1
00:00:00,179 --> 00:00:02,999
Good afternoon and welcome to NASA Glenn

2
00:00:03,000 --> 00:00:05,159
Research Center's Plum Brook station in

3
00:00:05,160 --> 00:00:08,009
Sandusky, Ohio. I'm Nikki Welch and I'm

4
00:00:08,010 --> 00:00:10,409
at our Space Environments complex.

5
00:00:10,410 --> 00:00:12,209
This complex houses the world's largest

6
00:00:12,210 --> 00:00:14,369
and most powerful space environment

7
00:00:14,370 --> 00:00:16,799
simulation facilities and it's where we

8
00:00:16,800 --> 00:00:18,569
subject spacecraft to the rigorous

9
00:00:18,570 --> 00:00:20,639
conditions of launch and the vacuum

10
00:00:20,640 --> 00:00:22,288
conditions and extreme temperatures of

11
00:00:22,289 --> 00:00:24,358
space. Today we're going inside our

12
00:00:24,359 --> 00:00:26,639
Reverberant Acoustic Test Facility.

13
00:00:26,640 --> 00:00:28,919

This place takes noise and vibration to

14
00:00:28,920 --> 00:00:30,959
a new level. It's the world's most

15
00:00:30,960 --> 00:00:33,569
powerful acoustic test chamber and we're

16
00:00:33,570 --> 00:00:34,769
going in for a closer look

17
00:00:34,770 --> 00:00:36,569
as engineers prepare to test a

18
00:00:36,570 --> 00:00:38,729
full-scale test version of the Orion

19
00:00:38,730 --> 00:00:41,308
spacecraft crew module right behind us.

20
00:00:41,309 --> 00:00:43,259
So we're gonna go in and take a look at

21
00:00:43,260 --> 00:00:46,319
that. As always we have NASA experts

22
00:00:46,320 --> 00:00:48,119
ready to answer your questions so go

23
00:00:48,120 --> 00:00:49,558
ahead and start sending those in in the

24
00:00:49,559 --> 00:00:51,448
comment section and we will answer them

25
00:00:51,449 --> 00:00:51,898
for you

26
00:00:51,899 --> 00:00:53,878
throughout today's show. To get us

27
00:00:53,879 --> 00:00:55,109
started with our look around this

28
00:00:55,110 --> 00:00:56,549
facility and tell us more about the

29
00:00:56,550 --> 00:00:58,828
tests and Orion, I'd like to introduce the

30
00:00:58,829 --> 00:01:00,749
test project manager Ms. Nicole Smith

31
00:01:00,750 --> 00:01:04,798
hi Nicole. To get us started tell us

32
00:01:04,799 --> 00:01:06,959
more about the facility, the reverberant

33
00:01:06,960 --> 00:01:08,728
acoustic test facility, what does it do

34
00:01:08,729 --> 00:01:11,969
and how does it work? so welcome to the

35
00:01:11,970 --> 00:01:13,889
Space Environments Complex which is the

36
00:01:13,890 --> 00:01:15,658
world's largest space simulation

37
00:01:15,659 --> 00:01:18,419
facility specifically today we're gonna

38
00:01:18,420 --> 00:01:20,129

be talking a little bit about the

39
00:01:20,130 --> 00:01:22,529
world's most powerful acoustic chamber

40
00:01:22,530 --> 00:01:24,569
of its size which is right behind us

41
00:01:24,570 --> 00:01:27,419
also known as the RATF for reverberant

42
00:01:27,420 --> 00:01:30,599
acoustic test facility. There are 36

43
00:01:30,600 --> 00:01:32,789
horns that we use you can see them all

44
00:01:32,790 --> 00:01:35,489
on the one wall to generate sound to be

45
00:01:35,490 --> 00:01:37,709
able to perform dynamic vibration

46
00:01:37,710 --> 00:01:40,559
testing on a spacecraft just like the

47
00:01:40,560 --> 00:01:43,109
Ascent Abort-2 crew module that you see

48
00:01:43,110 --> 00:01:45,629
right behind me. We can test all the way

49
00:01:45,630 --> 00:01:47,819
up to one hundred and sixty-three decibels

50
00:01:47,820 --> 00:01:50,879
in this chamber, which just for a little

51
00:01:50,880 --> 00:01:53,279
perspective if you stood behind a jet

52
00:01:53,280 --> 00:01:55,019
engine while it was running that's about

53
00:01:55,020 --> 00:01:57,269
a hundred and forty-five decibels . So

54
00:01:57,270 --> 00:01:59,548
this is actually ten times the amount of

55
00:01:59,549 --> 00:02:03,239
sound that we can produce here. OK, so

56
00:02:03,240 --> 00:02:05,849
we get this question a lot, why do we

57
00:02:05,850 --> 00:02:07,679
need to perform acoustic tests on

58
00:02:07,680 --> 00:02:09,529
spacecraft or spaceflight hardware?

59
00:02:09,530 --> 00:02:12,389
That's a great question, yeah so what

60
00:02:12,390 --> 00:02:13,209
we're simulating

61
00:02:13,210 --> 00:02:15,669
here in the acoustic test facility

62
00:02:15,670 --> 00:02:18,429
is the very dynamic vibrations that a

63
00:02:18,430 --> 00:02:20,979

spacecraft will see during launch and

64
00:02:20,980 --> 00:02:23,889
ascent. As the spacecraft accelerates

65
00:02:23,890 --> 00:02:25,959
up through the atmosphere you have all

66
00:02:25,960 --> 00:02:27,789
these aerodynamic forces that are

67
00:02:27,790 --> 00:02:29,109
beating on it and it gets very

68
00:02:29,110 --> 00:02:31,419
vibrational and so we want to make sure

69
00:02:31,420 --> 00:02:34,329
that this spacecraft can survive those

70
00:02:34,330 --> 00:02:38,829
loads. Obviously it would be way too loud

71
00:02:38,830 --> 00:02:40,659
for us to be anywhere near here when

72
00:02:40,660 --> 00:02:42,819
it's, on you talked about 163 decibel so

73
00:02:42,820 --> 00:02:44,439
how do you get data? Where you do you

74
00:02:44,440 --> 00:02:46,569
observe the tests? That's a great

75
00:02:46,570 --> 00:02:48,549
question, so of course we have to close

76
00:02:48,550 --> 00:02:50,349
this facility off because we try to

77
00:02:50,350 --> 00:02:52,539
reflect as much of the sound as possible.

78
00:02:52,540 --> 00:02:54,519
We can't even stand here where we're

79
00:02:54,520 --> 00:02:56,379
standing while this chamber is running

80
00:02:56,380 --> 00:02:57,609
because it's a hundred and forty

81
00:02:57,610 --> 00:03:00,009
decibels so it's way too loud for us to

82
00:03:00,010 --> 00:03:01,779
even be here but if you turn around and

83
00:03:01,780 --> 00:03:03,759
look you can see some cables that are

84
00:03:03,760 --> 00:03:05,889
running in there those all go to our

85
00:03:05,890 --> 00:03:08,799
data systems so we have microphones that

86
00:03:08,800 --> 00:03:11,499
we use to control the decibel level of

87
00:03:11,500 --> 00:03:14,199
the chamber and then the test customers

88
00:03:14,200 --> 00:03:16,419

will read all of their instrumentation

89
00:03:16,420 --> 00:03:18,789
take all the data and then after the

90
00:03:18,790 --> 00:03:20,739
tests they'll be able to take a look at

91
00:03:20,740 --> 00:03:22,359
it and make sure that everything went as

92
00:03:22,360 --> 00:03:24,609
planned . Our control room is several

93
00:03:24,610 --> 00:03:26,829
hundred feet outside of this facility

94
00:03:26,830 --> 00:03:29,709
and yeah we can definitely hear and feel

95
00:03:29,710 --> 00:03:31,239
this in there and I can definitely hear

96
00:03:31,240 --> 00:03:33,099
and feel this thing in my office even so

97
00:03:33,100 --> 00:03:35,919
it really rocks and rolls. Before

98
00:03:35,920 --> 00:03:37,719
we move on to talk about the specifics

99
00:03:37,720 --> 00:03:38,919
of the test that you're getting ready to

100
00:03:38,920 --> 00:03:41,259
prepare here I want to talk a little bit

101
00:03:41,260 --> 00:03:42,969
more about the Orion spacecraft for some

102
00:03:42,970 --> 00:03:44,199
of our viewers who may not be familiar

103
00:03:44,200 --> 00:03:46,239
with the program can you just tell us an

104
00:03:46,240 --> 00:03:47,559
overview of the spacecraft and its

105
00:03:47,560 --> 00:03:51,069
mission? Yeah, so the Orion is the next

106
00:03:51,070 --> 00:03:53,709
crew vehicle to go beyond Earth orbit so

107
00:03:53,710 --> 00:03:55,929
our missions are to the Moon and then

108
00:03:55,930 --> 00:03:59,979
eventually to Mars so there are

109
00:03:59,980 --> 00:04:01,989
three main parts of the spacecraft so

110
00:04:01,990 --> 00:04:03,789
there's the crew module as you see here

111
00:04:03,790 --> 00:04:05,079
which is where the astronauts will be

112
00:04:05,080 --> 00:04:07,629
the crew. There's a service module which

113
00:04:07,630 --> 00:04:09,969

provides services to keep the crew alive

114
00:04:09,970 --> 00:04:12,099
and to drive the spacecraft, so like

115
00:04:12,100 --> 00:04:14,889
power systems, thermal control systems

116
00:04:14,890 --> 00:04:17,079
and the main engine. And then there's the

117
00:04:17,080 --> 00:04:19,749
launch abort system which is to get the

118
00:04:19,750 --> 00:04:21,849
crew module away from the rocket in case

119
00:04:21,850 --> 00:04:23,589
something bad happens during launch an

120
00:04:23,590 --> 00:04:24,218
ascent.

121
00:04:24,219 --> 00:04:26,688
Speaking of that let's talk more

122
00:04:26,689 --> 00:04:29,119
about what's installed here. This is a

123
00:04:29,120 --> 00:04:31,309
test version but can you tell us more

124
00:04:31,310 --> 00:04:32,388
about it and the test that you're

125
00:04:32,389 --> 00:04:35,388
preparing to conduct? So this is the crew

126
00:04:35,389 --> 00:04:38,299
module for the ascent abort, or AA-2

127
00:04:38,300 --> 00:04:40,609
flight test, which is going to happen

128
00:04:40,610 --> 00:04:43,399
down at the Cape next April. This crew

129
00:04:43,400 --> 00:04:45,918
module structurally is very similar to

130
00:04:45,919 --> 00:04:48,528
the actual crew module that people will

131
00:04:48,529 --> 00:04:51,258
eventually fly in, but it has very test

132
00:04:51,259 --> 00:04:53,658
specific hardware in it like avionics

133
00:04:53,659 --> 00:04:55,848
and power systems and the data systems

134
00:04:55,849 --> 00:04:58,459
are all specific to this test. So we're

135
00:04:58,460 --> 00:05:00,408
gonna run it through the paces here, get

136
00:05:00,409 --> 00:05:01,999
it up to about a hundred and fifty five

137
00:05:02,000 --> 00:05:04,429
decibels so the engineers and designers

138
00:05:04,430 --> 00:05:07,038

can take all that data and check it

139
00:05:07,039 --> 00:05:08,749
against their engineering models and

140
00:05:08,750 --> 00:05:10,818
make sure that everything matches up and

141
00:05:10,819 --> 00:05:12,499
that they'll have a successful flight

142
00:05:12,500 --> 00:05:15,649
test in a few months. Speaking of the

143
00:05:15,650 --> 00:05:17,359
flight test the launch abort system, we

144
00:05:17,360 --> 00:05:19,728
do have an image of the Orion spacecraft

145
00:05:19,729 --> 00:05:22,188
with the launch abort system here so can

146
00:05:22,189 --> 00:05:23,838
you use it to kind of show and tell a

147
00:05:23,839 --> 00:05:25,248
little bit more about the launch abort

148
00:05:25,249 --> 00:05:28,188
system? OK well just to start out so

149
00:05:28,189 --> 00:05:29,809
here's our crew module that was behind

150
00:05:29,810 --> 00:05:31,848
us in the chamber so we're testing that

151
00:05:31,849 --> 00:05:34,128
and then this is a full up, fully

152
00:05:34,129 --> 00:05:36,438
functional launch abort system or LAS.

153
00:05:36,439 --> 00:05:38,749
So there are three many main types of

154
00:05:38,750 --> 00:05:41,418
engines on the launch abort system so

155
00:05:41,419 --> 00:05:43,459
the abort motor, the jettison motor and

156
00:05:43,460 --> 00:05:46,158
the attitude control motor.

157
00:05:46,159 --> 00:05:49,338
The abort motor is the one that fires in

158
00:05:49,339 --> 00:05:51,408
case something happens with the rocket

159
00:05:51,409 --> 00:05:53,959
and it pulls the crew module and the

160
00:05:53,960 --> 00:05:56,809
whole thing comes away from the rocket

161
00:05:56,810 --> 00:05:59,568
at a really fast speed the jettison

162
00:05:59,569 --> 00:06:01,848
motor, sorry let me go back the attitude

163
00:06:01,849 --> 00:06:03,198

control motor is the one that

164
00:06:03,199 --> 00:06:06,049
repositions the entire capsule to the

165
00:06:06,050 --> 00:06:08,059
right position for it to be able to

166
00:06:08,060 --> 00:06:10,249
eventually land and then the jettison

167
00:06:10,250 --> 00:06:13,098
motor gets rid of this whole tower so

168
00:06:13,099 --> 00:06:15,769
the crew module can start falling

169
00:06:15,770 --> 00:06:18,258
towards the ocean and the parachutes can

170
00:06:18,259 --> 00:06:20,658
come out and they can land gently and

171
00:06:20,659 --> 00:06:22,999
safely in the ocean. Now in the case of

172
00:06:23,000 --> 00:06:24,739
this specific test we aren't going to be

173
00:06:24,740 --> 00:06:26,418
using the parachutes because we don't

174
00:06:26,419 --> 00:06:27,739
need to they've been tested a whole

175
00:06:27,740 --> 00:06:29,299
bunch of times but we're going to be

176
00:06:29,300 --> 00:06:31,898
taking data as it goes down to the ocean.

177
00:06:31,899 --> 00:06:35,418
In an emergency situation how fast

178
00:06:35,419 --> 00:06:37,049
and how far could the

179
00:06:37,050 --> 00:06:38,788
launch abort system system carry the astronauts away

180
00:06:38,789 --> 00:06:41,388
from the launch vehicle?

181
00:06:41,389 --> 00:06:44,098
This launch abort system can separate

182
00:06:44,099 --> 00:06:46,079
the crew module from the launch vehicle

183
00:06:46,080 --> 00:06:48,689
within milliseconds and I think the

184
00:06:48,690 --> 00:06:50,728
speed is something like going a couple

185
00:06:50,729 --> 00:06:52,829
miles away within 15 seconds so it's

186
00:06:52,830 --> 00:06:55,859
super fast. What are the next steps

187
00:06:55,860 --> 00:06:58,138
after you complete the test here in the

188
00:06:58,139 --> 00:06:59,939

reverberant acoustic test facility? What are

189
00:06:59,940 --> 00:07:02,939
the next steps for this test article? So we'll

190
00:07:02,940 --> 00:07:04,529
get it all packaged up and put on a

191
00:07:04,530 --> 00:07:06,869
truck back to Houston to the Johnson

192
00:07:06,870 --> 00:07:09,119
Space Center. The crew module will be

193
00:07:09,120 --> 00:07:11,579
mated with a separation ring and then

194
00:07:11,580 --> 00:07:13,168
it'll be sent over to Kennedy Space

195
00:07:13,169 --> 00:07:15,179
Center where it'll be mated with

196
00:07:15,180 --> 00:07:17,939
its launch abort system and the booster

197
00:07:17,940 --> 00:07:19,589
rocket that this test is going to ride

198
00:07:19,590 --> 00:07:21,448
on and then they'll launch from the Cape

199
00:07:21,449 --> 00:07:24,329
in April of 2019. That's a really

200
00:07:24,330 --> 00:07:25,978
exciting time I'm sure for you and

201
00:07:25,979 --> 00:07:27,478
everybody else involved.

202
00:07:27,479 --> 00:07:30,149
Looking forward past April 2019 what other

203
00:07:30,150 --> 00:07:31,739
tests will you be performing here in

204
00:07:31,740 --> 00:07:33,388
the Space Environments Complex related

205
00:07:33,389 --> 00:07:36,989
to Orion? That's a great question, hot

206
00:07:36,990 --> 00:07:38,579
on the heels of this we'll be getting

207
00:07:38,580 --> 00:07:41,249
ready for Exploration Mission-1 or EM-1

208
00:07:41,250 --> 00:07:43,859
which is the first full up spacecraft

209
00:07:43,860 --> 00:07:48,239
that will fly to the Moon. It'll fly and

210
00:07:48,240 --> 00:07:51,388
be out on orbit for about 25 days, close

211
00:07:51,389 --> 00:07:53,399
to a month. But first it has to come here

212
00:07:53,400 --> 00:07:54,718
and we have to put it through the paces

213
00:07:54,719 --> 00:07:57,478

in our thermal vacuum chamber and also

214
00:07:57,479 --> 00:07:59,538
through the paces with

215
00:07:59,539 --> 00:08:02,068
electromagnetic interference testing so

216
00:08:02,069 --> 00:08:03,869
it'll be here for about 4 months. The

217
00:08:03,870 --> 00:08:07,138
thermal vacuum testing is about 65 days

218
00:08:07,139 --> 00:08:09,478
long and we'll make it really really

219
00:08:09,479 --> 00:08:12,299
cold minus 250 degrees Fahrenheit and

220
00:08:12,300 --> 00:08:14,939
really really hot 300 degrees Fahrenheit

221
00:08:14,940 --> 00:08:17,459
so we'll simulate the cold and the heat

222
00:08:17,460 --> 00:08:20,008
of space. And we'll pump it down, the

223
00:08:20,009 --> 00:08:22,109
vacuum, so there'll be no air at all in

224
00:08:22,110 --> 00:08:24,179
there for quite a while it's gonna be

225
00:08:24,180 --> 00:08:26,968
really exciting test. After that we

226
00:08:26,969 --> 00:08:29,309
also have a fairing separation test. So

227
00:08:29,310 --> 00:08:31,859
the fairings are these covers that go

228
00:08:31,860 --> 00:08:34,018
over the service module and they fall

229
00:08:34,019 --> 00:08:36,389
away, so they separate as it's going into

230
00:08:36,390 --> 00:08:38,609
orbit it's very important that they

231
00:08:38,610 --> 00:08:40,648
separate properly because if they don't

232
00:08:40,649 --> 00:08:42,658
your mission is pretty much done. So

233
00:08:42,659 --> 00:08:44,278
we'll test that in our thermal vacuum

234
00:08:44,279 --> 00:08:47,338
chamber and actually the crew module

235
00:08:47,339 --> 00:08:50,278
from EM-1 when it comes back

236
00:08:50,279 --> 00:08:52,289
we'll get all cleaned up and sent back

237
00:08:52,290 --> 00:08:54,239
to us and we'll put it in our acoustic

238
00:08:54,240 --> 00:08:56,729

chamber again and run abort level

239
00:08:56,730 --> 00:08:58,498
testing on it again. So we're pretty

240
00:08:58,499 --> 00:09:00,239
excited about all that testing over the

241
00:09:00,240 --> 00:09:01,078
next few years.

242
00:09:01,079 --> 00:09:03,359
Yeah, that will be an exciting time. So

243
00:09:03,360 --> 00:09:05,159
we're gonna go to Facebook and see if we

244
00:09:05,160 --> 00:09:10,828
have any questions from Facebook. The

245
00:09:10,829 --> 00:09:12,328
question is: what material is the

246
00:09:12,329 --> 00:09:16,258
spacecraft made of? This spacecraft is

247
00:09:16,259 --> 00:09:18,088
made out of aluminum but a lot of other

248
00:09:18,089 --> 00:09:19,799
parts of our spacecraft are also made

249
00:09:19,800 --> 00:09:27,419
out of composites . So the question is:

250
00:09:27,420 --> 00:09:29,818
Does the abort system stay on after the

251
00:09:29,819 --> 00:09:32,159
spacecraft has reached orbit? Yeah that's

252
00:09:32,160 --> 00:09:33,778
a great question. So I didn't point out

253
00:09:33,779 --> 00:09:37,859
that in a nominal test flight the launch

254
00:09:37,860 --> 00:09:40,349
abort system jettison motor would

255
00:09:40,350 --> 00:09:43,138
actually fire to get off right before it

256
00:09:43,139 --> 00:09:44,818
goes into orbit so that's a great

257
00:09:44,819 --> 00:09:47,509
question, thanks.

258
00:09:51,250 --> 00:09:53,588
So the question is: does all of the sound

259
00:09:53,589 --> 00:09:55,419
that you expose the spacecraft to come

260
00:09:55,420 --> 00:09:58,059
from the wall of where the horns are? Yes

261
00:09:58,060 --> 00:10:00,758
actually it does. So right behind us you

262
00:10:00,759 --> 00:10:02,528
kind of can't see it maybe but there's a

263
00:10:02,529 --> 00:10:04,539

huge door that rolls shut and another

264
00:10:04,540 --> 00:10:06,758
one here that folds. So this is a big

265
00:10:06,759 --> 00:10:08,859
reverberant chamber so we only have to

266
00:10:08,860 --> 00:10:10,838
have horns on one of the walls but the

267
00:10:10,839 --> 00:10:12,849
sound waves bounce all over the place

268
00:10:12,850 --> 00:10:16,119
and honestly based on how loud we want

269
00:10:16,120 --> 00:10:18,458
the sound to be we can tune how many of

270
00:10:18,459 --> 00:10:20,258
those horns on that wall that we have on

271
00:10:20,259 --> 00:10:24,489
at the same time, too. OK you know I had a

272
00:10:24,490 --> 00:10:26,859
question as we were talking um so when

273
00:10:26,860 --> 00:10:28,599
you run the test how long do you have to

274
00:10:28,600 --> 00:10:29,919
run them to sort of get the data that

275
00:10:29,920 --> 00:10:31,359
you need - so once you initiate that

276
00:10:31,360 --> 00:10:32,828
sound and that vibration that goes on

277
00:10:32,829 --> 00:10:35,948
how long those sets run? So this test

278
00:10:35,949 --> 00:10:37,508
will run each one of them for about

279
00:10:37,509 --> 00:10:39,489
three minutes but we can run the chamber

280
00:10:39,490 --> 00:10:41,409
up to about ten minutes in length.

281
00:10:41,410 --> 00:10:44,078
So they're pretty short? Yes. OK and the

282
00:10:44,079 --> 00:10:45,638
other question I had was when you talk

283
00:10:45,639 --> 00:10:48,429
about all of the work with partners and

284
00:10:48,430 --> 00:10:49,989
other NASA centers to make this come

285
00:10:49,990 --> 00:10:51,249
together can you talk a bit about how

286
00:10:51,250 --> 00:10:53,799
you coordinate? Yes, absolutely so yeah we have

287
00:10:53,800 --> 00:10:55,568
a big integrated program that's all

288
00:10:55,569 --> 00:10:57,489

across the United States and also with

289
00:10:57,490 --> 00:10:59,349
our European partners who help provide

290
00:10:59,350 --> 00:11:01,898
part of the service module. So in the

291
00:11:01,899 --> 00:11:04,599
case of this spacecraft you know the

292
00:11:04,600 --> 00:11:06,849
structures part was built at Langley out

293
00:11:06,850 --> 00:11:09,099
in Virginia. We talked about it being

294
00:11:09,100 --> 00:11:10,869
sent down to Houston where a lot of the

295
00:11:10,870 --> 00:11:12,878
avionics boxes and a lot of other

296
00:11:12,879 --> 00:11:14,979
hardware were installed. Now it's sent up

297
00:11:14,980 --> 00:11:17,109
here to Ohio to NASA Glenn for us to

298
00:11:17,110 --> 00:11:19,239
test it. We'll send it back to Johnson

299
00:11:19,240 --> 00:11:21,669
Space Center for the last little bit of

300
00:11:21,670 --> 00:11:24,278
work and then it goes to Kennedy and the

301
00:11:24,279 --> 00:11:26,349
LAS, which is also produced by Lockheed

302
00:11:26,350 --> 00:11:28,719
Martin, will be mated to it for the

303
00:11:28,720 --> 00:11:31,148
launch. So yeah so we work with a lot of

304
00:11:31,149 --> 00:11:32,799
different suppliers, a lot of different

305
00:11:32,800 --> 00:11:34,749
vendors all across the United States and

306
00:11:34,750 --> 00:11:37,958
when Exploration Mission-1 is here, the

307
00:11:37,959 --> 00:11:39,849
crew module and the service module will

308
00:11:39,850 --> 00:11:41,528
be here and the service module is being

309
00:11:41,529 --> 00:11:44,469
provided by the European Space Agency. So

310
00:11:44,470 --> 00:11:46,508
it's you know we're across a lot of

311
00:11:46,509 --> 00:11:48,128
different time zones a lot of different

312
00:11:48,129 --> 00:11:50,528
cultures, it's pretty exciting and it

313
00:11:50,529 --> 00:11:52,328

takes a lot of integration for us to

314
00:11:52,329 --> 00:11:55,659
pull it all together. Well do we have any

315
00:11:55,660 --> 00:11:58,419
more questions from Facebook? OK lastly

316
00:11:58,420 --> 00:11:59,778
one thing I want to ask, because a lot of

317
00:11:59,779 --> 00:12:01,818
times we have questions from students

318
00:12:01,819 --> 00:12:03,138
and young people who are interested in

319
00:12:03,139 --> 00:12:04,909
engineering, if you could just talk about

320
00:12:04,910 --> 00:12:07,518
kind of your path and how someone if

321
00:12:07,519 --> 00:12:08,929
they're interested in doing what you do

322
00:12:08,930 --> 00:12:11,359
how would they go about that?

323
00:12:11,360 --> 00:12:14,778
Sure, when I was in high school I found out

324
00:12:14,779 --> 00:12:16,278
that I was really good at math although

325
00:12:16,279 --> 00:12:18,679
a lot of times I was very artistic so I

326
00:12:18,680 --> 00:12:20,929
took ballet and I took piano and stuff

327
00:12:20,930 --> 00:12:23,268
like that. But I loved math and I loved

328
00:12:23,269 --> 00:12:24,799
that there was a single right answer for

329
00:12:24,800 --> 00:12:27,739
things and being able to find the answer

330
00:12:27,740 --> 00:12:29,388
to this was very challenging and I

331
00:12:29,389 --> 00:12:31,489
enjoyed it. So when I started college I

332
00:12:31,490 --> 00:12:33,198
was a mathematics and statistics major

333
00:12:33,199 --> 00:12:35,568
and then I added the aeronautics major

334
00:12:35,569 --> 00:12:37,909
because they had the best toys. So I

335
00:12:37,910 --> 00:12:39,859
loved like the rockets that we got to

336
00:12:39,860 --> 00:12:41,958
play with. I loved dealing with air foils

337
00:12:41,959 --> 00:12:44,028
and wind tunnels and then I went to

338
00:12:44,029 --> 00:12:45,349

graduate school to be an aerospace

339
00:12:45,350 --> 00:12:48,258
engineer. So that's how I started out.

340
00:12:48,259 --> 00:12:51,558
I would recommend for anyone one of the

341
00:12:51,559 --> 00:12:52,998
most important things you can do when

342
00:12:52,999 --> 00:12:54,799
you're in junior high or high school is

343
00:12:54,800 --> 00:12:57,078
really get the math classes. And you know

344
00:12:57,079 --> 00:12:59,508
what else don't feel bad if you don't do

345
00:12:59,509 --> 00:13:01,849
well on a test because you know I have

346
00:13:01,850 --> 00:13:04,909
plenty of tests that I got Cs on and

347
00:13:04,910 --> 00:13:06,588
then I just worked all the harder and

348
00:13:06,589 --> 00:13:09,558
made it happen. So you know just have

349
00:13:09,559 --> 00:13:12,229
creativity, have innovation, work really

350
00:13:12,230 --> 00:13:15,198
hard, try to get your math classes in and

351
00:13:15,199 --> 00:13:16,789
if you can do some fun things on the

352
00:13:16,790 --> 00:13:19,068
side like robotics or stuff like that to

353
00:13:19,069 --> 00:13:20,628
get experience that's a great way to do

354
00:13:20,629 --> 00:13:24,018
it, too. Thank you so much, Nicole and I want

355
00:13:24,019 --> 00:13:25,549
to thank you for the discussion and

356
00:13:25,550 --> 00:13:26,989
letting us know about your story. And

357
00:13:26,990 --> 00:13:29,148
thank you for joining us today. We have

358
00:13:29,149 --> 00:13:30,619
actually got to get out of the way

359
00:13:30,620 --> 00:13:32,119
because engineers need to get back to

360
00:13:32,120 --> 00:13:34,489
work to continue preparing this test to

361
00:13:34,490 --> 00:13:36,708
make sure it stays on schedule. But one

362
00:13:36,709 --> 00:13:38,419
thing you can do is continue to stay

363
00:13:38,420 --> 00:13:39,739

online. We're going to continue to answer

364
00:13:39,740 --> 00:13:41,448
questions as they come in, so we'll hang

365
00:13:41,449 --> 00:13:43,369
out a bit longer there. And if you're

366
00:13:43,370 --> 00:13:45,138
interested in exploring more of the

367
00:13:45,139 --> 00:13:47,119
Space Environments Complex,

368
00:13:47,120 --> 00:13:49,458
this facility and other facilities, the

369
00:13:49,459 --> 00:13:51,558
vacuum chamber that Nicole referenced we

370
00:13:51,559 --> 00:13:54,258
have an online 360-degree virtual tour

371
00:13:54,259 --> 00:13:56,448
that you can check out. It has videos

372
00:13:56,449 --> 00:13:58,219
images and lots more information about

373
00:13:58,220 --> 00:13:59,659
the work that we do here and other

374
00:13:59,660 --> 00:14:01,458
spacecraft that have been tested in this

375
00:14:01,459 --> 00:14:03,588
facility. And the link to that virtual

376
00:14:03,589 --> 00:14:05,808
tour is included in this post. So once