
PAO
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1
00:00:04,230 --> 00:00:02,389
welcome everybody to mission control

2
00:00:06,710 --> 00:00:04,240
houston this is the international space

3
00:00:09,190 --> 00:00:06,720
station flight control room we'd like to

4
00:00:09,910 --> 00:00:09,200
welcome the alvarado junior high school

5
00:00:15,430 --> 00:00:09,920
in

6
00:00:17,670 --> 00:00:15,440
public affairs office here at the

7
00:00:20,870 --> 00:00:17,680
johnson space center for nasa and

8
00:00:24,230 --> 00:00:20,880
joining me is megan hampshire hasher and

9
00:00:26,310 --> 00:00:24,240
megan is a space station flight software

10
00:00:27,109 --> 00:00:26,320
engineer i don't know i think i got that

11
00:00:27,990 --> 00:00:27,119
right

12
00:00:30,630 --> 00:00:28,000
and

13
00:00:33,670 --> 00:00:30,640

so she knows uh quite a bit about

14
00:00:35,670 --> 00:00:33,680
how the software it works and testing

15
00:00:37,510 --> 00:00:35,680
and simulation and getting it ready to

16
00:00:40,069 --> 00:00:37,520
actually work on board the international

17
00:00:42,150 --> 00:00:40,079
space station which is flying above us

18
00:00:44,069 --> 00:00:42,160
250 miles so

19
00:00:46,790 --> 00:00:44,079
we're excited to have you guys join us

20
00:00:49,110 --> 00:00:46,800
today uh here in mission control and i

21
00:00:54,470 --> 00:00:49,120
think we're both gonna try to answer

22
00:00:58,630 --> 00:00:56,150
michael we're ready whenever you guys

23
00:01:00,790 --> 00:00:58,640
are

24
00:01:03,349 --> 00:01:00,800
do the astronauts ever get tired of

25
00:01:05,990 --> 00:01:03,359
floating around

26
00:01:08,149 --> 00:01:06,000
personally if i was in space i wouldn't

27
00:01:10,230 --> 00:01:08,159
get tired i don't think but i couldn't

28
00:01:12,630 --> 00:01:10,240
answer that because i'm not an astronaut

29
00:01:15,109 --> 00:01:12,640
i think that astronauts don't get tired

30
00:01:17,270 --> 00:01:15,119
of floating around in space in fact it's

31
00:01:18,550 --> 00:01:17,280
pretty easy to do that if you've ever

32
00:01:20,149 --> 00:01:18,560
seen them on

33
00:01:21,990 --> 00:01:20,159
television

34
00:01:24,390 --> 00:01:22,000
it's pretty much effortless after they

35
00:01:26,149 --> 00:01:24,400
learn not to bump into things in fact

36
00:01:27,910 --> 00:01:26,159
you're looking right now at a live

37
00:01:29,990 --> 00:01:27,920
picture inside the station of one of the

38
00:01:32,550 --> 00:01:30,000

new crew members on board as he's

39
00:01:34,069 --> 00:01:32,560
working on a science experiment uh in

40
00:01:36,789 --> 00:01:34,079
the station so i don't think they get

41
00:01:39,670 --> 00:01:36,799
tired at all of floating around

42
00:01:43,830 --> 00:01:42,310
hello my name is cameron gunn and

43
00:01:46,310 --> 00:01:43,840
if you held your breath in space would

44
00:01:48,630 --> 00:01:46,320
you possibly float down to the floor

45
00:01:50,950 --> 00:01:48,640
like in a pool

46
00:01:52,950 --> 00:01:50,960
i don't think you would typically they

47
00:01:54,710 --> 00:01:52,960
are breathing normally and they're not

48
00:01:56,550 --> 00:01:54,720
moving around a whole lot unless they're

49
00:01:58,069 --> 00:01:56,560
pushing off something because they are

50
00:02:00,469 --> 00:01:58,079
weightless

51
00:02:02,630 --> 00:02:00,479
they do practice some of their extra

52
00:02:04,709 --> 00:02:02,640
vehicular activities in a pool

53
00:02:06,950 --> 00:02:04,719
because it can help simulate weakness

54
00:02:08,949 --> 00:02:06,960
weightlessness but

55
00:02:14,470 --> 00:02:08,959
they don't actually sink when they

56
00:02:18,229 --> 00:02:16,309
my name is mallory sotter and if a

57
00:02:19,830 --> 00:02:18,239
damage occurs can you find a way to

58
00:02:21,589 --> 00:02:19,840
repair or do you have to leave right

59
00:02:23,190 --> 00:02:21,599
away

60
00:02:24,869 --> 00:02:23,200
that's a good question

61
00:02:27,750 --> 00:02:24,879
and i think in general they try to

62
00:02:30,150 --> 00:02:27,760
repair it if at all possible i know last

63
00:02:33,990 --> 00:02:30,160

year in the news i think it was a in the

64
00:02:36,070 --> 00:02:34,000
fall time frame they had a problem with

65
00:02:37,589 --> 00:02:36,080
one of the

66
00:02:39,430 --> 00:02:37,599
power

67
00:02:40,949 --> 00:02:39,440
contraptions and

68
00:02:43,670 --> 00:02:40,959
they actually put out in the news that

69
00:02:45,910 --> 00:02:43,680
they used a toothbrush and some wire to

70
00:02:47,670 --> 00:02:45,920
help loosen a bolt so that they could

71
00:02:49,270 --> 00:02:47,680
replace the unit

72
00:02:51,270 --> 00:02:49,280
right but

73
00:02:53,270 --> 00:02:51,280
you know there's a lot of contingencies

74
00:02:55,830 --> 00:02:53,280
and precautions that crews trained for

75
00:02:58,070 --> 00:02:55,840
um in order to uh

76
00:03:00,390 --> 00:02:58,080
repair systems onboard the station it's

77
00:03:02,229 --> 00:03:00,400
a very big complex and and uh so we're

78
00:03:04,869 --> 00:03:02,239
trained pretty heavily these crew

79
00:03:06,550 --> 00:03:04,879
members to fix just about anything on

80
00:03:10,149 --> 00:03:06,560
the station so

81
00:03:14,390 --> 00:03:12,070
my name is drew did the astronauts

82
00:03:16,309 --> 00:03:14,400
control the nevada navigational system

83
00:03:18,149 --> 00:03:16,319
on the iss

84
00:03:20,149 --> 00:03:18,159
a lot of the control of the navigation

85
00:03:21,750 --> 00:03:20,159
system is actually done by computers in

86
00:03:23,670 --> 00:03:21,760
the flight software

87
00:03:25,990 --> 00:03:23,680
the controllers in mission control and

88
00:03:28,789 --> 00:03:26,000

the crew can send commands to do

89
00:03:30,789 --> 00:03:28,799
maneuvers but the software actually is

90
00:03:33,110 --> 00:03:30,799
the thing that does and performs the

91
00:03:35,670 --> 00:03:33,120
maneuvers with the hardware

92
00:03:37,830 --> 00:03:35,680
and if we uh if we have a wide shot of

93
00:03:39,350 --> 00:03:37,840
this room there's a flight control

94
00:03:40,949 --> 00:03:39,360
position

95
00:03:42,949 --> 00:03:40,959
actually in here that

96
00:03:45,110 --> 00:03:42,959
manages the flight software that watches

97
00:03:46,949 --> 00:03:45,120
over all of those computer systems the

98
00:03:48,550 --> 00:03:46,959
the overall command and control system

99
00:03:52,470 --> 00:03:48,560
right right

100
00:03:56,390 --> 00:03:54,710
my name is ashley ramsey when you get

101
00:03:58,309 --> 00:03:56,400
back home on earth does it take time to

102
00:03:59,910 --> 00:03:58,319
adjust back to gravity and if it does

103
00:04:00,869 --> 00:03:59,920
how long does it take to get back to

104
00:04:02,229 --> 00:04:00,879
normal

105
00:04:04,390 --> 00:04:02,239
well it depends on what they're

106
00:04:07,110 --> 00:04:04,400
adjusting from but typically it does

107
00:04:08,949 --> 00:04:07,120
take them a little bit of time to adjust

108
00:04:10,949 --> 00:04:08,959
i think on average they said in about

109
00:04:13,509 --> 00:04:10,959
three days any kind of nauseousness or

110
00:04:15,509 --> 00:04:13,519
anything like that from returning

111
00:04:17,430 --> 00:04:15,519
it has dissipated but they still have to

112
00:04:20,710 --> 00:04:17,440
work on regaining the muscle strength

113
00:04:22,870 --> 00:04:20,720

and bone strength that they had prior to

114
00:04:23,670 --> 00:04:22,880
going up in space because they do lose

115
00:04:25,270 --> 00:04:23,680
some

116
00:04:27,590 --> 00:04:25,280
of that while they're up there since

117
00:04:29,830 --> 00:04:27,600
they're not using their body like they

118
00:04:32,790 --> 00:04:29,840
normally do here on earth we've learned

119
00:04:34,150 --> 00:04:32,800
a lot after so many years of space

120
00:04:36,790 --> 00:04:34,160
flight and especially on these long

121
00:04:39,189 --> 00:04:36,800
duration flights like this

122
00:04:41,990 --> 00:04:39,199
the flight doctors have a

123
00:04:43,510 --> 00:04:42,000
very strict exercise protocol for the

124
00:04:44,710 --> 00:04:43,520
crew members on board so that when they

125
00:04:46,629 --> 00:04:44,720
do come home

126
00:04:49,749 --> 00:04:46,639
tries to reduce that time that it

127
00:04:51,830 --> 00:04:49,759
actually takes to re-adapt re-adapt to

128
00:04:53,270 --> 00:04:51,840
the one gravity environment that we feel

129
00:04:54,710 --> 00:04:53,280
right here so

130
00:04:57,189 --> 00:04:54,720
on the order they i think they have a

131
00:04:59,270 --> 00:04:57,199
protocol of about 45 days or so after

132
00:05:01,430 --> 00:04:59,280
landing that they kind of use as a rule

133
00:05:03,029 --> 00:05:01,440
of thumb but that's not hard and fast

134
00:05:07,909 --> 00:05:03,039
but that's a that's a great question

135
00:05:11,510 --> 00:05:09,670
my name is hannah wright

136
00:05:12,629 --> 00:05:11,520
what is the biggest worry about going to

137
00:05:14,629 --> 00:05:12,639
space

138
00:05:16,230 --> 00:05:14,639

i think in general the biggest worry is

139
00:05:17,189 --> 00:05:16,240
keeping the humans that are in space

140
00:05:19,510 --> 00:05:17,199
alive

141
00:05:21,590 --> 00:05:19,520
and the environment and space is vastly

142
00:05:22,790 --> 00:05:21,600
different than here on earth and so they

143
00:05:24,550 --> 00:05:22,800
have to worry about a lot of the

144
00:05:26,629 --> 00:05:24,560
environmental things making sure there's

145
00:05:28,790 --> 00:05:26,639
air up there making sure

146
00:05:30,150 --> 00:05:28,800
that it is a livable

147
00:05:32,150 --> 00:05:30,160
environment for them because you're

148
00:05:37,350 --> 00:05:32,160
going into a vacuum where there's

149
00:05:41,189 --> 00:05:39,430
my name is brandon and i want to know

150
00:05:43,029 --> 00:05:41,199
what college you have to go to to work

151
00:05:44,710 --> 00:05:43,039
at nasa and be an astronaut and what you

152
00:05:47,350 --> 00:05:44,720
have to study

153
00:05:49,430 --> 00:05:47,360
now i personally have not heard of any

154
00:05:51,590 --> 00:05:49,440
specific colleges that nasa says you

155
00:05:53,990 --> 00:05:51,600
have to go to i think more what they

156
00:05:55,749 --> 00:05:54,000
look at is what classes you've taken and

157
00:05:57,670 --> 00:05:55,759
how you've done in them

158
00:06:00,230 --> 00:05:57,680
for a lot of the people i work with

159
00:06:02,309 --> 00:06:00,240
personally they have degrees in

160
00:06:04,390 --> 00:06:02,319
engineering or physics or some kind of

161
00:06:07,590 --> 00:06:04,400
science or math or they have a computer

162
00:06:09,430 --> 00:06:07,600
science degree and a lot of the classes

163
00:06:11,029 --> 00:06:09,440

they look at you taking then are the

164
00:06:13,189 --> 00:06:11,039
sciences the engineering and the

165
00:06:15,430 --> 00:06:13,199
computer programming now i know they

166
00:06:17,270 --> 00:06:15,440
also have a business division here so

167
00:06:18,790 --> 00:06:17,280
that somebody actually manages the money

168
00:06:20,309 --> 00:06:18,800
for the engineers

169
00:06:22,070 --> 00:06:20,319
and so i know there are a lot of people

170
00:06:24,230 --> 00:06:22,080
who get their mbas

171
00:06:26,230 --> 00:06:24,240
or their business degrees to be able to

172
00:06:28,309 --> 00:06:26,240
work here so there's a there's a whole

173
00:06:30,790 --> 00:06:28,319
vast array of the type of degrees that

174
00:06:32,710 --> 00:06:30,800
you can study to work in the space

175
00:06:35,670 --> 00:06:32,720
industry if you want to the aerospace

176
00:06:37,749 --> 00:06:35,680
industry so but math and science is kind

177
00:06:38,550 --> 00:06:37,759
of a staple because if you understand

178
00:06:41,350 --> 00:06:38,560
those

179
00:06:44,150 --> 00:06:41,360
kind of

180
00:06:45,830 --> 00:06:44,160
studying habits then that can translate

181
00:06:48,230 --> 00:06:45,840
into just about anything you do in the

182
00:06:50,710 --> 00:06:48,240
aerospace industry and i know for me

183
00:06:53,110 --> 00:06:50,720
personally a couple of my physics

184
00:06:55,670 --> 00:06:53,120
mechanic classes so like the orbital

185
00:06:58,230 --> 00:06:55,680
mechanics you know how things move have

186
00:07:00,550 --> 00:06:58,240
come in handy a lot i've had a great

187
00:07:03,110 --> 00:07:00,560
deal of help in that regard great

188
00:07:05,749 --> 00:07:03,120

question

189
00:07:07,909 --> 00:07:05,759
hi my name is sierra how does the iss

190
00:07:10,710 --> 00:07:07,919
get out of the way of space debris or

191
00:07:13,029 --> 00:07:10,720
asteroids that's a good question

192
00:07:14,550 --> 00:07:13,039
they have thrusters on board the space

193
00:07:17,029 --> 00:07:14,560
station and they also have vehicles

194
00:07:18,309 --> 00:07:17,039
docked that have thrusters and they use

195
00:07:20,150 --> 00:07:18,319
those to

196
00:07:22,150 --> 00:07:20,160
move out of the way of debris providing

197
00:07:23,749 --> 00:07:22,160
they can find it ahead of time

198
00:07:25,510 --> 00:07:23,759
but they've got lots of people keeping

199
00:07:27,909 --> 00:07:25,520
eye and eye out on all of the debris

200
00:07:29,749 --> 00:07:27,919
that is up there exactly there's

201
00:07:34,469 --> 00:07:29,759
we track

202
00:07:36,870 --> 00:07:34,479
space debris of a certain size um that

203
00:07:38,629 --> 00:07:36,880
we can tell when it's going to come

204
00:07:39,830 --> 00:07:38,639
anywhere in the vicinity of the station

205
00:07:41,909 --> 00:07:39,840
and so

206
00:07:44,629 --> 00:07:41,919
and that's watched very very carefully

207
00:07:47,350 --> 00:07:44,639
and so the station as megan says can can

208
00:07:49,670 --> 00:07:47,360
actually maneuver ahead of time and be

209
00:07:51,670 --> 00:07:49,680
in a little bit different orbit

210
00:07:54,230 --> 00:07:51,680
so that it will be completely out of the

211
00:07:56,790 --> 00:07:54,240
way of any threat like that so that's a

212
00:07:58,629 --> 00:07:56,800
good question

213
00:08:00,950 --> 00:07:58,639

hi my name is rachel what are the first

214
00:08:02,390 --> 00:08:00,960
steps if there was a major problem with

215
00:08:04,390 --> 00:08:02,400
the computers

216
00:08:07,430 --> 00:08:04,400
that control the isa i think this is

217
00:08:09,430 --> 00:08:07,440
probably megan's area yeah

218
00:08:11,510 --> 00:08:09,440
there are a lot of computers aboard the

219
00:08:13,110 --> 00:08:11,520
space station and i think the last count

220
00:08:14,469 --> 00:08:13,120
i had heard was something like 52

221
00:08:16,550 --> 00:08:14,479
different computers

222
00:08:18,869 --> 00:08:16,560
now they're not all running at the same

223
00:08:20,869 --> 00:08:18,879
time we have a lot of backup computers

224
00:08:22,710 --> 00:08:20,879
especially for the command and control

225
00:08:24,230 --> 00:08:22,720
computers the ones that interface with

226
00:08:26,950 --> 00:08:24,240
everything there are three different

227
00:08:28,790 --> 00:08:26,960
computers one is used at a time one is

228
00:08:31,270 --> 00:08:28,800
on standby in case the first computer

229
00:08:33,589 --> 00:08:31,280
goes down and the other one's on standby

230
00:08:36,870 --> 00:08:33,599
and then on top of that we have

231
00:08:38,870 --> 00:08:36,880
another system in place that would go to

232
00:08:40,949 --> 00:08:38,880
redirect things to a different system so

233
00:08:43,029 --> 00:08:40,959
that we could still command and control

234
00:08:44,630 --> 00:08:43,039
the space station and i think the

235
00:08:46,870 --> 00:08:44,640
easiest answer is we have lots of

236
00:08:48,070 --> 00:08:46,880
computers so that we can replace things

237
00:08:49,829 --> 00:08:48,080
as needed

238
00:08:52,790 --> 00:08:49,839

and one of the

239
00:08:54,470 --> 00:08:52,800
good old standbys is to power cycle the

240
00:08:57,110 --> 00:08:54,480
computer like you would if sometimes you

241
00:08:58,949 --> 00:08:57,120
get a blue screen on your computer where

242
00:09:00,389 --> 00:08:58,959
you turn it off let it sit for a couple

243
00:09:04,949 --> 00:09:00,399
minutes and then turn it back on to try

244
00:09:08,710 --> 00:09:07,190
hi i'm sam um

245
00:09:10,630 --> 00:09:08,720
when descending to the earth does the

246
00:09:12,389 --> 00:09:10,640
size of an object determine whether or

247
00:09:14,949 --> 00:09:12,399
not it will burn up

248
00:09:17,269 --> 00:09:14,959
yes it it's actually dependent on a

249
00:09:19,030 --> 00:09:17,279
couple things the size of the object and

250
00:09:20,870 --> 00:09:19,040
how fast it's entering the atmosphere if

251
00:09:22,630 --> 00:09:20,880
it's going pretty slowly it's more

252
00:09:23,509 --> 00:09:22,640
likely to hit the surface of the earth

253
00:09:25,269 --> 00:09:23,519
because

254
00:09:26,550 --> 00:09:25,279
it's not creating as much friction for

255
00:09:29,350 --> 00:09:26,560
it to burn up

256
00:09:33,110 --> 00:09:29,360
and i think the last figure i saw was if

257
00:09:34,630 --> 00:09:33,120
it was under 25 meters in diameter it's

258
00:09:36,870 --> 00:09:34,640
more likely to

259
00:09:39,190 --> 00:09:36,880
burn up in the earth's atmosphere

260
00:09:41,269 --> 00:09:39,200
we have uh some visiting vehicles that

261
00:09:43,110 --> 00:09:41,279
we call them that deliver cargo to the

262
00:09:45,030 --> 00:09:43,120
station that burn up in the atmosphere

263
00:09:47,750 --> 00:09:45,040

and there some of those pieces make it

264
00:09:49,509 --> 00:09:47,760
to earth but they target the re-entry

265
00:09:51,670 --> 00:09:49,519
so that it's in the ocean and it and it

266
00:09:53,350 --> 00:09:51,680
would not harm anybody on the ground but

267
00:09:55,590 --> 00:09:53,360
most of the pieces burn up because of

268
00:09:58,710 --> 00:09:55,600
that friction that megan talked about

269
00:10:04,630 --> 00:10:01,750
hi my name is mason stevens is the isa

270
00:10:06,470 --> 00:10:04,640
does the iss fly in space or did it just

271
00:10:08,949 --> 00:10:06,480
stay in orbit around earth

272
00:10:09,910 --> 00:10:08,959
the iss stays in orbit around the earth

273
00:10:12,150 --> 00:10:09,920
um

274
00:10:14,389 --> 00:10:12,160
you could really be considering the iss

275
00:10:15,990 --> 00:10:14,399
to be falling towards earth and is

276
00:10:18,550 --> 00:10:16,000
making corrections so that it doesn't

277
00:10:20,230 --> 00:10:18,560
actually go towards earth

278
00:10:21,350 --> 00:10:20,240
but in the early days when it was being

279
00:10:24,870 --> 00:10:21,360
assembled

280
00:10:27,750 --> 00:10:24,880
parts of the space station did fly

281
00:10:29,829 --> 00:10:27,760
yeah it's a it's a like megan says it's

282
00:10:32,470 --> 00:10:29,839
a constant free fall but it's traveling

283
00:10:34,630 --> 00:10:32,480
17 500 miles per hour

284
00:10:37,910 --> 00:10:34,640
so it's constantly falling around the

285
00:10:40,550 --> 00:10:37,920
earth um at the altitude that it's at

286
00:10:42,230 --> 00:10:40,560
right now and so uh it never actually

287
00:10:44,310 --> 00:10:42,240
comes down to the earth and we adjust

288
00:10:46,470 --> 00:10:44,320

its orbit a little bit here and there

289
00:10:47,990 --> 00:10:46,480
like we did yesterday afternoon

290
00:10:50,310 --> 00:10:48,000
fired some thrusters on one of the

291
00:10:51,670 --> 00:10:50,320
russian vehicles on the station just to

292
00:10:53,430 --> 00:10:51,680
tweak its

293
00:10:55,269 --> 00:10:53,440
orbit just slightly

294
00:10:56,630 --> 00:10:55,279
which we do periodically to set the

295
00:10:59,750 --> 00:10:56,640
stage for

296
00:11:01,509 --> 00:10:59,760
rendezvous with upcoming vehicles and so

297
00:11:03,509 --> 00:11:01,519
so we do adjust the orbit every once in

298
00:11:05,670 --> 00:11:03,519
a while but it's it's it's i guess it's

299
00:11:07,590 --> 00:11:05,680
always flying but it's always free

300
00:11:09,590 --> 00:11:07,600
falling around the earth too so it's

301
00:11:14,230 --> 00:11:09,600
kind of up to how you how you define the

302
00:11:18,710 --> 00:11:16,630
um hi my name is seda hip leo what

303
00:11:21,350 --> 00:11:18,720
exactly are you studying in space what

304
00:11:23,110 --> 00:11:21,360
can be studied and why

305
00:11:24,550 --> 00:11:23,120
there are actually a lot of things being

306
00:11:26,310 --> 00:11:24,560
studied in space one of the biggest

307
00:11:28,710 --> 00:11:26,320
things i think right now is how the

308
00:11:30,630 --> 00:11:28,720
human body will react to being in space

309
00:11:32,550 --> 00:11:30,640
because one of nasa's goals in the long

310
00:11:34,550 --> 00:11:32,560
term is to go off to mars

311
00:11:35,910 --> 00:11:34,560
and people will be in space for a long

312
00:11:37,829 --> 00:11:35,920
amount of time

313
00:11:40,150 --> 00:11:37,839

for that and so they want to know what

314
00:11:42,550 --> 00:11:40,160
they can do to help the astronauts to be

315
00:11:44,710 --> 00:11:42,560
successful in that and i know they've

316
00:11:47,350 --> 00:11:44,720
also got experiments going on for

317
00:11:48,790 --> 00:11:47,360
radiation and different materials for

318
00:11:50,550 --> 00:11:48,800
how they will help protect the

319
00:11:52,629 --> 00:11:50,560
astronauts from radiation from things

320
00:11:54,710 --> 00:11:52,639
like solar flares from the sun

321
00:11:57,430 --> 00:11:54,720
which provide a lot of radiation then to

322
00:11:59,990 --> 00:11:57,440
the space station when that happens

323
00:12:03,829 --> 00:12:00,000
i think there's also a bunch of

324
00:12:05,430 --> 00:12:03,839
physical science experiments up there

325
00:12:08,069 --> 00:12:05,440
pretty much anything that can be studied

326
00:12:10,629 --> 00:12:08,079
in microgravity they're trying

327
00:12:13,030 --> 00:12:10,639
absolutely it's uh now that it's a

328
00:12:14,710 --> 00:12:13,040
operational laboratory it has been but

329
00:12:17,030 --> 00:12:14,720
now that it's completed in terms of

330
00:12:19,269 --> 00:12:17,040
assembly uh we have six crew members up

331
00:12:21,030 --> 00:12:19,279
there right now and they're uh pretty

332
00:12:22,949 --> 00:12:21,040
much all six in different areas of the

333
00:12:25,350 --> 00:12:22,959
space station which is a very huge

334
00:12:28,150 --> 00:12:25,360
complex if you picture a

335
00:12:29,829 --> 00:12:28,160
football field the station flying low

336
00:12:32,069 --> 00:12:29,839
over that football field would basically

337
00:12:33,670 --> 00:12:32,079
cover the whole football field so and

338
00:12:35,030 --> 00:12:33,680

there's three

339
00:12:36,550 --> 00:12:35,040
at least three or four different

340
00:12:38,870 --> 00:12:36,560
scientific laboratories where

341
00:12:41,750 --> 00:12:38,880
experiments can be going on all the time

342
00:12:43,990 --> 00:12:41,760
and the crew actually can can be working

343
00:12:46,470 --> 00:12:44,000
directly with an experiment or activate

344
00:12:48,949 --> 00:12:46,480
an experiment and then the scientist on

345
00:12:51,190 --> 00:12:48,959
the ground can interact with it from the

346
00:12:53,190 --> 00:12:51,200
ground and then have the crew

347
00:12:54,629 --> 00:12:53,200
provide some assistance where needed so

348
00:12:55,829 --> 00:12:54,639
it's a very interactive and

349
00:12:56,870 --> 00:12:55,839
collaborative

350
00:12:59,110 --> 00:12:56,880
process

351
00:13:02,310 --> 00:12:59,120
with science experiments on board good

352
00:13:06,710 --> 00:13:04,629
i'm landon what would happen is someone

353
00:13:08,150 --> 00:13:06,720
that lived on the space station did not

354
00:13:09,910 --> 00:13:08,160
work out

355
00:13:13,110 --> 00:13:09,920
how would that affect them when they got

356
00:13:14,150 --> 00:13:13,120
back on or back to earth that that's a

357
00:13:17,110 --> 00:13:14,160
very

358
00:13:18,710 --> 00:13:17,120
good question and timely question yes uh

359
00:13:21,590 --> 00:13:18,720
the astronauts if they don't actually

360
00:13:23,030 --> 00:13:21,600
work out in space their muscles and

361
00:13:25,590 --> 00:13:23,040
their bones will actually start to

362
00:13:27,190 --> 00:13:25,600
weaken a lot more significantly

363
00:13:28,870 --> 00:13:27,200

than they do

364
00:13:30,550 --> 00:13:28,880
by working out and i think

365
00:13:32,870 --> 00:13:30,560
i've read somewhere that astronauts have

366
00:13:35,110 --> 00:13:32,880
to work out up to four hours a day every

367
00:13:36,870 --> 00:13:35,120
day to make sure that their muscles and

368
00:13:38,230 --> 00:13:36,880
bones don't weaken because what happens

369
00:13:39,990 --> 00:13:38,240
is when you get back to earth and you've

370
00:13:42,470 --> 00:13:40,000
got the gravity all of a sudden you've

371
00:13:45,030 --> 00:13:42,480
got a lot of pressure on those bones and

372
00:13:46,710 --> 00:13:45,040
muscles and if you don't work out it

373
00:13:48,389 --> 00:13:46,720
could cause breaks in your bones and

374
00:13:49,990 --> 00:13:48,399
that kind of stuff and it ends up being

375
00:13:52,470 --> 00:13:50,000
a really bad and painful thing for the

376
00:13:54,230 --> 00:13:52,480
astronauts and it kind of is part of one

377
00:13:55,269 --> 00:13:54,240
of the early questions that was asked

378
00:13:57,269 --> 00:13:55,279
about

379
00:13:59,189 --> 00:13:57,279
how long does it take to

380
00:14:01,350 --> 00:13:59,199
get back to normal once you get back on

381
00:14:02,790 --> 00:14:01,360
the earth and and that's that's a great

382
00:14:04,949 --> 00:14:02,800
question because

383
00:14:06,870 --> 00:14:04,959
we've learned over the years how to

384
00:14:09,030 --> 00:14:06,880
counteract the changes that occur in

385
00:14:11,750 --> 00:14:09,040
space those same changes happen to us

386
00:14:14,230 --> 00:14:11,760
here on earth as we age over years and

387
00:14:16,470 --> 00:14:14,240
years it happens to astronauts and

388
00:14:18,949 --> 00:14:16,480

within a couple of days sometimes some

389
00:14:21,269 --> 00:14:18,959
of the changes that occur and so

390
00:14:23,990 --> 00:14:21,279
learning how to counteract that in space

391
00:14:25,509 --> 00:14:24,000
helps us on the ground in developing

392
00:14:28,389 --> 00:14:25,519
um you know

393
00:14:29,990 --> 00:14:28,399
protocols exercise protocols for

394
00:14:32,949 --> 00:14:30,000
maintaining your systems even on the

395
00:14:35,990 --> 00:14:32,959
ground as you age over time so exercise

396
00:14:37,110 --> 00:14:36,000
is very very important in rehabilitation

397
00:14:38,710 --> 00:14:37,120
to

398
00:14:42,389 --> 00:14:38,720
what we feel here on earth again good

399
00:14:46,949 --> 00:14:44,790
hi i'm caiman graves how do you know

400
00:14:48,870 --> 00:14:46,959
where you're going when you cannot tell

401
00:14:50,949 --> 00:14:48,880
if you're upside down

402
00:14:53,269 --> 00:14:50,959
that's a good question

403
00:14:54,710 --> 00:14:53,279
i actually read a lot of the labels on

404
00:14:56,550 --> 00:14:54,720
the space station are all facing a

405
00:14:58,790 --> 00:14:56,560
certain direction and so that's one way

406
00:15:01,110 --> 00:14:58,800
they can tell is by what way the words

407
00:15:03,910 --> 00:15:01,120
are facing as to whether they are facing

408
00:15:05,590 --> 00:15:03,920
what's considered up or down

409
00:15:07,509 --> 00:15:05,600
if they are near a window they can look

410
00:15:09,030 --> 00:15:07,519
to see what's out the window to know if

411
00:15:11,110 --> 00:15:09,040
they're looking towards earth or if

412
00:15:14,069 --> 00:15:11,120
they're looking towards

413
00:15:15,750 --> 00:15:14,079

pretty much space or the sun or

414
00:15:16,949 --> 00:15:15,760
whatever it is that that window is

415
00:15:20,230 --> 00:15:16,959
pointing to

416
00:15:21,750 --> 00:15:20,240
and i think they in general their mind

417
00:15:23,990 --> 00:15:21,760
comes up with some kind of sense of

418
00:15:25,750 --> 00:15:24,000
what's up and what's down

419
00:15:27,990 --> 00:15:25,760
yeah that's one beauty about the space

420
00:15:29,590 --> 00:15:28,000
station is is there for them there's no

421
00:15:31,590 --> 00:15:29,600
up or down in terms of their working

422
00:15:34,470 --> 00:15:31,600
environment or sleeping

423
00:15:37,030 --> 00:15:34,480
that type of thing but um but it is like

424
00:15:38,710 --> 00:15:37,040
megan says it is oriented a certain way

425
00:15:41,590 --> 00:15:38,720
in terms of labeling so they do have

426
00:15:44,150 --> 00:15:41,600
that sense of up or down but in the true

427
00:15:46,150 --> 00:15:44,160
sense of the word the way you and i

428
00:15:48,069 --> 00:15:46,160
feel it on the ground there's definitely

429
00:15:51,829 --> 00:15:48,079
up or down for us but not for them up

430
00:15:56,629 --> 00:15:54,389
hello my name is garen shackleford what

431
00:15:59,030 --> 00:15:56,639
materials do you use so that you don't

432
00:16:00,629 --> 00:15:59,040
burn during your descent

433
00:16:02,790 --> 00:16:00,639
that's a good question and i actually

434
00:16:04,790 --> 00:16:02,800
went online last night to see if i could

435
00:16:06,470 --> 00:16:04,800
find out what the soyuz vehicle actually

436
00:16:08,150 --> 00:16:06,480
uses because that's what typically is

437
00:16:09,030 --> 00:16:08,160
flying our astronauts up and down right

438
00:16:10,150 --> 00:16:09,040

now

439
00:16:13,350 --> 00:16:10,160
and

440
00:16:15,430 --> 00:16:13,360
i honestly other than some lightweight

441
00:16:17,269 --> 00:16:15,440
high temperature material that was all i

442
00:16:19,269 --> 00:16:17,279
could actually find on that i know on

443
00:16:20,150 --> 00:16:19,279
our space shuttle we had

444
00:16:24,949 --> 00:16:20,160
in

445
00:16:27,030 --> 00:16:24,959
and they also had thermal blankets and

446
00:16:29,990 --> 00:16:27,040
that kind of stuff to help give more

447
00:16:32,470 --> 00:16:30,000
layers between the astronauts and

448
00:16:35,990 --> 00:16:32,480
the re-entry all right

449
00:16:39,829 --> 00:16:37,590
my name is nikki morgan how much

450
00:16:43,350 --> 00:16:39,839
training do the astronauts on the iss

451
00:16:45,269 --> 00:16:43,360
have to have to prepare for emergencies

452
00:16:47,189 --> 00:16:45,279
the astronauts go through years of

453
00:16:49,670 --> 00:16:47,199
training before they even officially

454
00:16:51,509 --> 00:16:49,680
become astronauts they go through a lot

455
00:16:53,110 --> 00:16:51,519
of classroom training a lot of survival

456
00:16:54,790 --> 00:16:53,120
skill training to learn a lot of the

457
00:16:56,150 --> 00:16:54,800
information they need to know

458
00:16:57,990 --> 00:16:56,160
and then once they've actually been

459
00:16:59,350 --> 00:16:58,000
selected as an astronaut and they're

460
00:17:01,670 --> 00:16:59,360
grouped up with a team they start

461
00:17:03,590 --> 00:17:01,680
working and doing simulations and a lot

462
00:17:05,189 --> 00:17:03,600
of those simulations not only help them

463
00:17:07,110 --> 00:17:05,199

to do their jobs and the experiments

464
00:17:08,949 --> 00:17:07,120
that they're going to perform up on

465
00:17:10,470 --> 00:17:08,959
the space station but they also have to

466
00:17:12,150 --> 00:17:10,480
go through what they would do in an

467
00:17:13,590 --> 00:17:12,160
emergency and that's probably one of the

468
00:17:15,510 --> 00:17:13,600
biggest things that they go through and

469
00:17:17,270 --> 00:17:15,520
they run through them time and time

470
00:17:20,870 --> 00:17:17,280
again i think i read somewhere that it

471
00:17:22,470 --> 00:17:20,880
was way over 300 plus hours that they

472
00:17:24,710 --> 00:17:22,480
actually trained for that kind of stuff

473
00:17:27,110 --> 00:17:24,720
right and not only not only the

474
00:17:28,390 --> 00:17:27,120
astronauts but everybody on the ground

475
00:17:30,789 --> 00:17:28,400
goes through

476
00:17:32,870 --> 00:17:30,799
the type of training for any emergency

477
00:17:34,710 --> 00:17:32,880
case as well every one of these people

478
00:17:36,549 --> 00:17:34,720
that you see in this flight control room

479
00:17:38,390 --> 00:17:36,559
have gone through extensive training in

480
00:17:40,870 --> 00:17:38,400
fact they do training when they're not

481
00:17:43,830 --> 00:17:40,880
in the room for maybe a future flight

482
00:17:46,549 --> 00:17:43,840
and then the work that megan does on

483
00:17:47,990 --> 00:17:46,559
software development and that has to be

484
00:17:50,549 --> 00:17:48,000
thoroughly tested and they do

485
00:17:53,190 --> 00:17:50,559
simulations probably on that just like

486
00:17:56,310 --> 00:17:53,200
the crew trains for a flight you guys do

487
00:17:58,150 --> 00:17:56,320
the same thing right oh yes we our

488
00:17:59,909 --> 00:17:58,160

flight software goes through extensive

489
00:18:02,870 --> 00:17:59,919
training i think it goes through two

490
00:18:05,110 --> 00:18:02,880
years of testing and simulations before

491
00:18:07,270 --> 00:18:05,120
it actually makes it on board the space

492
00:18:09,750 --> 00:18:07,280
station that's a great question and in

493
00:18:11,510 --> 00:18:09,760
fact yesterday the crew members on board

494
00:18:13,590 --> 00:18:11,520
four of them the commander and the three

495
00:18:16,310 --> 00:18:13,600
newest crew members went through a

496
00:18:18,470 --> 00:18:16,320
training exercise not directly emergency

497
00:18:19,830 --> 00:18:18,480
but they did go through procedures that

498
00:18:22,070 --> 00:18:19,840
if there was an emergency where they

499
00:18:24,310 --> 00:18:22,080
would go just like you would in your

500
00:18:26,310 --> 00:18:24,320
school for a fire drill

501
00:18:28,470 --> 00:18:26,320
exactly what procedures you would go

502
00:18:29,909 --> 00:18:28,480
through to make sure that you were safe

503
00:18:32,470 --> 00:18:29,919
in the event of an emergency they do

504
00:18:35,270 --> 00:18:32,480
that on the space station and they do it

505
00:18:37,990 --> 00:18:35,280
quite regularly to stay proficient great

506
00:18:44,470 --> 00:18:40,630
hi my name is dwayne spradlin how long

507
00:18:46,870 --> 00:18:44,480
until artificial gravity is invented

508
00:18:49,430 --> 00:18:46,880
that's a good question

509
00:18:52,070 --> 00:18:49,440
and i'm really not sure of the answer on

510
00:18:53,669 --> 00:18:52,080
that one i think it's still a ways off i

511
00:18:55,350 --> 00:18:53,679
think right now what they're mainly

512
00:18:57,590 --> 00:18:55,360
focusing on is how to have humans

513
00:18:58,870 --> 00:18:57,600

survive in the microgravity

514
00:19:05,110 --> 00:18:58,880
environment

515
00:19:08,630 --> 00:19:06,870
hi my name is jadis what would the car

516
00:19:11,510 --> 00:19:08,640
do if they did not have enough fuel to

517
00:19:13,990 --> 00:19:11,520
return to earth

518
00:19:15,590 --> 00:19:14,000
you know i'm not entirely sure what they

519
00:19:16,470 --> 00:19:15,600
have in their procedures for this one

520
00:19:18,870 --> 00:19:16,480
but

521
00:19:20,470 --> 00:19:18,880
i think in general they try to have a

522
00:19:22,830 --> 00:19:20,480
vehicle on standby that they could

523
00:19:24,950 --> 00:19:22,840
always send up in case of

524
00:19:27,430 --> 00:19:24,960
emergency yeah they're

525
00:19:31,510 --> 00:19:27,440
the the spacecraft that they fly to and

526
00:19:34,230 --> 00:19:31,520
from the space station uh right now

527
00:19:36,870 --> 00:19:34,240
it's very well calculated and they would

528
00:19:38,789 --> 00:19:36,880
know even probably before they got to

529
00:19:41,909 --> 00:19:38,799
the space station if they were not going

530
00:19:45,029 --> 00:19:41,919
to have enough fuel to get home and so

531
00:19:46,630 --> 00:19:45,039
it's very well organized and understood

532
00:19:47,909 --> 00:19:46,640
beforehand

533
00:19:50,950 --> 00:19:47,919
how much fuel they have on the

534
00:19:52,390 --> 00:19:50,960
spacecraft itself the space station has

535
00:19:54,150 --> 00:19:52,400
plenty of fuel the

536
00:19:55,590 --> 00:19:54,160
there are vehicles that come and go from

537
00:19:57,590 --> 00:19:55,600
the station

538
00:20:00,070 --> 00:19:57,600

that actually deliver fuel so they kind

539
00:20:02,310 --> 00:20:00,080
of fill up the tanks if you will on the

540
00:20:04,310 --> 00:20:02,320
station so so that those maneuvers we

541
00:20:06,230 --> 00:20:04,320
talked about earlier you know those can

542
00:20:07,990 --> 00:20:06,240
take place whenever they're necessary

543
00:20:10,470 --> 00:20:08,000
the smaller spacecraft that deliver the

544
00:20:12,390 --> 00:20:10,480
crew to and from the station

545
00:20:14,149 --> 00:20:12,400
you know they always have reserve fuel

546
00:20:16,870 --> 00:20:14,159
that's that's on board and they

547
00:20:18,470 --> 00:20:16,880
calculate it very carefully so they know

548
00:20:20,870 --> 00:20:18,480
exactly how much fuel they have and they

549
00:20:23,270 --> 00:20:20,880
know that they have enough to get home

550
00:20:25,270 --> 00:20:23,280
whether it be in an emergency or rather

551
00:20:27,110 --> 00:20:25,280
or when they're actually regularly

552
00:20:30,310 --> 00:20:27,120
scheduled to come home

553
00:20:34,870 --> 00:20:32,710
what would happen if the iss was knocked

554
00:20:38,789 --> 00:20:34,880
out of orbit

555
00:20:41,350 --> 00:20:38,799
um

556
00:20:43,510 --> 00:20:41,360
that's a good question i don't see it

557
00:20:47,190 --> 00:20:43,520
necessarily getting knocked out of orbit

558
00:20:49,350 --> 00:20:47,200
at least not with astronauts on board

559
00:20:51,270 --> 00:20:49,360
they would use thrusters to help put it

560
00:20:52,549 --> 00:20:51,280
back to where it needs to go

561
00:20:54,950 --> 00:20:52,559
they do

562
00:20:56,950 --> 00:20:54,960
have thrusters again actually on the

563
00:20:58,789 --> 00:20:56,960

space station and on the soyuz vehicles

564
00:21:01,430 --> 00:20:58,799
that are always docked there

565
00:21:03,110 --> 00:21:01,440
and those would all be used to help get

566
00:21:05,510 --> 00:21:03,120
it back to where it needs to be yeah if

567
00:21:07,029 --> 00:21:05,520
it was something yeah i'm not sure your

568
00:21:08,870 --> 00:21:07,039
question but if it's something big

569
00:21:11,350 --> 00:21:08,880
enough that knocks this that actually

570
00:21:13,270 --> 00:21:11,360
hits the station and and moves it it

571
00:21:15,750 --> 00:21:13,280
would be something severe enough that

572
00:21:18,230 --> 00:21:15,760
would probably

573
00:21:21,110 --> 00:21:18,240
cause the loss of the vehicle or require

574
00:21:23,029 --> 00:21:21,120
the crew to leave in an emergency

575
00:21:25,590 --> 00:21:23,039
but if it's something

576
00:21:27,909 --> 00:21:25,600
as simple as we lose command and control

577
00:21:29,510 --> 00:21:27,919
function for a while which we have done

578
00:21:31,750 --> 00:21:29,520
the station might be in what they what

579
00:21:34,149 --> 00:21:31,760
they call like free drift right that

580
00:21:37,190 --> 00:21:34,159
where it just changes direction or

581
00:21:39,430 --> 00:21:37,200
changes its position but the thrusters

582
00:21:41,029 --> 00:21:39,440
or the gyroscopes on board could could

583
00:21:46,710 --> 00:21:41,039
actually maneuver it back like megan

584
00:21:50,870 --> 00:21:48,549
i believe that was our last question for

585
00:21:53,350 --> 00:21:50,880
you today thank you very much oh we're

586
00:21:55,750 --> 00:21:53,360
very happy to have you all come into the

587
00:22:05,830 --> 00:21:55,760
room and join us yes thank you thanks a

588
00:22:09,590 --> 00:22:07,590

all right and kyle and megan thank you

589
00:22:12,470 --> 00:22:09,600
so much for answering the students

590
00:22:14,630 --> 00:22:12,480
questions and alvarado junior high uh

591
00:22:16,950 --> 00:22:14,640
thank you very much you guys did a great

592
00:22:19,669 --> 00:22:16,960
job especially speaking up clearly and

593
00:22:21,350 --> 00:22:19,679
loudly and uh now let's give one final