



1
00:01:03,420 --> 00:00:47,680
about a two-hour flight from ellington

2
00:01:09,260 --> 00:01:06,990
and the c-5 aircraft in the background

3
00:01:11,670 --> 00:01:09,270
is the airplane that brought the first

4
00:01:13,859 --> 00:01:11,680
space station flight hardware to the

5
00:01:22,469 --> 00:01:13,869
Kennedy Space Center last week they node

6
00:01:24,990 --> 00:01:22,479
one this is shuttle launch control at

7
00:01:27,149 --> 00:01:25,000
t-minus three hours and holding where

8
00:01:29,850 --> 00:01:27,159
we're standing by now to enter the suit

9
00:01:33,090 --> 00:01:29,860
up room to see the STS 94 astronauts

10
00:01:36,419 --> 00:01:33,100
there's our commander Jim Hall Cell

11
00:02:01,070 --> 00:01:36,429
being assisted with his launch and entry

12
00:02:18,949 --> 00:02:06,800
and our pilot Susan still with her

13
00:02:27,860 --> 00:02:21,349

and our payload commander mission

14

00:02:29,599 --> 00:02:27,870

specialist number one Janice Voss crew

15

00:02:55,980 --> 00:02:29,609

will be heading out for the launch pad

16

00:02:55,990 --> 00:03:02,280

on Thomas once again

17

00:03:08,550 --> 00:03:05,910

down to payload specialist or mission

18

00:03:20,490 --> 00:03:08,560

specialists Mike Bernhardt and then

19

00:03:25,200 --> 00:03:23,460

at t-minus two hours 58 minutes 50

20

00:03:35,130 --> 00:03:25,210

seconds and counting this is shuttle

21

00:03:37,770 --> 00:03:35,140

launch control and here we see our STS

22

00:03:43,280 --> 00:03:37,780

94 astronauts now leaving the suit-up

23

00:03:50,810 --> 00:03:47,640

also astronaut Bob Cabana and flight

24

00:03:53,580 --> 00:03:50,820

crew coordinator Dave Lisa with them

25

00:03:55,530 --> 00:03:53,590

Bob Cabana will be flying the weather

26
00:04:04,920 --> 00:03:55,540
reconnaissance aircraft a little bit

27
00:04:11,590 --> 00:04:07,720
and down below the astronaut ban waiting

28
00:04:15,070 --> 00:04:11,600
along with proud of Kennedy Space Center

29
00:04:20,360 --> 00:04:15,080
employees and pressed members waiting

30
00:04:27,379 --> 00:04:22,960
trip down three floors in the elevator

31
00:04:29,270 --> 00:04:27,389
and there are other Kennedy Space Center

32
00:05:12,730 --> 00:04:29,280
employees just inside the door waiting

33
00:05:18,500 --> 00:05:16,400
it's a DC DFS repeat yourself

34
00:05:22,000 --> 00:05:18,510
he might sort of a PPC double complete

35
00:05:24,410 --> 00:05:22,010
copy second and we're coming up on the

36
00:05:29,960 --> 00:05:24,420
t-minus nine minute built-in hold and

37
00:05:31,220 --> 00:05:29,970
about eight seconds five four three two

38
00:05:33,800 --> 00:05:31,230

one

39

00:05:43,960 --> 00:05:33,810

t-minus nine minutes and holding for ten

40

00:05:47,470 --> 00:05:46,100

vegetarian we'd also like to inflate our

41

00:05:54,530 --> 00:05:47,480

seats at this pass

42

00:05:56,810 --> 00:05:54,540

don't do that manager go ahead then the

43

00:05:57,470 --> 00:05:56,820

enemy has no other issues you now clear

44

00:06:01,340 --> 00:05:57,480

the launch

45

00:06:04,220 --> 00:06:01,350

copy that and Columbia it looks like

46

00:06:06,620 --> 00:06:04,230

we've got the will align up with us I

47

00:06:08,720 --> 00:06:06,630

get you guys out of here so how their

48

00:06:14,750 --> 00:06:08,730

plight and entity you're clear to launch

49

00:06:18,800 --> 00:06:14,760

I copy secret office negative ctls

50

00:06:20,710 --> 00:06:18,810

deputy telescope a cutout clock will

51
00:06:28,190 --> 00:06:20,720
resume on my mark

52
00:06:30,590 --> 00:06:28,200
five four three two what Marcus a lot of

53
00:06:47,010 --> 00:06:30,600
five others they telling us pls other

54
00:06:51,270 --> 00:06:49,230
the orbiter access arm can be moved back

55
00:07:06,220 --> 00:06:51,280
into position in less than 30 seconds

56
00:07:11,470 --> 00:07:08,080
and in just about another minute we'll

57
00:07:24,010 --> 00:07:11,480
start the pre-start sequence for the old

58
00:07:32,900 --> 00:07:25,749
main engines aren't gambling now

59
00:07:32,910 --> 00:07:44,459
okay

60
00:07:44,469 --> 00:07:59,389
t-minus two minutes 15 seconds

61
00:08:07,829 --> 00:08:01,679
baby-making turnaround possible we'll

62
00:08:12,239 --> 00:08:07,839
take this ship 16 days and we come to

63
00:08:21,239 --> 00:08:12,249

thank you sound suppression water system

64

00:08:27,149 --> 00:08:21,249

activated - eight seven six main engine

65

00:08:29,819 --> 00:08:27,159

start three two one zero and liftoff of

66

00:08:31,769 --> 00:08:29,829

Columbia with a microgravity science

67

00:08:38,850 --> 00:08:31,779

laboratory a research bridge to the

68

00:08:42,809 --> 00:08:38,860

International Space Station Roger roll

69

00:08:45,540 --> 00:08:42,819

Columbia Houston is now controlling roll

70

00:08:46,619 --> 00:08:45,550

maneuver is complete aboard Columbia the

71

00:08:48,960 --> 00:08:46,629

orbiter is now in a heads-down position

72

00:08:58,180 --> 00:08:48,970

on course for a twenty eight and a half

73

00:09:04,280 --> 00:09:01,190

now in 30 seconds the three engines

74

00:09:05,990 --> 00:09:04,290

aboard the orbiter will begin throttling

75

00:09:07,310 --> 00:09:06,000

down as the vehicle prepares to pass

76
00:09:20,320 --> 00:09:07,320
through the area of maximum dynamic

77
00:09:25,280 --> 00:09:22,820
standing by for a burnout and separation

78
00:09:35,980 --> 00:09:25,290
of the twin solid rocket boosters which

79
00:09:41,199 --> 00:09:38,650
SRB separation is confirmed two minutes

80
00:09:43,240 --> 00:09:41,209
15 seconds into the flight Columbia is

81
00:09:46,449 --> 00:09:43,250
now at an altitude of 31 miles downrange

82
00:10:27,620 --> 00:09:46,459
from the launch site 35 miles will be a

83
00:10:32,420 --> 00:10:29,750
one minute 30 seconds remaining in

84
00:10:35,120 --> 00:10:32,430
powered flight as Columbia heads out now

85
00:10:39,620 --> 00:10:35,130
across the Atlantic Ocean Columbia

86
00:10:43,610 --> 00:10:39,630
single-engine press 104 forth impress

87
00:10:45,980 --> 00:10:43,620
104 and with that call to Commander Jim

88
00:10:47,750 --> 00:10:45,990

hustle from dom gorie here in Mission

89

00:10:50,300 --> 00:10:47,760

Control Columbia can reach orbit on one

90

00:10:51,650 --> 00:10:50,310

engine now should two of them fail but

91

00:10:55,220 --> 00:10:51,660

again all three are still in excellent

92

00:10:57,230 --> 00:10:55,230

shape the hydraulic hydraulic systems ap

93

00:10:59,000 --> 00:10:57,240

use are performing well as are the fuel

94

00:11:09,450 --> 00:10:59,010

cells which produce the electricity for

95

00:11:16,980 --> 00:11:12,060

Columbia Houston for gym go for the

96

00:14:51,260 --> 00:11:16,990

priority group be power down okay thank

97

00:14:57,600 --> 00:14:53,690

remain fairly lean mixture is usually a

98

00:15:01,560 --> 00:14:57,610

hydrogen and oxygen

99

00:15:06,630 --> 00:15:01,570

we should be questioned called flame

100

00:15:15,660 --> 00:15:11,250

Wow we have the droplet combustion

101
00:15:19,240 --> 00:15:15,670
modules drop the combustion experiment

102
00:15:23,200 --> 00:15:19,250
single heptane droplets joined in

103
00:15:27,340 --> 00:15:23,210
geography we're very fortunate destiny

104
00:15:30,100 --> 00:15:27,350
that investigators decided to put live

105
00:15:34,240 --> 00:15:30,110
laboratory air into the chamber and burn

106
00:15:37,150 --> 00:15:34,250
hemp tape with air so that now we can

107
00:15:38,440 --> 00:15:37,160
directly compare all the experiments

108
00:15:40,600 --> 00:15:38,450
that have been done in the progress

109
00:15:43,570 --> 00:15:40,610
supported droplet combustion experiment

110
00:15:45,820 --> 00:15:43,580
next door there we've been results from

111
00:15:48,460 --> 00:15:45,830
the droplet combustion experiment so

112
00:15:51,100 --> 00:15:48,470
this is really a terrific result and

113
00:15:52,630 --> 00:15:51,110

then droplets burn beautifully Janice

114

00:15:55,480 --> 00:15:52,640

did the experiments last night while I

115

00:15:58,090 --> 00:15:55,490

was sleeping good coordination between

116

00:15:59,650 --> 00:15:58,100

the ground and Jamieson then pulled

117

00:16:01,060 --> 00:15:59,660

those rooms are often apparently they're

118

00:16:04,960 --> 00:16:01,070

going to try to do some more burn today

119

00:16:10,210 --> 00:16:06,700

right now in the door blocks we have

120

00:16:12,730 --> 00:16:10,220

cslm which is the coarsening of solid

121

00:16:16,000 --> 00:16:12,740

liquid pelts basically looking at the

122

00:16:18,610 --> 00:16:16,010

increase in grain size in two different

123

00:16:24,610 --> 00:16:18,620

metals as they're mixed and because you

124

00:16:30,850 --> 00:16:26,530

the only blue box experiments have been

125

00:16:33,260 --> 00:16:30,860

put away I have this over here that's an

126

00:16:52,220 --> 00:16:33,270

experimental science

127

00:17:15,980 --> 00:17:01,580

that is the greenhouse inside the water

128

00:17:18,200 --> 00:17:15,990

supply in their spinach plant has to

129

00:17:21,140 --> 00:17:18,210

decide how to portion up its energy

130

00:17:23,450 --> 00:17:21,150

between Lake Mendocino between the support

131

00:17:26,150 --> 00:17:23,460

materials the starches and sugars which

132

00:17:28,040 --> 00:17:26,160

are energy and the secondary metabolites

133

00:17:30,220 --> 00:17:28,050

which are chemicals for example which

134

00:17:32,570 --> 00:17:30,230

may repel insects and you can say

135

00:17:35,420 --> 00:17:32,580

because we use funds for different

136

00:17:37,760 --> 00:17:35,430

purposes the ability to manipulate how a

137

00:17:41,900 --> 00:17:37,770

plant uses its energy for those three

138

00:17:43,880 --> 00:17:41,910

different purposes in space plants made

139

00:17:45,020 --> 00:17:43,890

for a proportion their energy

140

00:17:47,450 --> 00:17:45,030

differently and produce different

141

00:17:49,520 --> 00:17:47,460

amounts of those different types of

142

00:17:54,080 --> 00:17:49,530

compounds that's one important thing

143

00:17:59,420 --> 00:17:56,440

over here is the tempest experiment

144

00:18:01,670 --> 00:17:59,430

another terminal science metallurgy

145

00:18:04,130 --> 00:18:01,680

experiment a lot of what they're doing

146

00:18:07,190 --> 00:18:04,140

is studying the physical properties of

147

00:18:10,430 --> 00:18:07,200

metals in their so-called snake so you

148

00:18:29,280 --> 00:18:10,440

take a metal and you cool it beyond its

149

00:18:35,310 --> 00:18:31,860

something that metal sample is located

150

00:18:37,950 --> 00:18:35,320

between electrical coils and is both

151
00:18:41,160 --> 00:18:37,960
heated and it's position controlled from

152
00:18:46,370 --> 00:18:41,170
those coils nothing they can do is

153
00:18:48,690 --> 00:18:46,380
perturb melted and then study its

154
00:18:50,910 --> 00:18:48,700
oscillations which tells us about

155
00:18:53,980 --> 00:18:50,920
cosmas about the viscosity of surface

156
00:18:56,230 --> 00:18:53,990
surface tension of the metal

157
00:19:01,560 --> 00:18:56,240
physical properties of metals and havoc

158
00:19:05,880 --> 00:19:03,690
wordfence rack is about like it would be

159
00:19:08,970 --> 00:19:05,890
on earth place to do work we have these

160
00:19:13,230 --> 00:19:08,980
nice scraps to build out my books as we

161
00:19:36,700 --> 00:19:13,240
take new pages in it drawers with spare

162
00:19:48,050 --> 00:19:40,210
lock bags and cook for a missile face

163
00:19:50,030 --> 00:19:48,060

appears are one of our two doors we have

164

00:19:57,230 --> 00:19:50,040

this nice name tag on the side then it

165

00:20:04,720 --> 00:20:00,560

and here for some of the tools Allen

166

00:20:10,639 --> 00:20:07,250

can be very handy they have a very well

167

00:20:13,070 --> 00:20:10,649

equipped facility which set which can be

168

00:21:26,900 --> 00:20:13,080

used to sell most of the jobs that come

169

00:21:34,130 --> 00:21:29,120

knocking about the state vector how

170

00:21:56,080 --> 00:21:34,140

useful this is to us and look over here

171

00:22:01,430 --> 00:21:59,060

this furnace is from the Japanese Space

172

00:22:04,940 --> 00:22:01,440

Agency and it's a cooperative program

173

00:22:07,460 --> 00:22:04,950

between NASA and Asda the cartridges

174

00:22:09,289 --> 00:22:07,470

look something like this they have a

175

00:22:11,659 --> 00:22:09,299

protective cover over them this is a

176
00:22:14,029 --> 00:22:11,669
sample that was run yesterday and taken

177
00:22:15,980 --> 00:22:14,039
out of the sample this morning this is a

178
00:22:18,289 --> 00:22:15,990
protected coating and then this is a

179
00:22:20,149 --> 00:22:18,299
cover to protect the inside of the

180
00:22:22,340 --> 00:22:20,159
furnace from the corrosive chemical

181
00:22:25,399 --> 00:22:22,350
reaction of the materials that are used

182
00:22:26,750 --> 00:22:25,409
in this particular sample examples of

183
00:22:29,060 --> 00:22:26,760
the kinds of experiments we're doing

184
00:22:31,240 --> 00:22:29,070
here are diffusion coefficients or

185
00:22:33,769 --> 00:22:31,250
measurement of movement of different

186
00:22:36,649 --> 00:22:33,779
materials within a material or

187
00:22:38,480 --> 00:22:36,659
impurities or things that are expected

188
00:22:40,669 --> 00:22:38,490

to give better properties to the

189

00:23:16,570 --> 00:22:40,679

material such as in semiconductors or

190

00:23:16,580 --> 00:23:34,670

got it

191

00:23:34,680 --> 00:25:11,080

going to pee-pee

192

00:25:11,090 --> 00:25:19,520

just beautiful

193

00:25:19,530 --> 00:25:27,600

this is exciting space teller

194

00:25:27,610 --> 00:25:34,300

okay

195

00:25:34,310 --> 00:25:44,510

bah bah blah blah blah a sec immediately

196

00:25:49,549 --> 00:25:46,730

what do you think Advanta data take here

197

00:25:53,060 --> 00:25:49,559

and knowing that it will this maybe

198

00:25:56,320 --> 00:25:53,070

isn't the peak frequency but it'll find

199

00:25:58,120 --> 00:25:56,330

the right frequency oscillator

200

00:26:09,460 --> 00:25:58,130

because I'm getting pretty good

201
00:26:21,000 --> 00:26:12,879
okay and my am to Nuiqsut 3 2003 right

202
00:27:04,299 --> 00:26:26,750
sighs okay sorry it's just

203
00:27:04,309 --> 00:27:55,610
dujun quick

204
00:27:55,620 --> 00:28:37,139
take you longer to talk about it

205
00:28:37,149 --> 00:32:21,160
Bart you know

206
00:32:28,480 --> 00:32:23,320
for live downlink video is coming from

207
00:32:29,860 --> 00:32:28,490
aboard the Space Lab module as the crew

208
00:32:31,780 --> 00:32:29,870
of the shuttle Columbia currently

209
00:32:33,789 --> 00:32:31,790
perform a an experiment in the

210
00:32:36,039 --> 00:32:33,799
combustion module one titled laminar

211
00:32:37,510 --> 00:32:36,049
suit processes experiment and now we're

212
00:32:39,360 --> 00:32:37,520
receiving live downlink video from

213
00:34:15,060 --> 00:32:39,370

inside that combustion module in the

214

00:34:15,070 --> 00:36:11,700

that's bad news for fuel onboard

215

00:36:11,710 --> 00:36:59,420

ship full of happy campers

216

00:37:38,380 --> 00:37:02,849

is basically going after I placed a

217

00:37:38,390 --> 00:37:49,039

posterior through the hatch

218

00:37:49,049 --> 00:38:14,280

that message is not sacrilegious

219

00:38:27,569 --> 00:38:19,680

okay Tennessee scientists astronaut

220

00:38:27,579 --> 00:38:37,230

I'm gonna smack his head

221

00:38:47,380 --> 00:38:45,220

is Charles Atlas washing his hair just

222

00:38:48,550 --> 00:38:47,390

don't fake it then fake it a little bit

223

00:38:57,000 --> 00:38:48,560

okay

224

00:39:00,060 --> 00:38:57,010

yeah well I got a little bit around the

225

00:39:02,040 --> 00:39:00,070

side a little bit around the side robee

226

00:39:03,900 --> 00:39:02,050

robee dry knee here you're trying to

227

00:39:21,450 --> 00:39:03,910

hear you're trying to hear I need 5 or

228

00:39:39,720 --> 00:39:24,810

Shamir Space Station new this is kc5 are

229

00:39:46,890 --> 00:39:42,780

space shuttle Mir space shuttle Mir this

230

00:40:17,130 --> 00:39:46,900

is kc5 RN I space shuttle Columbia think

231

00:40:17,140 --> 00:40:32,830

belt

232

00:41:10,660 --> 00:40:42,350

what this is a note to my parents Jim

233

00:41:10,670 --> 00:43:22,660

Susie's

234

00:43:30,430 --> 00:43:24,460

now that you're watching we all get to

235

00:43:33,460 --> 00:43:30,440

carry why yell unless you want to stow

236

00:46:03,420 --> 00:43:33,470

it in your entry flight data file bag or

237

00:46:07,120 --> 00:46:05,260

do another banknote

238

00:46:10,210 --> 00:46:07,130

coming up oh my pleasure fill the powers

239

00:47:38,000 --> 00:46:10,220

coming on I have a hot stick we're still

240

00:47:46,200 --> 00:47:41,099

clubbing iron at the 90 that the

241

00:47:54,650 --> 00:47:46,210

Honorable any not see the red my yet I

242

00:48:09,010 --> 00:47:57,720

hair is the red way yeah we're going

243

00:48:18,560 --> 00:48:14,420

halite insight that's quite good the way

244

00:48:19,160 --> 00:48:18,570

inside Houston how deep in the roadways

245

00:48:24,350 --> 00:48:19,170

in sight

246

00:48:30,140 --> 00:48:24,360

good nav fellow 10 ok approaching land

247

00:48:31,880 --> 00:48:30,150

body flap to trail hey right on

248

00:48:42,400 --> 00:48:31,890

I see one white we're going for the

249

00:49:00,470 --> 00:48:51,740

right down centerline 5,000 said radar

250

00:49:06,320 --> 00:49:00,480

that'd be good Raider 3,000 for its

251
00:49:07,850 --> 00:49:06,330
commanding 21 a b7 pre player and a

252
00:49:17,140 --> 00:49:07,860
brief flare on the gear series 5 good

253
00:49:28,160 --> 00:49:25,400
1,500 400 here Deming Bob are zooming

254
00:49:31,580 --> 00:49:28,170
owe me a little bit slightly high jump

255
00:49:37,690 --> 00:49:31,590
eye off the ball bar you're down stop

256
00:49:46,580 --> 00:49:37,700
right there okay 50 40 30 to 30 20 to 25

257
00:49:56,590 --> 00:49:46,590
10 to 15 5 207 195 shoot 185 do you

258
00:50:00,050 --> 00:49:56,600
rotate to to nice landing thank you

259
00:50:07,520 --> 00:50:00,060
thank you literally oh good job Jim

260
00:50:09,020 --> 00:50:07,530
they're 120 breaking 610 breaking 5 so

261
00:50:17,480 --> 00:50:09,030
many easy on the break high right now

262
00:50:23,440 --> 00:50:17,490
breaking 790 breaking 880 breakin 779

263
00:50:32,230 --> 00:50:28,010

forty nine feet off and on signing up

264

00:50:32,240 --> 00:50:46,000

that's good to me

265

00:50:51,109 --> 00:50:49,910

congratulations Thank You Don it's great

266

00:50:55,849 --> 00:50:51,119

to be out there and it's good to be back

267

00:50:57,620 --> 00:50:55,859

thank you Libya's speed is down to five

268

00:51:07,780 --> 00:50:57,630

thousand two hundred miles per hour

269

00:51:45,550 --> 00:51:10,730

down at Columbia's altitude is eighty

270

00:53:27,810 --> 00:51:47,800

Columbia Houston we can take TPC number

271

00:53:33,310 --> 00:53:31,360

okay standby just do we have 450 repo is

272

00:53:39,400 --> 00:53:33,320

complete and you ever go for APU hide

273

00:53:48,580 --> 00:53:39,410

shutdown copy shutdown AP by 14 at the

274

00:53:54,850 --> 00:53:48,590

bottom now we're 514 at the top that you