



1  
00:00:05,120 --> 00:00:03,110  
good afternoon I've Cam Newton with the

2  
00:00:07,460 --> 00:00:05,130  
Public Affairs Office of NASA's Marshall

3  
00:00:08,990 --> 00:00:07,470  
Space Flight Center welcome to our panel

4  
00:00:11,780 --> 00:00:09,000  
discussion recognizing the 10th

5  
00:00:14,360 --> 00:00:11,790  
anniversary of the full time habitation

6  
00:00:16,670 --> 00:00:14,370  
and crew operation of the International

7  
00:00:18,439 --> 00:00:16,680  
Space Station the International Space

8  
00:00:22,990 --> 00:00:18,449  
Station is one of the greatest

9  
00:00:25,070 --> 00:00:23,000  
engineering and science achievements and

10  
00:00:27,679 --> 00:00:25,080  
international partnerships in human

11  
00:00:30,109 --> 00:00:27,689  
history Marshall Center is proud to be

12  
00:00:31,910 --> 00:00:30,119  
have played a significant role in the

13  
00:00:34,790 --> 00:00:31,920

development and integration of the

14

00:00:37,490 --> 00:00:34,800

International Space Station welcome

15

00:00:40,940 --> 00:00:37,500

today to our panel discussion and we

16

00:00:43,310 --> 00:00:40,950

have our combined panel here has over

17

00:00:45,500 --> 00:00:43,320

100 years of collective experience in

18

00:00:46,880 --> 00:00:45,510

the International Space Station let's

19

00:00:49,190 --> 00:00:46,890

start our discussion with the

20

00:00:51,229 --> 00:00:49,200

introduction or panelist first would

21

00:00:53,000 --> 00:00:51,239

like to introduce LaBrie's Woodard who

22

00:00:55,040 --> 00:00:53,010

has served in many management and

23

00:00:57,590 --> 00:00:55,050

leadership capabilities supporting the

24

00:00:59,860 --> 00:00:57,600

coordination and operation of science

25

00:01:02,299 --> 00:00:59,870

operations on board the space station

26

00:01:04,520 --> 00:01:02,309

next I'd like to introduce Bob bagged

27

00:01:06,710 --> 00:01:04,530

aegean who has served some 23 years

28

00:01:08,660 --> 00:01:06,720

experience with the development of the

29

00:01:10,670 --> 00:01:08,670

vital life support and environmental

30

00:01:13,580 --> 00:01:10,680

control systems onboard the space

31

00:01:16,429 --> 00:01:13,590

station our next panel member is annette

32

00:01:18,530 --> 00:01:16,439

sled annette has some 27 years of

33

00:01:20,300 --> 00:01:18,540

experience with the development of space

34

00:01:22,490 --> 00:01:20,310

station including leading the teams

35

00:01:25,190 --> 00:01:22,500

which built the Express racks for the

36

00:01:27,020 --> 00:01:25,200

modules of station Express racks are the

37

00:01:29,390 --> 00:01:27,030

structures with house several science

38

00:01:31,940 --> 00:01:29,400

experiments and supporting facilities on

39

00:01:34,460 --> 00:01:31,950

board station next I'd like to introduce

40

00:01:36,530 --> 00:01:34,470

Richard Google Richard is a material

41

00:01:38,450 --> 00:01:36,540

scientist here at Marshall and has flown

42

00:01:40,940 --> 00:01:38,460

to science experiments on the

43

00:01:43,100 --> 00:01:40,950

International Space Station last I'd

44

00:01:45,050 --> 00:01:43,110

like to introduce Sean Regan Sean

45

00:01:47,030 --> 00:01:45,060

represents a team of engineers and

46

00:01:50,179 --> 00:01:47,040

international partners who built and

47

00:01:52,700 --> 00:01:50,189

delivered three multi-purpose logistics

48

00:01:54,139 --> 00:01:52,710

modules the nuvi moving vans of the

49

00:01:56,149 --> 00:01:54,149

space station program which had

50

00:01:59,030 --> 00:01:56,159

delivered thousands of pounds of cargo

51  
00:02:01,459 --> 00:01:59,040  
and science experiments and facilities

52  
00:02:03,530 --> 00:02:01,469  
to the station Sean will also address

53  
00:02:06,139 --> 00:02:03,540  
Marshalls role in the development of to

54  
00:02:11,600 --> 00:02:06,149  
space station nodes let's begin with

55  
00:02:13,430 --> 00:02:11,610  
LaBrie's Woodard LaBrie's well good

56  
00:02:15,740 --> 00:02:13,440  
afternoon can afternoon

57  
00:02:17,300 --> 00:02:15,750  
and I'll talk a little bit about the

58  
00:02:21,290 --> 00:02:17,310  
group of folks that I've represented

59  
00:02:26,380 --> 00:02:21,300  
here today I work with the group the

60  
00:02:29,180 --> 00:02:26,390  
team that performs the 24 by 7 real-time

61  
00:02:31,430 --> 00:02:29,190  
support for the experiment operations

62  
00:02:37,930 --> 00:02:31,440  
that are aboard the International Space

63  
00:02:41,750 --> 00:02:37,940

Station and our team is encompassed with

64

00:02:45,080 --> 00:02:41,760

engineers and technicians that have been

65

00:02:49,040 --> 00:02:45,090

working together culminating the idea of

66

00:02:53,960 --> 00:02:49,050

doing science onboard station since the

67

00:02:58,190 --> 00:02:53,970

early 90s excuse me the mid to late 90s

68

00:03:02,060 --> 00:02:58,200

in fact really we pull together all the

69

00:03:05,990 --> 00:03:02,070

concepts that we needed in order to get

70

00:03:08,840 --> 00:03:06,000

the ideas for how we support the science

71

00:03:13,310 --> 00:03:08,850

experiments on board in the very late

72

00:03:16,520 --> 00:03:13,320

90s and in fact we culminated all of

73

00:03:20,840 --> 00:03:16,530

that planning to be able to be prepared

74

00:03:23,650 --> 00:03:20,850

to support the very first expedition of

75

00:03:29,330 --> 00:03:23,660

around-the-clock science operations in

76  
00:03:33,410 --> 00:03:29,340  
2001 that was when we began expedition

77  
00:03:36,979 --> 00:03:33,420  
to with the space station crew and that

78  
00:03:41,090 --> 00:03:36,989  
was with started with flight 581 it

79  
00:03:46,520 --> 00:03:41,100  
seems like so long ago then but the team

80  
00:03:49,729 --> 00:03:46,530  
we came together and had all the

81  
00:03:51,770 --> 00:03:49,739  
disciplines to represented to do that

82  
00:03:54,590 --> 00:03:51,780  
represented all the training all the

83  
00:03:57,290 --> 00:03:54,600  
planning all the scheduling and the

84  
00:04:00,229 --> 00:03:57,300  
procedure development for all of the

85  
00:04:02,540 --> 00:04:00,239  
experiments that came together at that

86  
00:04:06,050 --> 00:04:02,550  
time and have subsequently been coming

87  
00:04:09,500 --> 00:04:06,060  
together for each of the expedition's so

88  
00:04:12,380 --> 00:04:09,510

we are very very proud to be able to

89

00:04:15,620 --> 00:04:12,390

represent the research community it's

90

00:04:18,110 --> 00:04:15,630

the the idea is that when we get to

91

00:04:21,140 --> 00:04:18,120

execution we are making their dreams

92

00:04:26,210 --> 00:04:21,150

come true and so we are very proud of

93

00:04:27,110 --> 00:04:26,220

that it's great so thank you Bob tell us

94

00:04:31,010 --> 00:04:27,120

a little bit about what you

95

00:04:32,780 --> 00:04:31,020

they're okay LaBrie's my job and the

96

00:04:35,629 --> 00:04:32,790

people I work with was not so much

97

00:04:39,320 --> 00:04:35,639

geared towards you know the science part

98

00:04:40,879 --> 00:04:39,330

of space station but but more enabling

99

00:04:43,370 --> 00:04:40,889

the crew giving the crew everything they

100

00:04:45,830 --> 00:04:43,380

need to be able to occupy and live

101  
00:04:49,129 --> 00:04:45,840  
comfortable comfortably and do the

102  
00:04:54,320 --> 00:04:49,139  
science work that the the space station

103  
00:04:58,490 --> 00:04:54,330  
is all about the a lot of things go into

104  
00:05:01,310 --> 00:04:58,500  
making or keeping people alive and a lot

105  
00:05:03,379 --> 00:05:01,320  
of it we tend to take for granted in any

106  
00:05:05,750 --> 00:05:03,389  
kind of type of spacecraft whether it's

107  
00:05:07,219 --> 00:05:05,760  
a space shuttle or space station the

108  
00:05:08,629 --> 00:05:07,229  
part of that spacecraft that's

109  
00:05:10,430 --> 00:05:08,639  
responsible for keeping the crew alive

110  
00:05:13,310 --> 00:05:10,440  
we call that environmental control and

111  
00:05:14,930 --> 00:05:13,320  
life support and as the name implies it

112  
00:05:17,000 --> 00:05:14,940  
keeps the environment comfortable it

113  
00:05:20,060 --> 00:05:17,010

keeps it safe and most importantly keeps

114

00:05:21,620 --> 00:05:20,070

the people alive there's a lot of parts

115

00:05:26,830 --> 00:05:21,630

of an environmental control and life

116

00:05:31,580 --> 00:05:26,840

support system what Marshall worked on

117

00:05:34,430 --> 00:05:31,590

even before station became permanently

118

00:05:36,620 --> 00:05:34,440

manned as we worked on technologies that

119

00:05:39,500 --> 00:05:36,630

allowed us to more efficiently keep

120

00:05:42,409 --> 00:05:39,510

those astronauts alive and well while

121

00:05:45,770 --> 00:05:42,419

they're up in orbit a lot of things we

122

00:05:48,800 --> 00:05:45,780

take for granted people need oxygen to

123

00:05:50,540 --> 00:05:48,810

breathe they need water to consume and

124

00:05:53,450 --> 00:05:50,550

while they're doing that to generating a

125

00:05:55,700 --> 00:05:53,460

lot of wastes what we've developed here

126  
00:05:57,920 --> 00:05:55,710  
at Marshall for the space station where

127  
00:06:00,589 --> 00:05:57,930  
systems that allow us to take those

128  
00:06:03,830 --> 00:06:00,599  
wastes and recycle them back into

129  
00:06:06,650 --> 00:06:03,840  
reusable water and oxygen and that helps

130  
00:06:08,689 --> 00:06:06,660  
the space station by by making it less

131  
00:06:10,820 --> 00:06:08,699  
dependent on always having to have a

132  
00:06:13,820 --> 00:06:10,830  
space shuttle or some type of resupply

133  
00:06:17,240 --> 00:06:13,830  
vehicle supplying oxygen and water from

134  
00:06:19,550 --> 00:06:17,250  
the ground so it was a very long and

135  
00:06:23,689 --> 00:06:19,560  
challenging project we're very excited

136  
00:06:26,150 --> 00:06:23,699  
to be a part of that was exciting is

137  
00:06:28,939 --> 00:06:26,160  
engineers to be working on technologies

138  
00:06:31,790 --> 00:06:28,949

that that hadn't been used before but it

139

00:06:34,339 --> 00:06:31,800

was also exciting to be able to allow

140

00:06:36,020 --> 00:06:34,349

the space station that finally be able

141

00:06:38,120 --> 00:06:36,030

to live up to its potential and do all

142

00:06:40,430 --> 00:06:38,130

that science that little breeze helps

143

00:06:42,320 --> 00:06:40,440

organize so it's been a

144

00:06:44,570 --> 00:06:42,330

very cool ride and I was very privileged

145

00:06:49,850 --> 00:06:44,580

to have a chance to be part of it it's

146

00:06:52,520 --> 00:06:49,860

really nice Annette I manage the payload

147

00:06:55,400 --> 00:06:52,530

facilities that Marshall is responsible

148

00:06:57,500 --> 00:06:55,410

for as Kim mentioned my long time

149

00:07:01,760 --> 00:06:57,510

history is with the Express racks which

150

00:07:03,740 --> 00:07:01,770

came out of the idea to outfit a space

151  
00:07:07,910 --> 00:07:03,750  
station rack which is a refrigerator

152  
00:07:09,950 --> 00:07:07,920  
sized container that most all the space

153  
00:07:12,680 --> 00:07:09,960  
station hardware goes in and attaches to

154  
00:07:16,070 --> 00:07:12,690  
the modules but to outfit it to

155  
00:07:19,100 --> 00:07:16,080  
accommodate simpler smaller payloads or

156  
00:07:22,490 --> 00:07:19,110  
experiments for for various types

157  
00:07:25,160 --> 00:07:22,500  
research so we have built eight fly

158  
00:07:27,290 --> 00:07:25,170  
track seven of which are now on orbit

159  
00:07:29,720 --> 00:07:27,300  
the life supply track is planned to

160  
00:07:33,800 --> 00:07:29,730  
launch in November on the Ulf Bob

161  
00:07:36,770 --> 00:07:33,810  
mission and those have accommodated all

162  
00:07:40,700 --> 00:07:36,780  
types of experiments crystal growth

163  
00:07:44,930 --> 00:07:40,710

material science life science both plant

164

00:07:47,270 --> 00:07:44,940

growth mice experiments to determine the

165

00:07:51,980 --> 00:07:47,280

effects of microgravity on live

166

00:07:55,070 --> 00:07:51,990

specimens and together have operated

167

00:07:57,890 --> 00:07:55,080

almost 200,000 hours among the seven

168

00:08:01,580 --> 00:07:57,900

racks currently on board the station in

169

00:08:07,400 --> 00:08:01,590

all three lab modules provided by the US

170

00:08:10,730 --> 00:08:07,410

the Europeans and the Japanese and it's

171

00:08:13,909 --> 00:08:10,740

just it's been very rewarding to see how

172

00:08:15,770 --> 00:08:13,919

the people have worked together to come

173

00:08:18,890 --> 00:08:15,780

to make this happen and it's been the

174

00:08:23,540 --> 00:08:18,900

contribution of a just a lot of people

175

00:08:26,180 --> 00:08:23,550

working together and and providing the

176

00:08:29,600 --> 00:08:26,190

resources for the scientists to do their

177

00:08:32,240 --> 00:08:29,610

experiments on station and then we also

178

00:08:34,579 --> 00:08:32,250

have the window observational research

179

00:08:38,089 --> 00:08:34,589

facility which was launched earlier this

180

00:08:41,930 --> 00:08:38,099

year and will facilitate earth science

181

00:08:47,240 --> 00:08:41,940

using the optical quality window in the

182

00:08:50,630 --> 00:08:47,250

u.s. lab there's some specific payloads

183

00:08:54,250 --> 00:08:50,640

one is earthcam which is operating in it

184

00:08:57,760 --> 00:08:54,260

to support middle school educational

185

00:08:59,520 --> 00:08:57,770

aspects and then the other experiment

186

00:09:02,140 --> 00:08:59,530

planned for it is an agricultural

187

00:09:04,540 --> 00:09:02,150

experiment to look at the soil

188

00:09:07,240 --> 00:09:04,550

conditions irrigation that sort of thing

189

00:09:11,130 --> 00:09:07,250

to help farmers we hope to expand this

190

00:09:13,780 --> 00:09:11,140

to do more with earth science research

191

00:09:18,070 --> 00:09:13,790

disaster relief and that sort of thing

192

00:09:21,580 --> 00:09:18,080

by looking at the Earth from space also

193

00:09:24,280 --> 00:09:21,590

in my office is the microgravity science

194

00:09:29,590 --> 00:09:24,290

glovebox and this provides an enclosed

195

00:09:31,780 --> 00:09:29,600

environment for experimentation using

196

00:09:34,360 --> 00:09:31,790

gloves to manipulate the hardware but

197

00:09:37,110 --> 00:09:34,370

providing the the closure to protect the

198

00:09:41,620 --> 00:09:37,120

crew from any loose particles

199

00:09:44,190 --> 00:09:41,630

contaminants that sort of thing and they

200

00:09:48,420 --> 00:09:44,200

have accommodated approximately 20

201  
00:09:52,570 --> 00:09:48,430  
experiments since 2002 when it was

202  
00:09:57,250 --> 00:09:52,580  
launched and provided both by the

203  
00:10:00,070 --> 00:09:57,260  
Europeans and by US researchers and has

204  
00:10:02,770 --> 00:10:00,080  
been termed the backbone of station

205  
00:10:04,930 --> 00:10:02,780  
research in addition we have the

206  
00:10:08,530 --> 00:10:04,940  
material science research rack in my

207  
00:10:13,570 --> 00:10:08,540  
office and it provides for materials

208  
00:10:18,910 --> 00:10:13,580  
research both in metals alloys and has

209  
00:10:22,240 --> 00:10:18,920  
processed 12 samples to date from

210  
00:10:25,180 --> 00:10:22,250  
aluminum and copper alloys will allow

211  
00:10:28,570 --> 00:10:25,190  
the samples to be heated up to a

212  
00:10:30,880 --> 00:10:28,580  
thousand degrees Celsius and then riesel

213  
00:10:34,660 --> 00:10:30,890

it'd ified in space without the effects

214

00:10:37,540 --> 00:10:34,670

of gravity to determine higher quality

215

00:10:41,350 --> 00:10:37,550

materials for use on orbit can also

216

00:10:45,110 --> 00:10:41,360

support ceramics and semiconductor

217

00:10:50,510 --> 00:10:47,329

with that Richard tell us more about the

218

00:10:52,670 --> 00:10:50,520

science thank you my involvement of all

219

00:10:55,280 --> 00:10:52,680

the space station goes back a while when

220

00:10:58,550 --> 00:10:55,290

I was the project scientist for three

221

00:11:00,200 --> 00:10:58,560

material science investigations I was

222

00:11:02,990 --> 00:11:00,210

unfortunate enough to have two of my own

223

00:11:05,320 --> 00:11:03,000

the first one was the pfm I or pore

224

00:11:07,970 --> 00:11:05,330

formation and mobility investigation

225

00:11:11,210 --> 00:11:07,980

where we looked at an organic material

226

00:11:13,250 --> 00:11:11,220

and and looked at gravity independent

227

00:11:15,380 --> 00:11:13,260

effects on solidification and melting

228

00:11:18,050 --> 00:11:15,390

behavior and that was conducted in the

229

00:11:22,370 --> 00:11:18,060

material science glovebox and the second

230

00:11:24,769 --> 00:11:22,380

experiment was the ISS I or in space

231

00:11:28,600 --> 00:11:24,779

soldering investigation where we did a

232

00:11:31,130 --> 00:11:28,610

systematic series of experiments with

233

00:11:36,640 --> 00:11:31,140

materials available on the space station

234

00:11:43,030 --> 00:11:36,650

where we looked at solidification and

235

00:11:45,200 --> 00:11:43,040

soldering phenomena and then right now

236

00:11:48,890 --> 00:11:45,210

because we have such good facilities

237

00:11:52,190 --> 00:11:48,900

here at Marshall I'm evaluating the

238

00:11:54,500 --> 00:11:52,200

first sample first American Pie sample

239

00:11:57,079 --> 00:11:54,510

that came out of the MS up MSR our rack

240

00:11:58,250 --> 00:11:57,089

and we're doing that in our laboratory

241

00:12:01,370 --> 00:11:58,260

here and finding some interesting

242

00:12:05,000 --> 00:12:01,380

results that's what I'm up to now so

243

00:12:06,290 --> 00:12:05,010

okay in my office we have the project

244

00:12:08,750 --> 00:12:06,300

management responsibility for the

245

00:12:10,310 --> 00:12:08,760

multi-purpose logistics modules we have

246

00:12:12,350 --> 00:12:10,320

three modules that they were built by

247

00:12:15,500 --> 00:12:12,360

the Italian space agency for us under a

248

00:12:17,840 --> 00:12:15,510

barter agreement with NASA they built

249

00:12:20,690 --> 00:12:17,850

those modules and delivered them one

250

00:12:24,560 --> 00:12:20,700

module in 1998 one in 1999 and the third

251  
00:12:27,290 --> 00:12:24,570  
one in 2001 the three modules named by

252  
00:12:29,930 --> 00:12:27,300  
the the Italian space agency Leonardo

253  
00:12:34,030 --> 00:12:29,940  
Raphael oh and Donatello name for a

254  
00:12:36,890 --> 00:12:34,040  
famous Italian artists and engineers as

255  
00:12:39,350 --> 00:12:36,900  
you've heard Bob and it talked about the

256  
00:12:40,460 --> 00:12:39,360  
the racks on the science racks and the

257  
00:12:41,630 --> 00:12:40,470  
eclipse racks like you gotta have a way

258  
00:12:44,090 --> 00:12:41,640  
to get them up there and that's what the

259  
00:12:46,010 --> 00:12:44,100  
Logistics Module does for us it provides

260  
00:12:48,220 --> 00:12:46,020  
an environment where we can put up to 16

261  
00:12:50,810 --> 00:12:48,230  
racks in the module and carry them up

262  
00:12:53,060 --> 00:12:50,820  
the module goes in the payload bay of

263  
00:12:54,380 --> 00:12:53,070

the shuttle goes up comes out of the

264

00:12:55,970 --> 00:12:54,390

payload Bay is docked to the space

265

00:12:56,330 --> 00:12:55,980

station for the duration of the shuttle

266

00:12:58,590 --> 00:12:56,340

mish

267

00:13:00,270 --> 00:12:58,600

the crew will go in unload the supplies

268

00:13:01,680 --> 00:13:00,280

that we've taken up to space station and

269

00:13:03,300 --> 00:13:01,690

then repack it for those items that need

270

00:13:04,680 --> 00:13:03,310

to come back the experiments that are

271

00:13:07,560 --> 00:13:04,690

completed and need to come back in those

272

00:13:08,730 --> 00:13:07,570

types of things so then it goes once the

273

00:13:10,230 --> 00:13:08,740

crews completed they'll close the hatch

274

00:13:12,960 --> 00:13:10,240

put it back in the payload Bay and bring

275

00:13:15,540 --> 00:13:12,970

it back home for each flight so that's

276

00:13:18,030 --> 00:13:15,550

kind of a typical flight for each of our

277

00:13:19,950 --> 00:13:18,040

modules one thing that we're doing

278

00:13:21,960 --> 00:13:19,960

differently for the the upcoming flight

279

00:13:25,080 --> 00:13:21,970

that we have which is the November

280

00:13:26,430 --> 00:13:25,090

flight that mentioned in Ulf five we're

281

00:13:27,960 --> 00:13:26,440

leaving one module up there permanently

282

00:13:29,610 --> 00:13:27,970

basically it's going to become the

283

00:13:32,220 --> 00:13:29,620

closet for Space Station obviously

284

00:13:34,080 --> 00:13:32,230

anyhow you need a garage or an addict or

285

00:13:36,090 --> 00:13:34,090

some weird story or all of your stuff so

286

00:13:38,790 --> 00:13:36,100

that's what mpm because we call it as

287

00:13:41,280 --> 00:13:38,800

going to become to do that we had to do

288

00:13:43,290 --> 00:13:41,290

some modifications to the module since

289

00:13:47,190 --> 00:13:43,300

it was built for a typical two-week

290

00:13:48,480 --> 00:13:47,200

space shuttle mission the debris pounds

291

00:13:49,880 --> 00:13:48,490

around the outside of it we're not quite

292

00:13:51,960 --> 00:13:49,890

as thick so that we could save on weight

293

00:13:54,540 --> 00:13:51,970

obviously so we have my way to take up

294

00:13:57,240 --> 00:13:54,550

for the items that we were experiments

295

00:13:59,130 --> 00:13:57,250

in the racks that were needed for the

296

00:14:01,380 --> 00:13:59,140

rest of space station so we had to go

297

00:14:05,010 --> 00:14:01,390

back and reinforce those debris panels

298

00:14:06,420 --> 00:14:05,020

for this flight coming up we went back to

299

00:14:08,670 --> 00:14:06,430

the Italian space agency to their

300

00:14:11,100 --> 00:14:08,680

contractors they came back a lot of the

301  
00:14:14,070 --> 00:14:11,110  
original designers we're back helping us

302  
00:14:16,050 --> 00:14:14,080  
with this modification brought the new

303  
00:14:18,600 --> 00:14:16,060  
hardware down to Kennedy Space Center

304  
00:14:19,950 --> 00:14:18,610  
down in Florida and spent basically the

305  
00:14:22,680 --> 00:14:19,960  
whole summer down there helping us

306  
00:14:25,770 --> 00:14:22,690  
retrofit the module with the the updated

307  
00:14:27,270 --> 00:14:25,780  
debris shields and everything one of the

308  
00:14:29,550 --> 00:14:27,280  
other modifications that we had to make

309  
00:14:31,980 --> 00:14:29,560  
was for maintenance of the hardware

310  
00:14:33,090 --> 00:14:31,990  
inside the module this module was built

311  
00:14:35,010 --> 00:14:33,100  
with the idea that would always be

312  
00:14:36,680 --> 00:14:35,020  
serviced on the ground so we do not put

313  
00:14:39,120 --> 00:14:36,690

in a lot of things that the other

314

00:14:41,070 --> 00:14:39,130

modules on Space Station half or crew

315

00:14:43,620 --> 00:14:41,080

getting to getting access to the

316

00:14:45,540 --> 00:14:43,630

hardware in the boxes and everything if

317

00:14:46,850 --> 00:14:45,550

they had to do maintenance on orbit so

318

00:14:48,870 --> 00:14:46,860

we had to go back and do some

319

00:14:51,060 --> 00:14:48,880

retrofitting they're rerouting of some

320

00:14:52,800 --> 00:14:51,070

electrical cable harnesses and that type

321

00:14:54,210 --> 00:14:52,810

of thing so we've done a lot of work

322

00:14:56,590 --> 00:14:54,220

over the past summer to get ready for

323

00:14:58,550 --> 00:14:56,600

this coming flight

324

00:15:01,069 --> 00:14:58,560

so that we can leave this thing up there

325

00:15:04,100 --> 00:15:01,079

permanently one other thing to mention

326

00:15:06,790 --> 00:15:04,110

about the multi-purpose logistics

327

00:15:09,680 --> 00:15:06,800

modules is we've had ten flights to date

328

00:15:12,590 --> 00:15:09,690

our first flight was LaBrie she mentioned

329

00:15:14,420 --> 00:15:12,600

581 earlier our first flight was also on

330

00:15:17,210 --> 00:15:14,430

581 back in two thousand one was the

331

00:15:19,129 --> 00:15:17,220

first flight in mpls so we've flown 10

332

00:15:20,660 --> 00:15:19,139

times since then always up and back on

333

00:15:22,400 --> 00:15:20,670

the shuttle so this would be a unique

334

00:15:23,780 --> 00:15:22,410

experience for us this there's no going

335

00:15:25,100 --> 00:15:23,790

broke when we go up and leave leave the

336

00:15:26,780 --> 00:15:25,110

module up there so be nice to see her

337

00:15:29,269 --> 00:15:26,790

our Hardware stay up there on orbit this

338

00:15:31,129 --> 00:15:29,279

time and be able to see it whenever the

339

00:15:33,590 --> 00:15:31,139

shuttle backs away and see some pictures

340

00:15:35,420 --> 00:15:33,600

of it one other thing through our office

341

00:15:38,090 --> 00:15:35,430

has done has helped with the development

342

00:15:39,410 --> 00:15:38,100

of the node to node three those are

343

00:15:41,900 --> 00:15:39,420

basically the connecting blocks for

344

00:15:43,999 --> 00:15:41,910

station harmony and tranquility the

345

00:15:46,069 --> 00:15:44,009

names given to those two modules those

346

00:15:48,410 --> 00:15:46,079

were built by the European Space Agency

347

00:15:50,840 --> 00:15:48,420

again under agreement with NASA and our

348

00:15:52,699 --> 00:15:50,850

office has had a lot of interaction with

349

00:15:55,340 --> 00:15:52,709

the European Space Agency as well as

350

00:15:57,590 --> 00:15:55,350

Johnson has the project office out there

351  
00:15:59,600 --> 00:15:57,600  
for those modules so that both of those

352  
00:16:02,360 --> 00:15:59,610  
modules are already on orbit and flying

353  
00:16:04,999 --> 00:16:02,370  
on station in fact those two locations

354  
00:16:07,309 --> 00:16:05,009  
those two nodes are where the npl ends

355  
00:16:08,980 --> 00:16:07,319  
in the pmm have docked in on the past 10

356  
00:16:11,240 --> 00:16:08,990  
missions and on the accumulation as well

357  
00:16:13,189 --> 00:16:11,250  
think she'll that sounds interesting and

358  
00:16:14,929 --> 00:16:13,199  
I can't wait to see the pmm attached

359  
00:16:17,689 --> 00:16:14,939  
permanently as well that would be nice

360  
00:16:19,069 --> 00:16:17,699  
to see and think that arrests the panel

361  
00:16:21,620 --> 00:16:19,079  
members for that interesting information

362  
00:16:23,030 --> 00:16:21,630  
about what Marshall does and has done

363  
00:16:25,160 --> 00:16:23,040

over the past 10 years with the

364

00:16:28,009 --> 00:16:25,170

international space station since we are

365

00:16:29,210 --> 00:16:28,019

celebrating this 10th anniversary and

366

00:16:31,040 --> 00:16:29,220

I'd like to start out by asking some

367

00:16:33,199 --> 00:16:31,050

questions and just wanting to ask Bob

368

00:16:34,550 --> 00:16:33,209

you know looking at back at the past 10

369

00:16:37,429 --> 00:16:34,560

years Bob what do you think is the most

370

00:16:39,679 --> 00:16:37,439

interesting accomplishment that happened

371

00:16:43,939 --> 00:16:39,689

of the International Space Station while

372

00:16:46,850 --> 00:16:43,949

you've been working on it well it's hard

373

00:16:50,170 --> 00:16:46,860

to decide exactly where to start one of

374

00:16:55,189 --> 00:16:50,180

the things I've been fascinated with is

375

00:16:58,840 --> 00:16:55,199

it historically space missions are very

376

00:17:01,610 --> 00:16:58,850

well defined very highly planned out

377

00:17:03,650 --> 00:17:01,620

something you could call it scripted you

378

00:17:05,010 --> 00:17:03,660

know everything you know just about

379

00:17:07,290 --> 00:17:05,020

what's going to happen

380

00:17:09,060 --> 00:17:07,300

literally every minute of that mission

381

00:17:12,110 --> 00:17:09,070

and what the vehicle is going to look

382

00:17:14,820 --> 00:17:12,120

like how it's going to be operated very

383

00:17:17,579 --> 00:17:14,830

and unless you have a problem or

384

00:17:19,440 --> 00:17:17,589

something which have happened you have a

385

00:17:21,060 --> 00:17:19,450

pretty good idea of what what's going to

386

00:17:23,760 --> 00:17:21,070

happen in that mission what that vehicle

387

00:17:26,790 --> 00:17:23,770

is going to look like but space station

388

00:17:28,760 --> 00:17:26,800

back you know ten years ago or even

389

00:17:31,620 --> 00:17:28,770

before that when we were in the

390

00:17:34,200 --> 00:17:31,630

development stage I think if if you had

391

00:17:36,150 --> 00:17:34,210

asked all of us what we expected the

392

00:17:39,510 --> 00:17:36,160

space station to be looking like today

393

00:17:41,700 --> 00:17:39,520

and how it would be used I think you

394

00:17:43,440 --> 00:17:41,710

would probably get five maybe six or

395

00:17:45,870 --> 00:17:43,450

seven different different opinions so

396

00:17:49,410 --> 00:17:45,880

the thing that's really struck me is how

397

00:17:53,820 --> 00:17:49,420

over this past 10 years the space

398

00:17:56,910 --> 00:17:53,830

station has evolved it's adapted that

399

00:17:59,880 --> 00:17:56,920

the vehicle itself has changed from what

400

00:18:03,900 --> 00:17:59,890

original thoughts have been the way

401  
00:18:06,240 --> 00:18:03,910  
we're operating it has changed it's it's

402  
00:18:08,630 --> 00:18:06,250  
to me it's actually quite remarkable and

403  
00:18:12,090 --> 00:18:08,640  
then to be able to do that in such an

404  
00:18:15,420 --> 00:18:12,100  
international collaborative environment

405  
00:18:18,300 --> 00:18:15,430  
where you know a lot of times we tend to

406  
00:18:20,610 --> 00:18:18,310  
throw the word team around the log but I

407  
00:18:22,890 --> 00:18:20,620  
think actually in the space station case

408  
00:18:25,160 --> 00:18:22,900  
I think it's that that term is very well

409  
00:18:28,020 --> 00:18:25,170  
deserved it definitely is a

410  
00:18:30,060 --> 00:18:28,030  
international team effort I don't think

411  
00:18:34,350 --> 00:18:30,070  
it ever could have been possible for

412  
00:18:36,750 --> 00:18:34,360  
this vehicle to evolve to the state it's

413  
00:18:39,060 --> 00:18:36,760

in today and to continue to have so much

414

00:18:41,820 --> 00:18:39,070

promise for the future it's you know

415

00:18:43,020 --> 00:18:41,830

this the ten years is just the start of

416

00:18:44,910 --> 00:18:43,030

it there's certainly more to come from

417

00:18:48,450 --> 00:18:44,920

this vehicle and I'm sure the science

418

00:18:51,780 --> 00:18:48,460

guys are happy to hear that too one

419

00:18:55,650 --> 00:18:51,790

thing I'd like to piggyback on Bob that

420

00:18:57,300 --> 00:18:55,660

you mentioned was the intense

421

00:18:59,700 --> 00:18:57,310

coordination the planning and the

422

00:19:02,280 --> 00:18:59,710

scheduling and the such imagine now

423

00:19:06,330 --> 00:19:02,290

since we've since all of our partners

424

00:19:08,160 --> 00:19:06,340

are on board all of almost all the

425

00:19:10,650 --> 00:19:08,170

hardware has arrived we've got a few

426

00:19:13,860 --> 00:19:10,660

things that are still ahead of us but

427

00:19:16,920 --> 00:19:13,870

with our European Space Agency with the

428

00:19:22,590 --> 00:19:16,930

our European partners coming on and our

429

00:19:26,010 --> 00:19:22,600

Japanese partners it has been such a an

430

00:19:28,830 --> 00:19:26,020

amazing choreographed work of art to see

431

00:19:31,440 --> 00:19:28,840

how all the science between all the

432

00:19:35,220 --> 00:19:31,450

flight control teams associated with all

433

00:19:38,820 --> 00:19:35,230

the partners actually pull off all the

434

00:19:41,580 --> 00:19:38,830

science that gets accomplished one would

435

00:19:43,410 --> 00:19:41,590

think that and one of the goals of space

436

00:19:45,600 --> 00:19:43,420

station is that we are in a laboratory

437

00:19:49,280 --> 00:19:45,610

environment where you can you know roll

438

00:19:53,340 --> 00:19:49,290

up your sleeves and you can walk in and

439

00:19:57,870 --> 00:19:53,350

do you know do a unique thing on every

440

00:20:01,920 --> 00:19:57,880

day and amazingly enough one day we'll

441

00:20:04,680 --> 00:20:01,930

probably be that relaxed right now we're

442

00:20:06,390 --> 00:20:04,690

still in that early phase now that all

443

00:20:12,060 --> 00:20:06,400

of our partners have been there since

444

00:20:16,110 --> 00:20:12,070

last last well 2008 2000-2008 timeframe

445

00:20:20,250 --> 00:20:16,120

we are learning how to do that

446

00:20:23,880 --> 00:20:20,260

choreography amongst all 15 partners now

447

00:20:25,980 --> 00:20:23,890

and it is a win it and when a you know

448

00:20:28,140 --> 00:20:25,990

the show when a plan comes together it

449

00:20:30,450 --> 00:20:28,150

is an amazing thing there is so much

450

00:20:33,780 --> 00:20:30,460

science that is getting accomplished now

451

00:20:37,110 --> 00:20:33,790

and it is truly a work of art to see all

452

00:20:39,090 --> 00:20:37,120

the plans and the schedules that all of

453

00:20:41,640 --> 00:20:39,100

the partners pull together on a daily

454

00:20:45,480 --> 00:20:41,650

basis in order to get science like

455

00:20:47,760 --> 00:20:45,490

richard has spoken of and an it has

456

00:20:50,340 --> 00:20:47,770

talked about that is actually getting

457

00:20:52,560 --> 00:20:50,350

executed in the racks in all the partner

458

00:20:54,090 --> 00:20:52,570

modules as well that's an interesting

459

00:20:55,530 --> 00:20:54,100

point that you talk about the

460

00:20:57,000 --> 00:20:55,540

international partners and I was going

461

00:20:59,520 --> 00:20:57,010

to ask some of the rest of the team to

462

00:21:01,560 --> 00:20:59,530

what was it like working with all these

463

00:21:03,210 --> 00:21:01,570

international partners may be in it I

464

00:21:06,660 --> 00:21:03,220

don't know if you can elaborate on that

465

00:21:09,330 --> 00:21:06,670

well it's been a good overall experience

466

00:21:12,030 --> 00:21:09,340

and partly because we've all had the

467

00:21:15,300 --> 00:21:12,040

common goal of building the hardware and

468

00:21:17,670 --> 00:21:15,310

doing the research together for the good

469

00:21:20,880 --> 00:21:17,680

of the entire team certainly

470

00:21:23,670 --> 00:21:20,890

face-to-face meetings and interactions

471

00:21:25,990 --> 00:21:23,680

or necessary to build relationships to

472

00:21:28,930 --> 00:21:26,000

build up the trust among the teams and

473

00:21:30,850 --> 00:21:28,940

to then continue to work issues through

474

00:21:33,910 --> 00:21:30,860

telecoms and emails and that sort of

475

00:21:37,030 --> 00:21:33,920

thing but material science research brac

476  
00:21:40,300 --> 00:21:37,040  
houses an international furnace provided

477  
00:21:42,010 --> 00:21:40,310  
by the Europeans the microgravity

478  
00:21:45,150 --> 00:21:42,020  
science glovebox was built by the

479  
00:21:49,510 --> 00:21:45,160  
Europeans under a marshal management and

480  
00:21:52,300 --> 00:21:49,520  
continues to be formally sustained by

481  
00:21:54,190 --> 00:21:52,310  
the Europeans but yet managed by Bob

482  
00:21:56,260 --> 00:21:54,200  
Marshall so it's been a true

483  
00:21:58,810 --> 00:21:56,270  
collaborative effort with the

484  
00:22:00,910 --> 00:21:58,820  
international partners I think there's

485  
00:22:02,530 --> 00:22:00,920  
been the kind of two sides that's when

486  
00:22:04,540 --> 00:22:02,540  
your la Brisa seeing the operations

487  
00:22:07,210 --> 00:22:04,550  
which he talked about has a net said and

488  
00:22:09,670 --> 00:22:07,220

on the logistics modules as well excuse

489

00:22:10,810 --> 00:22:09,680

me we had the development and hardware

490

00:22:12,730 --> 00:22:10,820

build part of it where you were

491

00:22:15,640 --> 00:22:12,740

interacting back and forth more on a a

492

00:22:16,990 --> 00:22:15,650

technical level of you know here's the

493

00:22:18,430 --> 00:22:17,000

requirements of what we want to build

494

00:22:19,930 --> 00:22:18,440

and then they would come back with these

495

00:22:21,730 --> 00:22:19,940

design options and we'd have to evaluate

496

00:22:23,680 --> 00:22:21,740

that versus what our requirements were

497

00:22:26,710 --> 00:22:23,690

at the time and a lot of back-and-forth

498

00:22:28,890 --> 00:22:26,720

were there with that you know then you

499

00:22:31,030 --> 00:22:28,900

throw in the the time differences in the

500

00:22:33,220 --> 00:22:31,040

language barriers sometimes that you

501  
00:22:34,720 --> 00:22:33,230  
have to deal with so it's a you know a

502  
00:22:35,650 --> 00:22:34,730  
lot of times you'll have a question

503  
00:22:36,640 --> 00:22:35,660  
today that you're not going to have an

504  
00:22:38,860 --> 00:22:36,650  
answer tuned to you come into the office

505  
00:22:40,390 --> 00:22:38,870  
next morning or maybe even longer

506  
00:22:42,850 --> 00:22:40,400  
depending with the time difference is

507  
00:22:44,590 --> 00:22:42,860  
between we were working with so it's a

508  
00:22:47,080 --> 00:22:44,600  
lot of unique challenges that we had to

509  
00:22:48,370 --> 00:22:47,090  
start dealing with at least from my

510  
00:22:49,740 --> 00:22:48,380  
standpoint I hadn't hadn't done that

511  
00:22:52,510 --> 00:22:49,750  
before before I started working on the

512  
00:22:54,460 --> 00:22:52,520  
Logistics Module says and over the

513  
00:22:56,860 --> 00:22:54,470

course of time as an F said you build

514

00:22:59,290 --> 00:22:56,870

those relationships the Italians have

515

00:23:01,300 --> 00:22:59,300

been the sustaining engineering partners

516

00:23:02,980 --> 00:23:01,310

for the logistics modules ever since

517

00:23:04,630 --> 00:23:02,990

they were delivered so you know over

518

00:23:06,340 --> 00:23:04,640

that 10 years you begin to develop good

519

00:23:08,110 --> 00:23:06,350

relationships with those people and it's

520

00:23:09,760 --> 00:23:08,120

you know develop good friendships you

521

00:23:11,500 --> 00:23:09,770

know you you don't get to see them very

522

00:23:13,510 --> 00:23:11,510

often but still you talk to them on

523

00:23:16,360 --> 00:23:13,520

telecon zan email quite often so it's

524

00:23:19,840 --> 00:23:16,370

it's been a very good relationship and

525

00:23:22,270 --> 00:23:19,850

partnership between the two thing and

526

00:23:24,760 --> 00:23:22,280

then maybe somewhat behind the scenes is

527

00:23:27,580 --> 00:23:24,770

on I get involved with NASA headquarters

528

00:23:31,090 --> 00:23:27,590

and evaluating proposals that coordinate

529

00:23:34,450 --> 00:23:31,100

us p is with the European counterparts

530

00:23:36,430 --> 00:23:34,460

so we get to see what they're doing and

531

00:23:38,170 --> 00:23:36,440

and evaluate what they're doing and put

532

00:23:40,360 --> 00:23:38,180

the right teams together so we can get

533

00:23:42,390 --> 00:23:40,370

the best science out of these on this

534

00:23:44,920 --> 00:23:42,400

material science research rack and

535

00:23:47,950 --> 00:23:44,930

little gradient furnace or the SQL

536

00:23:49,990 --> 00:23:47,960

furnaces so it's it's really been nice

537

00:23:52,180 --> 00:23:50,000

for me too because it keeps me abreast

538

00:23:54,040 --> 00:23:52,190

of what's going on in in the latest in

539

00:23:55,360 --> 00:23:54,050

the science and interact with some of

540

00:23:59,020 --> 00:23:55,370

the best people in the world in this

541

00:24:01,180 --> 00:23:59,030

field so that's a good boy and one other

542

00:24:02,770 --> 00:24:01,190

thing but what do you guys think is one

543

00:24:06,340 --> 00:24:02,780

of your biggest challenges over the past

544

00:24:08,350 --> 00:24:06,350

decade working on the station or what's

545

00:24:12,340 --> 00:24:08,360

something that you you'd like to share

546

00:24:15,630 --> 00:24:12,350

talk about or reflect on that I'll take

547

00:24:20,410 --> 00:24:15,640

a stab it was not get it started I think

548

00:24:24,220 --> 00:24:20,420

just last year in fact we moved from a

549

00:24:28,060 --> 00:24:24,230

three-person crew onboard station to a

550

00:24:31,840 --> 00:24:28,070

six-person crew aboard station and up

551  
00:24:35,230 --> 00:24:31,850  
until that time frame you know we'd have

552  
00:24:36,880 --> 00:24:35,240  
three crewmen come up and then and they

553  
00:24:39,340 --> 00:24:36,890  
would stay for a six-month period of

554  
00:24:41,200 --> 00:24:39,350  
time and we'd have a flight that we

555  
00:24:44,980 --> 00:24:41,210  
would change out crewman over that time

556  
00:24:47,050 --> 00:24:44,990  
and now with six people there what we

557  
00:24:49,570 --> 00:24:47,060  
are experiencing now that we have the

558  
00:24:51,730 --> 00:24:49,580  
Columbus lab there and we have the

559  
00:24:56,710 --> 00:24:51,740  
Japanese experiment module there as well

560  
00:25:00,310 --> 00:24:56,720  
as a u.s. lab they have unique work

561  
00:25:04,290 --> 00:25:00,320  
environments that all six crewmen can

562  
00:25:08,830 --> 00:25:04,300  
also work in now so it has increased

563  
00:25:11,470 --> 00:25:08,840

threefold if you will the number of

564

00:25:14,680 --> 00:25:11,480

hours that are available now for us to

565

00:25:19,240 --> 00:25:14,690

be able to perform science operations up

566

00:25:21,400 --> 00:25:19,250

until that time and as we culminate the

567

00:25:24,910 --> 00:25:21,410

actual architecture of International

568

00:25:27,100 --> 00:25:24,920

Space Station we we have the prime

569

00:25:28,990 --> 00:25:27,110

things to be done of course is to get

570

00:25:30,790 --> 00:25:29,000

the structure developed and built and

571

00:25:33,640 --> 00:25:30,800

make sure that I you know all the

572

00:25:36,940 --> 00:25:33,650

systems check out and can support and we

573

00:25:41,170 --> 00:25:36,950

are on the cusp now with six crewmen

574

00:25:44,380 --> 00:25:41,180

there of seeing so much science being

575

00:25:46,570 --> 00:25:44,390

realized and so I think the fact that we

576  
00:25:48,400 --> 00:25:46,580  
went from the three-person crew to the

577  
00:25:51,640 --> 00:25:48,410  
six-person crew was a huge

578  
00:25:56,020 --> 00:25:51,650  
huge step for what the ultimate goal is

579  
00:25:59,530 --> 00:25:56,030  
for ISS Bob do you have anything to add

580  
00:26:03,580 --> 00:25:59,540  
to that well in in my own particular

581  
00:26:08,260 --> 00:26:03,590  
world in developing these life support

582  
00:26:10,600 --> 00:26:08,270  
systems the list of challenge is quite

583  
00:26:12,460 --> 00:26:10,610  
long you get microgravity you have to

584  
00:26:15,730 --> 00:26:12,470  
deal with where fluids and gases don't

585  
00:26:17,350 --> 00:26:15,740  
behave the same you're always challenged

586  
00:26:19,810 --> 00:26:17,360  
with keeping things small and

587  
00:26:23,560 --> 00:26:19,820  
lightweight and power all that stuff is

588  
00:26:26,500 --> 00:26:23,570

it goes without saying kind of but it

589

00:26:29,470 --> 00:26:26,510

also it's I think it's a new experience

590

00:26:30,940 --> 00:26:29,480

for us especially now is again in my

591

00:26:34,150 --> 00:26:30,950

world we've kind of transitioned out a

592

00:26:36,520 --> 00:26:34,160

development and now in the operation

593

00:26:39,790 --> 00:26:36,530

phase learning what it takes to actually

594

00:26:43,470 --> 00:26:39,800

keep systems keep complicated systems

595

00:26:46,390 --> 00:26:43,480

operating in a challenging environment

596

00:26:48,850 --> 00:26:46,400

hundreds of miles away from us where

597

00:26:52,600 --> 00:26:48,860

were the people that are that they have

598

00:26:54,040 --> 00:26:52,610

the the the the intellectual capital if

599

00:26:56,620 --> 00:26:54,050

you will and understanding how the

600

00:26:59,200 --> 00:26:56,630

systems are designed and stuff can't go

601  
00:27:01,270 --> 00:26:59,210  
and put their hands on the hardware you

602  
00:27:04,570 --> 00:27:01,280  
know it can't touch it they can't you

603  
00:27:07,090 --> 00:27:04,580  
listen to it and so you get calls down

604  
00:27:09,370 --> 00:27:07,100  
that or you get data coming down that

605  
00:27:14,290 --> 00:27:09,380  
something doesn't seem right and you

606  
00:27:16,870 --> 00:27:14,300  
really have to stretch yourself as an

607  
00:27:20,470 --> 00:27:16,880  
engineer and and work closely with

608  
00:27:22,270 --> 00:27:20,480  
operators and and the crew to really

609  
00:27:24,790 --> 00:27:22,280  
understand what's going on if they come

610  
00:27:27,190 --> 00:27:24,800  
up with much more innovative solutions

611  
00:27:28,660 --> 00:27:27,200  
to problems thought you know it it's

612  
00:27:30,370 --> 00:27:28,670  
unlike a shuttle program where the

613  
00:27:32,320 --> 00:27:30,380

shuttle comes down after two weeks and

614

00:27:34,180 --> 00:27:32,330

you can get into the vehicle and fig

615

00:27:36,610 --> 00:27:34,190

look and say AHA that that's what

616

00:27:38,650 --> 00:27:36,620

happened I know what I need to fix for

617

00:27:41,620 --> 00:27:38,660

the next mission we don't have that

618

00:27:45,190 --> 00:27:41,630

luxury now so we're fixing stuff on the

619

00:27:48,760 --> 00:27:45,200

fly we're having to do it remotely we're

620

00:27:51,310 --> 00:27:48,770

having a inner interact with the whole

621

00:27:53,470 --> 00:27:51,320

operation side and again with the people

622

00:27:55,300 --> 00:27:53,480

that are operating the systems they're

623

00:27:56,860 --> 00:27:55,310

up they're supposed to be doing science

624

00:28:00,430 --> 00:27:56,870

as well so we can't be taken a lot of

625

00:28:02,109 --> 00:28:00,440

their time to keep the lights on sort of

626

00:28:04,689 --> 00:28:02,119

Speak so it's

627

00:28:07,329 --> 00:28:04,699

It's a new environment that we're having

628

00:28:08,949 --> 00:28:07,339

to operate in to keep the systems up and

629

00:28:11,799 --> 00:28:08,959

running it's a great learning experience

630

00:28:13,839 --> 00:28:11,809

that's a good point station is 220 miles

631

00:28:15,729 --> 00:28:13,849

above us right now so does that that

632

00:28:17,409 --> 00:28:15,739

pose a lot of problems for for you all

633

00:28:20,289 --> 00:28:17,419

when you you know starting to work a

634

00:28:22,119 --> 00:28:20,299

problem you've got to think about you

635

00:28:23,769 --> 00:28:22,129

know this station is not coming down and

636

00:28:26,349 --> 00:28:23,779

and I've got to work this problem on the

637

00:28:30,459 --> 00:28:26,359

ground is that kind of post problems for

638

00:28:33,099 --> 00:28:30,469

you guys so a different kind of

639

00:28:35,199 --> 00:28:33,109  
challenge I'm I'm used to doing

640

00:28:37,329 --> 00:28:35,209  
experiment going you know across the

641

00:28:41,409 --> 00:28:37,339  
hall into the lab and doing it and

642

00:28:43,949 --> 00:28:41,419  
evaluating it and and now i'm doing my

643

00:28:46,389 --> 00:28:43,959  
experiment 200 miles away and and i'm

644

00:28:48,279 --> 00:28:46,399  
not even doing i'm kind of telling

645

00:28:52,239 --> 00:28:48,289  
someone what to do when it goes through

646

00:28:53,919 --> 00:28:52,249  
this amazing team of technical people

647

00:28:57,699 --> 00:28:53,929  
and logistic people and this tell a

648

00:29:00,189 --> 00:28:57,709  
science effort and when you can see what

649

00:29:03,399 --> 00:29:00,199  
happens it's it's really pretty amazing

650

00:29:07,269 --> 00:29:03,409  
and in principle all this all works very

651  
00:29:09,309 --> 00:29:07,279  
amazingly smooth and for the most part

652  
00:29:11,289 --> 00:29:09,319  
things work the way they're supposed to

653  
00:29:15,089 --> 00:29:11,299  
work but we're up there so we always see

654  
00:29:18,759 --> 00:29:15,099  
some surprises for instance uh we get

655  
00:29:20,619 --> 00:29:18,769  
the occasional a single event upset

656  
00:29:22,779 --> 00:29:20,629  
where some atomic particle comes through

657  
00:29:24,279 --> 00:29:22,789  
and knocks out a solid-state component

658  
00:29:25,509 --> 00:29:24,289  
and you got to stop your experiment and

659  
00:29:27,909 --> 00:29:25,519  
reboot it and we're not used to doing

660  
00:29:30,189 --> 00:29:27,919  
that down here and these are things that

661  
00:29:32,589 --> 00:29:30,199  
you're not aware of it and and you learn

662  
00:29:36,059 --> 00:29:32,599  
these on the fly and and you deal with

663  
00:29:38,199 --> 00:29:36,069

them in and the astronauts up there are

664

00:29:41,229 --> 00:29:38,209

very helpful and they want to make sure

665

00:29:44,859 --> 00:29:41,239

that they do all they can to get what we

666

00:29:48,249 --> 00:29:44,869

need to get done it's really interesting

667

00:29:53,319 --> 00:29:48,259

it's pretty good for him anything from a

668

00:29:55,599 --> 00:29:53,329

net no nothin um I I think like Bob and

669

00:29:59,319 --> 00:29:55,609

Richard have I've said and I'm just just

670

00:30:02,109 --> 00:29:59,329

working issues that may occur and I know

671

00:30:04,359 --> 00:30:02,119

we've tried to to make improvements to

672

00:30:06,939 --> 00:30:04,369

our hardware and software on our racks

673

00:30:09,549 --> 00:30:06,949

to get more insight to provide more

674

00:30:11,630 --> 00:30:09,559

flexibility and operating from the

675

00:30:15,500 --> 00:30:11,640

ground so that we can but

676  
00:30:19,240 --> 00:30:15,510  
be be more flexible and more supportive

677  
00:30:23,630 --> 00:30:19,250  
of the science of various situations

678  
00:30:25,040 --> 00:30:23,640  
well thank you guys now now we're going

679  
00:30:27,320 --> 00:30:25,050  
to move into questions from the audience

680  
00:30:29,810 --> 00:30:27,330  
so I'm going to ask our local visiting

681  
00:30:31,790 --> 00:30:29,820  
media to please state your name and

682  
00:30:34,610 --> 00:30:31,800  
media affiliation and please wait for

683  
00:30:37,460 --> 00:30:34,620  
the mic to come to you and we'll start

684  
00:30:39,050 --> 00:30:37,470  
out right here with hi I'm Lee Roop with

685  
00:30:41,060 --> 00:30:39,060  
the Huntsville Times thanks very much

686  
00:30:43,270 --> 00:30:41,070  
for coming and giving us a chance to

687  
00:30:45,560 --> 00:30:43,280  
talk to you about this is fascinating

688  
00:30:50,420 --> 00:30:45,570

we've decided as a nation we're going to

689

00:30:53,480 --> 00:30:50,430

extend the space station now into 2020

690

00:30:57,590 --> 00:30:53,490

and I think what challenges and what

691

00:31:00,620 --> 00:30:57,600

opportunities does that present to you

692

00:31:02,840 --> 00:31:00,630

as oh my gosh it's got a its gotta last

693

00:31:05,990 --> 00:31:02,850

five went oh boy gets to last by more

694

00:31:07,730 --> 00:31:06,000

years anyone like to take that I'll

695

00:31:09,140 --> 00:31:07,740

start with that one that was one of the

696

00:31:10,670 --> 00:31:09,150

things that we had to consider when we

697

00:31:13,010 --> 00:31:10,680

started doing the modifications for the

698

00:31:15,170 --> 00:31:13,020

for the leaving the multi-purpose

699

00:31:16,850 --> 00:31:15,180

Logistics Module up there permanently in

700

00:31:20,900 --> 00:31:16,860

fact we've changed the name of it to

701  
00:31:22,100 --> 00:31:20,910  
permanent multi-purpose module now as I

702  
00:31:24,230 --> 00:31:22,110  
mentioned earlier you know that the

703  
00:31:26,120 --> 00:31:24,240  
first module was delivered in 1998 so

704  
00:31:28,700 --> 00:31:26,130  
that modulus you know 12 plus years old

705  
00:31:30,080 --> 00:31:28,710  
now and that happens to be the module be

706  
00:31:31,400 --> 00:31:30,090  
modified to to leave on orbit

707  
00:31:33,530 --> 00:31:31,410  
permanently so we had to start looking

708  
00:31:35,810 --> 00:31:33,540  
at the various components of it the the

709  
00:31:37,700 --> 00:31:35,820  
seals the o-ring seals to keep the

710  
00:31:39,080 --> 00:31:37,710  
pressurized atmosphere in place to make

711  
00:31:41,480 --> 00:31:39,090  
sure that they would last the entire

712  
00:31:43,460 --> 00:31:41,490  
time it's we're at a little bit of a

713  
00:31:45,080 --> 00:31:43,470

unique advantage in that we could go

714

00:31:47,720 --> 00:31:45,090

replace those seals here on the ground

715

00:31:50,000 --> 00:31:47,730

before we launch this time to make that

716

00:31:51,230 --> 00:31:50,010

twenty twenty date the the items that

717

00:31:52,850 --> 00:31:51,240

are on orbit right now obviously you

718

00:31:54,890 --> 00:31:52,860

have to look at and say hey can we can

719

00:31:56,780 --> 00:31:54,900

we stretch this out to me meet that 2020

720

00:31:58,610 --> 00:31:56,790

will it last that long or do we need to

721

00:32:00,290 --> 00:31:58,620

have spares in place do we need to take

722

00:32:02,090 --> 00:32:00,300

some spares up on these these last

723

00:32:04,160 --> 00:32:02,100

couple of shuttle flights in the in

724

00:32:05,960 --> 00:32:04,170

Logistics Module so we have those spares

725

00:32:08,299 --> 00:32:05,970

in place so that we can make that twenty

726

00:32:12,330 --> 00:32:08,309

twenty date

727

00:32:15,600 --> 00:32:12,340

ok and I'll everyone think one thing too

728

00:32:18,440 --> 00:32:15,610

that from a standpoint of the operations

729

00:32:23,540 --> 00:32:18,450

team I think it's only going to get

730

00:32:27,120 --> 00:32:23,550

simpler for us we we hope we think as

731

00:32:30,390 --> 00:32:27,130

everyday that we communicate with our

732

00:32:33,210 --> 00:32:30,400

partners the flight control teams across

733

00:32:35,370 --> 00:32:33,220

this world and the remote sites

734

00:32:38,090 --> 00:32:35,380

associated with them we get a little bit

735

00:32:41,400 --> 00:32:38,100

sharper with how we conduct our business

736

00:32:43,410 --> 00:32:41,410

so the fact that we know there's a

737

00:32:45,210 --> 00:32:43,420

tremendous amount of science that is out

738

00:32:48,540 --> 00:32:45,220

there and chomping at the bit to be able

739

00:32:51,390 --> 00:32:48,550

to get executed and in and getting to

740

00:32:55,410 --> 00:32:51,400

2020 enables so much more science to get

741

00:32:57,780 --> 00:32:55,420

accomplished I think our relationships

742

00:33:02,010 --> 00:32:57,790

with our partners and how we do business

743

00:33:04,740 --> 00:33:02,020

is going to get that much slicker so we

744

00:33:08,520 --> 00:33:04,750

you know our thought process I believe

745

00:33:11,340 --> 00:33:08,530

is that we will get so much sharper at

746

00:33:14,100 --> 00:33:11,350

how we coordinate how we communicate it

747

00:33:15,960 --> 00:33:14,110

will become even more second nature with

748

00:33:18,810 --> 00:33:15,970

every day that we get in every passing

749

00:33:23,940 --> 00:33:18,820

year it so it will it will just continue

750

00:33:28,500 --> 00:33:23,950

to be a a marvel in a working as a the

751

00:33:32,100 --> 00:33:28,510

work is in progress I'm happy to see

752

00:33:36,090 --> 00:33:32,110

continued on also material science

753

00:33:38,100 --> 00:33:36,100

experiments that we do are important and

754

00:33:42,330 --> 00:33:38,110

we learn something from every one every

755

00:33:45,780 --> 00:33:42,340

one of them but we need to learn more

756

00:33:48,570 --> 00:33:45,790

and to do that we need to you know very

757

00:33:50,520 --> 00:33:48,580

the processing parameters and every

758

00:33:52,530 --> 00:33:50,530

processing parameters a new experiment

759

00:33:54,090 --> 00:33:52,540

and if we really want to understand

760

00:33:55,590 --> 00:33:54,100

what's going on we need to do that we

761

00:33:58,580 --> 00:33:55,600

need to do more experiments and this

762

00:34:04,330 --> 00:33:58,590

will give us the opportunity to do that

763

00:34:10,399 --> 00:34:08,000

is with the decatur daily I guess I'm

764

00:34:13,520 --> 00:34:10,409

kind of interested in 10 years ago we

765

00:34:16,369 --> 00:34:13,530

were on the just getting into this has

766

00:34:17,720 --> 00:34:16,379

it surpassed has it met you know your

767

00:34:18,680 --> 00:34:17,730

expectations at that time tell me a

768

00:34:20,419 --> 00:34:18,690

little bit about what you were expecting

769

00:34:22,250 --> 00:34:20,429

then and then what you're seeing today

770

00:34:26,200 --> 00:34:22,260

and what your expectations are for the

771

00:34:29,060 --> 00:34:26,210

next 10 years but from my perspective

772

00:34:30,590 --> 00:34:29,070

it's and I kind of have to force myself

773

00:34:31,909 --> 00:34:30,600

to do this every once in a while but

774

00:34:33,530 --> 00:34:31,919

when you're in the middle of a project

775

00:34:35,960 --> 00:34:33,540

your heads down you were in about

776

00:34:37,520 --> 00:34:35,970

today's problem and tomorrow's problem

777

00:34:40,790 --> 00:34:37,530

and trying to wrap up yesterday's

778

00:34:42,550 --> 00:34:40,800

problem and and I really have to admit

779

00:34:45,350 --> 00:34:42,560

that I think it was relatively

780

00:34:48,710 --> 00:34:45,360

infrequent during the time that was work

781

00:34:51,560 --> 00:34:48,720

on my prop my own project that I stood

782

00:34:58,040 --> 00:34:51,570

back and tried to take in the whole

783

00:35:03,820 --> 00:34:58,050

picture but when I do that it it is you

784

00:35:07,430 --> 00:35:03,830

know quite remarkable and and to to just

785

00:35:10,790 --> 00:35:07,440

think about how you know my project to

786

00:35:12,230 --> 00:35:10,800

me seems so complicated and complex and

787

00:35:14,390 --> 00:35:12,240

so many problems and then to look back

788

00:35:17,120 --> 00:35:14,400

and to realize that that is going on on

789

00:35:20,510 --> 00:35:17,130

such a bigger scale just beyond the

790

00:35:23,900 --> 00:35:20,520

sphere of my team and to see that it's

791

00:35:25,100 --> 00:35:23,910

it's working it's flying it's they're

792

00:35:27,680 --> 00:35:25,110

getting through day in and day out

793

00:35:29,060 --> 00:35:27,690

keeping that vehicle operating and

794

00:35:32,330 --> 00:35:29,070

getting some great results from it I

795

00:35:34,550 --> 00:35:32,340

think is actually quite remarkable and I

796

00:35:37,850 --> 00:35:34,560

would agree with that because you you

797

00:35:41,060 --> 00:35:37,860

know 10 plus years ago you had all of

798

00:35:44,290 --> 00:35:41,070

this hardware being defined in parallel

799

00:35:46,940 --> 00:35:44,300

from the big modules to the simple small

800

00:35:48,800 --> 00:35:46,950

experiments and you know they all had to

801  
00:35:50,810 --> 00:35:48,810  
interface and work together but yet they

802  
00:35:53,240 --> 00:35:50,820  
were being built basically all over the

803  
00:35:56,930 --> 00:35:53,250  
world and i think it's it's been an

804  
00:36:02,460 --> 00:35:56,940  
amazing engineering feat to be built and

805  
00:36:10,870 --> 00:36:07,620  
any other questions from the media okay

806  
00:36:13,720 --> 00:36:10,880  
sleep with the times again I like to

807  
00:36:15,370 --> 00:36:13,730  
think about it as and if I'm wrong

808  
00:36:16,930 --> 00:36:15,380  
correct me but you've got all the

809  
00:36:18,819 --> 00:36:16,940  
experiments going on that you're doing

810  
00:36:19,930 --> 00:36:18,829  
in all of the racks and then you've got

811  
00:36:22,839 --> 00:36:19,940  
all of the things that we're learning

812  
00:36:26,440 --> 00:36:22,849  
about what it's like to live and

813  
00:36:29,140 --> 00:36:26,450

function in space we've done both now

814

00:36:31,960 --> 00:36:29,150

for two years which one has which side

815

00:36:33,730 --> 00:36:31,970

of that has been the most I mean if we

816

00:36:35,589 --> 00:36:33,740

learned the most about about living and

817

00:36:40,240 --> 00:36:35,599

working in space or has the silence and

818

00:36:42,520 --> 00:36:40,250

actually the experiments well I material

819

00:36:46,420 --> 00:36:42,530

scientists what I think living in space

820

00:36:49,630 --> 00:36:46,430

has probably trumped what we've learned

821

00:36:51,130 --> 00:36:49,640

in terms of experiments and it's not

822

00:36:54,700 --> 00:36:51,140

that our experiments aren't good it's

823

00:36:56,799 --> 00:36:54,710

they take a long time to do and we would

824

00:36:58,329 --> 00:36:56,809

like to do more of them and if we could

825

00:36:59,890 --> 00:36:58,339

get more of them done which hopefully

826

00:37:02,170 --> 00:36:59,900

will be able to do now that we have a

827

00:37:04,859 --> 00:37:02,180

larger crew and more time then we're

828

00:37:07,990 --> 00:37:04,869

going to catch up to living in space I

829

00:37:11,799 --> 00:37:08,000

think once we got got past assembly

830

00:37:13,329 --> 00:37:11,809

complete you know the and not to say

831

00:37:15,280 --> 00:37:13,339

that we're still not learning about

832

00:37:18,400 --> 00:37:15,290

living and working in space but I

833

00:37:21,730 --> 00:37:18,410

definitely fully expect the the pendulum

834

00:37:24,370 --> 00:37:21,740

to swing now more towards you know the

835

00:37:25,569 --> 00:37:24,380

science beating the living and working

836

00:37:34,370 --> 00:37:25,579

in space but I think they'll always be

837

00:37:39,180 --> 00:37:36,300

Paul Huggins again with the decatur

838

00:37:41,550 --> 00:37:39,190

daily you might have heard about the

839

00:37:44,160 --> 00:37:41,560

Bigelow ideas for commercial

840

00:37:46,109 --> 00:37:44,170

applications for the space stations how

841

00:37:49,800 --> 00:37:46,119

do y'all see that is that is that like a

842

00:37:51,900 --> 00:37:49,810

competition or y'all see that the ISS is

843

00:37:53,760 --> 00:37:51,910

just you really open the door for a lot

844

00:37:55,859 --> 00:37:53,770

more opportunities and we're going to

845

00:37:57,930 --> 00:37:55,869

see you know far more space stations and

846

00:38:03,060 --> 00:37:57,940

in just three maybe 10 or 15 years from

847

00:38:06,620 --> 00:38:03,070

now I yeah I wouldn't see the the

848

00:38:08,880 --> 00:38:06,630

Bigelow example or any other of the

849

00:38:11,070 --> 00:38:08,890

commercial concepts out there is a

850

00:38:14,340 --> 00:38:11,080

competitor by any stretch of the

851  
00:38:18,750 --> 00:38:14,350  
imagination i think what space station

852  
00:38:22,349 --> 00:38:18,760  
is it's it's a you know the fantastic

853  
00:38:24,859 --> 00:38:22,359  
research complex that only could be done

854  
00:38:27,840 --> 00:38:24,869  
in terms of international governmental

855  
00:38:29,880 --> 00:38:27,850  
cooperation given that though I think

856  
00:38:33,480 --> 00:38:29,890  
there is there can be and should be a

857  
00:38:37,080 --> 00:38:33,490  
place to for commercial entities whoever

858  
00:38:40,380 --> 00:38:37,090  
they they might be to begin finding ways

859  
00:38:44,820 --> 00:38:40,390  
to serve other purposes in space whether

860  
00:38:47,070 --> 00:38:44,830  
it's its tourism or commerc some type of

861  
00:38:49,680 --> 00:38:47,080  
type of other commercial market I think

862  
00:38:51,359 --> 00:38:49,690  
that that's inevitable in it and I look

863  
00:38:55,650 --> 00:38:51,369

forward to seeing what they're able to

864

00:38:59,460 --> 00:38:55,660

do I agree with that I think that up to

865

00:39:02,580 --> 00:38:59,470

this point space station has been you

866

00:39:07,050 --> 00:39:02,590

know a wonderful a marvelous example of

867

00:39:08,420 --> 00:39:07,060

teamwork and as we move even further and

868

00:39:12,359 --> 00:39:08,430

there's the opportunity for

869

00:39:14,070 --> 00:39:12,369

commercialization for for other entities

870

00:39:17,310 --> 00:39:14,080

to come and be a part of that

871

00:39:19,410 --> 00:39:17,320

partnership that's you know that's what

872

00:39:22,740 --> 00:39:19,420

we're going to have we're just going to

873

00:39:26,099 --> 00:39:22,750

open the doors for partnership and the

874

00:39:30,240 --> 00:39:26,109

more the more diverse the opportunity is

875

00:39:32,940 --> 00:39:30,250

the the greater I think the things are

876

00:39:34,920 --> 00:39:32,950

that we're going to learn there are some

877

00:39:39,060 --> 00:39:34,930

awesome ideas out there that we don't

878

00:39:41,730 --> 00:39:39,070

even have in our imagination and to open

879

00:39:43,380 --> 00:39:41,740

the doors for those things to come in

880

00:39:45,299 --> 00:39:43,390

you know is only I think

881

00:39:48,809 --> 00:39:45,309

going to enhance our life here on earth

882

00:39:51,630 --> 00:39:48,819

and and help us to understand where we

883

00:39:54,450 --> 00:39:51,640

are and how we can continue to live on

884

00:39:57,450 --> 00:39:54,460

earth successfully and explore other

885

00:40:01,170 --> 00:39:57,460

territory so I think the more partners

886

00:40:05,089 --> 00:40:01,180

there are the greater the experience is

887

00:40:07,170 --> 00:40:05,099

going to be Lee do you have a fun okay

888

00:40:08,789 --> 00:40:07,180

with that this concludes our

889

00:40:11,039 --> 00:40:08,799

International Space Station 10th

890

00:40:13,019 --> 00:40:11,049

anniversary roundtable discussion I'd

891

00:40:14,370 --> 00:40:13,029

like to thank you all for joining us I'd

892

00:40:17,279 --> 00:40:14,380

like to thank our panelists for their

893

00:40:19,680 --> 00:40:17,289

interesting insight and history spanning

894

00:40:21,359 --> 00:40:19,690

the past decade if you would please stay

895

00:40:22,920 --> 00:40:21,369

tuned for a video that we're going to

896

00:40:24,599 --> 00:40:22,930

air that will show Marshalls

897

00:42:59,079 --> 00:40:24,609

contribution to the International Space

898

00:43:08,190 --> 00:43:01,029

and the big day were nothing but the

899

00:43:08,200 --> 00:44:09,309

that leads to the shuttle discovery