



SPACESTATION
LIVE

1
00:00:11,400 --> 00:00:08,580
crews onboard the International Space

2
00:00:14,010 --> 00:00:11,410
Station work on science experiments as

3
00:00:16,289 --> 00:00:14,020
the crews doing today also maintenance

4
00:00:18,779 --> 00:00:16,299
and upkeep of the station and it's

5
00:00:21,890 --> 00:00:18,789
hardware they also work on a lot of

6
00:00:24,540 --> 00:00:21,900
educational competitions or challenges

7
00:00:27,089 --> 00:00:24,550
there's one of those that's underway now

8
00:00:30,210 --> 00:00:27,099
that combines thinking out of the box

9
00:00:32,730 --> 00:00:30,220
with a new 3d printer that's on the

10
00:00:33,600 --> 00:00:32,740
station my colleague NASA commentator

11
00:00:35,910 --> 00:00:33,610
Lori Meggs

12
00:00:37,200 --> 00:00:35,920
is at the payload operations integration

13
00:00:39,720 --> 00:00:37,210

Center at the Marshall Space Flight

14

00:00:42,420 --> 00:00:39,730

Center in Huntsville Alabama with some

15

00:00:48,810 --> 00:00:42,430

special guests to talk about 3d printing

16

00:00:51,390 --> 00:00:48,820

for future exploration it is an exciting

17

00:00:53,850 --> 00:00:51,400

day here because we have the future

18

00:00:56,520 --> 00:00:53,860

engineers told challenge winner

19

00:00:58,710 --> 00:00:56,530

RJ Helen he created and he designed a

20

00:01:00,510 --> 00:00:58,720

tool that could be created to use in

21

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

space for future exploration and he's

22

00:01:05,009 --> 00:01:02,530

here with us today because as you said

23

00:01:06,899 --> 00:01:05,019

an exciting day he gets to speak to tim

24

00:01:09,179 --> 00:01:06,909

kopra and jeff williams on the

25

00:01:11,249 --> 00:01:09,189

International Space Station in just a

26

00:01:13,590 --> 00:01:11,259

couple of hours and you know kind of

27

00:01:15,330 --> 00:01:13,600

chatted up about his design and and then

28

00:01:16,770 --> 00:01:15,340

they just recently printed that so you

29

00:01:19,529 --> 00:01:16,780

can find out what they think about it

30

00:01:20,760 --> 00:01:19,539

what's this day mean to you RJ it's a

31

00:01:22,440 --> 00:01:20,770

really exciting day it's an opportunity

32

00:01:24,300 --> 00:01:22,450

for me to do what I've always wanted to

33

00:01:26,609 --> 00:01:24,310

do which is to get involved with space

34

00:01:28,559 --> 00:01:26,619

exploration and really create new and

35

00:01:30,569 --> 00:01:28,569

exciting things that can be used up off

36

00:01:33,389 --> 00:01:30,579

earth what's the number one question you

37

00:01:36,800 --> 00:01:33,399

want to ask them probably what they

38

00:01:39,929 --> 00:01:36,810

think the future of 3d printing will

39

00:01:42,980 --> 00:01:39,939

bring for Space Exploration what do you

40

00:01:46,230 --> 00:01:42,990

think that is I think it's gonna be

41

00:01:47,520 --> 00:01:46,240

really create on demand and maybe make

42

00:01:51,029 --> 00:01:47,530

things that many people don't really

43

00:01:53,129 --> 00:01:51,039

think that will be necessary in space so

44

00:01:56,130 --> 00:01:53,139

let's back up a little bit just a bit

45

00:01:57,899 --> 00:01:56,140

you were a senior in high school

46

00:02:00,210 --> 00:01:57,909

and how did you learn about the future

47

00:02:02,700 --> 00:02:00,220

engineers space tools challenge and why

48

00:02:04,890 --> 00:02:02,710

did you want to participate well I

49

00:02:06,120 --> 00:02:04,900

actually learned about the competition

50

00:02:06,600 --> 00:02:06,130

through an ad that I found on the

51
00:02:08,609 --> 00:02:06,610
Internet

52
00:02:10,020 --> 00:02:08,619
I just was browsing through I think it

53
00:02:11,940 --> 00:02:10,030
was like nasa.gov because I saw some new

54
00:02:13,830 --> 00:02:11,950
article and then I found the ad I

55
00:02:15,930 --> 00:02:13,840
clicked on it and I read through it

56
00:02:17,910 --> 00:02:15,940
after realizing that it was an actual

57
00:02:19,530 --> 00:02:17,920
competition I wanted to protect

58
00:02:21,690 --> 00:02:19,540
participate and I mean I've always been

59
00:02:23,280 --> 00:02:21,700
interested in space exploration so it

60
00:02:25,440 --> 00:02:23,290
gave me an opportunity to really kinda

61
00:02:28,320 --> 00:02:25,450
like put forth my knowledge and test

62
00:02:30,870 --> 00:02:28,330
myself out so high school a senior

63
00:02:32,430 --> 00:02:30,880

Enterprise high school what your friends

64

00:02:33,690 --> 00:02:32,440

think when or what did you think I guess

65

00:02:36,630 --> 00:02:33,700

first of all when you learned that you

66

00:02:38,610 --> 00:02:36,640

had won I was really excited I mean I

67

00:02:41,009 --> 00:02:38,620

knew that that meant that you know my

68

00:02:42,990 --> 00:02:41,019

design got to be put up into space so it

69

00:02:44,880 --> 00:02:43,000

was it was really exciting kind of just

70

00:02:46,710 --> 00:02:44,890

solidified that I knew what I was

71

00:02:47,970 --> 00:02:46,720

talking about just a couple of tweets

72

00:02:51,690 --> 00:02:47,980

and a couple of Facebook posts right

73

00:02:53,580 --> 00:02:51,700

yeah just feel so tell me now you've to

74

00:02:55,350 --> 00:02:53,590

tell us what the tool is I guess you

75

00:02:57,150 --> 00:02:55,360

should talk a little bit more about so

76

00:02:59,490 --> 00:02:57,160

the tool is called the multi-purpose

77

00:03:01,500 --> 00:02:59,500

brushes and maintenance tool RM PMT and

78

00:03:03,479 --> 00:03:01,510

it's basically like a small little block

79

00:03:04,680 --> 00:03:03,489

that has a variety of different tools

80

00:03:06,990 --> 00:03:04,690

that astronauts could use on board

81

00:03:08,789 --> 00:03:07,000

station all right and I think this

82

00:03:10,920 --> 00:03:08,799

challenge is really from what I

83

00:03:13,650 --> 00:03:10,930

understand kind of changed your life

84

00:03:16,560 --> 00:03:13,660

I'm yes it's changed my actual career

85

00:03:19,020 --> 00:03:16,570

path drastically I've managed to meet so

86

00:03:21,449 --> 00:03:19,030

many people I'm CEOs dark-dark apart

87

00:03:23,220 --> 00:03:21,459

from the rocket center I got to meet the

88

00:03:25,560 --> 00:03:23,230

director of Marshall and a variety of

89

00:03:27,600 --> 00:03:25,570

astronauts so it's it's really changed

90

00:03:30,270 --> 00:03:27,610

my career path from really focusing on

91

00:03:32,370 --> 00:03:30,280

being a sole engineer to trying to look

92

00:03:33,730 --> 00:03:32,380

at different opportunity and business

93

00:03:35,770 --> 00:03:33,740

side of things

94

00:03:37,360 --> 00:03:35,780

engineer and businessman I like that

95

00:03:38,530 --> 00:03:37,370

well and and then we're so glad you

96

00:03:39,640 --> 00:03:38,540

could be with us today and you get to

97

00:03:41,380 --> 00:03:39,650

talk to the crew okay we're going to

98

00:03:43,600 --> 00:03:41,390

talk to the crew that's cool RJ let's

99

00:03:45,280 --> 00:03:43,610

bring in Niki Werkheiser now she is the

100

00:03:47,710 --> 00:03:45,290

in space manufacturing project manager

101
00:03:50,200 --> 00:03:47,720
for NASA here at Marshall and Nikki what

102
00:03:52,300 --> 00:03:50,210
do challenges like this really mean to

103
00:03:53,830 --> 00:03:52,310
NASA they they mean a great deal as a

104
00:03:55,660 --> 00:03:53,840
matter of fact our in space

105
00:03:57,850 --> 00:03:55,670
manufacturing project is actually under

106
00:03:59,530 --> 00:03:57,860
NASA's advanced exploration systems and

107
00:04:01,690 --> 00:03:59,540
so the whole goal of our projects really

108
00:04:03,040 --> 00:04:01,700
is to develop the technologies that

109
00:04:05,500 --> 00:04:03,050
we're going to need to travel to

110
00:04:06,940 --> 00:04:05,510
destinations such as Mars and these are

111
00:04:07,870 --> 00:04:06,950
quite different missions than what we

112
00:04:09,850 --> 00:04:07,880
experienced today on Space Station

113
00:04:11,260 --> 00:04:09,860

you're talking about sometimes up to a

114

00:04:13,420 --> 00:04:11,270

three-year mission so it's quite a

115

00:04:15,430 --> 00:04:13,430

paradigm shift the exciting part about

116

00:04:18,460 --> 00:04:15,440

in space manufacturing is that we can

117

00:04:21,520 --> 00:04:18,470

really adapt and leverage the rapid

118

00:04:23,110 --> 00:04:21,530

involvement of evolution of additive

119

00:04:24,970 --> 00:04:23,120

manufacturing technologies commercially

120

00:04:28,120 --> 00:04:24,980

on the ground and really adapt them for

121

00:04:30,400 --> 00:04:28,130

our in space needs the form-fitting

122

00:04:32,650 --> 00:04:30,410

function that we need however as

123

00:04:35,350 --> 00:04:32,660

important as the technologies are the

124

00:04:38,230 --> 00:04:35,360

skill sets that we need to design and

125

00:04:39,970 --> 00:04:38,240

build these parts is most important so

126
00:04:41,440 --> 00:04:39,980
from the inception of the project we

127
00:04:43,150 --> 00:04:41,450
really knew and understood that we

128
00:04:45,610 --> 00:04:43,160
needed to help develop these skill sets

129
00:04:47,950 --> 00:04:45,620
and what a more exciting area than in

130
00:04:49,930 --> 00:04:47,960
space manufacturing to do that with so

131
00:04:52,330 --> 00:04:49,940
we started through the American Society

132
00:04:53,950 --> 00:04:52,340
of Mechanical Engineers this new STEM

133
00:04:56,140 --> 00:04:53,960
program through a Space Act agreement

134
00:04:59,260 --> 00:04:56,150
with NASA through advanced exploration

135
00:05:01,930 --> 00:04:59,270
systems office to to really excite

136
00:05:04,360 --> 00:05:01,940
students today to design parts that we

137
00:05:05,320 --> 00:05:04,370
can use in space I'm very thrilled to

138
00:05:07,360 --> 00:05:05,330

say we're actually on our fourth

139

00:05:09,790 --> 00:05:07,370

challenge and RJ was our first teen

140

00:05:11,980 --> 00:05:09,800

winner and we have all kinds of exciting

141

00:05:14,470 --> 00:05:11,990

prizes but really to spark the

142

00:05:16,150 --> 00:05:14,480

creativity that's already there in our

143

00:05:18,580 --> 00:05:16,160

students and show that there's a viable

144

00:05:20,170 --> 00:05:18,590

career path in this area and what I

145

00:05:22,390 --> 00:05:20,180

really love is that in STEM a lot of

146

00:05:24,480 --> 00:05:22,400

times we target your math and science

147

00:05:27,040 --> 00:05:24,490

students that already kind of have a

148

00:05:29,110 --> 00:05:27,050

affinity for those subjects but this is

149

00:05:30,730 --> 00:05:29,120

in a creative process so so many times

150

00:05:32,110 --> 00:05:30,740

I'll be working with students and will

151
00:05:33,460 --> 00:05:32,120
be designing apart and I'll say you know

152
00:05:35,050 --> 00:05:33,470
what you just did you just did

153
00:05:37,330 --> 00:05:35,060
engineering and the light bulb will go

154
00:05:38,500 --> 00:05:37,340
off and they'll say no I couldn't do

155
00:05:40,510 --> 00:05:38,510
that I'm not really good at math or

156
00:05:42,280 --> 00:05:40,520
science and we say you did engineering

157
00:05:43,719 --> 00:05:42,290
as a state of mind it's not a degree on

158
00:05:44,890 --> 00:05:43,729
a wall and that's what we want to

159
00:05:46,800 --> 00:05:44,900
develop in this hole in

160
00:05:49,240 --> 00:05:46,810
three that's gonna help NASA get to Mars

161
00:05:52,090 --> 00:05:49,250
I'm really too old to go to Mars

162
00:05:53,830 --> 00:05:52,100
unfortunately no yeah well and this is

163
00:05:55,330 --> 00:05:53,840

the generation that will get there so we

164

00:05:57,370 --> 00:05:55,340

really want to make them feel part of

165

00:05:59,529 --> 00:05:57,380

the process today so tell us where we

166

00:06:03,790 --> 00:05:59,539

are with additive manufacturing of that

167

00:06:05,860 --> 00:06:03,800

AMF and 3d printing same thing really

168

00:06:07,330 --> 00:06:05,870

you've got two printers now on station

169

00:06:09,129 --> 00:06:07,340

tell me where we are and where we're

170

00:06:11,320 --> 00:06:09,139

going well it's going to be a very

171

00:06:12,850 --> 00:06:11,330

exciting few years we actually under the

172

00:06:15,010 --> 00:06:12,860

in-space manufacturing project have a

173

00:06:16,480 --> 00:06:15,020

phased technology development roadmap of

174

00:06:18,340 --> 00:06:16,490

all those technologies that we're going

175

00:06:20,830 --> 00:06:18,350

to leverage space station is an

176

00:06:23,110 --> 00:06:20,840

absolutely critical testbed it is the

177

00:06:25,000 --> 00:06:23,120

only laboratory crewed laboratory we

178

00:06:26,860 --> 00:06:25,010

have in microgravity to test all of this

179

00:06:29,020 --> 00:06:26,870

out and get ready for those exploration

180

00:06:30,640 --> 00:06:29,030

missions so now as you mentioned we have

181

00:06:33,760 --> 00:06:30,650

two printers we have the 3d print tech

182

00:06:34,990 --> 00:06:33,770

demo that flew September 2014 that we're

183

00:06:37,300 --> 00:06:35,000

getting ready to start our phase two of

184

00:06:39,580 --> 00:06:37,310

operations and we have the maiden space

185

00:06:41,439 --> 00:06:39,590

additive manufacturing facility and the

186

00:06:42,969 --> 00:06:41,449

really exciting thing about AMF is this

187

00:06:45,640 --> 00:06:42,979

actually a commercial printer that is

188

00:06:48,070 --> 00:06:45,650

owned and operated by maiden space Inc

189

00:06:50,589 --> 00:06:48,080

how to Silicon Valley California and and

190

00:06:52,990 --> 00:06:50,599

through the ISS National Lab in cases

191

00:06:55,659 --> 00:06:53,000

not only NASA will be using this printer

192

00:06:57,969 --> 00:06:55,669

but other entities in industry academia

193

00:07:00,580 --> 00:06:57,979

other government agencies can all print

194

00:07:02,350 --> 00:07:00,590

on space station to manufacture parts so

195

00:07:04,210 --> 00:07:02,360

not only we see the first ever student

196

00:07:06,640 --> 00:07:04,220

design part manufactured on station

197

00:07:08,830 --> 00:07:06,650

you'll see all sorts of exciting things

198

00:07:10,659 --> 00:07:08,840

on our roadmap next year we'll actually

199

00:07:13,600 --> 00:07:10,669

be launching the first-ever in space

200

00:07:15,040 --> 00:07:13,610

recycler with a company called yes it's

201
00:07:17,500 --> 00:07:15,050
really going to be the step that takes

202
00:07:19,839 --> 00:07:17,510
us to more of a closed-loop sustainable

203
00:07:20,950 --> 00:07:19,849
system more autonomy and sustainability

204
00:07:22,600 --> 00:07:20,960
during these missions that our

205
00:07:25,330 --> 00:07:22,610
astronauts are going to need that we can

206
00:07:27,279 --> 00:07:25,340
recycle the 3d 3d printed part back into

207
00:07:29,260 --> 00:07:27,289
filament and then make any new object we

208
00:07:30,580 --> 00:07:29,270
want and we're doing printable

209
00:07:32,860 --> 00:07:30,590
electronics and we're doing more

210
00:07:35,230 --> 00:07:32,870
autonomy I think you mentioned clothing

211
00:07:37,450 --> 00:07:35,240
to maybe in the future yes so there is a

212
00:07:38,379 --> 00:07:37,460
AAAS project as well that works on you

213
00:07:39,969 --> 00:07:38,389

know when you think about a three year

214

00:07:41,800 --> 00:07:39,979

mission my closet looks pretty rough

215

00:07:43,089 --> 00:07:41,810

right now so I could imagine a

216

00:07:45,070 --> 00:07:43,099

three-year mission and we have to bring

217

00:07:46,420 --> 00:07:45,080

enough clothes for everyone so one of

218

00:07:48,460 --> 00:07:46,430

the options could be to actually 3d

219

00:07:50,170 --> 00:07:48,470

print those clothes do you hear that RJ

220

00:07:53,200 --> 00:07:50,180

you need to get on that clothing thing

221

00:07:54,969 --> 00:07:53,210

now so again if you want to get involved

222

00:07:58,070 --> 00:07:54,979

if your student out there watching you

223

00:08:00,230 --> 00:07:58,080

go to future engineers org they have

224

00:08:01,550 --> 00:08:00,240

challenges going on all the time and we

225

00:08:03,439 --> 00:08:01,560

hope to see you here maybe you can be

226

00:08:05,920 --> 00:08:03,449

like RJ someday and talk to the crew

227

00:08:09,740 --> 00:08:05,930

that happens today live on NASA TV at

228

00:08:11,480 --> 00:08:09,750

12:30 Central Time and I might have a

229

00:08:13,490 --> 00:08:11,490

few questions that you can ask him RJ

230

00:08:15,020 --> 00:08:13,500

nah he's got his own they'll do it for

231

00:08:16,790 --> 00:08:15,030

us here from the payload operations