



1
00:00:00,640 --> 00:00:16,630
30 seconds to undock

2
00:00:23,269 --> 00:00:19,189
houston and station we have physical

3
00:00:23,279 --> 00:00:32,870
houston copies

4
00:00:37,270 --> 00:00:34,790
endeavor uh undocking from the

5
00:00:40,549 --> 00:00:37,280
international space station uh right on

6
00:00:44,310 --> 00:00:40,559
schedule at 10 55 pm central 11 55

7
00:00:46,869 --> 00:00:44,320
eastern as the two spacecraft fly 200.

8
00:00:50,549 --> 00:00:46,879
miles above bolivia tracking

9
00:00:54,470 --> 00:00:52,150
endeavour

10
00:00:55,910 --> 00:00:54,480
setting her sails one last time

11
00:00:57,029 --> 00:00:55,920
departing the international space

12
00:00:59,510 --> 00:00:57,039
station

13
00:02:07,109 --> 00:00:59,520

after 12 missions to the orbiting

14

00:02:19,589 --> 00:02:09,190

disregard the station is in attitude

15

00:02:29,510 --> 00:02:21,190

international space station now in

16

00:02:33,589 --> 00:02:31,270

endeavor departing

17

00:02:34,830 --> 00:02:33,599

fairwinds and phones these guys

18

00:02:36,470 --> 00:02:34,840

yeah thanks

19

00:02:38,949 --> 00:02:36,480

ron

20

00:02:42,630 --> 00:02:38,959

appreciate all the help

21

00:02:42,640 --> 00:03:03,589

go navy

22

00:03:09,350 --> 00:03:06,390

station expedition 28 flight engineer

23

00:03:11,990 --> 00:03:09,360

ron garan ringing the traditional

24

00:03:15,509 --> 00:03:13,430

welcoming

25

00:03:18,869 --> 00:03:15,519

endeavor on its departure from the

26

00:03:21,350 --> 00:03:18,879

international space station

27

00:03:23,830 --> 00:03:21,360

the 12th mission of endeavor to the

28

00:03:25,110 --> 00:03:23,840

orbiting complex that's virtually half

29

00:03:27,030 --> 00:03:25,120

of endeavors

30

00:05:09,830 --> 00:03:27,040

missions have been devoted to

31

00:05:43,510 --> 00:05:12,310

endeavor continuing to slowly back away

32

00:05:48,790 --> 00:05:45,189

alpha

33

00:06:08,870 --> 00:05:48,800

station attitude for rpop if you'd like

34

00:06:45,350 --> 00:06:12,070

minus zero decimal nine plus zero

35

00:06:49,510 --> 00:06:46,870

endeavor in the international space

36

00:06:52,150 --> 00:06:49,520

station flying high off the northern

37

00:07:05,430 --> 00:06:52,160

coast of south america crossing the

38

00:07:10,469 --> 00:07:07,270

the crew now has powered down the

39

00:07:12,950 --> 00:07:10,479

docking mechanism and activated the

40

00:07:15,029 --> 00:07:12,960

small vernier thruster jets on the

41

00:07:18,469 --> 00:07:15,039

orbiter as it continues to back away

42

00:07:21,430 --> 00:07:18,479

from the international space station

43

00:07:23,990 --> 00:07:21,440

orbital sunrise coming about 10 minutes

44

00:07:31,430 --> 00:07:24,000

from now as the two spacecraft fly high

45

00:07:36,469 --> 00:07:33,510

endeavor was docked to the international

46

00:07:49,510 --> 00:07:36,479

space station for 11 days 17 hours and

47

00:07:52,950 --> 00:07:51,270

it's the 36th

48

00:07:55,029 --> 00:07:52,960

shuttle mission to the international

49

00:07:57,270 --> 00:07:55,039

space station space shuttles

50

00:07:58,430 --> 00:07:57,280

have been docked to the space station

51
00:08:00,390 --> 00:07:58,440
for a total of

52
00:08:03,430 --> 00:08:00,400
267 days

53
00:08:06,790 --> 00:08:03,440
20 hours and 2 minutes

54
00:08:09,270 --> 00:08:06,800
during those 36 missions the

55
00:08:11,510 --> 00:08:09,280
shuttles and stations crews have

56
00:08:15,350 --> 00:08:11,520
conducted joint operations with hatches

57
00:08:54,550 --> 00:08:15,360
open for a total of 226 days 16 hours

58
00:09:00,550 --> 00:08:58,470
the hhl matches the tcs

59
00:09:03,670 --> 00:09:00,560
endeavor we copy

60
00:09:08,230 --> 00:09:03,680
hhl is a handheld laser and tcs is a

61
00:09:10,870 --> 00:09:08,240
trajectory control control sensor

62
00:09:13,350 --> 00:09:10,880
rendezvous tools that the crew uses on

63
00:09:15,030 --> 00:09:13,360

board for targeting of the distance

64

00:09:35,030 --> 00:09:15,040

between endeavor and the international

65

00:09:40,310 --> 00:09:38,230

as endeavor departs it leaves behind a

66

00:09:41,990 --> 00:09:40,320

space station with a mass in space of

67

00:10:01,509 --> 00:09:42,000

904

68

00:10:05,470 --> 00:10:03,350

the pressurized volume of the space

69

00:10:11,990 --> 00:10:05,480

station is 32

70

00:10:18,949 --> 00:10:16,710

and the complex stretches 357 feet from

71

00:10:22,550 --> 00:10:18,959

end to end along the truss structure and

72

00:12:45,829 --> 00:10:22,560

240 feet long along the pressurized

73

00:12:51,269 --> 00:12:47,470

endeavors now

74

00:12:55,750 --> 00:12:53,670

from the international space station

75

00:12:58,069 --> 00:12:55,760

backing away straight down the velocity

76

00:12:59,829 --> 00:12:58,079

vector

77

00:13:05,190 --> 00:12:59,839

inching away at about

78

00:13:09,670 --> 00:13:07,910

should get television back in about 15

79

00:13:14,310 --> 00:13:09,680

minutes through the shuttle

80

00:15:36,550 --> 00:13:16,870

orbital sunrise coming in about five

81

00:15:43,350 --> 00:15:39,749

now about 230 feet from the space

82

00:15:47,590 --> 00:15:45,430

and the

83

00:16:36,470 --> 00:15:47,600

russian segment solar rays are back in

84

00:16:41,030 --> 00:16:39,110

about uh 22 minutes after the hour is

85

00:16:43,350 --> 00:16:41,040

the point where endeavor should reach a

86

00:16:48,230 --> 00:16:43,360

point about 400 feet

87

00:16:53,590 --> 00:16:51,590

and it is at that distance that uh pilot

88

00:16:55,430 --> 00:16:53,600

greg johnson

89

00:16:59,269 --> 00:16:55,440
will take over manual flying of

90

00:17:01,350 --> 00:16:59,279
endeavour through a 360 degree

91

00:19:53,110 --> 00:17:01,360
fly around or rotation of the

92

00:19:53,120 --> 00:19:56,630
houston endeavor

93

00:19:56,640 --> 00:19:59,750
go ahead endeavor

94

00:20:04,549 --> 00:20:02,870
as we come up on about our 200th sunrise

95

00:20:08,070 --> 00:20:04,559
of the mission we can see

96

00:20:08,950 --> 00:20:08,080
clearly see ams now on station and elc

97

00:20:11,510 --> 00:20:08,960
3.

98

00:20:13,110 --> 00:20:11,520
i just want to congratulate the whole

99

00:20:16,549 --> 00:20:13,120
team on the ground

100

00:20:18,549 --> 00:20:16,559
and the expedition 27 and 28 crews

101

00:20:21,110 --> 00:20:18,559

for all the hard work

102

00:20:23,029 --> 00:20:21,120

that that you guys have put into this uh

103

00:20:24,549 --> 00:20:23,039

we're the ones that get to see this

104

00:20:26,789 --> 00:20:24,559

incredible view

105

00:20:29,909 --> 00:20:26,799

um but you know you're all with us in

106

00:20:32,070 --> 00:20:29,919

spirit and this is really a new day for

107

00:20:35,510 --> 00:20:32,080

uh science support the space station so

108

00:20:37,350 --> 00:20:35,520

uh thanks to all of you

109

00:20:39,029 --> 00:20:37,360

endeavor thanks very much for the kind

110

00:20:43,830 --> 00:20:39,039

words we'll pass the message and it's a

111

00:20:43,840 --> 00:20:53,990

you are welcome

112

00:20:59,990 --> 00:20:56,470

from houston we've switched

113

00:21:00,000 --> 00:21:03,590

we copy cg

114

00:21:10,950 --> 00:21:05,430

and what i really meant was the hhl

115

00:21:10,960 --> 00:22:24,870

copy

116

00:22:24,880 --> 00:22:29,350

houston we're going to block nine alpha

117

00:22:33,669 --> 00:22:31,590

copy nine alpha

118

00:22:36,470 --> 00:22:33,679

block nine alpha in the rendezvous is

119

00:22:39,510 --> 00:22:36,480

the initiation of the fly around at the

120

00:22:41,750 --> 00:22:39,520

distance of at a distance of 425 feet

121

00:22:44,230 --> 00:22:41,760

from the international space station

122

00:23:19,669 --> 00:22:44,240

as the two spacecraft fly high above

123

00:23:23,270 --> 00:23:20,630

once

124

00:23:26,710 --> 00:23:23,280

endeavor has reached a distance outside

125

00:23:28,630 --> 00:23:26,720

400 feet the station solar arrays can be

126
00:24:07,669 --> 00:23:28,640
unlocked there are beta gimbal

127
00:24:12,870 --> 00:24:10,630
pilot greg johnson targeting the fly

128
00:25:03,909 --> 00:24:12,880
around maneuver loading those targets

129
00:25:03,919 --> 00:25:19,830
uh

130
00:25:24,149 --> 00:25:21,350
and the fly around has now been

131
00:25:27,830 --> 00:25:24,159
initiated at start time 11

132
00:25:36,390 --> 00:25:27,840
20 pm central time 12 20

133
00:25:42,470 --> 00:25:39,669
the fly around begins with endeavor at a

134
00:26:11,669 --> 00:25:42,480
distance of 460 feet out in front of the

135
00:26:15,669 --> 00:26:13,190
endeavor in the international space

136
00:26:17,909 --> 00:26:15,679
station high above the czech republic

137
00:26:27,909 --> 00:26:17,919
tracking easterly across

138
00:26:34,950 --> 00:26:31,269

we'll track across the border between

139

00:26:37,029 --> 00:26:34,960

belarus and the ukraine

140

00:27:08,390 --> 00:26:37,039

and then southern russia and then

141

00:27:12,470 --> 00:27:09,310

about

142

00:27:14,230 --> 00:27:12,480

480 feet separate space shuttle

143

00:27:19,029 --> 00:27:14,240

endeavour from the international space

144

00:27:23,590 --> 00:27:21,430

this view from the station looking at

145

00:27:25,750 --> 00:27:23,600

endeavour and we now have a television

146

00:27:27,909 --> 00:27:25,760

view from endeavor

147

00:27:29,430 --> 00:27:27,919

looking through the orbiter docking

148

00:27:31,350 --> 00:27:29,440

system

149

00:27:46,789 --> 00:27:31,360

back toward the international space

150

00:27:46,799 --> 00:28:00,950

my

151
00:29:02,070 --> 00:28:02,110
range

152
00:29:06,789 --> 00:29:05,269
endeavour's guidance system targeted the

153
00:29:08,950 --> 00:29:06,799
fly around about

154
00:29:12,710 --> 00:29:08,960
as it turns out about three minutes

155
00:29:17,029 --> 00:29:15,110
but shuttle pilot greg johnson now

156
00:29:19,710 --> 00:29:17,039
flying endeavor

157
00:29:21,750 --> 00:29:19,720
through the initial stages of a

158
00:31:15,669 --> 00:29:21,760
360-degree run

159
00:31:15,679 --> 00:31:39,269
uh

160
00:31:39,279 --> 00:32:55,750
so

161
00:32:55,760 --> 00:33:11,190
foreign

162
00:33:16,070 --> 00:33:13,110
this distance view

163
00:33:19,269 --> 00:33:16,080

from 560 feet

164

00:33:22,070 --> 00:33:19,279

as uh endeavor continues to

165

00:33:24,870 --> 00:33:22,080

fly around the station now

166

00:33:27,990 --> 00:33:24,880

coming up on about a 90 degree

167

00:33:32,070 --> 00:33:28,000

the 90 degree point of the 360 degree

168

00:33:32,080 --> 00:33:36,149

the international space station

169

00:33:42,470 --> 00:33:40,310

stretching 357 feet from tip to tip

170

00:33:45,389 --> 00:33:42,480

the pressurized volume

171

00:33:48,950 --> 00:33:45,399

perpendicular volume there is about

172

00:33:53,669 --> 00:33:51,269

at the bottom the docking port from

173

00:33:56,870 --> 00:33:53,679

which endeavour departed

174

00:33:58,630 --> 00:33:56,880

at 10 55 pm

175

00:34:02,470 --> 00:33:58,640

central time

176

00:34:06,070 --> 00:34:03,269

the

177

00:34:08,470 --> 00:34:06,080

european columbus science laboratory off

178

00:34:09,430 --> 00:34:08,480

to the left and the japanese experiment

179

00:34:12,629 --> 00:34:09,440

module

180

00:34:14,470 --> 00:34:12,639

kibo the japanese word for hope

181

00:34:15,990 --> 00:34:14,480

off to the right

182

00:34:18,710 --> 00:34:16,000

and then heading down the length of the

183

00:34:21,030 --> 00:34:18,720

volume the harmony connecting node to

184

00:34:23,589 --> 00:34:21,040

which those modules are attached

185

00:34:25,270 --> 00:34:23,599

in turn is attached to the us laboratory

186

00:34:30,069 --> 00:34:25,280

destiny

187

00:34:34,389 --> 00:34:30,079

that 300

188

00:34:37,109 --> 00:34:34,399

almost 360 degree or 60 foot long truss

189

00:34:41,589 --> 00:34:39,510

and then the first u.s element of the

190

00:34:44,389 --> 00:34:41,599

international space station launched

191

00:34:45,909 --> 00:34:44,399

back in december of 1998 the unity

192

00:34:48,230 --> 00:34:45,919

module

193

00:34:49,990 --> 00:34:48,240

is the connecting point from the u.s

194

00:34:51,270 --> 00:34:50,000

segment to the russian segment of the

195

00:34:53,829 --> 00:34:51,280

station

196

00:34:55,510 --> 00:34:53,839

next in line the first ever component of

197

00:34:57,589 --> 00:34:55,520

the international space station the

198

00:35:01,190 --> 00:34:57,599

zarya control module

199

00:35:01,200 --> 00:35:06,710

mostly retracted in accordion style

200

00:35:13,990 --> 00:35:10,870

the zvezda module on the back end is the

201
00:35:15,430 --> 00:35:14,000
the next module with its solar arrays

202
00:35:17,910 --> 00:35:15,440
deployed

203
00:35:20,470 --> 00:35:17,920
served as the early living quarters and

204
00:35:22,870 --> 00:35:20,480
the control section of the russian

205
00:35:25,910 --> 00:35:22,880
segment of the complex and then on the

206
00:35:29,829 --> 00:35:25,920
back end with the scissor-shaped solar

207
00:35:31,589 --> 00:35:29,839
rays is the european space agency

208
00:35:35,430 --> 00:35:31,599
automat automated

209
00:35:35,440 --> 00:35:42,829
known as the johannes

210
00:35:47,670 --> 00:35:45,109
kepler it's been

211
00:35:50,230 --> 00:35:47,680
a part of the space station since late

212
00:35:52,630 --> 00:35:50,240
february when it arrived delivering

213
00:35:56,069 --> 00:35:52,640

supplies to the station it's one of

214

00:35:56,079 --> 00:36:01,670

visiting vehicles that the station

215

00:36:07,670 --> 00:36:04,950

hosts including the russian soyuz

216

00:36:09,910 --> 00:36:07,680

capsule which delivers crews to and from

217

00:36:15,430 --> 00:36:09,920

the station and also the progress supply

218

00:36:19,990 --> 00:36:18,230

now directly

219

00:36:22,310 --> 00:36:20,000

over the top of the international space

220

00:36:26,390 --> 00:36:22,320

station looking straight down from a

221

00:36:28,630 --> 00:36:26,400

range of 600 feet

222

00:36:31,510 --> 00:36:28,640

each of the pair of u.s solar arrays

223

00:36:33,510 --> 00:36:31,520

stretch 240 feet tip to tip and each one

224

00:36:35,430 --> 00:36:33,520

of those has its own

225

00:36:37,270 --> 00:36:35,440

radiator that you see

226

00:36:41,829 --> 00:36:37,280

stretching off perpendicular to the

227

00:36:47,109 --> 00:36:44,790

that uh trust structure has a

228

00:36:49,190 --> 00:36:47,119

an elaborate system of uh cooling

229

00:36:51,109 --> 00:36:49,200

ammonia cooling

230

00:36:54,150 --> 00:36:51,119

for heat rejection

231

00:36:55,829 --> 00:36:54,160

for all of the electronics equipment the

232

00:37:01,990 --> 00:36:55,839

basically the power systems of the

233

00:37:07,589 --> 00:37:04,870

the solar arrays four pair of them us

234

00:37:10,390 --> 00:37:07,599

solar rays track the sun

235

00:37:12,790 --> 00:37:10,400

garner energy store it into

236

00:37:15,349 --> 00:37:12,800

batteries along that truss structure

237

00:37:16,470 --> 00:37:15,359

that power then transferred into the

238

00:37:18,630 --> 00:37:16,480

station

239

00:37:37,910 --> 00:37:18,640

for use by all of the

240

00:37:42,470 --> 00:37:39,430

endeavor in the international space

241

00:37:55,190 --> 00:37:42,480

station now high above western china

242

00:37:59,829 --> 00:37:57,670

the ground track will take uh

243

00:38:06,710 --> 00:37:59,839

the two spacecraft

244

00:38:37,510 --> 00:38:08,790

and then directly across central

245

00:39:40,630 --> 00:39:07,589

foreign

246

00:39:40,640 --> 00:39:49,790

my

247

00:39:54,069 --> 00:39:51,670

640 feet

248

00:40:36,710 --> 00:39:54,079

above and now slightly behind the

249

00:40:36,720 --> 00:44:45,349

foreign

250

00:44:45,359 --> 00:45:02,150

so

251
00:45:02,160 --> 00:45:05,910
foreign

252
00:45:05,920 --> 00:45:37,190
okay

253
00:45:40,309 --> 00:45:39,190
during endeavors um

254
00:45:42,390 --> 00:45:40,319
almost

255
00:45:45,109 --> 00:45:42,400
12 days of docked operations at the

256
00:45:47,030 --> 00:45:45,119
international space station that

257
00:45:49,190 --> 00:45:47,040
left behind the alpha magnetic

258
00:45:51,829 --> 00:45:49,200
spectrometer

259
00:45:54,150 --> 00:45:51,839
now a permanent component on the

260
00:45:57,030 --> 00:45:54,160
starboard side of the station's truss

261
00:45:59,670 --> 00:45:57,040
structure the ams

262
00:46:01,910 --> 00:45:59,680
has a mass in space of fifteen thousand

263
00:46:04,309 --> 00:46:01,920

two hundred pounds

264

00:46:06,150 --> 00:46:04,319

also delivered to the

265

00:46:08,710 --> 00:46:06,160

orbiting complex

266

00:46:10,550 --> 00:46:08,720

an express logistics carrier

267

00:46:13,910 --> 00:46:10,560

with uh several

268

00:46:15,990 --> 00:46:13,920

spare components for use

269

00:46:17,990 --> 00:46:16,000

when needed at the international space

270

00:46:22,069 --> 00:46:18,000

station the express

271

00:46:24,630 --> 00:46:22,079

the the elc as it's known by its acronym

272

00:46:30,630 --> 00:46:24,640

has a mass in space of 13

273

00:46:36,069 --> 00:46:31,510

the

274

00:46:38,710 --> 00:46:36,079

enhanced iss boom assembly which is

275

00:46:40,309 --> 00:46:38,720

formerly known as the orbiter boom

276
00:46:41,990 --> 00:46:40,319
sensor system

277
00:46:44,150 --> 00:46:42,000
that

278
00:46:47,990 --> 00:46:44,160
weight in space uh

279
00:46:49,990 --> 00:46:48,000
totaled 622 pounds

280
00:46:52,470 --> 00:46:50,000
but in addition to that there was some

281
00:46:55,109 --> 00:46:52,480
internal transfers and

282
00:46:57,589 --> 00:46:55,119
some of the most important items that

283
00:47:00,230 --> 00:46:57,599
are transferred are nitrogen and oxygen

284
00:47:04,230 --> 00:47:00,240
to the space station throughout the

285
00:47:08,069 --> 00:47:05,589
endeavor

286
00:47:11,349 --> 00:47:08,079
transferred

287
00:47:15,589 --> 00:47:11,359
18 pounds of nitrogen to the space

288
00:47:19,109 --> 00:47:15,599

station 17 pounds of oxygen to the iss

289

00:47:21,549 --> 00:47:19,119

high pressurized gas tanks

290

00:47:23,510 --> 00:47:21,559

and throughout the mission

291

00:47:26,549 --> 00:47:23,520

278 pounds

292

00:47:29,030 --> 00:47:26,559

of oxygen was

293

00:47:31,109 --> 00:47:29,040

transferred to the station atmosphere

294

00:47:32,950 --> 00:47:31,119

both for metabolic use and for

295

00:47:35,030 --> 00:47:32,960

repressurization

296

00:47:59,349 --> 00:47:35,040

of the station's atmosphere while

297

00:47:59,359 --> 00:48:31,230

so

298

00:48:35,190 --> 00:48:32,829

640

299

00:48:37,670 --> 00:48:35,200

feet from the international space

300

00:48:41,589 --> 00:48:37,680

station

301
00:48:47,829 --> 00:48:44,710
the fly around of about 180 degrees now

302
00:48:50,390 --> 00:48:47,839
of the 360 degree fly around so

303
00:49:24,950 --> 00:48:50,400
endeavors now

304
00:49:30,390 --> 00:49:28,150
that block of activity means that the

305
00:49:33,910 --> 00:49:30,400
shuttle crew is now going to initiate a

306
00:49:37,829 --> 00:49:33,920
radar acquisition switching the ku band

307
00:50:25,190 --> 00:49:37,839
antenna system from the com mode to

308
00:50:25,200 --> 00:50:45,349
okay

309
00:50:45,359 --> 00:51:33,829
so

310
00:51:40,309 --> 00:51:35,670
endeavour houston on two for iss

311
00:51:46,150 --> 00:51:43,030
pitch yeah roll minus two decimal four

312
00:51:53,349 --> 00:51:46,160
minus six decimal zero plus zero decimal

313
00:51:57,990 --> 00:51:55,030

minus two difficult four minus six

314

00:52:24,150 --> 00:51:58,000

decimal zero and plus zero decimal four

315

00:52:29,750 --> 00:52:26,230

beautiful view of the russian segment of

316

00:53:03,750 --> 00:52:29,760

the station with endeavor

317

00:53:12,150 --> 00:53:05,510

endeavor houston on two for radar

318

00:53:15,990 --> 00:53:13,750

mark we need to need you to check your

319

00:53:22,309 --> 00:53:16,000

config on a1 upper please we see a

320

00:53:22,319 --> 00:53:28,549

okay uh just call them up to us houston

321

00:53:28,559 --> 00:53:36,630

ku power to stand by

322

00:53:40,069 --> 00:53:37,750

okay it looks like you're in a good

323

00:53:53,910 --> 00:53:40,079

config now

324

00:53:58,710 --> 00:53:56,950

600 feet from the space station

325

00:54:02,549 --> 00:53:58,720

tracking toward the

326

00:54:02,559 --> 00:54:06,990

endeavour now behind and

327

00:54:14,069 --> 00:54:10,710

below we went power to on i think we

328

00:54:14,079 --> 00:54:31,829

we concur