1
00:01:06,609 --> 00:00:19,900
[Music]

2
00:01:10,969 --> 00:01:09,410
hey welcome once again this is NASA at

3
00:01:13,160 --> 00:01:10,979
home spaceport series I am your host

4
00:01:14,300 --> 00:01:13,170
Joshua Santora I would traditionally be

5
00:01:16,190 --> 00:01:14,310
coming to you live from the Kennedy

6
00:01:17,480 --> 00:01:16,200
Space Center but with today's current

7
00:01:18,710 --> 00:01:17,490
state I'm coming to you live from my

8
00:01:22,670 --> 00:01:18,720
house and super excited you're joining

9
00:01:24,050 --> 00:01:22,680
me to talk about plant growth in space

10
00:01:26,210 --> 00:01:24,060
so this is the advanced plant habitat

11
00:01:28,700 --> 00:01:26,220
we're gonna dive into this in just a

12
00:01:29,870 --> 00:01:28,710
second but before we do that one take a

13
00:01:32,420 --> 00:01:29,880

look obviously we have the whole

14
00:01:33,889 --> 00:01:32,430
spaceport here the most prolific

15
00:01:36,410 --> 00:01:33,899
spaceport in all of history

16
00:01:39,669 --> 00:01:36,420
and specifically today we're looking at

17
00:01:42,710 --> 00:01:39,679
the research components of that so plant

18
00:01:43,880 --> 00:01:42,720
growth is a space endeavor now which is

19
00:01:45,230 --> 00:01:43,890
pretty wild

20
00:01:47,450 --> 00:01:45,240
before I forget make sure you're asking

21
00:01:50,710 --> 00:01:47,460
your questions live through the chat

22
00:01:52,609 --> 00:01:50,720
window there on the screen as well as

23
00:01:54,319 --> 00:01:52,619
telling us what you'd like to see in

24
00:01:55,969 --> 00:01:54,329
future episodes and be sure to subscribe

25
00:01:57,620 --> 00:01:55,979
to our channel so you never miss

26
00:01:59,480 --> 00:01:57,630
anything that we're doing and putting

27
00:02:02,030 --> 00:01:59,490
out as we continue the series and other

28
00:02:04,370 --> 00:02:02,040
spaceport activities so I want to go

29
00:02:08,930 --> 00:02:04,380
ahead here and introduce my two guests

30
00:02:11,569 --> 00:02:08,940
so please welcome this is Ralph Ralph

31
00:02:13,069 --> 00:02:11,579
actually sorry about that one second so

32
00:02:15,699 --> 00:02:13,079
your last name for me Ralph I'm not sure

33
00:02:21,229 --> 00:02:19,660
look sorry one more time

34
00:02:22,910 --> 00:02:21,239
Richie okay

35
00:02:25,250 --> 00:02:22,920
senior project manager for space crop

36
00:02:30,530 --> 00:02:25,260
production thanks for being here

37
00:02:31,940 --> 00:02:30,540
Matt is it Matt Roman well mine sorry

38
00:02:33,259 --> 00:02:31,950

about that project scientist for space

39
00:02:35,120 --> 00:02:33,269
crop production

40
00:02:37,539 --> 00:02:35,130
so again appreciate you both being here

41
00:02:39,740 --> 00:02:37,549
again it is amazing to think about space

42
00:02:42,020 --> 00:02:39,750
being a place where we grow plants now

43
00:02:43,850 --> 00:02:42,030
it's pretty pretty wild idea but before

44
00:02:46,940 --> 00:02:43,860
we get going we're at the end of what we

45
00:02:49,099 --> 00:02:46,950
called our 10 day challenge for popcorn

46
00:02:51,979 --> 00:02:49,109
and I wanted to actually unveil my

47
00:02:55,009 --> 00:02:51,989
popcorn so my son and I planted some

48
00:02:57,050 --> 00:02:55,019
popcorn we planted two sets last week

49
00:02:57,460 --> 00:02:57,060
and I actually full-disclosure forgot

50
00:02:59,350 --> 00:02:57,470
about

51
00:03:01,540 --> 00:02:59,360
and decided to be fun to open it up here

52
00:03:03,370 --> 00:03:01,550
live one on camera um so we're gonna

53
00:03:04,870 --> 00:03:03,380
take a look here I haven't seen this and

54
00:03:06,640 --> 00:03:04,880
it doesn't look very good here so I'm

55
00:03:08,620 --> 00:03:06,650
gonna have to ask Ralph and Matt here to

56
00:03:10,510 --> 00:03:08,630
to help me understand maybe a little bit

57
00:03:13,000 --> 00:03:10,520
what's going on here this was just some

58
00:03:15,310 --> 00:03:13,010
dirt and that looks like there's just

59
00:03:17,320 --> 00:03:15,320
some some mold happen in there nothing

60
00:03:19,990 --> 00:03:17,330
too interesting there and then here and

61
00:03:23,710 --> 00:03:20,000
this one this was I think I ended up

62
00:03:25,720 --> 00:03:23,720
using flour for this so obviously no

63
00:03:27,550 --> 00:03:25,730

whole lot of growth there so I'm

64
00:03:29,710 --> 00:03:27,560
probably not cut out for the space plant

65
00:03:31,720 --> 00:03:29,720
growth world but want to get your your

66
00:03:33,340 --> 00:03:31,730
thoughts on what you're seeing here can

67
00:03:52,150 --> 00:03:33,350
you give me anything on on what went

68
00:03:56,620 --> 00:03:52,160
wrong here this one right here we down

69
00:04:06,430 --> 00:03:56,630
there gave a little bit carbohydrate so

70
00:04:07,930 --> 00:04:06,440
be sure maybe so maybe so but anyway

71
00:04:09,370 --> 00:04:07,940
that's not why we're here today

72
00:04:11,470 --> 00:04:09,380
but doing encourage you if you if you

73
00:04:12,910 --> 00:04:11,480
send out you said if you do the popcorn

74
00:04:14,259 --> 00:04:12,920
challenge I'm gonna try again I'm gonna

75
00:04:16,030 --> 00:04:14,269
use paper towels next time because I've

76
00:04:18,250 --> 00:04:16,040
seen those work really well send us your

77
00:04:21,340 --> 00:04:18,260
photos and your information at hashtag

78
00:04:23,350 --> 00:04:21,350
NASA at home but today advanced plant

79
00:04:25,530 --> 00:04:23,360
habitat so let's jump right in here Matt

80
00:04:39,760 --> 00:04:25,540
tell us about advanced plant habitat

81
00:04:42,730 --> 00:04:39,770
what what is it and what's it for you

82
00:04:43,950 --> 00:04:42,740
may have Vance plant habitat is our more

83
00:04:47,110 --> 00:04:43,960
advanced

84
00:04:49,690 --> 00:04:47,120
180 centers fully controlled environment

85
00:04:52,150 --> 00:04:49,700
a bunch of cameras really advanced

86
00:04:55,870 --> 00:04:52,160
lighting system it's like our Cadillac

87
00:04:57,970 --> 00:04:55,880
growth system and we are we've had

88
00:04:59,490 --> 00:04:57,980

several tests on a mat and we are gonna

89
00:05:03,640 --> 00:04:59,500
be sending the hatch chili pepper sauce

90
00:05:05,620 --> 00:05:03,650
okay so that's one of the first tests

91
00:05:10,000 --> 00:05:05,630
actually had a recent type of radishes

92
00:05:14,680 --> 00:05:12,400
so there's a pepper so we are growing a

93
00:05:17,020 --> 00:05:14,690
type of hatch chili pepper it's from New

94
00:05:20,050 --> 00:05:17,030
Mexico it's actually called the Espanola

95
00:05:21,670 --> 00:05:20,060
hurry to cross between a southern New

96
00:05:24,280 --> 00:05:21,680
Mexico pepper have jelly of warmer

97
00:05:26,230 --> 00:05:24,290
weather pepper and a pepper that's

98
00:05:27,580 --> 00:05:26,240
native New Mexico from the northern

99
00:05:29,770 --> 00:05:27,590
region has more Mountains

100
00:05:30,880 --> 00:05:29,780
well since it has a shorter day cycle

101
00:05:33,340 --> 00:05:30,890
it's actually really good for space

102
00:05:34,900 --> 00:05:33,350
because it's easier that dwarf it and it

103
00:05:36,970 --> 00:05:34,910
handles a temperature we have on station

104
00:05:40,260 --> 00:05:36,980
a lot better than the crop has used to

105
00:05:42,400 --> 00:05:40,270
grown in and in air grass for instance

106
00:05:45,460 --> 00:05:42,410
so you mentioned obviously we call it

107
00:05:47,230 --> 00:05:45,470
the advanced plant habitat so what makes

108
00:05:49,240 --> 00:05:47,240
it so much more advanced because I think

109
00:05:51,250 --> 00:05:49,250
that we're comparing that to veggie

110
00:05:52,690 --> 00:05:51,260
being one of the first and and certainly

111
00:05:55,300 --> 00:05:52,700
it's on the more recent side of things

112
00:05:59,380 --> 00:05:55,310
so what's making this advanced plant

113
00:06:02,350 --> 00:05:59,390

habitat well so compared to Benji Benji

114
00:06:05,320 --> 00:06:02,360
is really just a white cap fan and the

115
00:06:06,970 --> 00:06:05,330
pills are all passively watered the

116
00:06:08,860 --> 00:06:06,980
advanced plant habitat has advanced

117
00:06:12,430 --> 00:06:08,870
watering system where it's sunny water

118
00:06:14,620 --> 00:06:12,440
for ceramic dudes the brute zone you've

119
00:06:17,080 --> 00:06:14,630
got many sensors in the root zone metric

120
00:06:19,960 --> 00:06:17,090
things like moisture level temperature

121
00:06:22,060 --> 00:06:19,970
oxygen levels you've got numerous

122
00:06:24,040 --> 00:06:22,070
atmosphere control systems that can

123
00:06:26,920 --> 00:06:24,050
change everything you want increase the

124
00:06:28,130 --> 00:06:26,930
co2 level we can decrease it the same

125
00:06:30,500 --> 00:06:28,140
thing

126
00:06:32,150 --> 00:06:30,510
so so what so actually that's a good

127
00:06:33,350 --> 00:06:32,160
segue there because we had somebody over

128
00:06:35,690 --> 00:06:33,360
the course of the week asked us the

129
00:06:36,980 --> 00:06:35,700
question what are co2 levels like on

130
00:06:40,310 --> 00:06:36,990
Space Station can you talk about that

131
00:06:42,170 --> 00:06:40,320
and and why are why is monitoring all

132
00:06:44,150 --> 00:06:42,180
that so important because ultimately I

133
00:06:45,740 --> 00:06:44,160
could walk outside my house and I can

134
00:06:47,810 --> 00:06:45,750
plant things and I don't have to monitor

135
00:06:51,860 --> 00:06:47,820
any of that so it's so critical for

136
00:06:54,520 --> 00:06:51,870
space that we have those things is co2

137
00:06:57,170 --> 00:06:54,530
levels bombs between about 1,500 and

138
00:07:00,770 --> 00:06:57,180

3,000 parts per million am being

139
00:07:02,270 --> 00:07:00,780
outsider now is about 450 500 so for

140
00:07:03,710 --> 00:07:02,280
plants that make some that makes a big

141
00:07:06,140 --> 00:07:03,720
difference because it controls a lot of

142
00:07:08,990 --> 00:07:06,150
things like transpiration but for plants

143
00:07:10,820 --> 00:07:09,000
co2 is really faster than food that's

144
00:07:14,720 --> 00:07:10,830
ultimately the source of the carbon it

145
00:07:17,390 --> 00:07:14,730
makes it even everything so we're having

146
00:07:20,180 --> 00:07:17,400
that too high we've noticed numerous you

147
00:07:23,400 --> 00:07:20,190
know sometimes issues sometimes benefits

148
00:07:27,780 --> 00:07:26,370
okay very cool and so let's talk about

149
00:07:32,280 --> 00:07:27,790
peppers obviously we've shown peppers a

150
00:07:34,650 --> 00:07:32,290
decent amount now so why is our peppers

151
00:07:38,040 --> 00:07:34,660
so important why is that kind of a hot

152
00:07:38,400 --> 00:07:38,050
topic for you guys well for one the

153
00:07:42,030 --> 00:07:38,410
courage

154
00:07:43,620 --> 00:07:42,040
asthma's for hot space they have poor

155
00:07:46,490 --> 00:07:43,630
drainage and their sinuses that

156
00:07:49,830 --> 00:07:46,500
decreases their taste sensation and they

157
00:07:51,780 --> 00:07:49,840
cost more flavorful foods from our

158
00:07:53,970 --> 00:07:51,790
perspective we're trying to fill

159
00:07:56,810 --> 00:07:53,980
nutritional gaps and distort astronaut

160
00:07:59,430 --> 00:07:56,820
diet numbers are very high in vitamin C

161
00:08:02,460 --> 00:07:59,440
many times more dense actually than

162
00:08:05,160 --> 00:08:02,470
things like price difference so we have

163
00:08:06,450 --> 00:08:05,170

that you know that benefit and it's you

164
00:08:09,570 --> 00:08:06,460
know it's a new crop we haven't grown in

165
00:08:13,350 --> 00:08:09,580
space yet it's a complicated crop as a

166
00:08:16,590 --> 00:08:13,360
long germination time it's flowering so

167
00:08:19,890 --> 00:08:16,600
and the fruit has a wide bearing some

168
00:08:22,740 --> 00:08:19,900
flavor if you of you know if you were a

169
00:08:24,000 --> 00:08:22,750
trials trust a pepper plant you could

170
00:08:26,160 --> 00:08:24,010
get more heat from the pepper food

171
00:08:28,560 --> 00:08:26,170
versus if you were to over water and

172
00:08:29,940 --> 00:08:28,570
probably pretty plain boring so there's

173
00:08:33,029 --> 00:08:29,950
lots of little considerations and

174
00:08:35,010 --> 00:08:33,039
factors that go strong successful

175
00:08:37,079 --> 00:08:35,020
spacers

176
00:08:39,329 --> 00:08:37,089
cool so obviously all of this research

177
00:08:40,409 --> 00:08:39,339
is for a specific purpose and now I

178
00:08:43,019 --> 00:08:40,419
think you can kind of speak to this a

179
00:08:45,360 --> 00:08:43,029
some more is what's what's the path

180
00:08:46,860 --> 00:08:45,370
forward not only kind of from where we

181
00:08:49,320 --> 00:08:46,870
are today what what are we doing for the

182
00:08:51,540 --> 00:08:49,330
future but also why is this so important

183
00:08:55,350 --> 00:08:51,550
looking at things like living on the

184
00:09:10,650 --> 00:08:55,360
Moon or Mars or beyond well you know we

185
00:09:15,720 --> 00:09:13,890
near-space once we start talking about

186
00:09:18,030 --> 00:09:15,730
getting away from low-earth orbit going

187
00:09:19,950 --> 00:09:18,040
to munitions of them and Mars and

188
00:09:22,950 --> 00:09:19,960

staying there for extended periods of

189
00:09:25,320 --> 00:09:22,960
time now we have to worry about several

190
00:09:27,510 --> 00:09:25,330
things first of all the distance they

191
00:09:30,270 --> 00:09:27,520
get to these places especially Mars

192
00:09:33,180 --> 00:09:30,280
takes a lot of time so what's the

193
00:09:35,400 --> 00:09:33,190
relative effectiveness of the nutrition

194
00:09:37,680 --> 00:09:35,410
in the prepackaged meals when I start

195
00:09:40,200 --> 00:09:37,690
talking about missions three plus years

196
00:09:41,790 --> 00:09:40,210
they start to degrade certain key

197
00:09:44,130 --> 00:09:41,800
nutrients the ones that we're targeting

198
00:09:46,890 --> 00:09:44,140
to try to supplement start to degrade

199
00:09:51,330 --> 00:09:46,900
over that period of time you also have

200
00:09:52,890 --> 00:09:51,340
the logistical resupply mass so not the

201
00:09:54,840 --> 00:09:52,900
crews are not going to have benefit of

202
00:09:56,550 --> 00:09:54,850
constant resupply from Earth they're

203
00:09:58,680 --> 00:09:56,560
gonna have to bring with them either

204
00:10:00,630 --> 00:09:58,690
what they can take in their vehicle or

205
00:10:02,610 --> 00:10:00,640
things are gonna have to be pre position

206
00:10:06,000 --> 00:10:02,620
but fresh food they're not going to have

207
00:10:08,700 --> 00:10:06,010
access to any more with resupply so it's

208
00:10:11,330 --> 00:10:08,710
going to be up to the folks on the

209
00:10:13,770 --> 00:10:11,340
spacecraft themselves to be able to grow

210
00:10:16,680 --> 00:10:13,780
supplemental aspects of nutrition for

211
00:10:20,370 --> 00:10:16,690
their diet and that adds not

212
00:10:22,560 --> 00:10:20,380
the nutrients it also adds variety to

213
00:10:24,420 --> 00:10:22,570

the food that they have in addition to

214
00:10:25,980 --> 00:10:24,430
that it gives them something to do to

215
00:10:28,740 --> 00:10:25,990
give them something that's reminiscent

216
00:10:32,010 --> 00:10:28,750
of home so there's a psychosocial

217
00:10:33,690 --> 00:10:32,020
benefit so there's it's definitely

218
00:10:36,690 --> 00:10:33,700
giving me a component of the diet when

219
00:10:39,510 --> 00:10:36,700
you look at how expiration has evolved

220
00:10:42,090 --> 00:10:39,520
on the earth ever since you know the

221
00:10:44,610 --> 00:10:42,100
first explorers came to the new world

222
00:10:46,080 --> 00:10:44,620
and beyond they brought plants from all

223
00:10:48,140 --> 00:10:46,090
with them they brought things they were

224
00:10:50,790 --> 00:10:48,150
familiar with so it's part of our

225
00:10:55,160 --> 00:10:50,800
culture and the human nature to be able

226
00:11:01,879 --> 00:10:58,970
so thinking about that have we seen kind

227
00:11:03,049 --> 00:11:01,889
of a psychological impact in the

228
00:11:04,519 --> 00:11:03,059
research we've done on station because

229
00:11:05,960 --> 00:11:04,529
obviously you talk about all these

230
00:11:09,049 --> 00:11:05,970
things that make it different than Space

231
00:11:10,340 --> 00:11:09,059
Station we have the the far destinations

232
00:11:13,189 --> 00:11:10,350
we're going to arena to transport things

233
00:11:15,289 --> 00:11:13,199
with you so how do we have that tangible

234
00:11:21,769 --> 00:11:15,299
result of how it's benefiting them today

235
00:11:24,109 --> 00:11:21,779
on station so a few months ago they got

236
00:11:26,569 --> 00:11:24,119
the first real quantitative data on that

237
00:11:30,409 --> 00:11:26,579
so I don't want to jump out make any

238
00:11:31,970 --> 00:11:30,419

statements on that right now but in

239
00:11:34,789 --> 00:11:31,980
general with our acts interviews that

240
00:11:37,309 --> 00:11:34,799
crew they think enjoy them growing

241
00:11:41,059 --> 00:11:37,319
plants in space so if nothing else it's

242
00:11:42,710 --> 00:11:41,069
enjoyable yeah hey that's important hey

243
00:11:44,960 --> 00:11:42,720
I want to have Ralph if you could kind

244
00:11:47,769 --> 00:11:44,970
of speak to we have some images here

245
00:11:49,879 --> 00:11:47,779
some very futuristic looking things

246
00:11:52,849 --> 00:11:49,889
number one what are we looking at here

247
00:11:56,049 --> 00:11:52,859
and how does this apply to just the idea

248
00:11:58,789 --> 00:11:56,059
of plant growth beyond our world you

249
00:12:00,650 --> 00:11:58,799
know so I think what you're seeing are

250
00:12:02,720 --> 00:12:00,660
just some of the early concepts and

251
00:12:12,970 --> 00:12:02,730
there's a lot of different concepts out

252
00:12:18,519 --> 00:12:15,269
and so there's a lot of different either

253
00:12:20,230 --> 00:12:18,529
academia or commercial interests looking

254
00:12:22,840 --> 00:12:20,240
at studying what are the best types of

255
00:12:24,790 --> 00:12:22,850
habitats to design and ultimately if

256
00:12:27,460 --> 00:12:24,800
we're talking about eventually growing

257
00:12:30,069 --> 00:12:27,470
plants as a supplemental source of food

258
00:12:32,290 --> 00:12:30,079
or as a caloric replacement to

259
00:12:34,300 --> 00:12:32,300
prepackaged food system we're going to

260
00:12:37,420 --> 00:12:34,310
need volume to be able to do that

261
00:12:39,189 --> 00:12:37,430
space to spread out and so when I start

262
00:12:41,889 --> 00:12:39,199
talking about deploying systems like

263
00:12:43,449 --> 00:12:41,899

that long term on the Moon and Mars it's

264
00:12:45,639 --> 00:12:43,459
going to be something that's going to be

265
00:12:48,579 --> 00:12:45,649
an evolution of the first missions to

266
00:12:52,030 --> 00:12:48,589
the moon likely we'll use the moon over

267
00:12:55,150 --> 00:12:52,040
time to develop an analog system or a

268
00:12:58,389 --> 00:12:55,160
demonstration system of the concepts

269
00:12:59,470 --> 00:12:58,399
that we'll bring with us to Mars and so

270
00:13:01,860 --> 00:12:59,480
what you're seeing are a lot of

271
00:13:05,379 --> 00:13:01,870
different representations of how do I

272
00:13:07,480 --> 00:13:05,389
deploy and make these systems in a lot

273
00:13:09,910 --> 00:13:07,490
of cases that would be beneficial to use

274
00:13:12,819 --> 00:13:09,920
Institute resources so if I could take

275
00:13:14,980 --> 00:13:12,829
the material on the moon and manufacture

276
00:13:16,620 --> 00:13:14,990
our surface habitats out of that

277
00:13:22,800 --> 00:13:16,630
material

278
00:13:30,639 --> 00:13:26,110
that would be beneficial so

279
00:13:33,610 --> 00:13:30,649
you guys still hear me yep I've got you

280
00:13:36,970 --> 00:13:33,620
Ralph loud and clear okay just bear with

281
00:13:38,290 --> 00:13:36,980
me yeah so so basically that's what

282
00:13:40,090 --> 00:13:38,300
you're seeing your different concepts

283
00:13:45,300 --> 00:13:40,100
the one that was populated a lot of

284
00:13:49,499 --> 00:13:47,519
used at the University of Arizona to

285
00:13:51,150 --> 00:13:49,509
show a confined space for growing plants

286
00:13:53,160 --> 00:13:51,160
we're actually looking at Kennedy Space

287
00:13:55,170 --> 00:13:53,170
Center to acquiring one of those systems

288
00:13:55,920 --> 00:13:55,180

that we can do further research in a

289
00:13:58,199 --> 00:13:55,930
more spread-out

290
00:14:00,780 --> 00:13:58,209
area to test different hardware systems

291
00:14:03,059 --> 00:14:00,790
a lot of our focus right now is based on

292
00:14:04,829 --> 00:14:03,069
the plants themselves and we're looking

293
00:14:06,989 --> 00:14:04,839
at seeing what are the best hardware

294
00:14:08,280 --> 00:14:06,999
systems to grow these plants in long

295
00:14:11,160 --> 00:14:08,290
term

296
00:14:13,230 --> 00:14:11,170
so we're bad at I'm for today but wanted

297
00:14:15,210 --> 00:14:13,240
to ask you both if you have you ever

298
00:14:17,670 --> 00:14:15,220
envisioned yourself working on plant

299
00:14:19,410 --> 00:14:17,680
growth for space obviously when it comes

300
00:14:21,720 --> 00:14:19,420
to plant growth in scientific research

301
00:14:22,769 --> 00:14:21,730
there's lots of opportunity on earth but

302
00:14:26,400 --> 00:14:22,779
did you ever think you'd be doing this

303
00:14:37,650 --> 00:14:26,410
for space I didn't know this was a thing

304
00:14:43,110 --> 00:14:40,790
you know just kind of fell into this

305
00:14:45,330 --> 00:14:43,120
it's actually really exciting some of

306
00:14:48,270 --> 00:14:45,340
the most exciting work I've done cool

307
00:14:50,580 --> 00:14:48,280
good well Ralph Matt appreciate you both

308
00:14:54,120 --> 00:14:50,590
and I look forward to seeing all kinds

309
00:14:55,800 --> 00:14:54,130
of green and colorful things growing in

310
00:14:58,310 --> 00:14:55,810
a healthy way on space station sooner

311
00:15:02,460 --> 00:14:58,320
than later and even further than that

312
00:15:04,920 --> 00:15:02,470
thank you thank you all right a big

313
00:15:10,020 --> 00:15:04,930

things to those guys always fun to talk

314
00:15:11,850 --> 00:15:10,030
with it's amazing how frequently we talk

315
00:15:13,020 --> 00:15:11,860
with people and plant growth is one of

316
00:15:14,760 --> 00:15:13,030
the big highlights for them when it

317
00:15:16,470 --> 00:15:14,770
comes to visiting the Kennedy Space

318
00:15:18,690 --> 00:15:16,480
Center despite everything else that's

319
00:15:20,070 --> 00:15:18,700
going on people love that and we we're

320
00:15:22,440 --> 00:15:20,080
glad they love that we're glad that they

321
00:15:24,600 --> 00:15:22,450
see the value in that so before we go I

322
00:15:26,640 --> 00:15:24,610
want to give a couple kind of quick

323
00:15:28,350 --> 00:15:26,650
quick plug here obviously the NASA at

324
00:15:30,210 --> 00:15:28,360
home team is a lot more than just the

325
00:15:34,170 --> 00:15:30,220
spaceport series there's a ton at

326
00:15:36,210 --> 00:15:34,180
nasa.gov slash NASA at home this is the

327
00:15:39,630 --> 00:15:36,220
main page there and want to specifically

328
00:15:41,310 --> 00:15:39,640
plug a podcast which is one of the

329
00:15:43,140 --> 00:15:41,320
things on here the rocket range podcast

330
00:15:44,970 --> 00:15:43,150
released an episode this week actually

331
00:15:48,180 --> 00:15:44,980
featuring NFL quarterback Josh Dobbs

332
00:15:50,910 --> 00:15:48,190
who's also a Tennessee volunteer who is

333
00:15:53,520 --> 00:15:50,920
an aerospace engineer with a 4.0

334
00:15:55,530 --> 00:15:53,530
it is incredibly uncommon to find a guy

335
00:15:57,960 --> 00:15:55,540
who could do both of those things check

336
00:15:59,040 --> 00:15:57,970
out the podcast lots of fun lots of hard

337
00:16:01,590 --> 00:15:59,050
work and dedication that went into that

338
00:16:04,230 --> 00:16:01,600

but that is gonna do it for me here from

339
00:16:06,000 --> 00:16:04,240
the Kennedy Space Center sort of I'm