
NASA
88
Endeavour

1
00:00:05,329 --> 00:00:03,230
joining us is Bob Cabana director of the

2
00:00:07,789 --> 00:00:05,339
Kennedy Space Center Bob but it's really

3
00:00:11,089 --> 00:00:07,799
nice of you to take the time out to join

4
00:00:14,600 --> 00:00:11,099
us here in Mission Control it's my

5
00:00:15,860 --> 00:00:14,610
pleasure Kyle I the only way this could

6
00:00:18,290 --> 00:00:15,870
be better as if I were sitting on

7
00:00:20,240 --> 00:00:18,300
console with you i miss my days as a

8
00:00:23,420 --> 00:00:20,250
Capcom well you know I was going to

9
00:00:26,810 --> 00:00:23,430
touch on on all of that stuff we've got

10
00:00:29,359 --> 00:00:26,820
such a great background and wide varied

11
00:00:32,450 --> 00:00:29,369
background in not only spaceflight on

12
00:00:34,760 --> 00:00:32,460
orbit obviously but but obviously on the

13
00:00:37,850 --> 00:00:34,770

ground with all that you've done since

14
00:00:41,270 --> 00:00:37,860
you joined NASA back in 1985 not to date

15
00:00:43,069 --> 00:00:41,280
you obviously but I know you work I know

16
00:00:45,860 --> 00:00:43,079
you worked here in Mission Control and

17
00:00:47,299 --> 00:00:45,870
and of course that's where we're talking

18
00:00:50,869 --> 00:00:47,309
to you from as the station flight

19
00:00:53,000 --> 00:00:50,879
control room yeah I I've been blessed

20
00:00:55,790 --> 00:00:53,010
I've had a great career at NASA but it's

21
00:00:57,979 --> 00:00:55,800
not over yet we still we still got a lot

22
00:01:00,049 --> 00:00:57,989
of good stuff to do and we're making

23
00:01:03,830 --> 00:01:00,059
great progress towards the future well

24
00:01:06,170 --> 00:01:03,840
exactly you know I was going to ask you

25
00:01:08,810 --> 00:01:06,180
is you know what's more challenging what

26
00:01:12,140 --> 00:01:08,820
you're doing now or flying in space but

27
00:01:15,530 --> 00:01:12,150
i'm not sure that one is less

28
00:01:20,330 --> 00:01:15,540
challenging than another but can you

29
00:01:21,830 --> 00:01:20,340
imagine I volunteered I volunteered to

30
00:01:23,929 --> 00:01:21,840
the chief es not office I'd be willing

31
00:01:25,160 --> 00:01:23,939
to take that that your flight anything

32
00:01:28,789 --> 00:01:25,170
to get out of a wearing a coat and tie

33
00:01:31,010 --> 00:01:28,799
to work well if you worked in mcc i

34
00:01:33,770 --> 00:01:31,020
guess you don't have to but it's

35
00:01:36,200 --> 00:01:33,780
probably something that would be more

36
00:01:39,649 --> 00:01:36,210
appropriate to wear but again you

37
00:01:44,569 --> 00:01:39,659
imagine that it's been let's see your

38
00:01:46,609 --> 00:01:44,579

first flight 1990 can you imagine from

39
00:01:49,700 --> 00:01:46,619
from that point to where you are now

40
00:01:51,490 --> 00:01:49,710
that we now have a space station where

41
00:01:56,359 --> 00:01:51,500
crew members are living on board

42
00:01:58,609 --> 00:01:56,369
permanently i know in an amazing space

43
00:02:03,499 --> 00:01:58,619
station at that i can't believe it's

44
00:02:06,859 --> 00:02:03,509
been 14 years since we united unity and

45
00:02:08,719 --> 00:02:06,869
zaria together in fact today i guess

46
00:02:11,479 --> 00:02:08,729
when this airs it will be EV a day but

47
00:02:12,920 --> 00:02:11,489
today what we're talking this was the

48
00:02:15,559 --> 00:02:12,930
day that we

49
00:02:19,550 --> 00:02:15,569
rendezvous didn't join unity this area

50
00:02:22,099 --> 00:02:19,560
hers are you to uni yeah and and you

51
00:02:24,709 --> 00:02:22,109
know STS 41 was what four days and

52
00:02:27,099 --> 00:02:24,719
incrementally you know your second

53
00:02:30,830 --> 00:02:27,109
flight which was essentially a

54
00:02:32,479 --> 00:02:30,840
laboratory flight on a on a duration

55
00:02:34,339 --> 00:02:32,489
that was obviously shorter than what

56
00:02:36,250 --> 00:02:34,349
we're doing with station but you know

57
00:02:39,020 --> 00:02:36,260
you guys performed on that flight

58
00:02:40,580 --> 00:02:39,030
something like 80 experiments and I was

59
00:02:43,429 --> 00:02:40,590
talking to Chris Hadfield and Tom

60
00:02:45,949 --> 00:02:43,439
Marshburn earlier this week and and they

61
00:02:47,420 --> 00:02:45,959
relayed that that during their increment

62
00:02:48,679 --> 00:02:47,430
both they're going to they're going to

63
00:02:51,020 --> 00:02:48,689

be performing something like a hundred

64
00:02:53,869 --> 00:02:51,030
and thirty but these are experiments

65
00:02:55,849 --> 00:02:53,879
that are ongoing that they interact with

66
00:02:58,940 --> 00:02:55,859
and don't interact with with teller

67
00:03:02,690 --> 00:02:58,950
abadox or tell a science it's it's kind

68
00:03:05,809 --> 00:03:02,700
of a an evolution that we anticipated

69
00:03:08,000 --> 00:03:05,819
but but you know now it's here yeah well

70
00:03:12,229 --> 00:03:08,010
that in that lab flight that we flew on

71
00:03:13,789 --> 00:03:12,239
levitation my third flight sts 65 and at

72
00:03:15,319 --> 00:03:13,799
the time we set the record for the

73
00:03:18,860 --> 00:03:15,329
longest shuttle mission it was sixteen

74
00:03:20,869 --> 00:03:18,870
days and that got surpassed by a couple

75
00:03:22,430 --> 00:03:20,879
days but you know we thought a little

76
00:03:24,860 --> 00:03:22,440
over two weeks in space was really a

77
00:03:28,009 --> 00:03:24,870
long flight and yeah we had 81

78
00:03:29,629 --> 00:03:28,019
experiments from around the world and we

79
00:03:32,360 --> 00:03:29,639
were you know talking to the folks up in

80
00:03:34,399 --> 00:03:32,370
marshall through the payload ops center

81
00:03:36,890 --> 00:03:34,409
up their control and stuff as well as

82
00:03:39,199 --> 00:03:36,900
houston and you know i look at what

83
00:03:41,809 --> 00:03:39,209
we're doing on space station now and i

84
00:03:44,059 --> 00:03:41,819
think you know a lot of what we learned

85
00:03:46,670 --> 00:03:44,069
got applied to how we're operating on

86
00:03:48,080 --> 00:03:46,680
Space Station but it's all I mean this

87
00:03:50,420 --> 00:03:48,090
is the way it's supposed to be you're

88
00:03:52,069 --> 00:03:50,430

supposed to go to space and actually be

89
00:03:55,879 --> 00:03:52,079
involved with the experiments be able to

90
00:03:59,149 --> 00:03:55,889
make changes it's this is this is

91
00:04:02,089 --> 00:03:59,159
exciting stuff that's going on it's

92
00:04:04,309 --> 00:04:02,099
essentially like a you view a shuttle

93
00:04:07,280 --> 00:04:04,319
flight you obviously know better than I

94
00:04:09,589 --> 00:04:07,290
but you know a shuttle flight of 16 days

95
00:04:12,080 --> 00:04:09,599
that's a considered a laboratory flight

96
00:04:17,420 --> 00:04:12,090
is it's very structured in terms of

97
00:04:18,499 --> 00:04:17,430
timeline and 16 days versus what it like

98
00:04:20,839 --> 00:04:18,509
you just mentioned what a real

99
00:04:24,230 --> 00:04:20,849
laboratory is like one station where you

100
00:04:26,709 --> 00:04:24,240
can allow something to play out over a

101
00:04:29,749 --> 00:04:26,719
longer period of time right

102
00:04:31,939 --> 00:04:29,759
absolutely and you know even those guys

103
00:04:33,409 --> 00:04:31,949
on the space station they're pretty darn

104
00:04:35,869 --> 00:04:33,419
busy up there there's not a whole lot of

105
00:04:38,779 --> 00:04:35,879
free time I know on the shuttle flights

106
00:04:40,640 --> 00:04:38,789
we people always ask me what it's like

107
00:04:42,140 --> 00:04:40,650
and I said gee you hardly have time to

108
00:04:45,740 --> 00:04:42,150
look out the window in fact i was told

109
00:04:48,980 --> 00:04:45,750
first-time Flyers make sure you take you

110
00:04:50,390 --> 00:04:48,990
know 5-10 minutes just to yourself and

111
00:04:52,369 --> 00:04:50,400
stick your nose up the window and make a

112
00:04:54,499 --> 00:04:52,379
memory because I mean we'd be working

113
00:04:55,730 --> 00:04:54,509

you know as soon as we get up in the

114
00:04:57,619 --> 00:04:55,740
morning we'd be working in our post

115
00:04:59,450 --> 00:04:57,629
sleep and we work into our pre sleep in

116
00:05:02,119 --> 00:04:59,460
order to get everything done that we

117
00:05:08,330 --> 00:05:02,129
needed to do yeah and the transition

118
00:05:11,390 --> 00:05:08,340
from for you from sts-48 53 those were

119
00:05:14,990 --> 00:05:11,400
fairly short duration flights and do you

120
00:05:18,619 --> 00:05:15,000
remember in terms of when you got

121
00:05:21,200 --> 00:05:18,629
assigned to sts 65 and then later on 288

122
00:05:23,719 --> 00:05:21,210
but 65 the difference between those

123
00:05:26,510 --> 00:05:23,729
four-day flights was it was it dramatic

124
00:05:28,850 --> 00:05:26,520
in terms of preparation obviously a lab

125
00:05:33,010 --> 00:05:28,860
flight you prepare a lot longer but that

126
00:05:36,369 --> 00:05:33,020
was your first command after 41 and 53

127
00:05:39,430 --> 00:05:36,379
absolutely I mean things I remember

128
00:05:42,350 --> 00:05:39,440
first off a lot of training with the

129
00:05:44,450 --> 00:05:42,360
payloads in the crew but I remember

130
00:05:45,860 --> 00:05:44,460
being on orbit I mean it seemed like a

131
00:05:48,170 --> 00:05:45,870
long time I mean two and a half weeks

132
00:05:49,640 --> 00:05:48,180
actually you know when you compared it

133
00:05:53,209 --> 00:05:49,650
to those shorter five and seven day

134
00:05:55,700 --> 00:05:53,219
flights being up there for for two weeks

135
00:05:59,420 --> 00:05:55,710
seemed more like it should be you really

136
00:06:02,499 --> 00:05:59,430
got accustomed to being in space the

137
00:06:04,879 --> 00:06:02,509
other thing I remember is after sts 53

138
00:06:07,909 --> 00:06:04,889

yes the pilot coming around the Hat I

139
00:06:09,529 --> 00:06:07,919
just felt so heavy on both those flights

140
00:06:12,760 --> 00:06:09,539
and I thought man how do you how do you

141
00:06:15,679 --> 00:06:12,770
land a spatial you know feeling all that

142
00:06:18,409 --> 00:06:15,689
gravity as you come back into the G

143
00:06:21,170 --> 00:06:18,419
field and when I actually got to land a

144
00:06:22,909 --> 00:06:21,180
cs65 I never even felt gravity I had so

145
00:06:27,920 --> 00:06:22,919
much adrenaline going it was pretty

146
00:06:32,779 --> 00:06:27,930
amazing the and the other aspect I guess

147
00:06:35,870 --> 00:06:32,789
between 4153 and 65 is is that flight

148
00:06:38,080 --> 00:06:35,880
obviously being longer but she also it

149
00:06:40,360 --> 00:06:38,090
was kind of your introduction to

150
00:06:42,129 --> 00:06:40,370
kind of an international crew because

151
00:06:47,909 --> 00:06:42,139
you had Chiaki on that flight as well

152
00:06:50,230 --> 00:06:47,919
right that's right and it was

153
00:06:54,219 --> 00:06:50,240
experiments from around the world we had

154
00:06:56,290 --> 00:06:54,229
japanese isa experiments so it was very

155
00:06:57,790 --> 00:06:56,300
much an international aspect to the

156
00:07:00,640 --> 00:06:57,800
mission and it was setting the stage for

157
00:07:03,520 --> 00:07:00,650
how we operate on the on the space

158
00:07:05,620 --> 00:07:03,530
station you know when I look at

159
00:07:07,810 --> 00:07:05,630
operating on the space station the

160
00:07:08,560 --> 00:07:07,820
International aspects of it yes we've

161
00:07:11,440 --> 00:07:08,570
been working with our international

162
00:07:13,900 --> 00:07:11,450
partners the Europeans and Japanese for

163
00:07:16,150 --> 00:07:13,910

a long time but getting ready to build a

164
00:07:18,280 --> 00:07:16,160
space station with the Russians the

165
00:07:19,960 --> 00:07:18,290
shuttle-mir program was crucial to

166
00:07:21,400 --> 00:07:19,970
building that relationship that we

167
00:07:22,690 --> 00:07:21,410
needed to be successful with the

168
00:07:25,629 --> 00:07:22,700
International Space Station and the

169
00:07:28,330 --> 00:07:25,639
Russians the yeah and then the course

170
00:07:31,779 --> 00:07:28,340
the while shuttle Mir was going on that

171
00:07:34,090 --> 00:07:31,789
you had already been in the mix for well

172
00:07:35,890 --> 00:07:34,100
I guess during that time you were on the

173
00:07:42,219 --> 00:07:35,900
ground you were were you chief of the

174
00:07:44,980 --> 00:07:42,229
astronaut office by then yep we was in

175
00:07:46,779 --> 00:07:44,990
fact norm Fay guard and Bonnie had been

176
00:07:49,210 --> 00:07:46,789
enormous prime and bonnie was back up

177
00:07:51,790 --> 00:07:49,220
for that first flight and when my first

178
00:07:53,950 --> 00:07:51,800
duties as chief the astronaut office was

179
00:07:55,659 --> 00:07:53,960
to go over and visit them in Star City

180
00:07:58,270 --> 00:07:55,669
and see how they're training was going

181
00:08:01,120 --> 00:07:58,280
and that was my first introduction to to

182
00:08:02,500 --> 00:08:01,130
Moscow winner and actually I'll kind of

183
00:08:04,060 --> 00:08:02,510
at home it was a lot like being up in

184
00:08:06,159 --> 00:08:04,070
northern Minnesota I was going to say

185
00:08:09,820 --> 00:08:06,169
bacon that I said and you're pretty used

186
00:08:13,570 --> 00:08:09,830
to that it was very very much the same

187
00:08:16,930 --> 00:08:13,580
but not that was a it was a challenging

188
00:08:19,330 --> 00:08:16,940

time because we were flying 78 Shuttle

189
00:08:23,110 --> 00:08:19,340
missions a year doing shuttle Mir doing

190
00:08:26,650 --> 00:08:23,120
Spacelab missions you know Hubble repair

191
00:08:29,680 --> 00:08:26,660
missions it was a lot of a lot of work

192
00:08:31,300 --> 00:08:29,690
going on but we were also getting ready

193
00:08:34,829 --> 00:08:31,310
to build the International Space Station

194
00:08:37,690 --> 00:08:34,839
and it was in its design phase and I

195
00:08:39,310 --> 00:08:37,700
spent those three years as chief the

196
00:08:41,920 --> 00:08:39,320
astronaut office and I was very

197
00:08:45,640 --> 00:08:41,930
fortunate to get to be assigned to

198
00:08:49,690 --> 00:08:45,650
commandant first space station assembly

199
00:08:51,460 --> 00:08:49,700
flight and man that that was that was

200
00:08:55,770 --> 00:08:51,470
special

201
00:08:59,320 --> 00:08:55,780
say no so it has been 14 years now since

202
00:09:02,410 --> 00:08:59,330
STS 88 which obviously kind of

203
00:09:06,880 --> 00:09:02,420
inaugurated the Assembly of the station

204
00:09:08,490 --> 00:09:06,890
and do you obviously recall but you know

205
00:09:11,470 --> 00:09:08,500
of course sorry was launched in late

206
00:09:13,750 --> 00:09:11,480
November to you to you what are your

207
00:09:16,120 --> 00:09:13,760
memories of where you were watching

208
00:09:17,830 --> 00:09:16,130
sorry has launched knowing that the way

209
00:09:20,200 --> 00:09:17,840
things were laid out that you guys were

210
00:09:23,590 --> 00:09:20,210
I guess ready to go about two weeks

211
00:09:26,110 --> 00:09:23,600
later we were all in my house in Nassau

212
00:09:30,280 --> 00:09:26,120
Bay November 20th and in the evening

213
00:09:32,860 --> 00:09:30,290

watching zaria launch and as soon as it

214
00:09:34,930 --> 00:09:32,870
was launched and was successful we knew

215
00:09:38,440 --> 00:09:34,940
we were gone and we were all pretty

216
00:09:41,170 --> 00:09:38,450
excited that was that was neat and then

217
00:09:42,820 --> 00:09:41,180
you know a couple weeks later here we

218
00:09:47,470 --> 00:09:42,830
are down at the Cape getting ready to

219
00:09:50,230 --> 00:09:47,480
launch with with unity and the first

220
00:09:53,740 --> 00:09:50,240
night we went out and we had an issue

221
00:09:56,830 --> 00:09:53,750
starting one of the AP use and by the

222
00:10:00,340 --> 00:09:56,840
time everybody figured out you know that

223
00:10:03,310 --> 00:10:00,350
we were okay to go it was it was too

224
00:10:04,900 --> 00:10:03,320
late we didn't have the performance

225
00:10:10,090 --> 00:10:04,910
margin to go and we stopped the count at

226
00:10:12,520 --> 00:10:10,100
18 seconds in and didn't go and then the

227
00:10:17,620 --> 00:10:12,530
the next night we went back and it was

228
00:10:19,690 --> 00:10:17,630
flawless it was a perfect launch and it

229
00:10:22,510 --> 00:10:19,700
was it set the stage for the the whole

230
00:10:26,380 --> 00:10:22,520
mission it just went went flawlessly it

231
00:10:30,640 --> 00:10:26,390
was really outstanding the rendezvous

232
00:10:33,130 --> 00:10:30,650
I'll never forget it it it was you know

233
00:10:35,890 --> 00:10:33,140
right down the way it was supposed to be

234
00:10:37,990 --> 00:10:35,900
and the one thing that I will never feel

235
00:10:41,920 --> 00:10:38,000
I'll share one quick story with you we

236
00:10:44,290 --> 00:10:41,930
were waiting to get over Russian ground

237
00:10:47,740 --> 00:10:44,300
site we'd flown unity into the payload

238
00:10:49,210 --> 00:10:47,750

Bay it was about three feet from the end

239
00:10:52,690 --> 00:10:49,220
of the arm just waiting for Nancy to

240
00:10:54,610 --> 00:10:52,700
reach over and grab it and we had to get

241
00:10:57,280 --> 00:10:54,620
over a Russian grant site to have them

242
00:10:59,440 --> 00:10:57,290
confirm that the FGB was in free drift

243
00:11:02,520 --> 00:10:59,450
so when we grabbed it with the arm it

244
00:11:05,440 --> 00:11:02,530
didn't fight the rman and break it and

245
00:11:09,250 --> 00:11:05,450
so we're just waiting everything

246
00:11:15,340 --> 00:11:09,260
perfect and we reached a dead band in

247
00:11:17,770 --> 00:11:15,350
the attitude of the shuttle and we were

248
00:11:20,020 --> 00:11:17,780
when we apply a rendezvous we allow the

249
00:11:21,490 --> 00:11:20,030
autopilot to hold our attitude pitch

250
00:11:23,980 --> 00:11:21,500
roll and yaw and we just control the

251
00:11:26,440 --> 00:11:23,990
translations and when it reached the

252
00:11:30,070 --> 00:11:26,450
edge of a dead band where it fired the

253
00:11:32,860 --> 00:11:30,080
jets to Center it back up it caused the

254
00:11:36,190 --> 00:11:32,870
big Jets fire and it isn't a pure

255
00:11:38,500 --> 00:11:36,200
rotation it couples into a translation

256
00:11:40,180 --> 00:11:38,510
and all of a sudden this 45 thousand

257
00:11:42,460 --> 00:11:40,190
pound mass is moving down into the

258
00:11:44,530 --> 00:11:42,470
payload Bay and toward the arm and I

259
00:11:47,290 --> 00:11:44,540
fired the Jets to back away from it and

260
00:11:50,410 --> 00:11:47,300
nothing happened and we were in the bead

261
00:11:53,290 --> 00:11:50,420
app which was programmed that that point

262
00:11:54,790 --> 00:11:53,300
in the mission for very fine control and

263
00:11:56,350 --> 00:11:54,800

I real quick switched over and selected

264
00:11:59,080 --> 00:11:56,360
the a depth to get more control power

265
00:12:02,500 --> 00:11:59,090
and we got moving away from it and then

266
00:12:05,590 --> 00:12:02,510
back back back in and got everything

267
00:12:08,200 --> 00:12:05,600
centered up again and him got cleared to

268
00:12:11,500 --> 00:12:08,210
grapple it but for a while there it was

269
00:12:16,330 --> 00:12:11,510
pretty tense is kind of exciting and one

270
00:12:19,840 --> 00:12:16,340
of my crewmates jim newman PhD smart guy

271
00:12:23,500 --> 00:12:19,850
wrote a lot of our rendezvous training

272
00:12:24,550 --> 00:12:23,510
software he always had advice and for

273
00:12:26,230 --> 00:12:24,560
what we ought to be doing during the

274
00:12:28,320 --> 00:12:26,240
rendezvous and when that happened it was

275
00:12:31,630 --> 00:12:28,330
just dead silence in the cockpit and

276
00:12:33,040 --> 00:12:31,640
after as I said Jim I said how come you

277
00:12:35,920 --> 00:12:33,050
didn't say anything so he says I know

278
00:12:38,680 --> 00:12:35,930
when to keep my mouth shut I was it was

279
00:12:39,940 --> 00:12:38,690
pretty pretty pretty tense there for a

280
00:12:42,250 --> 00:12:39,950
minute but then everything works out

281
00:12:45,220 --> 00:12:42,260
perfect and Nancy grabbed on to it and

282
00:12:46,930 --> 00:12:45,230
we lifted up above the node and got it

283
00:12:49,930 --> 00:12:46,940
lined up with the pressurized mating

284
00:12:51,430 --> 00:12:49,940
adapter and fired the Jets to bring the

285
00:12:55,120 --> 00:12:51,440
two pieces together and they've been

286
00:12:57,550 --> 00:12:55,130
been together ever since and let's see

287
00:12:59,290 --> 00:12:57,560
you left behind let's say I'm looking at

288
00:13:03,250 --> 00:12:59,300

them trying to do the math while we're

289
00:13:06,820 --> 00:13:03,260
talking and that looks like about 68 + 5

290
00:13:09,820 --> 00:13:06,830
so about 75,000 pounds of mass that you

291
00:13:12,850 --> 00:13:09,830
guys left behind and and now the latest

292
00:13:16,809 --> 00:13:12,860
numbers that I'm looking at or very

293
00:13:20,169 --> 00:13:16,819
close to about 900,000 pounds of mass

294
00:13:22,840 --> 00:13:20,179
that make up the entire station and and

295
00:13:25,569 --> 00:13:22,850
you guys were part of that core it's

296
00:13:28,090 --> 00:13:25,579
it's it's a quite a legacy to leave

297
00:13:30,400 --> 00:13:28,100
behind it to look up and watch it fly

298
00:13:32,799 --> 00:13:30,410
over I guess periodically and know that

299
00:13:35,319 --> 00:13:32,809
you know that you were part of the least

300
00:13:40,719 --> 00:13:35,329
the initial stage of that whole thing

301
00:13:43,900 --> 00:13:40,729
coming together it really is I mean we

302
00:13:46,809 --> 00:13:43,910
had an amazing team and it just shows

303
00:13:48,429 --> 00:13:46,819
what we can accomplish when we all work

304
00:13:50,049 --> 00:13:48,439
together toward a common goal I mean

305
00:13:52,599 --> 00:13:50,059
nobody thought he looked back on the

306
00:13:53,919 --> 00:13:52,609
Assembly of the space station and if you

307
00:13:55,569 --> 00:13:53,929
look back at the beginning everybody

308
00:13:57,069 --> 00:13:55,579
said there was this wall of EBA we're

309
00:13:59,979 --> 00:13:57,079
never going to be able to do all the ABS

310
00:14:01,119 --> 00:13:59,989
and and look at how smoothly every one

311
00:14:04,210 --> 00:14:01,129
of them went and yeah there were some

312
00:14:05,949 --> 00:14:04,220
hiccups along the way but you know the

313
00:14:08,469 --> 00:14:05,959

team improvised the team came back the

314
00:14:11,079 --> 00:14:08,479
next day whatever we were successful on

315
00:14:14,079 --> 00:14:11,089
all those EBA is building that space

316
00:14:16,989 --> 00:14:14,089
station with no major hiccups and that

317
00:14:18,279 --> 00:14:16,999
is just truly amazing I remember going

318
00:14:19,389 --> 00:14:18,289
in for the first time everybody kept

319
00:14:21,399 --> 00:14:19,399
saying who's going to be the first one

320
00:14:23,559 --> 00:14:21,409
in I wouldn't tell anybody and when it

321
00:14:26,289 --> 00:14:23,569
came time and we opened the hatch I just

322
00:14:28,479 --> 00:14:26,299
kind of had Sergei krikalev up alongside

323
00:14:31,710 --> 00:14:28,489
man I just kind of waved my arm into the

324
00:14:34,929 --> 00:14:31,720
hatch and we went in side-by-side and I

325
00:14:37,449 --> 00:14:34,939
the node I mean it was empty and the FGB

326
00:14:40,299 --> 00:14:37,459
was empty and I look at pictures of it

327
00:14:43,059 --> 00:14:40,309
now and I see all the equipment that is

328
00:14:45,219 --> 00:14:43,069
in both of those modules now and it it's

329
00:14:47,469 --> 00:14:45,229
pretty amazing it was very roomy

330
00:14:49,239 --> 00:14:47,479
especially after being on on the shuttle

331
00:14:52,059 --> 00:14:49,249
to get inside the nose and have all that

332
00:14:54,099 --> 00:14:52,069
space you know as we work through the

333
00:14:56,889 --> 00:14:54,109
the procedures that we had for getting

334
00:14:59,379 --> 00:14:56,899
things ready for that first crew well I

335
00:15:01,899 --> 00:14:59,389
know without question that you would

336
00:15:04,419 --> 00:15:01,909
love to go back and see it but obviously

337
00:15:07,329 --> 00:15:04,429
you you're you've got an important role

338
00:15:09,369 --> 00:15:07,339

now as well and you know the shuttle the

339
00:15:11,519 --> 00:15:09,379
legacy that the shuttle leaves behind is

340
00:15:13,840 --> 00:15:11,529
the space station and all the other

341
00:15:15,909 --> 00:15:13,850
scientific instruments like Hubble like

342
00:15:18,489 --> 00:15:15,919
you mentioned up there and you guys

343
00:15:21,549 --> 00:15:18,499
launch Ulysses on your deployed Ulysses

344
00:15:23,469 --> 00:15:21,559
on your first flight but you know when

345
00:15:25,000 --> 00:15:23,479
you look forward now the shuttles

346
00:15:26,950 --> 00:15:25,010
retired

347
00:15:30,960 --> 00:15:26,960
but there's so many things that are

348
00:15:33,700 --> 00:15:30,970
going on and obviously you're at KSC and

349
00:15:35,170 --> 00:15:33,710
you describe a little bit about some of

350
00:15:37,750 --> 00:15:35,180
the transitional things that are going

351
00:15:40,330 --> 00:15:37,760
on relative to like Orion and Commercial

352
00:15:43,020 --> 00:15:40,340
Crew that that you guys are kind of

353
00:15:46,300 --> 00:15:43,030
starting to work on down there oh

354
00:15:49,360 --> 00:15:46,310
absolutely you know I mean the shuttle

355
00:15:51,760 --> 00:15:49,370
was phenomenal the 30 years that we flew

356
00:15:55,120 --> 00:15:51,770
shuttle look at what it accomplished and

357
00:15:56,920 --> 00:15:55,130
it truly is an amazing vehicle and we

358
00:16:01,030 --> 00:15:56,930
couldn't have done the space station or

359
00:16:03,430 --> 00:16:01,040
many other things without it but you

360
00:16:05,260 --> 00:16:03,440
know it is time to move on and change is

361
00:16:07,240 --> 00:16:05,270
hard but you can't have something better

362
00:16:10,120 --> 00:16:07,250
without change and we are now focusing

363
00:16:12,250 --> 00:16:10,130

on exploring beyond our home planet once

364
00:16:14,620 --> 00:16:12,260
again being able to leave planet earth

365
00:16:16,840 --> 00:16:14,630
with the Space Launch System in the

366
00:16:18,610 --> 00:16:16,850
multi-purpose crew vehicle we're

367
00:16:20,890 --> 00:16:18,620
enabling commercial operations to

368
00:16:25,540 --> 00:16:20,900
low-earth orbit commercial crew program

369
00:16:27,640 --> 00:16:25,550
is doing an outstanding job as we narrow

370
00:16:30,400 --> 00:16:27,650
down to finally select a commercial

371
00:16:31,780 --> 00:16:30,410
contractor that we can contract with to

372
00:16:34,270 --> 00:16:31,790
fly our cruise to the International

373
00:16:35,740 --> 00:16:34,280
Space Station and it's a great

374
00:16:39,040 --> 00:16:35,750
partnership with the Johnson Space

375
00:16:42,490 --> 00:16:39,050
Center it's a 50-50 between us as we

376
00:16:43,930 --> 00:16:42,500
work that program to make it happen the

377
00:16:46,540 --> 00:16:43,940
progress that we're making down here at

378
00:16:49,990 --> 00:16:46,550
the Cape it's phenomenal I mean if you

379
00:16:51,880 --> 00:16:50,000
look at the northern pad pad 39b all the

380
00:16:53,020 --> 00:16:51,890
shuttle infrastructure is gone it's got

381
00:16:55,420 --> 00:16:53,030
a state-of-the-art lightning protection

382
00:16:56,830 --> 00:16:55,430
system on it we pulled all the copper

383
00:16:59,920 --> 00:16:56,840
wire out and replaced it with fiber

384
00:17:01,840 --> 00:16:59,930
optics it's got digital control systems

385
00:17:03,520 --> 00:17:01,850
that you know people look out at the

386
00:17:06,220 --> 00:17:03,530
launch pads and it looks like this mound

387
00:17:08,410 --> 00:17:06,230
of dirt and cement but that is a complex

388
00:17:11,410 --> 00:17:08,420

underneath there that we're upgrading

389
00:17:13,270 --> 00:17:11,420
now for the future refurbishing the

390
00:17:15,490 --> 00:17:13,280
propellant distribution systems to make

391
00:17:19,270 --> 00:17:15,500
that a viable launch complex for another

392
00:17:22,390 --> 00:17:19,280
20 plus years we've refurbished one of

393
00:17:25,510 --> 00:17:22,400
the firing control rooms to support

394
00:17:28,420 --> 00:17:25,520
multiple operations from the same

395
00:17:30,640 --> 00:17:28,430
control room easily reconfigurable we've

396
00:17:33,370 --> 00:17:30,650
pulled all the shuttle infrastructure

397
00:17:35,710 --> 00:17:33,380
out of high bay three in the Vehicle

398
00:17:37,590 --> 00:17:35,720
Assembly Building as we prepare for the

399
00:17:40,320 --> 00:17:37,600
Space Launch

400
00:17:42,090 --> 00:17:40,330
system that new rocket and we're

401
00:17:45,299 --> 00:17:42,100
designing the platforms such that

402
00:17:47,310 --> 00:17:45,309
they're adjustable so it is the vehicle

403
00:17:49,260 --> 00:17:47,320
evolves you know it's not a fixed

404
00:17:51,480 --> 00:17:49,270
structure in there and when we change

405
00:17:53,029 --> 00:17:51,490
the vehicle we're stuck and we got to

406
00:17:56,760 --> 00:17:53,039
redo everything we're making it

407
00:17:59,970 --> 00:17:56,770
adjustable so it adapts to an evolving

408
00:18:03,240 --> 00:17:59,980
vehicle initially starting out with five

409
00:18:06,930 --> 00:18:03,250
segments solid rocket motors heritage

410
00:18:09,299 --> 00:18:06,940
hardware for shuttle main engines I was

411
00:18:12,060 --> 00:18:09,309
over at Stennis Space Center here a few

412
00:18:13,799 --> 00:18:12,070
weeks ago and saw those engines in

413
00:18:16,490 --> 00:18:13,809

storage over there getting ready for the

414
00:18:19,830 --> 00:18:16,500
future I'm a multi-purpose crew vehicle

415
00:18:22,919 --> 00:18:19,840
we are building the very first one right

416
00:18:25,529 --> 00:18:22,929
now here in high bay over in the

417
00:18:27,990 --> 00:18:25,539
operations and check-out building at KSC

418
00:18:29,399 --> 00:18:28,000
Lockheed Martin you know in a

419
00:18:31,320 --> 00:18:29,409
partnership with the state of Florida

420
00:18:34,169 --> 00:18:31,330
they refurbished the high bay it's a

421
00:18:37,080 --> 00:18:34,179
state-of-the-art processing facility now

422
00:18:39,240 --> 00:18:37,090
assembly facility and the first vehicle

423
00:18:42,480 --> 00:18:39,250
is over there getting ready for a flight

424
00:18:44,909 --> 00:18:42,490
in 2014 aboard a delta 4 rocket to test

425
00:18:47,730 --> 00:18:44,919
the thermal protection system and other

426
00:18:50,909 --> 00:18:47,740
systems on it I think we've seen the

427
00:18:52,799 --> 00:18:50,919
progress that SpaceX is made going to

428
00:18:55,770 --> 00:18:52,809
the International Space Station with the

429
00:18:57,600 --> 00:18:55,780
Dragon vehicle and they want to evolve

430
00:19:00,210 --> 00:18:57,610
that dragon capsule into the Dragon

431
00:19:02,370 --> 00:19:00,220
Rider and be able to fly crew on it in

432
00:19:04,409 --> 00:19:02,380
our commercial crew program is working

433
00:19:06,810 --> 00:19:04,419
through Space Act agreements with SpaceX

434
00:19:09,360 --> 00:19:06,820
for the Dragon Rider sierra nevada for

435
00:19:13,230 --> 00:19:09,370
the dream chaser which would fly on a an

436
00:19:16,110 --> 00:19:13,240
atlas 5 rocket and boeing with the

437
00:19:19,440 --> 00:19:16,120
cst-100 capsule also on an atlas 5 and

438
00:19:23,010 --> 00:19:19,450

boeing plans on building and processing

439
00:19:24,620 --> 00:19:23,020
their vehicle in opf bay 3 in again in

440
00:19:27,630 --> 00:19:24,630
partnership with the state of florida

441
00:19:30,090 --> 00:19:27,640
here's a facility that we have no use

442
00:19:31,500 --> 00:19:30,100
for we can't afford to maintain and

443
00:19:34,049 --> 00:19:31,510
we've turned it over to the state of

444
00:19:37,320 --> 00:19:34,059
Florida and they are refurbishing it and

445
00:19:40,350 --> 00:19:37,330
I'm going to get Boeing in there for

446
00:19:42,330 --> 00:19:40,360
their cst-100 so we're looking at what

447
00:19:44,370 --> 00:19:42,340
infrastructure we actually need for the

448
00:19:46,680 --> 00:19:44,380
future down here what we don't need

449
00:19:49,680 --> 00:19:46,690
which doesn't support anything that's

450
00:19:51,030 --> 00:19:49,690
old we're going to tear down and save

451
00:19:53,220 --> 00:19:51,040
costs on what

452
00:19:55,230 --> 00:19:53,230
still has another need for the future

453
00:19:57,090 --> 00:19:55,240
and can able commercial operations we're

454
00:19:59,220 --> 00:19:57,100
looking at Space Act agreements in order

455
00:20:01,410 --> 00:19:59,230
and enhanced useless in order to allow

456
00:20:04,380 --> 00:20:01,420
commercial companies to utilize that

457
00:20:06,390 --> 00:20:04,390
excess capacity that we have to make

458
00:20:09,150 --> 00:20:06,400
commercial operations to low Earth orbit

459
00:20:11,250 --> 00:20:09,160
more viable so just an awful lot of

460
00:20:14,280 --> 00:20:11,260
stuff going on down here and in great

461
00:20:18,300 --> 00:20:14,290
progress is being made in in all areas

462
00:20:21,600 --> 00:20:18,310
so you know the future i think is very

463
00:20:23,730 --> 00:20:21,610

exciting to think that we're going to

464
00:20:27,480 --> 00:20:23,740
leave planet earth again be able to go

465
00:20:30,440 --> 00:20:27,490
you know off to asteroids to the moon to

466
00:20:33,530 --> 00:20:30,450
Mars to wherever with an involve about

467
00:20:36,600 --> 00:20:33,540
architecture it's really exciting and

468
00:20:38,190 --> 00:20:36,610
you know low-earth orbit we've been

469
00:20:40,070 --> 00:20:38,200
going back and forth to low-earth orbit

470
00:20:43,260 --> 00:20:40,080
for 50 years I think it's about time we

471
00:20:45,300 --> 00:20:43,270
we trusted that to to somebody else to

472
00:20:47,600 --> 00:20:45,310
do that we know how to do it and we can

473
00:20:51,270 --> 00:20:47,610
focus on a really tough job of exploring

474
00:20:54,560 --> 00:20:51,280
that that's great and of course part of

475
00:20:57,270 --> 00:20:54,570
that is the evolution of the human

476
00:20:59,430 --> 00:20:57,280
spaceflight in terms of duration and of

477
00:21:01,680 --> 00:20:59,440
course you know we've got the cruise up

478
00:21:04,290 --> 00:21:01,690
there on roughly six month rotation and

479
00:21:07,170 --> 00:21:04,300
we just named the two crew members that

480
00:21:09,450 --> 00:21:07,180
are going to go and live on the ISS for

481
00:21:11,550 --> 00:21:09,460
a year so you know your your first

482
00:21:14,370 --> 00:21:11,560
flight was four days and then scott

483
00:21:16,650 --> 00:21:14,380
kelly and mikhail kornienko next flights

484
00:21:18,930 --> 00:21:16,660
will be you know one year in durations

485
00:21:21,270 --> 00:21:18,940
and that's that probably will be

486
00:21:23,160 --> 00:21:21,280
considered at some point hopefully maybe

487
00:21:26,130 --> 00:21:23,170
just a baby step for the kind of

488
00:21:28,230 --> 00:21:26,140

durations that we're looking toward with

489
00:21:32,280 --> 00:21:28,240
Orion and you know possibly future

490
00:21:34,200 --> 00:21:32,290
spacecraft well we still have so much to

491
00:21:36,540 --> 00:21:34,210
learn I mean we have learned tremendous

492
00:21:39,450 --> 00:21:36,550
amounts about human physiology and a

493
00:21:42,510 --> 00:21:39,460
microgravity environment we're fortunate

494
00:21:45,360 --> 00:21:42,520
in in Earth orbit that were protected by

495
00:21:47,610 --> 00:21:45,370
our magnetosphere from the radiation of

496
00:21:50,220 --> 00:21:47,620
space but we have to come up with better

497
00:21:52,530 --> 00:21:50,230
means of shielding crews from radiation

498
00:21:55,260 --> 00:21:52,540
on these long-duration flights as we

499
00:21:57,650 --> 00:21:55,270
leave planet earth right now the crews

500
00:22:00,450 --> 00:21:57,660
on orbit exercise for two hours a day

501
00:22:03,390 --> 00:22:00,460
aerobic in strength resistive exercise

502
00:22:04,700 --> 00:22:03,400
and we found that you know that's

503
00:22:07,760 --> 00:22:04,710
mandatory to

504
00:22:11,500 --> 00:22:07,770
crews home with the minimal bone loss

505
00:22:14,930 --> 00:22:11,510
with you know muscles that still work

506
00:22:16,970 --> 00:22:14,940
systems wise we have to do a better job

507
00:22:18,560 --> 00:22:16,980
designing our environmental control

508
00:22:20,269 --> 00:22:18,570
systems so that you know they'll

509
00:22:21,919 --> 00:22:20,279
actually last for a year and a half so

510
00:22:25,299 --> 00:22:21,929
we can go someplace like Mars with

511
00:22:27,590 --> 00:22:25,309
current propulsion technology you know

512
00:22:29,180 --> 00:22:27,600
my example that I always uses the

513
00:22:31,760 --> 00:22:29,190

electron on the Russian side that

514
00:22:34,690 --> 00:22:31,770
generates electricity I mean oxygen

515
00:22:37,190 --> 00:22:34,700
through electrolysis it's a it's got a

516
00:22:39,320 --> 00:22:37,200
285 day design life it gets replaced

517
00:22:41,690 --> 00:22:39,330
every 285 days and during that time

518
00:22:44,779 --> 00:22:41,700
there are constant repairs on it as with

519
00:22:49,370 --> 00:22:44,789
there are on many of our systems the

520
00:22:51,860 --> 00:22:49,380
cedar you name it and we are learning we

521
00:22:55,220 --> 00:22:51,870
are using the space station as a testbed

522
00:22:56,720 --> 00:22:55,230
to refine and make those systems more

523
00:22:59,180 --> 00:22:56,730
reliable and better so that we can

524
00:23:03,049 --> 00:22:59,190
actually make these trips beyond planet

525
00:23:05,000 --> 00:23:03,059
Earth well it's a it is definitely an

526
00:23:07,029 --> 00:23:05,010
exciting time and and we really

527
00:23:09,889 --> 00:23:07,039
appreciate you taking some time out to

528
00:23:12,470 --> 00:23:09,899
visit us here in Mission Control and and

529
00:23:16,039 --> 00:23:12,480
talk about not only you know the past

530
00:23:18,649 --> 00:23:16,049
and and the anniversary of STS 88 the

531
00:23:20,600 --> 00:23:18,659
start of assembly but also you know

532
00:23:23,149 --> 00:23:20,610
what's in store for us for the future so

533
00:23:27,580 --> 00:23:23,159
Bob we really appreciate you joining us

534
00:23:32,510 --> 00:23:27,590
thanks a lot I'll Kyle it's my pleasure

535
00:23:34,970 --> 00:23:32,520
NASA is a phenomenal team and I know I

536
00:23:36,980 --> 00:23:34,980
have no qualms about our future because

537
00:23:38,269 --> 00:23:36,990
I've seen the people that are coming to

538
00:23:40,730 --> 00:23:38,279

work for us and they currently work for

539
00:23:41,870 --> 00:23:40,740
us and I know that if you challenge them

540
00:23:43,850 --> 00:23:41,880
and give them the tools to get the job

541
00:23:46,220 --> 00:23:43,860
done they can do anything and I believe

542
00:23:48,169 --> 00:23:46,230
we have an outstanding teacher in front