
STATIONLIFE

1
00:00:16,790 --> 00:00:15,509
to boldly go where no one has gone

2
00:00:18,710 --> 00:00:16,800
before

3
00:00:20,950 --> 00:00:18,720
one problem we have to develop the

4
00:00:23,429 --> 00:00:20,960
technologies and build the vehicles to

5
00:00:24,950 --> 00:00:23,439
get us there luckily one of the main

6
00:00:27,029 --> 00:00:24,960
missions of the international space

7
00:00:29,750 --> 00:00:27,039
station program is to develop and

8
00:00:32,150 --> 00:00:29,760
demonstrate technology capabilities that

9
00:00:34,549 --> 00:00:32,160
will enable future exploration missions

10
00:00:37,030 --> 00:00:34,559
beyond low earth orbit

11
00:00:39,430 --> 00:00:37,040
the iss is a critical testbed for

12
00:00:42,229 --> 00:00:39,440
verifying a variety of technologies

13
00:00:44,229 --> 00:00:42,239

systems and materials that will enable

14
00:00:47,910 --> 00:00:44,239
future long duration exploration

15
00:00:50,470 --> 00:00:47,920
missions to infinity and beyond hi i'm

16
00:00:51,910 --> 00:00:50,480
nasa astronaut tracy dyson welcome to

17
00:01:04,710 --> 00:00:51,920
station line

18
00:01:08,950 --> 00:01:06,469
today we're going to talk about the iss

19
00:01:10,950 --> 00:01:08,960
as a platform to test and demonstrate

20
00:01:13,350 --> 00:01:10,960
new technologies that will enable us to

21
00:01:16,789 --> 00:01:13,360
go on future exploration missions beyond

22
00:01:18,950 --> 00:01:16,799
low earth orbit to infinity and beyond

23
00:01:22,390 --> 00:01:18,960
no kidding we're talking about potential

24
00:01:24,789 --> 00:01:22,400
missions to asteroids and even mars

25
00:01:27,270 --> 00:01:24,799
right now scott kelly's on the iss for

26
00:01:28,950 --> 00:01:27,280
the one year mission nasa scientists are

27
00:01:30,870 --> 00:01:28,960
hoping to learn more about the effects

28
00:01:31,990 --> 00:01:30,880
of prolonged space flight on the human

29
00:01:33,670 --> 00:01:32,000
body

30
00:01:35,670 --> 00:01:33,680
typically our stay aboard the

31
00:01:38,230 --> 00:01:35,680
international space station is about six

32
00:01:40,789 --> 00:01:38,240
months long and right now a mission to

33
00:01:42,469 --> 00:01:40,799
mars would take 30 months

34
00:01:43,749 --> 00:01:42,479
we need to know how to stay healthy for

35
00:01:45,749 --> 00:01:43,759
long periods of time if we're going to

36
00:01:48,230 --> 00:01:45,759
take on a journey like this and there's

37
00:01:50,789 --> 00:01:48,240
only one place to learn how you guessed

38
00:01:52,230 --> 00:01:50,799

it the international space station

39
00:01:54,310 --> 00:01:52,240
there's a lot of interest right now in

40
00:01:55,910 --> 00:01:54,320
the journey to mars great strides are

41
00:01:58,069 --> 00:01:55,920
taking place in the orion program and

42
00:02:00,389 --> 00:01:58,079
the sls rocket which we hope will take

43
00:02:02,630 --> 00:02:00,399
us to mars someday check out this video

44
00:02:04,469 --> 00:02:02,640
from nasa's associate administrator bill

45
00:02:06,950 --> 00:02:04,479
gerstenmaier as he discusses the

46
00:02:08,309 --> 00:02:06,960
challenges we face on a journey to mars

47
00:02:15,030 --> 00:02:08,319
and the lessons we've learned from the

48
00:02:18,630 --> 00:02:17,270
if the future of mankind means living on

49
00:02:21,030 --> 00:02:18,640
another planet

50
00:02:24,309 --> 00:02:21,040
our close neighbor mars has got to be a

51
00:02:29,030 --> 00:02:26,550
it's a huge challenge for us but it's

52
00:02:32,949 --> 00:02:29,040
not so overwhelming that we couldn't get

53
00:02:38,150 --> 00:02:35,910
this is no pipe dream the engines rocket

54
00:02:40,309 --> 00:02:38,160
bodies and abort systems to make this

55
00:02:47,110 --> 00:02:40,319
journey to mars and back are being built

56
00:02:51,509 --> 00:02:49,110
and here is a preview of the space

57
00:02:53,509 --> 00:02:51,519
launch system or sls

58
00:02:56,790 --> 00:02:53,519
scheduled for its first test flight in

59
00:02:59,990 --> 00:02:58,949
it will be the most powerful rocket in

60
00:03:02,309 --> 00:03:00,000
history

61
00:03:05,830 --> 00:03:02,319
designed like the shuttle to take huge

62
00:03:07,430 --> 00:03:05,840
payloads into orbit

63
00:03:10,470 --> 00:03:07,440

it's about as tall as the statue of

64
00:03:13,430 --> 00:03:10,480
liberty and it can launch 130 metric

65
00:03:22,390 --> 00:03:15,750
the sls is designed to carry a crew

66
00:03:27,750 --> 00:03:24,630
and nasa's plans for testing the capsule

67
00:03:32,149 --> 00:03:29,990
involve capturing an asteroid and having

68
00:03:35,190 --> 00:03:32,159
the astronauts do a space walk to

69
00:03:35,200 --> 00:03:39,670
before returning to earth

70
00:03:44,070 --> 00:03:41,509
this is kind of our proving ground to

71
00:03:46,149 --> 00:03:44,080
build those next series of concepts and

72
00:03:50,710 --> 00:03:46,159
techniques and hardware that will be

73
00:03:54,869 --> 00:03:52,229
much of what happens on the space

74
00:03:57,110 --> 00:03:54,879
station today lays the groundwork for a

75
00:04:01,030 --> 00:03:57,120
future when nasa is ready to transport

76
00:04:05,509 --> 00:04:03,030
the human mission to mars will

77
00:04:07,589 --> 00:04:05,519
eventually require another spaceship

78
00:04:10,789 --> 00:04:07,599
built on the same scale and in the same

79
00:04:13,110 --> 00:04:10,799
way as space station

80
00:04:15,830 --> 00:04:13,120
we've learned from station we can build

81
00:04:18,150 --> 00:04:15,840
over multiple years decades and actually

82
00:04:20,229 --> 00:04:18,160
assemble a fairly large structure

83
00:04:22,710 --> 00:04:20,239
it will be built from parts flown into

84
00:04:25,270 --> 00:04:22,720
orbit by the new sls

85
00:04:27,749 --> 00:04:25,280
once complete and with orion attached as

86
00:04:29,830 --> 00:04:27,759
the mars lander the new spaceship will

87
00:04:31,830 --> 00:04:29,840
embark on the sixth month voyage to the

88
00:04:33,270 --> 00:04:31,840

red planet

89
00:04:35,189 --> 00:04:33,280
we're ready to break that tie with the

90
00:04:36,790 --> 00:04:35,199
home planet and become independent of

91
00:04:38,870 --> 00:04:36,800
the earth we better have learned all

92
00:04:40,629 --> 00:04:38,880
those lessons from space station this is

93
00:04:42,710 --> 00:04:40,639
not the beginning of the end this is

94
00:04:46,469 --> 00:04:42,720
really the beginning of a new bright

95
00:04:46,479 --> 00:05:21,150
and then

96
00:05:21,160 --> 00:05:42,150
rs-25 rocket engine

97
00:05:42,160 --> 00:05:52,950
heat shield testing

98
00:06:42,870 --> 00:05:54,550
ground systems development and

99
00:06:42,880 --> 00:07:00,070
rocket core

100
00:07:00,080 --> 00:07:12,390
solid rocket booster construction

101
00:07:12,400 --> 00:07:17,189
solid rocket booster test

102
00:07:23,350 --> 00:07:19,270
commit the motor

103
00:07:29,909 --> 00:07:23,360
motor is committed that flush is on

104
00:07:56,950 --> 00:07:29,919
t minus 10 is 10 9 9 8 8 7 7 6 6 5 five

105
00:08:01,670 --> 00:07:58,950
nasa is suiting up

106
00:08:03,990 --> 00:08:01,680
getting ready to send humans on a

107
00:08:06,629 --> 00:08:04,000
journey to mars

108
00:08:07,749 --> 00:08:06,639
to do it right the space suit must be

109
00:08:11,029 --> 00:08:07,759
tough

110
00:08:15,110 --> 00:08:11,039
shielding the astronaut from dust heat

111
00:08:18,790 --> 00:08:15,120
cold radiation it must be sophisticated

112
00:08:21,830 --> 00:08:18,800
providing air power communications

113
00:08:25,189 --> 00:08:21,840

the spacesuit must be flexible allowing

114
00:08:31,589 --> 00:08:25,199
the human body the freedom to explore

115
00:08:36,870 --> 00:08:33,990
we have 50 years of experience suiting

116
00:08:39,829 --> 00:08:36,880
up sending humans out of the spacecraft

117
00:08:41,190 --> 00:08:39,839
and what nasa calls extra vehicular

118
00:08:43,269 --> 00:08:41,200
activity

119
00:08:45,670 --> 00:08:43,279
we have walked in space

120
00:08:48,230 --> 00:08:45,680
and proved there was a universe of

121
00:08:50,949 --> 00:08:48,240
possibilities that awaited us

122
00:08:53,590 --> 00:08:50,959
we have shown that with a spacesuit

123
00:08:58,230 --> 00:08:53,600
human hands can repair

124
00:09:02,150 --> 00:09:01,110
with spacesuits we even explored the

125
00:09:04,870 --> 00:09:02,160
moon

126
00:09:05,910 --> 00:09:04,880
opening new frontiers and expanding our

127
00:09:08,710 --> 00:09:05,920
knowledge

128
00:09:11,509 --> 00:09:08,720
and as nasa prepares to travel further

129
00:09:14,389 --> 00:09:11,519
into the solar system a new generation

130
00:09:17,269 --> 00:09:14,399
of spacesuits will help us make future

131
00:09:23,670 --> 00:09:19,990
suit up with us and explore this nasa

132
00:09:34,550 --> 00:09:23,680
website celebrating 50 years of extra

133
00:09:39,110 --> 00:09:36,790
welcome back we already mentioned how

134
00:09:40,389 --> 00:09:39,120
the iss is a great place to learn how to

135
00:09:41,990 --> 00:09:40,399
live in space

136
00:09:44,630 --> 00:09:42,000
one of the basic things we're figuring

137
00:09:46,870 --> 00:09:44,640
out is how to grow food in space

138
00:09:48,470 --> 00:09:46,880

a series of experiments called veggie is

139
00:09:50,630 --> 00:09:48,480
helping us to learn how to grow food in

140
00:09:52,790 --> 00:09:50,640
space right now

141
00:09:55,030 --> 00:09:52,800
the farther and longer humans go away

142
00:09:57,590 --> 00:09:55,040
from earth the greater the need will be

143
00:10:00,630 --> 00:09:57,600
to grow plants for food atmosphere

144
00:10:02,389 --> 00:10:00,640
revitalization and psychological benefit

145
00:10:04,150 --> 00:10:02,399
check out this video about growing

146
00:10:05,910 --> 00:10:04,160
lettuce on the international space

147
00:10:08,150 --> 00:10:05,920
station

148
00:10:10,470 --> 00:10:08,160
it's spring and all around the northern

149
00:10:13,430 --> 00:10:10,480
hemisphere gardeners are planting seeds

150
00:10:15,990 --> 00:10:13,440
tilling soil and watering crops

151
00:10:17,750 --> 00:10:16,000
imagine a gardener's surprise however if

152
00:10:20,310 --> 00:10:17,760
the water from the hose instead of

153
00:10:23,350 --> 00:10:20,320
hitting the soil and sinking in floated

154
00:10:25,829 --> 00:10:23,360
up to the sky or if the soil itself rose

155
00:10:27,670 --> 00:10:25,839
up from the ground and fled the garden

156
00:10:29,430 --> 00:10:27,680
that's exactly the kind of dilemma

157
00:10:31,750 --> 00:10:29,440
astronauts aboard the international

158
00:10:33,829 --> 00:10:31,760
space station have faced for years

159
00:10:36,630 --> 00:10:33,839
without gravity how do you make your

160
00:10:39,110 --> 00:10:36,640
garden grow the situation is even more

161
00:10:42,389 --> 00:10:39,120
confusing for plants in a weightless

162
00:10:45,750 --> 00:10:42,399
environment up and down have no meaning

163
00:10:47,750 --> 00:10:45,760

so roots grow in odd chaotic directions

164
00:10:50,470 --> 00:10:47,760
shoots that emerge from the soil in

165
00:10:53,509 --> 00:10:50,480
search of sun find instead a cold

166
00:10:55,990 --> 00:10:53,519
metallic lamp that never rises or sets

167
00:10:58,870 --> 00:10:56,000
and needless to say it never rains

168
00:11:01,670 --> 00:10:58,880
inside the space station in 2014 the

169
00:11:04,230 --> 00:11:01,680
spacex falcon rocket carrying the dragon

170
00:11:06,150 --> 00:11:04,240
cargo spacecraft blasted off from cape

171
00:11:08,790 --> 00:11:06,160
canaveral in florida with a possible

172
00:11:09,829 --> 00:11:08,800
solution to these problems we call it

173
00:11:12,310 --> 00:11:09,839
veggie

174
00:11:15,190 --> 00:11:12,320
it's a plant growth chamber designed to

175
00:11:17,829 --> 00:11:15,200
make gardens thrive in weightlessness

176
00:11:19,910 --> 00:11:17,839
joya masa who leads the veggie science

177
00:11:22,550 --> 00:11:19,920
team has been working on the project for

178
00:11:24,710 --> 00:11:22,560
years veggie's heritage traces back

179
00:11:27,110 --> 00:11:24,720
decades to experiments with plants

180
00:11:29,509 --> 00:11:27,120
onboard the russian space station mir

181
00:11:32,150 --> 00:11:29,519
and nasa's space shuttles

182
00:11:34,949 --> 00:11:32,160
in all that time nasa astronauts have

183
00:11:37,350 --> 00:11:34,959
never tasted homegrown food in space

184
00:11:39,670 --> 00:11:37,360
but that could soon change our first

185
00:11:42,470 --> 00:11:39,680
crop will be a variety of lettuce called

186
00:11:43,990 --> 00:11:42,480
outredges it is delicious

187
00:11:46,550 --> 00:11:44,000
veggie solves the problems of

188
00:11:49,190 --> 00:11:46,560

weightlessness using plant pillows

189
00:11:52,150 --> 00:11:49,200
basically these are bags of quote space

190
00:11:55,430 --> 00:11:52,160
dirt and slow release fertilizer

191
00:11:57,829 --> 00:11:55,440
wicks inserted into the bags draw water

192
00:12:00,310 --> 00:11:57,839
into the soil where it can't float away

193
00:12:02,389 --> 00:12:00,320
in addition to guiding water the wicks

194
00:12:04,629 --> 00:12:02,399
act as kind of a gardening stake the

195
00:12:06,550 --> 00:12:04,639
wicks are where we glue the seeds we

196
00:12:08,790 --> 00:12:06,560
have to be very careful to orient the

197
00:12:11,030 --> 00:12:08,800
seeds so that the roots grow down into

198
00:12:12,310 --> 00:12:11,040
the soil and the shoots pop out of the

199
00:12:14,310 --> 00:12:12,320
back

200
00:12:17,430 --> 00:12:14,320
when the shoots emerge they find an

201
00:12:19,829 --> 00:12:17,440
array of leds shining overhead providing

202
00:12:22,389 --> 00:12:19,839
light for photosynthesis and a sense of

203
00:12:24,389 --> 00:12:22,399
direction to keep the shoots moving up

204
00:12:26,790 --> 00:12:24,399
the bellows like walls of the chamber

205
00:12:28,230 --> 00:12:26,800
allow it to expand to make room for the

206
00:12:29,910 --> 00:12:28,240
growing crop

207
00:12:31,990 --> 00:12:29,920
pictures of veggie often show the

208
00:12:33,430 --> 00:12:32,000
chamber flooded with a mixture of red

209
00:12:35,430 --> 00:12:33,440
and blue light

210
00:12:37,590 --> 00:12:35,440
that's the color of light plants use

211
00:12:40,069 --> 00:12:37,600
most for photosynthesis

212
00:12:42,230 --> 00:12:40,079
we're just giving them what they want

213
00:12:44,790 --> 00:12:42,240

under a purplish light plants appear

214
00:12:45,829 --> 00:12:44,800
gray and unappetizing who wants to look

215
00:12:47,990 --> 00:12:45,839
at that

216
00:12:50,629 --> 00:12:48,000
astronaut gardeners can switch on green

217
00:12:53,350 --> 00:12:50,639
leds as well adding that color to the

218
00:12:56,150 --> 00:12:53,360
red blue mix produces white light and

219
00:12:57,509 --> 00:12:56,160
displays the garden to better effect

220
00:12:59,350 --> 00:12:57,519
the appearance of the garden is

221
00:13:01,430 --> 00:12:59,360
important because gardening has

222
00:13:02,629 --> 00:13:01,440
psychological as well as nutritional

223
00:13:04,870 --> 00:13:02,639
benefits

224
00:13:07,110 --> 00:13:04,880
compared to earth spaceships are a

225
00:13:10,069 --> 00:13:07,120
relatively lifeless environment

226
00:13:11,750 --> 00:13:10,079
cold metallic and sterile

227
00:13:13,829 --> 00:13:11,760
plants allow astronauts to form a

228
00:13:15,670 --> 00:13:13,839
connection to living things

229
00:13:17,509 --> 00:13:15,680
there could be a huge psychological

230
00:13:19,030 --> 00:13:17,519
benefit

231
00:13:21,190 --> 00:13:19,040
chalking up another success for

232
00:13:23,030 --> 00:13:21,200
commercial space flight the dragon

233
00:13:26,949 --> 00:13:23,040
capsule delivered veggie to the space

234
00:13:29,110 --> 00:13:26,959
station on sunday april 20th 2014. the

235
00:13:31,990 --> 00:13:29,120
first crop of outregis was harvested in

236
00:13:33,590 --> 00:13:32,000
late may of 2014 but astronauts weren't

237
00:13:35,269 --> 00:13:33,600
allowed to taste test

238
00:13:36,629 --> 00:13:35,279

first we had to bring the lettuce home

239
00:13:38,949 --> 00:13:36,639
for analysis

240
00:13:41,590 --> 00:13:38,959
thankfully it turned out fine no

241
00:13:44,150 --> 00:13:41,600
bacteria or contaminations were found

242
00:13:47,110 --> 00:13:44,160
the latest veggie experiment on the iss

243
00:13:49,430 --> 00:13:47,120
will be harvested in august of 2015 to

244
00:13:51,590 --> 00:13:49,440
be half eaten by the crew and half

245
00:16:02,470 --> 00:13:51,600
frozen for further analysis

246
00:16:06,790 --> 00:16:04,150
tomatoes

247
00:16:35,269 --> 00:16:06,800
and artichokes

248
00:16:35,279 --> 00:17:35,990
a space cheeseburger

249
00:17:39,350 --> 00:17:37,830
you may not know this but the

250
00:17:41,909 --> 00:17:39,360
international space station was

251
00:17:45,190 --> 00:17:41,919
assembled by partners from 15 countries

252
00:17:47,590 --> 00:17:45,200
over a 15-year period using huge robotic

253
00:17:49,909 --> 00:17:47,600
arms to do the construction work that

254
00:17:52,070 --> 00:17:49,919
was too large and massive for astronauts

255
00:17:54,230 --> 00:17:52,080
to handle on their own for future

256
00:17:55,909 --> 00:17:54,240
exploration we plan to use these same

257
00:17:57,909 --> 00:17:55,919
large robotic arms to do a lot of the

258
00:18:00,230 --> 00:17:57,919
heavy lifting but we also have

259
00:18:02,070 --> 00:18:00,240
humanoid-like robots to assist

260
00:18:05,909 --> 00:18:02,080
astronauts in doing the smaller

261
00:18:07,909 --> 00:18:05,919
fundamental space exploration tasks

262
00:18:10,549 --> 00:18:07,919
let's hear from our very own robotics

263
00:18:12,310 --> 00:18:10,559

genius dr rob ambrose from the johnson

264
00:18:14,710 --> 00:18:12,320
space center as he explains the

265
00:18:21,669 --> 00:18:14,720
significant role that robotics will play

266
00:18:25,190 --> 00:18:23,110
so in this lab we've got a number of

267
00:18:26,789 --> 00:18:25,200
robotic systems that you see behind me

268
00:18:29,029 --> 00:18:26,799
these are the robonauts in fact the

269
00:18:31,510 --> 00:18:29,039
second generation robonaut 2 as we refer

270
00:18:34,070 --> 00:18:31,520
to it these robots are some of the first

271
00:18:36,710 --> 00:18:34,080
caretakers that nasa has developed

272
00:18:37,750 --> 00:18:36,720
we've got one on space station right now

273
00:18:39,669 --> 00:18:37,760
in fact

274
00:18:40,630 --> 00:18:39,679
it's got legs like the one over my right

275
00:18:42,470 --> 00:18:40,640
shoulder

276
00:18:44,470 --> 00:18:42,480
it's able to move around on the space

277
00:18:46,230 --> 00:18:44,480
station and get to wherever it needs to

278
00:18:48,950 --> 00:18:46,240
be to do some work

279
00:18:51,590 --> 00:18:48,960
it's got pretty amazing hands not as

280
00:18:54,310 --> 00:18:51,600
good as human hands but good enough that

281
00:18:56,470 --> 00:18:54,320
it can handle a tool that's built for a

282
00:18:58,870 --> 00:18:56,480
human and what that allows

283
00:19:00,549 --> 00:18:58,880
is that the robot is able to work with

284
00:19:01,990 --> 00:19:00,559
the same interfaces and equipment that

285
00:19:03,750 --> 00:19:02,000
are built for the people

286
00:19:06,310 --> 00:19:03,760
if i were to ask space station once you

287
00:19:07,830 --> 00:19:06,320
start all over again and

288
00:19:09,270 --> 00:19:07,840

put in a bunch of rails and other things

289
00:19:11,190 --> 00:19:09,280
that would allow me to use a simpler

290
00:19:14,150 --> 00:19:11,200
robot they'll say uh

291
00:19:16,310 --> 00:19:14,160
go away you know it's it's already built

292
00:19:17,669 --> 00:19:16,320
and it's built for people and we're not

293
00:19:20,470 --> 00:19:17,679
going to go customize everything just

294
00:19:22,630 --> 00:19:20,480
for a robot and that's that's reasonable

295
00:19:24,310 --> 00:19:22,640
if you can get the world to adapt to

296
00:19:25,909 --> 00:19:24,320
your design you know that's great

297
00:19:27,909 --> 00:19:25,919
because then you can use a simpler

298
00:19:29,990 --> 00:19:27,919
robotic system but it's good work if you

299
00:19:31,590 --> 00:19:30,000
can get it but most of the world's

300
00:19:32,630 --> 00:19:31,600
already built and it's built for us as

301
00:19:33,590 --> 00:19:32,640
humans

302
00:19:35,350 --> 00:19:33,600
so

303
00:19:37,750 --> 00:19:35,360
we're kind of turning the corner where

304
00:19:40,150 --> 00:19:37,760
we now have this new opportunity to

305
00:19:42,390 --> 00:19:40,160
have a robot that can work in a

306
00:19:45,510 --> 00:19:42,400
world built for people now it's harder

307
00:19:47,669 --> 00:19:45,520
but the technology is now there

308
00:19:50,150 --> 00:19:47,679
a robot that can handle a tool built for

309
00:19:52,710 --> 00:19:50,160
the human hand a robot that can climb or

310
00:19:54,710 --> 00:19:52,720
even walk into a location that was

311
00:19:55,510 --> 00:19:54,720
developed for a human to get to we're

312
00:19:56,789 --> 00:19:55,520
now

313
00:19:59,270 --> 00:19:56,799

able to do that

314
00:20:01,669 --> 00:19:59,280
and so it allows us to just accept the

315
00:20:03,430 --> 00:20:01,679
human as the standard and not have to

316
00:20:05,909 --> 00:20:03,440
build extra equipment just for the

317
00:20:08,710 --> 00:20:05,919
robots the most sophisticated jobs well

318
00:20:09,990 --> 00:20:08,720
we're not there yet human judgment is

319
00:20:11,750 --> 00:20:10,000
is you know

320
00:20:13,190 --> 00:20:11,760
far ahead of where we are with robots

321
00:20:15,830 --> 00:20:13,200
you know they'll just stare at something

322
00:20:17,350 --> 00:20:15,840
and it just looks shiny to a robot

323
00:20:18,950 --> 00:20:17,360
humans have the judgment and that's what

324
00:20:20,470 --> 00:20:18,960
we really want to use with our

325
00:20:22,230 --> 00:20:20,480
astronauts in space

326
00:20:23,270 --> 00:20:22,240
a robot can do things like here hold

327
00:20:25,190 --> 00:20:23,280
this

328
00:20:26,070 --> 00:20:25,200
for four hours you know crummy job for a

329
00:20:28,149 --> 00:20:26,080
person

330
00:20:30,310 --> 00:20:28,159
turns out robots like to stand still

331
00:20:32,789 --> 00:20:30,320
they're really good at it so if you have

332
00:20:34,950 --> 00:20:32,799
a job that's crummy for a person let's

333
00:20:37,190 --> 00:20:34,960
have a robot do that task and then we'll

334
00:20:39,430 --> 00:20:37,200
save the astronauts time which is very

335
00:21:00,070 --> 00:20:39,440
valuable for the ones that really need

336
00:21:04,149 --> 00:21:02,390
as you can see for the future of human

337
00:21:07,110 --> 00:21:04,159
exploration it's all about the

338
00:21:09,029 --> 00:21:07,120

technology so to get the big picture of

339
00:21:11,029 --> 00:21:09,039
advancing technologies and how it all

340
00:21:13,110 --> 00:21:11,039
fits together let's hear from the chief

341
00:21:15,430 --> 00:21:13,120
technologist from the johnson space

342
00:21:17,430 --> 00:21:15,440
center douglas terrier

343
00:21:18,870 --> 00:21:17,440
awesome

344
00:21:20,630 --> 00:21:18,880
i'd like to tell you about how we're

345
00:21:22,630 --> 00:21:20,640
using the international space station as

346
00:21:24,390 --> 00:21:22,640
a critical element in our technology

347
00:21:26,310 --> 00:21:24,400
development strategy to develop the

348
00:21:29,110 --> 00:21:26,320
capabilities that we need to send humans

349
00:21:31,350 --> 00:21:29,120
into deep space and eventually to mars

350
00:21:33,110 --> 00:21:31,360
so we have a comprehensive technology

351
00:21:34,549 --> 00:21:33,120
development strategy at nasa where we

352
00:21:36,230 --> 00:21:34,559
work with the

353
00:21:38,149 --> 00:21:36,240
exploration architecture teams to

354
00:21:39,830 --> 00:21:38,159
understand exactly what the critical

355
00:21:41,190 --> 00:21:39,840
capabilities are that we need for humans

356
00:21:42,870 --> 00:21:41,200
to survive in deep space for the

357
00:21:45,909 --> 00:21:42,880
extended missions that we

358
00:21:48,149 --> 00:21:45,919
anticipate to go to the moon region and

359
00:21:49,590 --> 00:21:48,159
on to mars using our research and

360
00:21:51,270 --> 00:21:49,600
technology money we've demonstrated

361
00:21:53,029 --> 00:21:51,280
those capabilities on the ground and

362
00:21:55,190 --> 00:21:53,039
we're now ready to demonstrate them in a

363
00:21:56,870 --> 00:21:55,200

microgravity environment so the

364
00:21:59,350 --> 00:21:56,880
international space station provides the

365
00:22:02,149 --> 00:21:59,360
ideal platform for doing that today we

366
00:22:03,830 --> 00:22:02,159
have an r2 robot humanoid robot on the

367
00:22:06,230 --> 00:22:03,840
international space station and we're

368
00:22:07,750 --> 00:22:06,240
using that as an as a way to prove out a

369
00:22:10,390 --> 00:22:07,760
lot of the capabilities and automation

370
00:22:12,230 --> 00:22:10,400
that we need to demonstrate for eventual

371
00:22:14,070 --> 00:22:12,240
operation of that system in deep space

372
00:22:15,909 --> 00:22:14,080
exploration missions

373
00:22:17,430 --> 00:22:15,919
in this episode of station life we

374
00:22:19,669 --> 00:22:17,440
learned how the international space

375
00:22:21,990 --> 00:22:19,679
station is being used as a test bed for

376
00:22:24,630 --> 00:22:22,000
new exploration technologies so we can

377
00:22:26,470 --> 00:22:24,640
go beyond low earth orbit we're refining

378
00:22:28,149 --> 00:22:26,480
how to grow food in space

379
00:22:30,070 --> 00:22:28,159
we're learning more about the effects of

380
00:22:31,830 --> 00:22:30,080
long-duration space flight with the

381
00:22:34,549 --> 00:22:31,840
current one-year mission in astronaut

382
00:22:37,029 --> 00:22:34,559
scott kelly we're testing laser

383
00:22:39,350 --> 00:22:37,039
communication systems and understanding

384
00:22:41,990 --> 00:22:39,360
what's required in keeping our life

385
00:22:43,830 --> 00:22:42,000
support systems functioning reliably you

386
00:22:46,230 --> 00:22:43,840
better believe that the technologies

387
00:22:49,029 --> 00:22:46,240
developed for space exploration often

388
00:22:51,270 --> 00:22:49,039

find applications right here on earth

389
00:22:52,789 --> 00:22:51,280
nasa spinoffs provide solutions for

390
00:22:55,350 --> 00:22:52,799
challenges in the fields of health and

391
00:22:58,070 --> 00:22:55,360
medicine industrial production

392
00:23:00,789 --> 00:22:58,080
communications transportation consumer

393
00:23:08,789 --> 00:23:00,799
goods public safety and much much more

394
00:23:08,799 --> 00:23:14,310
imagine doctors giving an ultrasound

395
00:23:20,630 --> 00:23:16,549
to patients hundreds of miles away

396
00:23:26,149 --> 00:23:23,430
imagine tiny life-saving heart pumps

397
00:23:29,270 --> 00:23:26,159
created with rocket engine technology

398
00:23:32,149 --> 00:23:29,280
imagine robot-assisted surgery

399
00:23:34,789 --> 00:23:32,159
nasa did while creating the advanced

400
00:23:37,590 --> 00:23:34,799
technologies needed for space missions

401
00:23:39,590 --> 00:23:37,600
nasa has developed medical innovations

402
00:23:40,950 --> 00:23:39,600
that can be applied to life right here

403
00:23:43,830 --> 00:23:40,960
on earth

404
00:23:45,990 --> 00:23:43,840
these technologies give first responders

405
00:23:48,149 --> 00:23:46,000
fast and reliable medical tools that

406
00:23:50,390 --> 00:23:48,159
help save lives they also enhance

407
00:23:52,710 --> 00:23:50,400
preventive care

408
00:23:54,630 --> 00:23:52,720
the thermometer pills originally made

409
00:23:56,789 --> 00:23:54,640
for astronauts which are now used to

410
00:23:59,269 --> 00:23:56,799
make sure athletes firefighters and

411
00:24:01,830 --> 00:23:59,279
soldiers don't overheat in the field

412
00:24:04,149 --> 00:24:01,840
nasa's innovations have even resulted in

413
00:24:06,710 --> 00:24:04,159

nutrition plans that help people stay

414
00:24:08,789 --> 00:24:06,720
healthy and lose weight

415
00:24:09,990 --> 00:24:08,799
spin-offs like these are just a few

416
00:24:12,390 --> 00:24:10,000
examples

417
00:24:13,909 --> 00:24:12,400
of how nasa technology turns science

418
00:24:16,310 --> 00:24:13,919
fiction

419
00:24:18,789 --> 00:24:16,320
into science fact

420
00:24:24,230 --> 00:24:18,799
there's more space in your life

421
00:24:29,029 --> 00:24:26,870
thanks captain as you can see we're well

422
00:24:30,470 --> 00:24:29,039
on our way to going where no human has

423
00:24:32,470 --> 00:24:30,480
gone before

424
00:24:34,310 --> 00:24:32,480
be sure to stay in touch and follow us

425
00:24:36,230 --> 00:24:34,320
on facebook and twitter for the latest

426
00:24:38,149 --> 00:24:36,240
research news and don't forget to

427
00:24:40,789 --> 00:24:38,159
download our kick and app on your mobile

428
00:24:42,870 --> 00:24:40,799
device until next time we're working off

429
00:24:44,310 --> 00:24:42,880
the earth for the earth

430
00:24:46,789 --> 00:24:44,320
to infinity

431
00:24:47,990 --> 00:24:46,799
and beyond