SPACESTATION
LIVE

1
00:00:09,750 --> 00:00:07,909
the next dragon cargo ship headed to the

2
00:00:11,990 --> 00:00:09,760
international space station with

3
00:00:14,789 --> 00:00:12,000
thousands of pounds of provisions for

4
00:00:15,910 --> 00:00:14,799
crew members and experiment supplies

5
00:00:17,510 --> 00:00:15,920
is coming to the international space

6
00:00:20,150 --> 00:00:17,520
station on april 8th

7
00:00:22,950 --> 00:00:20,160
it also is including a first of its kind

8
00:00:24,790 --> 00:00:22,960
experimental module an expand expandable

9
00:00:27,349 --> 00:00:24,800
capsule that will be attached to this

10
00:00:28,550 --> 00:00:27,359
station for a two-year period and today

11
00:00:30,950 --> 00:00:28,560
joining me

12
00:00:32,870 --> 00:00:30,960
uh to talk about the bigelow expandable

13
00:00:35,990 --> 00:00:32,880

activity module or the beam

14
00:00:37,830 --> 00:00:36,000
is rajib descuta the international space

15
00:00:40,069 --> 00:00:37,840
station research integration manager and

16
00:00:41,190 --> 00:00:40,079
the project manager for beam rajib

17
00:00:42,150 --> 00:00:41,200
thanks for being with us today good

18
00:00:44,389 --> 00:00:42,160
morning

19
00:00:46,470 --> 00:00:44,399
so why don't we start off um if you can

20
00:00:48,549 --> 00:00:46,480
give us a quick history of expandable

21
00:00:49,510 --> 00:00:48,559
modules and where bigelow fits into that

22
00:00:51,110 --> 00:00:49,520
story

23
00:00:53,110 --> 00:00:51,120
first of all thank you for giving me the

24
00:00:55,270 --> 00:00:53,120
opportunity to come and talk about this

25
00:00:57,029 --> 00:00:55,280
exciting beam project

26
00:00:58,470 --> 00:00:57,039
nasa actually

27
00:01:00,229 --> 00:00:58,480
started

28
00:01:02,630 --> 00:01:00,239
looking at expandable technology in the

29
00:01:03,590 --> 00:01:02,640
early 1990s as part of the transha

30
00:01:06,469 --> 00:01:03,600
project

31
00:01:09,030 --> 00:01:06,479
and that work went on for about

32
00:01:11,990 --> 00:01:09,040
a few years five or six years then in

33
00:01:13,590 --> 00:01:12,000
the early 2000s congress actually

34
00:01:14,950 --> 00:01:13,600
canceled the project due to funding

35
00:01:18,070 --> 00:01:14,960
problems

36
00:01:20,390 --> 00:01:18,080
and then all of that work was documented

37
00:01:21,990 --> 00:01:20,400
in a u.s patent

38
00:01:24,390 --> 00:01:22,000

at that point

39
00:01:26,149 --> 00:01:24,400
bigelow aerospace purchased that patent

40
00:01:28,390 --> 00:01:26,159
from nasa and started developing

41
00:01:29,350 --> 00:01:28,400
commercial inflatables

42
00:01:34,149 --> 00:01:29,360
and

43
00:01:36,310 --> 00:01:34,159
actually

44
00:01:38,550 --> 00:01:36,320
launched two expandable modules called

45
00:01:40,630 --> 00:01:38,560
genesis 1 and genesis 2. both of them

46
00:01:42,469 --> 00:01:40,640
were successful but

47
00:01:44,550 --> 00:01:42,479
the thing to be noted is that none of

48
00:01:46,710 --> 00:01:44,560
them are human rated but their

49
00:01:49,990 --> 00:01:46,720
performance from a leaked standpoint and

50
00:01:52,870 --> 00:01:50,000
structural standpoint were very good

51
00:01:55,190 --> 00:01:52,880
so this went on in the mid 2000s now in

52
00:01:57,990 --> 00:01:55,200
twenty

53
00:02:01,350 --> 00:01:58,000
bigelow aerospace gave nasa a proposal

54
00:02:02,709 --> 00:02:01,360
to launch a human rated small expandable

55
00:02:05,190 --> 00:02:02,719
module to the international space

56
00:02:07,749 --> 00:02:05,200
station just to prove the technology for

57
00:02:09,510 --> 00:02:07,759
future deep space applications

58
00:02:11,430 --> 00:02:09,520
so that is the short history of

59
00:02:12,309 --> 00:02:11,440
expandables and its association with

60
00:02:13,430 --> 00:02:12,319
nasa

61
00:02:14,710 --> 00:02:13,440
excellent

62
00:02:16,550 --> 00:02:14,720
so um

63
00:02:17,990 --> 00:02:16,560

this expandable module is made out of a

64
00:02:19,350 --> 00:02:18,000
very different type of material than

65
00:02:21,110 --> 00:02:19,360
we're used to we're used to the metal

66
00:02:23,430 --> 00:02:21,120
modules right so can you tell me about

67
00:02:25,750 --> 00:02:23,440
the similarities and differences in the

68
00:02:28,309 --> 00:02:25,760
strength and protection of the bigelow

69
00:02:30,710 --> 00:02:28,319
module expandable modules actually from

70
00:02:34,630 --> 00:02:30,720
a strength standpoint gives equal or

71
00:02:37,110 --> 00:02:34,640
better protection than metal modules

72
00:02:37,990 --> 00:02:37,120
just to give you a point of reference

73
00:02:39,990 --> 00:02:38,000
for

74
00:02:43,030 --> 00:02:40,000
expandable modules because they are made

75
00:02:45,030 --> 00:02:43,040
of non-metallic soft goods materials

76
00:02:46,869 --> 00:02:45,040
the safety factors we have to certify

77
00:02:49,670 --> 00:02:46,879
these materials to is much higher than

78
00:02:53,030 --> 00:02:49,680
comparable metal metal structure

79
00:02:55,190 --> 00:02:53,040
so from a unit weight standpoint

80
00:02:56,390 --> 00:02:55,200
just the primary structure of the

81
00:02:59,270 --> 00:02:56,400
expandable

82
00:03:01,110 --> 00:02:59,280
is happens to be lighter

83
00:03:03,830 --> 00:03:01,120
if you compare

84
00:03:06,070 --> 00:03:03,840
per unit weight but if you add all the

85
00:03:08,390 --> 00:03:06,080
other protective layers like the mmod

86
00:03:10,470 --> 00:03:08,400
and the external mli

87
00:03:12,710 --> 00:03:10,480
we don't really see that much of a

88
00:03:14,630 --> 00:03:12,720

weight benefit the main benefit of

89
00:03:17,030 --> 00:03:14,640
expandables is in the launch volume

90
00:03:19,430 --> 00:03:17,040
because you can pack the expandable to a

91
00:03:20,630 --> 00:03:19,440
tighter volume and then expand it in

92
00:03:22,470 --> 00:03:20,640
space

93
00:03:23,509 --> 00:03:22,480
now in the case of beam

94
00:03:25,750 --> 00:03:23,519
um

95
00:03:27,509 --> 00:03:25,760
it expands to four times its packed

96
00:03:29,990 --> 00:03:27,519
launch volume so that's a considerable

97
00:03:33,270 --> 00:03:30,000
advantage from a launch standpoint

98
00:03:35,589 --> 00:03:33,280
and from a protection we also look at

99
00:03:37,750 --> 00:03:35,599
protection from orbital debris mmod

100
00:03:40,390 --> 00:03:37,760
micro material normal debris

101
00:03:43,030 --> 00:03:40,400
and the beam module has been tested

102
00:03:45,910 --> 00:03:43,040
and proven to be equal or better than

103
00:03:48,390 --> 00:03:45,920
equivalent metallic modules wow yes so

104
00:03:50,470 --> 00:03:48,400
then what are the overall goals of this

105
00:03:51,750 --> 00:03:50,480
demonstration for the beam being

106
00:03:53,670 --> 00:03:51,760
attached to the international space

107
00:03:55,589 --> 00:03:53,680
station for two years

108
00:03:56,949 --> 00:03:55,599
the first and foremost goal is to

109
00:03:59,589 --> 00:03:56,959
obviously

110
00:04:01,910 --> 00:03:59,599
prove the expandable technology

111
00:04:04,070 --> 00:04:01,920
to with a human rated

112
00:04:04,949 --> 00:04:04,080
spacecraft like iss

113
00:04:06,149 --> 00:04:04,959

and

114
00:04:08,630 --> 00:04:06,159
we call it

115
00:04:10,630 --> 00:04:08,640
increase its technology readiness level

116
00:04:12,070 --> 00:04:10,640
called something called trl to nine

117
00:04:13,990 --> 00:04:12,080
which is a flight demonstration so

118
00:04:15,509 --> 00:04:14,000
that's the first and foremost objective

119
00:04:16,469 --> 00:04:15,519
of it

120
00:04:18,710 --> 00:04:16,479
and then

121
00:04:20,789 --> 00:04:18,720
some of the other main objectives are to

122
00:04:22,550 --> 00:04:20,799
test its long-term performance from a

123
00:04:24,469 --> 00:04:22,560
leak standpoint

124
00:04:26,950 --> 00:04:24,479
to characterize the radiation

125
00:04:29,510 --> 00:04:26,960
environment inside the module

126
00:04:31,270 --> 00:04:29,520
to also characterize the thermal

127
00:04:32,790 --> 00:04:31,280
thermal conditions inside the module and

128
00:04:33,990 --> 00:04:32,800
the air quality

129
00:04:36,070 --> 00:04:34,000
so those are those are the main

130
00:04:38,230 --> 00:04:36,080
objectives of the beam demonstration and

131
00:04:40,230 --> 00:04:38,240
we have a suite of sensors which i can

132
00:04:41,350 --> 00:04:40,240
describe later

133
00:04:42,790 --> 00:04:41,360
to collect

134
00:04:44,629 --> 00:04:42,800
all of these data

135
00:04:46,710 --> 00:04:44,639
inside the beam module

136
00:04:48,629 --> 00:04:46,720
so then what will happen whenever uh

137
00:04:50,550 --> 00:04:48,639
beam is attached how is describe how

138
00:04:53,030 --> 00:04:50,560

it's going to be deployed once it's

139
00:04:55,350 --> 00:04:53,040
attached to the tranquility module

140
00:04:57,430 --> 00:04:55,360
okay so so i'll start off from dragon

141
00:04:59,350 --> 00:04:57,440
launch if you don't mind so dragon

142
00:05:01,749 --> 00:04:59,360
launchers as you know i mean falcon 9

143
00:05:03,350 --> 00:05:01,759
launches with the dragon spacecraft on

144
00:05:04,469 --> 00:05:03,360
april 8th

145
00:05:06,390 --> 00:05:04,479
and

146
00:05:08,550 --> 00:05:06,400
in 48 hours or

147
00:05:10,150 --> 00:05:08,560
around two days it it bursts to the no

148
00:05:12,469 --> 00:05:10,160
two nader

149
00:05:13,350 --> 00:05:12,479
docking birthing port of space station

150
00:05:14,629 --> 00:05:13,360
right

151
00:05:17,830 --> 00:05:14,639
and then

152
00:05:19,990 --> 00:05:17,840
five days later after dagon births five

153
00:05:21,909 --> 00:05:20,000
days later we're going to use

154
00:05:23,990 --> 00:05:21,919
the space station's robotic arm which is

155
00:05:25,909 --> 00:05:24,000
called the ssrms

156
00:05:28,870 --> 00:05:25,919
to extract the beam module from the

157
00:05:30,950 --> 00:05:28,880
dragon's unpressurized trunk

158
00:05:33,510 --> 00:05:30,960
translate the arm and birth it to the

159
00:05:35,350 --> 00:05:33,520
note 3 aft port okay

160
00:05:38,070 --> 00:05:35,360
so once birth

161
00:05:39,909 --> 00:05:38,080
the module will stay in that condition

162
00:05:42,790 --> 00:05:39,919
until the end of may

163
00:05:44,870 --> 00:05:42,800

at that point we we plan to deploy and

164
00:05:47,029 --> 00:05:44,880
inflate it okay

165
00:05:48,230 --> 00:05:47,039
and there is a lot of preparations that

166
00:05:50,550 --> 00:05:48,240
goes on

167
00:05:52,870 --> 00:05:50,560
as part of the inflation process

168
00:05:54,629 --> 00:05:52,880
after the you know once it's birthed the

169
00:05:57,350 --> 00:05:54,639
crew has to

170
00:05:59,830 --> 00:05:57,360
first pressurize the vestibule

171
00:06:02,070 --> 00:05:59,840
which is the section between

172
00:06:03,590 --> 00:06:02,080
between the beam and the note 3 that's

173
00:06:05,670 --> 00:06:03,600
the vestibule section so they have to

174
00:06:08,150 --> 00:06:05,680
first pressurize that prepare the

175
00:06:10,390 --> 00:06:08,160
vestibule for the deployment in other

176
00:06:11,909 --> 00:06:10,400
words set up the deployment controller

177
00:06:15,189 --> 00:06:11,919
make the electrical connections and all

178
00:06:17,510 --> 00:06:15,199
that and then once all of that is done

179
00:06:20,550 --> 00:06:17,520
then the crew starts

180
00:06:24,790 --> 00:06:20,560
in expanding the beam module

181
00:06:27,270 --> 00:06:24,800
first with iss air through a tiny port

182
00:06:29,029 --> 00:06:27,280
and a valve called npv

183
00:06:31,590 --> 00:06:29,039
np valve okay

184
00:06:34,390 --> 00:06:31,600
so we use isis air to inflate beam to

185
00:06:36,710 --> 00:06:34,400
its full full shape and a pressure of

186
00:06:39,430 --> 00:06:36,720
about 0.4 psi

187
00:06:40,790 --> 00:06:39,440
once that is done then the crew through

188
00:06:42,950 --> 00:06:40,800

the controller

189
00:06:45,189 --> 00:06:42,960
releases the air from the eight

190
00:06:46,710 --> 00:06:45,199
inflation tanks from beam

191
00:06:50,150 --> 00:06:46,720
and that air

192
00:06:53,189 --> 00:06:50,160
pressurizes the beam module from 0.4 psi

193
00:06:55,830 --> 00:06:53,199
to roughly about 14.7 psi

194
00:06:57,909 --> 00:06:55,840
to equalize the pressure with iss

195
00:06:59,350 --> 00:06:57,919
so once that is done beam is fully

196
00:07:00,150 --> 00:06:59,360
inflated

197
00:07:02,550 --> 00:07:00,160
then

198
00:07:04,550 --> 00:07:02,560
the crew does a 80 hour leak check we

199
00:07:06,629 --> 00:07:04,560
want to make sure that the module is not

200
00:07:07,909 --> 00:07:06,639
leaking due to transportation handling

201
00:07:10,230 --> 00:07:07,919
and other conditions which we don't

202
00:07:12,710 --> 00:07:10,240
expect but just in case

203
00:07:14,710 --> 00:07:12,720
after the leak check is done

204
00:07:16,469 --> 00:07:14,720
the crew then goes in

205
00:07:19,110 --> 00:07:16,479
uh

206
00:07:21,270 --> 00:07:19,120
prepares the vestibule ducting to start

207
00:07:23,110 --> 00:07:21,280
the air airflow inside the module and

208
00:07:25,589 --> 00:07:23,120
does first first ingress

209
00:07:28,629 --> 00:07:25,599
takes the air sample for safety reasons

210
00:07:30,550 --> 00:07:28,639
then once once we are sure the air is

211
00:07:32,550 --> 00:07:30,560
clean and habitable

212
00:07:34,230 --> 00:07:32,560
then the crew gets in first ingress and

213
00:07:35,990 --> 00:07:34,240

then starts the airflow that's how the

214
00:07:37,990 --> 00:07:36,000
operation goes basically so it's going

215
00:07:39,189 --> 00:07:38,000
to be inflated in late may and they have

216
00:07:40,870 --> 00:07:39,199
to go through all of these checks and

217
00:07:42,550 --> 00:07:40,880
balances right but it'll stay there for

218
00:07:44,550 --> 00:07:42,560
two years so what's going to happen

219
00:07:46,309 --> 00:07:44,560
during that two-year period so we are

220
00:07:47,830 --> 00:07:46,319
going to during the two-year period

221
00:07:49,350 --> 00:07:47,840
we're going to collect

222
00:07:51,909 --> 00:07:49,360
all of that

223
00:07:55,110 --> 00:07:51,919
technology data that i just talked about

224
00:07:58,390 --> 00:07:55,120
so we have two radiation sensors

225
00:08:00,629 --> 00:07:58,400
called the rem and the ram passive

226
00:08:02,390 --> 00:08:00,639
badges with both those two of those

227
00:08:04,950 --> 00:08:02,400
sensors is going to characterize the

228
00:08:06,150 --> 00:08:04,960
radiation environment inside beam

229
00:08:07,990 --> 00:08:06,160
and

230
00:08:10,550 --> 00:08:08,000
actually we have those

231
00:08:12,710 --> 00:08:10,560
identical two sensors in this in the

232
00:08:15,110 --> 00:08:12,720
metallic part of space station all the

233
00:08:16,710 --> 00:08:15,120
other modules so what that'll enable us

234
00:08:18,790 --> 00:08:16,720
to do is compare the radiation

235
00:08:20,790 --> 00:08:18,800
environment inside beam

236
00:08:22,550 --> 00:08:20,800
with the radiation environment inside

237
00:08:24,869 --> 00:08:22,560
space station so that'll that'll be a

238
00:08:27,029 --> 00:08:24,879

very important piece of data

239
00:08:29,430 --> 00:08:27,039
then the other sensor we have is called

240
00:08:31,510 --> 00:08:29,440
the deployment dynamics sensor

241
00:08:34,389 --> 00:08:31,520
that is actually going to use at the

242
00:08:36,709 --> 00:08:34,399
time of deployment to measure

243
00:08:38,389 --> 00:08:36,719
the dynamic loads that are generated

244
00:08:40,389 --> 00:08:38,399
during the deployment

245
00:08:42,070 --> 00:08:40,399
and the third sensor is called the did

246
00:08:44,070 --> 00:08:42,080
sensor that

247
00:08:45,190 --> 00:08:44,080
and that the function of the dit sensor

248
00:08:48,070 --> 00:08:45,200
is to

249
00:08:49,750 --> 00:08:48,080
measure any mmod particle impacts on the

250
00:08:52,070 --> 00:08:49,760
outer surface of beam

251
00:08:53,910 --> 00:08:52,080
and then we also have the last one is

252
00:08:55,990 --> 00:08:53,920
the temperature sensor that measures the

253
00:08:56,710 --> 00:08:56,000
thermal environment inside beam

254
00:08:59,110 --> 00:08:56,720
so

255
00:09:01,030 --> 00:08:59,120
in the two years span we are going to

256
00:09:02,870 --> 00:09:01,040
get all of this data

257
00:09:05,110 --> 00:09:02,880
okay so it's going to be valuable data

258
00:09:08,230 --> 00:09:05,120
for us to study the expandable

259
00:09:11,030 --> 00:09:08,240
technology demonstration on iss

260
00:09:14,310 --> 00:09:11,040
and also we'll have the on orbit crew

261
00:09:17,990 --> 00:09:16,470
around two to three times every six

262
00:09:19,350 --> 00:09:18,000
month increment

263
00:09:20,630 --> 00:09:19,360

and

264
00:09:23,190 --> 00:09:20,640
check the surface condition of the

265
00:09:24,630 --> 00:09:23,200
module get surface and air microbial

266
00:09:26,310 --> 00:09:24,640
samples

267
00:09:28,470 --> 00:09:26,320
and then change out these radiation

268
00:09:30,150 --> 00:09:28,480
badges the ram badges because they need

269
00:09:32,150 --> 00:09:30,160
to be changed out from time to time and

270
00:09:34,550 --> 00:09:32,160
sent to the earth for analysis

271
00:09:36,870 --> 00:09:34,560
so this is the overall kind of plan for

272
00:09:39,110 --> 00:09:36,880
the next two years and uh hopefully

273
00:09:41,350 --> 00:09:39,120
it'll give us some very good data a lot

274
00:09:42,870 --> 00:09:41,360
of data a lot of data you have two years

275
00:09:44,630 --> 00:09:42,880
to do it and we hope to see some really

276
00:09:48,070 --> 00:09:44,640
good results from that so then after the

277
00:09:50,790 --> 00:09:48,080
two year period what happens to beam

278
00:09:53,269 --> 00:09:50,800
after the two year period

279
00:09:55,910 --> 00:09:53,279
because space station program needs to

280
00:09:56,630 --> 00:09:55,920
use that port for other purposes we have

281
00:09:58,389 --> 00:09:56,640
to

282
00:10:00,310 --> 00:09:58,399
jettison beam

283
00:10:01,670 --> 00:10:00,320
dispose beam by the robotic jettison

284
00:10:03,430 --> 00:10:01,680
method so the

285
00:10:06,310 --> 00:10:03,440
space station arm again goes and

286
00:10:07,910 --> 00:10:06,320
grapples beam

287
00:10:10,389 --> 00:10:07,920
through the aft

288
00:10:12,630 --> 00:10:10,399

aft side grapple fixtures

289
00:10:14,550 --> 00:10:12,640
and then takes it to the nader extreme

290
00:10:16,550 --> 00:10:14,560
nader position of space station and

291
00:10:18,630 --> 00:10:16,560
releases it for

292
00:10:20,550 --> 00:10:18,640
for jettison for jettison and

293
00:10:22,870 --> 00:10:20,560
uncontrolled re-entry and we have we

294
00:10:24,470 --> 00:10:22,880
have done all our analysis to show that

295
00:10:26,150 --> 00:10:24,480
it will take about

296
00:10:28,310 --> 00:10:26,160
less than a year for

297
00:10:29,910 --> 00:10:28,320
for that jettison object to come and

298
00:10:32,230 --> 00:10:29,920
reach the earth so that's how it's going

299
00:10:34,470 --> 00:10:32,240
to be disposed after two years wow yeah

300
00:10:36,310 --> 00:10:34,480
so two year period a lot of data to

301
00:10:39,269 --> 00:10:36,320
collect we are very much looking forward

302
00:10:41,990 --> 00:10:39,279
to its launch on april 8th the crew is

303
00:10:43,670 --> 00:10:42,000
going to grapple it on april 10th rajiv

304
00:10:45,350 --> 00:10:43,680
i'd like to thank you for being with us

305
00:10:46,550 --> 00:10:45,360
today we are very excited for the launch

306
00:10:49,269 --> 00:10:46,560
and to see all this data that is going

307
00:10:51,509 --> 00:10:49,279
to be coming on over a two-year period

308
00:10:53,509 --> 00:10:51,519
rajib descuda international space