



SCIENCE LIVE

# MOON TO MARS ICE & PROSPECTING CHALLENGE



1  
00:00:35,210 --> 00:00:43,030

[Music]

2  
00:00:43,040 --> 00:00:46,700

oh

3  
00:00:51,750 --> 00:00:49,720

[Music]

4  
00:01:09,270 --> 00:00:51,760

[Applause]

5  
00:01:13,910 --> 00:01:11,590

hey everybody and welcome to nasa

6  
00:01:16,550 --> 00:01:13,920

science live i'm molly mckinney one of

7  
00:01:18,550 --> 00:01:16,560

your co-hosts for today as we join you

8  
00:01:21,270 --> 00:01:18,560

from the hampton roads convention center

9  
00:01:23,749 --> 00:01:21,280

right here in hampton virginia and cover

10  
00:01:25,910 --> 00:01:23,759

day one of the 2021

11  
00:01:27,749 --> 00:01:25,920

moon to mars ice and prospecting

12  
00:01:29,190 --> 00:01:27,759

challenge brought to you by nasa what's

13  
00:01:30,630 --> 00:01:29,200

going on behind me why don't you all

14

00:01:32,469 --> 00:01:30,640

take a look

15

00:01:33,910 --> 00:01:32,479

students have gathered from 10 different

16

00:01:35,749 --> 00:01:33,920

universities

17

00:01:38,469 --> 00:01:35,759

across the country to test their

18

00:01:41,190 --> 00:01:38,479

original technologies to solve a lunar

19

00:01:44,069 --> 00:01:41,200

and martian exploration dilemma which is

20

00:01:46,310 --> 00:01:44,079

how to access subsurface ice and then

21

00:01:48,149 --> 00:01:46,320

melt that ice into water

22

00:01:50,069 --> 00:01:48,159

why is this important to nasa

23

00:01:52,310 --> 00:01:50,079

well as we look forward to the artemis

24

00:01:54,710 --> 00:01:52,320

program to the moon and even one day

25

00:01:57,109 --> 00:01:54,720

crude missions to mars being able to

26

00:01:59,109 --> 00:01:57,119

access resources like water will be

27

00:02:01,510 --> 00:01:59,119

crucial for humans to survive on other

28

00:02:03,590 --> 00:02:01,520

worlds so teams have been tasked with

29

00:02:06,950 --> 00:02:03,600

designing an ice and water harvesting

30

00:02:09,109 --> 00:02:06,960

system for use on the moon or mars not

31

00:02:11,430 --> 00:02:09,119

an easy task and today they're testing

32

00:02:13,830 --> 00:02:11,440

their systems out in a head-to-head

33

00:02:15,589 --> 00:02:13,840

competition now we are in person this

34

00:02:17,670 --> 00:02:15,599

year who jumped through quite a few

35

00:02:19,830 --> 00:02:17,680

hurdles to make that happen and we are

36

00:02:21,670 --> 00:02:19,840

following very strict covid protocols to

37

00:02:23,990 --> 00:02:21,680

make that possible including everyone on

38

00:02:25,990 --> 00:02:24,000

the floor wearing face masks we are all

39

00:02:28,630 --> 00:02:26,000

fully vaccinated or we've had proof of a

40

00:02:30,070 --> 00:02:28,640

negative covid test in hand

41

00:02:31,350 --> 00:02:30,080

now if you have any questions throughout

42

00:02:33,430 --> 00:02:31,360

the show today

43

00:02:35,910 --> 00:02:33,440

you can send them in using the hashtag

44

00:02:37,990 --> 00:02:35,920

asknasa or you can leave a question in

45

00:02:38,869 --> 00:02:38,000

the comment box wherever you're watching

46

00:02:40,710 --> 00:02:38,879

from

47

00:02:42,550 --> 00:02:40,720

and we'll try our best to get those

48

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

answered for you today it is a live show

49

00:02:45,190 --> 00:02:44,000

that's one of the many perks of it being

50

00:02:46,630 --> 00:02:45,200

live

51

00:02:48,309 --> 00:02:46,640

well i'm sure you can hear the

52

00:02:49,910 --> 00:02:48,319

excitement in this room

53

00:02:52,070 --> 00:02:49,920

this is a real live show so there's

54

00:02:53,350 --> 00:02:52,080

drills happening as we talk but before

55

00:02:54,470 --> 00:02:53,360

we get into the competition why don't

56

00:02:56,550 --> 00:02:54,480

you step over here and i'm going to

57

00:02:58,869 --> 00:02:56,560

explain a little bit more of the process

58

00:03:00,869 --> 00:02:58,879

so you can understand how the muno mars

59

00:03:03,110 --> 00:03:00,879

ice and prospecting challenge works so

60

00:03:05,750 --> 00:03:03,120

you'll see these blue bins at each one

61

00:03:08,390 --> 00:03:05,760

of the team stations and situated at the

62

00:03:10,790 --> 00:03:08,400

very bottom of these bins is a block of

63

00:03:12,630 --> 00:03:10,800

water ice now the objective of this

64

00:03:14,070 --> 00:03:12,640

challenge is for teams to get their

65

00:03:16,070 --> 00:03:14,080

drilling apparatus or their drilling

66

00:03:17,750 --> 00:03:16,080

system all the way down to that wider

67

00:03:19,750 --> 00:03:17,760

ice and they're supposed to extract

68

00:03:21,110 --> 00:03:19,760

water from the ice that's where these

69

00:03:23,509 --> 00:03:21,120

buckets come into play you'll actually

70

00:03:25,110 --> 00:03:23,519

see water funneling into them

71

00:03:27,830 --> 00:03:25,120

what's tricky about this challenge if

72

00:03:29,910 --> 00:03:27,840

that's not hard enough which that's hard

73

00:03:31,670 --> 00:03:29,920

is hidden underneath

74

00:03:33,350 --> 00:03:31,680

is this word called regolic you'll hear

75

00:03:35,670 --> 00:03:33,360

it getting tossed around quite a bit

76  
00:03:38,229 --> 00:03:35,680  
today and it's actually simulated lunar

77  
00:03:40,070 --> 00:03:38,239  
or martian terrain because let's face it

78  
00:03:41,509 --> 00:03:40,080  
on the moon and on mars we may not know

79  
00:03:43,990 --> 00:03:41,519  
what the soil is like underneath the

80  
00:03:46,630 --> 00:03:44,000  
surface so teams have to be able to as

81  
00:03:48,390 --> 00:03:46,640  
they're drilling down collect data to

82  
00:03:49,990 --> 00:03:48,400  
put together a digital core so if you

83  
00:03:51,750 --> 00:03:50,000  
think of a core sample when you pull it

84  
00:03:53,750 --> 00:03:51,760  
out of earth you see all these different

85  
00:03:55,190 --> 00:03:53,760  
layers of soil so teams have to

86  
00:03:57,670 --> 00:03:55,200  
digitally gather

87  
00:03:59,830 --> 00:03:57,680  
how many layers they are how thick the

88  
00:04:01,429 --> 00:03:59,840

layers are and how hard they are some

89

00:04:03,990 --> 00:04:01,439

layers may be really soft some may be

90

00:04:05,589 --> 00:04:04,000

hard more like a cement consistency so

91

00:04:07,750 --> 00:04:05,599

it's a really difficult challenge for

92

00:04:10,789 --> 00:04:07,760

these teams not to mention keeping in

93

00:04:12,390 --> 00:04:10,799

mind weight specifications and uh you

94

00:04:15,190 --> 00:04:12,400

know different dimensions that they have

95

00:04:16,310 --> 00:04:15,200

to focus on so someone who can tell us a

96

00:04:18,789 --> 00:04:16,320

little bit more about why this

97

00:04:20,469 --> 00:04:18,799

technology is important into space is

98

00:04:22,230 --> 00:04:20,479

the special guest that my co-host

99

00:04:23,749 --> 00:04:22,240

natalie joseph has over the

100

00:04:25,270 --> 00:04:23,759

correspondence desk so natalie let's

101  
00:04:27,510 --> 00:04:25,280  
take it over to you

102  
00:04:29,670 --> 00:04:27,520  
thanks molly hi everyone i'm natalie

103  
00:04:32,150 --> 00:04:29,680  
joseph your co-host for today's moon to

104  
00:04:33,909 --> 00:04:32,160  
mars ice ice and prospecting challenge

105  
00:04:35,749 --> 00:04:33,919  
coming to you live from the hampton

106  
00:04:38,070 --> 00:04:35,759  
roads convention center

107  
00:04:40,710 --> 00:04:38,080  
and let me tell you you can just feel

108  
00:04:42,870 --> 00:04:40,720  
the excitement in the air as teams work

109  
00:04:45,270 --> 00:04:42,880  
diligently to extract water from these

110  
00:04:47,749 --> 00:04:45,280  
bins i'm so excited because i'm joined

111  
00:04:50,390 --> 00:04:47,759  
by alejandro pensado

112  
00:04:51,909 --> 00:04:50,400  
an aerospace engineer at nasa langley

113  
00:04:53,670 --> 00:04:51,919

research center thank you so much for

114

00:04:56,629 --> 00:04:53,680

joining us today alejandro oh thank you

115

00:04:59,030 --> 00:04:56,639

for having me yes so i understand that

116

00:05:00,629 --> 00:04:59,040

nasa is returning to the moon can you

117

00:05:03,350 --> 00:05:00,639

tell me more about this exciting

118

00:05:05,430 --> 00:05:03,360

endeavor yes of course this uh this is

119

00:05:08,150 --> 00:05:05,440

all part of the artemis program

120

00:05:10,550 --> 00:05:08,160

um we're returning to the moon after

121

00:05:13,110 --> 00:05:10,560

50 years of robotic exploration

122

00:05:14,230 --> 00:05:13,120

uh this time with a sustained presence

123

00:05:16,070 --> 00:05:14,240

there we're partnering up with

124

00:05:18,790 --> 00:05:16,080

industries in ways we haven't done

125

00:05:20,790 --> 00:05:18,800

before and um ultimately

126

00:05:23,430 --> 00:05:20,800

setting a precedent to uh

127

00:05:26,310 --> 00:05:23,440

keep expanding human exploration that is

128

00:05:28,790 --> 00:05:26,320

so exciting so how does the moon to mars

129

00:05:30,870 --> 00:05:28,800

ice and prospecting challenge help us

130

00:05:31,830 --> 00:05:30,880

achieve this goal of returning to the

131

00:05:33,909 --> 00:05:31,840

moon

132

00:05:35,189 --> 00:05:33,919

so we are going to the south pole

133

00:05:36,390 --> 00:05:35,199

somewhere where humans haven't been

134

00:05:38,390 --> 00:05:36,400

there before

135

00:05:40,390 --> 00:05:38,400

and so for example one of the challenges

136

00:05:43,029 --> 00:05:40,400

is we don't really know what the surface

137

00:05:44,550 --> 00:05:43,039

and subservice are made of

138

00:05:47,110 --> 00:05:44,560

so one of the challenges that they're

139

00:05:49,189 --> 00:05:47,120

facing here is being able to demonstrate

140

00:05:51,590 --> 00:05:49,199

the capability of creating a

141

00:05:53,430 --> 00:05:51,600

digital core to identify the layers as

142

00:05:55,270 --> 00:05:53,440

they drill into them and that's going to

143

00:05:56,230 --> 00:05:55,280

be a very useful capability that we'll

144

00:05:57,430 --> 00:05:56,240

need to

145

00:05:59,029 --> 00:05:57,440

use to

146

00:06:01,430 --> 00:05:59,039

explore the moon

147

00:06:04,309 --> 00:06:01,440

and why is nasa interested in harvesting

148

00:06:06,469 --> 00:06:04,319

water on the moon and mars

149

00:06:09,110 --> 00:06:06,479

being able to harvest water on the

150

00:06:11,430 --> 00:06:09,120

on the moon and mars it goes a long way

151  
00:06:13,909 --> 00:06:11,440  
for human exploration

152  
00:06:16,150 --> 00:06:13,919  
there are multiple ways you can use it

153  
00:06:19,189 --> 00:06:16,160  
it can support the day-to-day operations

154  
00:06:22,710 --> 00:06:19,199  
of humans in those locations and you

155  
00:06:25,110 --> 00:06:22,720  
could use it to as uh fuel propellant so

156  
00:06:27,510 --> 00:06:25,120  
ultimately having a sustainable presence

157  
00:06:28,790 --> 00:06:27,520  
in these locations uh water is going to

158  
00:06:31,110 --> 00:06:28,800  
be essential

159  
00:06:33,670 --> 00:06:31,120  
and we keep mentioning water so what do

160  
00:06:36,070 --> 00:06:33,680  
we know so far about water on the moon

161  
00:06:37,990 --> 00:06:36,080  
and on mars

162  
00:06:40,629 --> 00:06:38,000  
so for both

163  
00:06:43,029 --> 00:06:40,639

moon and mars we've been studying

164

00:06:44,870 --> 00:06:43,039

what is there for quite some time now

165

00:06:47,590 --> 00:06:44,880

for the moon there's been orbital

166

00:06:50,150 --> 00:06:47,600

nations that have identified water on

167

00:06:53,510 --> 00:06:50,160

the moon and more recently with a elk

168

00:06:55,670 --> 00:06:53,520

and I cross impact mission identified

169

00:06:56,870 --> 00:06:55,680

that there's water on the permanently

170

00:06:58,870 --> 00:06:56,880

shadowed

171

00:07:01,270 --> 00:06:58,880

regions of the moon

172

00:07:04,150 --> 00:07:01,280

similarly for mars there's a orbital

173

00:07:05,990 --> 00:07:04,160

nations that are identified water and

174

00:07:07,670 --> 00:07:06,000

since the phoenix lander we've been

175

00:07:08,870 --> 00:07:07,680

learning more and more about the water

176  
00:07:10,629 --> 00:07:08,880  
on mars

177  
00:07:13,029 --> 00:07:10,639  
recent discoveries have shown that there

178  
00:07:14,870 --> 00:07:13,039  
might be large ice deposits beneath the

179  
00:07:18,230 --> 00:07:14,880  
surface which makes this competition

180  
00:07:19,830 --> 00:07:18,240  
very important i bet and tell me a

181  
00:07:22,870 --> 00:07:19,840  
little bit more about this thing called

182  
00:07:26,309 --> 00:07:22,880  
in-situ resource utilization

183  
00:07:29,430 --> 00:07:26,319  
what is it and why is it so important

184  
00:07:31,830 --> 00:07:29,440  
so in-situ resource utilization or icru

185  
00:07:34,550 --> 00:07:31,840  
is essentially looking at uh being able

186  
00:07:36,230 --> 00:07:34,560  
to use resources on site

187  
00:07:39,270 --> 00:07:36,240  
uh so you can imagine that as we're

188  
00:07:40,870 --> 00:07:39,280

gonna be doing these more ambitious uh

189

00:07:42,230 --> 00:07:40,880

missions we're gonna be needing more and

190

00:07:44,230 --> 00:07:42,240

more of everything propellant

191

00:07:45,670 --> 00:07:44,240

consumables

192

00:07:47,270 --> 00:07:45,680

and this is going to be more of a

193

00:07:49,029 --> 00:07:47,280

challenge in terms of if you have to

194

00:07:50,869 --> 00:07:49,039

bring everything from earth so then the

195

00:07:52,390 --> 00:07:50,879

question stems can we use things that

196

00:07:54,869 --> 00:07:52,400

are on the moon and mars

197

00:07:56,790 --> 00:07:54,879

and water being one of the crucial items

198

00:08:00,070 --> 00:07:56,800

that if you could use it then you could

199

00:08:01,430 --> 00:08:00,080

be helping how things go in terms of the

200

00:08:04,390 --> 00:08:01,440

operations and

201  
00:08:05,430 --> 00:08:04,400  
potentially uh for refueling so you can

202  
00:08:07,189 --> 00:08:05,440  
imagine

203  
00:08:08,950 --> 00:08:07,199  
you're lessening the

204  
00:08:11,110 --> 00:08:08,960  
challenges of having to take everything

205  
00:08:12,550 --> 00:08:11,120  
there and similarly maybe you can start

206  
00:08:15,270 --> 00:08:12,560  
making some just

207  
00:08:17,189 --> 00:08:15,280  
design changes based off of you can use

208  
00:08:18,950 --> 00:08:17,199  
things that are already there so iso

209  
00:08:20,629 --> 00:08:18,960  
ultimately gives us a lot of flexibility

210  
00:08:22,869 --> 00:08:20,639  
and how we can design these for future

211  
00:08:24,629 --> 00:08:22,879  
missions yeah thank you and something

212  
00:08:26,309 --> 00:08:24,639  
that i think alejandro is super cool

213  
00:08:28,790 --> 00:08:26,319

about this challenge is it's all about

214

00:08:30,710 --> 00:08:28,800

students and getting their ideas so how

215

00:08:32,550 --> 00:08:30,720

can students how why is it important

216

00:08:34,550 --> 00:08:32,560

that we engage with them and how might

217

00:08:35,670 --> 00:08:34,560

we use these students ideas in the

218

00:08:37,990 --> 00:08:35,680

future

219

00:08:39,589 --> 00:08:38,000

so um it's

220

00:08:41,110 --> 00:08:39,599

going to the moon and mars is going to

221

00:08:42,790 --> 00:08:41,120

be a challenge that we're not going to

222

00:08:45,190 --> 00:08:42,800

solve today or tomorrow

223

00:08:47,350 --> 00:08:45,200

and in this long endeavor it's important

224

00:08:50,710 --> 00:08:47,360

to engage with the students early on

225

00:08:52,550 --> 00:08:50,720

because ultimately having them uh

226

00:08:54,949 --> 00:08:52,560

aware what these challenges are getting

227

00:08:56,470 --> 00:08:54,959

their ideas on these things

228

00:08:57,829 --> 00:08:56,480

will be critical as they will be the

229

00:09:00,150 --> 00:08:57,839

ones that kind of answer these

230

00:09:01,590 --> 00:09:00,160

challenges down the line yeah and i've

231

00:09:03,350 --> 00:09:01,600

got a chance to kind of look around and

232

00:09:05,509 --> 00:09:03,360

i see all this these really cool

233

00:09:07,030 --> 00:09:05,519

drilling systems and people are already

234

00:09:09,269 --> 00:09:07,040

getting some water and it's super

235

00:09:11,430 --> 00:09:09,279

exciting have you had a chance to walk

236

00:09:13,990 --> 00:09:11,440

around and take a look at the designs is

237

00:09:15,990 --> 00:09:14,000

there anything that stands out to you

238

00:09:17,590 --> 00:09:16,000

yeah it's very exciting to see the

239

00:09:20,150 --> 00:09:17,600

designs in action

240

00:09:22,550 --> 00:09:20,160

um it's it's very interesting to see how

241

00:09:24,710 --> 00:09:22,560

they've been refining and working off of

242

00:09:26,310 --> 00:09:24,720

ideas from previous years you can see

243

00:09:27,750 --> 00:09:26,320

that they uh all have their kind of

244

00:09:29,509 --> 00:09:27,760

unique uh

245

00:09:31,670 --> 00:09:29,519

design choices on how they did like the

246

00:09:33,350 --> 00:09:31,680

structural systems and so forth and then

247

00:09:35,110 --> 00:09:33,360

they're still doing some interesting

248

00:09:36,870 --> 00:09:35,120

trait studies where you how do you

249

00:09:38,710 --> 00:09:36,880

extract the water in terms of liquid

250

00:09:40,550 --> 00:09:38,720

form or vapor so all they're getting a

251

00:09:42,389 --> 00:09:40,560

chance to test all these ideas and i'm

252

00:09:44,630 --> 00:09:42,399

excited to see how they come out

253

00:09:46,389 --> 00:09:44,640

well thank you alejandro um we actually

254

00:09:48,790 --> 00:09:46,399

have some questions coming in from our

255

00:09:51,590 --> 00:09:48,800

hashtag ask nasa and you can submit your

256

00:09:55,110 --> 00:09:51,600

questions just use that hashtag ask nasa

257

00:09:58,070 --> 00:09:55,120

so alejandro emily on youtube asks are

258

00:10:00,710 --> 00:09:58,080

there any future plans to launch to mars

259

00:10:04,389 --> 00:10:00,720

from the moon since the moon's gravity

260

00:10:06,389 --> 00:10:04,399

well is much smaller than the earth so

261

00:10:07,910 --> 00:10:06,399

that is a part of a

262

00:10:09,670 --> 00:10:07,920

trade study that

263

00:10:12,550 --> 00:10:09,680

is being conducted

264

00:10:14,949 --> 00:10:12,560

obviously there are benefits into using

265

00:10:16,710 --> 00:10:14,959

a lower gravity well as a launching

266

00:10:18,790 --> 00:10:16,720

point

267

00:10:20,550 --> 00:10:18,800

but there's so many uh pieces along that

268

00:10:22,710 --> 00:10:20,560

way that we're still trying to figure

269

00:10:24,710 --> 00:10:22,720

out the benefits and

270

00:10:26,630 --> 00:10:24,720

how we can go about that

271

00:10:29,030 --> 00:10:26,640

and brittany on twitter asked this

272

00:10:31,590 --> 00:10:29,040

question i love this question brittany

273

00:10:34,310 --> 00:10:31,600

is it really safe to drink martian or

274

00:10:36,949 --> 00:10:34,320

lunar water

275

00:10:39,269 --> 00:10:36,959

so the the

276

00:10:41,030 --> 00:10:39,279

the answer is carefully this is going to

277

00:10:42,790 --> 00:10:41,040

require

278

00:10:45,110 --> 00:10:42,800

pushing the technology to make sure that

279

00:10:47,829 --> 00:10:45,120

we can process it there will need to be

280

00:10:49,190 --> 00:10:47,839

a filtration system um so i will go with

281

00:10:50,949 --> 00:10:49,200

them maybe

282

00:10:53,509 --> 00:10:50,959

maybe okay

283

00:10:56,069 --> 00:10:53,519

we'll see so we have one more our final

284

00:10:58,550 --> 00:10:56,079

ask nasa question for you alejandro and

285

00:11:00,870 --> 00:10:58,560

scott on youtube wants to know more

286

00:11:03,350 --> 00:11:00,880

about the new viper mission that will

287

00:11:05,430 --> 00:11:03,360

scout for water on the moon and actually

288

00:11:07,430 --> 00:11:05,440

scott we just selected the landing site

289

00:11:09,590 --> 00:11:07,440

for the viper rover on monday so that's

290

00:11:11,910 --> 00:11:09,600

a great question i love this so

291

00:11:14,230 --> 00:11:11,920

alejandro can you tell me more about

292

00:11:16,949 --> 00:11:14,240

that and how the viper rover ties into

293

00:11:18,630 --> 00:11:16,959

this competition today of course um so

294

00:11:21,269 --> 00:11:18,640

yes the landing site was recently

295

00:11:23,829 --> 00:11:21,279

selected uh it was selected for the

296

00:11:25,829 --> 00:11:23,839

nobile region near the south pole so one

297

00:11:28,470 --> 00:11:25,839

of the challenges is we know there is

298

00:11:30,310 --> 00:11:28,480

water there but we don't know exactly

299

00:11:33,269 --> 00:11:30,320

what concentration and distribution is

300

00:11:35,110 --> 00:11:33,279

there so viper is going to answer those

301  
00:11:37,829 --> 00:11:35,120  
very questions and give us a better idea

302  
00:11:39,430 --> 00:11:37,839  
of kind of a resource mapping and based

303  
00:11:41,430 --> 00:11:39,440  
off that it will give us a better idea

304  
00:11:42,710 --> 00:11:41,440  
of how we can extract the

305  
00:11:45,670 --> 00:11:42,720  
water from

306  
00:11:47,190 --> 00:11:45,680  
um those areas which is in turn uh going

307  
00:11:49,910 --> 00:11:47,200  
to guide us and how we can develop these

308  
00:11:52,069 --> 00:11:49,920  
icu technologies that you see today

309  
00:11:53,990 --> 00:11:52,079  
great that's so exciting i am really

310  
00:11:56,310 --> 00:11:54,000  
really excited about all these missions

311  
00:11:57,990 --> 00:11:56,320  
we have going on at nasa so alejandro

312  
00:11:59,590 --> 00:11:58,000  
thank you so much for joining us today

313  
00:12:01,750 --> 00:11:59,600

of course thank you for having me

314

00:12:05,030 --> 00:12:01,760

now molly has some exciting things to

315

00:12:06,949 --> 00:12:05,040

show you all out in the pit but first

316

00:12:09,990 --> 00:12:06,959

let's learn a little bit more about

317

00:12:11,910 --> 00:12:10,000

nasa's upcoming viper rover

318

00:12:15,190 --> 00:12:11,920

we know from decades of study that the

319

00:12:18,150 --> 00:12:15,200

moon has water but where and how much

320

00:12:21,030 --> 00:12:18,160

in 2023 a robotic rover will explore the

321

00:12:23,269 --> 00:12:21,040

moon's surface in search of water ice

322

00:12:25,190 --> 00:12:23,279

nasa's viper moon rover will perform the

323

00:12:27,670 --> 00:12:25,200

first resource mapping mission on

324

00:12:29,829 --> 00:12:27,680

another world using advanced instruments

325

00:12:32,230 --> 00:12:29,839

and tools to determine the location and

326

00:12:34,470 --> 00:12:32,240

concentration of water on the moon

327

00:12:36,629 --> 00:12:34,480

to send viper to the moon we're

328

00:12:38,790 --> 00:12:36,639

leveraging industry as part of our

329

00:12:41,190 --> 00:12:38,800

commercial lunar payload services

330

00:12:43,110 --> 00:12:41,200

program a program designed to send

331

00:12:45,110 --> 00:12:43,120

science instruments and technology

332

00:12:47,110 --> 00:12:45,120

payloads to the surface of the moon

333

00:12:49,430 --> 00:12:47,120

wiper represents a very different

334

00:12:52,389 --> 00:12:49,440

development paradigm we are developing

335

00:12:54,790 --> 00:12:52,399

each instrument for launch on eclipse

336

00:12:56,790 --> 00:12:54,800

ahead of wiper totally flipping on its

337

00:12:59,509 --> 00:12:56,800

head how we normally do this this is

338

00:13:01,990 --> 00:12:59,519

truly creative an industry partner will

339

00:13:05,110 --> 00:13:02,000

launch viper to the moon's south pole

340

00:13:07,430 --> 00:13:05,120

this is a place where no human or rover

341

00:13:09,110 --> 00:13:07,440

has ever been before

342

00:13:11,110 --> 00:13:09,120

the rover's survey will provide

343

00:13:13,670 --> 00:13:11,120

scientists with the most detailed view

344

00:13:16,069 --> 00:13:13,680

of the moon's water to date and point to

345

00:13:18,389 --> 00:13:16,079

spots where water could be harvested by

346

00:13:20,629 --> 00:13:18,399

future astronauts

347

00:13:22,230 --> 00:13:20,639

viper will be the first resource mapping

348

00:13:25,430 --> 00:13:22,240

mission on the surface of another

349

00:13:27,190 --> 00:13:25,440

celestial body it represents a new kind

350

00:13:29,430 --> 00:13:27,200

of mission for nasa in which the

351

00:13:32,629 --> 00:13:29,440

objectives of advancing science and

352

00:13:34,150 --> 00:13:32,639

human exploration are closer than ever

353

00:13:36,069 --> 00:13:34,160

the measurements that viper's

354

00:13:38,710 --> 00:13:36,079

instruments will make can help us

355

00:13:40,790 --> 00:13:38,720

understand the source and distribution

356

00:13:42,710 --> 00:13:40,800

of the water and other volatiles on the

357

00:13:44,949 --> 00:13:42,720

moon giving us insight into the

358

00:13:47,430 --> 00:13:44,959

evolution of the moon and the earth moon

359

00:13:48,949 --> 00:13:47,440

system the moon's water is also a

360

00:13:51,189 --> 00:13:48,959

precious resource that could be

361

00:13:53,110 --> 00:13:51,199

extracted to support human exploration

362

00:13:55,430 --> 00:13:53,120

of the moon and beyond

363

00:13:58,550 --> 00:13:55,440

what we learn from viper will bring us a

364

00:14:07,910 --> 00:13:58,560

step closer to developing a sustainable

365

00:14:11,990 --> 00:14:10,230

go team viper we are proud of you all

366

00:14:13,750 --> 00:14:12,000

looking forward to it for those of you

367

00:14:16,230 --> 00:14:13,760

just joining us we are coming to you

368

00:14:18,710 --> 00:14:16,240

live for nasa's coverage of the 2021

369

00:14:20,870 --> 00:14:18,720

moon to mars ice and prospecting

370

00:14:23,030 --> 00:14:20,880

challenge now as you look around the pit

371

00:14:25,350 --> 00:14:23,040

area today you'll notice that each of

372

00:14:27,110 --> 00:14:25,360

these teams have a different design

373

00:14:29,509 --> 00:14:27,120

that's really unique to that team and to

374

00:14:31,750 --> 00:14:29,519

that university each team brings a

375

00:14:33,910 --> 00:14:31,760

different idea to the table and that

376

00:14:35,829 --> 00:14:33,920

diversity of ideas that we get from

377

00:14:37,829 --> 00:14:35,839

including students in a competition like

378

00:14:39,990 --> 00:14:37,839

this really helps us expand our

379

00:14:42,550 --> 00:14:40,000

collective understanding not just for

380

00:14:44,310 --> 00:14:42,560

nasa but really as a as a global science

381

00:14:45,670 --> 00:14:44,320

community

382

00:14:47,670 --> 00:14:45,680

now this is the fifth year of this

383

00:14:49,509 --> 00:14:47,680

competition and every year we really

384

00:14:51,509 --> 00:14:49,519

learned something new what worked what

385

00:14:53,750 --> 00:14:51,519

didn't work and this collective

386

00:14:55,910 --> 00:14:53,760

knowledge from student-led ideas can

387

00:14:57,590 --> 00:14:55,920

really pave the way for future crude

388

00:14:59,350 --> 00:14:57,600

missions to places like mars and the

389

00:15:00,870 --> 00:14:59,360

moon

390

00:15:02,790 --> 00:15:00,880

today is day one of this year's

391

00:15:05,189 --> 00:15:02,800

competition and teams are operating

392

00:15:06,629 --> 00:15:05,199

their systems for the first time

393

00:15:08,470 --> 00:15:06,639

i was talking to a couple of the teams

394

00:15:10,629 --> 00:15:08,480

yesterday and these systems had never

395

00:15:12,230 --> 00:15:10,639

traveled before so

396

00:15:14,870 --> 00:15:12,240

it's always a little nerve-wracking

397

00:15:17,030 --> 00:15:14,880

powering these on for the first time

398

00:15:18,949 --> 00:15:17,040

most of the university students today

399

00:15:21,110 --> 00:15:18,959

are using a drill to dig through the

400

00:15:22,790 --> 00:15:21,120

simulated lunar and martian soil to get

401  
00:15:24,870 --> 00:15:22,800  
to the ice below it

402  
00:15:26,710 --> 00:15:24,880  
and along the way to the ice teams have

403  
00:15:28,949 --> 00:15:26,720  
to collect data about the layers they're

404  
00:15:31,670 --> 00:15:28,959  
drilling through how many layers there

405  
00:15:33,829 --> 00:15:31,680  
are how thick they are how dense they

406  
00:15:35,749 --> 00:15:33,839  
are and they'll use this information to

407  
00:15:38,550 --> 00:15:35,759  
create a digital core that they'll be

408  
00:15:40,710 --> 00:15:38,560  
judged on at the end of the competition

409  
00:15:42,710 --> 00:15:40,720  
and then to extract the water below

410  
00:15:44,629 --> 00:15:42,720  
teams have converged upon a strategy of

411  
00:15:46,629 --> 00:15:44,639  
melting a pool of ice underneath the

412  
00:15:49,110 --> 00:15:46,639  
surface and pumping it out

413  
00:16:05,509 --> 00:15:49,120

rather than trying to extract the ice

414

00:16:08,629 --> 00:16:06,790

so now that you all understand a little

415

00:16:09,910 --> 00:16:08,639

bit about the competition let's go talk

416

00:16:12,230 --> 00:16:09,920

to some of the teams out here on the

417

00:16:14,470 --> 00:16:12,240

floor our first one up here is from

418

00:16:15,670 --> 00:16:14,480

stevens institute of technology and you

419

00:16:17,350 --> 00:16:15,680

made it easy for me i don't even need

420

00:16:19,910 --> 00:16:17,360

the cue card for this one

421

00:16:21,350 --> 00:16:19,920

steven nice to meet you nice to meet you

422

00:16:23,110 --> 00:16:21,360

so tell me a little bit about your

423

00:16:24,870 --> 00:16:23,120

design and if you modeled it after

424

00:16:27,189 --> 00:16:24,880

anything sure so that is the

425

00:16:29,110 --> 00:16:27,199

extractinator very much like a 3d

426

00:16:31,350 --> 00:16:29,120

printer we're able to translate our

427

00:16:33,350 --> 00:16:31,360

drone extractor back and forth forward

428

00:16:35,670 --> 00:16:33,360

and back and up and down using stepper

429

00:16:37,990 --> 00:16:35,680

motors our drill is a commercial off the

430

00:16:39,910 --> 00:16:38,000

shelf rotary percussion drill which has

431

00:16:40,870 --> 00:16:39,920

a half meter long drill bit

432

00:16:43,189 --> 00:16:40,880

while we're drawing through the

433

00:16:45,749 --> 00:16:43,199

overburden layers we use system

434

00:16:47,749 --> 00:16:45,759

telemetry to map out our digital core so

435

00:16:48,790 --> 00:16:47,759

we're measuring things such as weight on

436

00:16:52,550 --> 00:16:48,800

bit

437

00:16:54,710 --> 00:16:52,560

feed speed rpm current voltage all that

438

00:16:55,990 --> 00:16:54,720

and that goes into our msc calculations

439

00:16:58,230 --> 00:16:56,000

and we can calculate the hardness of

440

00:17:00,310 --> 00:16:58,240

each of the layers after we're done

441

00:17:02,629 --> 00:17:00,320

creating our digital core we retract the

442

00:17:05,350 --> 00:17:02,639

drill move the extractor over and lower

443

00:17:07,590 --> 00:17:05,360

it down into the hole we use a 750 watt

444

00:17:08,870 --> 00:17:07,600

cartridge heater and a peristaltic pump

445

00:17:10,789 --> 00:17:08,880

that should do it

446

00:17:13,270 --> 00:17:10,799

yeah it's pretty strong

447

00:17:15,189 --> 00:17:13,280

we create a rod well so while we're

448

00:17:17,429 --> 00:17:15,199

also extracting the water also

449

00:17:19,590 --> 00:17:17,439

simultaneously circulating the water to

450

00:17:21,110 --> 00:17:19,600

further melt the ice and then once we

451

00:17:23,110 --> 00:17:21,120

collect the water it goes through our

452

00:17:24,549 --> 00:17:23,120

sand filter and then into our collection

453

00:17:27,029 --> 00:17:24,559

container

454

00:17:29,350 --> 00:17:27,039

it sounds like you thought this through

455

00:17:30,950 --> 00:17:29,360

now your team has competed before what

456

00:17:32,150 --> 00:17:30,960

were some of the challenges you ran into

457

00:17:33,830 --> 00:17:32,160

in years past and how have you

458

00:17:36,710 --> 00:17:33,840

compensated for some of those this year

459

00:17:38,710 --> 00:17:36,720

as you compete sure so two years ago our

460

00:17:41,590 --> 00:17:38,720

team faced the issue of over melting the

461

00:17:42,950 --> 00:17:41,600

hole so as they were melting the ice

462

00:17:45,110 --> 00:17:42,960

water was leaking out the side of it and

463

00:17:48,710 --> 00:17:45,120

down the test container making get

464

00:17:51,029 --> 00:17:48,720

unretrievable so to fix that issue we

465

00:17:53,110 --> 00:17:51,039

installed an optical sensor so that

466

00:17:55,590 --> 00:17:53,120

tracks the water level of the ice of the

467

00:17:57,510 --> 00:17:55,600

water as we melt it and combining that

468

00:17:59,909 --> 00:17:57,520

with our rate of penetration into the

469

00:18:02,070 --> 00:17:59,919

ice and the time that the pump is

470

00:18:04,150 --> 00:18:02,080

running we're able to estimate a radius

471

00:18:05,669 --> 00:18:04,160

of the hole that we melt so we can also

472

00:18:07,990 --> 00:18:05,679

map out the ice

473

00:18:09,190 --> 00:18:08,000

as well as the overburden

474

00:18:11,110 --> 00:18:09,200

having addressed that how do you feel

475

00:18:12,710 --> 00:18:11,120

about your odds this year of winning

476

00:18:15,110 --> 00:18:12,720

uh we feel pretty good we have a few

477

00:18:17,110 --> 00:18:15,120

more issues to work out but once we get

478

00:18:19,190 --> 00:18:17,120

going i think we'll go strong

479

00:18:20,390 --> 00:18:19,200

cool we'll be we'll be rooting for you

480

00:18:21,750 --> 00:18:20,400

thanks so much for your time i'll let

481

00:18:23,750 --> 00:18:21,760

you get back to it thank you it's been a

482

00:18:25,669 --> 00:18:23,760

pleasure yeah let's go over here we've

483

00:18:29,110 --> 00:18:25,679

got one more team to interview arturo

484

00:18:31,110 --> 00:18:29,120

over here from uh amd correct yes ma'am

485

00:18:32,630 --> 00:18:31,120

so arturo tell me a little bit about

486

00:18:34,789 --> 00:18:32,640

your design and how long you've been

487

00:18:37,190 --> 00:18:34,799

working on it so this project we've been

488

00:18:39,029 --> 00:18:37,200

uh working over a year and it has three

489

00:18:41,350 --> 00:18:39,039

sub systems so the main attraction is

490

00:18:43,590 --> 00:18:41,360

our tensegrity structure so it consists

491

00:18:45,590 --> 00:18:43,600

of aluminum rods and uh

492

00:18:47,350 --> 00:18:45,600

high molecular weight polyethylene

493

00:18:50,230 --> 00:18:47,360

cables so it's 1/8 of the weight of a

494

00:18:52,390 --> 00:18:50,240

steel cable and 50 times the strength uh

495

00:18:54,470 --> 00:18:52,400

when compared to um

496

00:18:56,390 --> 00:18:54,480

steel cable intention so when you're

497

00:18:57,669 --> 00:18:56,400

doing a space system you really want to

498

00:18:59,750 --> 00:18:57,679

do uh lightweight lightweight

499

00:19:01,669 --> 00:18:59,760

lightweight so that was our first uh

500

00:19:03,590 --> 00:19:01,679

idea and we went with that so following

501  
00:19:05,350 --> 00:19:03,600  
light and tight yes ma'am that's right

502  
00:19:07,190 --> 00:19:05,360  
and then uh following that we have our

503  
00:19:09,830 --> 00:19:07,200  
three in one system so it's able to

504  
00:19:12,470 --> 00:19:09,840  
drill extract and heat the eyes to melt

505  
00:19:14,310 --> 00:19:12,480  
it so that uh that system was integrated

506  
00:19:15,909 --> 00:19:14,320  
all throughout and it was a great you

507  
00:19:18,390 --> 00:19:15,919  
know opportunity to do all things

508  
00:19:20,230 --> 00:19:18,400  
without moving the drill just even to go

509  
00:19:21,669 --> 00:19:20,240  
go down once and then just stay down

510  
00:19:22,950 --> 00:19:21,679  
there and do the whole process as well

511  
00:19:24,630 --> 00:19:22,960  
then lastly you have our mounting

512  
00:19:25,830 --> 00:19:24,640  
structure it's an aluminum railing

513  
00:19:27,830 --> 00:19:25,840

system low

514

00:19:29,510 --> 00:19:27,840

uh friction carts that's able to move

515

00:19:31,909 --> 00:19:29,520

the rail around in case we need to make

516

00:19:33,510 --> 00:19:31,919

another hole as well yes ma'am and of

517

00:19:35,430 --> 00:19:33,520

course you did all of this in the midst

518

00:19:37,430 --> 00:19:35,440

of a global pandemic like all the other

519

00:19:39,590 --> 00:19:37,440

teams here how did kobit pose some

520

00:19:41,669 --> 00:19:39,600

challenges for your team of course so

521

00:19:43,430 --> 00:19:41,679

the main thing was communication and

522

00:19:45,750 --> 00:19:43,440

manufacturing so communicating with our

523

00:19:47,270 --> 00:19:45,760

team was you know slower you know

524

00:19:49,350 --> 00:19:47,280

everyone's at home the machine shop was

525

00:19:51,029 --> 00:19:49,360

closed so uh the way we overcame this

526  
00:19:52,710 --> 00:19:51,039  
you know we we pulled together knowing

527  
00:19:53,990 --> 00:19:52,720  
that if you didn't do your stuff at home

528  
00:19:55,430 --> 00:19:54,000  
you know you couldn't meet at the lab or

529  
00:19:57,430 --> 00:19:55,440  
someone else could do your job so

530  
00:19:59,270 --> 00:19:57,440  
everyone came together and kind of did

531  
00:20:00,950 --> 00:19:59,280  
their part knowing that we were counting

532  
00:20:02,630 --> 00:20:00,960  
on them to do their stuff at home and

533  
00:20:04,470 --> 00:20:02,640  
you know the manufacturing

534  
00:20:06,149 --> 00:20:04,480  
machine shop was closed so we ran into a

535  
00:20:08,230 --> 00:20:06,159  
lot of issues there but you know adapt

536  
00:20:10,549 --> 00:20:08,240  
and overcome and you know make sure we

537  
00:20:12,710 --> 00:20:10,559  
we tackle the task ahead for sure how do

538  
00:20:14,230 --> 00:20:12,720

you think your team did enduring all of

539

00:20:16,149 --> 00:20:14,240

those hurdles they had to hop through to

540

00:20:18,310 --> 00:20:16,159

still make it here and be here this year

541

00:20:19,909 --> 00:20:18,320

of course i mean we we did a great job

542

00:20:21,510 --> 00:20:19,919

in my opinion you know we have a diverse

543

00:20:23,029 --> 00:20:21,520

group of engineers uh

544

00:20:24,789 --> 00:20:23,039

we have mechanical engineers patrol

545

00:20:26,310 --> 00:20:24,799

engineers aerospace engineers so

546

00:20:27,669 --> 00:20:26,320

everyone having this different

547

00:20:30,070 --> 00:20:27,679

disciplines and different backgrounds

548

00:20:31,990 --> 00:20:30,080

that gave us the edge of cover all our

549

00:20:33,909 --> 00:20:32,000

bases and have different viewpoints and

550

00:20:35,270 --> 00:20:33,919

successfully present a project here in

551  
00:20:36,789 --> 00:20:35,280  
nasa

552  
00:20:38,390 --> 00:20:36,799  
well we're really excited to have you

553  
00:20:40,230 --> 00:20:38,400  
guys here thanks for taking the time

554  
00:20:41,990 --> 00:20:40,240  
good luck

555  
00:20:43,669 --> 00:20:42,000  
i think you'll hear that common thread

556  
00:20:45,750 --> 00:20:43,679  
throughout this competition that covet

557  
00:20:47,350 --> 00:20:45,760  
19 pandemic really posed some hurdles

558  
00:20:49,190 --> 00:20:47,360  
this is a difficult challenge to begin

559  
00:20:51,190 --> 00:20:49,200  
with and then to add in you know

560  
00:20:52,630 --> 00:20:51,200  
manufacturers being closed and

561  
00:20:54,390 --> 00:20:52,640  
restricted access to different

562  
00:20:55,750 --> 00:20:54,400  
facilities a lot of the resources they

563  
00:20:57,190 --> 00:20:55,760

had planned on using for these one of

564

00:20:58,870 --> 00:20:57,200

the teams back here is using wood

565

00:21:00,470 --> 00:20:58,880

instead of aluminum they weren't

566

00:21:02,549 --> 00:21:00,480

planning to send something to space made

567

00:21:03,750 --> 00:21:02,559

of wood so we have a video to take a

568

00:21:06,310 --> 00:21:03,760

look at really quick to give you a

569

00:21:08,630 --> 00:21:06,320

little more background on that

570

00:21:10,789 --> 00:21:08,640

2020 virtual moon to mars ice and

571

00:21:12,310 --> 00:21:10,799

prospecting challenge tasked university

572

00:21:14,470 --> 00:21:12,320

teams with coming up with novel

573

00:21:16,710 --> 00:21:14,480

solutions to extract water ice beneath

574

00:21:18,549 --> 00:21:16,720

the surface on the moon and mars these

575

00:21:20,470 --> 00:21:18,559

are some of the novel ways that last

576  
00:21:23,029 --> 00:21:20,480  
year's teams came up with to solve this

577  
00:21:25,430 --> 00:21:23,039  
unique challenge our drill idea uh the

578  
00:21:27,669 --> 00:21:25,440  
unique thing about it was pulverizing

579  
00:21:30,789 --> 00:21:27,679  
the overburden and then sheathing the

580  
00:21:33,110 --> 00:21:30,799  
hole augering out the dirt melt the ice

581  
00:21:35,029 --> 00:21:33,120  
within the simulated test bed and then

582  
00:21:36,950 --> 00:21:35,039  
we recirculate it back down which then

583  
00:21:39,909 --> 00:21:36,960  
heats up more ice around it we have a

584  
00:21:42,070 --> 00:21:39,919  
second tool that rotates and articulates

585  
00:21:43,909 --> 00:21:42,080  
out melt downwards and then melt out we

586  
00:21:45,830 --> 00:21:43,919  
borrow from the aerospace it's a kind of

587  
00:21:47,669 --> 00:21:45,840  
structure called consecutive structure

588  
00:21:50,149 --> 00:21:47,679

it's a kind of roads and strength it is

589

00:21:52,630 --> 00:21:50,159

not like our house structure

590

00:21:55,510 --> 00:21:52,640

what we were trying to do with leslie is

591

00:21:58,710 --> 00:21:55,520

incorporate laser heating into our

592

00:22:01,190 --> 00:21:58,720

system for the extraction of water

593

00:22:02,710 --> 00:22:01,200

with the onset of the covet 19 pandemic

594

00:22:05,190 --> 00:22:02,720

universities across the country

595

00:22:07,110 --> 00:22:05,200

restricted access to on-site facilities

596

00:22:09,909 --> 00:22:07,120

greatly impacting the moon to mars ice

597

00:22:11,350 --> 00:22:09,919

and prospecting challenge student teams

598

00:22:13,190 --> 00:22:11,360

we had

599

00:22:14,230 --> 00:22:13,200

constructed all of our subsystems we

600

00:22:16,789 --> 00:22:14,240

were in the middle of putting them

601  
00:22:19,190 --> 00:22:16,799  
together when everything hit as spring

602  
00:22:22,070 --> 00:22:19,200  
break happened then everything with kobe

603  
00:22:25,669 --> 00:22:22,080  
started to ramp up by a week later mit

604  
00:22:27,830 --> 00:22:25,679  
had already sent all undergraduates home

605  
00:22:29,830 --> 00:22:27,840  
it was very sudden here

606  
00:22:31,669 --> 00:22:29,840  
we thought that we would just be able to

607  
00:22:33,270 --> 00:22:31,679  
do some design work and stuff from home

608  
00:22:35,510 --> 00:22:33,280  
for a couple weeks and go back and get

609  
00:22:37,270 --> 00:22:35,520  
access to our lab again but it became

610  
00:22:39,590 --> 00:22:37,280  
evident that that wasn't going to happen

611  
00:22:41,270 --> 00:22:39,600  
so we rushed over collected all of our

612  
00:22:43,590 --> 00:22:41,280  
supplies threw them in the back of one

613  
00:22:44,950 --> 00:22:43,600

of our teammates trucks so we had to

614

00:22:46,549 --> 00:22:44,960

take all the parts that were originally

615

00:22:49,029 --> 00:22:46,559

designed to be machined in our machine

616

00:22:50,870 --> 00:22:49,039

shop and then redesigned them for 3d

617

00:22:53,590 --> 00:22:50,880

printing and other things you can make

618

00:22:54,390 --> 00:22:53,600

at home we're actually a few hours

619

00:22:57,110 --> 00:22:54,400

before

620

00:22:58,310 --> 00:22:57,120

they locked the doors for three months

621

00:22:59,830 --> 00:22:58,320

i don't want to sugarcoat anything

622

00:23:02,230 --> 00:22:59,840

obviously we lost the full head of steam

623

00:23:04,549 --> 00:23:02,240

that we had we hit that brick wall of

624

00:23:07,590 --> 00:23:04,559

coke at 19. when things

625

00:23:09,669 --> 00:23:07,600

moved online and everyone had to go home

626

00:23:11,990 --> 00:23:09,679

a lot of people kind of gave up a lot of

627

00:23:13,909 --> 00:23:12,000

the team members did step back and uh

628

00:23:15,990 --> 00:23:13,919

kind of focus on their own things but

629

00:23:18,149 --> 00:23:16,000

still we we were trying to get a great

630

00:23:20,310 --> 00:23:18,159

paper out so the only thing i can do at

631

00:23:22,310 --> 00:23:20,320

this time was to keep a zoom meeting

632

00:23:24,390 --> 00:23:22,320

between every team member we used

633

00:23:26,230 --> 00:23:24,400

discord and zoom for each one of those

634

00:23:28,950 --> 00:23:26,240

meetings we had a zoom call we zoomed

635

00:23:31,029 --> 00:23:28,960

calls we stayed together using zooms try

636

00:23:33,350 --> 00:23:31,039

to do this over zoom with microsoft

637

00:23:34,870 --> 00:23:33,360

teams it was just like a snap of the

638

00:23:36,470 --> 00:23:34,880

finger and everybody just got right back

639

00:23:38,310 --> 00:23:36,480

on board and was able to like let's

640

00:23:40,310 --> 00:23:38,320

finish this let's do this let's let's

641

00:23:41,990 --> 00:23:40,320

prove ourselves right because we knew at

642

00:23:44,390 --> 00:23:42,000

the end goal we could still present

643

00:23:45,510 --> 00:23:44,400

something and the chance of that kind of

644

00:23:47,590 --> 00:23:45,520

pushed us

645

00:23:50,310 --> 00:23:47,600

going into a second year with

646

00:23:52,149 --> 00:23:50,320

a head start and also a lot more wisdom

647

00:23:53,830 --> 00:23:52,159

would be really helpful our senior

648

00:23:55,830 --> 00:23:53,840

project's actually done we finished up

649

00:23:57,750 --> 00:23:55,840

all of our testing we made that push and

650

00:23:59,669 --> 00:23:57,760

we're handing it off to the next senior

651  
00:24:01,510 --> 00:23:59,679  
project team that should carry it on for

652  
00:24:04,070 --> 00:24:01,520  
the next three quarters

653  
00:24:05,909 --> 00:24:04,080  
luckily all of us were freshmen so we

654  
00:24:08,149 --> 00:24:05,919  
have many more years that we'll be able

655  
00:24:09,990 --> 00:24:08,159  
to refine our design and then go back we

656  
00:24:12,230 --> 00:24:10,000  
expect that the people who were working

657  
00:24:13,909 --> 00:24:12,240  
on last year's design to keep finishing

658  
00:24:15,990 --> 00:24:13,919  
and tweaking last year's design as much

659  
00:24:18,230 --> 00:24:16,000  
as possible and getting the best results

660  
00:24:19,990 --> 00:24:18,240  
on that one and then the new 27 members

661  
00:24:21,990 --> 00:24:20,000  
that we just brought in we'll work on a

662  
00:24:23,990 --> 00:24:22,000  
completely new design from scratch

663  
00:24:25,909 --> 00:24:24,000

it's an entirely new team this year they

664

00:24:27,590 --> 00:24:25,919

have some very good ideas about things

665

00:24:30,390 --> 00:24:27,600

that we hadn't even had time to consider

666

00:24:31,909 --> 00:24:30,400

we're already planning to do everything

667

00:24:33,269 --> 00:24:31,919

that we were going to do this year we

668

00:24:34,950 --> 00:24:33,279

would do it next year

669

00:24:36,549 --> 00:24:34,960

we're definitely very appreciative of

670

00:24:37,750 --> 00:24:36,559

the opportunity to

671

00:24:39,430 --> 00:24:37,760

to get to

672

00:24:41,350 --> 00:24:39,440

work and learn through this whole

673

00:24:51,590 --> 00:24:41,360

process so we'd like to thank nasa for

674

00:24:55,269 --> 00:24:53,269

if you are just now joining us we're

675

00:24:58,070 --> 00:24:55,279

coming to you live from nasa's moon to

676  
00:24:59,750 --> 00:24:58,080  
mars ice and prospecting challenge where

677  
00:25:01,510 --> 00:24:59,760  
teams are drilling through simulated

678  
00:25:04,390 --> 00:25:01,520  
lunar and martian

679  
00:25:06,070 --> 00:25:04,400  
regolith or soil to get to the ice in

680  
00:25:08,549 --> 00:25:06,080  
hopes of extracting water from down

681  
00:25:10,470 --> 00:25:08,559  
below and i believe my colleague over

682  
00:25:12,230 --> 00:25:10,480  
there natalie has one of the event

683  
00:25:14,070 --> 00:25:12,240  
organizers so let's kick things off over

684  
00:25:16,549 --> 00:25:14,080  
to natalie at the correspondence desk

685  
00:25:17,830 --> 00:25:16,559  
and hear how this competition came to be

686  
00:25:19,590 --> 00:25:17,840  
natalie

687  
00:25:21,510 --> 00:25:19,600  
thanks molly and yes i am here with

688  
00:25:23,190 --> 00:25:21,520

someone very important i'm joined by

689

00:25:25,830 --> 00:25:23,200

shelly spears who's in charge of

690

00:25:27,590 --> 00:25:25,840

bringing this whole event together thank

691

00:25:29,269 --> 00:25:27,600

you so much for joining us shelley thank

692

00:25:31,590 --> 00:25:29,279

you natalie it's wonderful to be with

693

00:25:33,669 --> 00:25:31,600

you thank you yeah and we're back for

694

00:25:35,669 --> 00:25:33,679

another competition so how is this

695

00:25:37,669 --> 00:25:35,679

year's competition going it's going

696

00:25:39,669 --> 00:25:37,679

fantastic these teams really came ready

697

00:25:41,430 --> 00:25:39,679

to compete this year as you can tell or

698

00:25:43,590 --> 00:25:41,440

just hearing all the drilling and all

699

00:25:45,669 --> 00:25:43,600

the excitement in the room it's been we

700

00:25:47,830 --> 00:25:45,679

are off to a fantastic start that's so

701

00:25:49,269 --> 00:25:47,840

great to hear and i know especially

702

00:25:51,029 --> 00:25:49,279

because i understand that last year's

703

00:25:53,590 --> 00:25:51,039

competition was canceled due to the

704

00:25:56,230 --> 00:25:53,600

pandemic and so i know for you it must

705

00:25:58,310 --> 00:25:56,240

be just so great to see all of these uh

706

00:26:00,310 --> 00:25:58,320

these designs here in person and seeing

707

00:26:02,070 --> 00:26:00,320

everything in action today absolutely

708

00:26:03,909 --> 00:26:02,080

they worked so hard on this throughout

709

00:26:05,590 --> 00:26:03,919

the year and they've had so many

710

00:26:07,510 --> 00:26:05,600

challenges putting their systems

711

00:26:10,149 --> 00:26:07,520

together with all of the hiccups and

712

00:26:12,630 --> 00:26:10,159

obstacles of covid um and so to have

713

00:26:14,310 --> 00:26:12,640

them actually physically be here to put

714

00:26:15,750 --> 00:26:14,320

all of their hard work to the test and

715

00:26:17,750 --> 00:26:15,760

compete with their colleagues at other

716

00:26:20,070 --> 00:26:17,760

universities they're excited we're

717

00:26:22,710 --> 00:26:20,080

excited uh and it's it's really great to

718

00:26:24,310 --> 00:26:22,720

see people face to face again i agree so

719

00:26:25,830 --> 00:26:24,320

shelley this is the fifth year of the

720

00:26:28,149 --> 00:26:25,840

moon tomorrow's ice and prospecting

721

00:26:29,590 --> 00:26:28,159

challenge with new teams competing with

722

00:26:31,590 --> 00:26:29,600

new designs

723

00:26:34,310 --> 00:26:31,600

what have we learned so far over the

724

00:26:37,190 --> 00:26:34,320

lifetime of this competition and why

725

00:26:39,430 --> 00:26:37,200

does nasa continue to support it

726  
00:26:41,110 --> 00:26:39,440  
so we've learned when we first started

727  
00:26:42,870 --> 00:26:41,120  
the competition there were so many

728  
00:26:45,750 --> 00:26:42,880  
different approaches to solving this

729  
00:26:48,230 --> 00:26:45,760  
complex challenge and over time we've

730  
00:26:50,630 --> 00:26:48,240  
seen teams start to gravitate towards

731  
00:26:53,269 --> 00:26:50,640  
one or two approaches as they learn on

732  
00:26:55,029 --> 00:26:53,279  
through our through reading technical

733  
00:26:56,789 --> 00:26:55,039  
papers and lessons learned and all the

734  
00:26:58,630 --> 00:26:56,799  
knowledge capture that we do because we

735  
00:27:00,310 --> 00:26:58,640  
really it's a competition but we're all

736  
00:27:02,710 --> 00:27:00,320  
in this together so we want to share all

737  
00:27:04,470 --> 00:27:02,720  
the best practices everything that works

738  
00:27:05,750 --> 00:27:04,480

everything that doesn't work so we've

739

00:27:07,590 --> 00:27:05,760

maybe even more importantly we've

740

00:27:09,110 --> 00:27:07,600

learned what doesn't work and now we're

741

00:27:11,110 --> 00:27:09,120

starting to gravitate towards a couple

742

00:27:12,390 --> 00:27:11,120

of approaches that are working well but

743

00:27:14,070 --> 00:27:12,400

we don't want to make it that easy on

744

00:27:16,230 --> 00:27:14,080

them so we keep adding complexity to the

745

00:27:17,909 --> 00:27:16,240

competition things that will help nasa

746

00:27:20,710 --> 00:27:17,919

such as the drilling telemetry and some

747

00:27:21,669 --> 00:27:20,720

other elements to keep it really hard

748

00:27:23,830 --> 00:27:21,679

for them

749

00:27:25,750 --> 00:27:23,840

yeah and why do you think competitions

750

00:27:28,310 --> 00:27:25,760

like the moon to mars eisen prospecting

751  
00:27:29,510 --> 00:27:28,320  
challenge are beneficial

752  
00:27:30,549 --> 00:27:29,520  
well they're important for a lot of

753  
00:27:32,070 --> 00:27:30,559  
reasons

754  
00:27:33,990 --> 00:27:32,080  
for students that are entering the

755  
00:27:36,389 --> 00:27:34,000  
workforce and want to go into aerospace

756  
00:27:39,029 --> 00:27:36,399  
and exploration systems it gives them

757  
00:27:42,230 --> 00:27:39,039  
the opportunity to apply their skills in

758  
00:27:44,630 --> 00:27:42,240  
a very hands-on way it helps it's a very

759  
00:27:46,389 --> 00:27:44,640  
cost-effective way for nasa to be able

760  
00:27:47,909 --> 00:27:46,399  
to put out these complex challenge to

761  
00:27:50,149 --> 00:27:47,919  
academia because let's face it it's

762  
00:27:51,669 --> 00:27:50,159  
going to take a lot of innovative and

763  
00:27:53,110 --> 00:27:51,679

creative inputs to solve some of these

764

00:27:54,789 --> 00:27:53,120

complex problems

765

00:27:56,549 --> 00:27:54,799

and so it takes industry it takes

766

00:27:58,389 --> 00:27:56,559

academia it takes our partners and

767

00:27:59,990 --> 00:27:58,399

international space agencies all of us

768

00:28:01,990 --> 00:28:00,000

working together

769

00:28:04,149 --> 00:28:02,000

it also creates a very rich talent pool

770

00:28:06,789 --> 00:28:04,159

for industry and for nasa and let's face

771

00:28:08,549 --> 00:28:06,799

it these these students here when we go

772

00:28:09,990 --> 00:28:08,559

and have longer duration human presence

773

00:28:11,909 --> 00:28:10,000

on mars and moons it's going to happen

774

00:28:13,909 --> 00:28:11,919

in their during their career so they're

775

00:28:15,830 --> 00:28:13,919

really getting a good head start

776

00:28:17,669 --> 00:28:15,840

and how can students get involved in

777

00:28:20,070 --> 00:28:17,679

future challenges

778

00:28:22,230 --> 00:28:20,080

there's so many opportunities out there

779

00:28:23,990 --> 00:28:22,240

so whether you're in kindergarten or

780

00:28:25,510 --> 00:28:24,000

even some preschool all the way through

781

00:28:27,510 --> 00:28:25,520

graduate school

782

00:28:29,510 --> 00:28:27,520

nasa does a great job of trying to

783

00:28:32,149 --> 00:28:29,520

create opportunities for students

784

00:28:34,230 --> 00:28:32,159

so i would say to go to nasa express you

785

00:28:36,710 --> 00:28:34,240

could just search that in the internet

786

00:28:38,149 --> 00:28:36,720

and nasa express as a newsletter and

787

00:28:39,750 --> 00:28:38,159

they do a wonderful job of letting

788

00:28:41,909 --> 00:28:39,760

everyone know all the opportunities that

789

00:28:43,590 --> 00:28:41,919

are out there and shelley how about

790

00:28:45,029 --> 00:28:43,600

just getting involved specifically in

791

00:28:47,590 --> 00:28:45,039

the moon to mars ice and prospecting

792

00:28:49,669 --> 00:28:47,600

challenge so you can go to the nia

793

00:28:52,230 --> 00:28:49,679

website or to the nasa website and just

794

00:28:55,950 --> 00:28:52,240

do a search to um nasa moon tomorrow's

795

00:28:57,830 --> 00:28:55,960

ice and prospecting challenge or go to

796

00:28:59,750 --> 00:28:57,840

rascal.nia.net and you can find the

797

00:29:01,510 --> 00:28:59,760

competition and you can see all about

798

00:29:02,389 --> 00:29:01,520

what we're coming up with next sounds

799

00:29:05,590 --> 00:29:02,399

good

800

00:29:07,830 --> 00:29:05,600

well we have so many ask nasa questions

801  
00:29:09,510 --> 00:29:07,840  
coming in from our live viewers today

802  
00:29:11,269 --> 00:29:09,520  
and if you're at home and you'd like to

803  
00:29:15,510 --> 00:29:11,279  
have your question answered live on

804  
00:29:17,269 --> 00:29:15,520  
today's show use the hashtag asknasa and

805  
00:29:18,870 --> 00:29:17,279  
drop your questions in the comment or

806  
00:29:21,750 --> 00:29:18,880  
the chat box from wherever you're

807  
00:29:25,750 --> 00:29:21,760  
watching us today so shelly our first

808  
00:29:29,350 --> 00:29:25,760  
ask nasa question comes from at i mean

809  
00:29:30,789 --> 00:29:29,360  
humanone on twitter and they're asking

810  
00:29:33,269 --> 00:29:30,799  
what are the colleges that are

811  
00:29:35,510 --> 00:29:33,279  
participating in the challenge

812  
00:29:37,350 --> 00:29:35,520  
okay let's see i could start around the

813  
00:29:38,630 --> 00:29:37,360

room i well

814

00:29:41,110 --> 00:29:38,640

okay there's ten there's ten there's

815

00:29:43,830 --> 00:29:41,120

definitely there's ten so there's mit

816

00:29:45,190 --> 00:29:43,840

virginia tech i'm gonna is it okay if i

817

00:29:48,470 --> 00:29:45,200

do this okay i don't wanna leave anybody

818

00:29:49,430 --> 00:29:48,480

out okay auburn university mit san diego

819

00:29:51,430 --> 00:29:49,440

state

820

00:29:53,430 --> 00:29:51,440

uh stevens institute of technology

821

00:29:54,630 --> 00:29:53,440

university of pittsburgh

822

00:29:56,630 --> 00:29:54,640

cal poly

823

00:30:00,149 --> 00:29:56,640

northeastern south dakota state

824

00:30:02,149 --> 00:30:00,159

university texas a m and virginia tech

825

00:30:03,909 --> 00:30:02,159

great awesome well congratulations to

826

00:30:06,389 --> 00:30:03,919

all those universities for making it out

827

00:30:08,310 --> 00:30:06,399

here today and getting this far and so

828

00:30:11,269 --> 00:30:08,320

we have another question from carla

829

00:30:13,669 --> 00:30:11,279

suttle on facebook and she wants to know

830

00:30:16,230 --> 00:30:13,679

how were these teams chosen

831

00:30:19,029 --> 00:30:16,240

okay so we put out a call for proposals

832

00:30:21,510 --> 00:30:19,039

across the country um it's open to all

833

00:30:22,789 --> 00:30:21,520

u.s based universities they can partner

834

00:30:23,830 --> 00:30:22,799

with international universities if

835

00:30:25,669 --> 00:30:23,840

they'd like

836

00:30:27,750 --> 00:30:25,679

and we put out the specs and

837

00:30:31,269 --> 00:30:27,760

requirements they submit a project

838

00:30:33,350 --> 00:30:31,279

proposal plan it's reviewed by industry

839

00:30:36,230 --> 00:30:33,360

experts and nasa experts our judging

840

00:30:38,389 --> 00:30:36,240

panel we pick the teams that seem like

841

00:30:41,110 --> 00:30:38,399

they have uh innovative ideas and also

842

00:30:43,909 --> 00:30:41,120

seem well prepared to compete

843

00:30:45,750 --> 00:30:43,919

uh and then we do a down select we give

844

00:30:47,110 --> 00:30:45,760

them some initial

845

00:30:49,029 --> 00:30:47,120

small amount of funding to start with

846

00:30:50,630 --> 00:30:49,039

their software and hardware designs and

847

00:30:52,470 --> 00:30:50,640

then they go through another mid-project

848

00:30:54,230 --> 00:30:52,480

review and then they make the final cut

849

00:30:55,909 --> 00:30:54,240

and now they're here all right well

850

00:30:59,029 --> 00:30:55,919

thank you so much shelly thank you for

851  
00:31:01,110 --> 00:30:59,039  
joining us thank you natalie yes and um

852  
00:31:03,430 --> 00:31:01,120  
molly it's back to you

853  
00:31:04,950 --> 00:31:03,440  
thanks natalie and thank you shelly for

854  
00:31:07,110 --> 00:31:04,960  
putting on another great competition we

855  
00:31:09,430 --> 00:31:07,120  
love coming to this one well i also had

856  
00:31:11,990 --> 00:31:09,440  
a really neat opportunity to interview

857  
00:31:13,590 --> 00:31:12,000  
crew one nasa astronaut victor glover if

858  
00:31:15,350 --> 00:31:13,600  
you've never heard him speak before get

859  
00:31:16,870 --> 00:31:15,360  
ready because he's an amazingly

860  
00:31:19,029 --> 00:31:16,880  
well-spoken person and he's just a

861  
00:31:20,870 --> 00:31:19,039  
genuinely wonderful human being and we

862  
00:31:22,950 --> 00:31:20,880  
get to talk about this challenge and

863  
00:31:24,549 --> 00:31:22,960

what it means for astronauts like him

864

00:31:26,950 --> 00:31:24,559

who might actually be an end user of

865

00:31:29,029 --> 00:31:26,960

this technology one day sin he does know

866

00:31:30,470 --> 00:31:29,039

a thing or two about space first hand so

867

00:31:32,710 --> 00:31:30,480

let's take a look

868

00:31:34,630 --> 00:31:32,720

victor thank you so much for joining us

869

00:31:36,470 --> 00:31:34,640

today we are so excited to have you on

870

00:31:38,070 --> 00:31:36,480

the show

871

00:31:40,630 --> 00:31:38,080

molly it's great to be here thank you

872

00:31:45,830 --> 00:31:42,950

so right now in the competition our

873

00:31:47,909 --> 00:31:45,840

student teams are operating their unique

874

00:31:49,350 --> 00:31:47,919

technology and they're demonstrating

875

00:31:52,070 --> 00:31:49,360

drilling through

876  
00:31:53,830 --> 00:31:52,080  
our simulated lunar and martian surface

877  
00:31:56,070 --> 00:31:53,840  
and they're trying to access the water

878  
00:31:58,630 --> 00:31:56,080  
ice that's hidden beneath

879  
00:32:01,669 --> 00:31:58,640  
i'm curious for you as an end user that

880  
00:32:03,590 --> 00:32:01,679  
might benefit from technology like this

881  
00:32:05,590 --> 00:32:03,600  
what value do you see in competitions

882  
00:32:07,110 --> 00:32:05,600  
like this

883  
00:32:08,630 --> 00:32:07,120  
you know first of all i have to really

884  
00:32:10,070 --> 00:32:08,640  
just appreciate that statement you know

885  
00:32:11,990 --> 00:32:10,080  
as a potential end user of this

886  
00:32:14,149 --> 00:32:12,000  
technology that it's amazing that we're

887  
00:32:15,669 --> 00:32:14,159  
going back to the moon with artemis and

888  
00:32:16,870 --> 00:32:15,679

the goals of the artemis program and so

889

00:32:18,789 --> 00:32:16,880

it's it's actually amazing that our

890

00:32:20,630 --> 00:32:18,799

generation is going to to have a moon

891

00:32:22,389 --> 00:32:20,640

mission a moon program that's going to

892

00:32:24,310 --> 00:32:22,399

send us back and i'm really excited

893

00:32:26,149 --> 00:32:24,320

about that effort and so for these

894

00:32:27,990 --> 00:32:26,159

students to be working on technology for

895

00:32:29,990 --> 00:32:28,000

us to get access to ice which is a

896

00:32:31,509 --> 00:32:30,000

valuable resource you know because we

897

00:32:33,830 --> 00:32:31,519

can you need it for life but you also

898

00:32:36,870 --> 00:32:33,840

need it for propulsion it's it's a great

899

00:32:39,350 --> 00:32:36,880

component in rocket fuel and so

900

00:32:42,310 --> 00:32:39,360

this technology is going to enable us to

901  
00:32:44,710 --> 00:32:42,320  
to find new ways and new ideas for uh

902  
00:32:46,310 --> 00:32:44,720  
extracting this valuable resource from

903  
00:32:50,230 --> 00:32:46,320  
this these sources that we've actually

904  
00:32:54,789 --> 00:32:52,549  
i'd like to focus a little bit on water

905  
00:32:56,549 --> 00:32:54,799  
component of that because

906  
00:32:58,630 --> 00:32:56,559  
for you

907  
00:33:00,310 --> 00:32:58,640  
when you've been in space water is such

908  
00:33:01,909 --> 00:33:00,320  
a limited resource

909  
00:33:03,750 --> 00:33:01,919  
i imagine you have to treat it with a

910  
00:33:05,669 --> 00:33:03,760  
lot of care

911  
00:33:06,789 --> 00:33:05,679  
what what does water signify for you i

912  
00:33:08,470 --> 00:33:06,799  
assume it's different than what it

913  
00:33:10,789 --> 00:33:08,480

signifies for me

914

00:33:13,029 --> 00:33:10,799

here or another well you know it's

915

00:33:15,190 --> 00:33:13,039

interesting living in space helps you to

916

00:33:17,590 --> 00:33:15,200

appreciate the things that we take for

917

00:33:19,750 --> 00:33:17,600

granted or at least really um

918

00:33:21,909 --> 00:33:19,760

just expect to be there like water you

919

00:33:23,750 --> 00:33:21,919

know in space we have to reclaim water

920

00:33:25,430 --> 00:33:23,760

we actually take you know that i heard

921

00:33:27,269 --> 00:33:25,440

someone say once i believe it was mike

922

00:33:29,590 --> 00:33:27,279

fossum we turned yesterday's coffee into

923

00:33:31,909 --> 00:33:29,600

tomorrow's coffee it's because we take

924

00:33:33,750 --> 00:33:31,919

the water out of everything if i run on

925

00:33:36,070 --> 00:33:33,760

the treadmill and sweat into it and wipe

926

00:33:37,990 --> 00:33:36,080

my face with a towel i hang that towel

927

00:33:40,389 --> 00:33:38,000

up and the air conditioning system will

928

00:33:42,470 --> 00:33:40,399

will dry it out and pull that moisture

929

00:33:44,070 --> 00:33:42,480

out of the air and our air conditioner

930

00:33:45,990 --> 00:33:44,080

will separate it take the moisture out

931

00:33:47,909 --> 00:33:46,000

put it in our water system that purifies

932

00:33:49,669 --> 00:33:47,919

it and turns it into drinking water

933

00:33:51,909 --> 00:33:49,679

water is extremely valuable and so it

934

00:33:53,430 --> 00:33:51,919

represents life to me i think it's

935

00:33:55,350 --> 00:33:53,440

that's the most exciting part the

936

00:33:57,509 --> 00:33:55,360

ability to get access to that that

937

00:34:00,630 --> 00:33:57,519

resource that is already up there on the

938

00:34:02,070 --> 00:34:00,640

moon is is a critical capability a very

939

00:34:03,509 --> 00:34:02,080

very neat thing to be able to do and

940

00:34:05,909 --> 00:34:03,519

this technology that these students are

941

00:34:07,029 --> 00:34:05,919

working on the ingenuity the new ideas i

942

00:34:08,310 --> 00:34:07,039

mean they're not all going to take the

943

00:34:09,750 --> 00:34:08,320

same approach and that's one of the

944

00:34:11,589 --> 00:34:09,760

things i think is really exciting about

945

00:34:13,349 --> 00:34:11,599

this type of competition

946

00:34:14,869 --> 00:34:13,359

how do you think as an astronaut

947

00:34:16,629 --> 00:34:14,879

technology that's derived from

948

00:34:19,030 --> 00:34:16,639

competitions like this one the moon to

949

00:34:21,349 --> 00:34:19,040

mars ice and prospecting challenge could

950

00:34:23,430 --> 00:34:21,359

directly impact you and other future

951  
00:34:25,829 --> 00:34:23,440  
astronauts as you explore the moon as

952  
00:34:27,430 --> 00:34:25,839  
you explore mars

953  
00:34:28,629 --> 00:34:27,440  
you know knowing that these these

954  
00:34:31,190 --> 00:34:28,639  
students are creating something that

955  
00:34:33,510 --> 00:34:31,200  
might be the a tool that we use in space

956  
00:34:35,669 --> 00:34:33,520  
one day is actually quite motivating and

957  
00:34:37,829 --> 00:34:35,679  
inspiring and to see some of the ideas

958  
00:34:39,589 --> 00:34:37,839  
they come up with but more importantly i

959  
00:34:41,829 --> 00:34:39,599  
think the ideas they come up with are

960  
00:34:43,829 --> 00:34:41,839  
great but then to see the physical

961  
00:34:45,750 --> 00:34:43,839  
competition where they show their

962  
00:34:48,069 --> 00:34:45,760  
hardware they have a design some of

963  
00:34:50,069 --> 00:34:48,079

they've had to code for and they they

964

00:34:52,149 --> 00:34:50,079

put all of that together hardware and

965

00:34:53,909 --> 00:34:52,159

software and they put it out there and

966

00:34:56,069 --> 00:34:53,919

then they run it they have to come up

967

00:34:58,470 --> 00:34:56,079

with procedures they have to communicate

968

00:35:00,310 --> 00:34:58,480

work together as a team and and

969

00:35:03,190 --> 00:35:00,320

move this material from one place to

970

00:35:05,750 --> 00:35:03,200

another it's so amazing to actually see

971

00:35:07,589 --> 00:35:05,760

that idea become a reality and so this

972

00:35:10,230 --> 00:35:07,599

type of competition i think is so

973

00:35:13,270 --> 00:35:10,240

important to inspire those students to

974

00:35:15,270 --> 00:35:13,280

to to dream and create uh but also for

975

00:35:17,349 --> 00:35:15,280

us to to learn about what what ideas are

976  
00:35:18,950 --> 00:35:17,359  
out there because nasa has some very

977  
00:35:20,790 --> 00:35:18,960  
good things that we've done for a long

978  
00:35:22,470 --> 00:35:20,800  
time that are working and they work well

979  
00:35:25,190 --> 00:35:22,480  
but that might not be the best or most

980  
00:35:26,790 --> 00:35:25,200  
efficient way to do things right now

981  
00:35:30,069 --> 00:35:26,800  
victor thank you so much for your time

982  
00:35:31,589 --> 00:35:30,079  
today we are so appreciative

983  
00:35:33,589 --> 00:35:31,599  
thank you molly it's been great talking

984  
00:35:35,589 --> 00:35:33,599  
to you and congratulations to all the

985  
00:35:39,510 --> 00:35:35,599  
students and advisors at the event great

986  
00:35:43,270 --> 00:35:41,030  
if you're like me and could listen to

987  
00:35:44,870 --> 00:35:43,280  
victor glover talk all day stay tuned

988  
00:35:47,670 --> 00:35:44,880

for part two of our interview where we

989

00:35:49,750 --> 00:35:47,680

talk about nasa's artemis mission and we

990

00:35:51,750 --> 00:35:49,760

get to hear from him firsthand what it

991

00:35:54,470 --> 00:35:51,760

would be like to actually be using this

992

00:35:55,750 --> 00:35:54,480

technology on the moon one day so stay

993

00:35:57,670 --> 00:35:55,760

with us you don't want to miss that and

994

00:36:00,150 --> 00:35:57,680

if you're just now joining us we are

995

00:36:02,470 --> 00:36:00,160

coming to you live from the moon to mars

996

00:36:04,150 --> 00:36:02,480

ice and prospecting challenge

997

00:36:07,109 --> 00:36:04,160

where university teams are drilling

998

00:36:09,589 --> 00:36:07,119

through simulated lunar and martian soil

999

00:36:11,349 --> 00:36:09,599

in an attempt to extract water from the

1000

00:36:13,190 --> 00:36:11,359

ice below

1001  
00:36:14,950 --> 00:36:13,200  
now one day systems like these could be

1002  
00:36:17,589 --> 00:36:14,960  
used to extract water ice below the

1003  
00:36:20,150 --> 00:36:17,599  
surface of the moon or mars and for

1004  
00:36:22,870 --> 00:36:20,160  
future explorers being able to access

1005  
00:36:25,190 --> 00:36:22,880  
resources like water will be crucial for

1006  
00:36:27,109 --> 00:36:25,200  
creating a sustained human presence

1007  
00:36:28,390 --> 00:36:27,119  
beyond earth

1008  
00:36:30,710 --> 00:36:28,400  
so now that you get a little bit of

1009  
00:36:31,990 --> 00:36:30,720  
context about the challenge itself i'm

1010  
00:36:34,230 --> 00:36:32,000  
joined here on the floor with some of

1011  
00:36:37,349 --> 00:36:34,240  
the team so we can see how it's going in

1012  
00:36:39,349 --> 00:36:37,359  
the pit area so um pollock and eric you

1013  
00:36:41,430 --> 00:36:39,359

guys are both from mit

1014

00:36:43,430 --> 00:36:41,440

Paula give me just a rundown of your

1015

00:36:45,589 --> 00:36:43,440

design and your system

1016

00:36:47,270 --> 00:36:45,599

right so um i just first of all like to

1017

00:36:49,750 --> 00:36:47,280

say that we've got an amazing team of

1018

00:36:51,030 --> 00:36:49,760

seven people and we have complementary

1019

00:36:52,950 --> 00:36:51,040

um like

1020

00:36:55,109 --> 00:36:52,960

skills and it's just amazing what we've

1021

00:36:56,790 --> 00:36:55,119

actually come up with so we have a

1022

00:36:58,470 --> 00:36:56,800

really stable rig this time and we

1023

00:37:01,030 --> 00:36:58,480

focused on that a lot

1024

00:37:04,230 --> 00:37:01,040

so we've got a parallel drill and a

1025

00:37:05,910 --> 00:37:04,240

heater as well so first we drill a hole

1026

00:37:08,390 --> 00:37:05,920

that's about an inch

1027

00:37:10,710 --> 00:37:08,400

in diameter and then we use a servo

1028

00:37:13,270 --> 00:37:10,720

motor that's really accurate and on the

1029

00:37:16,310 --> 00:37:13,280

y-axis we move the heater into place

1030

00:37:18,550 --> 00:37:16,320

right above the drilled hole and then we

1031

00:37:21,030 --> 00:37:18,560

drop the heater down and use radiative

1032

00:37:23,670 --> 00:37:21,040

heating to melt the ice and basically

1033

00:37:26,470 --> 00:37:23,680

going into mars melting the ice and we

1034

00:37:27,430 --> 00:37:26,480

use a pump to pump the water out

1035

00:37:29,430 --> 00:37:27,440

and so

1036

00:37:32,390 --> 00:37:29,440

yeah that's basically the hardware of

1037

00:37:35,430 --> 00:37:32,400

what we do and this can be controlled by

1038

00:37:36,950 --> 00:37:35,440

a team of i guess astronauts where we

1039

00:37:39,510 --> 00:37:36,960

don't actually have to touch the

1040

00:37:41,829 --> 00:37:39,520

instrument and we're just working on

1041

00:37:43,349 --> 00:37:41,839

the just controlling it from a distance

1042

00:37:44,870 --> 00:37:43,359

and i've been really lucky and i've

1043

00:37:47,270 --> 00:37:44,880

gotten to actually be one of those

1044

00:37:49,190 --> 00:37:47,280

astronauts for our system so yeah that's

1045

00:37:51,030 --> 00:37:49,200

exactly how our hardware works so it's

1046

00:37:53,270 --> 00:37:51,040

not autonomous yet it could be but right

1047

00:37:55,270 --> 00:37:53,280

now it's hands off and while it's hands

1048

00:37:57,910 --> 00:37:55,280

off the software side takes over which

1049

00:38:00,310 --> 00:37:57,920

is your department eric so so walk me

1050

00:38:02,150 --> 00:38:00,320

through some of the software and some of

1051

00:38:03,589 --> 00:38:02,160

the unique tools that you're using to

1052

00:38:05,430 --> 00:38:03,599

get some of your data especially for

1053

00:38:06,630 --> 00:38:05,440

that digital core i heard it's something

1054

00:38:08,550 --> 00:38:06,640

like this

1055

00:38:10,310 --> 00:38:08,560

okay cool yeah so you know first off we

1056

00:38:12,790 --> 00:38:10,320

got a microphone you know we got it

1057

00:38:14,710 --> 00:38:12,800

closely attached to jail and you know

1058

00:38:16,790 --> 00:38:14,720

getting water is nice now we've done a

1059

00:38:18,710 --> 00:38:16,800

fantastic job at doing that but one of

1060

00:38:20,710 --> 00:38:18,720

the main things that you know we really

1061

00:38:22,870 --> 00:38:20,720

want for the moon and mars is to

1062

00:38:24,790 --> 00:38:22,880

understand what are the layers that make

1063

00:38:27,190 --> 00:38:24,800

up the thing we're digging so one of the

1064

00:38:28,870 --> 00:38:27,200

many things that we have is a microphone

1065

00:38:30,069 --> 00:38:28,880

and you know you can sense the vibration

1066

00:38:31,270 --> 00:38:30,079

the different kind of sounds whenever

1067

00:38:32,710 --> 00:38:31,280

you're drilling into a different kind of

1068

00:38:34,870 --> 00:38:32,720

material the other thing is that we're

1069

00:38:36,950 --> 00:38:34,880

on a bit sensor so whenever you know

1070

00:38:38,710 --> 00:38:36,960

more force is being applied to the drill

1071

00:38:40,150 --> 00:38:38,720

we would know immediately more current

1072

00:38:42,950 --> 00:38:40,160

is being applied to it more current to

1073

00:38:45,589 --> 00:38:42,960

the you know the drill the motor moving

1074

00:38:47,589 --> 00:38:45,599

the drill downwards and you can also

1075

00:38:49,109 --> 00:38:47,599

read the current of the drill bit as

1076

00:38:50,390 --> 00:38:49,119

well as

1077

00:38:52,310 --> 00:38:50,400

yeah that's pretty much it and you know

1078

00:38:54,550 --> 00:38:52,320

we have all that and then we map it into

1079

00:38:56,069 --> 00:38:54,560

like a neural net so you know a

1080

00:38:57,510 --> 00:38:56,079

combination of data you know heavy

1081

00:38:59,109 --> 00:38:57,520

statistics then you could figure out

1082

00:39:00,950 --> 00:38:59,119

okay i'm drilling in clay and i'm

1083

00:39:02,630 --> 00:39:00,960

drilling in you know concrete right now

1084

00:39:04,150 --> 00:39:02,640

i'm drilling in soil right now oh i'm

1085

00:39:05,430 --> 00:39:04,160

drilling an ice you know and that's how

1086

00:39:08,310 --> 00:39:05,440

you know you want to turn on the heater

1087

00:39:11,109 --> 00:39:08,320

you want to you know you want to put the

1088

00:39:12,550 --> 00:39:11,119

heater down melt the water and you know

1089

00:39:14,630 --> 00:39:12,560

get water out

1090

00:39:16,710 --> 00:39:14,640

i've covered this competition for years

1091

00:39:18,550 --> 00:39:16,720

and i hadn't seen a microphone before i

1092

00:39:21,109 --> 00:39:18,560

wouldn't have thought to utilize a wave

1093

00:39:23,030 --> 00:39:21,119

file like that yeah it's uh you know it

1094

00:39:24,390 --> 00:39:23,040

was just at the very end we were

1095

00:39:26,310 --> 00:39:24,400

realizing oh it's making different kind

1096

00:39:28,310 --> 00:39:26,320

of sounds we can probably figure out

1097

00:39:29,750 --> 00:39:28,320

what sounds it is and you know there we

1098

00:39:31,670 --> 00:39:29,760

go

1099

00:39:33,349 --> 00:39:31,680

how confident are you and your ability

1100

00:39:34,950 --> 00:39:33,359

to capture a clean water sample from

1101

00:39:37,109 --> 00:39:34,960

this would you drink the water that your

1102

00:39:38,710 --> 00:39:37,119

your system produces over here yeah i

1103

00:39:40,630 --> 00:39:38,720

would drink the water like it's

1104

00:39:43,670 --> 00:39:40,640

relatively clean you know i drink

1105

00:39:45,030 --> 00:39:43,680

dirtier water in my life before

1106

00:39:47,190 --> 00:39:45,040

but um

1107

00:39:49,349 --> 00:39:47,200

all the name of science right yeah yeah

1108

00:39:50,550 --> 00:39:49,359

yeah and obnoxious you know dealings

1109

00:39:52,470 --> 00:39:50,560

with

1110

00:39:53,670 --> 00:39:52,480

we'll take it it's a live show well

1111

00:39:55,109 --> 00:39:53,680

thank you guys so much i know you have a

1112

00:39:56,630 --> 00:39:55,119

bunch of work to get back to so thank

1113

00:39:58,310 --> 00:39:56,640

you very much i appreciate your time so

1114

00:40:00,790 --> 00:39:58,320

much for having us yeah yeah thank you

1115

00:40:04,230 --> 00:40:02,310

let's come over here we've got someone

1116

00:40:06,150 --> 00:40:04,240

else to talk to really quick

1117

00:40:07,910 --> 00:40:06,160

so this is cole collier with the

1118

00:40:08,950 --> 00:40:07,920

university of pittsburgh

1119

00:40:10,710 --> 00:40:08,960

right

1120

00:40:12,710 --> 00:40:10,720

so cole tell me a little bit about your

1121

00:40:14,309 --> 00:40:12,720

your machine your design

1122

00:40:17,030 --> 00:40:14,319

uh sure um

1123

00:40:18,309 --> 00:40:17,040

so our system is actually pretty unique

1124

00:40:20,390 --> 00:40:18,319

when you compare it to the rest of the

1125

00:40:22,390 --> 00:40:20,400

systems around here uh we're the only

1126

00:40:25,430 --> 00:40:22,400

team this year to attempt to extract

1127

00:40:27,430 --> 00:40:25,440

water as a vapor instead of a liquid

1128

00:40:29,109 --> 00:40:27,440

let me ask the question is are we doing

1129

00:40:30,790 --> 00:40:29,119

the right thing if no one else here is

1130

00:40:32,870 --> 00:40:30,800

choosing that approach why did you

1131

00:40:34,309 --> 00:40:32,880

choose that approach well we really fell

1132

00:40:36,309 --> 00:40:34,319

in love with the theme of this

1133

00:40:38,630 --> 00:40:36,319

competition which is to build a robot

1134

00:40:39,589 --> 00:40:38,640

that could extract water on mars and on

1135

00:40:42,550 --> 00:40:39,599

the moon

1136

00:40:43,990 --> 00:40:42,560

and the conditions on mar on mars and on

1137

00:40:45,829 --> 00:40:44,000

the moon

1138

00:40:48,390 --> 00:40:45,839

suggest that

1139

00:40:50,710 --> 00:40:48,400

you can actually have ice uh sublimate

1140

00:40:53,829 --> 00:40:50,720

directly to a gaseous form when you add

1141

00:40:56,710 --> 00:40:53,839

heat and so easier than here on earth uh

1142

00:40:58,870 --> 00:40:56,720

yes so uh we're actually having the

1143

00:41:00,470 --> 00:40:58,880

hardest time competing here on earth and

1144

00:41:02,150 --> 00:41:00,480

if we were to send our assistant to the

1145

00:41:03,430 --> 00:41:02,160

moon we'd actually have an easier time

1146

00:41:04,950 --> 00:41:03,440

we'll have to talk to shelly one of the

1147

00:41:06,870 --> 00:41:04,960

event organizers about maybe just doing

1148

00:41:07,990 --> 00:41:06,880

it up there next time be easier for you

1149

00:41:12,390 --> 00:41:08,000

guys

1150

00:41:13,829 --> 00:41:12,400

yeah um i think uh um the cto of nasa

1151

00:41:15,430 --> 00:41:13,839

told us we're gonna ship it up there

1152

00:41:18,150 --> 00:41:15,440

next week

1153

00:41:19,670 --> 00:41:18,160

wait seriously oh

1154

00:41:21,109 --> 00:41:19,680

i was like no one told me it's not my

1155

00:41:23,030 --> 00:41:21,119

cue cards

1156

00:41:24,150 --> 00:41:23,040

well have you burned through any heating

1157

00:41:25,910 --> 00:41:24,160

apparatus

1158

00:41:27,270 --> 00:41:25,920

today to get to this point yes we've

1159

00:41:29,510 --> 00:41:27,280

we've already gone through one heating

1160

00:41:30,790 --> 00:41:29,520

element but i have great news a couple

1161

00:41:36,790 --> 00:41:30,800

hours ago we actually were able to

1162

00:41:41,270 --> 00:41:38,870

that's great congratulations

1163

00:41:43,270 --> 00:41:41,280

super excited it's amazing um and

1164

00:41:45,589 --> 00:41:43,280

special thanks to my whole team we all

1165

00:41:48,230 --> 00:41:45,599

put in a ton of hard work this past year

1166

00:41:50,150 --> 00:41:48,240

more than i think we all expected but we

1167

00:41:50,950 --> 00:41:50,160

all wrote we rose to the challenge and

1168

00:41:52,390 --> 00:41:50,960

um

1169

00:41:54,309 --> 00:41:52,400

i'm just super proud of all the guys

1170

00:41:55,990 --> 00:41:54,319

that we have with us today oh that's

1171

00:41:58,150 --> 00:41:56,000

awesome congratulations cool i'm really

1172

00:42:00,309 --> 00:41:58,160

excited for you guys we all are here

1173

00:42:01,670 --> 00:42:00,319

this is not an easy challenge and one of

1174

00:42:04,390 --> 00:42:01,680

the things that you can go ahead and get

1175

00:42:06,710 --> 00:42:04,400

back to um one of the things that uh i

1176

00:42:08,470 --> 00:42:06,720

think is really important is the judges

1177

00:42:10,390 --> 00:42:08,480

here so natalie over the correspondence

1178

00:42:12,390 --> 00:42:10,400

desk has someone a special guest that

1179

00:42:13,910 --> 00:42:12,400

knows the in and outs i might even argue

1180

00:42:15,670 --> 00:42:13,920

the official in and outs of this

1181

00:42:17,750 --> 00:42:15,680

challenge so natalie we'll kick it over

1182

00:42:19,990 --> 00:42:17,760

to you at the correspondence desk

1183

00:42:22,230 --> 00:42:20,000

yes molly i do have a very important

1184

00:42:24,150 --> 00:42:22,240

person with me i'm joined by chris jones

1185

00:42:26,309 --> 00:42:24,160

and he's one of the judges of today's

1186

00:42:28,550 --> 00:42:26,319

competition so happy you could join us

1187

00:42:30,950 --> 00:42:28,560

chris natalie it's great to be here yes

1188

00:42:33,109 --> 00:42:30,960

so chris you've been so instrumental in

1189

00:42:35,270 --> 00:42:33,119

this the creation of this challenge so

1190

00:42:37,670 --> 00:42:35,280

you're probably the best person to ask

1191

00:42:40,069 --> 00:42:37,680

how does this challenge work and what do

1192

00:42:41,750 --> 00:42:40,079

students need to accomplish so we really

1193

00:42:43,430 --> 00:42:41,760

have two big challenges that we're

1194

00:42:45,430 --> 00:42:43,440

asking the students to do here and it's

1195

00:42:47,030 --> 00:42:45,440

why we call it the moon to mars ice and

1196

00:42:48,950 --> 00:42:47,040

prospecting challenge

1197

00:42:50,790 --> 00:42:48,960

part of that is the prospecting side of

1198

00:42:52,309 --> 00:42:50,800

it and what we're looking for here is

1199

00:42:54,309 --> 00:42:52,319

for teams to be able to give us what we

1200

00:42:55,910 --> 00:42:54,319

call a digital core

1201  
00:42:57,670 --> 00:42:55,920  
we've given them these test beds that

1202  
00:42:59,589 --> 00:42:57,680  
have multiple layers but they don't know

1203  
00:43:02,150 --> 00:42:59,599  
what those layers are before they get to

1204  
00:43:04,069 --> 00:43:02,160  
the ice so we're asking them to use the

1205  
00:43:06,470 --> 00:43:04,079  
sensors and the instruments they have

1206  
00:43:09,030 --> 00:43:06,480  
aboard their systems to determine what

1207  
00:43:11,670 --> 00:43:09,040  
those layers are how hard they are how

1208  
00:43:13,829 --> 00:43:11,680  
many of them are there and give us that

1209  
00:43:15,589 --> 00:43:13,839  
information back as a demonstration of

1210  
00:43:17,910 --> 00:43:15,599  
the kind of thing we could do as we're

1211  
00:43:19,829 --> 00:43:17,920  
exploring moon in artemis

1212  
00:43:22,150 --> 00:43:19,839  
and then they need to once they find

1213  
00:43:24,710 --> 00:43:22,160

that core they need to find and collect

1214

00:43:26,710 --> 00:43:24,720

water also how does that work right so

1215

00:43:28,150 --> 00:43:26,720

the other half of this is getting to

1216

00:43:30,069 --> 00:43:28,160

that ice that's at the bottom of the

1217

00:43:31,990 --> 00:43:30,079

cooler and processing that in some

1218

00:43:34,230 --> 00:43:32,000

fashion into water they can deliver to

1219

00:43:35,510 --> 00:43:34,240

us so they know there's ice there

1220

00:43:37,349 --> 00:43:35,520

they've designed their systems to

1221

00:43:38,950 --> 00:43:37,359

acquire it but they also have to design

1222

00:43:40,790 --> 00:43:38,960

these systems such that they have

1223

00:43:43,430 --> 00:43:40,800

forward application to future missions

1224

00:43:45,430 --> 00:43:43,440

we would do on the moon and on mars in

1225

00:43:46,790 --> 00:43:45,440

order to be something we can use someday

1226

00:43:49,349 --> 00:43:46,800

in a real mission

1227

00:43:51,510 --> 00:43:49,359

and then after all of that chris

1228

00:43:53,430 --> 00:43:51,520

how does a team win the moon to mars ice

1229

00:43:55,190 --> 00:43:53,440

and prospecting challenge okay a big

1230

00:43:56,710 --> 00:43:55,200

part of it is how much water can you

1231

00:43:58,230 --> 00:43:56,720

deliver to us you get a lot of points

1232

00:44:00,790 --> 00:43:58,240

for showing up with a lot of water that

1233

00:44:03,190 --> 00:44:00,800

you can use but beyond that the quality

1234

00:44:04,790 --> 00:44:03,200

of that digital core did you understand

1235

00:44:06,630 --> 00:44:04,800

the layers you went through we give you

1236

00:44:08,470 --> 00:44:06,640

points for that the teams have also

1237

00:44:10,230 --> 00:44:08,480

written technical papers that explain

1238

00:44:13,109 --> 00:44:10,240

not just how their concept works here

1239

00:44:14,790 --> 00:44:13,119

for the earth demonstration but also how

1240

00:44:16,630 --> 00:44:14,800

it would be adjusted to work on the moon

1241

00:44:18,309 --> 00:44:16,640

and on mars what's the path to flight so

1242

00:44:20,470 --> 00:44:18,319

that we at nasa could potentially take

1243

00:44:21,990 --> 00:44:20,480

advantage of this and all of the points

1244

00:44:23,670 --> 00:44:22,000

for that come together to determine

1245

00:44:25,349 --> 00:44:23,680

who's going to be the winning team

1246

00:44:27,270 --> 00:44:25,359

and speaking of taking advantage of it

1247

00:44:28,550 --> 00:44:27,280

what's on the line here and what can

1248

00:44:30,710 --> 00:44:28,560

students win

1249

00:44:34,309 --> 00:44:30,720

so among the things that are on the line

1250

00:44:35,990 --> 00:44:34,319

here is uh the glory of doing this but

1251

00:44:37,670 --> 00:44:36,000

more realistically and maybe of more

1252

00:44:39,270 --> 00:44:37,680

interest to the students here we have a

1253

00:44:40,950 --> 00:44:39,280

ten thousand dollar prize pool that the

1254

00:44:42,230 --> 00:44:40,960

judges will determine how to distribute

1255

00:44:43,910 --> 00:44:42,240

among the teams

1256

00:44:45,589 --> 00:44:43,920

in past years we've used that as a

1257

00:44:47,829 --> 00:44:45,599

travel stipend to attend the space

1258

00:44:49,109 --> 00:44:47,839

resources roundtable but it could also

1259

00:44:51,270 --> 00:44:49,119

be used for any number of other

1260

00:44:53,430 --> 00:44:51,280

opportunities for the students to go and

1261

00:44:55,750 --> 00:44:53,440

present their ideas to a broader

1262

00:44:57,829 --> 00:44:55,760

audience and in addition they get the

1263

00:45:00,150 --> 00:44:57,839

opportunity to provide these really cool

1264

00:45:01,990 --> 00:45:00,160

ideas to us here at nasa for us to

1265

00:45:03,910 --> 00:45:02,000

hopefully someday build and fly very

1266

00:45:05,829 --> 00:45:03,920

cool so we've got some questions coming

1267

00:45:08,870 --> 00:45:05,839

in from the hashtag ask nasa for you

1268

00:45:11,510 --> 00:45:08,880

chris so our first question is

1269

00:45:13,750 --> 00:45:11,520

from a youtube user and they're asking

1270

00:45:16,550 --> 00:45:13,760

what are a few things that might differ

1271

00:45:19,190 --> 00:45:16,560

in experimenting on the moon and mars

1272

00:45:22,069 --> 00:45:19,200

okay uh the two definitely are different

1273

00:45:23,589 --> 00:45:22,079

environments both of them are much lower

1274

00:45:24,790 --> 00:45:23,599

gravity than we have here on earth so

1275

00:45:26,870 --> 00:45:24,800

teams would have to understand how to

1276

00:45:29,190 --> 00:45:26,880

deal with that on the moon there's a

1277

00:45:30,630 --> 00:45:29,200

vacuum which means that there is no air

1278

00:45:33,430 --> 00:45:30,640

surrounding them at all and that's going

1279

00:45:35,990 --> 00:45:33,440

to significantly impact the ability of a

1280

00:45:38,790 --> 00:45:36,000

system to use certain kinds of pressure

1281

00:45:40,470 --> 00:45:38,800

in order to acquire the resources

1282

00:45:42,710 --> 00:45:40,480

in both locations they have to deal with

1283

00:45:45,270 --> 00:45:42,720

dust but the way the dust behaves

1284

00:45:47,349 --> 00:45:45,280

differs on the moon and on mars

1285

00:45:49,349 --> 00:45:47,359

in addition the ways in which we might

1286

00:45:51,270 --> 00:45:49,359

find ice are going to vary between those

1287

00:45:52,870 --> 00:45:51,280

two on the moon we're probably going to

1288

00:45:54,630 --> 00:45:52,880

find that in a permanently shadowed

1289

00:45:56,950 --> 00:45:54,640

region which means we have to operate in

1290

00:45:59,109 --> 00:45:56,960

cold and in darkness on mars we're

1291

00:46:01,430 --> 00:45:59,119

hoping we can find it in much more

1292

00:46:04,230 --> 00:46:01,440

accessible locations

1293

00:46:06,630 --> 00:46:04,240

and so savant day silva on twitter uh

1294

00:46:08,710 --> 00:46:06,640

excuse me on youtube asks what's the

1295

00:46:12,069 --> 00:46:08,720

sole purpose of extracting water from

1296

00:46:14,390 --> 00:46:12,079

the moon ooh on the moon so i think one

1297

00:46:16,950 --> 00:46:14,400

of the biggest reasons to extract water

1298

00:46:19,109 --> 00:46:16,960

on the moon is it's a chance to make up

1299

00:46:21,190 --> 00:46:19,119

not just the life support goods that

1300

00:46:23,589 --> 00:46:21,200

astronauts would need things like water

1301

00:46:25,589 --> 00:46:23,599

or breathable oxygen but it's also a way

1302

00:46:27,589 --> 00:46:25,599

to get the propellant they would use in

1303

00:46:29,750 --> 00:46:27,599

the course of doing missions leaving the

1304

00:46:31,430 --> 00:46:29,760

lunar surface and going back to earth

1305

00:46:32,710 --> 00:46:31,440

orbit one of the things i've actually

1306

00:46:35,109 --> 00:46:32,720

looked at and worked with a number of

1307

00:46:37,910 --> 00:46:35,119

folks on is when and where is the best

1308

00:46:39,750 --> 00:46:37,920

location to use lunar isru where is it

1309

00:46:41,750 --> 00:46:39,760

best to use that lunar water to support

1310

00:46:43,190 --> 00:46:41,760

exploration and the answer is there's a

1311

00:46:45,349 --> 00:46:43,200

lot of possibilities there for how it

1312

00:46:47,270 --> 00:46:45,359

can really benefit us okay cool so we

1313

00:46:49,990 --> 00:46:47,280

have another question from twitter this

1314

00:46:52,390 --> 00:46:50,000

time and amber wants to know due to the

1315

00:46:54,710 --> 00:46:52,400

freezing temperatures on mars how will

1316

00:46:56,470 --> 00:46:54,720

you keep the water from re-freezing

1317

00:46:58,390 --> 00:46:56,480

after it's been extracted it's an

1318

00:47:00,069 --> 00:46:58,400

interesting challenge and it's not the

1319

00:47:02,230 --> 00:47:00,079

only challenge we have with managing the

1320

00:47:03,750 --> 00:47:02,240

water because of the low pressure there

1321

00:47:06,870 --> 00:47:03,760

water is also at risk of turning

1322

00:47:08,309 --> 00:47:06,880

directly from ice into a gas which means

1323

00:47:10,309 --> 00:47:08,319

that we can't even capture it as a

1324

00:47:12,230 --> 00:47:10,319

liquid some of the teams here are

1325

00:47:14,790 --> 00:47:12,240

looking at using and taking advantage of

1326  
00:47:16,710 --> 00:47:14,800  
that but often it's a balance of keeping

1327  
00:47:19,109 --> 00:47:16,720  
it warm enough keeping it pressurized

1328  
00:47:20,230 --> 00:47:19,119  
enough with additional systems in order

1329  
00:47:22,390 --> 00:47:20,240  
to make sure

1330  
00:47:24,790 --> 00:47:22,400  
that we can keep it in a usable state

1331  
00:47:26,870 --> 00:47:24,800  
for future missions cool and chris fair

1332  
00:47:28,470 --> 00:47:26,880  
on facebook asks if you do find

1333  
00:47:30,549 --> 00:47:28,480  
launching from the moon to mars as a

1334  
00:47:32,710 --> 00:47:30,559  
viable option what would you first have

1335  
00:47:34,950 --> 00:47:32,720  
to transport to the moon to ready a

1336  
00:47:36,390 --> 00:47:34,960  
launch okay so in order to take

1337  
00:47:38,710 --> 00:47:36,400  
advantage of this we're going to need

1338  
00:47:40,390 --> 00:47:38,720

the systems that can find this ice

1339

00:47:41,910 --> 00:47:40,400

before we can ever take advantage of it

1340

00:47:43,589 --> 00:47:41,920

then the systems that can mine it

1341

00:47:45,990 --> 00:47:43,599

process it store it turn it into

1342

00:47:48,069 --> 00:47:46,000

something useful and it's going and

1343

00:47:49,750 --> 00:47:48,079

demonstrating all of these and doing the

1344

00:47:51,910 --> 00:47:49,760

science that's needed to find where it

1345

00:47:53,990 --> 00:47:51,920

is in order to turn it into something we

1346

00:47:55,750 --> 00:47:54,000

can do very cool kind of like the stuff

1347

00:47:57,910 --> 00:47:55,760

we're doing today absolutely this is a

1348

00:47:59,910 --> 00:47:57,920

great first step yes well thank you

1349

00:48:01,270 --> 00:47:59,920

chris it has been a pleasure and i know

1350

00:48:03,430 --> 00:48:01,280

you not only put this competition

1351  
00:48:04,950 --> 00:48:03,440  
together but you're also a judge so i'll

1352  
00:48:07,190 --> 00:48:04,960  
let you get back to that all right

1353  
00:48:08,710 --> 00:48:07,200  
thanks natalie all right now molly back

1354  
00:48:10,710 --> 00:48:08,720  
to you

1355  
00:48:12,549 --> 00:48:10,720  
thanks natalie as some of you all might

1356  
00:48:14,470 --> 00:48:12,559  
have seen earlier in the show i had the

1357  
00:48:16,710 --> 00:48:14,480  
amazing opportunity to sit down with

1358  
00:48:18,470 --> 00:48:16,720  
astronaut victor glover and talk about

1359  
00:48:20,069 --> 00:48:18,480  
this challenge and how it affects

1360  
00:48:22,390 --> 00:48:20,079  
astronauts like him that might be end

1361  
00:48:25,589 --> 00:48:22,400  
users of this technology today and might

1362  
00:48:27,990 --> 00:48:25,599  
also get the opportunity to walk here so

1363  
00:48:29,589 --> 00:48:28,000

let's take a little look at what victor

1364

00:48:32,549 --> 00:48:29,599

had to say

1365

00:48:34,710 --> 00:48:32,559

as we speak mass is actively preparing

1366

00:48:36,549 --> 00:48:34,720

to send humans to the moon as part of

1367

00:48:38,630 --> 00:48:36,559

the artemis program so

1368

00:48:41,510 --> 00:48:38,640

what is artemis and

1369

00:48:43,430 --> 00:48:41,520

is it essentially the next apollo

1370

00:48:45,750 --> 00:48:43,440

you know i i think that's an easy way to

1371

00:48:47,430 --> 00:48:45,760

describe it but but uh

1372

00:48:50,309 --> 00:48:47,440

it's not the next apollo it's our

1373

00:48:52,230 --> 00:48:50,319

generation's moon program it is artemis

1374

00:48:54,470 --> 00:48:52,240

uh but but if you're familiar with

1375

00:48:57,030 --> 00:48:54,480

apollo it is a similar concept we are

1376

00:48:59,270 --> 00:48:57,040

building a very large rocket sls which

1377

00:49:01,510 --> 00:48:59,280

stands for the space launch system it's

1378

00:49:03,349 --> 00:49:01,520

going to be a very powerful very big

1379

00:49:07,910 --> 00:49:03,359

rocket that's capable of getting a

1380

00:49:09,910 --> 00:49:07,920

spacecraft orion to lunar orbit uh which

1381

00:49:12,950 --> 00:49:09,920

will enable us to get humans there and

1382

00:49:14,549 --> 00:49:12,960

to a gateway uh which would be like a

1383

00:49:15,990 --> 00:49:14,559

space station that's orbiting around the

1384

00:49:19,190 --> 00:49:16,000

moon we'd be able to get humans to the

1385

00:49:21,030 --> 00:49:19,200

gateway or to a human lander system that

1386

00:49:23,030 --> 00:49:21,040

then could get human beings to the

1387

00:49:25,109 --> 00:49:23,040

surface of the moon and then one other

1388

00:49:26,630 --> 00:49:25,119

very exciting component is artemis

1389

00:49:28,309 --> 00:49:26,640

astronauts and so we're starting to

1390

00:49:30,309 --> 00:49:28,319

identify folks that are going to be a

1391

00:49:32,150 --> 00:49:30,319

part of it and we call it team artemis

1392

00:49:34,390 --> 00:49:32,160

and so we're going to start hopefully in

1393

00:49:37,030 --> 00:49:34,400

the very near future actually naming

1394

00:49:38,710 --> 00:49:37,040

folks from team artemis but also the the

1395

00:49:40,470 --> 00:49:38,720

greater astronaut office as well as our

1396

00:49:42,710 --> 00:49:40,480

international partners

1397

00:49:45,190 --> 00:49:42,720

to these missions specifically and those

1398

00:49:47,030 --> 00:49:45,200

will be the actual artemis lunar

1399

00:49:48,309 --> 00:49:47,040

astronauts that's very exciting very

1400

00:49:50,470 --> 00:49:48,319

exciting

1401

00:49:52,390 --> 00:49:50,480

how would it feel to be the next person

1402

00:49:53,910 --> 00:49:52,400

to walk on the moon what would that mean

1403

00:49:55,349 --> 00:49:53,920

to you

1404

00:49:56,870 --> 00:49:55,359

you know i

1405

00:50:00,309 --> 00:49:56,880

i really

1406

00:50:02,549 --> 00:50:00,319

i have no idea i mean i just i thought

1407

00:50:04,710 --> 00:50:02,559

going into space and living on the space

1408

00:50:07,030 --> 00:50:04,720

station was going to feel a certain way

1409

00:50:09,510 --> 00:50:07,040

and it did but also so much more than

1410

00:50:11,750 --> 00:50:09,520

that it blew away my expectations and so

1411

00:50:13,430 --> 00:50:11,760

i could only imagine

1412

00:50:15,270 --> 00:50:13,440

not even going to the surface of the

1413

00:50:17,589 --> 00:50:15,280

moon but actually

1414

00:50:19,109 --> 00:50:17,599

being in orbit around the moon like or

1415

00:50:21,510 --> 00:50:19,119

you know before you go down to the

1416

00:50:23,430 --> 00:50:21,520

surface orbiting the moon

1417

00:50:25,109 --> 00:50:23,440

and being able to just look out the

1418

00:50:26,950 --> 00:50:25,119

window and see

1419

00:50:29,270 --> 00:50:26,960

earth rise

1420

00:50:31,589 --> 00:50:29,280

i mean think about that that picture

1421

00:50:33,910 --> 00:50:31,599

that that bill anders took you know

1422

00:50:35,750 --> 00:50:33,920

changed the way people saw themselves

1423

00:50:37,670 --> 00:50:35,760

when they see our planet and so for me

1424

00:50:40,549 --> 00:50:37,680

to be able to witness that with my own

1425

00:50:42,950 --> 00:50:40,559

eyes or even to be in mission control

1426

00:50:45,270 --> 00:50:42,960

as the communicator as the capcom

1427

00:50:47,750 --> 00:50:45,280

speaking to crew members my colleagues

1428

00:50:48,549 --> 00:50:47,760

my friends while they're experiencing

1429

00:50:50,549 --> 00:50:48,559

that

1430

00:50:52,309 --> 00:50:50,559

it would be unreal and so i i really

1431

00:50:53,670 --> 00:50:52,319

couldn't tell you how it would feel but

1432

00:50:55,270 --> 00:50:53,680

i would love to go and have that

1433

00:50:58,230 --> 00:50:55,280

experience and then come back and

1434

00:51:02,390 --> 00:51:00,470

you know one of the things i love about

1435

00:51:03,829 --> 00:51:02,400

being a part of competitions like this

1436

00:51:05,670 --> 00:51:03,839

is you see

1437

00:51:08,470 --> 00:51:05,680

people come together

1438

00:51:09,910 --> 00:51:08,480

as the human race and you see all these

1439

00:51:11,750 --> 00:51:09,920

different walks of life people from

1440

00:51:13,910 --> 00:51:11,760

different backgrounds they speak

1441

00:51:16,150 --> 00:51:13,920

different languages and make cases and

1442

00:51:19,190 --> 00:51:16,160

um you really get to see this beautiful

1443

00:51:21,750 --> 00:51:19,200

picture of our world and of our planet

1444

00:51:23,430 --> 00:51:21,760

does having a view of our planet like

1445

00:51:26,470 --> 00:51:23,440

that that you've been able to have has

1446

00:51:28,870 --> 00:51:26,480

it changed your perspective on what life

1447

00:51:31,270 --> 00:51:28,880

is like here

1448

00:51:33,349 --> 00:51:31,280

you know going to to space one of the

1449

00:51:34,950 --> 00:51:33,359

things that it makes you do i believe it

1450

00:51:37,030 --> 00:51:34,960

would do this for all people is it makes

1451  
00:51:39,190 --> 00:51:37,040  
you appreciate life right there on the

1452  
00:51:41,270 --> 00:51:39,200  
surface you don't get to see you see the

1453  
00:51:42,309 --> 00:51:41,280  
entire oceans you see these countries

1454  
00:51:44,069 --> 00:51:42,319  
without

1455  
00:51:46,630 --> 00:51:44,079  
borders you see entire continents you

1456  
00:51:48,710 --> 00:51:46,640  
it's amazing that perspective doing any

1457  
00:51:50,630 --> 00:51:48,720  
of these amazing science and technology

1458  
00:51:53,670 --> 00:51:50,640  
things like living in space putting

1459  
00:51:56,470 --> 00:51:53,680  
humans in space requires us to do our

1460  
00:51:58,470 --> 00:51:56,480  
best in just about every science and

1461  
00:52:00,870 --> 00:51:58,480  
technology endeavor that we've had life

1462  
00:52:02,549 --> 00:52:00,880  
support medical health radiation

1463  
00:52:04,790 --> 00:52:02,559

protection water reclamation waste

1464

00:52:07,109 --> 00:52:04,800

management and and all of those things

1465

00:52:09,910 --> 00:52:07,119

drive us to be our best selves and they

1466

00:52:11,829 --> 00:52:09,920

remind us that we need the best from

1467

00:52:13,589 --> 00:52:11,839

everyone and that's what's great about

1468

00:52:15,750 --> 00:52:13,599

these competitions seeing these students

1469

00:52:17,990 --> 00:52:15,760

from all over the country from all these

1470

00:52:19,990 --> 00:52:18,000

universities especially my alma mater

1471

00:52:21,270 --> 00:52:20,000

cal poly go mustangs learn by doing for

1472

00:52:23,349 --> 00:52:21,280

the bad news

1473

00:52:24,710 --> 00:52:23,359

i think you do i just got comfortable

1474

00:52:26,630 --> 00:52:24,720

over here unfortunately we're out of

1475

00:52:28,790 --> 00:52:26,640

time but i tell you what we have seen

1476  
00:52:30,470 --> 00:52:28,800  
some really amazing prototypes today

1477  
00:52:32,790 --> 00:52:30,480  
i've seen designs i've never seen here

1478  
00:52:34,309 --> 00:52:32,800  
before covering this competition so i

1479  
00:52:36,230 --> 00:52:34,319  
truly believe we've heard it over and

1480  
00:52:38,549 --> 00:52:36,240  
over again today that the technology

1481  
00:52:41,030 --> 00:52:38,559  
that's being developed today will really

1482  
00:52:42,710 --> 00:52:41,040  
help us advance exploration as a whole

1483  
00:52:44,710 --> 00:52:42,720  
in space as we start to pursue other

1484  
00:52:46,150 --> 00:52:44,720  
worlds like mars and of course the moon

1485  
00:52:47,750 --> 00:52:46,160  
yes and it's really going to be these

1486  
00:52:49,109 --> 00:52:47,760  
students ideas and the ideas of the

1487  
00:52:50,710 --> 00:52:49,119  
future that are going to help us take

1488  
00:52:53,190 --> 00:52:50,720

that next giant leap and i'm very

1489

00:52:54,470 --> 00:52:53,200

excited and i want more people to get

1490

00:52:56,630 --> 00:52:54,480

involved and i think people are

1491

00:52:57,990 --> 00:52:56,640

wondering how they can do that so if you

1492

00:53:00,390 --> 00:52:58,000

want to get involved and you're curious

1493

00:53:03,430 --> 00:53:00,400

about more challenges like this you can

1494

00:53:06,710 --> 00:53:03,440

subscribe to the nasa express newsletter

1495

00:53:08,630 --> 00:53:06,720

at nasa.gov [backslash](#) stem [backslash](#)

1496

00:53:12,150 --> 00:53:08,640

express and if you want to learn more

1497

00:53:15,430 --> 00:53:12,160

about our very exciting artemis program

1498

00:53:17,589 --> 00:53:15,440

visit nasa.gov [backslash](#) artemis

1499

00:53:20,309 --> 00:53:17,599

all right well thank you for joining us

1500

00:53:22,309 --> 00:53:20,319

today on nasa science live i'm natalie

1501

00:53:24,870 --> 00:53:22,319

joseph and i'm molly mckinney and we'll

1502

00:53:49,530 --> 00:53:24,880

see you next time thank you bye