1
00:00:12,230 --> 00:00:08,790
hello and welcome to our observation of

2
00:00:13,990 --> 00:00:12,240
the 10th anniversary of human life work

3
00:00:16,550 --> 00:00:14,000
and research aboard the international

4
00:00:18,310 --> 00:00:16,560
space station i'm kelly humphries with

5
00:00:20,310 --> 00:00:18,320
the johnson space center's

6
00:00:22,870 --> 00:00:20,320
communications and public affairs office

7
00:00:25,830 --> 00:00:22,880
and i want to welcome you here today

8
00:00:27,589 --> 00:00:25,840
these activities are part of a series of

9
00:00:30,310 --> 00:00:27,599
a larger nasa series of events that have

10
00:00:32,389 --> 00:00:30,320
been going on and already started today

11
00:00:34,150 --> 00:00:32,399
include similar roundtable productions

12
00:00:36,150 --> 00:00:34,160
going on at kennedy space center and

13
00:00:38,470 --> 00:00:36,160

marshall space flight center

14
00:00:40,630 --> 00:00:38,480
and nasa headquarters

15
00:00:43,190 --> 00:00:40,640
today's activities here at johnson space

16
00:00:45,029 --> 00:00:43,200
center are part of a joint effort

17
00:00:47,910 --> 00:00:45,039
between the public affairs and

18
00:00:49,750 --> 00:00:47,920
communications office and the jsc chief

19
00:00:51,990 --> 00:00:49,760
knowledge officer

20
00:00:54,630 --> 00:00:52,000
and their storytelling series

21
00:00:56,069 --> 00:00:54,640
that aims to document for posterity the

22
00:00:58,310 --> 00:00:56,079
knowledge

23
00:01:00,069 --> 00:00:58,320
behind our nation's human space program

24
00:01:02,950 --> 00:01:00,079
and you saw earlier today

25
00:01:05,750 --> 00:01:02,960
joe kerwin's discussion from

26
00:01:07,750 --> 00:01:05,760
last week about the development of space

27
00:01:11,030 --> 00:01:07,760
stations in general

28
00:01:13,429 --> 00:01:11,040
introducing today's panel is

29
00:01:16,310 --> 00:01:13,439
melt heflin the johnson space center's

30
00:01:20,149 --> 00:01:16,320
associate director for technical matters

31
00:01:22,230 --> 00:01:20,159
uh milt joined nasa in 1966 and

32
00:01:25,670 --> 00:01:22,240
was a lead recovery engineer for the

33
00:01:29,030 --> 00:01:25,680
splashdowns of the apollo 16 apollo 17

34
00:01:30,710 --> 00:01:29,040
skylab 2 3 and 4 missions and the apollo

35
00:01:32,710 --> 00:01:30,720
soyuz missions

36
00:01:35,030 --> 00:01:32,720
he was a mission control flight director

37
00:01:36,950 --> 00:01:35,040
for 20 space shuttle missions

38
00:01:39,109 --> 00:01:36,960

and served as the chief of the flight

39
00:01:41,590 --> 00:01:39,119
director office and deputy director of

40
00:01:44,069 --> 00:01:41,600
the mission operations directorate

41
00:01:45,830 --> 00:01:44,079
and milt will be introducing our panel

42
00:01:48,469 --> 00:01:45,840
today and i'll hand it over to you

43
00:01:50,550 --> 00:01:48,479
thanks kelly uh before i introduce the

44
00:01:51,789 --> 00:01:50,560
panel i want to take a couple of minutes

45
00:01:55,030 --> 00:01:51,799
and just give you

46
00:01:57,590 --> 00:01:55,040
a personal perspective of where i i

47
00:01:59,030 --> 00:01:57,600
believe we are today

48
00:02:01,749 --> 00:01:59,040
when we landed on the moon for the first

49
00:02:04,469 --> 00:02:01,759
time in 1969 i had been working here for

50
00:02:06,950 --> 00:02:04,479
just about three years so my perspective

51
00:02:08,949 --> 00:02:06,960
back then and my perspective today

52
00:02:10,150 --> 00:02:08,959
is certainly certainly

53
00:02:11,750 --> 00:02:10,160
different

54
00:02:13,910 --> 00:02:11,760
and one of the things i've tried to do

55
00:02:16,150 --> 00:02:13,920
is sort of look at the and engage the

56
00:02:17,589 --> 00:02:16,160
degree of difficulty

57
00:02:19,270 --> 00:02:17,599
from landing on the moon for the first

58
00:02:21,270 --> 00:02:19,280
time and what we have been doing the

59
00:02:24,150 --> 00:02:21,280
last several years here with the

60
00:02:27,510 --> 00:02:24,160
international space station

61
00:02:30,470 --> 00:02:27,520
now from my very non-scientific study

62
00:02:32,630 --> 00:02:30,480
i have come to these conclusions

63
00:02:34,630 --> 00:02:32,640

from a purely technical and physics

64
00:02:37,430 --> 00:02:34,640
standpoint i consider them to be about

65
00:02:38,790 --> 00:02:37,440
the same degree of difficulty

66
00:02:41,110 --> 00:02:38,800
however

67
00:02:44,869 --> 00:02:41,120
from an overall programmatic

68
00:02:47,509 --> 00:02:44,879
social and political arena standpoint

69
00:02:48,869 --> 00:02:47,519
i think billing iss has been much more

70
00:02:50,470 --> 00:02:48,879
difficult

71
00:02:51,750 --> 00:02:50,480
and all of you involved need to really

72
00:02:54,150 --> 00:02:51,760
appreciate

73
00:02:55,750 --> 00:02:54,160
what you have accomplished

74
00:02:57,830 --> 00:02:55,760
and i think what has contributed the

75
00:02:59,589 --> 00:02:57,840
most to making this harder has been the

76
00:03:02,830 --> 00:02:59,599
long term

77
00:03:06,229 --> 00:03:02,840
persistence and dedication expanded by

78
00:03:08,710 --> 00:03:06,239
us and our international partners

79
00:03:10,710 --> 00:03:08,720
to make this thing work

80
00:03:12,470 --> 00:03:10,720
bringing together not only different

81
00:03:15,270 --> 00:03:12,480
people cultures

82
00:03:16,949 --> 00:03:15,280
but also different space fights flight

83
00:03:19,030 --> 00:03:16,959
cultures

84
00:03:21,030 --> 00:03:19,040
and as hard as it's been you all have

85
00:03:23,830 --> 00:03:21,040
made it look easy

86
00:03:26,949 --> 00:03:23,840
and you've done that by staying hungry

87
00:03:28,789 --> 00:03:26,959
and you take no detail for granted

88
00:03:30,630 --> 00:03:28,799

so keep up that vigilance it's very

89
00:03:32,789 --> 00:03:30,640
important

90
00:03:35,030 --> 00:03:32,799
and as chris kraft remarked a few years

91
00:03:36,949 --> 00:03:35,040
back addressing a group of engineers at

92
00:03:40,309 --> 00:03:36,959
mit

93
00:03:42,390 --> 00:03:40,319
every day is a compromise

94
00:03:44,309 --> 00:03:42,400
so i believe one of the major legacies

95
00:03:45,670 --> 00:03:44,319
from the iss program will be this

96
00:03:47,350 --> 00:03:45,680
international connection we have

97
00:03:49,110 --> 00:03:47,360
established

98
00:03:52,309 --> 00:03:49,120
one of the foundations we must build

99
00:03:54,470 --> 00:03:52,319
upon for future human exploration beyond

100
00:03:56,229 --> 00:03:54,480
lower earth orbit

101
00:03:57,990 --> 00:03:56,239
and finally

102
00:04:00,630 --> 00:03:58,000
to get off my soapbox and

103
00:04:03,670 --> 00:04:00,640
introduce the panel in talking about

104
00:04:07,750 --> 00:04:03,680
groups of people often refer to iss as a

105
00:04:09,990 --> 00:04:07,760
zero gravity united nations

106
00:04:12,550 --> 00:04:10,000
and i tell them that i think it i don't

107
00:04:14,470 --> 00:04:12,560
think it does work a lot better than the

108
00:04:15,910 --> 00:04:14,480
united nations that is hosted in new

109
00:04:17,749 --> 00:04:15,920
york city

110
00:04:19,349 --> 00:04:17,759
so congratulations to all who have

111
00:04:21,189 --> 00:04:19,359
contributed to this

112
00:04:23,189 --> 00:04:21,199
program since this beginning please keep

113
00:04:26,550 --> 00:04:23,199

that up

114
00:04:28,230 --> 00:04:26,560
and now introducing the panel

115
00:04:30,629 --> 00:04:28,240
first of all i'd like to just a quick

116
00:04:33,670 --> 00:04:30,639
summary of of where we've been the first

117
00:04:35,749 --> 00:04:33,680
element for iss the zarya module was

118
00:04:37,030 --> 00:04:35,759
launched from the baikonur cosmodrome in

119
00:04:39,830 --> 00:04:37,040
kazakhstan

120
00:04:42,070 --> 00:04:39,840
in november of 1998.

121
00:04:44,070 --> 00:04:42,080
the first american module unity launched

122
00:04:46,070 --> 00:04:44,080
aboard special endeavor in december of

123
00:04:48,550 --> 00:04:46,080
that year and the first crew

124
00:04:51,270 --> 00:04:48,560
commander bill shepard flight engineers

125
00:04:54,870 --> 00:04:51,280
sergey krikalov and yuri gonzinko

126
00:04:56,710 --> 00:04:54,880
launched on october the 31st 2000

127
00:04:59,749 --> 00:04:56,720
and entered the fledgling outpost on

128
00:05:02,629 --> 00:04:59,759
november the second two thousand

129
00:05:05,350 --> 00:05:02,639
since then 196 people have visited the

130
00:05:08,870 --> 00:05:05,360
station as it has traveled some 1.5

131
00:05:10,790 --> 00:05:08,880
billion miles in orbit around the earth

132
00:05:12,790 --> 00:05:10,800
and by another perspective provided to

133
00:05:14,950 --> 00:05:12,800
me that's enough for eight round trips

134
00:05:17,029 --> 00:05:14,960
to our son

135
00:05:19,510 --> 00:05:17,039
so today's panel

136
00:05:21,110 --> 00:05:19,520
uh in the middle of the group here

137
00:05:22,710 --> 00:05:21,120
mike stefferdini

138
00:05:25,909 --> 00:05:22,720

mike has been the international space

139
00:05:27,670 --> 00:05:25,919
station's program manager since 2005

140
00:05:29,749 --> 00:05:27,680
he's responsible for the overall

141
00:05:31,830 --> 00:05:29,759
management development integration and

142
00:05:33,590 --> 00:05:31,840
operation of the station

143
00:05:35,749 --> 00:05:33,600
and he looks to a talented worldwide

144
00:05:37,670 --> 00:05:35,759
team to accomplish that

145
00:05:40,150 --> 00:05:37,680
he works with the leaders of nasa's four

146
00:05:42,950 --> 00:05:40,160
partner agencies the canadian space

147
00:05:46,150 --> 00:05:42,960
agency the european space agency

148
00:05:48,550 --> 00:05:46,160
the japan aerospace exploration agency

149
00:05:51,590 --> 00:05:48,560
and the russian federal space agency on

150
00:05:53,270 --> 00:05:51,600
both strategic and day-to-day management

151
00:05:56,230 --> 00:05:53,280
of the international program that

152
00:05:58,870 --> 00:05:56,240
involves 15 sovereign nations

153
00:06:01,110 --> 00:05:58,880
mike has a very diverse skill set

154
00:06:03,189 --> 00:06:01,120
for making him very effective in his in

155
00:06:05,029 --> 00:06:03,199
this arena

156
00:06:07,670 --> 00:06:05,039
mike was deputy manager of the program

157
00:06:09,430 --> 00:06:07,680
in 2004 and five prior to that he was

158
00:06:11,029 --> 00:06:09,440
operations integration manager and

159
00:06:12,790 --> 00:06:11,039
chairman of the station's mission

160
00:06:15,510 --> 00:06:12,800
management team

161
00:06:17,430 --> 00:06:15,520
from 2001 to 2004

162
00:06:18,830 --> 00:06:17,440
and manager of space station vehicle

163
00:06:23,029 --> 00:06:18,840

development from

164
00:06:26,070 --> 00:06:23,039
1999 to 2001 and manager of station's

165
00:06:27,909 --> 00:06:26,080
payloads office from 96 to 99 so as you

166
00:06:29,990 --> 00:06:27,919
can see a great deal of

167
00:06:31,749 --> 00:06:30,000
expertise and experience in the station

168
00:06:33,350 --> 00:06:31,759
program part of that he came to the

169
00:06:35,909 --> 00:06:33,360
station program after serving as

170
00:06:39,590 --> 00:06:35,919
assistant manager for the space shuttle

171
00:06:41,270 --> 00:06:39,600
program from 1995 to 1996.

172
00:06:43,749 --> 00:06:41,280
next i want to introduce just to mike's

173
00:06:45,270 --> 00:06:43,759
left there is peggy whitson

174
00:06:46,710 --> 00:06:45,280
peggy has been chief of the astronaut

175
00:06:49,189 --> 00:06:46,720
office here at the johnson space center

176
00:06:51,029 --> 00:06:49,199
since 2009

177
00:06:53,670 --> 00:06:51,039
prior to that she was a flight engineer

178
00:06:56,790 --> 00:06:53,680
and science officer on expedition 5

179
00:06:58,710 --> 00:06:56,800
accumulating more than 184 days in space

180
00:07:01,029 --> 00:06:58,720
she followed that by serving as the

181
00:07:02,790 --> 00:07:01,039
first female station commander during

182
00:07:05,510 --> 00:07:02,800
expedition 16

183
00:07:08,629 --> 00:07:05,520
spending another 192 days in space for a

184
00:07:09,909 --> 00:07:08,639
total of 376 days so many hours and so

185
00:07:11,589 --> 00:07:09,919
many minutes

186
00:07:13,589 --> 00:07:11,599
both of her missions were long-duration

187
00:07:15,749 --> 00:07:13,599
missions aboard the space station

188
00:07:17,990 --> 00:07:15,759

helping her set the woman's world record

189
00:07:20,070 --> 00:07:18,000
for the most time in space

190
00:07:21,350 --> 00:07:20,080
peggy also holds the woman's record for

191
00:07:23,909 --> 00:07:21,360
space walks

192
00:07:26,629 --> 00:07:23,919
having performed six evas for a total of

193
00:07:28,550 --> 00:07:26,639
39 hours and 46 minutes

194
00:07:30,790 --> 00:07:28,560
peggy began her career with the agency

195
00:07:31,749 --> 00:07:30,800
before becoming an astronaut

196
00:07:34,469 --> 00:07:31,759
from

197
00:07:36,629 --> 00:07:34,479
1989 to 1993

198
00:07:38,550 --> 00:07:36,639
she worked as a research biochemist and

199
00:07:41,029 --> 00:07:38,560
biomedical operations and research

200
00:07:43,189 --> 00:07:41,039
branch here at the jsc

201
00:07:44,629 --> 00:07:43,199
she performed numerous roles

202
00:07:46,230 --> 00:07:44,639
before joining the astronaut corps in

203
00:07:48,230 --> 00:07:46,240
1996.

204
00:07:50,790 --> 00:07:48,240
my my sound bite from peggy is

205
00:07:53,029 --> 00:07:50,800
recognizing her enormous reservoir of

206
00:07:56,309 --> 00:07:53,039
energy that always is focused on team

207
00:08:00,790 --> 00:07:57,749
and on the end of the road down here on

208
00:08:04,790 --> 00:08:00,800
your far right is mike lopez alegria or

209
00:08:06,869 --> 00:08:04,800
l.a or mike la as we we refer to him

210
00:08:08,629 --> 00:08:06,879
he's a retired captain in the u.s navy

211
00:08:11,270 --> 00:08:08,639
and assistant director for space station

212
00:08:14,469 --> 00:08:11,280
flight crew operations la joined nasa in

213
00:08:16,390 --> 00:08:14,479

92 and has flown on four space shuttle

214
00:08:18,869 --> 00:08:16,400
missions his last one as the commander

215
00:08:21,670 --> 00:08:18,879
of expedition 14 a seven month mission

216
00:08:24,629 --> 00:08:21,680
to operate maintain build and use the

217
00:08:26,869 --> 00:08:24,639
station and its research facilities

218
00:08:29,909 --> 00:08:26,879
a veteran four space flights la has

219
00:08:32,790 --> 00:08:29,919
logged more than 257 days in space and

220
00:08:35,190 --> 00:08:32,800
performed 10 space walks totaling 67

221
00:08:36,790 --> 00:08:35,200
hours and 40 minutes

222
00:08:38,389 --> 00:08:36,800
two of his shuttle missions helped with

223
00:08:39,750 --> 00:08:38,399
the building and construction of the

224
00:08:42,709 --> 00:08:39,760
space station

225
00:08:45,030 --> 00:08:42,719
sts-92 delivered the z1 truss and

226
00:08:48,150 --> 00:08:45,040
pressurized mating adapter 3

227
00:08:51,110 --> 00:08:48,160
and sts-113 deliver the expedition 6

228
00:08:51,990 --> 00:08:51,120
crew and return the expedition 5 crew to

229
00:08:54,550 --> 00:08:52,000
earth

230
00:08:56,070 --> 00:08:54,560
as i observed mike la in action

231
00:08:58,150 --> 00:08:56,080
i take great comfort in his

232
00:09:00,790 --> 00:08:58,160
understanding and assessments

233
00:09:02,949 --> 00:09:00,800
of any technical operational

234
00:09:05,509 --> 00:09:02,959
or safety issues associated with this

235
00:09:07,110 --> 00:09:05,519
worldwide partnership

236
00:09:09,509 --> 00:09:07,120
and right next to

237
00:09:12,310 --> 00:09:09,519
mike is clay anderson clay is also a

238
00:09:14,230 --> 00:09:12,320

nasa astronaut and space station veteran

239
00:09:16,790 --> 00:09:14,240
clay's first mission was a long duration

240
00:09:19,670 --> 00:09:16,800
mission as a flight engineer and iss

241
00:09:21,590 --> 00:09:19,680
science officer on expedition 15.

242
00:09:24,949 --> 00:09:21,600
he launched the station onboard shuttle

243
00:09:27,829 --> 00:09:24,959
atlantis with the crew of sts-117

244
00:09:30,630 --> 00:09:27,839
during his 152-day tour of duty aboard

245
00:09:32,949 --> 00:09:30,640
iss he performed three spacewalks

246
00:09:34,790 --> 00:09:32,959
totaling just over 18 hours

247
00:09:37,430 --> 00:09:34,800
in addition clay operated the station's

248
00:09:39,590 --> 00:09:37,440
robotic arm canada arm 2

249
00:09:42,470 --> 00:09:39,600
to move the station's pressurized mating

250
00:09:44,310 --> 00:09:42,480
adapter 3 to the earth-facing port on

251
00:09:46,550 --> 00:09:44,320
unity in preparation

252
00:09:48,949 --> 00:09:46,560
for the delivery of harmony by the crew

253
00:09:51,190 --> 00:09:48,959
of sts-120

254
00:09:53,750 --> 00:09:51,200
clay returned home aboard discovery as a

255
00:09:55,990 --> 00:09:53,760
member of the sts-120 crew

256
00:09:57,590 --> 00:09:56,000
clay also flew as a mission specialist

257
00:09:59,829 --> 00:09:57,600
on 131

258
00:10:01,430 --> 00:09:59,839
a resupply mission to the station

259
00:10:02,949 --> 00:10:01,440
performing another

260
00:10:05,590 --> 00:10:02,959
three spacewalks

261
00:10:07,670 --> 00:10:05,600
clay has a long history with the agency

262
00:10:09,750 --> 00:10:07,680
before becoming an astronaut he joined

263
00:10:12,069 --> 00:10:09,760

nasa in 1983

264
00:10:14,470 --> 00:10:12,079
in the mission planning mission planning

265
00:10:16,630 --> 00:10:14,480
and analysis division and later moved to

266
00:10:19,269 --> 00:10:16,640
mission operations directorate and was

267
00:10:22,790 --> 00:10:19,279
selected as a mission specialist

268
00:10:24,870 --> 00:10:22,800
in 1998 and i certainly enjoyed my time

269
00:10:27,110 --> 00:10:24,880
in mod with clay and was pleased when he

270
00:10:29,269 --> 00:10:27,120
was selected to be an astronaut his

271
00:10:31,269 --> 00:10:29,279
focus and attention to details have

272
00:10:33,509 --> 00:10:31,279
served the cause well

273
00:10:34,630 --> 00:10:33,519
and keep smiling clay

274
00:10:36,790 --> 00:10:34,640
thanks

275
00:10:38,630 --> 00:10:36,800
john mccullough just to the right of

276
00:10:40,790 --> 00:10:38,640
mike surfadini john mccull is chief of

277
00:10:43,430 --> 00:10:40,800
nasa's flight director office

278
00:10:45,670 --> 00:10:43,440
he has led more than 620 shifts as a

279
00:10:47,430 --> 00:10:45,680
flight director in mission control

280
00:10:48,949 --> 00:10:47,440
john was the lead flight director for

281
00:10:51,990 --> 00:10:48,959
expedition 7

282
00:10:55,030 --> 00:10:52,000
and the sts-115 12a assembly mission

283
00:10:57,430 --> 00:10:55,040
with atlantis in september of 2006.

284
00:10:59,590 --> 00:10:57,440
he also managed the build-up of the new

285
00:11:01,269 --> 00:10:59,600
new space station flight control room

286
00:11:04,630 --> 00:11:01,279
ficker one

287
00:11:06,230 --> 00:11:04,640
which began high use in september 2006

288
00:11:08,470 --> 00:11:06,240

and is the current home of the space

289
00:11:10,550 --> 00:11:08,480
station flight control team

290
00:11:12,949 --> 00:11:10,560
prior to his current job john

291
00:11:15,030 --> 00:11:12,959
established and served as chief of the

292
00:11:16,949 --> 00:11:15,040
space flight training management office

293
00:11:18,630 --> 00:11:16,959
responsible for all crew and flight

294
00:11:22,069 --> 00:11:18,640
controller training

295
00:11:24,230 --> 00:11:22,079
from 1992 to 2000 he supported 14

296
00:11:25,750 --> 00:11:24,240
shuttle missions as mission control

297
00:11:28,710 --> 00:11:25,760
payloads officer

298
00:11:30,790 --> 00:11:28,720
additionally he was the nasa imax

299
00:11:32,389 --> 00:11:30,800
mission manager for the space station

300
00:11:34,310 --> 00:11:32,399
assembly flights

301
00:11:36,870 --> 00:11:34,320
that was responsible for getting all the

302
00:11:37,910 --> 00:11:36,880
hardware manifested flown and used on

303
00:11:40,150 --> 00:11:37,920
orbit

304
00:11:42,069 --> 00:11:40,160
i greatly appreciate john's leadership

305
00:11:43,990 --> 00:11:42,079
mission operations as they have

306
00:11:46,470 --> 00:11:44,000
navigated and adjusted

307
00:11:48,870 --> 00:11:46,480
to the environment always managing

308
00:11:51,030 --> 00:11:48,880
managing to keep the technical

309
00:11:53,509 --> 00:11:51,040
in mind and that has become somewhat

310
00:11:55,030 --> 00:11:53,519
more difficult because quite often today

311
00:11:57,110 --> 00:11:55,040
it ain't about physics it's about

312
00:11:59,829 --> 00:11:57,120
politics

313
00:12:01,269 --> 00:11:59,839

john valmer is director of avionics and

314
00:12:06,150 --> 00:12:01,279
software for the international space

315
00:12:10,150 --> 00:12:08,310
he's a director for avionics software

316
00:12:13,030 --> 00:12:10,160
for the international space station and

317
00:12:14,790 --> 00:12:13,040
space exploration for the boeing company

318
00:12:16,069 --> 00:12:14,800
which is nasa's prime contractor for

319
00:12:17,990 --> 00:12:16,079
space station

320
00:12:20,150 --> 00:12:18,000
he leads boeing sustaining engineering

321
00:12:22,949 --> 00:12:20,160
for space station communication

322
00:12:25,829 --> 00:12:22,959
and tracking guidance navigation and

323
00:12:28,069 --> 00:12:25,839
control command and data handling

324
00:12:29,269 --> 00:12:28,079
avionics and software systems

325
00:12:31,829 --> 00:12:29,279
engineering

326
00:12:35,590 --> 00:12:31,839
and all aspects of software including

327
00:12:38,710 --> 00:12:35,600
flight ground test and simulation

328
00:12:40,949 --> 00:12:38,720
do you ever sleep yeah

329
00:12:42,310 --> 00:12:40,959
his organization also supports nasa with

330
00:12:43,829 --> 00:12:42,320
maintenance and operations of the

331
00:12:45,750 --> 00:12:43,839
various laboratories required for

332
00:12:47,829 --> 00:12:45,760
on-orbit operations

333
00:12:49,910 --> 00:12:47,839
for simulations for troubleshooting and

334
00:12:53,110 --> 00:12:49,920
test and verification activities for all

335
00:12:54,949 --> 00:12:53,120
the interfacing entities

336
00:12:57,350 --> 00:12:54,959
prior to his position in avionics

337
00:12:59,269 --> 00:12:57,360
software john was director of program

338
00:13:01,110 --> 00:12:59,279

integration for the station

339
00:13:03,110 --> 00:13:01,120
he controlled cost schedule and

340
00:13:05,430 --> 00:13:03,120
technical baselines for boeing station

341
00:13:06,470 --> 00:13:05,440
contract and served as the primary

342
00:13:08,470 --> 00:13:06,480
interface

343
00:13:10,870 --> 00:13:08,480
with nasa for contract changes and

344
00:13:12,470 --> 00:13:10,880
strategic program decisions

345
00:13:14,629 --> 00:13:12,480
over the years i have watched john and

346
00:13:16,949 --> 00:13:14,639
his contractor team in various technical

347
00:13:18,150 --> 00:13:16,959
interchange meetings exercise enormous

348
00:13:19,670 --> 00:13:18,160
patience

349
00:13:21,590 --> 00:13:19,680
and professional persistence in

350
00:13:24,710 --> 00:13:21,600
negotiating with international

351
00:13:26,870 --> 00:13:24,720
engineering teams to get what was needed

352
00:13:27,910 --> 00:13:26,880
so they could move on to the next

353
00:13:33,430 --> 00:13:27,920
challenge

354
00:13:34,949 --> 00:13:33,440
overcome during these past many years

355
00:13:37,430 --> 00:13:34,959
that's it kelly do we have time now for

356
00:13:39,430 --> 00:13:37,440
the panel or have i used up all the time

357
00:13:41,829 --> 00:13:39,440
i think we're good okay with that is

358
00:13:43,829 --> 00:13:41,839
yours not killing all right thanks and i

359
00:13:46,230 --> 00:13:43,839
want to start today's activities off uh

360
00:13:48,790 --> 00:13:46,240
by letting mike seffredini uh get the

361
00:13:50,710 --> 00:13:48,800
first word in on this significant

362
00:13:52,550 --> 00:13:50,720
milestone in human spaceflight something

363
00:13:54,389 --> 00:13:52,560

that i know he's personally put his

364
00:13:56,150 --> 00:13:54,399
heart and soul into

365
00:13:57,750 --> 00:13:56,160
well good morning

366
00:13:59,829 --> 00:13:57,760
i guess i'm the lucky person that gets

367
00:14:02,069 --> 00:13:59,839
to to get things started

368
00:14:04,790 --> 00:14:02,079
you know when when you think about uh

369
00:14:05,910 --> 00:14:04,800
where we've all been together it you try

370
00:14:08,230 --> 00:14:05,920
to think of

371
00:14:10,550 --> 00:14:08,240
the right adjectives to describe what

372
00:14:12,790 --> 00:14:10,560
we've been through and and uh what's on

373
00:14:14,949 --> 00:14:12,800
orbit today and we can talk about the

374
00:14:17,990 --> 00:14:14,959
size of the spacecraft it's it's very

375
00:14:18,710 --> 00:14:18,000
very large 150 000 pound spacecraft it's

376
00:14:21,269 --> 00:14:18,720
got

377
00:14:23,030 --> 00:14:21,279
upwards of 32 000 square feet of

378
00:14:25,430 --> 00:14:23,040
internal volume

379
00:14:27,750 --> 00:14:25,440
4 million lines of code the list goes on

380
00:14:30,470 --> 00:14:27,760
and on and on

381
00:14:33,189 --> 00:14:30,480
and it's an amazing spacecraft and the

382
00:14:34,710 --> 00:14:33,199
and the feat uh that we have

383
00:14:36,710 --> 00:14:34,720
accomplished as a team with our

384
00:14:38,629 --> 00:14:36,720
international partners

385
00:14:40,949 --> 00:14:38,639
is is honestly

386
00:14:42,629 --> 00:14:40,959
nothing short of perhaps the most

387
00:14:45,030 --> 00:14:42,639
difficult thing ever attempted by

388
00:14:46,470 --> 00:14:45,040

humankind so

389
00:14:48,870 --> 00:14:46,480
it's really

390
00:14:50,790 --> 00:14:48,880
it's humbling to to sit here and in

391
00:14:53,189 --> 00:14:50,800
front of you today and in front of the

392
00:14:54,870 --> 00:14:53,199
audience and and to reflect on

393
00:14:57,590 --> 00:14:54,880
on what's occurred over the last 10

394
00:14:59,829 --> 00:14:57,600
years actually over the last 12 years

395
00:15:01,269 --> 00:14:59,839
since the the first flight but but of

396
00:15:03,269 --> 00:15:01,279
course today we are

397
00:15:05,430 --> 00:15:03,279
we're focusing on the fact that we've

398
00:15:07,110 --> 00:15:05,440
had 10 years of permanent human presence

399
00:15:10,150 --> 00:15:07,120
as of uh

400
00:15:12,470 --> 00:15:10,160
early next week

401
00:15:14,470 --> 00:15:12,480
and another interesting tidbits and and

402
00:15:16,629 --> 00:15:14,480
we're full of milestones in this program

403
00:15:18,550 --> 00:15:16,639
which is which it makes it fun because

404
00:15:20,069 --> 00:15:18,560
it you know if you if if you if you

405
00:15:21,670 --> 00:15:20,079
didn't have milestones every so often

406
00:15:23,110 --> 00:15:21,680
you you turn around and say what did i

407
00:15:26,069 --> 00:15:23,120
do yesterday but

408
00:15:27,910 --> 00:15:26,079
but uh monday i walked into the fr and

409
00:15:30,269 --> 00:15:27,920
and was stopped by kyle herring who

410
00:15:32,550 --> 00:15:30,279
reminded me that this was

411
00:15:34,629 --> 00:15:32,560
3644 days

412
00:15:36,550 --> 00:15:34,639
uh and i said thanks kyle that's

413
00:15:38,710 --> 00:15:36,560

interesting and then kyle told me that

414
00:15:41,110 --> 00:15:38,720
was the previous record for continuous

415
00:15:43,269 --> 00:15:41,120
human presence on space so

416
00:15:45,749 --> 00:15:43,279
not only are we approaching 10 years on

417
00:15:48,069 --> 00:15:45,759
iss but we now are the record holder for

418
00:15:50,710 --> 00:15:48,079
permanent human presence in space

419
00:15:52,470 --> 00:15:50,720
and that's that's a neat tribute but but

420
00:15:55,189 --> 00:15:52,480
if you think about it in terms of the

421
00:15:57,350 --> 00:15:55,199
international partnership

422
00:15:59,030 --> 00:15:57,360
which to many of us and and i'm included

423
00:16:01,110 --> 00:15:59,040
in that group believe that is perhaps

424
00:16:02,550 --> 00:16:01,120
the more remarkable thing about about

425
00:16:04,069 --> 00:16:02,560
international space station is the

426
00:16:06,150 --> 00:16:04,079
partnership and what we have done

427
00:16:06,870 --> 00:16:06,160
together as a partnership

428
00:16:09,670 --> 00:16:06,880
but

429
00:16:12,389 --> 00:16:09,680
since we really began this as part of

430
00:16:15,910 --> 00:16:12,399
the the mir program uh with the shuttle

431
00:16:17,990 --> 00:16:15,920
mir program our our our presence uh as

432
00:16:20,150 --> 00:16:18,000
an international community in space is

433
00:16:22,470 --> 00:16:20,160
is much much longer than than the 10

434
00:16:25,030 --> 00:16:22,480
years we're here to celebrate today and

435
00:16:27,110 --> 00:16:25,040
that is extremely important we learned

436
00:16:28,949 --> 00:16:27,120
quite a bit in what we referred to as

437
00:16:31,189 --> 00:16:28,959
the phase one program

438
00:16:33,509 --> 00:16:31,199

that helped us be successful in iss and

439
00:16:35,350 --> 00:16:33,519
we we ought to think about that in in

440
00:16:38,069 --> 00:16:35,360
those terms

441
00:16:40,310 --> 00:16:38,079
the international space station program

442
00:16:42,949 --> 00:16:40,320
and the partnership to me

443
00:16:44,629 --> 00:16:42,959
not only is the this this space station

444
00:16:48,230 --> 00:16:44,639
this remarkable vehicle is on orbit

445
00:16:50,550 --> 00:16:48,240
today in my mind the the the toehold and

446
00:16:52,949 --> 00:16:50,560
our ability to do exploration in terms

447
00:16:55,269 --> 00:16:52,959
of of not over not only human research

448
00:16:57,189 --> 00:16:55,279
but technology development but also in

449
00:16:59,030 --> 00:16:57,199
terms of the partnership that that i

450
00:17:00,389 --> 00:16:59,040
believe is necessary for us to do

451
00:17:01,590 --> 00:17:00,399
exploration

452
00:17:03,509 --> 00:17:01,600
and so

453
00:17:05,829 --> 00:17:03,519
so while we while we sit here today and

454
00:17:07,990 --> 00:17:05,839
reflect on on the many years we've all

455
00:17:10,630 --> 00:17:08,000
spent uh together building the space

456
00:17:12,390 --> 00:17:10,640
station with our international partners

457
00:17:13,750 --> 00:17:12,400
we we should

458
00:17:15,990 --> 00:17:13,760
we should

459
00:17:18,949 --> 00:17:16,000
believe and think about the fact that

460
00:17:21,270 --> 00:17:18,959
that we will explore humanity will

461
00:17:23,510 --> 00:17:21,280
explore beyond low earth orbit and this

462
00:17:24,789 --> 00:17:23,520
really was the first step in that

463
00:17:26,789 --> 00:17:24,799

endeavor

464
00:17:27,909 --> 00:17:26,799
and so i look forward to

465
00:17:29,510 --> 00:17:27,919
to

466
00:17:31,110 --> 00:17:29,520
reflecting on this remarkable journey

467
00:17:33,270 --> 00:17:31,120
with everyone today and so i'll turn it

468
00:17:34,630 --> 00:17:33,280
over to kelly and he can help us do that

469
00:17:36,390 --> 00:17:34,640
thanks mike

470
00:17:37,909 --> 00:17:36,400
just a little bit about the format i'm

471
00:17:39,750 --> 00:17:37,919
going to kick things off with some

472
00:17:40,950 --> 00:17:39,760
questions to start discussion among the

473
00:17:43,350 --> 00:17:40,960
panel

474
00:17:45,830 --> 00:17:43,360
and then we'll have time for employee

475
00:17:48,549 --> 00:17:45,840
and media questions if we have

476
00:17:49,990 --> 00:17:48,559
any toward the end of the hour so

477
00:17:51,750 --> 00:17:50,000
let me start it off with the first

478
00:17:54,150 --> 00:17:51,760
question which is kind of mandatory for

479
00:17:56,310 --> 00:17:54,160
everybody and and and that is how did

480
00:17:58,230 --> 00:17:56,320
each of you first become involved in the

481
00:18:01,909 --> 00:17:58,240
international space station

482
00:18:03,270 --> 00:18:01,919
and how has your role evolved since that

483
00:18:05,669 --> 00:18:03,280
point and why don't we just start with

484
00:18:07,350 --> 00:18:05,679
john here since he's handy on my left

485
00:18:08,789 --> 00:18:07,360
and work our way down

486
00:18:11,430 --> 00:18:08,799
okay well

487
00:18:12,630 --> 00:18:11,440
thank you and i actually got involved in

488
00:18:15,669 --> 00:18:12,640

space

489
00:18:16,630 --> 00:18:15,679
on the shuttle

490
00:18:18,950 --> 00:18:16,640
um

491
00:18:21,669 --> 00:18:18,960
on the solid rocket boosters for rock

492
00:18:25,190 --> 00:18:21,679
wall at the marshall space flight center

493
00:18:27,750 --> 00:18:25,200
back before the challenger disaster so

494
00:18:29,669 --> 00:18:27,760
i got involved in space then i grew up

495
00:18:30,870 --> 00:18:29,679
around space my father was on the apollo

496
00:18:32,390 --> 00:18:30,880
program

497
00:18:34,470 --> 00:18:32,400
and when station came along well that

498
00:18:36,630 --> 00:18:34,480
was the best next big apollo for me and

499
00:18:38,390 --> 00:18:36,640
so i was want to be a part of it

500
00:18:40,870 --> 00:18:38,400
so i joined the boeing company they were

501
00:18:43,350 --> 00:18:40,880
bidding on the at that time the work

502
00:18:45,270 --> 00:18:43,360
package one phase of the program

503
00:18:46,710 --> 00:18:45,280
so i joined the boeing company and

504
00:18:48,950 --> 00:18:46,720
helped them get through the proposal

505
00:18:50,870 --> 00:18:48,960
phase of it i started off building

506
00:18:53,029 --> 00:18:50,880
specifications for the laboratory and

507
00:18:55,909 --> 00:18:53,039
the pressurized elements and

508
00:18:57,350 --> 00:18:55,919
that led into working some design team

509
00:19:00,470 --> 00:18:57,360
activities where we went through and

510
00:19:01,909 --> 00:19:00,480
looked at optimization of the station

511
00:19:03,909 --> 00:19:01,919
subsystems

512
00:19:06,950 --> 00:19:03,919
that ended up leading to the crystal

513
00:19:08,470 --> 00:19:06,960

city redesign effort when the president

514
00:19:10,710 --> 00:19:08,480
asked us to go work with the russians

515
00:19:12,470 --> 00:19:10,720
and so i participated in that

516
00:19:15,590 --> 00:19:12,480
and that eventually led me here to

517
00:19:17,510 --> 00:19:15,600
houston to establish the the first

518
00:19:18,950 --> 00:19:17,520
contractor team to work with nasa on

519
00:19:21,990 --> 00:19:18,960
establishing the new

520
00:19:24,710 --> 00:19:22,000
at that time called alpha station

521
00:19:27,350 --> 00:19:24,720
since then i've had various

522
00:19:29,590 --> 00:19:27,360
responsibilities i

523
00:19:32,310 --> 00:19:29,600
i became the node one launch package

524
00:19:34,549 --> 00:19:32,320
manager and uh so i was participating in

525
00:19:36,470 --> 00:19:34,559
getting the first u.s element up there

526
00:19:38,549 --> 00:19:36,480
and it was a exciting time when we

527
00:19:40,950 --> 00:19:38,559
integrated it with the

528
00:19:43,350 --> 00:19:40,960
lazaria module from russia and really

529
00:19:45,270 --> 00:19:43,360
formed that first core station

530
00:19:46,950 --> 00:19:45,280
and uh since then i've gone on and

531
00:19:48,789 --> 00:19:46,960
worked payloads and

532
00:19:49,990 --> 00:19:48,799
utilization of station with payloads and

533
00:19:52,070 --> 00:19:50,000
then

534
00:19:54,310 --> 00:19:52,080
program integration various system

535
00:19:56,789 --> 00:19:54,320
engineering and now working avions and

536
00:19:58,390 --> 00:19:56,799
software so i've touched a lot of the uh

537
00:20:00,310 --> 00:19:58,400
the station program and have an

538
00:20:02,390 --> 00:20:00,320

understanding of a great deal of what's

539
00:20:04,630 --> 00:20:02,400
going on over the past

540
00:20:07,510 --> 00:20:04,640
20 years

541
00:20:09,590 --> 00:20:07,520
okay thanks john john well let me say

542
00:20:11,590 --> 00:20:09,600
i'm i'm honored to be here and represent

543
00:20:14,230 --> 00:20:11,600
in some small way the tremendous team

544
00:20:16,470 --> 00:20:14,240
that that is behind this milestone and

545
00:20:18,470 --> 00:20:16,480
working today and has been working uh

546
00:20:19,990 --> 00:20:18,480
up to this point and into the future uh

547
00:20:23,110 --> 00:20:20,000
on the operations and the training and

548
00:20:24,950 --> 00:20:23,120
preparation for uh for space station

549
00:20:26,950 --> 00:20:24,960
as milt mentioned i started out on the

550
00:20:28,630 --> 00:20:26,960
shuttle side in flight control grew up

551
00:20:31,190 --> 00:20:28,640
with the shuttle as a payload officer

552
00:20:32,549 --> 00:20:31,200
and that position evolved into uh

553
00:20:34,070 --> 00:20:32,559
assembly checkout officer and the

554
00:20:36,149 --> 00:20:34,080
assembly checkout officer is the one

555
00:20:38,710 --> 00:20:36,159
responsible for um integrating the

556
00:20:41,270 --> 00:20:38,720
hardware with the with the uh mission

557
00:20:43,110 --> 00:20:41,280
objectives and and getting them up on on

558
00:20:45,270 --> 00:20:43,120
station on orbit

559
00:20:46,870 --> 00:20:45,280
i worked 3a which is one of the early

560
00:20:48,549 --> 00:20:46,880
flights uh got to work with a lot of

561
00:20:50,710 --> 00:20:48,559
folks on this

562
00:20:53,350 --> 00:20:50,720
panel repeatedly

563
00:20:55,669 --> 00:20:53,360

in close quarters and

564
00:20:57,350 --> 00:20:55,679
great team awesome awesome group

565
00:20:58,470 --> 00:20:57,360
and

566
00:21:00,390 --> 00:20:58,480
my jobs

567
00:21:02,070 --> 00:21:00,400
have evolved over time through through

568
00:21:03,669 --> 00:21:02,080
the training community and through the

569
00:21:05,190 --> 00:21:03,679
operations community as a flight

570
00:21:07,350 --> 00:21:05,200
controller flight director and and

571
00:21:08,789 --> 00:21:07,360
manager uh largely in the last three

572
00:21:11,830 --> 00:21:08,799
years i've been associated with every

573
00:21:13,110 --> 00:21:11,840
flight at the mod console the liaison

574
00:21:14,950 --> 00:21:13,120
between the flight control team and the

575
00:21:16,470 --> 00:21:14,960
management team

576
00:21:18,310 --> 00:21:16,480
for every flight for the last three

577
00:21:19,909 --> 00:21:18,320
years and to see the consistency and the

578
00:21:22,230 --> 00:21:19,919
dedication and the effort that every

579
00:21:24,230 --> 00:21:22,240
team puts into accomplishing the goals

580
00:21:26,710 --> 00:21:24,240
that they do is really an honor and

581
00:21:28,310 --> 00:21:26,720
really uh really sets your mind at at

582
00:21:30,789 --> 00:21:28,320
ease for the future because we're in

583
00:21:33,029 --> 00:21:30,799
good hands we have a good team and so

584
00:21:34,230 --> 00:21:33,039
that's really about it okay back to you

585
00:21:36,710 --> 00:21:34,240
mike

586
00:21:38,230 --> 00:21:36,720
oh well let's see i was uh happy uh

587
00:21:40,149 --> 00:21:38,240
working as the assistant manager in the

588
00:21:41,909 --> 00:21:40,159

space shuttle program for tommy holloway

589
00:21:43,350 --> 00:21:41,919
at the time i i had been working for

590
00:21:45,590 --> 00:21:43,360
brewster and then they changed that

591
00:21:47,669 --> 00:21:45,600
management i was working for tommy so i

592
00:21:49,510 --> 00:21:47,679
it was uh quite a pleasure and a

593
00:21:51,110 --> 00:21:49,520
learning experience to work with both of

594
00:21:52,870 --> 00:21:51,120
those gentlemen

595
00:21:54,789 --> 00:21:52,880
and i think i was about a year and

596
00:21:56,710 --> 00:21:54,799
change into it when harvey hartman came

597
00:21:57,990 --> 00:21:56,720
and visited me one day and

598
00:22:00,310 --> 00:21:58,000
you guys probably remember him he was

599
00:22:02,470 --> 00:22:00,320
the head of human resources

600
00:22:05,110 --> 00:22:02,480
and he said hey george thinks you need

601
00:22:07,350 --> 00:22:05,120
to go work in the budget office at iss

602
00:22:09,669 --> 00:22:07,360
and i looked at him and

603
00:22:11,110 --> 00:22:09,679
felt like saying this is a joke but

604
00:22:12,630 --> 00:22:11,120
harv is a nice guy but generally didn't

605
00:22:14,149 --> 00:22:12,640
come to your office to joke about things

606
00:22:15,350 --> 00:22:14,159
like that so

607
00:22:17,830 --> 00:22:15,360
i said well

608
00:22:19,909 --> 00:22:17,840
that's interesting why the budget office

609
00:22:21,510 --> 00:22:19,919
and and why space station and he said

610
00:22:23,990 --> 00:22:21,520
well i don't know george just thinks

611
00:22:26,390 --> 00:22:24,000
that's a good idea and he suggested that

612
00:22:29,669 --> 00:22:26,400
you go interview with dan tam which many

613
00:22:33,750 --> 00:22:29,679

of you will recall was our our budget

614
00:22:36,230 --> 00:22:33,760
our budget king at the time and uh he uh

615
00:22:37,990 --> 00:22:36,240
he was like a one-man show relative to

616
00:22:39,669 --> 00:22:38,000
deciding what we should invest in and

617
00:22:41,029 --> 00:22:39,679
how much it would cost

618
00:22:42,230 --> 00:22:41,039
and and

619
00:22:43,830 --> 00:22:42,240
so

620
00:22:45,350 --> 00:22:43,840
i said okay well i'll go interview

621
00:22:47,590 --> 00:22:45,360
that's that's fair enough so i went to

622
00:22:49,430 --> 00:22:47,600
sit down and talk to dan tam and

623
00:22:50,710 --> 00:22:49,440
and i said dan what are you looking for

624
00:22:52,950 --> 00:22:50,720
and he says well i'm looking for a

625
00:22:55,110 --> 00:22:52,960
lawyer with the cpa degree and i said oh

626
00:22:56,710 --> 00:22:55,120
okay so why are you talking to me and he

627
00:22:58,230 --> 00:22:56,720
said well george said you should come

628
00:22:59,350 --> 00:22:58,240
over here and talk

629
00:23:01,110 --> 00:22:59,360
so uh

630
00:23:02,710 --> 00:23:01,120
so then i so we talked for a little

631
00:23:04,789 --> 00:23:02,720
while and it was a it was an interesting

632
00:23:07,190 --> 00:23:04,799
conversation and then

633
00:23:09,430 --> 00:23:07,200
i i left there

634
00:23:11,510 --> 00:23:09,440
really concerned that that the budget

635
00:23:13,029 --> 00:23:11,520
guy wants a lawyer with the cpa degree

636
00:23:14,470 --> 00:23:13,039
and and uh

637
00:23:16,710 --> 00:23:14,480
you know i knew how to do engineering

638
00:23:19,029 --> 00:23:16,720

and i could follow numbers but

639
00:23:20,390 --> 00:23:19,039
but i didn't the lawyer and cpa thing

640
00:23:22,630 --> 00:23:20,400
kind of scared me so i went to harvard

641
00:23:24,549 --> 00:23:22,640
and i said say harv you know what what

642
00:23:26,549 --> 00:23:24,559
would happen if i said i really didn't

643
00:23:28,070 --> 00:23:26,559
want to do this he goes well

644
00:23:29,909 --> 00:23:28,080
mike you know it's i don't think it's

645
00:23:31,669 --> 00:23:29,919
ever been done before i'm not sure i'd

646
00:23:33,590 --> 00:23:31,679
do that so

647
00:23:35,110 --> 00:23:33,600
so i became the deputy manager of the

648
00:23:37,190 --> 00:23:35,120
budget office

649
00:23:39,350 --> 00:23:37,200
and and since then i've kind of grown up

650
00:23:41,029 --> 00:23:39,360
in the space station program in in many

651
00:23:43,190 --> 00:23:41,039
of the offices and

652
00:23:45,029 --> 00:23:43,200
and find myself where i am today but

653
00:23:47,430 --> 00:23:45,039
it's been a it's been a

654
00:23:49,669 --> 00:23:47,440
fun ride and i look back on it now and

655
00:23:51,510 --> 00:23:49,679
and uh and thank george for giving me

656
00:23:53,750 --> 00:23:51,520
the opportunity because it was a it's

657
00:23:55,990 --> 00:23:53,760
been a remarkable ride

658
00:23:57,430 --> 00:23:56,000
just before we go over to peggy just

659
00:23:59,430 --> 00:23:57,440
because you didn't mention his last name

660
00:24:01,990 --> 00:23:59,440
all you're talking about uh former jsc

661
00:24:03,909 --> 00:24:02,000
director george abbey so

662
00:24:05,830 --> 00:24:03,919
just so everybody knows

663
00:24:07,269 --> 00:24:05,840

we all grew up together right so you say

664
00:24:08,470 --> 00:24:07,279
george

665
00:24:09,510 --> 00:24:08,480
there's probably thousands of other

666
00:24:11,750 --> 00:24:09,520
georgia's out there going where they're

667
00:24:13,190 --> 00:24:11,760
talking about me

668
00:24:15,669 --> 00:24:13,200
but mr abby knows who we're talking

669
00:24:18,310 --> 00:24:15,679
about that's awesome

670
00:24:20,230 --> 00:24:18,320
um well i've always said that uh i've

671
00:24:23,190 --> 00:24:20,240
never wanted to do anything besides uh

672
00:24:25,750 --> 00:24:23,200
work at nasa after uh seeing neil

673
00:24:28,470 --> 00:24:25,760
armstrong and uh buzz aldrin walk on the

674
00:24:29,909 --> 00:24:28,480
moon i thought wow cool job i'd like to

675
00:24:32,470 --> 00:24:29,919
work there too

676
00:24:34,789 --> 00:24:32,480
and i think it was actually a kind of

677
00:24:36,149 --> 00:24:34,799
key timing that the year i graduated

678
00:24:38,710 --> 00:24:36,159
from high school is also the year they

679
00:24:40,630 --> 00:24:38,720
picked first female astronauts and being

680
00:24:42,310 --> 00:24:40,640
from you know rural iowa on a farm you

681
00:24:43,990 --> 00:24:42,320
don't know a whole lot about the process

682
00:24:45,190 --> 00:24:44,000
and i just like okay well i'll do that

683
00:24:48,950 --> 00:24:45,200
too

684
00:24:52,870 --> 00:24:50,310
and as soon as i finished graduate

685
00:24:55,350 --> 00:24:52,880
school i started working at nasa

686
00:24:57,110 --> 00:24:55,360
for a contractor initially as a nrc post

687
00:24:58,830 --> 00:24:57,120
doctoral fellow and then as a contractor

688
00:25:01,990 --> 00:24:58,840

and eventually for

689
00:25:03,830 --> 00:25:02,000
nasa and in that that

690
00:25:06,310 --> 00:25:03,840
10 years before i was lucky enough to

691
00:25:09,190 --> 00:25:06,320
get selected and i was working at nasa i

692
00:25:11,190 --> 00:25:09,200
felt like you know i i always wanted to

693
00:25:11,990 --> 00:25:11,200
be an astronaut but at the same time i

694
00:25:15,190 --> 00:25:12,000
think

695
00:25:17,029 --> 00:25:15,200
having had that experience at nasa

696
00:25:18,149 --> 00:25:17,039
really made me a much better astronaut

697
00:25:19,590 --> 00:25:18,159
because

698
00:25:21,669 --> 00:25:19,600
primarily

699
00:25:23,350 --> 00:25:21,679
my jobs involved working with the

700
00:25:25,110 --> 00:25:23,360
russians

701
00:25:26,549 --> 00:25:25,120
initially as an investigator on a

702
00:25:28,870 --> 00:25:26,559
one-on-one level

703
00:25:30,310 --> 00:25:28,880
then as a project scientist and then

704
00:25:32,549 --> 00:25:30,320
later as a

705
00:25:34,470 --> 00:25:32,559
science working group co-chair

706
00:25:37,190 --> 00:25:34,480
so all of those relationships that i

707
00:25:38,870 --> 00:25:37,200
built i think were a key part of

708
00:25:40,710 --> 00:25:38,880
eventually being selected as an

709
00:25:43,110 --> 00:25:40,720
astronaut

710
00:25:45,029 --> 00:25:43,120
in those roles i think

711
00:25:46,870 --> 00:25:45,039
i learned a lot about working with

712
00:25:49,430 --> 00:25:46,880
international partners i think that

713
00:25:51,269 --> 00:25:49,440

obviously is very important uh in the

714
00:25:52,950 --> 00:25:51,279
international space station as everyone

715
00:25:54,149 --> 00:25:52,960
can attest

716
00:25:56,149 --> 00:25:54,159
you know there's good days and there's

717
00:25:58,230 --> 00:25:56,159
bad days but it's all been a really good

718
00:25:59,510 --> 00:25:58,240
learning experience some of those days

719
00:26:01,110 --> 00:25:59,520
you wouldn't necessarily choose to

720
00:26:04,549 --> 00:26:01,120
relive

721
00:26:06,549 --> 00:26:04,559
but it's all been valuable and

722
00:26:08,950 --> 00:26:06,559
helped to get the station to where it is

723
00:26:11,830 --> 00:26:08,960
now and it's such a beautiful place

724
00:26:13,830 --> 00:26:11,840
my first space flight i was so impressed

725
00:26:15,269 --> 00:26:13,840
with just being in space and living in

726
00:26:17,430 --> 00:26:15,279
space and looking at the view of the

727
00:26:19,110 --> 00:26:17,440
earth and my second space flight i got

728
00:26:20,870 --> 00:26:19,120
the opportunity to do even more space

729
00:26:23,029 --> 00:26:20,880
walks and i was really really impressed

730
00:26:25,430 --> 00:26:23,039
with this structure this huge structure

731
00:26:26,870 --> 00:26:25,440
that we've built there

732
00:26:28,789 --> 00:26:26,880
thanks peggy

733
00:26:30,630 --> 00:26:28,799
it's great to be here i'm very excited

734
00:26:31,510 --> 00:26:30,640
especially to have you folks out in the

735
00:26:33,190 --> 00:26:31,520
audience

736
00:26:34,789 --> 00:26:33,200
i started here i was talking to la

737
00:26:37,110 --> 00:26:34,799
earlier that

738
00:26:38,710 --> 00:26:37,120

way back in june of 81 i sat in the

739
00:26:41,669 --> 00:26:38,720
chairs here in this auditorium as i

740
00:26:44,070 --> 00:26:41,679
listened to the post sts-1

741
00:26:46,870 --> 00:26:44,080
symposium that was being held here and i

742
00:26:49,430 --> 00:26:46,880
was a summer intern at the time for nasa

743
00:26:50,390 --> 00:26:49,440
at the johnson space center so i grew up

744
00:26:52,950 --> 00:26:50,400
here

745
00:26:54,710 --> 00:26:52,960
as mike has referred to and i also had

746
00:26:56,470 --> 00:26:54,720
the opportunity though to

747
00:26:58,390 --> 00:26:56,480
go from sitting in those seats to be

748
00:27:00,070 --> 00:26:58,400
able to be

749
00:27:02,630 --> 00:27:00,080
fortunate enough to sit in a seat like

750
00:27:04,470 --> 00:27:02,640
this today uh when i was an early

751
00:27:06,390 --> 00:27:04,480
engineer here we worked on the shuttle

752
00:27:07,990 --> 00:27:06,400
and until the point where this thing

753
00:27:09,750 --> 00:27:08,000
called a space station was being talked

754
00:27:11,990 --> 00:27:09,760
about and everybody said oh we need

755
00:27:13,909 --> 00:27:12,000
people to go work on that so uh somebody

756
00:27:16,230 --> 00:27:13,919
just came to our desk one day and said

757
00:27:18,789 --> 00:27:16,240
hey you're now working on station and it

758
00:27:20,950 --> 00:27:18,799
was a great time because there was no

759
00:27:23,190 --> 00:27:20,960
space station there were just designs of

760
00:27:25,430 --> 00:27:23,200
space stations different kinds that that

761
00:27:27,990 --> 00:27:25,440
had different features uh one shaped

762
00:27:30,070 --> 00:27:28,000
like a triangle one shaped like a huge

763
00:27:31,590 --> 00:27:30,080

keel in in the middle of space and

764
00:27:33,269 --> 00:27:31,600
others shaped like

765
00:27:35,430 --> 00:27:33,279
you might see on the tv movies with all

766
00:27:36,470 --> 00:27:35,440
the modules locked together in different

767
00:27:38,230 --> 00:27:36,480
shapes

768
00:27:40,710 --> 00:27:38,240
so it was really cool for me to be able

769
00:27:42,789 --> 00:27:40,720
to have that opportunity to begin

770
00:27:44,230 --> 00:27:42,799
in the design of this structure that

771
00:27:45,669 --> 00:27:44,240
then i had the

772
00:27:46,950 --> 00:27:45,679
awesome fortune

773
00:27:51,269 --> 00:27:46,960
to live on

774
00:27:53,590 --> 00:27:51,279
for five months so for me to come from

775
00:27:55,990 --> 00:27:53,600
being just an employee that

776
00:27:58,950 --> 00:27:56,000
had a dream to work on whatever it was

777
00:27:59,990 --> 00:27:58,960
nasa had in mind and then to be able to

778
00:28:02,549 --> 00:28:00,000
live

779
00:28:05,430 --> 00:28:02,559
on that structure that with all the

780
00:28:06,630 --> 00:28:05,440
people out here i helped design is uh it

781
00:28:08,630 --> 00:28:06,640
was quite a

782
00:28:09,909 --> 00:28:08,640
quite an achievement for me so thank you

783
00:28:13,190 --> 00:28:09,919
to all of you for giving me that

784
00:28:16,870 --> 00:28:15,350
for my part first kelly thanks for

785
00:28:18,630 --> 00:28:16,880
including me on this it's uh it's

786
00:28:20,549 --> 00:28:18,640
obviously a privilege

787
00:28:21,909 --> 00:28:20,559
to sit up here but it's also very

788
00:28:23,750 --> 00:28:21,919

entertaining to hear so many stories

789
00:28:26,070 --> 00:28:23,760
that i hadn't heard about

790
00:28:28,310 --> 00:28:26,080
and unlike some of my predecessors i did

791
00:28:30,389 --> 00:28:28,320
not grow up here although having been

792
00:28:32,950 --> 00:28:30,399
here since 1992 now i've lived here

793
00:28:37,110 --> 00:28:32,960
longer than any place in my life which

794
00:28:39,430 --> 00:28:37,120
is not unusual for a military guy but

795
00:28:41,750 --> 00:28:39,440
my path to nasa was

796
00:28:44,230 --> 00:28:41,760
pretty typical for a military astronaut

797
00:28:47,269 --> 00:28:44,240
through a test pilot school and then

798
00:28:50,230 --> 00:28:47,279
directly here in 1992 my start with the

799
00:28:51,430 --> 00:28:50,240
iss program

800
00:28:55,430 --> 00:28:51,440
was in the

801
00:28:56,950 --> 00:28:55,440
about 14 years ago so at the end of 1996

802
00:28:58,950 --> 00:28:56,960
i was assigned to be the director of

803
00:29:01,350 --> 00:28:58,960
operations russia which

804
00:29:03,110 --> 00:29:01,360
sounds like the czar but it was really

805
00:29:05,269 --> 00:29:03,120
the head of an office of about a dozen

806
00:29:07,029 --> 00:29:05,279
people half of them were russians half

807
00:29:09,990 --> 00:29:07,039
of them or

808
00:29:11,909 --> 00:29:10,000
nasa contractors or civil servants and

809
00:29:13,750 --> 00:29:11,919
our job was sort of the care and feeding

810
00:29:15,430 --> 00:29:13,760
of astronauts that were participating in

811
00:29:17,590 --> 00:29:15,440
the shuttle mirror program or as mike

812
00:29:19,669 --> 00:29:17,600
referred to it before phase one

813
00:29:21,190 --> 00:29:19,679

so we had about four or five people

814
00:29:23,669 --> 00:29:21,200
living out there

815
00:29:25,909 --> 00:29:23,679
and not long after that the first

816
00:29:28,470 --> 00:29:25,919
crew bill shepard and his backup showed

817
00:29:33,430 --> 00:29:28,480
up for the beginning of iss training so

818
00:29:38,870 --> 00:29:35,350
i stayed there for nine months learned a

819
00:29:41,269 --> 00:29:38,880
lot as peggy said you really do

820
00:29:43,750 --> 00:29:41,279
get a lot of benefit from interfacing

821
00:29:45,510 --> 00:29:43,760
with the international partners

822
00:29:46,950 --> 00:29:45,520
as a result of that experience i became

823
00:29:48,710 --> 00:29:46,960
involved with something which was at

824
00:29:50,149 --> 00:29:48,720
that time called the bilateral crew

825
00:29:51,590 --> 00:29:50,159
operations panel

826
00:29:54,230 --> 00:29:51,600
now it's the multilateral crew

827
00:29:55,269 --> 00:29:54,240
operations panel and we decide among

828
00:29:56,950 --> 00:29:55,279
other things

829
00:29:58,630 --> 00:29:56,960
what astronauts cosmonauts are going to

830
00:29:59,990 --> 00:29:58,640
fly on which increments who's a

831
00:30:02,389 --> 00:30:00,000
commander and that sort of thing which

832
00:30:03,750 --> 00:30:02,399
has been interesting the whole time a

833
00:30:05,510 --> 00:30:03,760
whole new set of challenges like

834
00:30:07,830 --> 00:30:05,520
somebody before said

835
00:30:09,510 --> 00:30:07,840
it's uh it's a lot less about physics

836
00:30:11,430 --> 00:30:09,520
than it is about politics sometimes but

837
00:30:13,750 --> 00:30:11,440
that's not bad that's just the world in

838
00:30:15,510 --> 00:30:13,760

which we live

839
00:30:17,590 --> 00:30:15,520
i also was lucky enough to visit the

840
00:30:19,750 --> 00:30:17,600
space station twice the first time

841
00:30:21,909 --> 00:30:19,760
nobody was living up there in fact

842
00:30:24,389 --> 00:30:21,919
we closed the hatch on the unmanned

843
00:30:26,149 --> 00:30:24,399
space station for the last time

844
00:30:29,750 --> 00:30:26,159
that was on october

845
00:30:31,750 --> 00:30:29,760
21st or so uh 2000 and

846
00:30:33,590 --> 00:30:31,760
about a week later bill shepard and his

847
00:30:34,950 --> 00:30:33,600
crew showed up and opened that same

848
00:30:36,230 --> 00:30:34,960
hatch and came in

849
00:30:38,710 --> 00:30:36,240
actually they probably came in in a

850
00:30:41,029 --> 00:30:38,720
different hatch

851
00:30:43,990 --> 00:30:41,039
and then again a little bit later we

852
00:30:46,470 --> 00:30:44,000
brought up the expedition 6 crew

853
00:30:48,389 --> 00:30:46,480
and brought preggy and her exhibition 5

854
00:30:52,149 --> 00:30:48,399
crew home and we also brought up the p1

855
00:30:54,389 --> 00:30:52,159
truss which was you know this the

856
00:30:55,430 --> 00:30:54,399
second beginning if you will of the long

857
00:30:57,509 --> 00:30:55,440
traverse

858
00:30:59,590 --> 00:30:57,519
structure that now holds a solar rays

859
00:31:02,310 --> 00:30:59,600
radiation etc

860
00:31:03,990 --> 00:31:02,320
and now it's uh sadly wearing a tie

861
00:31:05,669 --> 00:31:04,000
instead of a flight suit more often than

862
00:31:08,549 --> 00:31:05,679
not but um

863
00:31:09,830 --> 00:31:08,559

i guess i i can't complain i have an

864
00:31:12,230 --> 00:31:09,840
interesting

865
00:31:13,990 --> 00:31:12,240
function where it's all operations based

866
00:31:16,149 --> 00:31:14,000
um kind of take care of this sort of

867
00:31:17,509 --> 00:31:16,159
care and feeding again but not of people

868
00:31:19,430 --> 00:31:17,519
that are training in russia but people

869
00:31:21,669 --> 00:31:19,440
that are training all over the world and

870
00:31:23,990 --> 00:31:21,679
flying on the space station

871
00:31:26,149 --> 00:31:24,000
okay well thanks everybody

872
00:31:28,549 --> 00:31:26,159
let's start off the discussions here

873
00:31:30,149 --> 00:31:28,559
with the first question which is

874
00:31:32,950 --> 00:31:30,159
what in your opinion

875
00:31:34,870 --> 00:31:32,960
is the most significant accomplishment

876
00:31:36,789 --> 00:31:34,880
of the international space station team

877
00:31:38,710 --> 00:31:36,799
and i just ask you to jump in as you

878
00:31:40,870 --> 00:31:38,720
feel appropriate and have a good

879
00:31:42,950 --> 00:31:40,880
discussion

880
00:31:45,590 --> 00:31:42,960
well pretty much everybody has said the

881
00:31:46,470 --> 00:31:45,600
international partnership is probably

882
00:31:56,230 --> 00:31:46,480
the

883
00:31:57,669 --> 00:31:56,240
to be able to understand everyone each

884
00:32:00,389 --> 00:31:57,679
other well enough to be able to put

885
00:32:01,669 --> 00:32:00,399
together pieces of hardware that we

886
00:32:02,870 --> 00:32:01,679
didn't actually put together on the

887
00:32:04,950 --> 00:32:02,880
ground

888
00:32:07,110 --> 00:32:04,960

putting it together up on normal was

889
00:32:09,029 --> 00:32:07,120
pretty special

890
00:32:10,149 --> 00:32:09,039
i think the interesting part about space

891
00:32:12,310 --> 00:32:10,159
station is

892
00:32:13,909 --> 00:32:12,320
the most impressive accomplishment is

893
00:32:15,590 --> 00:32:13,919
probably the next one whatever it is

894
00:32:17,269 --> 00:32:15,600
it's always the next one

895
00:32:18,950 --> 00:32:17,279
if you work with mike or anyone around

896
00:32:21,029 --> 00:32:18,960
here very long it's it's what's the next

897
00:32:22,870 --> 00:32:21,039
thing that's going to happen and and and

898
00:32:23,590 --> 00:32:22,880
how can we put that together and achieve

899
00:32:25,830 --> 00:32:23,600
it

900
00:32:27,669 --> 00:32:25,840
but i think like peggy mentioned the the

901
00:32:29,110 --> 00:32:27,679
space station's

902
00:32:30,950 --> 00:32:29,120
i think crowning glory is that it's it's

903
00:32:32,070 --> 00:32:30,960
made the world a smaller place

904
00:32:35,590 --> 00:32:32,080
both

905
00:32:36,870 --> 00:32:35,600
from a perspective of uh international

906
00:32:38,950 --> 00:32:36,880
cooperation

907
00:32:40,230 --> 00:32:38,960
and technology and and really to give

908
00:32:42,389 --> 00:32:40,240
people something to think about as we

909
00:32:44,470 --> 00:32:42,399
push the frontier out i think those are

910
00:32:46,149 --> 00:32:44,480
significant milestones

911
00:32:47,830 --> 00:32:46,159
i want to cast my vote for the

912
00:32:49,430 --> 00:32:47,840
international piece of it as well and

913
00:32:51,350 --> 00:32:49,440

and with a little bit of a story you

914
00:32:53,269 --> 00:32:51,360
know as i mentioned before i grew up in

915
00:32:55,190 --> 00:32:53,279
the military and as i

916
00:32:57,190 --> 00:32:55,200
uh was starting my training as a junior

917
00:32:58,789 --> 00:32:57,200
officer the russians were the bad guys

918
00:33:00,789 --> 00:32:58,799
and there's no doubt about that and i

919
00:33:03,430 --> 00:33:00,799
learned a lot about the way they fight

920
00:33:04,789 --> 00:33:03,440
wars and the way they man their aircraft

921
00:33:08,070 --> 00:33:04,799
and their ships

922
00:33:10,710 --> 00:33:08,080
and i never dreamed that you know some

923
00:33:13,110 --> 00:33:10,720
20 years later i actually wore my u.s

924
00:33:15,990 --> 00:33:13,120
navy uniform in red square and laid

925
00:33:18,470 --> 00:33:16,000
flowers at yuri gagarin's grave there at

926
00:33:20,149 --> 00:33:18,480
the kremlin so i think that speaks

927
00:33:21,669 --> 00:33:20,159
volumes

928
00:33:23,509 --> 00:33:21,679
if we can

929
00:33:25,350 --> 00:33:23,519
continue what mike said to be sort of

930
00:33:28,230 --> 00:33:25,360
the united nations in zero g i think

931
00:33:29,990 --> 00:33:28,240
that's a wonderful achievement

932
00:33:32,470 --> 00:33:30,000
wow you know

933
00:33:34,710 --> 00:33:32,480
do we the partnership is clearly the

934
00:33:37,190 --> 00:33:34,720
answer that question for me but but i i

935
00:33:39,669 --> 00:33:37,200
will touch a little bit on what peggy

936
00:33:41,669 --> 00:33:39,679
briefly talked about in order to build

937
00:33:43,669 --> 00:33:41,679
the spacecraft the size of iss it had to

938
00:33:45,190 --> 00:33:43,679

be assembled low earth orbit

939
00:33:47,750 --> 00:33:45,200
but when you take a few moments to

940
00:33:49,909 --> 00:33:47,760
realize that those elements were built

941
00:33:53,029 --> 00:33:49,919
many of them here

942
00:33:55,509 --> 00:33:53,039
many of them in other countries and

943
00:33:57,750 --> 00:33:55,519
not one not even the ones here saw each

944
00:34:00,149 --> 00:33:57,760
other before they got to orbit

945
00:34:02,870 --> 00:34:00,159
and you reflect on the

946
00:34:04,710 --> 00:34:02,880
very small problems that that we

947
00:34:07,110 --> 00:34:04,720
occasionally dealt with during assembly

948
00:34:08,950 --> 00:34:07,120
of iss that is

949
00:34:10,149 --> 00:34:08,960
that is awe-inspiring that's just a

950
00:34:12,869 --> 00:34:10,159
that's just a

951
00:34:15,190 --> 00:34:12,879
monumental feat and it speaks volumes of

952
00:34:17,349 --> 00:34:15,200
what the engineers were able to do and

953
00:34:20,550 --> 00:34:17,359
and in a previous

954
00:34:22,710 --> 00:34:20,560
um the ksc did a similar thing on tv the

955
00:34:23,349 --> 00:34:22,720
the previous hour and david bethay said

956
00:34:25,270 --> 00:34:23,359
it

957
00:34:27,510 --> 00:34:25,280
very well there's nothing like getting

958
00:34:29,190 --> 00:34:27,520
an engineering drawing and you can get a

959
00:34:31,030 --> 00:34:29,200
good engineering drawing from any

960
00:34:32,950 --> 00:34:31,040
engineer in the world

961
00:34:35,829 --> 00:34:32,960
and another engineer can pick up that

962
00:34:37,669 --> 00:34:35,839
drawing and and work with it and uh and

963
00:34:40,950 --> 00:34:37,679

i'm convinced that's true based on the

964
00:34:42,389 --> 00:34:40,960
success we had with space station

965
00:34:43,829 --> 00:34:42,399
you know i think it's interesting that

966
00:34:45,750 --> 00:34:43,839
um

967
00:34:48,230 --> 00:34:45,760
you know one of the things that i saw in

968
00:34:49,990 --> 00:34:48,240
freedom was the constant you know

969
00:34:52,710 --> 00:34:50,000
keeping the budget going every year and

970
00:34:54,389 --> 00:34:52,720
so it's amazing that this project

971
00:34:56,790 --> 00:34:54,399
you know has plowed through all these

972
00:34:59,109 --> 00:34:56,800
years and we've been through several

973
00:35:01,030 --> 00:34:59,119
administrations not only internally here

974
00:35:03,190 --> 00:35:01,040
in the u.s but several administrations

975
00:35:06,550 --> 00:35:03,200
in other countries as well so it really

976
00:35:08,390 --> 00:35:06,560
bodes for how we as a as a you know a

977
00:35:10,470 --> 00:35:08,400
unity of nations pulled together to make

978
00:35:12,150 --> 00:35:10,480
this thing happen so once again the

979
00:35:14,310 --> 00:35:12,160
international partner aspect of this

980
00:35:15,990 --> 00:35:14,320
thing is incredible

981
00:35:17,510 --> 00:35:16,000
i guess we all have to answer we lose

982
00:35:19,670 --> 00:35:17,520
points at the end when they total up the

983
00:35:21,670 --> 00:35:19,680
score so

984
00:35:24,230 --> 00:35:21,680
the one thing i would add to all this is

985
00:35:26,710 --> 00:35:24,240
what the space station does

986
00:35:29,829 --> 00:35:26,720
for the world as

987
00:35:31,829 --> 00:35:29,839
kids all around the world and and adults

988
00:35:33,910 --> 00:35:31,839

look up into the sky and see that thing

989
00:35:36,710 --> 00:35:33,920
pass overhead i think that the other

990
00:35:38,550 --> 00:35:36,720
thing it does beside all the wonderful

991
00:35:40,470 --> 00:35:38,560
ideas of the international cooperation

992
00:35:43,349 --> 00:35:40,480
is it gives people something to look up

993
00:35:46,710 --> 00:35:43,359
to and something to dream about which

994
00:35:48,230 --> 00:35:46,720
you know we don't know what the next

995
00:35:49,829 --> 00:35:48,240
spectacular

996
00:35:52,870 --> 00:35:49,839
activity is going to be

997
00:35:53,670 --> 00:35:52,880
but maybe they do

998
00:35:55,670 --> 00:35:53,680
okay

999
00:35:57,670 --> 00:35:55,680
thanks

1000
00:35:59,990 --> 00:35:57,680
the next question i'm going to change up

1001
00:36:01,510 --> 00:36:00,000
just a little bit because we've

1002
00:36:04,150 --> 00:36:01,520
we've had a really good discussion on

1003
00:36:05,670 --> 00:36:04,160
the international cooperation aspect so

1004
00:36:08,069 --> 00:36:05,680
i'm going to ask you what was the most

1005
00:36:15,349 --> 00:36:08,079
important large-scale technical

1006
00:36:19,349 --> 00:36:17,510
i think if you uh ask any flight

1007
00:36:21,190 --> 00:36:19,359
director or uh flight controller or

1008
00:36:22,310 --> 00:36:21,200
engineer associated with uh with space

1009
00:36:23,750 --> 00:36:22,320
station that i'll give you a different

1010
00:36:25,190 --> 00:36:23,760
answer probably because they were all

1011
00:36:26,950 --> 00:36:25,200
involved in

1012
00:36:29,349 --> 00:36:26,960
very very important aspects that each

1013
00:36:31,109 --> 00:36:29,359

one had to be successful with

1014
00:36:33,109 --> 00:36:31,119
you know we've installed huge

1015
00:36:35,510 --> 00:36:33,119
pressurized modules and large trust

1016
00:36:38,150 --> 00:36:35,520
components powered to raise huge

1017
00:36:40,710 --> 00:36:38,160
choreography between spacewalks and

1018
00:36:42,630 --> 00:36:40,720
robotics and ground commanding

1019
00:36:44,069 --> 00:36:42,640
every month we send 70 000 commands to

1020
00:36:46,790 --> 00:36:44,079
the space station from the ground so

1021
00:36:48,390 --> 00:36:46,800
it's it's a very intensive uh focused

1022
00:36:49,750 --> 00:36:48,400
effort that everybody has their heart

1023
00:36:51,190 --> 00:36:49,760
and soul poured into i think i think

1024
00:36:53,190 --> 00:36:51,200
you'd get a different answer for each

1025
00:36:55,510 --> 00:36:53,200
each person as to what

1026
00:36:57,349 --> 00:36:55,520
installation or repair or significant

1027
00:36:58,550 --> 00:36:57,359
activity really is

1028
00:37:00,310 --> 00:36:58,560
has

1029
00:37:02,470 --> 00:37:00,320
made the difference for space station

1030
00:37:04,230 --> 00:37:02,480
they all have had to be successful

1031
00:37:06,870 --> 00:37:04,240
i i actually i'd like to chime in and

1032
00:37:08,630 --> 00:37:06,880
say i absolutely agree i think everybody

1033
00:37:10,870 --> 00:37:08,640
has touched a different part of this

1034
00:37:12,470 --> 00:37:10,880
elephant and we see a different piece of

1035
00:37:15,190 --> 00:37:12,480
it and saw the different challenges

1036
00:37:17,589 --> 00:37:15,200
associated with each piece

1037
00:37:19,750 --> 00:37:17,599
you know we i just i think the assembly

1038
00:37:20,950 --> 00:37:19,760

is the big thing and i i touched on that

1039
00:37:23,670 --> 00:37:20,960
earlier but

1040
00:37:25,510 --> 00:37:23,680
it's as as we

1041
00:37:27,510 --> 00:37:25,520
get close to this milestones and others

1042
00:37:30,230 --> 00:37:27,520
it it causes me to reflect that until

1043
00:37:32,310 --> 00:37:30,240
one one short story just and it kind of

1044
00:37:33,910 --> 00:37:32,320
speaks to the team effort to make all

1045
00:37:37,510 --> 00:37:33,920
these flights work

1046
00:37:39,910 --> 00:37:37,520
um we were we were rolling out uh the p6

1047
00:37:41,109 --> 00:37:39,920
truss which was the 4a launch

1048
00:37:43,589 --> 00:37:41,119
and uh

1049
00:37:44,310 --> 00:37:43,599
and our our boeing friends came to us in

1050
00:37:45,990 --> 00:37:44,320
in

1051
00:37:47,430 --> 00:37:46,000
and we were right about to roll out and

1052
00:37:49,630 --> 00:37:47,440
they came to us and said based on

1053
00:37:51,190 --> 00:37:49,640
testing

1054
00:37:52,390 --> 00:37:51,200
dcsu's

1055
00:37:54,230 --> 00:37:52,400
which are

1056
00:37:55,829 --> 00:37:54,240
dc switching

1057
00:37:58,069 --> 00:37:55,839
units of some sort

1058
00:38:00,310 --> 00:37:58,079
very large boxes two of which resided on

1059
00:38:02,310 --> 00:38:00,320
p6 we had a component that was faulty

1060
00:38:04,790 --> 00:38:02,320
and they were concerned that it wouldn't

1061
00:38:05,750 --> 00:38:04,800
it wouldn't survive very long in orbit

1062
00:38:07,990 --> 00:38:05,760
and after

1063
00:38:09,750 --> 00:38:08,000

many hours of talking about that

1064
00:38:11,829 --> 00:38:09,760
we were finally convinced that perhaps

1065
00:38:13,510 --> 00:38:11,839
this test data was true and that in fact

1066
00:38:15,109 --> 00:38:13,520
we were at risk on this

1067
00:38:17,270 --> 00:38:15,119
on this element

1068
00:38:19,670 --> 00:38:17,280
except one of the things that we had

1069
00:38:22,150 --> 00:38:19,680
really tried to pride ourselves was to

1070
00:38:23,670 --> 00:38:22,160
once we started down this path of flying

1071
00:38:25,270 --> 00:38:23,680
these flights we were trying really hard

1072
00:38:27,030 --> 00:38:25,280
to make sure we had the elements ready

1073
00:38:28,390 --> 00:38:27,040
when the shuttle was ready to fly

1074
00:38:29,910 --> 00:38:28,400
fortunately shuttle was nice enough to

1075
00:38:31,270 --> 00:38:29,920
give us a little margin every so often

1076
00:38:33,670 --> 00:38:31,280
we were able to slip underneath of it

1077
00:38:35,510 --> 00:38:33,680
but but in this particular case we were

1078
00:38:37,270 --> 00:38:35,520
literally about to roll out and and so

1079
00:38:39,349 --> 00:38:37,280
we had to figure out as a team what the

1080
00:38:41,829 --> 00:38:39,359
right answer was to solve this problem

1081
00:38:43,030 --> 00:38:41,839
we're going to put it back in the in the

1082
00:38:44,870 --> 00:38:43,040
queues and

1083
00:38:46,470 --> 00:38:44,880
remove these boxes and change about do

1084
00:38:47,829 --> 00:38:46,480
all the testing

1085
00:38:50,230 --> 00:38:47,839
or where we're going to try to fly as is

1086
00:38:52,630 --> 00:38:50,240
or were there other answers and

1087
00:38:54,950 --> 00:38:52,640
the boeing the boeing guys

1088
00:38:56,310 --> 00:38:54,960

led by uh at the time greg martin who

1089
00:38:58,470 --> 00:38:56,320
was who was my counterpart in the

1090
00:39:00,230 --> 00:38:58,480
vehicle office came back with a really

1091
00:39:01,589 --> 00:39:00,240
clever idea and their clever idea was

1092
00:39:04,069 --> 00:39:01,599
they were going to move

1093
00:39:05,829 --> 00:39:04,079
the top from the box what resided in

1094
00:39:08,230 --> 00:39:05,839
place change out these i believe they

1095
00:39:10,230 --> 00:39:08,240
were large capacitors at the time

1096
00:39:12,069 --> 00:39:10,240
replaced the capacitors put the lids

1097
00:39:13,190 --> 00:39:12,079
back on the box there were some testing

1098
00:39:15,030 --> 00:39:13,200
we could do

1099
00:39:16,390 --> 00:39:15,040
right there in place and we did that on

1100
00:39:20,150 --> 00:39:16,400
that vehicle

1101
00:39:22,550 --> 00:39:20,160
pad in time for the shuttle launch and

1102
00:39:25,109 --> 00:39:22,560
and uh you know that was one of many

1103
00:39:27,990 --> 00:39:25,119
stories that that we could tell but it

1104
00:39:30,710 --> 00:39:28,000
it it speaks volumes to the the amount

1105
00:39:32,310 --> 00:39:30,720
of work that the team did and and and

1106
00:39:33,750 --> 00:39:32,320
the kind of effort that took place

1107
00:39:35,829 --> 00:39:33,760
regardless of the

1108
00:39:37,430 --> 00:39:35,839
of time of year and time of day that

1109
00:39:38,710 --> 00:39:37,440
everybody was willing to step in there

1110
00:39:40,950 --> 00:39:38,720
and they

1111
00:39:43,190 --> 00:39:40,960
always work to creative solutions and

1112
00:39:45,270 --> 00:39:43,200
and and as a team effort

1113
00:39:47,829 --> 00:39:45,280

uh solved many many problems that allow

1114
00:39:49,430 --> 00:39:47,839
us to to be where we are again it

1115
00:39:51,829 --> 00:39:49,440
the assembly looked easy but there's a

1116
00:39:56,470 --> 00:39:51,839
lot of work by a lot of folks to to give

1117
00:40:00,390 --> 00:39:59,030
okay i think as a system engineer the

1118
00:40:02,069 --> 00:40:00,400
most important thing we did of course

1119
00:40:04,390 --> 00:40:02,079
was system engineering

1120
00:40:06,069 --> 00:40:04,400
so it was it was a real challenge we did

1121
00:40:07,510 --> 00:40:06,079
some cutting edge system engineering on

1122
00:40:08,630 --> 00:40:07,520
this program

1123
00:40:09,829 --> 00:40:08,640
um

1124
00:40:11,829 --> 00:40:09,839
you know everybody we talk about the

1125
00:40:13,990 --> 00:40:11,839
space station i talked about as the node

1126
00:40:16,150 --> 00:40:14,000
one manager we put the the node with

1127
00:40:18,150 --> 00:40:16,160
zeria and we formed the initial space

1128
00:40:19,589 --> 00:40:18,160
station the core but you know really

1129
00:40:21,109 --> 00:40:19,599
what we've done from a system

1130
00:40:22,630 --> 00:40:21,119
engineering standpoint is we've built

1131
00:40:24,230 --> 00:40:22,640
not one but

1132
00:40:26,230 --> 00:40:24,240
literally hundreds of stations and we've

1133
00:40:28,230 --> 00:40:26,240
done it incrementally on orbit so our

1134
00:40:29,670 --> 00:40:28,240
factories up there on orbit

1135
00:40:31,349 --> 00:40:29,680
and like mike said these things have

1136
00:40:32,790 --> 00:40:31,359
come apart from you know different parts

1137
00:40:33,990 --> 00:40:32,800
of the world they never saw each other

1138
00:40:36,150 --> 00:40:34,000

on the ground

1139
00:40:37,990 --> 00:40:36,160
anyway the system engineering part of

1140
00:40:39,670 --> 00:40:38,000
pulling that together and specifying

1141
00:40:41,589 --> 00:40:39,680
that design to make it work when he

1142
00:40:42,870 --> 00:40:41,599
actually built the hardware was was a

1143
00:40:44,710 --> 00:40:42,880
challenge that we overcame that we

1144
00:40:46,470 --> 00:40:44,720
absolutely had to come overcome to be

1145
00:40:47,589 --> 00:40:46,480
successful so

1146
00:40:49,030 --> 00:40:47,599
different perspectives people don't

1147
00:40:50,790 --> 00:40:49,040
appreciate that

1148
00:40:52,470 --> 00:40:50,800
in the outside world

1149
00:40:54,950 --> 00:40:52,480
i have never found anyone who really

1150
00:40:56,870 --> 00:40:54,960
appreciates that every single flight

1151
00:40:58,870 --> 00:40:56,880
every single step in the assembly that

1152
00:41:00,550 --> 00:40:58,880
vehicle had to survive for a very long

1153
00:41:02,630 --> 00:41:00,560
time so we had to assess every

1154
00:41:04,390 --> 00:41:02,640
configuration and ensure that

1155
00:41:06,069 --> 00:41:04,400
configuration could

1156
00:41:07,430 --> 00:41:06,079
could live on orbit for an extended

1157
00:41:09,589 --> 00:41:07,440
period of time because we could never be

1158
00:41:11,430 --> 00:41:09,599
sure when the next flight flew and in

1159
00:41:13,589 --> 00:41:11,440
fact as a result of the columbia accent

1160
00:41:16,230 --> 00:41:13,599
that paid huge dividends because we

1161
00:41:18,150 --> 00:41:16,240
stayed in that particular configuration

1162
00:41:21,270 --> 00:41:18,160
that i think l.a left it in

1163
00:41:25,030 --> 00:41:21,280

in his flight and um

1164
00:41:26,550 --> 00:41:25,040
it uh it it spoke to the the amount of

1165
00:41:28,390 --> 00:41:26,560
systems engineering work that had to be

1166
00:41:30,069 --> 00:41:28,400
done because that was some of the most

1167
00:41:32,309 --> 00:41:30,079
trying things we had to do i remember at

1168
00:41:34,470 --> 00:41:32,319
least as a vehicle guy is each of those

1169
00:41:36,309 --> 00:41:34,480
stages and and thinking about the long

1170
00:41:37,589 --> 00:41:36,319
term and what you want to say is gosh

1171
00:41:39,510 --> 00:41:37,599
the next vehicle is going to be there in

1172
00:41:41,589 --> 00:41:39,520
a couple months it'll be okay but you

1173
00:41:42,550 --> 00:41:41,599
know that couldn't be the tact you took

1174
00:41:44,950 --> 00:41:42,560
you had to

1175
00:41:47,109 --> 00:41:44,960
say long term this configuration could

1176
00:41:49,030 --> 00:41:47,119
survive and that was a that was one of

1177
00:41:51,829 --> 00:41:49,040
the most challenging aspects of building

1178
00:41:53,349 --> 00:41:51,839
building a vehicle this size so i i

1179
00:41:55,030 --> 00:41:53,359
agree with you yeah we really did we

1180
00:41:55,750 --> 00:41:55,040
specified it end-to-end and then you had

1181
00:41:58,950 --> 00:41:55,760
to

1182
00:42:00,630 --> 00:41:58,960
and make sure each of those had their

1183
00:42:02,550 --> 00:42:00,640
own mission and represented an

1184
00:42:04,069 --> 00:42:02,560
independent space station

1185
00:42:05,270 --> 00:42:04,079
well and you haven't finished it yet

1186
00:42:06,550 --> 00:42:05,280
it's still not going through changes

1187
00:42:07,990 --> 00:42:06,560
you're going to send up another module

1188
00:42:09,349 --> 00:42:08,000

that wasn't originally planned on the

1189
00:42:11,589 --> 00:42:09,359
next shuttle machine

1190
00:42:13,589 --> 00:42:11,599
the crew every time we flew an mplm the

1191
00:42:15,589 --> 00:42:13,599
crew would say and we'd really like to

1192
00:42:17,349 --> 00:42:15,599
keep it on orbit

1193
00:42:18,710 --> 00:42:17,359
and we'd say we really can't afford to

1194
00:42:20,710 --> 00:42:18,720
keep it on orbit

1195
00:42:21,829 --> 00:42:20,720
but now we're doing that so

1196
00:42:22,710 --> 00:42:21,839
thanks

1197
00:42:24,550 --> 00:42:22,720
yeah

1198
00:42:27,829 --> 00:42:24,560
it's a present let's move on to the next

1199
00:42:30,390 --> 00:42:27,839
one which which is uh what uh

1200
00:42:33,270 --> 00:42:30,400
you know little things build into us

1201
00:42:35,750 --> 00:42:33,280
into bigger things and and vice versa

1202
00:42:37,670 --> 00:42:35,760
what's the most important small scale

1203
00:42:43,030 --> 00:42:37,680
challenge of the first decade that we've

1204
00:42:46,710 --> 00:42:45,190
i don't know how you define what's big

1205
00:42:48,630 --> 00:42:46,720
scale what small scale because like you

1206
00:42:49,750 --> 00:42:48,640
said the small things end up bad enough

1207
00:42:51,109 --> 00:42:49,760
but um

1208
00:42:53,030 --> 00:42:51,119
something i think

1209
00:42:55,030 --> 00:42:53,040
gets overlooked and every time we do it

1210
00:42:56,470 --> 00:42:55,040
kind of turns on and bites us is the the

1211
00:42:58,230 --> 00:42:56,480
environment up there so we've kind of

1212
00:42:59,829 --> 00:42:58,240
belittled the physics and said politics

1213
00:43:01,109 --> 00:42:59,839

is important but let's not forget the

1214
00:43:03,030 --> 00:43:01,119
physics i mean

1215
00:43:05,190 --> 00:43:03,040
it's it can get really cold and really

1216
00:43:06,790 --> 00:43:05,200
hot out there and all these

1217
00:43:08,309 --> 00:43:06,800
connections whether they be fluid

1218
00:43:14,870 --> 00:43:08,319
connections or

1219
00:43:17,589 --> 00:43:14,880
surfaces have to take into account

1220
00:43:19,430 --> 00:43:17,599
the the variation from day to night you

1221
00:43:20,950 --> 00:43:19,440
know we recently relatively recently

1222
00:43:23,030 --> 00:43:20,960
discovered this problem with launch run

1223
00:43:25,349 --> 00:43:23,040
shadowing which is really takes a lot of

1224
00:43:27,030 --> 00:43:25,359
management on john's team's

1225
00:43:28,390 --> 00:43:27,040
part to to

1226
00:43:30,550 --> 00:43:28,400
think about what are we going to do when

1227
00:43:32,230 --> 00:43:30,560
we're maneuvering we have a vehicle

1228
00:43:35,190 --> 00:43:32,240
arriving or departing how does that

1229
00:43:37,030 --> 00:43:35,200
affect the whole go no-go process so

1230
00:43:39,430 --> 00:43:37,040
a lot of the things that are due to the

1231
00:43:43,589 --> 00:43:39,440
fact that oh by the way we're in space

1232
00:43:46,790 --> 00:43:44,950
i think managing the living and

1233
00:43:48,710 --> 00:43:46,800
breathing aspects of the day-to-day

1234
00:43:50,150 --> 00:43:48,720
operations with a changing vehicle has

1235
00:43:50,870 --> 00:43:50,160
been touched on significantly but i

1236
00:43:52,230 --> 00:43:50,880
think

1237
00:43:53,990 --> 00:43:52,240
you know the software updates they have

1238
00:43:56,069 --> 00:43:54,000

to be done on the ground in the control

1239
00:43:57,910 --> 00:43:56,079
center and on the vehicle to keep

1240
00:43:59,270 --> 00:43:57,920
everything in sync as you change the

1241
00:44:01,510 --> 00:43:59,280
configuration

1242
00:44:04,069 --> 00:44:01,520
the ability to to live in the house that

1243
00:44:06,230 --> 00:44:04,079
you're changing as you change it is

1244
00:44:08,309 --> 00:44:06,240
these things are

1245
00:44:10,230 --> 00:44:08,319
very complicated and have to be right

1246
00:44:12,390 --> 00:44:10,240
every time and so

1247
00:44:15,589 --> 00:44:12,400
those little challenges are things that

1248
00:44:18,470 --> 00:44:15,599
that add up over time to success

1249
00:44:20,630 --> 00:44:18,480
when i was on station with oleg kotov

1250
00:44:22,309 --> 00:44:20,640
and fyodor yurchikhin

1251
00:44:24,150 --> 00:44:22,319
partway through our mission i remember

1252
00:44:25,430 --> 00:44:24,160
being in the lab one day and just

1253
00:44:27,109 --> 00:44:25,440
working at the computer or whatever it

1254
00:44:28,550 --> 00:44:27,119
was i was doing and ollie floats down

1255
00:44:33,829 --> 00:44:28,560
and he looks at me

1256
00:44:37,270 --> 00:44:35,589
and i looked at him and that means the

1257
00:44:38,470 --> 00:44:37,280
toilet's broken

1258
00:44:40,309 --> 00:44:38,480
and uh

1259
00:44:43,030 --> 00:44:40,319
right after that he said uh that we

1260
00:44:44,950 --> 00:44:43,040
can't eat anymore

1261
00:44:46,630 --> 00:44:44,960
and you know when a guy when you only

1262
00:44:47,990 --> 00:44:46,640
have one toilet and it's in the russian

1263
00:44:49,510 --> 00:44:48,000

segment and the russian guy comes and

1264
00:44:51,750 --> 00:44:49,520
tells you it's broken and you can't eat

1265
00:44:53,270 --> 00:44:51,760
anymore it kind of as you live in your

1266
00:44:55,589 --> 00:44:53,280
day-to-day house it kind of makes you a

1267
00:44:57,990 --> 00:44:55,599
little nervous so uh

1268
00:45:00,230 --> 00:44:58,000
it built up a little bit in that uh it

1269
00:45:01,990 --> 00:45:00,240
kept breaking for several days and we

1270
00:45:03,670 --> 00:45:02,000
were one of the first crews i think that

1271
00:45:05,430 --> 00:45:03,680
had to deal with multiple toilet

1272
00:45:08,230 --> 00:45:05,440
problems over time

1273
00:45:10,309 --> 00:45:08,240
but that fortunately led to

1274
00:45:12,150 --> 00:45:10,319
getting the toilet fixed we now have two

1275
00:45:14,630 --> 00:45:12,160
toilets on board everything works better

1276
00:45:17,349 --> 00:45:14,640
we're actually doing some amazing things

1277
00:45:18,870 --> 00:45:17,359
in terms of regenerating

1278
00:45:20,390 --> 00:45:18,880
waste fluids and things to allow the

1279
00:45:23,589 --> 00:45:20,400
crew to have more water so all that

1280
00:45:25,510 --> 00:45:23,599
stuff you know as you build up over time

1281
00:45:28,470 --> 00:45:25,520
little things in the life

1282
00:45:30,069 --> 00:45:28,480
inside the tin can up there

1283
00:45:32,550 --> 00:45:30,079
can lead to some great things in the end

1284
00:45:33,430 --> 00:45:32,560
so

1285
00:45:34,390 --> 00:45:33,440
okay

1286
00:45:36,309 --> 00:45:34,400
well it's

1287
00:45:38,150 --> 00:45:36,319
the next question a little bit more

1288
00:45:40,390 --> 00:45:38,160

expansive and and that's what's your

1289
00:45:43,030 --> 00:45:40,400
biggest hope for the next decade of the

1290
00:45:47,349 --> 00:45:45,030
mine of course is and i'd say every

1291
00:45:49,829 --> 00:45:47,359
chance i get is that

1292
00:45:51,990 --> 00:45:49,839
that we that we fully utilize this

1293
00:45:53,990 --> 00:45:52,000
vehicle that we've that we've built and

1294
00:45:57,750 --> 00:45:54,000
that and we're not quite there yet today

1295
00:46:00,150 --> 00:45:57,760
we keep the crew very busy and uh and

1296
00:46:01,510 --> 00:46:00,160
but but if you look at the projections

1297
00:46:04,390 --> 00:46:01,520
for the research

1298
00:46:07,510 --> 00:46:04,400
on board iss here in the near future it

1299
00:46:09,670 --> 00:46:07,520
looks like we're going to have

1300
00:46:11,190 --> 00:46:09,680
some available capacity and then if you

1301
00:46:13,910 --> 00:46:11,200
look at the curve it looks like it picks

1302
00:46:16,069 --> 00:46:13,920
back up but i'd like to to see us fully

1303
00:46:16,950 --> 00:46:16,079
utilize this this vehicle and get the

1304
00:46:19,990 --> 00:46:16,960
most

1305
00:46:21,670 --> 00:46:20,000
uh out of her as well as uh make sure it

1306
00:46:23,750 --> 00:46:21,680
is the

1307
00:46:25,190 --> 00:46:23,760
fully utilized to to get all the

1308
00:46:28,309 --> 00:46:25,200
information

1309
00:46:30,390 --> 00:46:28,319
and test data and that we need to to do

1310
00:46:32,309 --> 00:46:30,400
exploration because

1311
00:46:34,390 --> 00:46:32,319
we're going to try really hard to get

1312
00:46:36,069 --> 00:46:34,400
somewhere in the in the neighborhood of

1313
00:46:37,670 --> 00:46:36,079

30 years out of

1314
00:46:39,589 --> 00:46:37,680
out of this wonderful vehicle that we

1315
00:46:40,870 --> 00:46:39,599
have and in that time we've got to

1316
00:46:44,069 --> 00:46:40,880
figure out

1317
00:46:46,069 --> 00:46:44,079
uh how to cross all the challenges of

1318
00:46:48,550 --> 00:46:46,079
long duration space flight and and this

1319
00:46:50,470 --> 00:46:48,560
is the way for us to do this

1320
00:46:52,790 --> 00:46:50,480
the transit to mars has many many

1321
00:46:54,470 --> 00:46:52,800
challenges the long-term transit period

1322
00:46:57,349 --> 00:46:54,480
has many challenges

1323
00:46:58,870 --> 00:46:57,359
many of which we can test and uh

1324
00:47:01,190 --> 00:46:58,880
and mitigate

1325
00:47:02,550 --> 00:47:01,200
uh onboard iss and prove to ourselves we

1326
00:47:04,630 --> 00:47:02,560
know how to do that

1327
00:47:06,230 --> 00:47:04,640
um and i think regenerative eclipse is

1328
00:47:08,870 --> 00:47:06,240
one of those systems today we're

1329
00:47:10,870 --> 00:47:08,880
learning a lot about onboard iss

1330
00:47:13,510 --> 00:47:10,880
and uh uh

1331
00:47:16,230 --> 00:47:13,520
crew just just crew health has been a

1332
00:47:18,630 --> 00:47:16,240
been a major step we we've got uh

1333
00:47:20,309 --> 00:47:18,640
the a red on board iss it seems to be

1334
00:47:21,589 --> 00:47:20,319
working very well our crews are coming

1335
00:47:23,510 --> 00:47:21,599
home in really

1336
00:47:25,589 --> 00:47:23,520
wonderful shape but we can't fly an

1337
00:47:27,750 --> 00:47:25,599
a-red on some sort of transfer vehicle

1338
00:47:29,589 --> 00:47:27,760

that thing's probably as heavy as almost

1339
00:47:30,870 --> 00:47:29,599
all the other systems combined that they

1340
00:47:32,950 --> 00:47:30,880
plan to carry

1341
00:47:35,030 --> 00:47:32,960
so so we have to figure out ways to make

1342
00:47:37,349 --> 00:47:35,040
the system smaller and still

1343
00:47:39,829 --> 00:47:37,359
still be able to do the same mitigations

1344
00:47:42,069 --> 00:47:39,839
that they do for us on iss today so we

1345
00:47:44,150 --> 00:47:42,079
have a lot to do between now and

1346
00:47:46,150 --> 00:47:44,160
exploration and i think

1347
00:47:48,470 --> 00:47:46,160
you know my my hope is that we fully

1348
00:47:50,309 --> 00:47:48,480
utilize iss to give us the experience

1349
00:47:52,950 --> 00:47:50,319
and the information we need to to be

1350
00:47:54,470 --> 00:47:52,960
successful when we leave low earth orbit

1351
00:47:55,990 --> 00:47:54,480
i'm going to jump in real quick a red

1352
00:47:58,309 --> 00:47:56,000
for those who are uninitiated is the

1353
00:47:59,910 --> 00:47:58,319
advanced resistive exercise device

1354
00:48:01,829 --> 00:47:59,920
basically lets you work out like you're

1355
00:48:03,990 --> 00:48:01,839
working out on weights in the absence of

1356
00:48:06,390 --> 00:48:04,000
gravity yeah i see all these folks

1357
00:48:08,069 --> 00:48:06,400
these guys all know but the folks that i

1358
00:48:10,790 --> 00:48:08,079
got

1359
00:48:12,870 --> 00:48:10,800
on a more philosophical basis um

1360
00:48:14,870 --> 00:48:12,880
i'd really like to see

1361
00:48:17,030 --> 00:48:14,880
the station represent an inspiration to

1362
00:48:19,109 --> 00:48:17,040
the you know the next generation

1363
00:48:21,510 --> 00:48:19,119

just as apollo did for my generation and

1364
00:48:23,750 --> 00:48:21,520
it's peggy reflected as well right

1365
00:48:25,589 --> 00:48:23,760
so i hope it's it encourages the next

1366
00:48:27,510 --> 00:48:25,599
generation of scientists and engineers

1367
00:48:29,430 --> 00:48:27,520
and gets them interested in space and

1368
00:48:31,510 --> 00:48:29,440
helps us carry on the

1369
00:48:32,549 --> 00:48:31,520
you know tradition of space exploration

1370
00:48:34,309 --> 00:48:32,559
so

1371
00:48:36,309 --> 00:48:34,319
and following up on that i think we have

1372
00:48:38,470 --> 00:48:36,319
a couple of challenges uh facing us

1373
00:48:40,470 --> 00:48:38,480
first of all as the shuttle is retired

1374
00:48:43,030 --> 00:48:40,480
you know it's a it's really a

1375
00:48:45,510 --> 00:48:43,040
magnificent one-of-a-kind

1376
00:48:46,390 --> 00:48:45,520
unbelievably sophisticated uh flying

1377
00:48:48,390 --> 00:48:46,400
machine

1378
00:48:51,750 --> 00:48:48,400
and you know when you see a picture of

1379
00:48:54,390 --> 00:48:51,760
it or a a silhouette of it it sort of

1380
00:48:57,990 --> 00:48:54,400
says something it's very symbolic

1381
00:48:58,870 --> 00:48:58,000
and as it um is retired i i hope that we

1382
00:49:01,670 --> 00:48:58,880
can

1383
00:49:03,109 --> 00:49:01,680
continue to be able to inspire as was

1384
00:49:04,870 --> 00:49:03,119
said

1385
00:49:07,030 --> 00:49:04,880
because i think that the day-to-day

1386
00:49:09,510 --> 00:49:07,040
operations on the space station to the

1387
00:49:11,190 --> 00:49:09,520
uninitiated don't seem as exciting as a

1388
00:49:12,549 --> 00:49:11,200

shuttle launch or landing or some of the

1389
00:49:13,750 --> 00:49:12,559
operations that

1390
00:49:15,270 --> 00:49:13,760
are so

1391
00:49:16,549 --> 00:49:15,280
high visibility that go on during a

1392
00:49:19,589 --> 00:49:16,559
shuttle mission

1393
00:49:21,990 --> 00:49:19,599
the second thing that faces us is you

1394
00:49:25,910 --> 00:49:22,000
know we live in a society where

1395
00:49:30,950 --> 00:49:28,630
satisfactory times for

1396
00:49:32,309 --> 00:49:30,960
return on investment so it used to be

1397
00:49:34,470 --> 00:49:32,319
you you'd write a letter to your

1398
00:49:36,230 --> 00:49:34,480
relative overseas and it would take a

1399
00:49:37,589 --> 00:49:36,240
month for you to get an answer

1400
00:49:38,790 --> 00:49:37,599
now you send an email and if you don't

1401
00:49:41,430 --> 00:49:38,800
get something that same day you're

1402
00:49:43,109 --> 00:49:41,440
impatient you know what what's going on

1403
00:49:45,109 --> 00:49:43,119
and i think that since this is a

1404
00:49:47,430 --> 00:49:45,119
politically

1405
00:49:49,349 --> 00:49:47,440
publicly funded

1406
00:49:50,790 --> 00:49:49,359
project that works with a political

1407
00:49:53,349 --> 00:49:50,800
process

1408
00:49:55,990 --> 00:49:53,359
we have an obligation to

1409
00:49:58,630 --> 00:49:56,000
convince the the shareholders which are

1410
00:50:00,790 --> 00:49:58,640
the citizens of this and other countries

1411
00:50:01,990 --> 00:50:00,800
that human space flight is important and

1412
00:50:03,750 --> 00:50:02,000
the way to do that is through

1413
00:50:05,270 --> 00:50:03,760

inspiration so

1414
00:50:07,670 --> 00:50:05,280
again with the shuttle retiring with

1415
00:50:09,270 --> 00:50:07,680
this need for sort of immediate feedback

1416
00:50:10,790 --> 00:50:09,280
what i sort of hope for in this in the

1417
00:50:12,710 --> 00:50:10,800
next decade is

1418
00:50:13,510 --> 00:50:12,720
with all the science that we're doing up

1419
00:50:15,030 --> 00:50:13,520
there

1420
00:50:17,349 --> 00:50:15,040
it would be really nice to have one of

1421
00:50:18,230 --> 00:50:17,359
those ah-ha moments

1422
00:50:19,829 --> 00:50:18,240
we

1423
00:50:22,230 --> 00:50:19,839
are frequently asked you know what is

1424
00:50:25,510 --> 00:50:22,240
the greatest scientific contribution

1425
00:50:26,790 --> 00:50:25,520
that you have learned on space station

1426
00:50:29,670 --> 00:50:26,800
and frankly

1427
00:50:31,270 --> 00:50:29,680
i think that answer to date can leave

1428
00:50:32,710 --> 00:50:31,280
some people flat because it sort of

1429
00:50:35,589 --> 00:50:32,720
doesn't affect them you know what's in

1430
00:50:36,470 --> 00:50:35,599
it for me is is a very uh often asked

1431
00:50:38,829 --> 00:50:36,480
question

1432
00:50:41,349 --> 00:50:38,839
if we can come up with something a

1433
00:50:43,190 --> 00:50:41,359
discovery uh either looking outside or

1434
00:50:44,950 --> 00:50:43,200
looking inside the human bodies or some

1435
00:50:47,510 --> 00:50:44,960
kind of technology

1436
00:50:48,790 --> 00:50:47,520
demonstration that that really gives us

1437
00:50:51,430 --> 00:50:48,800
a leg up

1438
00:50:53,750 --> 00:50:51,440

and we don't have to wait the 20 or 30

1439
00:50:55,510 --> 00:50:53,760
years that it took to reap the benefits

1440
00:50:57,829 --> 00:50:55,520
from the apollo program although they

1441
00:50:59,349 --> 00:50:57,839
were technological maybe less more than

1442
00:51:02,069 --> 00:50:59,359
scientific

1443
00:51:04,870 --> 00:51:02,079
i think that would go a long way toward

1444
00:51:06,630 --> 00:51:04,880
you know securing the political uh the

1445
00:51:08,549 --> 00:51:06,640
public interest through the political

1446
00:51:10,549 --> 00:51:08,559
process and also the education you know

1447
00:51:11,990 --> 00:51:10,559
the kids that john mentioned of being

1448
00:51:16,069 --> 00:51:12,000
inspired

1449
00:51:18,470 --> 00:51:16,079
shuttle which i think is a a challenge

1450
00:51:21,190 --> 00:51:18,480
that we're going to have to face

1451
00:51:22,870 --> 00:51:21,200
i think space flight is a

1452
00:51:24,950 --> 00:51:22,880
hostile and unforgiving environment for

1453
00:51:26,950 --> 00:51:24,960
humanity it's really hard to to live and

1454
00:51:28,549 --> 00:51:26,960
work in and this is

1455
00:51:30,390 --> 00:51:28,559
a good test bed

1456
00:51:32,230 --> 00:51:30,400
to evolve systems to be able to keep

1457
00:51:34,390 --> 00:51:32,240
thermal systems going for 10 years and

1458
00:51:36,870 --> 00:51:34,400
to be able to keep in a closed closing

1459
00:51:40,309 --> 00:51:36,880
loop on the environmental systems and be

1460
00:51:42,390 --> 00:51:40,319
able to be as efficient and and learn as

1461
00:51:44,710 --> 00:51:42,400
much as you can as as

1462
00:51:45,589 --> 00:51:44,720
that testbed provides is really is

1463
00:51:47,270 --> 00:51:45,599

really

1464
00:51:48,150 --> 00:51:47,280
an outstanding purpose for the space

1465
00:51:49,349 --> 00:51:48,160
station

1466
00:51:53,430 --> 00:51:49,359
and

1467
00:51:55,910 --> 00:51:53,440
for the next uh next big adventure is is

1468
00:51:57,990 --> 00:51:55,920
going to be uh the key

1469
00:51:59,030 --> 00:51:58,000
i have one more thing to add i think

1470
00:52:00,630 --> 00:51:59,040
that

1471
00:52:03,510 --> 00:52:00,640
um

1472
00:52:05,190 --> 00:52:03,520
the station as a as a symbol and over

1473
00:52:06,710 --> 00:52:05,200
the next 10 years when i when i first

1474
00:52:08,309 --> 00:52:06,720
came here one of the first projects we

1475
00:52:09,670 --> 00:52:08,319
worked on as young engineers was

1476
00:52:11,990 --> 00:52:09,680
something called

1477
00:52:13,589 --> 00:52:12,000
the operational control zones concept

1478
00:52:15,109 --> 00:52:13,599
and the idea back at that time was that

1479
00:52:16,950 --> 00:52:15,119
we'd have a station flying around the

1480
00:52:18,549 --> 00:52:16,960
earth we'd have a lot of other vehicles

1481
00:52:20,710 --> 00:52:18,559
flying around it we'd have to keep them

1482
00:52:21,829 --> 00:52:20,720
in basic zones you know like air traffic

1483
00:52:23,430 --> 00:52:21,839
control

1484
00:52:24,950 --> 00:52:23,440
and with all you've heard lately with

1485
00:52:26,630 --> 00:52:24,960
commercialization and all those sort of

1486
00:52:28,069 --> 00:52:26,640
things i would like to see in the next

1487
00:52:31,030 --> 00:52:28,079
10 years

1488
00:52:33,030 --> 00:52:31,040

other vehicles coming to visit us

1489
00:52:34,230 --> 00:52:33,040
perhaps other vehicles up there because

1490
00:52:36,710 --> 00:52:34,240
i think

1491
00:52:40,309 --> 00:52:36,720
in my mind as

1492
00:52:41,589 --> 00:52:40,319
symbolic as the station is is that can

1493
00:52:43,190 --> 00:52:41,599
be that

1494
00:52:45,349 --> 00:52:43,200
beginning of that hub you know that

1495
00:52:47,430 --> 00:52:45,359
allows other things to happen that are

1496
00:52:49,430 --> 00:52:47,440
not necessarily

1497
00:52:51,510 --> 00:52:49,440
within the government's control but but

1498
00:52:52,870 --> 00:52:51,520
it does it inspires everywhere it

1499
00:52:54,870 --> 00:52:52,880
creates

1500
00:52:57,430 --> 00:52:54,880
excitement throughout the world of

1501
00:52:59,190 --> 00:52:57,440
people who may get the shot to see

1502
00:53:01,030 --> 00:52:59,200
what we got to see when we looked out

1503
00:53:02,150 --> 00:53:01,040
the windows so maybe in the next 10

1504
00:53:04,470 --> 00:53:02,160
years we'll have a little bit more of

1505
00:53:07,829 --> 00:53:06,470
well i want to give folks here in the

1506
00:53:09,829 --> 00:53:07,839
audience an opportunity to come up to

1507
00:53:19,190 --> 00:53:09,839
one of the microphones here and ask

1508
00:53:24,150 --> 00:53:21,990
hi i'm roger weiss i work for saac i've

1509
00:53:26,069 --> 00:53:24,160
been with the iss payloads office here

1510
00:53:27,510 --> 00:53:26,079
since about year 2000 just a little bit

1511
00:53:29,589 --> 00:53:27,520
after

1512
00:53:31,910 --> 00:53:29,599
mike was head of the office and it's

1513
00:53:34,790 --> 00:53:31,920

been nothing short of a

1514
00:53:37,109 --> 00:53:34,800
of a privilege to grow up with iss and

1515
00:53:42,390 --> 00:53:39,910
see it fully assembled and watch

1516
00:53:45,510 --> 00:53:42,400
research

1517
00:53:47,750 --> 00:53:45,520
sustain itself and and diversify

1518
00:53:49,990 --> 00:53:47,760
diversify and

1519
00:53:52,870 --> 00:53:50,000
and even be maximized during some of our

1520
00:53:54,309 --> 00:53:52,880
shuttle downtime so and now getting into

1521
00:53:56,950 --> 00:53:54,319
national lab

1522
00:53:58,950 --> 00:53:56,960
a more related research

1523
00:54:01,030 --> 00:53:58,960
so i really appreciate all your comments

1524
00:54:04,309 --> 00:54:01,040
today it's it's just great to hear these

1525
00:54:06,069 --> 00:54:04,319
recollections some i knew some i didn't

1526
00:54:08,549 --> 00:54:06,079
since we're commemorating and

1527
00:54:11,349 --> 00:54:08,559
acknowledging human habitation

1528
00:54:13,030 --> 00:54:11,359
i've always been curious about

1529
00:54:15,430 --> 00:54:13,040
uh this question of

1530
00:54:17,510 --> 00:54:15,440
the duration of the of the increments or

1531
00:54:19,510 --> 00:54:17,520
expeditions if you will and how you all

1532
00:54:20,950 --> 00:54:19,520
feel if that's been

1533
00:54:22,870 --> 00:54:20,960
um

1534
00:54:25,990 --> 00:54:22,880
even though we've gone 10 years it's

1535
00:54:27,670 --> 00:54:26,000
been obviously broken apart by several

1536
00:54:31,190 --> 00:54:27,680
many many crew members

1537
00:54:33,750 --> 00:54:31,200
but do you feel that's been a an

1538
00:54:35,910 --> 00:54:33,760

appropriate amount of time

1539
00:54:37,750 --> 00:54:35,920
to get the work done to of course

1540
00:54:40,069 --> 00:54:37,760
notwithstanding missing your families

1541
00:54:42,069 --> 00:54:40,079
and hamburgers and pizza and beer and

1542
00:54:43,829 --> 00:54:42,079
the ocean and whatnot but

1543
00:54:45,910 --> 00:54:43,839
is it enough time to have gotten the

1544
00:54:47,990 --> 00:54:45,920
research done to get the right analogs

1545
00:54:50,630 --> 00:54:48,000
and data that you need to be a true

1546
00:54:54,150 --> 00:54:50,640
stepping stone to long duration space

1547
00:54:56,789 --> 00:54:54,160
flight and exploration or maybe longer

1548
00:54:58,870 --> 00:54:56,799
i'm curious as to what the managers and

1549
00:55:01,030 --> 00:54:58,880
and crew have to say about that thank

1550
00:55:04,789 --> 00:55:02,390
i think from

1551
00:55:06,950 --> 00:55:04,799
my perspective you know time is a little

1552
00:55:09,270 --> 00:55:06,960
bit different uh on the station on my

1553
00:55:11,670 --> 00:55:09,280
first flight uh you know first time up

1554
00:55:13,589 --> 00:55:11,680
there really excited to be there

1555
00:55:15,589 --> 00:55:13,599
you know the six months flew by felt

1556
00:55:17,430 --> 00:55:15,599
like about two and a half uh on my

1557
00:55:19,670 --> 00:55:17,440
second flight we were really busy we had

1558
00:55:21,829 --> 00:55:19,680
lots going on it was a phenomenal flight

1559
00:55:22,870 --> 00:55:21,839
really exciting but six months felt like

1560
00:55:24,390 --> 00:55:22,880
six months

1561
00:55:28,789 --> 00:55:24,400
so

1562
00:55:29,750 --> 00:55:28,799
the first time thing will wear off and

1563
00:55:31,829 --> 00:55:29,760

uh

1564
00:55:32,789 --> 00:55:31,839
you know the time in space is a factor i

1565
00:55:34,390 --> 00:55:32,799
think

1566
00:55:36,390 --> 00:55:34,400
on the space station

1567
00:55:37,670 --> 00:55:36,400
the the challenges that we face are

1568
00:55:39,190 --> 00:55:37,680
going to be different

1569
00:55:41,750 --> 00:55:39,200
uh as compared to some of the

1570
00:55:43,190 --> 00:55:41,760
exploration that we'll do in the future

1571
00:55:44,950 --> 00:55:43,200
you know being able to see the earth

1572
00:55:47,349 --> 00:55:44,960
being able to communicate easily with

1573
00:55:50,309 --> 00:55:47,359
your families makes a huge difference

1574
00:55:51,910 --> 00:55:50,319
in being up there i think six months

1575
00:55:53,990 --> 00:55:51,920
isn't too long when you have that kind

1576
00:55:55,670 --> 00:55:54,000
of communication it's going to

1577
00:55:58,789 --> 00:55:55,680
definitely be more of a challenge from a

1578
00:56:01,270 --> 00:55:58,799
psychological perspective to handle a

1579
00:56:02,789 --> 00:56:01,280
mission away from the earth

1580
00:56:04,309 --> 00:56:02,799
it's not something i don't think we can

1581
00:56:06,150 --> 00:56:04,319
overcome it's just something that i

1582
00:56:08,470 --> 00:56:06,160
think

1583
00:56:10,549 --> 00:56:08,480
you know we'll have to anticipate and

1584
00:56:14,630 --> 00:56:10,559
look forward to i think we should assign

1585
00:56:18,069 --> 00:56:16,710
i i would say there's a there's another

1586
00:56:19,270 --> 00:56:18,079
aspect to this

1587
00:56:22,150 --> 00:56:19,280
and that is

1588
00:56:24,630 --> 00:56:22,160

just the time that you have to conduct

1589
00:56:26,150 --> 00:56:24,640
uh all the operations um and we've been

1590
00:56:28,230 --> 00:56:26,160
trying over the last year and a half as

1591
00:56:30,309 --> 00:56:28,240
you know to focus more on the research

1592
00:56:31,030 --> 00:56:30,319
and say research guys get this much time

1593
00:56:32,390 --> 00:56:31,040
and

1594
00:56:35,349 --> 00:56:32,400
everybody else is just going to have to

1595
00:56:37,349 --> 00:56:35,359
now fit inside their box whereas

1596
00:56:39,190 --> 00:56:37,359
not long ago it was you know research

1597
00:56:40,470 --> 00:56:39,200
got what was left but

1598
00:56:43,750 --> 00:56:40,480
what you find when you look at this

1599
00:56:46,230 --> 00:56:43,760
whole crew rotation idea is that every

1600
00:56:48,710 --> 00:56:46,240
rotation costs you time as well every

1601
00:56:50,470 --> 00:56:48,720
extra flight that comes to space station

1602
00:56:52,950 --> 00:56:50,480
takes a significant amount of crew time

1603
00:56:54,390 --> 00:56:52,960
to prep for the the the pre-pack the

1604
00:56:56,309 --> 00:56:54,400
post pack the

1605
00:56:57,990 --> 00:56:56,319
the uh once a crew gets there they have

1606
00:57:00,069 --> 00:56:58,000
to get acclimated so we reduce the

1607
00:57:01,750 --> 00:57:00,079
amount of their workload early on we

1608
00:57:03,190 --> 00:57:01,760
have the safety briefings we have all

1609
00:57:04,710 --> 00:57:03,200
these things that take place and they

1610
00:57:06,470 --> 00:57:04,720
take away from time

1611
00:57:08,789 --> 00:57:06,480
and then in fact peggy's mentioned to

1612
00:57:10,069 --> 00:57:08,799
this this to me before you get to a

1613
00:57:11,910 --> 00:57:10,079

point as a crew member where you get

1614
00:57:13,670 --> 00:57:11,920
really efficient on orbit and it it

1615
00:57:16,549 --> 00:57:13,680
takes a couple of months something like

1616
00:57:18,230 --> 00:57:16,559
that so so you after the first couple

1617
00:57:20,710 --> 00:57:18,240
months you get really efficient so as a

1618
00:57:22,549 --> 00:57:20,720
program manager what i prefer to do is

1619
00:57:24,390 --> 00:57:22,559
not rotate the crews every two or three

1620
00:57:25,990 --> 00:57:24,400
months because they never really get to

1621
00:57:28,470 --> 00:57:26,000
the point where they're really efficient

1622
00:57:30,549 --> 00:57:28,480
space station is very big in spite of

1623
00:57:31,990 --> 00:57:30,559
what we do with would try to find have

1624
00:57:33,510 --> 00:57:32,000
all of our stowage laid out and

1625
00:57:35,430 --> 00:57:33,520
identified where it is we're always

1626
00:57:37,990 --> 00:57:35,440
searching for items and that takes

1627
00:57:39,829 --> 00:57:38,000
much more time than than than you can

1628
00:57:42,470 --> 00:57:39,839
imagine and so

1629
00:57:44,390 --> 00:57:42,480
so there's this balance between

1630
00:57:46,309 --> 00:57:44,400
so long that the crews become

1631
00:57:48,150 --> 00:57:46,319
inefficient because they're missing home

1632
00:57:50,309 --> 00:57:48,160
and all these kinds of things and flying

1633
00:57:52,870 --> 00:57:50,319
them so often that they never reach

1634
00:57:55,589 --> 00:57:52,880
a point where they can

1635
00:57:57,510 --> 00:57:55,599
be more efficient and you're saving this

1636
00:58:00,470 --> 00:57:57,520
this significant time about 100 hours of

1637
00:58:02,789 --> 00:58:00,480
crew time for for a rotation uh to occur

1638
00:58:04,789 --> 00:58:02,799

and so this is the balance you do as as

1639
00:58:07,270 --> 00:58:04,799
a as a program manager through all this

1640
00:58:09,270 --> 00:58:07,280
so today we do six month rotations and

1641
00:58:10,950 --> 00:58:09,280
it seems about right and there's been a

1642
00:58:13,030 --> 00:58:10,960
lot of questions about the future and

1643
00:58:14,470 --> 00:58:13,040
what we're going to do

1644
00:58:16,309 --> 00:58:14,480
but i would tell you today we kind of

1645
00:58:17,670 --> 00:58:16,319
got into six months with because this is

1646
00:58:19,349 --> 00:58:17,680
what our russian

1647
00:58:20,710 --> 00:58:19,359
colleagues have done and and we were

1648
00:58:23,670 --> 00:58:20,720
flying with our russian colleagues on

1649
00:58:25,349 --> 00:58:23,680
the soyuz and uh and my personal opinion

1650
00:58:27,589 --> 00:58:25,359
is it's been a it's been a pretty good

1651
00:58:28,789 --> 00:58:27,599
balance and we'll always be looking at

1652
00:58:31,190 --> 00:58:28,799
it but it seems like a pretty good

1653
00:58:32,789 --> 00:58:31,200
balance you were talking about doing a

1654
00:58:34,309 --> 00:58:32,799
year ago

1655
00:58:37,589 --> 00:58:34,319
well i still i still think for

1656
00:58:41,510 --> 00:58:37,599
exploration eventually it'll take time

1657
00:58:43,270 --> 00:58:41,520
perhaps we should have crews on iss as

1658
00:58:45,270 --> 00:58:43,280
long as a transit might take if we

1659
00:58:47,270 --> 00:58:45,280
believe that makes sense

1660
00:58:48,470 --> 00:58:47,280
in order just to see what it what are we

1661
00:58:49,430 --> 00:58:48,480
going to trip over anything in nine

1662
00:58:51,589 --> 00:58:49,440
months of

1663
00:58:55,270 --> 00:58:51,599

of uh you know hanging out in a tin can

1664
00:58:57,270 --> 00:58:55,280
or or is is it not remarkable past six

1665
00:58:58,950 --> 00:58:57,280
months and i think it'll have us a lot

1666
00:59:01,270 --> 00:58:58,960
to do with and it'll be part of what

1667
00:59:02,950 --> 00:59:01,280
we'll try to test is your ability to

1668
00:59:04,630 --> 00:59:02,960
communicate back home you know the

1669
00:59:06,390 --> 00:59:04,640
closer you get to mars the longer each

1670
00:59:08,789 --> 00:59:06,400
communication takes

1671
00:59:10,230 --> 00:59:08,799
there won't be the same interactions we

1672
00:59:12,309 --> 00:59:10,240
have today

1673
00:59:14,230 --> 00:59:12,319
and we need to test all that to see a is

1674
00:59:16,150 --> 00:59:14,240
there things we can do about it and b

1675
00:59:18,549 --> 00:59:16,160
you know what's the mitigation if you

1676
00:59:20,630 --> 00:59:18,559
just have to live with it well mike i

1677
00:59:22,950 --> 00:59:20,640
guess you get the last word because we

1678
00:59:25,190 --> 00:59:22,960
are out of time i'm sorry

1679
00:59:27,510 --> 00:59:25,200
so i want to thank everybody in the

1680
00:59:29,910 --> 00:59:27,520
audience for coming and everybody on

1681
00:59:31,670 --> 00:59:29,920
nasa television for watching today

1682
00:59:33,750 --> 00:59:31,680
the next event in our series of events

1683
00:59:35,589 --> 00:59:33,760
today will be a recording of a

1684
00:59:37,109 --> 00:59:35,599
discussion similar to this one that

1685
00:59:39,190 --> 00:59:37,119
occurred at marshall space flight center

1686
00:59:41,190 --> 00:59:39,200
in alabama on monday

1687
00:59:44,630 --> 00:59:41,200
and then at

1688
00:59:47,109 --> 00:59:44,640

3 30 pm eastern time we'll go to our

1689
00:59:49,190 --> 00:59:47,119
final live round table discussion

1690
00:59:50,470 --> 00:59:49,200
from nasa headquarters with an all-star

1691
00:59:52,630 --> 00:59:50,480
panel there

1692
00:59:54,230 --> 00:59:52,640
thanks again for coming and