



1
00:00:04,870 --> 00:00:01,990
good morning welcome to the mission

2
00:00:07,590 --> 00:00:04,880
control center here in houston we are

3
00:00:09,190 --> 00:00:07,600
working today on uh we're talking today

4
00:00:10,790 --> 00:00:09,200
rather with a principal investigator of

5
00:00:12,629 --> 00:00:10,800
one of the experiments the crew worked

6
00:00:14,789 --> 00:00:12,639
on earlier this week the body measures

7
00:00:16,790 --> 00:00:14,799
experiment one of the main things that

8
00:00:18,470 --> 00:00:16,800
we are trying to learn as the crew lives

9
00:00:20,710 --> 00:00:18,480
in space for these long periods of time

10
00:00:22,630 --> 00:00:20,720
is how that uh stay in space affects

11
00:00:24,950 --> 00:00:22,640
their body and the body measure

12
00:00:26,230 --> 00:00:24,960
experiment looks at exactly that so this

13
00:00:28,310 --> 00:00:26,240

is uh

14

00:00:29,830 --> 00:00:28,320

sudakur rajulu who's going to be telling

15

00:00:31,029 --> 00:00:29,840

us a little bit about that experiment

16

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

thanks so much for joining us oh you're

17

00:00:33,670 --> 00:00:32,000

welcome

18

00:00:34,790 --> 00:00:33,680

so tell us first of all just explain

19

00:00:36,790 --> 00:00:34,800

kind of what the body measures

20

00:00:39,670 --> 00:00:36,800

experiment is right uh the body

21

00:00:41,830 --> 00:00:39,680

merchant's experiment is to

22

00:00:44,069 --> 00:00:41,840

understand uh

23

00:00:45,190 --> 00:00:44,079

when crew members spend the time in

24

00:00:47,350 --> 00:00:45,200

space

25

00:00:49,110 --> 00:00:47,360

how their body

26

00:00:51,110 --> 00:00:49,120

dimensions change

27

00:00:53,110 --> 00:00:51,120

like for instance the height

28

00:00:54,950 --> 00:00:53,120

you know the stature of the person

29

00:00:57,270 --> 00:00:54,960

and also

30

00:00:59,029 --> 00:00:57,280

circumference because there are fluid

31

00:01:01,270 --> 00:00:59,039

shape that happens that

32

00:01:04,549 --> 00:01:01,280

you know you can see the crew members

33

00:01:07,109 --> 00:01:04,559

face in space kind of like puffed up you

34

00:01:09,429 --> 00:01:07,119

know because of the fluid from

35

00:01:11,109 --> 00:01:09,439

feet to the to the head you know so

36

00:01:14,469 --> 00:01:11,119

there are changes in

37

00:01:17,109 --> 00:01:14,479

the paper that happens in space

38

00:01:19,030 --> 00:01:17,119

that could affect how they are wearing

39

00:01:21,590 --> 00:01:19,040

the suit for instance this is a

40

00:01:24,550 --> 00:01:21,600

spacesuit or it's a spacesuit yeah so

41

00:01:26,870 --> 00:01:24,560

when crew members go into space

42

00:01:27,670 --> 00:01:26,880

because of some changes that happen to

43

00:01:29,830 --> 00:01:27,680

their

44

00:01:32,630 --> 00:01:29,840

stature and things like that they need

45

00:01:33,429 --> 00:01:32,640

to be re resized in space

46

00:01:35,270 --> 00:01:33,439

so

47

00:01:36,630 --> 00:01:35,280

uh

48

00:01:37,910 --> 00:01:36,640

because of that

49

00:01:40,950 --> 00:01:37,920

uh

50

00:01:42,310 --> 00:01:40,960

there are

51
00:01:45,270 --> 00:01:42,320
things

52
00:01:47,429 --> 00:01:45,280
that do not

53
00:01:48,950 --> 00:01:47,439
remain the same as

54
00:01:51,190 --> 00:01:48,960
as they were measured

55
00:01:53,670 --> 00:01:51,200
on the ground so when they go into space

56
00:01:55,749 --> 00:01:53,680
you have to adjust for those things

57
00:01:58,069 --> 00:01:55,759
and that's what the reason for the

58
00:01:59,109 --> 00:01:58,079
testing okay so you see a number of

59
00:02:00,550 --> 00:01:59,119
different changes it sounds like you

60
00:02:02,310 --> 00:02:00,560
mentioned that you can even observe from

61
00:02:04,389 --> 00:02:02,320
the ground that their faces get maybe a

62
00:02:05,910 --> 00:02:04,399
little puffy right that's from the fluid

63
00:02:08,710 --> 00:02:05,920

shift you also i think said they get

64

00:02:11,029 --> 00:02:08,720

taller is that right they do get taller

65

00:02:15,430 --> 00:02:12,390

it varies from

66

00:02:17,750 --> 00:02:15,440

person to person but in general

67

00:02:21,430 --> 00:02:17,760

there is a growth in space it's because

68

00:02:22,790 --> 00:02:21,440

of the elongation of the spine

69

00:02:25,350 --> 00:02:22,800

um

70

00:02:28,070 --> 00:02:25,360

and are those changes permanent

71

00:02:30,150 --> 00:02:28,080

those changes remain so long they are in

72

00:02:32,550 --> 00:02:30,160

space but when they come back most of

73

00:02:34,070 --> 00:02:32,560

them revert back to the normal position

74

00:02:35,589 --> 00:02:34,080

okay so you just need to you can't

75

00:02:37,030 --> 00:02:35,599

really measure on the ground when they

76

00:02:39,270 --> 00:02:37,040

get back what it's like so you measure

77

00:02:41,030 --> 00:02:39,280

it in space in space so what is how does

78

00:02:42,550 --> 00:02:41,040

that work what does that look like

79

00:02:43,990 --> 00:02:42,560

uh what do you mean how does it look

80

00:02:45,270 --> 00:02:44,000

like what how did they actually go about

81

00:02:47,350 --> 00:02:45,280

measuring making those measurements in

82

00:02:49,750 --> 00:02:47,360

space well if you're on ground we have

83

00:02:51,670 --> 00:02:49,760

different devices to measure them like

84

00:02:55,030 --> 00:02:51,680

anthropometers and

85

00:02:57,190 --> 00:02:55,040

you know different devices that we have

86

00:02:59,110 --> 00:02:57,200

it takes time also to do that in space

87

00:03:01,589 --> 00:02:59,120

what we're doing is

88

00:03:04,229 --> 00:03:01,599

using what we call video analysis we

89

00:03:06,229 --> 00:03:04,239

take pictures of the crew members uh in

90

00:03:09,670 --> 00:03:06,239

specific postures

91

00:03:10,710 --> 00:03:09,680

and uh here's a uh it's an example like

92

00:03:13,750 --> 00:03:10,720

uh

93

00:03:17,990 --> 00:03:13,760

we identify the markers on the body and

94

00:03:19,990 --> 00:03:18,000

we place some reflective markers okay on

95

00:03:22,149 --> 00:03:20,000

the uh

96

00:03:23,990 --> 00:03:22,159

specific landmarks on the body we

97

00:03:25,270 --> 00:03:24,000

identify those things before they go

98

00:03:28,710 --> 00:03:25,280

into space

99

00:03:30,710 --> 00:03:28,720

and we place those markers and take uh

100

00:03:33,270 --> 00:03:30,720

you know when we take a picture

101
00:03:36,229 --> 00:03:33,280
uh using photogrammetric technique we

102
00:03:38,149 --> 00:03:36,239
can then identify the distance between

103
00:03:40,949 --> 00:03:38,159
two of those markers

104
00:03:42,149 --> 00:03:40,959
so for instance we put place one on top

105
00:03:43,990 --> 00:03:42,159
of your head

106
00:03:44,869 --> 00:03:44,000
and we know where you're standing on the

107
00:03:47,509 --> 00:03:44,879
floor

108
00:03:50,390 --> 00:03:47,519
so the distance between the head to the

109
00:03:51,750 --> 00:03:50,400
floor will give us the height okay same

110
00:03:53,830 --> 00:03:51,760
thing with the shoulder height you know

111
00:03:55,750 --> 00:03:53,840
we put markers on the shoulder okay a

112
00:03:57,270 --> 00:03:55,760
little little more complex than just

113
00:03:59,910 --> 00:03:57,280

marking it on the wall like you might do

114

00:04:01,830 --> 00:03:59,920

for a kid at home right i mean it's you

115

00:04:04,309 --> 00:04:01,840

can do that i mean crew members have

116

00:04:07,429 --> 00:04:04,319

done that but since we are concerned

117

00:04:09,670 --> 00:04:07,439

about sizing precisely the suit we need

118

00:04:12,309 --> 00:04:09,680

to have scientific measurement

119

00:04:13,670 --> 00:04:12,319

techniques and repeatability so that

120

00:04:15,830 --> 00:04:13,680

when we tell the

121

00:04:18,710 --> 00:04:15,840

sizing engineers how much you have to

122

00:04:19,749 --> 00:04:18,720

allow for it it'll be more precise

123

00:04:21,590 --> 00:04:19,759

okay

124

00:04:23,590 --> 00:04:21,600

so why is that important why exactly do

125

00:04:24,790 --> 00:04:23,600

we need to know precisely what these

126
00:04:26,469 --> 00:04:24,800
measurements are

127
00:04:28,550 --> 00:04:26,479
well um

128
00:04:31,189 --> 00:04:28,560
for instance um

129
00:04:33,510 --> 00:04:31,199
like i said the suits are sized

130
00:04:34,629 --> 00:04:33,520
uh before the crew members go into

131
00:04:36,950 --> 00:04:34,639
in space

132
00:04:39,110 --> 00:04:36,960
uh when we had the shuttle uh the crew

133
00:04:40,310 --> 00:04:39,120
members had their own suits

134
00:04:42,150 --> 00:04:40,320
and they would

135
00:04:44,469 --> 00:04:42,160
be they would have been adjusted to

136
00:04:45,990 --> 00:04:44,479
account for some changes

137
00:04:48,390 --> 00:04:46,000
unfortunately with the shuttle being

138
00:04:50,550 --> 00:04:48,400

retired we are now relying on the suits

139

00:04:51,590 --> 00:04:50,560

that are on the station

140

00:04:53,990 --> 00:04:51,600

and

141

00:04:56,710 --> 00:04:54,000

if you don't size them properly you may

142

00:04:58,550 --> 00:04:56,720

run into difficulties uh in getting into

143

00:05:01,189 --> 00:04:58,560

the suit or it may be uncomfortable for

144

00:05:03,749 --> 00:05:01,199

you in fact recently about six months

145

00:05:04,710 --> 00:05:03,759

ago we had a crew member who had just a

146

00:05:07,029 --> 00:05:04,720

little bit

147

00:05:08,469 --> 00:05:07,039

tight fit into the suit

148

00:05:11,029 --> 00:05:08,479

so

149

00:05:12,629 --> 00:05:11,039

it is necessary for us to help the

150

00:05:13,830 --> 00:05:12,639

sizing engineers

151

00:05:16,150 --> 00:05:13,840

to

152

00:05:19,110 --> 00:05:16,160

account for it and if it is variable

153

00:05:21,430 --> 00:05:19,120

from person to person then we can then

154

00:05:23,909 --> 00:05:21,440

inform the crew members how to size

155

00:05:26,469 --> 00:05:23,919

themselves in space we don't have the

156

00:05:29,110 --> 00:05:26,479

luxury of having the suits sent by the

157

00:05:30,950 --> 00:05:29,120

shuttle like we used to do before okay

158

00:05:33,189 --> 00:05:30,960

and um i guess it's really important for

159

00:05:35,510 --> 00:05:33,199

the space suits to fit well as they are

160

00:05:37,749 --> 00:05:35,520

absolutely yes because you know you

161

00:05:40,469 --> 00:05:37,759

don't want to be in a suit for

162

00:05:43,430 --> 00:05:40,479

eight to ten hours and having

163

00:05:45,990 --> 00:05:43,440

you know to deal with uh discomfort

164

00:05:49,510 --> 00:05:46,000

and that may you know distract you from

165

00:05:51,590 --> 00:05:49,520

doing the tasks or you may have to

166

00:05:53,029 --> 00:05:51,600

you know not have a successful

167

00:05:54,710 --> 00:05:53,039

successful mission

168

00:05:56,950 --> 00:05:54,720

and which is a very difficult thing to

169

00:05:58,790 --> 00:05:56,960

do you know when you are planning for

170

00:06:00,950 --> 00:05:58,800

important tasks and you're going to be

171

00:06:02,230 --> 00:06:00,960

out in the suit for eight hours or nine

172

00:06:03,990 --> 00:06:02,240

hours

173

00:06:05,510 --> 00:06:04,000

we need to make sure that it is as

174

00:06:09,110 --> 00:06:05,520

comfortable as possible for the crew

175

00:06:10,950 --> 00:06:09,120

members okay so um i guess that's uh

176
00:06:11,990 --> 00:06:10,960
even if they're not necessarily doing a

177
00:06:14,309 --> 00:06:12,000
spacewalk now they're still

178
00:06:15,590 --> 00:06:14,319
participating maybe in this experiment i

179
00:06:16,790 --> 00:06:15,600
guess they were doing taking some

180
00:06:18,469 --> 00:06:16,800
measurements yesterday for the

181
00:06:21,270 --> 00:06:18,479
experiment do you

182
00:06:22,870 --> 00:06:21,280
um when they are on on orbit taking the

183
00:06:24,070 --> 00:06:22,880
measurements you talked about putting

184
00:06:25,270 --> 00:06:24,080
the reflective

185
00:06:26,790 --> 00:06:25,280
um

186
00:06:28,469 --> 00:06:26,800
markers on and and taking the

187
00:06:29,990 --> 00:06:28,479
measurements is that is that the extent

188
00:06:32,309 --> 00:06:30,000

of it or is there more

189

00:06:34,870 --> 00:06:32,319

well what we want to do is that

190

00:06:36,710 --> 00:06:34,880

certain measurements uh like here's an

191

00:06:39,189 --> 00:06:36,720

example of

192

00:06:40,550 --> 00:06:39,199

the setup how we want the crew members

193

00:06:41,909 --> 00:06:40,560

to be measured

194

00:06:43,909 --> 00:06:41,919

uh there are

195

00:06:45,830 --> 00:06:43,919

certain things we need to we also want

196

00:06:48,469 --> 00:06:45,840

to capture

197

00:06:49,510 --> 00:06:48,479

in doing the skylab what we found was

198

00:06:52,629 --> 00:06:49,520

that

199

00:06:54,309 --> 00:06:52,639

as soon as you go into zero gravity

200

00:06:56,790 --> 00:06:54,319

there is this sudden increase in the

201
00:06:57,589 --> 00:06:56,800
height and there is a another phase

202
00:06:59,430 --> 00:06:57,599
where

203
00:07:01,270 --> 00:06:59,440
the height was still growing a little

204
00:07:03,350 --> 00:07:01,280
bit so it kind of like it took a while

205
00:07:05,749 --> 00:07:03,360
for it to plateau it out okay

206
00:07:07,029 --> 00:07:05,759
so we also want to measure

207
00:07:09,589 --> 00:07:07,039
uh the

208
00:07:13,189 --> 00:07:09,599
the durational change you know if

209
00:07:15,350 --> 00:07:13,199
is there a uh you know growth continuing

210
00:07:17,589 --> 00:07:15,360
throughout the mission or it you know

211
00:07:19,110 --> 00:07:17,599
kind of platters out so we have

212
00:07:20,390 --> 00:07:19,120
periodically measuring these

213
00:07:23,270 --> 00:07:20,400

measurements

214

00:07:24,710 --> 00:07:23,280

um not just the height but also

215

00:07:26,469 --> 00:07:24,720

circumference

216

00:07:28,830 --> 00:07:26,479

uh at the chest

217

00:07:31,350 --> 00:07:28,840

calf level and tile of the thigh

218

00:07:33,990 --> 00:07:31,360

circumference the reason for that is

219

00:07:37,189 --> 00:07:34,000

that we want to make sure

220

00:07:39,909 --> 00:07:37,199

if we want to tell the sizing engineer

221

00:07:41,589 --> 00:07:39,919

you need to make this adjustment is it

222

00:07:42,950 --> 00:07:41,599

something going to be remain constant

223

00:07:45,189 --> 00:07:42,960

throughout the mission because the crew

224

00:07:47,670 --> 00:07:45,199

members are going to be there on space

225

00:07:49,589 --> 00:07:47,680

on the space station for

226

00:07:51,270 --> 00:07:49,599

you know six months to you know three to

227

00:07:52,950 --> 00:07:51,280

six months so

228

00:07:54,950 --> 00:07:52,960

if it's changing

229

00:07:57,589 --> 00:07:54,960

we need to be able to account for it

230

00:08:00,150 --> 00:07:57,599

otherwise we can say you know it was a

231

00:08:02,629 --> 00:08:00,160

constant sizing delta that they can

232

00:08:04,390 --> 00:08:02,639

apply to it okay so we are measuring you

233

00:08:06,070 --> 00:08:04,400

know periodically okay well just one

234

00:08:07,670 --> 00:08:06,080

more question then we'll wrap it up um

235

00:08:09,430 --> 00:08:07,680

you know we always like to hear about it

236

00:08:11,749 --> 00:08:09,440

this sounds pretty specific to to

237

00:08:13,270 --> 00:08:11,759

spacefly but are there applications for

238

00:08:15,270 --> 00:08:13,280

us here on earth as well is there are

239

00:08:17,589 --> 00:08:15,280

there any benefits well right now i

240

00:08:19,510 --> 00:08:17,599

think it's more specifically geared

241

00:08:20,230 --> 00:08:19,520

towards suit sizing

242

00:08:21,830 --> 00:08:20,240

but

243

00:08:23,830 --> 00:08:21,840

one thing we notice is that we just

244

00:08:25,350 --> 00:08:23,840

finished one data collection one crew

245

00:08:27,589 --> 00:08:25,360

member had participated we haven't even

246

00:08:29,749 --> 00:08:27,599

finished the analysis yet but we're

247

00:08:33,190 --> 00:08:29,759

noticing that calf circumference changes

248

00:08:36,230 --> 00:08:33,200

a lot it actually decreases and that's

249

00:08:39,509 --> 00:08:36,240

mostly because of the muscle atrophy but

250

00:08:41,829 --> 00:08:39,519

it's still preliminary you know

251

00:08:45,430 --> 00:08:41,839

ultimately what we really want is

252

00:08:46,310 --> 00:08:45,440

clothing and suits are self-adjustable

253

00:08:49,430 --> 00:08:46,320

right

254

00:08:51,910 --> 00:08:49,440

and uh if we find that

255

00:08:54,230 --> 00:08:51,920

uh there are means to do that

256

00:08:55,990 --> 00:08:54,240

that may have impact also and then also

257

00:08:58,230 --> 00:08:56,000

we have better studies you know we have

258

00:09:00,630 --> 00:08:58,240

same similar situation that happens for

259

00:09:02,949 --> 00:09:00,640

group for the subjects undergrowth

260

00:09:05,430 --> 00:09:02,959

changes in the body dimensions so there

261

00:09:06,790 --> 00:09:05,440

may be some benefit there too yeah okay

262

00:09:08,310 --> 00:09:06,800

well great we look forward to hearing

263

00:09:09,590 --> 00:09:08,320

more about that thank you so much for

264

00:09:10,630 --> 00:09:09,600

coming and speaking with us again this

265

00:09:12,710 --> 00:09:10,640

was

266

00:09:14,150 --> 00:09:12,720

sue docker rajulu who is the principal