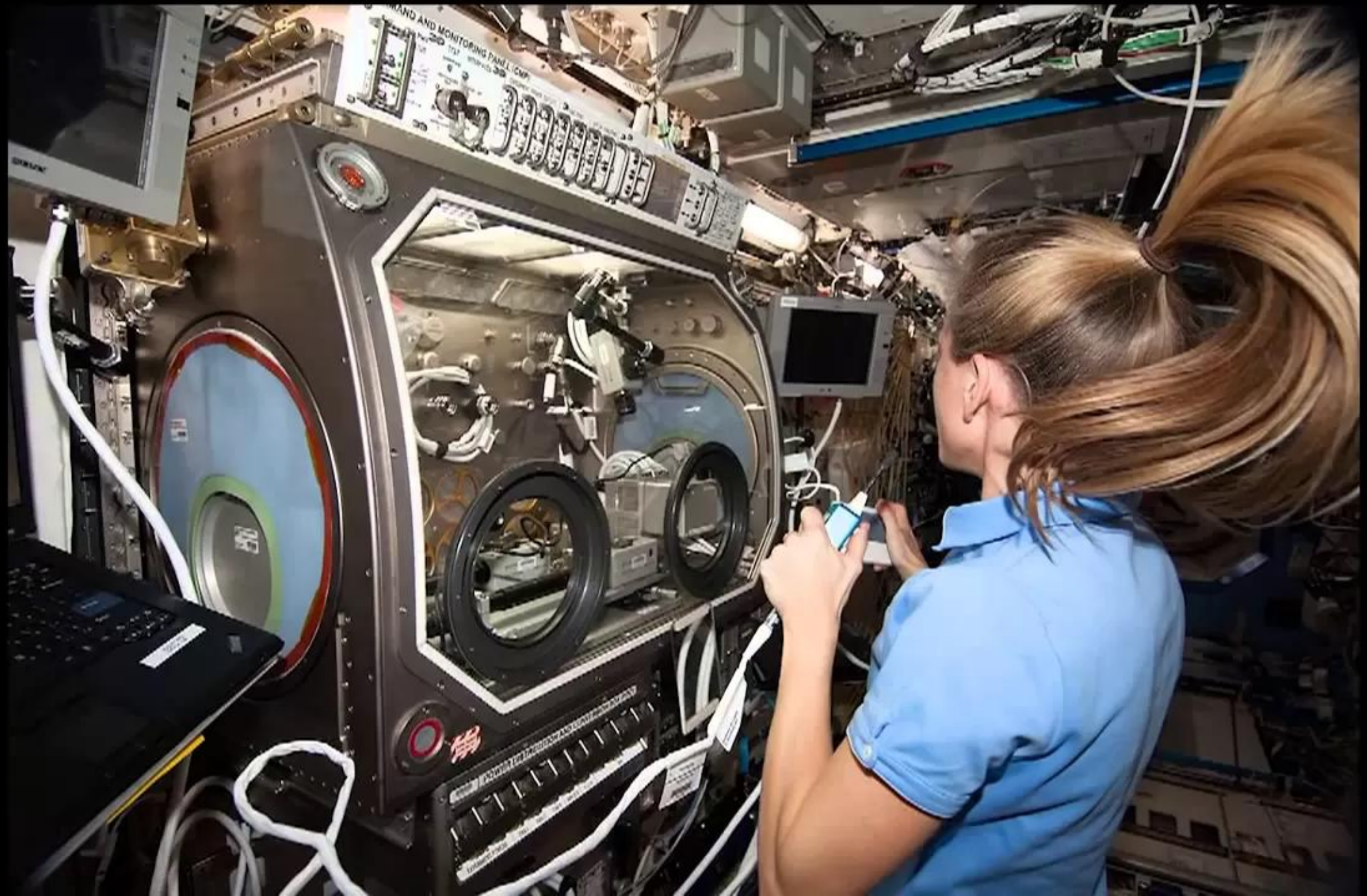

1
00:00:04,309 --> 00:00:02,710
this is mission control houston again

2
00:00:05,910 --> 00:00:04,319
looking down inside of the international

3
00:00:07,190 --> 00:00:05,920
space station flight control room here

4
00:00:08,710 --> 00:00:07,200
in houston

5
00:00:11,110 --> 00:00:08,720
one of the remarkable things about the

6
00:00:12,870 --> 00:00:11,120
station being how many centers and

7
00:00:14,870 --> 00:00:12,880
countries around the world have been

8
00:00:16,150 --> 00:00:14,880
involved one of the other u.s centers

9
00:00:17,910 --> 00:00:16,160
the marshall space flight center in

10
00:00:19,750 --> 00:00:17,920
huntsville alabama taking a very

11
00:00:21,990 --> 00:00:19,760
integral role in all space station

12
00:00:24,230 --> 00:00:22,000
operations why don't we go out there now

13
00:00:26,550 --> 00:00:24,240

where laurie megs is standing by live

14
00:00:27,910 --> 00:00:26,560
lori i understand you have some pretty

15
00:00:30,070 --> 00:00:27,920
amazing people out there who have been

16
00:00:31,269 --> 00:00:30,080
contributing to the past 15 years as

17
00:00:32,950 --> 00:00:31,279
well

18
00:00:34,709 --> 00:00:32,960
that's right you know we've talked a lot

19
00:00:36,549 --> 00:00:34,719
about the folks behind me here in the

20
00:00:38,470 --> 00:00:36,559
payload operations integration center i

21
00:00:40,549 --> 00:00:38,480
mean they make science happen every day

22
00:00:43,110 --> 00:00:40,559
we talk about their contributions almost

23
00:00:44,709 --> 00:00:43,120
weekly daily but we wanted to introduce

24
00:00:46,630 --> 00:00:44,719
you to some folks who've actually played

25
00:00:48,310 --> 00:00:46,640
a role in the hardware marshall has done

26
00:00:50,950 --> 00:00:48,320
a lot of work in that and joining me now

27
00:00:53,189 --> 00:00:50,960
is brian mitchell and brian he was the

28
00:00:54,709 --> 00:00:53,199
element project manager for node one

29
00:00:56,470 --> 00:00:54,719
which was built right here at marshall

30
00:00:58,709 --> 00:00:56,480
brian thanks for joining us

31
00:01:00,389 --> 00:00:58,719
take us back to those early days

32
00:01:02,229 --> 00:01:00,399
i guess it was more than 15 years ago

33
00:01:03,590 --> 00:01:02,239
really for you guys yes

34
00:01:05,590 --> 00:01:03,600
good morning um

35
00:01:07,030 --> 00:01:05,600
let me first say i consider myself lucky

36
00:01:09,270 --> 00:01:07,040
and privileged to have worked on the

37
00:01:10,950 --> 00:01:09,280
node and all the pressurized modules

38
00:01:13,670 --> 00:01:10,960

it's not every day that you get a chance

39
00:01:14,630 --> 00:01:13,680
to crawl in each module and

40
00:01:16,789 --> 00:01:14,640
and

41
00:01:18,710 --> 00:01:16,799
see it from the time it was

42
00:01:21,670 --> 00:01:18,720
paint in the paint booth to the time it

43
00:01:22,710 --> 00:01:21,680
was launched at ksc

44
00:01:24,870 --> 00:01:22,720
the node

45
00:01:27,350 --> 00:01:24,880
lab and airlock were all manufactured

46
00:01:29,190 --> 00:01:27,360
here in huntsville and

47
00:01:30,710 --> 00:01:29,200
the assembly and integration took place

48
00:01:33,190 --> 00:01:30,720
here

49
00:01:35,749 --> 00:01:33,200
the early emphasis of space station

50
00:01:38,390 --> 00:01:35,759
was on qualifying the structural

51
00:01:41,350 --> 00:01:38,400
integrity of the pressurized module

52
00:01:43,510 --> 00:01:41,360
providing a robust ceiling capability

53
00:01:45,270 --> 00:01:43,520
and finally the ability to attach the

54
00:01:47,670 --> 00:01:45,280
modules in space

55
00:01:49,749 --> 00:01:47,680
the node made it all possible right to

56
00:01:51,030 --> 00:01:49,759
start the assembly really yeah well the

57
00:01:52,550 --> 00:01:51,040
node

58
00:01:55,510 --> 00:01:52,560
paved the way for a lot of common

59
00:01:57,990 --> 00:01:55,520
hardware that was used by all the other

60
00:02:01,270 --> 00:01:58,000
modules such as the hatches

61
00:02:02,389 --> 00:02:01,280
the fluid power connectors

62
00:02:04,630 --> 00:02:02,399
seals

63
00:02:06,709 --> 00:02:04,640

and the common berthing mechanism also

64
00:02:09,669 --> 00:02:06,719
known as the cbm

65
00:02:12,070 --> 00:02:09,679
how many ports were on node one there

66
00:02:14,710 --> 00:02:12,080
are on one i guess i should node one had

67
00:02:16,869 --> 00:02:14,720
six ports they had two pressurized

68
00:02:17,750 --> 00:02:16,879
mating adapters on the forward and aft

69
00:02:19,910 --> 00:02:17,760
end

70
00:02:22,710 --> 00:02:19,920
and it also served as the hub that all

71
00:02:24,550 --> 00:02:22,720
the other us modules was attached to

72
00:02:25,910 --> 00:02:24,560
tell us more about those common berthing

73
00:02:28,150 --> 00:02:25,920
mechanisms

74
00:02:30,229 --> 00:02:28,160
well the cbms are

75
00:02:33,270 --> 00:02:30,239
primarily consist of

76
00:02:35,430 --> 00:02:33,280
alignment guides capture latches powered

77
00:02:37,430 --> 00:02:35,440
bolts and controllers

78
00:02:39,670 --> 00:02:37,440
that allow automatically attaching the

79
00:02:42,229 --> 00:02:39,680
modules together in space

80
00:02:44,390 --> 00:02:42,239
that's no easy task i'm sure right no it

81
00:02:46,150 --> 00:02:44,400
was it was we were quite nervous when we

82
00:02:46,949 --> 00:02:46,160
first started but

83
00:02:55,589 --> 00:02:46,959
the

84
00:02:58,309 --> 00:02:55,599
41 birthing operations

85
00:03:01,830 --> 00:02:58,319
31 de-birthing operations

86
00:03:03,350 --> 00:03:01,840
and it continues to be used today

87
00:03:07,589 --> 00:03:03,360
by our

88
00:03:10,630 --> 00:03:07,599

our payload delivery with japanese htv

89
00:03:13,030 --> 00:03:10,640
as well as spacex and orbital delivering

90
00:03:15,350 --> 00:03:13,040
cargo to space station working just as

91
00:03:16,869 --> 00:03:15,360
you planned so many years ago right yeah

92
00:03:19,670 --> 00:03:16,879
we were real nervous when we first

93
00:03:21,750 --> 00:03:19,680
started but as time went on

94
00:03:23,990 --> 00:03:21,760
we gained a lot of confidence and has

95
00:03:26,630 --> 00:03:24,000
performed beautifully over the years as

96
00:03:28,630 --> 00:03:26,640
we celebrate this 15th anniversary

97
00:03:30,070 --> 00:03:28,640
what do you want others to know about

98
00:03:30,949 --> 00:03:30,080
the space station

99
00:03:33,110 --> 00:03:30,959
well

100
00:03:35,670 --> 00:03:33,120
one thing that that amazes me about the

101
00:03:38,470 --> 00:03:35,680
space station is that people almost

102
00:03:40,630 --> 00:03:38,480
anywhere in the world can go outside

103
00:03:42,229 --> 00:03:40,640
and on when the weather's right and the

104
00:03:44,390 --> 00:03:42,239
time's right you can see the space

105
00:03:46,789 --> 00:03:44,400
station flying overhead

106
00:03:48,229 --> 00:03:46,799
and to me that's amazing and i just want

107
00:03:50,710 --> 00:03:48,239
them to know that the pressurized

108
00:03:53,350 --> 00:03:50,720
modules as well as the hatches and the

109
00:03:56,070 --> 00:03:53,360
cbms were all manufactured and built

110
00:03:59,509 --> 00:03:56,080
here at marshall and all the testing and

111
00:04:01,509 --> 00:03:59,519
qualification was done here at marshall

112
00:04:03,830 --> 00:04:01,519
tell us something unique about or maybe

113
00:04:05,350 --> 00:04:03,840

a story from from way back then i know

114
00:04:07,990 --> 00:04:05,360
that you you kind of came up with

115
00:04:09,509 --> 00:04:08,000
something to help out uh on the project

116
00:04:11,110 --> 00:04:09,519
it's made of a hockey puck i don't know

117
00:04:13,750 --> 00:04:11,120
if we had that with us yeah i have it

118
00:04:16,069 --> 00:04:13,760
sitting over here in the chair but um

119
00:04:17,430 --> 00:04:16,079
we actually had when when the nodes were

120
00:04:19,430 --> 00:04:17,440
in the paint booth

121
00:04:21,189 --> 00:04:19,440
as a first element

122
00:04:23,749 --> 00:04:21,199
we had a lot of feed-through connections

123
00:04:26,390 --> 00:04:23,759
that we had to provide nickel plating

124
00:04:29,270 --> 00:04:26,400
so that we could get an electrical bond

125
00:04:32,550 --> 00:04:29,280
and we were having trouble providing a

126
00:04:33,350 --> 00:04:32,560
good smooth sealing surface for that

127
00:04:35,990 --> 00:04:33,360
so

128
00:04:37,510 --> 00:04:36,000
um i had the idea to

129
00:04:39,510 --> 00:04:37,520
fart for a tool

130
00:04:41,270 --> 00:04:39,520
and i went down to the

131
00:04:43,110 --> 00:04:41,280
to the hockey rink

132
00:04:45,909 --> 00:04:43,120
and i got a high key puck

133
00:04:46,629 --> 00:04:45,919
and i made a tool that actually you

134
00:04:49,350 --> 00:04:46,639
could

135
00:04:50,469 --> 00:04:49,360
um stick in the the feed throughs and

136
00:04:53,189 --> 00:04:50,479
sand

137
00:04:54,950 --> 00:04:53,199
the nickel plating and when we got done

138
00:04:56,390 --> 00:04:54,960

it turned out great all of the nickel

139
00:04:57,670 --> 00:04:56,400
turned out to look kind of like record

140
00:04:59,909 --> 00:04:57,680
albums and

141
00:05:01,830 --> 00:04:59,919
it worked very well took a lot of

142
00:05:03,590 --> 00:05:01,840
innovation like that back then thank you

143
00:05:06,550 --> 00:05:03,600
so much brian thanks for sharing with us

144
00:05:08,950 --> 00:05:06,560
we also want to talk about the hardware

145
00:05:11,029 --> 00:05:08,960
for the payloads we've played a big role

146
00:05:13,590 --> 00:05:11,039
in that and continued to this day

147
00:05:15,830 --> 00:05:13,600
mike cole is the deputy uh manager for

148
00:05:17,029 --> 00:05:15,840
the iss office here at marshall and mike

149
00:05:19,270 --> 00:05:17,039
you were also

150
00:05:21,029 --> 00:05:19,280
the project manager when they delivered

151
00:05:22,390 --> 00:05:21,039
the microgravity science glove box tell

152
00:05:25,510 --> 00:05:22,400
us about that

153
00:05:27,670 --> 00:05:25,520
i appreciate that it was a joy working

154
00:05:29,510 --> 00:05:27,680
on some of the early payloads and

155
00:05:31,990 --> 00:05:29,520
facilities that were uh

156
00:05:33,749 --> 00:05:32,000
flown to the station here at marshall we

157
00:05:37,270 --> 00:05:33,759
were responsible for quite a few

158
00:05:39,189 --> 00:05:37,280
different facilities we had

159
00:05:41,270 --> 00:05:39,199
from the vehicle side several of the key

160
00:05:43,749 --> 00:05:41,280
uh systems like the environmental

161
00:05:45,909 --> 00:05:43,759
control and life support systems uh

162
00:05:48,070 --> 00:05:45,919
which included the water recovery system

163
00:05:50,629 --> 00:05:48,080

uh that had a urine processor assembly

164
00:05:53,350 --> 00:05:50,639
associated with it and an oxygen

165
00:05:55,110 --> 00:05:53,360
generation assembly rack as well and

166
00:05:56,870 --> 00:05:55,120
obviously those were very important to

167
00:05:58,230 --> 00:05:56,880
keeping crew tended on the on the

168
00:06:00,230 --> 00:05:58,240
station critical and then when we

169
00:06:02,230 --> 00:06:00,240
increased numbers of crew members too

170
00:06:04,469 --> 00:06:02,240
absolutely that's right and then from

171
00:06:06,710 --> 00:06:04,479
the payload facilities as you mentioned

172
00:06:08,309 --> 00:06:06,720
the the glove box and

173
00:06:10,710 --> 00:06:08,319
that was actually a

174
00:06:12,150 --> 00:06:10,720
facility that was a bartered payload so

175
00:06:14,629 --> 00:06:12,160
it was designed and developed by the

176
00:06:17,270 --> 00:06:14,639
european space agency however we at

177
00:06:19,909 --> 00:06:17,280
marshall manage the the program and have

178
00:06:22,390 --> 00:06:19,919
the integration team so we help the

179
00:06:24,469 --> 00:06:22,400
payloads that fly in the facility we do

180
00:06:26,070 --> 00:06:24,479
the integration process and help them

181
00:06:27,749 --> 00:06:26,080
get ready to

182
00:06:29,909 --> 00:06:27,759
do all of their science and research on

183
00:06:31,510 --> 00:06:29,919
the station and it's a unique facility

184
00:06:33,830 --> 00:06:31,520
because it besides

185
00:06:35,909 --> 00:06:33,840
distributing station resources uh the

186
00:06:38,070 --> 00:06:35,919
power and data and the video and those

187
00:06:40,629 --> 00:06:38,080
things it also provides a work volume

188
00:06:43,350 --> 00:06:40,639

that's a two levels of containment so

189
00:06:45,590 --> 00:06:43,360
that it does hazard control for being

190
00:06:48,070 --> 00:06:45,600
able to

191
00:06:49,909 --> 00:06:48,080
from a safety perspective and it has the

192
00:06:52,469 --> 00:06:49,919
glove port so it's very interactive with

193
00:06:54,710 --> 00:06:52,479
the crew so it gets a lot of uh

194
00:06:56,150 --> 00:06:54,720
i guess video time

195
00:06:58,150 --> 00:06:56,160
on board the station

196
00:07:00,390 --> 00:06:58,160
it's a workhorse too i mean we've had

197
00:07:02,309 --> 00:07:00,400
thousands i mean 15 to 17 000 hours

198
00:07:03,990 --> 00:07:02,319
maybe have worked so far and it's been

199
00:07:05,350 --> 00:07:04,000
very reliable

200
00:07:07,110 --> 00:07:05,360
today

201
00:07:07,909 --> 00:07:07,120
here at marshall we've also done several

202
00:07:09,990 --> 00:07:07,919
other

203
00:07:11,670 --> 00:07:10,000
facilities as well

204
00:07:13,350 --> 00:07:11,680
one of the more traditional research

205
00:07:14,950 --> 00:07:13,360
facilities is the material science

206
00:07:17,830 --> 00:07:14,960
research rack

207
00:07:20,390 --> 00:07:17,840
that was also has some esa hardware in

208
00:07:22,469 --> 00:07:20,400
it as well the microgravity science

209
00:07:23,350 --> 00:07:22,479
laboratory but

210
00:07:25,189 --> 00:07:23,360
that

211
00:07:28,230 --> 00:07:25,199
facility does like i said the

212
00:07:30,390 --> 00:07:28,240
traditional research we install samples

213
00:07:32,230 --> 00:07:30,400

and they do directional solidification

214
00:07:35,029 --> 00:07:32,240
or quenching type of

215
00:07:36,950 --> 00:07:35,039
operations and that's basically to study

216
00:07:39,029 --> 00:07:36,960
material properties and hopefully

217
00:07:41,189 --> 00:07:39,039
someday that research will lead to

218
00:07:43,670 --> 00:07:41,199
better materials

219
00:07:45,350 --> 00:07:43,680
for use here on the on the ground it

220
00:07:47,189 --> 00:07:45,360
really is an international partnership

221
00:07:50,230 --> 00:07:47,199
that is crucial to the whole space

222
00:07:52,309 --> 00:07:50,240
station absolutely uh also let's talk

223
00:07:54,150 --> 00:07:52,319
about the window observational research

224
00:07:56,070 --> 00:07:54,160
facility we have a role in that and it

225
00:07:58,550 --> 00:07:56,080
actually plays into a bigger part right

226
00:08:01,189 --> 00:07:58,560
absolutely that actually is a

227
00:08:03,110 --> 00:08:01,199
express rack derivative and express is

228
00:08:05,430 --> 00:08:03,120
uh expediting the

229
00:08:07,430 --> 00:08:05,440
processing of research the space station

230
00:08:09,189 --> 00:08:07,440
how make you say all those

231
00:08:10,790 --> 00:08:09,199
i may not even gotten it right

232
00:08:12,950 --> 00:08:10,800
but the

233
00:08:15,830 --> 00:08:12,960
those racks were some of the first uh

234
00:08:17,350 --> 00:08:15,840
payload racks that were um our first

235
00:08:18,710 --> 00:08:17,360
racks delivered to the station for

236
00:08:21,510 --> 00:08:18,720
conducting uh

237
00:08:24,070 --> 00:08:21,520
research and they were centered around

238
00:08:26,550 --> 00:08:24,080

uh being able to use

239
00:08:27,830 --> 00:08:26,560
mid-deck lockers which was some of the

240
00:08:31,350 --> 00:08:27,840
ways we did

241
00:08:33,750 --> 00:08:31,360
station or not station research on the

242
00:08:35,350 --> 00:08:33,760
shuttle and so

243
00:08:37,350 --> 00:08:35,360
those racks were delivered and i think

244
00:08:39,110 --> 00:08:37,360
there's actually eight of them on board

245
00:08:41,110 --> 00:08:39,120
and talking about thousands of hours of

246
00:08:43,829 --> 00:08:41,120
operation i think one of the first ones

247
00:08:45,670 --> 00:08:43,839
has over 90 000 hours of operation now

248
00:08:48,389 --> 00:08:45,680
but wharf being a derivative that uses

249
00:08:51,350 --> 00:08:48,399
several of the same key subsystems but

250
00:08:53,350 --> 00:08:51,360
it's unique and it's mounted above the

251
00:08:55,750 --> 00:08:53,360
station window so it's set up to do

252
00:08:57,590 --> 00:08:55,760
earth observation science right now we

253
00:09:00,070 --> 00:08:57,600
have another marshall payload that's

254
00:09:02,389 --> 00:09:00,080
installed in wharf called i serve

255
00:09:03,910 --> 00:09:02,399
which is actually there for being able

256
00:09:05,030 --> 00:09:03,920
to photo and

257
00:09:07,829 --> 00:09:05,040
back of

258
00:09:09,910 --> 00:09:07,839
earth and do some help with disaster

259
00:09:12,150 --> 00:09:09,920
relief so i think some of the recent

260
00:09:14,470 --> 00:09:12,160
photos were of the flooding in the

261
00:09:16,949 --> 00:09:14,480
cambodia thailand area

262
00:09:19,190 --> 00:09:16,959
earlier in the month very important work

263
00:09:21,190 --> 00:09:19,200

let's talk about how emphasis has

264
00:09:22,470 --> 00:09:21,200
changed i mean you've gone from assembly

265
00:09:25,030 --> 00:09:22,480
complete to now it's really on the

266
00:09:27,110 --> 00:09:25,040
payloads how is that for you yes man

267
00:09:29,110 --> 00:09:27,120
we've actually had a lot of changes over

268
00:09:31,190 --> 00:09:29,120
time i mentioned the shuttle

269
00:09:33,350 --> 00:09:31,200
era in that time frame you know we had

270
00:09:36,550 --> 00:09:33,360
our missions were 10 to 14 days very

271
00:09:39,670 --> 00:09:36,560
restricted and and so we had a lot of

272
00:09:42,389 --> 00:09:39,680
emphasis on doing a lot of very

273
00:09:43,990 --> 00:09:42,399
robust qualification and test program to

274
00:09:45,910 --> 00:09:44,000
make sure all the hardware worked right

275
00:09:48,870 --> 00:09:45,920
the very first time and

276
00:09:50,550 --> 00:09:48,880
a lot of planning to get everything

277
00:09:52,790 --> 00:09:50,560
orchestrated for that short period of

278
00:09:54,949 --> 00:09:52,800
time but we still do a lot of planning

279
00:09:57,269 --> 00:09:54,959
working with the with the station but

280
00:09:59,990 --> 00:09:57,279
the the hardware is is different we're

281
00:10:02,389 --> 00:10:00,000
more focused on reliability and

282
00:10:04,870 --> 00:10:02,399
maintainability as far as the systems go

283
00:10:06,310 --> 00:10:04,880
for conducting research so since that

284
00:10:08,550 --> 00:10:06,320
hardware is going to be there for a long

285
00:10:10,230 --> 00:10:08,560
time we want to make sure

286
00:10:11,750 --> 00:10:10,240
nothing lasts forever we want to make

287
00:10:13,990 --> 00:10:11,760
sure that we could replace things so

288
00:10:16,150 --> 00:10:14,000

there's the whole design is geared

289
00:10:17,910 --> 00:10:16,160
around orbital replacement units to be

290
00:10:18,790 --> 00:10:17,920
able to keep things operating for a long

291
00:10:20,630 --> 00:10:18,800
time

292
00:10:22,389 --> 00:10:20,640
but then the biggest shift is now that

293
00:10:24,550 --> 00:10:22,399
assembly is complete

294
00:10:26,550 --> 00:10:24,560
from the payload perspective we want to

295
00:10:28,870 --> 00:10:26,560
make things as absolutely simple for

296
00:10:31,110 --> 00:10:28,880
payload developers as we can so there's

297
00:10:33,030 --> 00:10:31,120
been an emphasis on

298
00:10:35,750 --> 00:10:33,040
cots type of hardware commercial off the

299
00:10:37,350 --> 00:10:35,760
shelf type of hardware an emphasis on

300
00:10:39,509 --> 00:10:37,360
reducing the amount of verification

301
00:10:41,110 --> 00:10:39,519
requirements that it takes and one of

302
00:10:42,470 --> 00:10:41,120
the unique things here at marshall is we

303
00:10:44,310 --> 00:10:42,480
have

304
00:10:45,990 --> 00:10:44,320
associated with the

305
00:10:48,069 --> 00:10:46,000
facility payloads i was talking about we

306
00:10:50,069 --> 00:10:48,079
have ground units on uh here at marshall

307
00:10:52,790 --> 00:10:50,079
for both the the material science

308
00:10:54,389 --> 00:10:52,800
research rack the the glove box and i

309
00:10:56,310 --> 00:10:54,399
put my hands over there

310
00:10:58,790 --> 00:10:56,320
and the express we have a functional

311
00:11:01,430 --> 00:10:58,800
checkout unit and so we have a real

312
00:11:03,750 --> 00:11:01,440
emphasis on helping the payloads develop

313
00:11:06,630 --> 00:11:03,760

their hardware and make it as simple as

314
00:11:09,190 --> 00:11:06,640
possible to get them on board and and

315
00:11:11,430 --> 00:11:09,200
we're able to do true end-to-end

316
00:11:13,590 --> 00:11:11,440
testing here and we have the opportunity

317
00:11:15,269 --> 00:11:13,600
to work with the operations folks and

318
00:11:17,430 --> 00:11:15,279
they can come over and and help put

319
00:11:19,590 --> 00:11:17,440
their hands on the hardware as well so

320
00:11:20,790 --> 00:11:19,600
it provides a unique capability here

321
00:11:23,110 --> 00:11:20,800
well thank you for all your

322
00:11:25,350 --> 00:11:23,120
contributions uh congratulations on the

323
00:11:27,110 --> 00:11:25,360
anniversary to you and brian and let's

324
00:11:29,190 --> 00:11:27,120
take a live look at the other folks who

325
00:11:31,269 --> 00:11:29,200
really made a contribution and continue

326
00:11:33,829 --> 00:11:31,279
to in the payload operations integration

327
00:11:35,829 --> 00:11:33,839
center jason norwood is the pod today

328
00:11:37,430 --> 00:11:35,839
the payload operations director

329
00:11:40,310 --> 00:11:37,440
and he says they've been working today

330
00:11:42,310 --> 00:11:40,320
with the cfe test run he says

331
00:11:44,630 --> 00:11:42,320
mike has been training koichi on how to

332
00:11:46,550 --> 00:11:44,640
do his first solo run which begins

333
00:11:48,870 --> 00:11:46,560
tomorrow so i'm sure the payload

334
00:11:51,190 --> 00:11:48,880
developers in portland and cleveland are

335
00:11:52,870 --> 00:11:51,200
ecstatic about that and that'll do it

336
00:11:55,030 --> 00:11:52,880
for us here at the payload operations