
PAO

1
00:00:03,990 --> 00:00:02,389
so a lot of the work being done these

2
00:00:07,030 --> 00:00:04,000
days on board the international space

3
00:00:08,629 --> 00:00:07,040
station not only to continue scientific

4
00:00:10,709 --> 00:00:08,639
research and things like that but also

5
00:00:13,589 --> 00:00:10,719
to prepare us for what's coming next

6
00:00:16,150 --> 00:00:13,599
exploration to very far off destinations

7
00:00:18,630 --> 00:00:16,160
asteroids mars moon all these places

8
00:00:19,990 --> 00:00:18,640
we're really excited to go and while

9
00:00:21,510 --> 00:00:20,000
there's a lot of work being done in

10
00:00:23,429 --> 00:00:21,520
space there's also a lot of work being

11
00:00:24,950 --> 00:00:23,439
done down here on the ground one of

12
00:00:26,870 --> 00:00:24,960
those projects taking place here at the

13
00:00:29,029 --> 00:00:26,880

johnson space center is the the

14
00:00:31,189 --> 00:00:29,039
development of the space suits

15
00:00:33,190 --> 00:00:31,199
that future orion travelers might be

16
00:00:34,950 --> 00:00:33,200
wearing joining me now to talk about the

17
00:00:37,590 --> 00:00:34,960
work that's taking place is nasa

18
00:00:39,510 --> 00:00:37,600
astronaut rex walheim who's the chief of

19
00:00:41,030 --> 00:00:39,520
the exploration branch inside of the

20
00:00:43,430 --> 00:00:41,040
astronaut office works pretty heavily

21
00:00:46,470 --> 00:00:43,440
with orion has been very integral in a

22
00:00:48,069 --> 00:00:46,480
lot of these uh tests now first off uh

23
00:00:50,389 --> 00:00:48,079
the suit let's talk about the zoo real

24
00:00:52,150 --> 00:00:50,399
quick it's very familiar suit yes

25
00:00:54,310 --> 00:00:52,160
orange pumpkin suit that they wore on

26
00:00:56,630 --> 00:00:54,320
the shuttle yep and that's why the term

27
00:00:59,270 --> 00:00:56,640
maces are the modified aces suit which

28
00:01:00,630 --> 00:00:59,280
is uh it's a offshoot of the suit we

29
00:01:02,150 --> 00:01:00,640
wore during the space shuttle's launch

30
00:01:03,430 --> 00:01:02,160
and entry phases so

31
00:01:04,789 --> 00:01:03,440
the modified portion is what we're

32
00:01:06,550 --> 00:01:04,799
working on to try to get it to do more

33
00:01:07,990 --> 00:01:06,560
than it did during the shuttle program

34
00:01:09,510 --> 00:01:08,000
and that more that you guys were working

35
00:01:10,950 --> 00:01:09,520
on so it was a launch and entry suit so

36
00:01:12,550 --> 00:01:10,960
the astronauts they only wore it when

37
00:01:14,070 --> 00:01:12,560
they were launching off and when they

38
00:01:15,910 --> 00:01:14,080

were coming back down

39
00:01:17,990 --> 00:01:15,920
and what do we want to add to so we want

40
00:01:19,590 --> 00:01:18,000
to add the capability of doing an eva or

41
00:01:20,950 --> 00:01:19,600
a space walk with this suit which is a

42
00:01:22,870 --> 00:01:20,960
tricky proposition because it was

43
00:01:24,310 --> 00:01:22,880
designed originally as an asus suit as

44
00:01:25,910 --> 00:01:24,320
just launch an entry so it could hold

45
00:01:27,429 --> 00:01:25,920
pressure but it wasn't meant to give you

46
00:01:28,710 --> 00:01:27,439
the mobility to do all the types of

47
00:01:29,830 --> 00:01:28,720
tasks you would generally do on a

48
00:01:32,710 --> 00:01:29,840
spacewalk

49
00:01:34,149 --> 00:01:32,720
now why would we want to just i mean

50
00:01:35,830 --> 00:01:34,159
because traditionally we've had two

51
00:01:37,830 --> 00:01:35,840
suits we've had the launch and entry and

52
00:01:39,590 --> 00:01:37,840
we've had the great big emu the great

53
00:01:41,990 --> 00:01:39,600
big white space walking suit why would

54
00:01:44,230 --> 00:01:42,000
we just want one you bet now if i had my

55
00:01:46,149 --> 00:01:44,240
druthers i'd take my white emu spacewalk

56
00:01:47,830 --> 00:01:46,159
and suit with me wherever i go in space

57
00:01:49,429 --> 00:01:47,840
however you know with the orion program

58
00:01:50,630 --> 00:01:49,439
we're going to beyond low earth orbits

59
00:01:53,510 --> 00:01:50,640
we're going out to these deep space

60
00:01:55,270 --> 00:01:53,520
destinations that it takes a lot of uh a

61
00:01:57,910 --> 00:01:55,280
lot of thrust and a lot of gas to get

62
00:01:59,429 --> 00:01:57,920
out there so weight is a big issue so

63
00:02:00,950 --> 00:01:59,439

anything we can do to reduce the weight

64
00:02:02,149 --> 00:02:00,960
the launch weight and the landing weight

65
00:02:03,990 --> 00:02:02,159
actually also

66
00:02:05,510 --> 00:02:04,000
is very important so if we can make a

67
00:02:07,270 --> 00:02:05,520
suit that can do both the launch and

68
00:02:09,350 --> 00:02:07,280
entry which the orange

69
00:02:11,029 --> 00:02:09,360
asus suit did in the shuttle area and

70
00:02:12,550 --> 00:02:11,039
also was able to carry out the eva or

71
00:02:14,470 --> 00:02:12,560
the spacewalk functions that our big

72
00:02:16,790 --> 00:02:14,480
white space walking suit did then we can

73
00:02:19,190 --> 00:02:16,800
save a tremendous amount of weight so

74
00:02:21,030 --> 00:02:19,200
very real reason to be doing this work

75
00:02:22,949 --> 00:02:21,040
and been doing some pretty cool tests in

76
00:02:24,070 --> 00:02:22,959
the pool we'll get to those in a second

77
00:02:25,910 --> 00:02:24,080
what's some of the work that you guys

78
00:02:28,229 --> 00:02:25,920
have been doing up until this point sure

79
00:02:29,750 --> 00:02:28,239
you know to prepare to kind of advance

80
00:02:31,190 --> 00:02:29,760
the suit to where it is now well we've

81
00:02:33,270 --> 00:02:31,200
been taking an incremental approach so

82
00:02:35,589 --> 00:02:33,280
we're doing step by step and the first

83
00:02:37,350 --> 00:02:35,599
step is we we put ourselves in the the

84
00:02:38,630 --> 00:02:37,360
old aces suit and you know figured out

85
00:02:40,710 --> 00:02:38,640
where the pressure points were and

86
00:02:42,309 --> 00:02:40,720
things like that and uh it was pretty

87
00:02:43,750 --> 00:02:42,319
tricky to work in that and that the

88
00:02:45,190 --> 00:02:43,760

smart guys in the suit labs they figured

89
00:02:47,190 --> 00:02:45,200
out well if you sized it differently if

90
00:02:48,390 --> 00:02:47,200
you kept it as tight as you can it's

91
00:02:49,589 --> 00:02:48,400
going to be a lot more comfortable and

92
00:02:51,670 --> 00:02:49,599
you're going to be able to be able to

93
00:02:52,630 --> 00:02:51,680
move around a lot better so we started

94
00:02:55,030 --> 00:02:52,640
with that and one of the things we

95
00:02:56,470 --> 00:02:55,040
quickly realized was that the gloves

96
00:02:59,110 --> 00:02:56,480
were not good enough the gloves we used

97
00:03:00,470 --> 00:02:59,120
in the uh in the aces suit when we're on

98
00:03:02,229 --> 00:03:00,480
the launch and entry

99
00:03:03,750 --> 00:03:02,239
they're meant to be used non-pressurized

100
00:03:05,670 --> 00:03:03,760
unless there's an emergency

101
00:03:06,869 --> 00:03:05,680
and then they would pressurize but

102
00:03:08,470 --> 00:03:06,879
they're not they don't have very good

103
00:03:09,910 --> 00:03:08,480
tactile feel when you're pressurized so

104
00:03:11,030 --> 00:03:09,920
we realized quickly that these gloves

105
00:03:12,630 --> 00:03:11,040
aren't going to be good enough to do a

106
00:03:14,790 --> 00:03:12,640
space walk with so we switched out what

107
00:03:16,390 --> 00:03:14,800
are called phase six gloves those are

108
00:03:18,070 --> 00:03:16,400
our great space walking gloves that we

109
00:03:21,270 --> 00:03:18,080
use on our on our white

110
00:03:23,110 --> 00:03:21,280
emu spacesuit so we adapted the aces to

111
00:03:24,789 --> 00:03:23,120
be able to handle those kind of uh those

112
00:03:25,750 --> 00:03:24,799
kind of gloves there's also some

113
00:03:28,149 --> 00:03:25,760

important things we need to do with the

114
00:03:30,229 --> 00:03:28,159
life controls life support system so the

115
00:03:31,509 --> 00:03:30,239
aces suit on the shuttle it's it flows

116
00:03:33,910 --> 00:03:31,519
overboard it's kind of what we call an

117
00:03:36,710 --> 00:03:33,920
open loop so it would flow the the air

118
00:03:38,309 --> 00:03:36,720
you breathe out overboard into the cabin

119
00:03:39,990 --> 00:03:38,319
whereas the you can't do that on a

120
00:03:41,589 --> 00:03:40,000
spacewalk because you'd use so much uh

121
00:03:44,070 --> 00:03:41,599
so much oxygen that it would be

122
00:03:45,670 --> 00:03:44,080
prohibitive so uh they modified the asus

123
00:03:47,509 --> 00:03:45,680
so that it has a closed circulation

124
00:03:49,110 --> 00:03:47,519
system so that it can recycle the air so

125
00:03:50,630 --> 00:03:49,120
you're not losing all that oxygen so now

126
00:03:53,030 --> 00:03:50,640
you're kind of mirroring a little bit of

127
00:03:54,550 --> 00:03:53,040
what the emu already exactly exactly so

128
00:03:56,390 --> 00:03:54,560
then we got so now we had the closed

129
00:03:58,229 --> 00:03:56,400
loop system we had the the phase six

130
00:04:00,550 --> 00:03:58,239
gloves well one of the things we need is

131
00:04:02,789 --> 00:04:00,560
ability to stabilize ourselves at a work

132
00:04:04,149 --> 00:04:02,799
site and to do that we commonly on our

133
00:04:06,070 --> 00:04:04,159
spacewalks on the space station use

134
00:04:08,390 --> 00:04:06,080
what's called a portable foot restraint

135
00:04:10,229 --> 00:04:08,400
or a pfr and a portable foot restraint

136
00:04:12,229 --> 00:04:10,239
you just put your your feet in there you

137
00:04:13,990 --> 00:04:12,239
put them under a toe clip and you you

138
00:04:15,509 --> 00:04:14,000

clip your heels underneath the clip and

139
00:04:16,949 --> 00:04:15,519
you can stay there with both hands free

140
00:04:18,710 --> 00:04:16,959
and be able to work

141
00:04:20,789 --> 00:04:18,720
the ace's suit the original one with the

142
00:04:22,950 --> 00:04:20,799
shuttle you couldn't do that and so one

143
00:04:24,150 --> 00:04:22,960
of the most recent modifications we did

144
00:04:26,710 --> 00:04:24,160
was add

145
00:04:28,150 --> 00:04:26,720
these these boots from the emu so that

146
00:04:29,590 --> 00:04:28,160
we'd be able to you know use these

147
00:04:30,390 --> 00:04:29,600
portable foot restraints so we added

148
00:04:34,950 --> 00:04:30,400
that

149
00:04:36,150 --> 00:04:34,960
proved out to be a really useful uh

150
00:04:38,070 --> 00:04:36,160
useful addition

151
00:04:40,710 --> 00:04:38,080
now then even if we have these these

152
00:04:42,150 --> 00:04:40,720
good these good uh gloves and good boots

153
00:04:44,230 --> 00:04:42,160
another problem we have with asus it

154
00:04:45,110 --> 00:04:44,240
just isn't very mobile and so we knew

155
00:04:46,230 --> 00:04:45,120
that from the start that we're gonna

156
00:04:47,830 --> 00:04:46,240
have a problem with mobility because

157
00:04:49,830 --> 00:04:47,840
when it's pressurized it's just not an

158
00:04:52,070 --> 00:04:49,840
emu where you can move it really nicely

159
00:04:53,510 --> 00:04:52,080
so um we've added some arm bearings to

160
00:04:54,390 --> 00:04:53,520
be able to move the arms a little bit

161
00:04:57,110 --> 00:04:54,400
and so

162
00:04:58,790 --> 00:04:57,120
uh on the test we did last week we had

163
00:05:00,150 --> 00:04:58,800

two suits in the water for the first

164
00:05:02,710 --> 00:05:00,160
time two modified asus suits for the

165
00:05:05,350 --> 00:05:02,720
first time and i worked with dan burbank

166
00:05:06,550 --> 00:05:05,360
and he had the uh the modified aces

167
00:05:08,390 --> 00:05:06,560
without the arm bearings and i had them

168
00:05:10,150 --> 00:05:08,400
with the arm bearing so we got to

169
00:05:11,830 --> 00:05:10,160
compare that and see how what those arm

170
00:05:13,430 --> 00:05:11,840
brings do for you and then next week

171
00:05:14,950 --> 00:05:13,440
we'll get in the pool again dan and i

172
00:05:16,550 --> 00:05:14,960
and i get the suit without the arm

173
00:05:18,550 --> 00:05:16,560
bearings and dan gets the arm bearing so

174
00:05:20,710 --> 00:05:18,560
uh we actually have some of the video

175
00:05:22,710 --> 00:05:20,720
from last week as well so we can see you

176
00:05:23,749 --> 00:05:22,720
guys working in the pool so just i mean

177
00:05:25,670 --> 00:05:23,759
walk me through what are we looking at

178
00:05:26,790 --> 00:05:25,680
yeah so you see the familiar orange suit

179
00:05:28,629 --> 00:05:26,800
that we wore on the shuttle but you also

180
00:05:29,990 --> 00:05:28,639
see a bunch of white objects number the

181
00:05:32,230 --> 00:05:30,000
one the big ones you see on my legs

182
00:05:33,590 --> 00:05:32,240
there and dan's legs are weights we have

183
00:05:35,749 --> 00:05:33,600
to have weights to keep us neutrally

184
00:05:37,430 --> 00:05:35,759
buoyant but then you'll see a little bit

185
00:05:38,790 --> 00:05:37,440
below you see that we've got the white

186
00:05:41,189 --> 00:05:38,800
boots on you can see that so those are

187
00:05:43,029 --> 00:05:41,199
the uh the spacesuit the emu boots and

188
00:05:44,710 --> 00:05:43,039

we have white gloves which are phase six

189
00:05:46,870 --> 00:05:44,720
uh gloves also

190
00:05:49,110 --> 00:05:46,880
and so uh it's kind of a combination

191
00:05:51,029 --> 00:05:49,120
there of the of the two suits

192
00:05:52,950 --> 00:05:51,039
and uh here we're testing our mobility

193
00:05:54,710 --> 00:05:52,960
basically we're getting into the in and

194
00:05:56,070 --> 00:05:54,720
out of the uh the space station airlock

195
00:05:57,830 --> 00:05:56,080
now it's not only tasks we would do on

196
00:05:59,670 --> 00:05:57,840
an orion mission to an asteroid but it's

197
00:06:01,270 --> 00:05:59,680
a it's a typical task we've trained on

198
00:06:03,350 --> 00:06:01,280
many times before so we can test our

199
00:06:05,510 --> 00:06:03,360
mobility and see how well we can move

200
00:06:06,790 --> 00:06:05,520
around there

201
00:06:08,790 --> 00:06:06,800
and again here we're doing some more

202
00:06:10,790 --> 00:06:08,800
translation tasks and how well you can

203
00:06:12,550 --> 00:06:10,800
move around uh with these new arm

204
00:06:14,550 --> 00:06:12,560
bearings and uh with your phase six

205
00:06:16,150 --> 00:06:14,560
gloves and your boots

206
00:06:18,309 --> 00:06:16,160
and i remember you talking a little bit

207
00:06:20,390 --> 00:06:18,319
about you know getting into the pool

208
00:06:22,710 --> 00:06:20,400
it's an important step because you kind

209
00:06:25,270 --> 00:06:22,720
of learn things about the suit that you

210
00:06:26,870 --> 00:06:25,280
didn't even think about right and it's a

211
00:06:28,950 --> 00:06:26,880
it's a big trade-off it is not an easy

212
00:06:30,390 --> 00:06:28,960
thing to go to one suit from two suits

213
00:06:31,430 --> 00:06:30,400

the reason we had two suits was because

214
00:06:32,790 --> 00:06:31,440
they were they were they were

215
00:06:34,230 --> 00:06:32,800
specialized and they own they had their

216
00:06:35,189 --> 00:06:34,240
each they had their own specific

217
00:06:36,550 --> 00:06:35,199
function

218
00:06:38,710 --> 00:06:36,560
so when you're trying to combine two

219
00:06:40,070 --> 00:06:38,720
suits it gets a little tricky obviously

220
00:06:41,430 --> 00:06:40,080
when you when you have only one suit

221
00:06:43,110 --> 00:06:41,440
when you're in the launch phase you're

222
00:06:44,469 --> 00:06:43,120
gonna be unpressurized nominally so

223
00:06:45,749 --> 00:06:44,479
normally you wouldn't have a pressure so

224
00:06:47,189 --> 00:06:45,759
you want the suit to fit comfortably

225
00:06:48,870 --> 00:06:47,199
when you're just sitting in the rocket

226
00:06:50,550 --> 00:06:48,880
during the launch phase

227
00:06:51,589 --> 00:06:50,560
and uh so that's important because

228
00:06:52,950 --> 00:06:51,599
you're there you're in there you're

229
00:06:54,550 --> 00:06:52,960
gonna be there for a minute many hours

230
00:06:56,309 --> 00:06:54,560
you know so but then if you're gonna do

231
00:06:57,749 --> 00:06:56,319
a space walk that comfortable you know

232
00:06:59,110 --> 00:06:57,759
loose-fitting suit may not be great for

233
00:07:00,629 --> 00:06:59,120
doing a spacewalk when it's pressurized

234
00:07:02,950 --> 00:07:00,639
because the suit bulges out and you know

235
00:07:04,790 --> 00:07:02,960
it tends to extend now you can't move as

236
00:07:06,469 --> 00:07:04,800
well so it can be a bit of a problem

237
00:07:07,189 --> 00:07:06,479
from that so you got to have a a bit of

238
00:07:33,990 --> 00:07:07,199

a

239
00:07:35,510 --> 00:07:34,000
hurt when it's unpressurized but you're

240
00:07:36,629 --> 00:07:35,520
still able to function in it when it's

241
00:07:38,629 --> 00:07:36,639
pressurized and you're doing a space

242
00:07:40,390 --> 00:07:38,639
walk and so what are some of the steps

243
00:07:42,390 --> 00:07:40,400
kind of going forward or

244
00:07:44,629 --> 00:07:42,400
what did you guys really first off what

245
00:07:46,469 --> 00:07:44,639
did you guys really focus on last week

246
00:07:48,150 --> 00:07:46,479
what was what were the major elements of

247
00:07:49,189 --> 00:07:48,160
last week's major element last week we

248
00:07:50,469 --> 00:07:49,199
were just trying to tell whether we

249
00:07:51,990 --> 00:07:50,479
could work together as a team because it

250
00:07:53,430 --> 00:07:52,000
was the first time we had two people in

251
00:07:55,189 --> 00:07:53,440
the pool at the same time with this new

252
00:07:57,749 --> 00:07:55,199
modified asus suit it's really the first

253
00:07:59,670 --> 00:07:57,759
time we've we've tested a new suit

254
00:08:01,510 --> 00:07:59,680
together two of them in the pool since

255
00:08:03,430 --> 00:08:01,520
the you know since we started the uh the

256
00:08:05,350 --> 00:08:03,440
space shuttle programs emu so it's been

257
00:08:07,589 --> 00:08:05,360
a long time so we just see could we work

258
00:08:10,070 --> 00:08:07,599
together um and then we continue to

259
00:08:11,830 --> 00:08:10,080
evaluate the new boots uh the the phase

260
00:08:13,110 --> 00:08:11,840
six gloves and then you know since i had

261
00:08:14,469 --> 00:08:13,120
the wrist bearings and dan didn't we

262
00:08:16,710 --> 00:08:14,479
could see what kind of differences that

263
00:08:18,390 --> 00:08:16,720

made and so uh that we worked all those

264
00:08:19,830 --> 00:08:18,400
things together and and did some typical

265
00:08:21,990 --> 00:08:19,840
tasks we would do on the space station

266
00:08:23,749 --> 00:08:22,000
as kind of uh you know basically just

267
00:08:25,510 --> 00:08:23,759
benchmarking what we know we can do in

268
00:08:28,309 --> 00:08:25,520
the emu and how hard is that to do it in

269
00:08:29,670 --> 00:08:28,319
the in the uh in the uh aces suit okay

270
00:08:31,110 --> 00:08:29,680
and what are what are some of the things

271
00:08:32,389 --> 00:08:31,120
you guys are going to be focusing on

272
00:08:33,670 --> 00:08:32,399
going forward or what are some of the

273
00:08:35,269 --> 00:08:33,680
you know some of the cooler tests you

274
00:08:36,310 --> 00:08:35,279
guys might have coming up well so we're

275
00:08:39,750 --> 00:08:36,320
gonna

276
00:08:41,190 --> 00:08:39,760
suits so we can we can really test out

277
00:08:42,630 --> 00:08:41,200
what the function of that arm bearings

278
00:08:43,589 --> 00:08:42,640
is i really like those arm bearings when

279
00:08:45,030 --> 00:08:43,599
they take them away i'm sure i'm going

280
00:08:46,790 --> 00:08:45,040
to say hey you know that wasn't a great

281
00:08:48,070 --> 00:08:46,800
idea so we'll test that and then we're

282
00:08:49,590 --> 00:08:48,080
going to start doing more representative

283
00:08:50,949 --> 00:08:49,600
tasks of an asteroid retrieval mission

284
00:08:52,630 --> 00:08:50,959
which is what we want to use this suit

285
00:08:53,990 --> 00:08:52,640
for potentially could you do some of the

286
00:08:57,110 --> 00:08:54,000
tasks we expect to do on an asteroid

287
00:08:58,790 --> 00:08:57,120
retrieval mission okay well rex walheim

288
00:09:00,550 --> 00:08:58,800

uh nasa astronaut and chief of their

289
00:09:02,870 --> 00:09:00,560
exploration branch again talking to us

290
00:09:03,990 --> 00:09:02,880
about the modified aces suit uh work

291
00:09:05,910 --> 00:09:04,000
being done here

292
00:09:08,070 --> 00:09:05,920
at the johnson space center uh rex

293
00:09:09,750 --> 00:09:08,080
thanks for coming on it's really cool

294
00:09:11,509 --> 00:09:09,760
good luck in the pool next week i hope

295
00:09:13,829 --> 00:09:11,519
dan doesn't run too many circles around