

484

00:24:55,010 --> 00:24:52,280

have to occur on the surface of the the

485

00:24:57,080 --> 00:24:55,020

TPS and that's five times what your oven

486

00:25:00,450 --> 00:24:57,090

is at the home that you bake cookies

487

00:25:05,920 --> 00:25:03,280

the other problem is weight because

488

00:25:09,160 --> 00:25:05,930

after all this is an airplane so you

489

00:25:10,870 --> 00:25:09,170

can't have a metallic system on it that

490

00:25:12,730 --> 00:25:10,880

weighs tons it has to be extremely

491

00:25:15,880 --> 00:25:12,740

lightweight and in fact the shuttle

492

00:25:18,610 --> 00:25:15,890

tiles are about 90% air and that gives

493

00:25:20,320 --> 00:25:18,620

the combination of being able to be

494

00:25:22,780 --> 00:25:20,330

temperature resistant and yet at the

495

00:25:24,420 --> 00:25:22,790

same time light each orbiter has a

496

00:25:27,840 --> 00:25:24,430

unique number of protective tiles

497

00:25:30,910 --> 00:25:27,850

Challenger was built with the most 30

498

00:25:36,160 --> 00:25:30,920

1088 while Atlantis has the fewest a

499

00:25:38,260 --> 00:25:36,170

mere 24,000 177 over in Palmdale they

500

00:25:40,870 --> 00:25:38,270

had put on their first effort of putting

501
00:25:42,220 --> 00:25:40,880
the tiles on to protect the aluminum

502
00:25:45,820 --> 00:25:42,230
from the heating then we're going to get

503
00:25:48,100 --> 00:25:45,830
on reentry and some of those tiles would

504
00:25:50,350 --> 00:25:48,110
they put them on in the daytime next

505
00:25:53,230 --> 00:25:50,360
morning the tiles were on the hangar

506
00:25:54,760 --> 00:25:53,240
floor and so that was real scary that

507
00:25:56,380 --> 00:25:54,770
they we could lose some tiles whether

508
00:25:58,060 --> 00:25:56,390
they're on orbit and really have a

509
00:26:00,550 --> 00:25:58,070
problem with the heat coming back on

510
00:26:02,740 --> 00:26:00,560
reentry Columbia had a lot of tiles

511
00:26:04,990 --> 00:26:02,750
missing yet needed quite a bit of work

512
00:26:10,180 --> 00:26:05,000
before we could deliver it to the Cape

513
00:26:15,200 --> 00:26:10,190

and we scrounged throughout the city of

514

00:26:17,570 --> 00:26:15,210

Lancaster for rkv which was the

515

00:26:20,479 --> 00:26:17,580

the material we use to glue the tiles on

516

00:26:23,749 --> 00:26:20,489

with more glue did keep the tiles in

517

00:26:26,119 --> 00:26:23,759

place however water was literally

518

00:26:28,639 --> 00:26:26,129

ripping them apart it turns out an

519

00:26:31,519 --> 00:26:28,649

instant we hit rained the tiles who

520

00:26:33,950 --> 00:26:31,529

almost exploded the tiles fabrication

521

00:26:36,589 --> 00:26:33,960

process was modified and the problem

522

00:26:38,629 --> 00:26:36,599

overcome other shuttle design features

523

00:26:41,089 --> 00:26:38,639

proved less problematic and more

524

00:26:43,849 --> 00:26:41,099

groundbreaking a computerized digital

525

00:26:46,639 --> 00:26:43,859

flight control system now common in

526

00:26:48,859 --> 00:26:46,649

commercial and military aircraft was

527

00:26:51,919 --> 00:26:48,869

developed for the orbiter in flying the

528

00:26:53,659 --> 00:26:51,929

space shuttle you were so aware that you

529

00:26:55,700 --> 00:26:53,669

aren't necessarily talking to the

530

00:26:57,829 --> 00:26:55,710

shuttle you're talking to a computer who

531

00:27:02,089 --> 00:26:57,839

in turn was going to talk to the to the

532

00:27:04,339 --> 00:27:02,099

shuttle barriers of race and gender were

533

00:27:06,229 --> 00:27:04,349

falling everywhere and America's core of

534

00:27:08,299 --> 00:27:06,239

shuttle astronauts would become more

535

00:27:09,979 --> 00:27:08,309

reflective of the nation it served

536

00:27:12,680 --> 00:27:09,989

there's been a lot that's that the

537

00:27:15,349 --> 00:27:12,690

shuttle era has done to bring space

538

00:27:18,099 --> 00:27:15,359

flight into into the domain of the

539

00:27:21,139 --> 00:27:18,109

average person we know it's not just

540

00:27:23,060 --> 00:27:21,149

crew-cut white test pilots anymore it's

541

00:27:24,889 --> 00:27:23,070

it's the essentially the United Nations

542

00:27:26,269 --> 00:27:24,899

that flies on the space shuttles it's

543

00:27:27,889 --> 00:27:26,279

people of every description that look

544

00:27:29,989 --> 00:27:27,899

very much like the rest of us the

545

00:27:33,680 --> 00:27:29,999

astronaut selection process reflected a

546

00:27:35,509 --> 00:27:33,690

changing nation and the changing NASA at

547

00:27:37,249 --> 00:27:35,519

the time all the astronauts were

548

00:27:39,799 --> 00:27:37,259

military test pilots and there were no

549

00:27:42,349 --> 00:27:39,809

females so it was kind of like one of

550

00:27:43,609 --> 00:27:42,359

those dreams that you hope will happen

551
00:27:47,180 --> 00:27:43,619
someday but you didn't really think

552
00:27:50,719 --> 00:27:47,190
would the NASA astronaut class of 1978

553
00:27:52,690 --> 00:27:50,729
the largest in the agency's history came

554
00:27:56,919 --> 00:27:52,700
from all walks of American life

555
00:27:58,670 --> 00:27:56,929
physicists meteorologists fighter pilots

556
00:28:00,880 --> 00:27:58,680
scientists

557
00:28:03,470 --> 00:28:00,890
for the first time women and

558
00:28:05,870 --> 00:28:03,480
african-americans when I came into the

559
00:28:08,000 --> 00:28:05,880
astronaut program in 78 there were three

560
00:28:09,860 --> 00:28:08,010
african-americans that came in at the

561
00:28:12,860 --> 00:28:09,870
same time and it was the first time that

562
00:28:15,020 --> 00:28:12,870
NASA had hired african-americans we had

563
00:28:17,720 --> 00:28:15,030

Fred Gregory who was a test pilot and

564

00:28:19,640 --> 00:28:17,730

then to Ron McNair who was a mission

565

00:28:21,530 --> 00:28:19,650

specialist and I came in as a mission

566

00:28:23,810 --> 00:28:21,540

specialist so all three of us were

567

00:28:26,180 --> 00:28:23,820

excited about flying in space and we all

568

00:28:28,220 --> 00:28:26,190

all three of us recognized that we were

569

00:28:30,140 --> 00:28:28,230

really going to open up the envelope for

570

00:28:32,450 --> 00:28:30,150

other African Americans to fly in space

571

00:28:34,270 --> 00:28:32,460

while the new class of NASA astronauts

572

00:28:37,910 --> 00:28:34,280

trained for subsequent shuttle flights

573

00:28:46,450 --> 00:28:37,920

Columbia was undergoing preparations for

574

00:28:51,220 --> 00:28:49,149

veteran astronaut John Young one of the

575

00:28:53,980 --> 00:28:51,230

12 men to set foot on the moon is in

576

00:28:58,509 --> 00:28:53,990

command this pilot is first-time flyer

577

00:29:00,399 --> 00:28:58,519

Bob Crippen to be sitting home board and

578

00:29:02,980 --> 00:29:00,409

up there with my buddy John Young and

579

00:29:07,169 --> 00:29:02,990

get to experience the whole thing from a

580

00:29:10,149 --> 00:29:07,179

scent to be an on-orbit flying reentry

581

00:29:17,040 --> 00:29:10,159

it was with more of the high points in

582

00:29:17,050 --> 00:29:33,700

[Music]

583

00:29:38,950 --> 00:29:35,470

together they would travel over a

584

00:29:42,010 --> 00:29:38,960

million miles and circle the earth 36

585

00:29:43,600 --> 00:29:42,020

times the launch finally occurred we've

586

00:29:46,360 --> 00:29:43,610

been waiting and postponing and

587

00:29:47,910 --> 00:29:46,370

postponing and when it finally lifted

588

00:29:51,760 --> 00:29:47,920

off and we knew it was going and

589

00:29:53,140 --> 00:29:51,770

achieved orbit we were wrong and anxious

590

00:29:53,920 --> 00:29:53,150

anticipation for what was going to

591

00:29:55,960 --> 00:29:53,930

happen next

592

00:29:58,780 --> 00:29:55,970

launched like a rocket two days earlier

593

00:30:00,970 --> 00:29:58,790

Columbia lands as a glider on the dry

594

00:30:02,950 --> 00:30:00,980

lake bed of Edwards Air Force Base in

595

00:30:06,280 --> 00:30:02,960

California watching out out the window

596

00:30:08,170 --> 00:30:06,290

watching the sea and the clouds rush by

597

00:30:10,990 --> 00:30:08,180

it actually gave her a sense of speed

598

00:30:13,900 --> 00:30:11,000

more so than then when we were up in

599

00:30:15,340 --> 00:30:13,910

orbit being a child I think they were

600

00:30:17,110 --> 00:30:15,350

all very relieved because they've been

601
00:30:19,300 --> 00:30:17,120
some concern because we had lost some

602
00:30:20,620 --> 00:30:19,310
tiles initially going on the orbit and

603
00:30:22,630 --> 00:30:20,630
they didn't know whether we'd lost any

604
00:30:24,370 --> 00:30:22,640
on the bottom or not slow down over the

605
00:30:26,800 --> 00:30:24,380
San Joaquin Valley we do a big

606
00:30:28,360 --> 00:30:26,810
turnaround to land on the lake bed that

607
00:30:30,490 --> 00:30:28,370
first ride I remember when John went

608
00:30:32,620 --> 00:30:30,500
into a bank of a big left bank I looked

609
00:30:34,780 --> 00:30:32,630
down to lake bed and there's thousands

610
00:30:37,540 --> 00:30:34,790
of people out there I think a child look

611
00:30:40,420 --> 00:30:37,550
at almost folks would come out to see

612
00:30:44,260 --> 00:30:40,430
you later Joe Engle was chased you're

613
00:30:47,080 --> 00:30:44,270

his voice coming in on final talking to

614

00:30:49,000 --> 00:30:47,090

John Young and in the airplane that

615

00:30:51,820 --> 00:30:49,010

they were right on glide slope coming in

616

00:30:54,040 --> 00:30:51,830

for a landing and then have that landing

617

00:30:57,700 --> 00:30:54,050

and then have John Young

618

00:30:57,700 --> 00:30:57,710

do his young dance

619

00:31:03,430 --> 00:31:00,940

he was just so elated it was such a

620

00:31:05,890 --> 00:31:03,440

magnificent flying machine to him at

621

00:31:08,530 --> 00:31:05,900

that time the first time I really saw a

622

00:31:11,140 --> 00:31:08,540

real shuttle with Columbia when it was

623

00:31:12,760 --> 00:31:11,150

out on a lake bed after the landing man

624

00:31:15,970 --> 00:31:12,770

I'm walking around it I couldn't believe

625

00:31:17,560 --> 00:31:15,980

they said that big a mass up in the air

626
00:31:20,290 --> 00:31:17,570
people really thought this was all

627
00:31:22,270 --> 00:31:20,300
impossible so what we do what we have

628
00:31:25,120 --> 00:31:22,280
done and shown and demonstrated through

629
00:31:27,880 --> 00:31:25,130
the shuttle program is we've shown that

630
00:31:28,780 --> 00:31:27,890
we can take the impossible and make it

631
00:31:31,030 --> 00:31:28,790
possible

632
00:31:33,190 --> 00:31:31,040
thousands of spectators lined up along

633
00:31:39,130 --> 00:31:33,200
the landing strip to greet the shuttle

634
00:31:41,350 --> 00:31:39,140
and it's two-man crew anyone who is

635
00:31:43,960 --> 00:31:41,360
associated with the program or they're

636
00:31:45,940 --> 00:31:43,970
just to see the shell returned I think

637
00:31:49,840 --> 00:31:45,950
felt a lot of pride in our country and

638
00:31:52,270 --> 00:31:49,850

our space program and so that those

639

00:31:54,640 --> 00:31:52,280

emotions were you know finally release

640

00:31:58,870 --> 00:31:54,650

and you said wow you know the flight was

641

00:32:00,610 --> 00:31:58,880

done safely they're back home the shell

642

00:32:02,560 --> 00:32:00,620

really does work it's a great program

643

00:32:05,830 --> 00:32:02,570

it's got a great future ahead of hey

644

00:32:07,510 --> 00:32:05,840

this thing works and we got it back all

645

00:32:09,550 --> 00:32:07,520

in one piece which is what we wanted to

646

00:32:11,980 --> 00:32:09,560

do while Columbia's return was

647

00:32:14,350 --> 00:32:11,990

spectacular it would renew NASA

648

00:32:16,900 --> 00:32:14,360

engineers worries about the shuttles

649

00:32:20,380 --> 00:32:16,910

thermal protection system during the

650

00:32:22,470 --> 00:32:20,390

post landing inspection 148 of the

651
00:32:25,870 --> 00:32:22,480
orbiters tiles were found shattered and

652
00:32:28,900 --> 00:32:25,880
16 more were missing due to the effects

653
00:32:31,540 --> 00:32:28,910
of an overpressure wave while that and

654
00:32:33,880 --> 00:32:31,550
other issues were addressed the 50-ton

655
00:32:36,820 --> 00:32:33,890
Columbia would be placed atop the

656
00:32:39,310 --> 00:32:36,830
specially configured 747 and ferried

657
00:32:40,060 --> 00:32:39,320
back to Florida and processing for its

658
00:32:44,590 --> 00:32:40,070
next mission

659
00:32:48,250 --> 00:32:44,600
it's a massive enterprise it's over

660
00:32:51,130 --> 00:32:48,260
eight stories tall sitting on the ground

661
00:32:52,990 --> 00:32:51,140
and it's you never get over that sight

662
00:32:55,480 --> 00:32:53,000
it's really awesome after the shuttle

663
00:32:58,210 --> 00:32:55,490

lands there's a processing procedure for

664

00:33:01,270 --> 00:32:58,220

the show post flighting int checking the

665

00:33:02,340 --> 00:33:01,280

tires checking the struts major get the

666

00:33:04,640 --> 00:33:02,350

right correct measure

667

00:33:08,490 --> 00:33:04,650

and then when the shuttle is ready to

668

00:33:11,430 --> 00:33:08,500

mate with worthy 747 we would tow

669

00:33:14,100 --> 00:33:11,440

underneath and then they would lower the

670

00:33:21,210 --> 00:33:14,110

space shuttle down on the supports on

671

00:33:23,520 --> 00:33:21,220

top of the aircraft take off on take

672

00:33:27,510 --> 00:33:23,530

offs from the extra long runways of

673

00:33:31,710 --> 00:33:29,280

[Music]

674

00:33:34,320 --> 00:33:31,720

the Shuttle Carrier aircraft crew of

675

00:33:35,700 --> 00:33:34,330

four would soon grow accustomed to the

676
00:33:37,799 --> 00:33:35,710
smell of burning rubber

677
00:33:39,990 --> 00:33:37,809
that's the intense heat generated by

678
00:33:42,840 --> 00:33:40,000
their plane spinning tires as they

679
00:33:45,390 --> 00:33:42,850
carried two massive aircraft at more

680
00:33:48,450 --> 00:33:45,400
than 100 miles an hour the average range

681
00:33:50,909 --> 00:33:48,460
of a 747 is about 5,000 miles but due to

682
00:33:53,400 --> 00:33:50,919
its weight configuration and special

683
00:33:56,909 --> 00:33:53,410
flight requirements the SCA can travel

684
00:33:59,850 --> 00:33:56,919
only 1,000 miles at a time a full term

685
00:34:05,520 --> 00:33:59,860
in a jet can take several Ziff country

686
00:34:07,700 --> 00:34:05,530
to avoid bad cruising at more than 250

687
00:34:10,649 --> 00:34:07,710
miles per hour the jumbo jet burns

688
00:34:12,690 --> 00:34:10,659

40,000 pounds of fuel per hour that's a

689

00:34:15,270 --> 00:34:12,700

hundred and thirty pounds per mile or

690

00:34:17,909 --> 00:34:15,280

the length of a football field per

691

00:34:20,520 --> 00:34:17,919

gallon no wonder it has to make several

692

00:34:24,810 --> 00:34:20,530

stops before reaching Florida's east

693

00:34:30,270 --> 00:34:28,290

we would get a spacecraft back go over

694

00:34:32,400 --> 00:34:30,280

it again be sure that we could reuse it

695

00:34:33,840 --> 00:34:32,410

repair it where we had to do had never

696

00:34:35,820 --> 00:34:33,850

been never been done before and so I

697

00:34:37,650 --> 00:34:35,830

think it's one of the marvelous things

698

00:34:40,260 --> 00:34:37,660

about the space shuttle was we found a

699

00:34:43,460 --> 00:34:40,270

way to turn this spacecraft around and

700

00:34:45,900 --> 00:34:43,470

use it again before the end of 1982

701
00:34:48,380 --> 00:34:45,910
Columbia would fly for more mission

702
00:34:51,930 --> 00:34:48,390
liftoff of America's space shuttle

703
00:34:56,350 --> 00:34:51,940
including STS five the first with a crew

704
00:35:01,309 --> 00:34:57,999
[Music]

705
00:35:11,019 --> 00:35:01,319
challenger ii orbit in the shuttle fleet

706
00:35:15,589 --> 00:35:13,759
STS six deployed a communication

707
00:35:18,769 --> 00:35:15,599
satellite and feature the first

708
00:35:21,109 --> 00:35:18,779
spacewalk of the shuttle era just two

709
00:35:22,819 --> 00:35:21,119
months later shuttle Challenger is back

710
00:35:27,920 --> 00:35:22,829
in orbit this time with the first

711
00:35:33,710 --> 00:35:30,859
physicist dr. Sally Ride was a member of

712
00:35:35,960 --> 00:35:33,720
commander Bob Crippen's STS 70 that

713
00:35:40,180 --> 00:35:35,970

deployed Canadian and Indonesian

714

00:35:44,480 --> 00:35:42,519

[Music]

715

00:35:46,160 --> 00:35:44,490

challenger was readied for flight in

716

00:35:48,529 --> 00:35:46,170

less than two minutes another massive

717

00:35:51,289 --> 00:35:48,539

first shuttling the first African

718

00:35:52,400 --> 00:35:51,299

American space an Air Force combat pilot

719

00:35:54,950 --> 00:35:52,410

guy Bluford

720

00:35:56,150 --> 00:35:54,960

for me it was an exciting moment because

721

00:35:59,960 --> 00:35:56,160

it was something that I had been

722

00:36:01,700 --> 00:35:59,970

training for for 15 to 16 months and so

723

00:36:10,650 --> 00:36:01,710

I was looking forward to the experience

724

00:36:16,890 --> 00:36:13,950

in 1984 286 the newest orbiter discovery

725

00:36:20,009 --> 00:36:16,900

would fly a record six missions and

726
00:36:22,620 --> 00:36:20,019
liftoff liftoff of mission 51 d and a

727
00:36:25,529 --> 00:36:22,630
seven-member crew of discovery carrying

728
00:36:28,019 --> 00:36:25,539
into space satellites international

729
00:36:28,769 --> 00:36:28,029
astronauts even a US senator and a

730
00:36:31,309 --> 00:36:28,779
congressman

731
00:36:36,630 --> 00:36:31,319
one year after Discovery's debut

732
00:36:38,730 --> 00:36:36,640
Atlantis flew her first mission a new

733
00:36:39,829 --> 00:36:38,740
orbiter joins a shuttle fleet and it has

734
00:36:44,130 --> 00:36:39,839
cleared the tower

735
00:36:46,319 --> 00:36:44,140
STS 51 J there was also one of seven

736
00:36:47,870 --> 00:36:46,329
classified missions the space shuttle

737
00:36:51,329 --> 00:36:47,880
would fly for the Department of Defense

738
00:36:53,269 --> 00:36:51,339

by the end of 1985 the space shuttle

739

00:36:56,809 --> 00:36:53,279

program had completed 23 issues

740

00:36:59,279 --> 00:36:56,819

including 9 that year alone each

741

00:37:02,460 --> 00:36:59,289

successful flight had the under tenant

742

00:37:05,190 --> 00:37:02,470

consequence of convincing some that

743

00:37:07,740 --> 00:37:05,200

space woman once considered among

744

00:37:10,809 --> 00:37:07,750

humankind's most inherently dangerous

745

00:37:13,839 --> 00:37:10,819

endeavors had become routine

746

00:37:18,219 --> 00:37:13,849

that note would soon be tragically

747

00:37:21,189 --> 00:37:18,229

dispelled well I am so excited to be

748

00:37:23,679 --> 00:37:21,199

here amid much fanfare christa mcauliffe

749

00:37:25,900 --> 00:37:23,689

an elementary school instructor from

750

00:37:28,929 --> 00:37:25,910

Concord New Hampshire had been chosen

751
00:37:31,269 --> 00:37:28,939
from among 11,000 applicants to be

752
00:37:34,029 --> 00:37:31,279
NASA's first teacher in space

753
00:37:36,789 --> 00:37:34,039
I would like to humanize the space age

754
00:37:38,679 --> 00:37:36,799
by giving a perspective from the nine

755
00:37:40,089 --> 00:37:38,689
astronaut because I think the students

756
00:37:42,339 --> 00:37:40,099
will look at that and say this is an

757
00:37:44,289 --> 00:37:42,349
ordinary person this ordinary person is

758
00:37:46,269 --> 00:37:44,299
contributing to history and if they can

759
00:37:47,620 --> 00:37:46,279
make that connection then they're going

760
00:37:48,849 --> 00:37:47,630
to get excited about history they're

761
00:37:50,079 --> 00:37:48,859
gonna get excited about the future

762
00:37:51,999 --> 00:37:50,089
they're going to get excited about space

763
00:37:54,609 --> 00:37:52,009

the American public's interest in its

764

00:37:57,459 --> 00:37:54,619

space program was renewed by her

765

00:37:59,620 --> 00:37:57,469

participation and was eager to see her

766

00:38:02,429 --> 00:37:59,630

alive commanding the flight was dick

767

00:38:04,449 --> 00:38:02,439

Scobee his pilot was Michael Smith

768

00:38:07,779 --> 00:38:04,459

serving as challengers mission

769

00:38:12,130 --> 00:38:07,789

specialists our Judy Resnik Ellison

770

00:38:16,019 --> 00:38:12,140

Onizuka and Ron McNair journey McAuliffe

771

00:38:17,759 --> 00:38:16,029

as a payload specialist was Greg Jarvis

772

00:38:22,029 --> 00:38:17,769

from the start

773

00:38:24,039 --> 00:38:22,039

STS 51 L was plagued by delays mostly

774

00:38:24,759 --> 00:38:24,049

due to unseasonally cold temperatures in

775

00:38:27,489 --> 00:38:24,769

Florida

776

00:38:29,709 --> 00:38:27,499

rather than give pause for thought the

777

00:38:32,799 --> 00:38:29,719

delays only tried the nation's patience

778

00:38:34,359 --> 00:38:32,809

everyone had seemed was itchy to go

779

00:38:36,399 --> 00:38:34,369

January 28th

780

00:38:40,269 --> 00:38:36,409

the ground temperature of launch pad 39b

781

00:38:42,759 --> 00:38:40,279

was a frigid 36 degrees ice could be

782

00:38:45,279 --> 00:38:42,769

seen on the launch vehicle despite

783

00:38:47,979 --> 00:38:45,289

concerns voiced by some shuttle managers

784

00:38:50,829 --> 00:38:47,989

reluctantly decided to press ahead for a

785

00:38:52,559 --> 00:38:50,839

late morning liftoff we have main engine

786

00:38:59,699 --> 00:38:52,569

start

787

00:39:01,620 --> 00:38:59,709

three two one liftoff of the 25th space

788

00:39:11,849 --> 00:39:01,630

shuttle mission and it has cleared the

789

00:39:12,539 --> 00:39:11,859

tower challenger go at throttle up at

790

00:39:14,699 --> 00:39:12,549

11:39

791

00:39:17,579 --> 00:39:14,709

booster twice the speed of sound the

792

00:39:20,419 --> 00:39:17,589

challengers fuselage breaks apart from

793

00:39:26,939 --> 00:39:20,429

the inside out America's space program

794

00:39:30,329 --> 00:39:26,949

suffers its first fatality in flight all

795

00:39:33,179 --> 00:39:30,339

seven challenger crew members okay

796

00:39:35,130 --> 00:39:33,189

everybody stay off the telephones make

797

00:39:37,469 --> 00:39:35,140

sure you maintain all your data start

798

00:39:41,099 --> 00:39:37,479

pulling it together we come together

799

00:39:44,489 --> 00:39:41,109

today to mourn the loss of seven brave

800

00:39:48,479 --> 00:39:44,499

Americans to share the grief that we all

801
00:39:53,189 --> 00:39:48,489
feel and perhaps in that sharing to find

802
00:39:54,929 --> 00:39:53,199
the strength to bear our sorrow and the

803
00:39:58,049 --> 00:39:54,939
courage to look for the seeds of hope

804
00:40:00,179 --> 00:39:58,059
the investigation headed by former

805
00:40:03,599 --> 00:40:00,189
Secretary of State William Rogers would

806
00:40:05,150 --> 00:40:03,609
fault a solid rocket booster re-rendered

807
00:40:08,029 --> 00:40:05,160
affected by the bitter

808
00:40:09,829 --> 00:40:08,039
but the Commission's findings also

809
00:40:12,559 --> 00:40:09,839
addressed the human factor the role

810
00:40:16,249 --> 00:40:12,569
played by shuttle program managers in

811
00:40:19,950 --> 00:40:16,259
sending challenger aloft that day the

812
00:40:23,730 --> 00:40:21,750
it took more than two and a half years

813
00:40:27,090 --> 00:40:23,740

of arduous engineering analysis and

814

00:40:30,510 --> 00:40:27,100

painful soul-searching before a retooled

815

00:40:32,790 --> 00:40:30,520

and reborn shuttle would return to fluid

816

00:40:34,140 --> 00:40:32,800

challenge it was tough because it not

817

00:40:36,000 --> 00:40:34,150

only represented a breakdown in

818

00:40:38,980 --> 00:40:36,010

communications but it just it

819

00:40:41,020 --> 00:40:38,990

represented everything that's wrong

820

00:40:43,750 --> 00:40:41,030

you know wrong about an agency like like

821

00:40:45,760 --> 00:40:43,760

we are we're segments of the agency

822

00:40:48,400 --> 00:40:45,770

weren't talking to each other and didn't

823

00:40:50,620 --> 00:40:48,410

know everything that we should know we

824

00:40:53,590 --> 00:40:50,630

thought we knew where all the risks were

825

00:40:55,450 --> 00:40:53,600

and had them pretty well contained the

826

00:40:56,590 --> 00:40:55,460

solid rocket boosters had called the

827

00:40:59,410 --> 00:40:56,600

accident obviously there was something

828

00:41:01,210 --> 00:40:59,420

that had slipped through so we went back

829

00:41:03,790 --> 00:41:01,220

throughout you know their complete

830

00:41:07,690 --> 00:41:03,800

vehicle all the systems and did a

831

00:41:09,490 --> 00:41:07,700

complete review and trying to find any

832

00:41:10,660 --> 00:41:09,500

other things that we may have missed

833

00:41:12,310 --> 00:41:10,670

that may be lurking there

834

00:41:13,960 --> 00:41:12,320

when things are really starting to look

835

00:41:15,880 --> 00:41:13,970

smooth and you're starting to get maybe

836

00:41:18,010 --> 00:41:15,890

overconfident in a way then it's time

837

00:41:19,870 --> 00:41:18,020

for you to step back think about what

838

00:41:21,790 --> 00:41:19,880

you're doing go back and look do some

839

00:41:23,470 --> 00:41:21,800

additional testing and see if there's

840

00:41:25,720 --> 00:41:23,480

something that you really hadn't

841

00:41:28,510 --> 00:41:25,730

anticipated that is going on with your

842

00:41:30,340 --> 00:41:28,520

systems your a lot of that time we got a

843

00:41:32,470 --> 00:41:30,350

lot of criticism that maybe the agency

844

00:41:34,390 --> 00:41:32,480

lost its edge there were folks inside

845

00:41:35,710 --> 00:41:34,400

the agency that started started losing

846

00:41:36,520 --> 00:41:35,720

their confidence thinking maybe we can't

847

00:41:38,560 --> 00:41:36,530

do this anymore

848

00:41:40,480 --> 00:41:38,570

two and a half years later and we flew

849

00:41:42,160 --> 00:41:40,490

and then landed that flight and showed

850

00:41:43,990 --> 00:41:42,170

that no we really can't overcome really

851
00:41:46,450 --> 00:41:44,000
really large problems will tough

852
00:41:48,340 --> 00:41:46,460
technical problems today just like we

853
00:41:50,680 --> 00:41:48,350
could 10 years ago 20 years ago 150

854
00:41:50,970 --> 00:41:50,690
years ago that was that was an important

855
00:41:56,060 --> 00:41:50,980
milestone

856
00:42:02,710 --> 00:41:57,880
every clears the

857
00:42:05,110 --> 00:42:02,720
on September 29th 1988 975 days after

858
00:42:07,990 --> 00:42:05,120
the loss of Challenger and her crew the

859
00:42:11,380 --> 00:42:08,000
orbiter discovery returns six veteran

860
00:42:14,170 --> 00:42:11,390
astronauts to space to deploy a tracking

861
00:42:18,310 --> 00:42:14,180
and data relay Center important to a

862
00:42:21,190 --> 00:42:18,320
number of NASA missions STS 26 proved to

863
00:42:24,340 --> 00:42:21,200

come back milestone over space chakra

864

00:42:27,310 --> 00:42:24,350

and initiated a tradition that survives

865

00:42:28,930 --> 00:42:27,320

with the program today during the flight

866

00:42:32,530 --> 00:42:28,940

we had roses show up in the Mission

867

00:42:34,990 --> 00:42:32,540

Control Center six roses five red one

868

00:42:36,280 --> 00:42:35,000

white and there was a card attached to

869

00:42:39,310 --> 00:42:36,290

it and it simply said congratulations

870

00:42:41,470 --> 00:42:39,320

return to flight we wish you well and it

871

00:42:44,620 --> 00:42:41,480

was signed Marc Terry and Mackenzie

872

00:42:47,020 --> 00:42:44,630

Shelton didn't know who they were but

873

00:42:48,970 --> 00:42:47,030

after the flight we threw the floral

874

00:42:51,280 --> 00:42:48,980

company we tracked them down so we could

875

00:42:52,900 --> 00:42:51,290

send him some pictures and and something

876

00:42:54,910 --> 00:42:52,910

to thank them for sending the roses to

877

00:42:57,940 --> 00:42:54,920

Mission Control so the next slide

878

00:43:00,460 --> 00:42:57,950

roses show up again and again it's five

879

00:43:02,440 --> 00:43:00,470

roses for the members of the crew and

880

00:43:04,780 --> 00:43:02,450

one rose for those who have lost their

881

00:43:06,430 --> 00:43:04,790

lives in this endeavour and so this

882

00:43:07,960 --> 00:43:06,440

family they have become part of our

883

00:43:10,630 --> 00:43:07,970

family and they haven't missed a flight

884

00:43:12,850 --> 00:43:10,640

since every flight since that time and

885

00:43:14,080 --> 00:43:12,860

in to date and I suspect they're going

886

00:43:17,980 --> 00:43:14,090

to go right with us to the end the

887

00:43:19,000 --> 00:43:17,990

shuttle program STS 26 ended on October

888

00:43:24,330 --> 00:43:19,010

30 1988

889

00:43:30,510 --> 00:43:27,180

with discoveries safe landing on runway

890

00:43:33,140 --> 00:43:30,520

one set the triumphant crew was greeted

891

00:43:38,809 --> 00:43:33,150

warmly by Vice President George Bush on

892

00:43:43,819 --> 00:43:41,089

there's something special about a return

893

00:43:46,370 --> 00:43:43,829

to flight that that makes you you have

894

00:43:48,469 --> 00:43:46,380

some trepidation because it's still

895

00:43:50,239 --> 00:43:48,479

fresh in your mind that you're frail and

896

00:43:54,919 --> 00:43:50,249

and you can make mistakes and you're

897

00:43:56,089 --> 00:43:54,929

human in the spring of 1990 the one and

898

00:43:58,039 --> 00:43:56,099

a half billion dollar Hubble Space

899

00:44:00,559 --> 00:43:58,049

Telescope was loaded into Space Shuttle

900

00:44:03,169 --> 00:44:00,569

Discovery's payload Bay and on April

901
00:44:09,620 --> 00:44:03,179
24th was sent aloft to be deployed to

902
00:44:15,079 --> 00:44:09,630
earth orbit on sts-31 early discovery go

903
00:44:16,809 --> 00:44:15,089
for Hubble release as envisioned Hubble

904
00:44:19,339 --> 00:44:16,819
would return never-before-seen images

905
00:44:21,849 --> 00:44:19,349
detailing our universe as it was

906
00:44:24,469 --> 00:44:21,859
millions upon millions of years before

907
00:44:28,009 --> 00:44:24,479
soon it would become clear that Hubble

908
00:44:29,779 --> 00:44:28,019
pictures were not several days later if

909
00:44:31,969 --> 00:44:29,789
not a couple of weeks we found out after

910
00:44:33,859 --> 00:44:31,979
we were back on earth that it had a

911
00:44:36,019 --> 00:44:33,869
problem with its vision and most of us

912
00:44:38,269 --> 00:44:36,029
were just devastated you know that year

913
00:44:39,679 --> 00:44:38,279

we had this marvelous instrument that we

914

00:44:42,589 --> 00:44:39,689

had put on orbit and it was gonna be

915

00:44:44,989 --> 00:44:42,599

useless it turned out that it wasn't

916

00:44:46,880 --> 00:44:44,999

useless at all because even as with its

917

00:44:49,099 --> 00:44:46,890

flaw it was still a much better

918

00:44:50,899 --> 00:44:49,109

telescope than anything if we had you

919

00:44:53,329 --> 00:44:50,909

know on earth a shuttle mission

920

00:44:55,640 --> 00:44:53,339

dedicated to the telescope's repair was

921

00:44:58,130 --> 00:44:55,650

planned in essence Hubble's

922

00:45:00,229 --> 00:44:58,140

nearsightedness would be corrected with

923

00:45:02,179 --> 00:45:00,239

a new pair of glasses liftoff of the

924

00:45:03,589 --> 00:45:02,189

space shuttle Endeavour on an ambitious

925

00:45:07,579 --> 00:45:03,599

mission to service the Hubble Space

926
00:45:09,669 --> 00:45:07,589
Telescope we finally flew sts-61 which

927
00:45:14,719 --> 00:45:09,679
was the first Hubble servicing nation

928
00:45:16,429 --> 00:45:14,729
absolutely incredible mission you cannot

929
00:45:18,919 --> 00:45:16,439
take the 84 inch mirror out of the

930
00:45:21,079 --> 00:45:18,929
telescope it's part of structure too big

931
00:45:23,749 --> 00:45:21,089
it's there so by putting in one box

932
00:45:25,189 --> 00:45:23,759
called co-star and we're able to correct

933
00:45:27,289 --> 00:45:25,199
air brake light for five other

934
00:45:29,029 --> 00:45:27,299
instruments of all the space shuttle

935
00:45:31,540 --> 00:45:29,039
missions we've flown it was without a

936
00:45:33,790 --> 00:45:31,550
doubt the most ambitious flight

937
00:45:37,720 --> 00:45:33,800
but the one that I think demonstrated

938
00:45:41,200 --> 00:45:37,730

NASA's can-do attitude its technological

939

00:45:45,160 --> 00:45:41,210

skill its technical capability and the

940

00:45:47,310 --> 00:45:45,170

spirit of its people two teams of

941

00:45:50,020 --> 00:45:47,320

astronauts made a record five

942

00:45:53,560 --> 00:45:50,030

back-to-back spacewalks to refurbish

943

00:45:56,810 --> 00:45:53,570

Hubble and realize her potential to all

944

00:46:02,450 --> 00:45:56,820

and a staff

945

00:46:05,609 --> 00:46:02,460

[Music]

946

00:46:10,900 --> 00:46:08,289

while Hubble servicing missions were

947

00:46:13,630 --> 00:46:10,910

very important the true gift of a

948

00:46:17,079 --> 00:46:13,640

maneuverable shuttle assume realized in

949

00:46:19,359 --> 00:46:17,089

a very different rescue mission booster

950

00:46:21,039 --> 00:46:19,369

ignition and liftoff of the maiden

951
00:46:23,620 --> 00:46:21,049
voyage of Endeavour on a satellite

952
00:46:26,970 --> 00:46:23,630
rescue mission months earlier in May of

953
00:46:30,250 --> 00:46:26,980
1992 the seven astronauts of sts-49

954
00:46:32,799 --> 00:46:30,260
overcame initial setbacks to pluck the

955
00:46:35,829 --> 00:46:32,809
hundred and eighty million dollar Intel

956
00:46:39,910 --> 00:46:35,839
SATs six communication satellite from an

957
00:46:42,700 --> 00:46:39,920
unusable orbit it was going to be a very

958
00:46:44,380 --> 00:46:42,710
simple rendezvous you know get close

959
00:46:46,089 --> 00:46:44,390
bring the satellite down close and

960
00:46:47,890 --> 00:46:46,099
grapple it with the remote manipulator

961
00:46:49,630 --> 00:46:47,900
system everything that could go wrong

962
00:46:53,289 --> 00:46:49,640
went wrong they got up there to capture

963
00:46:55,480 --> 00:46:53,299

it the bar we tap the satellite and the

964

00:47:07,690 --> 00:46:55,490

and the with the bar and the satellite

965

00:47:09,609 --> 00:47:07,700

started moving out of control it can be

966

00:47:11,500 --> 00:47:09,619

very difficult catching something like a

967

00:47:14,319 --> 00:47:11,510

tumbling satellite in space the

968

00:47:16,480 --> 00:47:14,329

slightest touch or miss touch by the

969

00:47:18,430 --> 00:47:16,490

astronaut with the equipment and you can

970

00:47:19,900 --> 00:47:18,440

send that satellite tumbling here like

971

00:47:21,970 --> 00:47:19,910

you're the one who I'm in a jar like you

972

00:47:27,069 --> 00:47:21,980

say alright okay the other time right is

973

00:47:29,410 --> 00:47:27,079

just right so it was very touch-and-go

974

00:47:31,960 --> 00:47:29,420

on that mission actually commander Dan

975

00:47:33,970 --> 00:47:31,970

brandenstein and pilot Kevin Chilton are

976

00:47:36,039 --> 00:47:33,980

preparing for the upcoming terminal

977

00:47:37,569 --> 00:47:36,049

initiate burn after several days of

978

00:47:40,299 --> 00:47:37,579

failed attempts with endeavours remote

979

00:47:42,300 --> 00:47:40,309

arm commander Dan brandenstein literally

980

00:47:50,840 --> 00:47:42,310

tries a new approach

981

00:47:53,910 --> 00:47:50,850

yeah real easy guys and endeavors helm

982

00:47:56,330 --> 00:47:53,920

brandenstein delicately maneuvers the

983

00:47:59,940 --> 00:47:56,340

orbiter up to the four and a half tonne

984

00:48:02,610 --> 00:47:59,950

Intelsat six the satellite is is rolling

985

00:48:04,020 --> 00:48:02,620

out of control in three different axes

986

00:48:06,990 --> 00:48:04,030

at once and you could actually fly the

987

00:48:10,830 --> 00:48:07,000

shuttle and fly this maneuver around and

988

00:48:14,790 --> 00:48:10,840

keep it aligned with it right here three

989

00:48:16,530 --> 00:48:14,800

people grabbed 18,000 pounds aware that

990

00:48:18,860 --> 00:48:16,540

any miscue could endanger not only the

991

00:48:21,390 --> 00:48:18,870

satellite but also the ride home

992

00:48:24,540 --> 00:48:21,400

spacewalkers peer through it Tom Akers

993

00:48:33,280 --> 00:48:24,550

and Rick he'd reach out and secure the

994

00:48:48,990 --> 00:48:42,980

[Music]

995

00:48:54,810 --> 00:48:52,890

a night job guys until sat 6 is released

996

00:48:57,120 --> 00:48:54,820

from the cargo bay with a new mini

997

00:48:59,220 --> 00:48:57,130

rocket motor for a gentle push to its

998

00:49:02,890 --> 00:48:59,230

proper orbit where it remains today

999

00:49:07,780 --> 00:49:05,920

and as the shuttle program ature so it

1000

00:49:14,920 --> 00:49:07,790

seemed it relationships between the

1001
00:49:16,930 --> 00:49:14,930
worlds spacefaring nations on STS 47 the

1002
00:49:18,910 --> 00:49:16,940
50th space shuttle mission saw the

1003
00:49:22,690 --> 00:49:18,920
orbiter endeavour back in space on

1004
00:49:24,310 --> 00:49:22,700
September 12 1992 the mission was a

1005
00:49:26,920 --> 00:49:24,320
cooperative Space Lab venture between

1006
00:49:29,140 --> 00:49:26,930
Japan and the United States that brought

1007
00:49:31,390 --> 00:49:29,150
the first Japanese astronaut into orbit

1008
00:49:31,960 --> 00:49:31,400
as a member of the seven person shuttle

1009
00:49:34,990 --> 00:49:31,970
foods

1010
00:49:37,740 --> 00:49:35,000
the Space Shuttle has launched people

1011
00:49:40,420 --> 00:49:37,750
from different nations around this world

1012
00:49:45,850 --> 00:49:40,430
that used to feel they could never ever

1013
00:49:50,500 --> 00:49:45,860

work together and it has ushered us from

1014

00:49:53,440 --> 00:49:50,510

the Cold War to this really cooperative

1015

00:49:55,900 --> 00:49:53,450

space program that we have with our

1016

00:49:58,240 --> 00:49:55,910

international partners including the

1017

00:50:01,630 --> 00:49:58,250

former Soviet regardless of what

1018

00:50:06,010 --> 00:50:01,640

language you speak you speak in love

1019

00:50:08,710 --> 00:50:06,020

space and that's pretty cool people we

1020

00:50:09,680 --> 00:50:08,720

have a lot in common with engineers and

1021

00:50:12,380 --> 00:50:09,690

scientists

1022

00:50:16,160 --> 00:50:12,390

that's kind of fun working program like

1023

00:50:18,529 --> 00:50:16,170

this on february 3rd 1995 Eileen Collins

1024

00:50:20,750 --> 00:50:18,539

the first woman to pilot a shuttle was

1025

00:50:23,329 --> 00:50:20,760

at the helm as discovery gave the u.s.

1026
00:50:23,930 --> 00:50:23,339
its first up-close look at the MIR Space

1027
00:50:25,849 --> 00:50:23,940
Station

1028
00:50:27,700 --> 00:50:25,859
Collins flew the shuttle through a

1029
00:50:30,410 --> 00:50:27,710
series of intricate maneuvers

1030
00:50:33,319 --> 00:50:30,420
approaching within 37 feet of the

1031
00:50:36,440 --> 00:50:33,329
Russian spacecraft and later performing

1032
00:50:38,329 --> 00:50:36,450
the fly around by hand and liftoff with

1033
00:50:39,650 --> 00:50:38,339
a space shuttle Atlantis on a mission

1034
00:50:42,140 --> 00:50:39,660
that will herald a new day of

1035
00:50:45,650 --> 00:50:42,150
international cooperation in space four

1036
00:50:47,690 --> 00:50:45,660
months later on June 27th 1995 shuttle

1037
00:50:51,589 --> 00:50:47,700
Atlantis would lift off from the Kennedy

1038
00:50:54,799 --> 00:50:51,599

Space Center to begin STS 71 the u.s.

1039

00:50:57,170 --> 00:50:54,809

space programs one hundredth human space

1040

00:50:59,029 --> 00:50:57,180

mission it would take two more days

1041

00:51:01,549 --> 00:50:59,039

before Atlantis caught up with and

1042

00:51:09,890 --> 00:51:01,559

performed the first shuttle docking with

1043

00:51:12,220 --> 00:51:09,900

the MIR space station orbiting 220 miles

1044

00:51:15,400 --> 00:51:12,230

above the earth the most unique and

1045

00:51:18,890 --> 00:51:15,410

historic celebration took place

1046

00:51:21,800 --> 00:51:18,900

[Applause]

1047

00:51:25,130 --> 00:51:21,810

as the MIR Space Station welcomed its

1048

00:51:27,620 --> 00:51:25,140

first American guests cosmonauts and

1049

00:51:30,410 --> 00:51:27,630

astronauts together broke figurative

1050

00:51:33,460 --> 00:51:30,420

bread tortillas and fruit to be exact

1051
00:51:36,890 --> 00:51:33,470
in a renewed spirit of cooperation

1052
00:51:39,140 --> 00:51:36,900
together shuttle and MIR formed the

1053
00:51:42,770 --> 00:51:39,150
largest flying spacecraft the world had

1054
00:51:45,080 --> 00:51:42,780
yet to see it tipped the scales at 250

1055
00:51:49,370 --> 00:51:45,090
metric tons more than a half a million

1056
00:51:52,160 --> 00:51:49,380
pounds between 1994 98 the shuttle-mir

1057
00:51:57,110 --> 00:51:52,170
program would involve 11 shuttle

1058
00:51:59,870 --> 00:51:57,120
missions including in 1996 STS 76 which

1059
00:52:02,330 --> 00:51:59,880
he began a continuous u.s. presence

1060
00:52:05,510 --> 00:52:02,340
aboard the Russian space station with a

1061
00:52:07,930 --> 00:52:05,520
visit by Atlantis barely fluent in

1062
00:52:10,880 --> 00:52:07,940
Russian astronaut Shannon Lucid a

1063
00:52:12,530 --> 00:52:10,890

biochemist embarked upon a mission that

1064

00:52:15,740 --> 00:52:12,540

would dramatically enhance our

1065

00:52:17,990 --> 00:52:15,750

understanding of life in space when she

1066

00:52:20,810 --> 00:52:18,000

finally landed at Edwards Air Force Base

1067

00:52:23,000 --> 00:52:20,820

on shuttle Atlantis she held the female

1068

00:52:25,670 --> 00:52:23,010

space endurance record for spending a

1069

00:52:29,450 --> 00:52:25,680

hundred and eighty eight days in orbit a

1070

00:52:35,900 --> 00:52:29,460

hero's welcome was in store I'm here to

1071

00:52:39,860 --> 00:52:35,910

say welcome home to Shannon lucid by the

1072

00:52:41,870 --> 00:52:39,870

time shuttle Mir ended with STS 91 seven

1073

00:52:44,180 --> 00:52:41,880

American astronauts had completed

1074

00:52:45,080 --> 00:52:44,190

extended stays aboard the Russian space

1075

00:52:47,150 --> 00:52:45,090

station

1076

00:52:49,310 --> 00:52:47,160

Tatiana met Eva I became very good

1077

00:52:50,870 --> 00:52:49,320

friends with and I remember us sitting

1078

00:52:53,570 --> 00:52:50,880

in Red Square having dinner together

1079

00:52:56,990 --> 00:52:53,580

with a full moon and remembering when I

1080

00:52:58,910 --> 00:52:57,000

was a child all those those parades as

1081

00:53:01,190 --> 00:52:58,920

May Day parades with the tanks going by

1082

00:53:02,260 --> 00:53:01,200

and here we were sitting there having a

1083

00:53:05,630 --> 00:53:02,270

nice dinner under the

1084

00:53:08,990 --> 00:53:05,640

with a lot of friendship so it just goes

1085

00:53:11,029 --> 00:53:09,000

to show how space can unite people and

1086

00:53:14,000 --> 00:53:11,039

that's one of I think one of the biggest

1087

00:53:15,920 --> 00:53:14,010

benefits eight cosmonauts had flown to

1088

00:53:18,319 --> 00:53:15,930

Mir on the u.s. shuttle and NASA

1089

00:53:20,079 --> 00:53:18,329

astronaut norm thagard had become the

1090

00:53:24,090 --> 00:53:20,089

first American to fly there or any

1091

00:53:24,100 --> 00:53:35,280

[Music]

1092

00:53:41,460 --> 00:53:38,850

in 2001 15 years after its commissioning

1093

00:53:44,760 --> 00:53:41,470

Muir would be abandoned to break up and

1094

00:53:47,010 --> 00:53:44,770

burn in Earth's atmosphere by then the

1095

00:53:49,980 --> 00:53:47,020

process of building upon mears legacy of

1096

00:53:52,250 --> 00:53:49,990

international cooperation in space had

1097

00:53:55,410 --> 00:53:52,260

already begun

1098

00:53:57,750 --> 00:53:55,420

whereas sts-61 had helped establish the

1099

00:54:02,220 --> 00:53:57,760

hubble space telescope as an icon of

1100

00:54:05,630 --> 00:54:02,230

American ingenuity sts-95 would update

1101
00:54:11,040 --> 00:54:05,640
the heroes credentials of one john clam

1102
00:54:13,140 --> 00:54:11,050
on october 29th 1998 almost 37 years

1103
00:54:15,540 --> 00:54:13,150
after becoming the first American to

1104
00:54:16,560 --> 00:54:15,550
orbit the earth as an original mercury 7

1105
00:54:20,130 --> 00:54:16,570
astronaut

1106
00:54:23,660 --> 00:54:20,140
Glenn now a 77 year old former US

1107
00:54:26,550 --> 00:54:23,670
senator made his return to space in

1108
00:54:28,980 --> 00:54:26,560
contrast to his first flight a three

1109
00:54:31,920 --> 00:54:28,990
orbit four and a half hour for a inside

1110
00:54:34,170 --> 00:54:31,930
the snug friendship 7 capsule liftoff of

1111
00:54:38,370 --> 00:54:34,180
discovery with a crew of six astronauts

1112
00:54:42,090 --> 00:54:38,380
heroes one American legend sts-95 would

1113
00:54:44,220 --> 00:54:42,100

take eight days and circle the earth 134

1114

00:54:46,470 --> 00:54:44,230

times my main reason for being on that

1115

00:54:50,070 --> 00:54:46,480

shuttle flight was to do research on

1116

00:54:51,810 --> 00:54:50,080

Aging I was 77 we went up and you know

1117

00:54:53,850 --> 00:54:51,820

NASA has charted some 52 different

1118

00:54:55,440 --> 00:54:53,860

things changes that occur in the human

1119

00:54:58,140 --> 00:54:55,450

body and you've been to space for a

1120

00:54:59,580 --> 00:54:58,150

period of time and the several of those

1121

00:55:01,590 --> 00:54:59,590

are very similar to what happens to the

1122

00:55:04,470 --> 00:55:01,600

natural process of Aging right here on

1123

00:55:05,850 --> 00:55:04,480

earth body's immune system changes you

1124

00:55:08,910 --> 00:55:05,860

get less resistant to disease and

1125

00:55:11,460 --> 00:55:08,920

infection body's ability to absorb

1126
00:55:13,140 --> 00:55:11,470
protein back into the muscles changes

1127
00:55:16,470 --> 00:55:13,150
for the young people up there and for

1128
00:55:17,970 --> 00:55:16,480
elderly here on earth the objective was

1129
00:55:20,520 --> 00:55:17,980
to take those things that are the same

1130
00:55:23,880 --> 00:55:20,530
and see if we couldn't find any

1131
00:55:25,380 --> 00:55:23,890
differences between my experience up

1132
00:55:27,900 --> 00:55:25,390
there and they're younger and the

1133
00:55:29,610 --> 00:55:27,910
younger people I would fly with and with

1134
00:55:31,350 --> 00:55:29,620
the idea of finding in the human body

1135
00:55:33,660 --> 00:55:31,360
what turns these different systems on

1136
00:55:35,250 --> 00:55:33,670
and off if we could do that we might be

1137
00:55:37,800 --> 00:55:35,260
able to make it possible for people to

1138
00:55:40,020 --> 00:55:37,810

stay in space longer but without harmful

1139

00:55:41,700 --> 00:55:40,030

effects and maybe cut out some of the

1140

00:55:44,030 --> 00:55:41,710

frailties of old age right here on earth

1141

00:55:46,670 --> 00:55:44,040

I really was happy to be because

1142

00:55:48,800 --> 00:55:46,680

that flight an interesting twist of fate

1143

00:55:51,470 --> 00:55:48,810

astronaut Glenn not only inspired both

1144

00:55:53,810 --> 00:55:51,480

the young and old around the globe but

1145

00:55:56,960 --> 00:55:53,820

also a fresh political science and

1146

00:56:00,320 --> 00:55:56,970

economics graduate lori garver the 18th

1147

00:56:02,960 --> 00:56:00,330

deputy administrator of nasa having the

1148

00:56:05,450 --> 00:56:02,970

ability at nasa to fly him again in

1149

00:56:07,730 --> 00:56:05,460

space after his first flight was

1150

00:56:10,610 --> 00:56:07,740

something we I think gave the nation and

1151
00:56:12,380 --> 00:56:10,620
it really helped explain what we were

1152
00:56:14,330 --> 00:56:12,390
doing on the space shuttle

1153
00:56:16,460 --> 00:56:14,340
John Glenn was very very focused on

1154
00:56:19,460 --> 00:56:16,470
doing that experience those experiments

1155
00:56:22,250 --> 00:56:19,470
for both I think the older generation

1156
00:56:24,410 --> 00:56:22,260
but he was also an inspiration to people

1157
00:56:26,770 --> 00:56:24,420
growing up discovery carried a variety

1158
00:56:29,900 --> 00:56:26,780
of payloads and research experiments

1159
00:56:31,580 --> 00:56:29,910
arguably the one most valuable was Glenn

1160
00:56:33,830 --> 00:56:31,590
himself not only did he provide

1161
00:56:36,590 --> 00:56:33,840
first-time data on what spaceflight

1162
00:56:38,780 --> 00:56:36,600
might do to the body of a septa Gennari

1163
00:56:41,240 --> 00:56:38,790

Glenn also renewed the interest of the

1164

00:56:43,610 --> 00:56:41,250

nation and the world in America's space

1165

00:56:46,190 --> 00:56:43,620

shuttle program while the program had

1166

00:56:48,500 --> 00:56:46,200

and continued to successfully deploy

1167

00:56:51,050 --> 00:56:48,510

winning service science probes and

1168

00:56:53,900 --> 00:56:51,060

satellites as well as conduct on-orbit

1169

00:56:58,010 --> 00:56:53,910

research the Space Shuttle undertook a

1170

00:57:00,950 --> 00:56:58,020

new long-range task perfectly suited to

1171

00:57:02,660 --> 00:57:00,960

her specialized capabilities you've got

1172

00:57:05,720 --> 00:57:02,670

a spacecraft that can carry at least

1173

00:57:08,810 --> 00:57:05,730

seven people into orbit and with those

1174

00:57:12,380 --> 00:57:08,820

seven people you can do a huge amount of

1175

00:57:14,210 --> 00:57:12,390

work one mission you can do multiple evh

1176
00:57:17,270 --> 00:57:14,220
you've got multiple crew members you've

1177
00:57:21,040 --> 00:57:17,280
got a huge payload and it's all kinds of

1178
00:57:23,450 --> 00:57:21,050
capabilities to be able to construct

1179
00:57:25,850 --> 00:57:23,460
less than two weeks after the Glenn's

1180
00:57:28,580 --> 00:57:25,860
returned to Earth a Russian Proton

1181
00:57:31,910 --> 00:57:28,590
rocket departs the Baikonur cosmodrome

1182
00:57:34,040 --> 00:57:31,920
in Kazakhstan carrying the Zarya module

1183
00:57:35,870 --> 00:57:34,050
the first component of the new

1184
00:57:37,940 --> 00:57:35,880
International Space Station liftoff of

1185
00:57:40,040 --> 00:57:37,950
the proton rocket and the Zarya control

1186
00:57:42,230 --> 00:57:40,050
module International Space Station is

1187
00:57:43,700 --> 00:57:42,240
underway two weeks after that space

1188
00:57:47,000 --> 00:57:43,710

shuttle Endeavour follows up with

1189

00:57:49,100 --> 00:57:47,010

delivery of America's unity module the

1190

00:57:53,890 --> 00:57:49,110

second piece of this largest space

1191

00:57:58,950 --> 00:57:55,750

oh yeah

1192

00:58:05,400 --> 00:58:02,040

mob until July 2000 will the Russian

1193

00:58:07,500 --> 00:58:05,410

Zvezda module yet finally allowing for

1194

00:58:09,870 --> 00:58:07,510

treating Russian cosmonauts and their

1195

00:58:12,510 --> 00:58:09,880

American expedition one commander bill

1196

00:58:14,700 --> 00:58:12,520

shepherd to journey aboard a Soyuz

1197

00:58:18,890 --> 00:58:14,710

spacecraft to the International Space

1198

00:58:21,750 --> 00:58:18,900

Station and begin humankind's continuous

1199

00:58:25,260 --> 00:58:21,760

extraterrestrial presence across the

1200

00:58:28,109 --> 00:58:25,270

world people are very very interested in

1201
00:58:30,599 --> 00:58:28,119
and delighted by the International Space

1202
00:58:33,000 --> 00:58:30,609
Station and the science that has taken

1203
00:58:35,309 --> 00:58:33,010
place there since only an orbiters

1204
00:58:38,480 --> 00:58:35,319
payload Bay could hold the station's

1205
00:58:43,170 --> 00:58:38,490
largest components the multi-year

1206
00:58:46,200 --> 00:58:43,180
multi-million servicing of the ISS with

1207
00:58:49,620 --> 00:58:46,210
cargo and crew would become primarily a

1208
00:58:51,930 --> 00:58:49,630
job for the shuttle amid these dynamic

1209
00:58:53,760 --> 00:58:51,940
station building missions one seemingly

1210
00:58:56,579 --> 00:58:53,770
simple and relatively uncomplicated

1211
00:59:00,000 --> 00:58:56,589
flight would prove problematic and

1212
00:59:06,790 --> 00:59:00,010
threaten the very future of America's

1213
00:59:12,080 --> 00:59:09,560

since 1988 the Space Shuttle had

1214

00:59:14,510 --> 00:59:12,090

completed 15 years of successful

1215

00:59:17,359 --> 00:59:14,520

missions each was unique each had its

1216

00:59:19,460 --> 00:59:17,369

own specific goals and tasks and each

1217

00:59:22,430 --> 00:59:19,470

had its own dedicated crew of astronauts

1218

00:59:25,490 --> 00:59:22,440

who trained exhaustively to meet and

1219

00:59:28,270 --> 00:59:25,500

carry them out yet each of those 87

1220

00:59:31,370 --> 00:59:28,280

flights did have two things in common

1221

00:59:33,890 --> 00:59:31,380

the safe launch liftoff of the space

1222

00:59:36,339 --> 00:59:33,900

shuttle Discovery the safe land nose

1223

00:59:42,710 --> 00:59:39,920

for the starch sts-107 seemed to be a

1224

00:59:45,260 --> 00:59:42,720

mission out of sorts by the time

1225

00:59:50,359 --> 00:59:45,270

Columbia was finally ready to fly on

1226

00:59:52,310 --> 00:59:50,369

January 16th 2003 its planned 16-day

1227

00:59:54,859 --> 00:59:52,320

mission had been delayed no fewer than

1228

00:59:57,170 --> 00:59:54,869

18 times all those delays have

1229

00:59:59,240 --> 00:59:57,180

ultimately positioned the sts-107 as a

1230

01:00:01,370 --> 00:59:59,250

sort of black sheep on the space shuttle

1231

01:00:03,380 --> 01:00:01,380

programs launch schedule

1232

01:00:05,750 --> 01:00:03,390

Columbia's crew commander Rick husband

1233

01:00:08,390 --> 01:00:05,760

pilot Willie McCool and mission

1234

01:00:12,250 --> 01:00:08,400

specialists Michael Anderson kapner

1235

01:00:15,620 --> 01:00:12,260

chavala Dave Brown Laurel Clark and

1236

01:00:19,040 --> 01:00:15,630

Israeli astronaut Ilan Ramon would not

1237

01:00:21,290 --> 01:00:19,050

go the National Space Station their

1238

01:00:23,690 --> 01:00:21,300

flight would require nothing more risky

1239

01:00:26,359 --> 01:00:23,700

than orbiting the earth booster ignition

1240

01:00:27,780 --> 01:00:26,369

and liftoff of space shuttle Columbia

1241

01:00:29,550 --> 01:00:27,790

with a multitude

1242

01:00:32,490 --> 01:00:29,560

and International Space Research

1243

01:00:34,710 --> 01:00:32,500

experiments 82 seconds after launch what

1244

01:00:37,530 --> 01:00:34,720

was later described as a suitcase size

1245

01:00:40,590 --> 01:00:37,540

transcript frozen foam insulation breaks

1246

01:00:42,480 --> 01:00:40,600

off Columbia's external tank and strikes

1247

01:00:48,180 --> 01:00:42,490

the leading edge of the orbiters left

1248

01:00:50,390 --> 01:00:48,190

wing a routine same-day video review of

1249

01:00:53,730 --> 01:00:50,400

the launch would reveal nothing unusual

1250

01:00:56,130 --> 01:00:53,740

however higher resolution tracking

1251

01:00:59,280 --> 01:00:56,140

camera film processed overnight and

1252

01:01:02,340 --> 01:00:59,290

reviewed on flight day - by the missions

1253

01:01:04,050 --> 01:01:02,350

assent team showed otherwise you saw

1254

01:01:07,170 --> 01:01:04,060

this little thing float toward the

1255

01:01:09,360 --> 01:01:07,180

leading edge of the wing and like you

1256

01:01:10,650 --> 01:01:09,370

know it was like a snowball hitting

1257

01:01:13,920 --> 01:01:10,660

something and then just being pulverized

1258

01:01:16,980 --> 01:01:13,930

but but when you saw it hit ooh we just

1259

01:01:19,110 --> 01:01:16,990

we just winced because we knew you know

1260

01:01:21,890 --> 01:01:19,120

the vehicles going 500 miles an hour or

1261

01:01:24,650 --> 01:01:21,900

better it was inconceivable in hindsight

1262

01:01:27,900 --> 01:01:24,660

that you could have that kind of impact

1263

01:01:29,970 --> 01:01:27,910

at the speed that the vehicle was going

1264

01:01:32,610 --> 01:01:29,980

and assumed that there was no damage and

1265

01:01:34,710 --> 01:01:32,620

that's what we we allowed ourselves to

1266

01:01:37,380 --> 01:01:34,720

feel comfortable that we were right and

1267

01:01:39,630 --> 01:01:37,390

we were dead wrong due to limitations in

1268

01:01:41,940 --> 01:01:39,640

the visual clarity the exact point of

1269

01:01:44,370 --> 01:01:41,950

impact and extent of any damage could

1270

01:01:46,620 --> 01:01:44,380

not be determined if the foam strike had

1271

01:01:48,750 --> 01:01:46,630

compromised Columbia's integrity little

1272

01:01:51,300 --> 01:01:48,760

if anything can be done to repair the

1273

01:01:54,440 --> 01:01:51,310

orbiter in space one week after launch

1274

01:01:58,110 --> 01:01:54,450

Mission Control emails the crew

1275

01:02:00,210 --> 01:01:58,120

informing of the debris strike save for

1276

01:02:03,180 --> 01:02:00,220

a relatively minor problem with a leaky

1277

01:02:05,730 --> 01:02:03,190

refrigeration unit sts-107 had been

1278

01:02:07,560 --> 01:02:05,740

without further incident as scheduled

1279

01:02:10,230 --> 01:02:07,570

the order is given on the morning of

1280

01:02:12,660 --> 01:02:10,240

February first for the Columbia crew to

1281

01:02:16,530 --> 01:02:12,670

begin the landing procedure and come

1282

01:02:19,020 --> 01:02:16,540

home to Florida traveling in excess of

1283

01:02:21,630 --> 01:02:19,030

12,000 miles per hour the orbiters belly

1284

01:02:24,180 --> 01:02:21,640

begins to glow red as it descends into

1285

01:02:27,540 --> 01:02:24,190

Earth's atmosphere that's why I have

1286

01:02:29,340 --> 01:02:27,550

just lost four separate temperature

1287

01:02:29,790 --> 01:02:29,350

transducers on the left side of the

1288

01:02:32,670 --> 01:02:29,800

vehicle

1289

01:02:34,410 --> 01:02:32,680

hydraulic return temperatures as reentry

1290

01:02:37,200 --> 01:02:34,420

started and as the ground track went

1291

01:02:39,390 --> 01:02:37,210

went across the states there's a the

1292

01:02:40,910 --> 01:02:39,400

ground track that course changes color

1293

01:02:43,270 --> 01:02:40,920

you can tell where the shuttle

1294

01:02:46,010 --> 01:02:43,280

is over what part of the country it is

1295

01:02:48,230 --> 01:02:46,020

well that display stopped update you in

1296

01:02:50,600 --> 01:02:48,240

other words that display to froze in a

1297

01:02:53,000 --> 01:02:50,610

certain position well sometimes you have

1298

01:02:55,490 --> 01:02:53,010

loss of data you have some problem with

1299

01:02:57,170 --> 01:02:55,500

the system on the ground of where you'll

1300

01:03:01,030 --> 01:02:57,180

have those kind of outages temporarily

1301

01:03:03,860 --> 01:03:01,040

well this lasted a bit longer then the

1302

01:03:07,400 --> 01:03:03,870

call went up to the crew you know call

1303

01:03:09,850 --> 01:03:07,410

went up and no response well I know I

1304

01:03:13,030 --> 01:03:09,860

just I just began to feel uneasy

1305

01:03:18,699 --> 01:03:13,040

Columbia Houston UHF comm check

1306

01:03:21,859 --> 01:03:18,709

[Music]

1307

01:03:25,009 --> 01:03:21,869

at speeds above Mach 20 the stress

1308

01:03:28,170 --> 01:03:25,019

becomes too much for the orbiter we do

1309

01:03:31,109 --> 01:03:28,180

not have any valid data at this time

1310

01:03:33,510 --> 01:03:31,119

the suitcase sized chunk of folk had

1311

01:03:35,670 --> 01:03:33,520

indeed touched a bowling ball sized hole

1312

01:03:38,099 --> 01:03:35,680

in the leading edge of Columbia's left

1313

01:03:40,500 --> 01:03:38,109

wing within seconds internal

1314

01:03:42,559 --> 01:03:40,510

temperatures spiked signaling the

1315

01:03:46,140 --> 01:03:42,569

cascade of structural disintegration

1316

01:03:48,539 --> 01:03:46,150

only 16 minutes from home space shuttle

1317

01:03:53,299 --> 01:03:48,549

Columbia breaks apart in the skies over

1318

01:04:09,829 --> 01:03:58,940

GC plant-wide is a block the doors happy

1319

01:04:09,839 --> 01:04:13,839

the grief is heavy

1320

01:04:24,160 --> 01:04:17,529

our nation shares in your sorrow and in

1321

01:04:28,359 --> 01:04:24,170

your pride and today we remember not

1322

01:04:38,640 --> 01:04:28,369

only one moment of tragedy but seven

1323

01:04:43,329 --> 01:04:41,650

within days hundreds of professionals

1324

01:04:45,849 --> 01:04:43,339

from federal and state agencies across

1325

01:04:47,769 --> 01:04:45,859

the country arrived in these Texas they

1326

01:04:50,559 --> 01:04:47,779

are joined by local volunteers to help

1327

01:04:52,930 --> 01:04:50,569

NASA recover and catalog debris from

1328

01:04:55,239 --> 01:04:52,940

Columbia in the hopes of literally

1329

01:04:58,029 --> 01:04:55,249

piecing together an answer to the

1330

01:05:00,279 --> 01:04:58,039

accidents caused this is one of the many

1331

01:05:05,259 --> 01:05:00,289

obstacles investigators are up against

1332

01:05:09,370 --> 01:05:05,269

it was really heartwarming and very

1333

01:05:12,009 --> 01:05:09,380

emotional for me too to see all of these

1334

01:05:15,279 --> 01:05:12,019

people from around the country come in

1335

01:05:17,499 --> 01:05:15,289

the Piney Woods of East Texas and spend

1336

01:05:20,079 --> 01:05:17,509

days and weeks there marching out

1337

01:05:22,059 --> 01:05:20,089

through these through the woods looking

1338

01:05:25,269 --> 01:05:22,069

for bits and pieces of their orbiter and

1339

01:05:27,609 --> 01:05:25,279

so forth if anybody ever wonders about

1340

01:05:29,680 --> 01:05:27,619

the the strength of the backbone of this

1341

01:05:31,779 --> 01:05:29,690

country then they ought to have the

1342

01:05:35,199 --> 01:05:31,789

privilege like I do to meet these people

1343

01:05:36,789 --> 01:05:35,209

who have come here to do this it just it

1344

01:05:39,350 --> 01:05:36,799

shows you the fabric of what this

1345

01:05:42,240 --> 01:05:39,360

country is made of

1346

01:05:44,760 --> 01:05:42,250

determined to return to flight stronger

1347

01:05:47,310 --> 01:05:44,770

and safer the grounded shuttle program

1348

01:05:51,840 --> 01:05:47,320

had taken a fresh look at itself during

1349

01:05:53,970 --> 01:05:51,850

my watch during my watch we lost the

1350

01:05:58,530 --> 01:05:53,980

Columbia crew and clearly as a flight

1351

01:06:01,140 --> 01:05:58,540

director of a context crew I think about

1352

01:06:04,110 --> 01:06:01,150

those every day every day I come to work

1353

01:06:05,820 --> 01:06:04,120

I need to be very vigilant I need to pay

1354

01:06:07,590 --> 01:06:05,830

attention and I need the people that

1355

01:06:08,790 --> 01:06:07,600

work for us in this business to pay

1356

01:06:10,770 --> 01:06:08,800

attention to what you're doing because

1357

01:06:13,800 --> 01:06:10,780

this is hard stuff that we do

1358

01:06:16,320 --> 01:06:13,810

it's very dangerous we have not figured

1359

01:06:20,630 --> 01:06:16,330

out a way to do a beam me up Scottie

1360

01:06:23,700 --> 01:06:20,640

right now it takes a lot of hydrocarbons

1361

01:06:25,650 --> 01:06:23,710

moving at very high speeds to fuel pumps

1362

01:06:28,950 --> 01:06:25,660

at very high temperatures high pressures

1363

01:06:30,600 --> 01:06:28,960

to get into space and it takes a

1364

01:06:32,250 --> 01:06:30,610

tremendous amount of effort to get out

1365

01:06:35,280 --> 01:06:32,260

of space back in the atmosphere and get

1366

01:06:37,380 --> 01:06:35,290

to get home I was sent out to David

1367

01:06:39,450 --> 01:06:37,390

Brown's parents home I'll never forget

1368

01:06:42,750 --> 01:06:39,460

this moment when Judge Brown looked at

1369

01:06:45,030 --> 01:06:42,760

me and said Leland my son is gone there

1370

01:06:47,760 --> 01:06:45,040

is nothing can do to bring him back but

1371

01:06:49,800 --> 01:06:47,770

the biggest tragedy would be if you

1372

01:06:53,940 --> 01:06:49,810

don't continue to fly and carry on his

1373

01:06:55,320 --> 01:06:53,950

legacy each of the remaining three

1374

01:06:57,540 --> 01:06:55,330

orbiters was pulled apart and

1375

01:06:59,280 --> 01:06:57,550

refurbished new capabilities were

1376

01:07:01,650 --> 01:06:59,290

devised for the crew and mission

1377

01:07:04,850 --> 01:07:01,660

controllers to assess and repair damage

1378

01:07:09,930 --> 01:07:07,560

processes and procedures were also

1379

01:07:12,660 --> 01:07:09,940

reexamined and reinvigorated cruise

1380

01:07:14,730 --> 01:07:12,670

safety would never again be taken for

1381

01:07:16,440 --> 01:07:14,740

granted nearly two and a half years

1382

01:07:19,290 --> 01:07:16,450

would pass before the nation would see

1383

01:07:21,270 --> 01:07:19,300

another orbiter poised for launch from

1384

01:07:24,150 --> 01:07:21,280

the Kennedy Space Center the time that

1385

01:07:26,280 --> 01:07:24,160

we fly the flight it's something that it

1386

01:07:28,320 --> 01:07:26,290

feels like we have flown many times so

1387

01:07:30,630 --> 01:07:28,330

if things don't go well it becomes very

1388

01:07:31,590 --> 01:07:30,640

very natural for us to know at certain

1389

01:07:33,300 --> 01:07:31,600

points during the mission if this

1390

01:07:35,010 --> 01:07:33,310

doesn't go well or if this significant

1391

01:07:36,720 --> 01:07:35,020

system breaks when we have this type of

1392

01:07:38,370 --> 01:07:36,730

emergency what's the most important

1393

01:07:39,900 --> 01:07:38,380

thing we need to do now because we've

1394

01:07:41,790 --> 01:07:39,910

been rehearsing it and it makes it look

1395

01:07:44,010 --> 01:07:41,800

really easy you don't really get the

1396

01:07:46,410 --> 01:07:44,020

full effect of how much real preparation

1397

01:07:48,870 --> 01:07:46,420

how much real studying went into making

1398

01:07:51,240 --> 01:07:48,880

it look that easy of all the changes

1399

01:07:54,030 --> 01:07:51,250

accompanying the shuttles return to

1400

01:07:57,300 --> 01:07:54,040

flight none was more significant than

1401

01:08:00,420 --> 01:07:57,310

the one announced in early 2004 at NASA

1402

01:08:03,330 --> 01:08:00,430

headquarters by President Bush our first

1403

01:08:07,440 --> 01:08:03,340

goal is to complete the International

1404

01:08:10,350 --> 01:08:07,450

Space Station by 2010 we will finish

1405

01:08:12,690 --> 01:08:10,360

what we have started we will meet our

1406

01:08:14,630 --> 01:08:12,700

obligations to our 15 international

1407

01:08:17,100 --> 01:08:14,640

partners on this project

1408

01:08:19,530 --> 01:08:17,110

the shuttles chief purpose over the next

1409

01:08:21,270 --> 01:08:19,540

several years will be to help finish

1410

01:08:28,380 --> 01:08:21,280

Assembly of the International Space

1411

01:08:31,410 --> 01:08:28,390

Station in 2010 the Space Shuttle after

1412

01:08:34,620 --> 01:08:31,420

nearly 30 years of Duty will be retired

1413

01:08:37,470 --> 01:08:34,630

from service even though each shuttle

1414

01:08:39,300 --> 01:08:37,480

was designed to fly 100 missions the

1415

01:08:41,940 --> 01:08:39,310

Columbia accident investigation board

1416

01:08:44,280 --> 01:08:41,950

called the shuttle an aging spacecraft

1417

01:08:47,220 --> 01:08:44,290

with the odds of losing another orbiter

1418

01:08:50,100 --> 01:08:47,230

and crew increasing with each subsequent

1419

01:08:53,090 --> 01:08:50,110

flight NASA's human spaceflight program

1420

01:08:56,220 --> 01:08:53,100

was faced with several basic challenges

1421

01:08:58,110 --> 01:08:56,230

including coming up with a successor to

1422

01:09:00,000 --> 01:08:58,120

the shuttle fleet however with an

1423

01:09:02,090 --> 01:09:00,010

impending cancellation of the shuttle

1424

01:09:04,740 --> 01:09:02,100

program looming shuttle managers

1425

01:09:07,410 --> 01:09:04,750

recommitted themselves to the paramount

1426

01:09:09,870 --> 01:09:07,420

task of safely completing the

1427

01:09:12,480 --> 01:09:09,880

International Space Station it would

1428

01:09:15,510 --> 01:09:12,490

become the program's mantra to be

1429

01:09:17,849 --> 01:09:15,520

repeated over and over again not only to

1430

01:09:20,790 --> 01:09:17,859

the media but also for every word

1431

01:09:23,940 --> 01:09:20,800

in the shuttle program no launch

1432

01:09:26,520 --> 01:09:23,950

schedule was too tight and no mission

1433

01:09:28,320 --> 01:09:26,530

too important to be rushed we are to

1434

01:09:30,480 --> 01:09:28,330

treat every flight in a sense as a

1435

01:09:32,520 --> 01:09:30,490

return to flight this is truly a test

1436

01:09:34,260 --> 01:09:32,530

program we go back we make sure

1437

01:09:35,849 --> 01:09:34,270

everything is right we double-check and

1438

01:09:37,380 --> 01:09:35,859

then we go commit into Flight Readiness

1439

01:09:41,790 --> 01:09:37,390

review that we're actually ready to go

1440

01:09:44,400 --> 01:09:41,800

fly on July 26 2005 discovery gets the

1441

01:09:46,320 --> 01:09:44,410

shuttle program flying again this is

1442

01:09:51,840 --> 01:09:46,330

shuttle launch control at t-minus 3

1443

01:09:54,820 --> 01:09:51,850

hours as our pilot now into the suit up

1444

01:10:20,790 --> 01:10:03,410

[Music]

1445

01:10:23,220 --> 01:10:20,800

alerting elodie years ago million people

1446

01:10:24,600 --> 01:10:23,230

who believe so deeply what we do good

1447

01:10:30,500 --> 01:10:24,610

luck Godspeed and have a little fun up

1448

01:10:37,380 --> 01:10:33,000

t-minus 10 seconds go for main engine

1449

01:10:41,910 --> 01:10:37,390

start seven six five three engines up

1450

01:10:43,740 --> 01:10:41,920

and burning three two one and liftoff of

1451
01:10:46,290 --> 01:10:43,750
space shuttle Discovery beginning

1452
01:10:47,790 --> 01:10:46,300
America's new journey and the vehicle

1453
01:10:50,760 --> 01:10:47,800
has cleared the tower

1454
01:10:53,830 --> 01:10:50,770
among the many changes instituted the

1455
01:10:59,420 --> 01:10:53,840
new r-bar pitch maneuver or backflip

1456
01:11:02,280 --> 01:10:59,430
[Applause]

1457
01:11:04,950 --> 01:11:02,290
will be used by each mission to the

1458
01:11:07,800 --> 01:11:04,960
International Space Station at arrival

1459
01:11:10,770 --> 01:11:07,810
the end over end flip allows the station

1460
01:11:14,000 --> 01:11:10,780
crew to visually document the condition

1461
01:11:35,050 --> 01:11:14,010
of the shuttles valium notes

1462
01:11:52,259 --> 01:11:48,659
[Music]

1463
01:11:54,750 --> 01:11:52,269

discovery and the sts-114 crew safely

1464

01:11:57,709 --> 01:11:54,760

began a final phase of the shuttle

1465

01:12:02,009 --> 01:11:57,719

programs historic journey with a smooth

1466

01:12:09,419 --> 01:12:02,019

pre-dawn landing on August 9th 2005 at

1467

01:12:12,659 --> 01:12:09,429

the Edwards Air Force Base California DD

1468

01:12:16,649 --> 01:12:12,669

ray sweetie handy Vegas charlie Wendy

1469

01:12:18,989 --> 01:12:16,659

and Eileen welcomed home friends with

1470

01:12:21,479 --> 01:12:18,999

this practically rebuilt space

1471

01:12:23,939 --> 01:12:21,489

transportation system each remaining

1472

01:12:27,389 --> 01:12:23,949

shuttle mission would be safer than the

1473

01:12:29,549 --> 01:12:27,399

one before and its final flight the

1474

01:12:32,399 --> 01:12:29,559

safest it's almost like we've had kind

1475

01:12:34,259 --> 01:12:32,409

of three different space shuttle

1476

01:12:35,879 --> 01:12:34,269

programs first 10 years we're off

1477

01:12:37,799 --> 01:12:35,889

learning how to fly the thing deploying

1478

01:12:39,629 --> 01:12:37,809

satellites and flying laboratories in

1479

01:12:41,609 --> 01:12:39,639

the bag review next 10 years we're doing

1480

01:12:43,620 --> 01:12:41,619

more of that and we're going out on more

1481

01:12:45,540 --> 01:12:43,630

and more spacewalks and we fly up to the

1482

01:12:47,520 --> 01:12:45,550

MIR space station and in the last 10

1483

01:12:49,649 --> 01:12:47,530

years we use it to build about a million

1484

01:12:51,389 --> 01:12:49,659

pound space station in orbit which

1485

01:12:53,069 --> 01:12:51,399

wouldn't have been possible without Shaw

1486

01:12:55,859 --> 01:12:53,079

it's a heck of a machine when you look

1487

01:12:57,600 --> 01:12:55,869

at the Hubble Space Telescope that would

1488

01:12:59,250 --> 01:12:57,610

not have been possible without shuttle

1489

01:13:01,259 --> 01:12:59,260

and you look at the International Space

1490

01:13:04,379 --> 01:13:01,269

Station which certainly would not have

1491

01:13:06,529 --> 01:13:04,389

been possible without shuttle every

1492

01:13:09,359 --> 01:13:06,539

launch is an emotional experience

1493

01:13:12,359 --> 01:13:09,369

watching what this nation is done but

1494

01:13:15,389 --> 01:13:12,369

nASA has done with the NASA contractor

1495

01:13:18,029 --> 01:13:15,399

team it's awesome it's wonderful we

1496

01:13:21,000 --> 01:13:18,039

didn't spend a dime in space not one

1497

01:13:23,819 --> 01:13:21,010

single penny has been spent in space

1498

01:13:25,529 --> 01:13:23,829

every single penny that went into the

1499

01:13:28,770 --> 01:13:25,539

space shuttle program over its 30-plus

1500

01:13:31,399 --> 01:13:28,780

years was spent right here on earth 1

1501

01:13:33,839 --> 01:13:31,409

creating jobs growing our economy

1502

01:13:36,439 --> 01:13:33,849

creating technological development of

1503

01:13:39,810 --> 01:13:36,449

which we never dreamed advancing science

1504

01:13:41,850 --> 01:13:39,820

and technology even advancing the field

1505

01:13:44,159 --> 01:13:41,860

of Aeronautics it just impresses me what

1506

01:13:45,959 --> 01:13:44,169

people can do what people can do it's a

1507

01:13:49,979 --> 01:13:45,969

it's a big machine it's a nice machine

1508

01:13:52,199 --> 01:13:49,989

it's a fantastic engineering marvel in

1509

01:13:53,760 --> 01:13:52,209

my opinion the whole space shuttle but

1510

01:13:56,730 --> 01:13:53,770

what's the real marvel is

1511

01:13:59,130 --> 01:13:56,740

behind it then make it go having a space

1512

01:14:00,720 --> 01:13:59,140

show enabled us to be able to complete

1513

01:14:03,600 --> 01:14:00,730

our science and do some really great

1514

01:14:05,880 --> 01:14:03,610

things to advance the area of metallurgy

1515

01:14:07,320 --> 01:14:05,890

without the space shuttle an experiment

1516

01:14:09,480 --> 01:14:07,330

like this one could not have been

1517

01:14:11,820 --> 01:14:09,490

conducted the shuttle is very important

1518

01:14:14,970 --> 01:14:11,830

for us to learn and be able to conduct

1519

01:14:17,490 --> 01:14:14,980

long period experiments out of the 50

1520

01:14:21,780 --> 01:14:17,500

states 48 of them have vendors that

1521

01:14:26,330 --> 01:14:21,790

provide parts or equipment to the the

1522

01:14:28,620 --> 01:14:26,340

space shuttle program so it's a vast

1523

01:14:30,720 --> 01:14:28,630

cross-section of America that bakes the

1524

01:14:33,060 --> 01:14:30,730

American space program what it is change

1525

01:14:34,740 --> 01:14:33,070

is inevitable as much as people don't

1526

01:14:37,770 --> 01:14:34,750

like change that's the only thing that's

1527

01:14:39,480 --> 01:14:37,780

constant in our lives and we have to

1528

01:14:42,990 --> 01:14:39,490

change we have to transition from

1529

01:14:44,970 --> 01:14:43,000

shuttle to a new future which we're

1530

01:14:47,520 --> 01:14:44,980

going to define which can be even better

1531

01:14:49,800 --> 01:14:47,530

a future that allows us to explore

1532

01:14:52,560 --> 01:14:49,810

beyond our home planet to seek our

1533

01:14:54,630 --> 01:14:52,570

destiny to learn what we couldn't

1534

01:14:57,170 --> 01:14:54,640

possibly learn if we were stuck in

1535

01:14:59,480 --> 01:14:57,180

low-earth orbit

1536

01:15:00,650 --> 01:14:59,490

and since its returned to flight the

1537

01:15:02,750 --> 01:15:00,660

shuttle program has been almost

1538

01:15:05,150 --> 01:15:02,760

singularly focused on completing

1539

01:15:07,370 --> 01:15:05,160

construction of the space station I

1540

01:15:09,230 --> 01:15:07,380

think back of all the challenges and all

1541

01:15:10,640 --> 01:15:09,240

the things that had to work right you

1542

01:15:12,440 --> 01:15:10,650

know a lot of these interfaces never

1543

01:15:14,600 --> 01:15:12,450

came together before all the shuttle

1544

01:15:16,490 --> 01:15:14,610

flights the 20-plus shuttle flights that

1545

01:15:18,740 --> 01:15:16,500

went into assembly all the Soyuz flights

1546

01:15:20,780 --> 01:15:18,750

to progress flights to see this station

1547

01:15:22,250 --> 01:15:20,790

come together in assembly is a true

1548

01:15:24,470 --> 01:15:22,260

testimony to the international

1549

01:15:26,360 --> 01:15:24,480

partnership this is probably the most

1550

01:15:28,490 --> 01:15:26,370

amazing research facility ever

1551

01:15:29,960 --> 01:15:28,500

constructed in space and it's

1552

01:15:33,260 --> 01:15:29,970

constructed internationally and it

1553

01:15:35,480 --> 01:15:33,270

operates every day 24 hours a day doing

1554

01:15:37,580 --> 01:15:35,490

world-class research internationally and

1555

01:15:39,170 --> 01:15:37,590

there is no more amazing facility than

1556

01:15:42,290 --> 01:15:39,180

what we have in orbit through and

1557

01:15:44,030 --> 01:15:42,300

possibly beyond 2020 the ISS will serve

1558

01:15:47,480 --> 01:15:44,040

as the world's first full-time research

1559

01:15:49,250 --> 01:15:47,490

laboratory in microgravity among zero-g

1560

01:15:51,590 --> 01:15:49,260

experiments already conducted aboard the

1561

01:15:53,210 --> 01:15:51,600

station several have led to promising

1562

01:15:56,390 --> 01:15:53,220

breakthroughs in research and treatment

1563

01:15:58,250 --> 01:15:56,400

of cancer many other on-orbit science

1564

01:16:00,770 --> 01:15:58,260

findings have the potential to

1565

01:16:03,770 --> 01:16:00,780

significantly improve the quality of

1566

01:16:07,520 --> 01:16:03,780

life back on earth in May 2009

1567

01:16:10,580 --> 01:16:07,530

Atlantis and its sts-125 crew took to

1568

01:16:12,800 --> 01:16:10,590

space not to visit the ISS but to return

1569

01:16:16,700 --> 01:16:12,810

to the Hubble Space Telescope for its

1570

01:16:19,160 --> 01:16:16,710

final servicing mission on five

1571

01:16:22,010 --> 01:16:19,170

spacewalks Atlantis astronauts repaired

1572

01:16:24,200 --> 01:16:22,020

and upgraded a Hubble telescope to

1573

01:16:26,930 --> 01:16:24,210

significantly improve its capacity to

1574

01:16:30,230 --> 01:16:26,940

explore the depths of the universe until

1575

01:16:32,090 --> 01:16:30,240

at least 2014 I think of all the finger

1576

01:16:33,920 --> 01:16:32,100

prints that are all over this thing it's

1577

01:16:36,170 --> 01:16:33,930

a phenomenal piece of machinery it's a

1578

01:16:39,109 --> 01:16:36,180

phenomenal airplane and its really as an

1579

01:16:41,089 --> 01:16:39,119

engineering mark the Space Shuttle will

1580

01:16:43,879 --> 01:16:41,099

go down in history as one of the great

1581

01:16:46,250 --> 01:16:43,889

flying machines that Americas has

1582

01:16:48,229 --> 01:16:46,260

produced a space shuttle you know at

1583

01:16:50,239 --> 01:16:48,239

this time was a vehicle for bringing

1584

01:16:50,689 --> 01:16:50,249

people together from all around the

1585

01:16:53,060 --> 01:16:50,699

planet

1586

01:16:55,100 --> 01:16:53,070

and having us work in harmony for the

1587

01:16:57,020 --> 01:16:55,110

betterment of humankind we may not have

1588

01:16:58,580 --> 01:16:57,030

understood when we first built it what

1589

01:17:01,250 --> 01:16:58,590

all we'd be able to accomplish with it

1590

01:17:02,869 --> 01:17:01,260

and after many years we've realized just

1591

01:17:04,850 --> 01:17:02,879

how useful it has been it's been a

1592

01:17:07,250 --> 01:17:04,860

learning experience on how to operate

1593

01:17:09,859 --> 01:17:07,260

and live in space what can you say about

1594

01:17:10,969 --> 01:17:09,869

the Space Shuttle it has changed

1595

01:17:13,459 --> 01:17:10,979

everything

1596

01:17:16,459 --> 01:17:13,469

well the shuttle from my perspective is

1597

01:17:21,919 --> 01:17:16,469

one of the great things that this nation

1598

01:17:25,250 --> 01:17:21,929

has done it was a lot of pride like I

1599

01:17:28,219 --> 01:17:25,260

said it's it's inspiring to come to work

1600

01:17:38,020 --> 01:17:28,229

every single day to work on this program

1601
01:17:43,880 --> 01:17:41,510
for more than 30 years the fleet of

1602
01:17:46,010 --> 01:17:43,890
thousands of Americans dedicated to its

1603
01:17:48,830 --> 01:17:46,020
safety and success have toiled in

1604
01:17:52,430 --> 01:17:48,840
exhilarating triumph heartbreaking

1605
01:17:55,250 --> 01:17:52,440
tragedy and most often quiet obscurity

1606
01:17:57,820 --> 01:17:55,260
their contributions have extended beyond

1607
01:17:59,990 --> 01:17:57,830
the bounds of space among others

1608
01:18:02,000 --> 01:18:00,000
shuttle-derived technologies have been

1609
01:18:03,620 --> 01:18:02,010
used in developing an artificial heart

1610
01:18:06,260 --> 01:18:03,630
and limbs three-dimensional

1611
01:18:08,480 --> 01:18:06,270
biotechnology a light for treating

1612
01:18:13,370 --> 01:18:08,490
tumors and children and improving crime

1613
01:18:16,510 --> 01:18:13,380

prevention and wildfire detection from

1614

01:18:22,250 --> 01:18:16,520

crawler driver to payload specialist

1615

01:18:25,400 --> 01:18:22,260

from scuba dive to pilot from scientist

1616

01:18:27,590 --> 01:18:25,410

to engineer they and many likely

1617

01:18:32,840 --> 01:18:27,600

throughout the nation share a commitment

1618

01:18:35,000 --> 01:18:32,850

to sending humankind safely into space

1619

01:18:39,070 --> 01:18:35,010

that dedication as much as any other

1620

01:18:42,800 --> 01:18:39,080

acclaim will be the legacy of America's

1621

01:18:46,790 --> 01:18:42,810

space shuttle I think we'll be

1622

01:18:48,560 --> 01:18:46,800

remembered in thousands of years you

1623

01:18:52,430 --> 01:18:48,570

know as perhaps the most incredible

1624

01:18:55,730 --> 01:18:52,440

technological feat of humans of our time

1625

01:18:57,320 --> 01:18:55,740

as is the order of life an ending for

1626

01:19:01,610 --> 01:18:57,330

the Space Shuttle becomes a beginning

1627

01:19:04,520 --> 01:19:01,620

for a space bound successor soon America

1628

01:19:09,419 --> 01:19:04,530

will again send astronauts into orbit

1629

01:19:27,370 --> 01:19:09,429

and beyond to do what NASA does best

1630

01:20:22,520 --> 01:20:04,780

[Music]